RESEARCH ARTICLE

TikTok – Potential Impact on the Use of Smokeless Tobacco and Betel Quid by Young People

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Abstract

   Introduction: TikTok has gained increasing popularity over the past year. The social media may affect awareness and perceptions of betel quid (BQ) and smokeless tobacco (SLT) by utilizing content generated by TikTok users. The purpose of this study is to examine how BQ and SLT are portrayed on TikTok. **Methods:** The 28 most viewed hashtag-based keywords were used to identify popular BQ and SLT-related videos on TikTok (n=513) from June 2018 to September 2021. Two researchers independently coded the number of likes, shares, views, user category and themes. **Results:** A final sample of 513 videos containing BQ and SLT that met the study criteria were included. Collectively, these videos were viewed over 725 million times, with a median 'view' count of 17,300 (range 152–155,000,000) and a median 'likes' count of 831 (range 4–2,400,000) and a median 'share' count of 21 (range 0–48,400). Majority of the videos showed BQ and SLT use positively i.e promoting the product (390/513; 76%) and these had more than 686 million times views. Neutral depictions of BQ and SLT use were viewed 15 million times (72/513; 14%) and negative portrayals of BQ and SLT have been viewed 193 million times (105/808; 13%). The video themes included 'life style' (349/513; 68.0%), 'marketing' (62/513; 12.09%), 'comedy' (44/513; 8.6%), 'warning' (25/513; 4.87%), 'awareness' (12/513; 2.3%), 'sports and other' (12/513; 2.3%) and social events or culture (9/513; 1.75%). **Conclusion:** Our results demonstrated that video clips related to BQ and SLT on TikTok, a fast-growing, popular video-sharing platform among teens, which is available with no age restrictions has been viewed multiple times. Majority (76%) promoted these two products, that could be detrimental to oral health. Therefore, the age restrictions especially for the videos containing BQ and SLT is mandatory in order to reduce the potential exposure of adolescents/young adults.

Keywords: TikTok- smokeless tobacco- betel quid- social media- teens

Introduction

   Around 600 million people globally chew betel quid (BQ). Three-quarters of its consumption is concentrated in the countries of the Pacific islands, South and Southeast Asia (Auluck et al., 2009). This habit begins at a very young age of almost 13 years and makes adolescents a high-risk group (Sorensen et al., 2005). BQ has a known relaxing and stimulating effect by acting on the autonomic nervous system (Winstock, 2002). The formulation of BQ depends on a variety of factors, which can include the cultural background of the country, regional background, personal preferences, and the availability of certain ingredients. It usually consists of betel leaf, betel/areca nut, slaked lime with or without tobacco (IARC, 2004). Commonly available products are; paan (preparation combining betel leaf with areca nut with/without tobacco), paan masala, supari, chaaliya, guthka and other

smokeless tobacco (SLT) varieties that comprise areca nut, catechu, cardamom, and lime (Warnakulasuriya and Peters, 2002). The use of SLT occurs in various countries around the world and is produced in different forms. These products contain substances harmful to health in different concentrations and nicotine, which are addictive for the user (Hecht, 2003). Snus (the traditional Swedish type of wet snuff) is prohibited for export outside of Sweden. Snus consumption commenced after 1990, initially among young men and young women since 2005 (Larsen et al., 2013). Among young Norwegian people, daily use of snus (19%) is now more common than daily smoking (3%) (https://www.ssb.no/en/statbank/list/royk). Therefore, an emerging trend is noted among young men and women who use both products, where the daily use of snus is more frequent (13%) as opposed to occasional cigarette smoking (7%) (Norwegian Institute of Public Health, 2017).

