Title: Smoking and Vaping during the COVID-19 Pandemic: A qualitative study among healthcare workers in a low and middle-income country (TobV-ID)

Running Title: Smoking and Vaping during the COVID-19 Pandemic

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Abstract

Objective: To investigate social, economic, and environmental contributors to quit or continue smoking and vaping during the COVID-19 pandemic.

Methods: A qualitative study design was adopted to identify smokers' beliefs in a LMIC, using a small community sample.

Results: 276 participants were primarily surveyed. Motivation to continue smoking included temporary pleasurable effects, working remotely, stress or anxiety, whereas a motivator to quit smoking was the overlap with COVID-19 symptomatology. There was a rise in social awareness regarding the potential harm of smoking and vaping during the pandemic yet those participants who were younger felt they were immune from its morbid complications.

Conclusions: With paradoxical associations of COVID-19 with cigarette and vape usage, it is important to pay attention to biases in data in favor of educating its users of the increased risk of severe disease.

Keywords: Tobacco, smoking, vaping, COVID-19, motivation, social, environmental

1. Introduction

Tobacco is a leading cause of morbidity and mortality in low and middle-income countries (LMICs). According to the World Health Organization (WHO), tobacco kills over half of its users, with over 8 million deaths every year due to direct tobacco use, whereas another 1.2 million deaths are due to non-smokers exposed to second-hand smoke (1). Over 80% of the

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world's 1.3 billion tobacco consumers live in LMICs, which are target customers of the tobacco industry marketing and interference (1). Tobacco products expose users to toxic chemicals, many of which cause cancer. Electronic nicotine delivery systems and electronic non-nicotine delivery systems, which are commonly referred to as e-cigarettes do not contain tobacco, but may or not have nicotine (1). While it is early to provide the long-term impact of electronic cigarettes, they are deemed harmful to health and are considered undoubtedly unsafe (1).

To comprehend the smoking continuation and quitting process, apart from the addiction, it is essential to understand factors contributing to behavioral changes. Several theories are noted in published literature. The first describes smoking cessation as the PRIME theory of motivation, which pertains to a) plans, b) responses, c) impulses, d) motives, e) evaluations (2)(3)(4). As per this theory, smokers' beliefs about the risks and individual benefits of smoking determine quitting decisions. This motivation is linked to internal desires to smoke and social or environmental cues which impact behaviors. The second is the Transtheoretical model that makes a broad assumption that the smoker will undergo a series of changes before ultimately quitting (4). The stages include a) pre-contemplation, b) contemplation, c) preparation, d) action, and e) maintenance (5). In all these stages, a specific desire to proceed must have been achieved. At all these stages, the smoker requires different levels of motivation and support (6).

A majority of smokers quit around the age of 40 years, while it has been suggested that quitting before the age of 35 years is associated with a life expectancy similar to non-smokers(7). Young adulthood is a critical time for smoking continuation or cessation. Individuals of low socioeconomic status have higher nicotine dependence and reduced successfully quitting attempts (8). Also, smoking cessation is