   Digital media provide increased opportunities for

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both marketing and social transmission of these risky products and behaviours. Adolescents (aged 13 to 18 years) and young adults (aged 18 to 30 years) are particularly vulnerable to the influence of social media in particular and digital communications in general: at the same time, they are early adopters, almost ubiquitous users and highly vulnerable to peer influence (Lenhart, 2015). Cigarette smoking among teens has declined in recent years (Johnston et al., 2017). However, according to a recent survey, ~21% of teens ages 12 to 17 have tried a tobacco product, including traditional cigarette use (13%), electronic cigarettes (11%), cigars (8%), water pipes (7%) and SLT (4%) (Ambrose et al., 2015). An important source of information on these products are freely available and accessible online, especially on social media platforms such as Facebook, Twitter, TikTok and YouTube. Therefore, especially the youngest people get fascinated and become interested in experimenting these harmful substances. However, unlike previous generations, in the present context where modern young people having unrestricted access to a strong source of exposure and peer pressure the tendency to use these harmful substances is becoming an emerging threat. Even though social media can't get teens to directly experiment alcohol or drugs, but has become a powerful motivator.

TikTok is a China-based social network that focuses on videos (Isaac, 2020) and is the fastest growing platform in the world with 800 million monthly users, and one-third of US users are 14 years old or younger. It hosts a variety of short-form user videos from genres such as dance, comedy, and education with a duration of 15 seconds to three minutes (Schwedel, 2018; Al-Heeti, 2020; Kastrenakes, 2021). The TikTok Community Guidelines restrict the uploading of videos that contain "the depiction, advertising, or trafficking of drugs or other controlled substances (Johnston, 2017). Advertising of tobacco and alcohol products is also prohibited on the platform (Tan and, Weinreich, 2020). The main aim of this study was to systematically evaluate the content of popular BQ and SLT videos on TikTok.

Materials and Methods

Sampling strategy

TikTok (https://www.tiktok.com/) posts containing top-viewed BQ and SLT related videos were obtained from the inception of TikTok (earliest upload date June 2018) to September 2021. This study analyzed TikTok posts under the hashtags, #paan, #meetapaan, #bengalipaan, #firepaan, #paanlover, #sweetpaan, #firepan, #arecanut, #tobaccolovers, #betelchewing, #betelnut, #beeda, #sweetbeeda, #firepaanchallenge, #coollipchallenge, #coollip, #gutkha, #snus, #snusaddicts, #snuff, #nicotinepouches, #snusleppa, #snusreview, #snuschallenge, #snuss, #nicopodscz, #smokeless tobacco and #oral cancer. The search revealed a total of 513 posts containing these terms which were posted during this time period. The inclusion criteria for videos were (1) related to BQ and SLT (2) under the top BQ and SLT related hashtags. The final sample contained 513 videos out of 689, after removing duplicates and videos unrelated to

betel quid/nut and smokeless tobacco-related, despite their hashtag (online supplemental Table 1). This study included non-English (n=316) and English language (n=197) videos.

The videos in this study were accessed by TikTok accounts created with an account holder's age set at 25 years. The co-authors first coded this set to identify its relevance to BQ or SLT. We developed our code classification system and codebook based on a random sample of 513 TikTok videos. If a video contained an act or artefact of BQ or SLT consumption, then the video could be coded for content. We developed the codebook based upon this set of relevant videos. The codebook included categories for objective measures: (1) depiction type of the video (encourage, discourage or neutral), (2) Theme of the video (awareness, comedy, lifestyle, marketing, warning, social event or culture, sports and other (3) gender of the primary presenter of the video (male, female or not shown) (4) age of the primary presenter of the video (< 20, > 20 or not shown), (5) number of views (6) number of likes and (7) number of shares. Coding for non-English language videos was based on visual interpretation, or caption/audio, which was translated into English using Google Translator. Descriptive statistic was employed to summarize video themes, depiction type and other metrics.

Results

The eight themes from the final sample of 513 BQ and SLT related videos were: (i) life style (ii) marketing (iii) comedy, (iv) warning, (v) awareness, (vi) social event or culture, (vii) sports and other. Videos categorized as 'life style' were most common (349/513; 68.0%), followed by 'marketing' (62/513; 12.09%), 'comedy' (44/513; 8.6%), 'warning' (25/513; 4.87%), 'awareness' (12/513; 2.3%), 'sports and other' (12/513; 2.3%) and social event or culture (9/513; 1.75%) (Table 1). Collectively, these videos were viewed over 725 million times, with a median 'view' count of 17300 (range 152–155,000,000) and a median 'likes' count of 831 (range 4–2,400,000) and a median 'share' count of 21(range 0–48400). Of 513 videos uploaded to TikTok under the most popular BQ and SLT-related hashtags between June 2018 and September 2021, over two-thirds (76%; 390/513) portrayed BQ and SLT use positively i.e., promotional. Such videos had been viewed collectively more than 686 million times. Among the positive videos, close to a quarter (21%) appeared to be under 25. Neutral depictions of BQ and SLT use have been viewed a total of 15 million times (72/513; 14%) and negative portrayals of BQ and SLT have been viewed a total of 193 million times (51/513; 9.9%). The primary presenter in the videos was perceived to be 49.90% male and 28.07% female. Among them, a maximum number of presenters appeared to be < 20 years (41.71%) followed by > 20 years (29.04%). In the majority of the video's ingredients were shown (79.5%), however, the ingredients were not properly described in many (88.7%). In addition, many uses employed vocal or instrumental sounds (394/513; 76.8%) or narration (104/513; 20.3%) in videos. Videos related to 'paan' were presented by people who appeared to be Asians (258/513;

Table 1. Summary of Key Results and Definitions Used for Coding Depiction Type and Themes (n=513)

	Definition	Number of videos (%)	The collective number of 'views'	The collective number of 'likes'	The collective number of 'shares'
Depiction type					
Positive	Promoting/encouraging BQ and SLT use	390 (76%)	686,748,541	12,086,010	284,935
Negative	Discouraging/deterring the BQ and SLT use	51 (10%)	23,904,531	1,109,559	71,091
Neutral	Ambiguous/no clear position towards BQ and SLT use	72 (14%)	15,235,866	1,217,825	59,959
Themes					
Awareness	Awareness of oral cancer and harmful effects caused by BQ and SLT consumption	12 (2.3%)	11,455,716	143,709	3,294
Comedy	Employs humor and joke when depicting the use of BQ and SLT	44 (8.6%)	17,142,819	1,517,816	96,662
Life style	Consumption of BQ and SLT associated with a desirable lifestyle	349 (68.0%)	498,224,653	9083982	197227
Social event or culture	Use of BQ and SLT in events, shows, social functions and parties	9 (1.75%)	280313	12602	950
Marketing	The action or business of promoting and selling BQ and SLT	62 (12.09%)	181,589,251	239,300	38,873
Warning	Cautionary advice regarding the use of BQ and SLT	25 (4.87%)	8,882,986	662,565	53,883
Sports & other	Association of the use of SLT and sports and other	12 (2.33%)	8,313,200	599,717	25,096
Gender of the primary presenter in the video					
Male	-	256 (49.90%)	334,684,540	6,363,988	189,043
Female	-	144 (28.07%)	377,287,349	7,108,240	142,288
Not shown	-	113 (22%)	13,917,049	941,166	84,654
Age of the primary presenter in the video					
< 20	-	214 (41.71%)	614,917,236	6,174,221	147,823
> 20	-	149 (29.04%)	75,251,987	6,237,599	154,925
Not shown	-	150 (29.24%)	35,719,715	2,001,574	113,237
How to use/step by step illustration					
Present	-	41 (8%)	148,057,116	1,120,105	11,808
Not present	-	191 (37%)	363,062,995	7,191,985	87,191
Partial	-	14 (3%)	133,766,635	606,602	18,067
Not applicable	-	267 (52%)	81,002,192	5,494,702	298,919
Ingredients included					
Yes	-	408 (79.5%)	382,159,749	7,577,185	251,174
No	-	105 (20.5%)	343,729,189	6,836,209	164,811
Ingredients described					
Yes	-	58 (11.3%)	20,914,099	1,583,600	101,199
No	-	455 (88.7%)	704,974,839	12,829,794	314,786
Preparation/use					
Preparation		43 (8.4%)	152,350,904	1,158,149	13,797
Preparation & use		9 (1.8%)	133,739,174	641,612	19,703
Use		261 (50.9%)	386,650,393	9,246,560	183,229
Neither use/preparation		188 (36.6%)	41,692,751	3,223,364	195,962
Not applicable		12 (2.3%)	11,455,716	143,709	3,294
Homemade/ Freshly prepared for commercial purposes /commercially available					
Homemade	BQ that made at home	13 (2.5%)	764,780	50,246	2,037
Freshly prepared for commercial purposes	BQ that made at shops	233 (45.4%)	644,121,966	8,868,446	115,029
Commercially available	SLT products available to buy within a reasonable time at an ordinary commercial price	255 (49.7%)	69,546,476	5,350,993	295,625
Not applicable	-	12 (2.3%)	11,455,716	143,709	3,294
Music/narration					
Music	Vocal or instrumental sounds	394 (76.8%)	687,975,538	11,430,733	271,066

Table 1. Continued

	Definition	Number of videos (%)	The collective number of 'views'	The collective number of 'likes'	The collective number of 'shares'
Music/narration					
Music & narration	A commentary delivered together with a vocal or instrumental sound	4 (0.8%)	508,074	35,060	585
Narration	A commentary delivered regarding the product (BQ and SLT)	104 (20.3%)	32,144,192	2,834,273	143,414
Neither music/narration	-	11 (2.1%)	5,261,134	113,328	920
Country					
Asia pacific	Whole of Asia as well as the countries of the Pacific Rim	258 (50.3%)	647,575,630	9,157,006	126,014
Western country	Majority of Europe and America	255 (49.7%)	78,313,308	5,256,388	289,971
Language					
English	English language	197 (38.4%)	60,587,211	3,852,115	214,344
Non-English	Regional languages in Asian Pacific region	316 (61.6%)	665,301,727	10,561,279	201,641
Year posted					
2021	-	390 (76%)	88,584,649	5,503,267	243,509
2020	-	98 (19.1%)	450,859,170	5,178,027	100,305
2018 and 2019	-	25 (4.9%)	186,445,119	3,732,100	72,171

50.3%), while videos of snus were majorly posted from western countries (255/513; 49.7%).

Categories for objective measures: (1) depiction type of the video (encourage, discourage or neutral), (2) Theme of the video (awareness, comedy, lifestyle, marketing, warning, social event or culture, sports and other (3) gender of the primary presenter of the video (male, female or not shown) (4) age of the primary presenter of the video (<20, >20 or not shown), (5) number of views (6) number of likes and (7) number

The correlation coefficient is an indicator of the strength of the linear relationship between two different variables. A linear correlation coefficient greater than zero indicates a positive relationship, while a value smaller than zero indicates a negative relationship. In these results, the spearman's correlation coefficient between depiction type * age, depiction type * views, depiction type * views, depiction type * likes, depiction type * shares, theme * age, theme * gender, theme * view, theme * likes, theme * shares and age * gender have positive values close to zero which indicates that there is a moderate/weak positive relationship between these variables. However,

Table 2. Non-Parametric Correlation Results

No.	Possible correlations	Spearman's rho	
		Correlation Coefficient	Sig. (2-tailed)
1	Depiction type * theme	-0.151	0
2	Depiction type * age	0.036	0.422
3	Depiction type * gender	-0.017	0.709
4	Depiction type * views	0.063	0.077
5	Depiction type * likes	0.044	0.159
6	Depiction type * shares	0.077	0.042
7	Theme * age	0.079	0.076
8	Theme * gender	0.041	0.35
9	Theme * view	0.059	0.091
10	Theme * likes	0.052	0.121
11	Theme * shares	0.085	0.027
12	Age * gender	0.52	0
13	Age * views	-0.062	0.079
14	Age * likes	-0.102	0.01
15	Age * shares	0.025	0.283
16	Gender * views	-0.203	0
17	Gender * likes	-0.25	0
18	Gender * shares	-0.176	0

Table 3. Chi-Square Test Results

No.	Possible associations	Chi-square test	
		Pearson Chi-Square	Asymp. Sig. (2-sided)
1	Depiction type * theme	408.129	0
2	Depiction type * age	4.025	0.403
3	Depiction type * gender	10.475	0.033
4	Depiction type * views	930.453	0.635
5	Depiction type * likes	876.184	0.275
6	Depiction type * shares	538.472	0.044
7	Theme * age	65.699	0
8	Theme * gender	59.662	0
9	Theme * view	2664.601	0.99
10	Theme * likes	2627.096	0.16
11	Theme * shares	1824.898	0
12	Age * gender	352.284	0
13	Age * views	953.175	0.429
14	Age * likes	878.135	0.26
15	Age * shares	501.143	0.286
16	Gender * views	957.786	0.388
17	Gender * likes	849.762	0.515
18	Gender * shares	453.484	0.837

spearman's correlation coefficient between other variables has negative values. Hence, the relationship between those variables is negative (Table 2).

Since, the p-value of the Chi-square test is less than the significance level $\alpha = 0.05$, based on the results, we can state the following: that there was a significant association between depiction type * theme ($X^2(1) = 408.129$, $p < 0.001$), depiction type * gender ($X^2(1) = 10.475$, $p < 0.05$), depiction type * shares ($X^2(1) = 538.472$, $p < 0.05$), theme * age ($X^2(1) = 65.699$, $p < 0.001$), theme * gender ($X2(1) = 59.662$, $p < 0.001$), theme * shares ($X^2(1) = 1824.898$, $p < 0.001$) and age * gender ($X^2(1) = 352.284$, $p < 0.001$). However, no association was found between other variables (Table 3). Further, the p value of the t test is less than the significance level $\alpha = 0.05$, from this data, it appears that the views and the shares in the videos that discourage BQ and SLT use were statistically significantly higher than the videos encouraging BQ and SLT use ($U = 9643$, $p = 0.033$) ($U = 9702.5$, $p = 0.038$).

Discussion

In order to gain a better understanding of how BQ & SLT related video contents affect people are being exposed to TikTok, this study assessed what types of these videos are present on TikTok and how they are portrayed. We have found that videos promoting BQ & SLT are the most common genres of these videos on TikTok and they are largely portraying the use of these substances as positive or socially acceptable. These Pro-BQ or SLT TikTok videos were also viewed more frequently and rated (liked and shared) much more favorably than anti-BQ & SLT videos, suggesting that viewers enjoy and prefer to watch these types of videos.

There are shreds of evidence that tobacco, SLT or other substance use is widely presented and discussed on social media, often in a positive light, and that these posts are easily accessible and attractive to younger people (Egan and Moreno, 2011; Morgan et al., 2010). This finding is alarming when considering the harm caused by substances like tobacco, SLT and betel quid/areca nut, since, according to social cognitive theory, parts of a person's acquisition of knowledge can be directly related to the observation of others in the context of social interactions, experiences and influences of external media (Bandura, 2001). The actual or perceived behaviours of peers and/or other famous or celebrated persons has been established as the main risk factors for tobacco and other substance use in adolescents and young adults (Bandura, 1971; Bandura, 2001). Repeated exposure to videos that model SLT / BQ use by members of the social media network itself can increase the perceived prevalence of tobacco use among peers, and potentially lead to imitation (Stefanone et al., 2010).

TikTok app introduced video making and sharing to the next level by simplifying and automating the process. The users only have to record everything related to their daily lifestyle and upload it immediately. Due to the short format, neither producing nor viewing videos requires a lot of time or effort. Also, this short video will automatically play when a user launches the app. The videos start to play one after another and the viewer is hugely interested, excited and influenced by these video materials. Due to the addictive nature of their content, it is easy for people to spend hours watching random videos. This app hosts a variety of niche audiences such as music, dance, beauty, sports, fitness, fashion, art, food, and comedy, etc. Studies have shown that people use social media primarily for entertainment purposes other than posting updates related to their personal life. It would be a perfect platform for everyone to freely share their creativity. Further, the hashtags inspire users to enter various contests and give the smallest account a chance to become a viral star (Cialdini and Trost, 1998). In the present study, we have identified the following challengers among the users such as #firepaanchallenge, #coollipchallenge, #snuschallenge in related to BQ and SLT.

Oral squamous cell carcinoma (OSCC) is a particular type of cancer classically known as a tobacco and alcohol-related disease that mainly affects older male patients. However, epidemiological studies have shown an increasing incidence of oral cancer (OC) in younger people (Bhandari, 2021). The relative frequency of OC in patients younger than 40 years varies between 0.4% and 3.6% but can reach 6.7% in studies considering 45 years as the cutoff point (Schmidt et al., 2015). The most common oral subsite of SCC on younger patients is the tongue, accounting for 39-77% of cases (Llewellyn et al., 2001; O'Regan et al., 2006). A study based in Taiwan found a higher incidence of OSCC in the buccal mucosa (53.6%) compared to the tongue (42.8%), but betel chewing was common in these patients (Shiboski et al., 2005). The use of BQ has proven to be associate with OC and potentially malignant lesions such as oral submucous fibrosis (OSF) and leukoplakia (Ho et al., 2008). BQ has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC) (Zaw et al., 2016; IARC; 2004). The use of SLT also has many oral effects such as OSCC, erythroplakia, leukoplakia, OSF (if mixed with areca nut), periodontitis (or gum diseases) and staining of teeth (Lin et al., 2006). However, the prevalence of cigarette smoking in the US has decreased in the past few years (22.2% in 2005 vs. 19.1% in 2010), and SLT use has increased slightly, but not significantly (prevalence of 2.7% in 2005 compared to 3.0% in 2010) (Muthukrishnan and Warnakulasuriya, 2018). Like other smoking tobacco products, SLT products also possess various carcinogens, such as tobacco-specific nitrosamines (Mazurek et al., 2014; IARC, 2007). IARC has concluded that there is sufficient evidence of carcinogenicity for SLT (IARC, 2012). The risk of OSCC resulted due to SLT use largely depend on the type of tobacco used and the geographical regions (Asthana et a., 2019).

However, there is no age restriction for these publicly available videos containing harmful substances. And the TikTok Community Guidelines state that "the display, promotion or trafficking of drugs or other controlled substances is not allowed" and users are encouraged not to post or share any "content that involves the purchase, sale, marketing or drug advertising", or other controlled substances, alcohol or tobacco products" (https://www.tiktok.com›community-guidelines). A statement from

TikTok once stated: "We strictly prohibit content that depicts or promotes the possession or use of tobacco and drugs by minors. We will remove content and accounts dedicated to promoting these substances and will not allow the promotion of such products including tobacco products or nicotine bags" (https://www.theguardian.com/society/2021/jul/27/urgent-need-for-age-restrictions-on-tiktok-vaping videos-Australian-study-finds). However, in the present study we have come across with 2 videos with children less than 5 years chewing BQ (or 'meetapaan'), which collectively had over 139,000 views. According to the terms and conditions of TikTok's, 13 is the minimum age for a TikTok user. However, TikTok does not use age verification tools when new users sign up for the app. This means that even a child can sign up for a new account without their parents/guardian knowledge, they will have access to explicit and inappropriate content. Therefore, age restrictions should be implemented for videos containing such harmful substances. The countries in high-risk regions for these substances should formulate and implement policies stringently for the regulation of such content available on social media. In the limitation of the study due to cosmetics such as lipstick or powder applied to the face (used to enhance or alter the appearance), hair extensions, filters (beauty filters) and other effects in TikTok we were unable to determine the real age of the primary presenter in few instances.

In conclusion, BQ or SLT-related video content available on TikTok reaches millions of viewers "Lifestyle' and 'marketing' themes videos dominated these user-generated TikTok videos related to BQ and SLT. TikTok has become the most popular app among young people globally and downloaded on devices more than 2 billion times. Due to the unique features of TikTok, especially the users can record themselves dancing or goofing around with a music clip or spoken word and then can alter the videos using a wide range of effects, young people have flocked to it. With the lack of age restrictions and regulations of posting such harmful substances, there is a potential threat on children/adolescents to get affected by such content. Hence, age restrictions are largely needed to prevent the younger generation get exposed to these harmful substances.

Author Contribution Statement

Kalpani Senevirathna: Data curation, Methodology, Formal analysis, Writing – original draft; Kalani Hettiarachchi: Data curation, Methodology, Writing – original draft, review & editing; Saman Warnakulasuriya: Conceptualization, Writing – review & editing; Ruwan Jayasinghe: Methodology, Writing – review & editing

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References

Al-Heeti A (2020). TikTok is reportedly experimenting with 3-minute videos. *CNET*, **2020**.

Ambrose BK, Day HR, Rostron B, et al (2015). Flavored tobacco product use among US youth aged 12-17 years, 2013-2014. *JAMA-J AM MED ASSOC*, **314**, 1871–3.

Asthana S, Labani S, Kailash U, Sinha DN, Mehrotra R (2019). Association of smokeless tobacco use and oral cancer: A Systematic Global Review and Meta-Analysis. *Nicotine Tob Res*, **21**, 1162-71.

Auluck A, Hislop G, Poh C, Zhang L, Rosin M (2009). Areca nut and betel quid chewing among south Asian immigrants to western countries and its implications for oral cancer screening. *RRH*, **9**, 1118.

Bandura A (2001). Social cognitive theory of mass communication. *Media Psychol*, **3**, 265–99.

Bandura A (1971). Social learning theory. New York, NY: General Learning Press.

Bhandari S (2021). Why is TikTok Popular among Teens? https://mobilespy.io/blogs/why-is-tiktok-popular-among-teens. Accessed Oct 11, 2021.

Cialdini RB, Trost MR (1998). Social influence: Social norms, conformity and compliance. In: Gilbert DT, Fiske ST, Lindzey G. eds. The handbook of social psychology. 4th ed. New York, NY: McGraw-Hill; pp 151–92.

Egan KG, Moreno MA (2011). Alcohol references on undergraduate males' Facebook profiles. *Am J Men's Health*, **5**, 413–20.

Hecht SS (2003). Tobacco carcinogens, their biomarkers and tobacco-induced cancer. *Nat Rev Cancer*, **3**, 733-44.

Ho HC, Lee MS, Hsiao SH, et al (2008). Squamous cell carcinoma of the oral cavity in young patients: A Matched-Pair Analysis. E*ur Arch Oto-Rhino-L*, **265**, 57-61.

IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, World Health Organization, International Agency for Research on Cancer. Betel-quid and areca-nut chewing and some areca-nut-derived nitrosamines. IARC; 2004.

International Agency for Research on Cancer. Personal Habits and Indoor Combustions: Smokeless Tobacco. (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol 100E). Lyon, France: International Agency for Research on Cancer; 2012.

International Agency for Research on Cancer. Smokeless Tobacco and Some Tobacco-Specific N-Nitrosamines. (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol 89). Lyon, France: International Agency for Research on Cancer; 2007.

Isaac, M (2020). U.S. Appeals Injunction Against TikTok Ban. The New York Times.

Lloyd JD, Patrick OM, Richard MA, Jerald BG, John SE (2017). Monitoring the future national survey results on drug use, 1975–2016: overview, key findings on adolescent drug use. http://www.monitoringthefuture.org/pubs/monographs/mtf-overview2016.pdf. Accessed Oct 12, 2021.

Kastrenakes J (2021). TikTok is rolling out longer videos to everyone. The Verge.

Larsen E, Rise J, Lund KE (2013). Risk and protective factors of adolescent exclusive snus users compared to non-users

of tobacco, exclusive smokers and dual users of snus and cigarettes. *Addict Behav*, **38**, 2288–94.

Lenhart A (2015). Teens, social media & technology overview. https://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015. Accessed Oct 15, 2021.

Lin C-F, Wang J-D, Chen P-H, et al (2006). Predictors of betel quid chewing behavior and cessation patterns in Taiwan aborigines. *BMC Public Health*, **6**, 1.

Llewellyn CD, Johnson NW, Warnakulasuriya KA (2001). Risk factors for squamous cell carcinoma of the oral cavity in young people- a comprehensive literature review. *Oral Oncol*, **37**, 401-18.

Mazurek JM, Syamlal G, King BA, Castellan RM (2014). Smokeless tobacco use among working adults-United States, 2005 and 2010. *Morb Mortal Wkly Rep*, **63**, 477-82.

Morgan EM, Snelson C, Elison-Bowers PR (2010). Image and video disclosure of substance use on social media websites. *Comput Hum Behav*, **26**, 1405–11.

Muthukrishnan A, Warnakulasuriya S (2018). Oral health consequences of smokeless tobacco use. *Indian J Med Res*, **148**, 35–40.

Norwegian Institute of Public Health (2017). Public health report, chapter "tobacco consumption in Norway" [in Norwegian: Røyking og snusbruk].

O'Regan EM, Timon C, Sheils O, et al (2006). Squamous cell carcinoma of the head and neck in young Irish adults. *Br J Oral Maxillofac Surg*, **44**, 203-6.

Schmidt LB, Tjioe KC, Assao A, et al (2015). Contemporary Issues in Head and Neck Cancer Management || Oral Squamous Cell Carcinoma in Young Population-Risk Factors, Clinical Presentation, and Prognosis.

Schwedel H (2018). A Guide to TikTok for Anyone Who Isn't a Teen. Slate Magazine.

Shiboski CH, Schmidt BL, Jordan RC (2005). Tongue and Tonsil Carcinoma: Increasing Trends in the U.S. Population Ages 20-44 Years. *Cancer*, **103**, 1843-49.

Sorensen G, Gupta PC, Sinha DN, et al (2005). Teacher tobacco use and tobacco use prevention in two regions in India: qualitative research findings. *Prev Med*, **41**, 424–32.

Statistics Norway: Smoking habits. 2018. https://www.ssb.no/en/statbank/list/royk. Accessed. Oct 17, 2021.

Stefanone M, Lackaff D, Rosen D (2010). The relationship between traditional mass media and "social media": Reality television as a model for social network site behavior. *J Broadcast Electron Media*, **54**, 508–25.

Tan ASL, Weinreich E (2020). #PuffBar: how do top videos on TikTok portray Puff Bars?. *Tob Control*, **0**, 1–2.

Warnakulasuriya S, Peters T (2002). Introduction: biology, medical and socio-economic aspects of areca nut use. *Addict Biol*, **7**, 75–6.

Winstock A (2002). Areca nut-abuse liability, dependence and public health. *Addict Biol*, **7**, 133–8.

Zaw K-K, Ohnmar M, Hlaing M-M, et al (2016). Betel quid and oral potentially malignant disorders in a periurban township in Myanmar. *PLoS One*, **11**, e0162081.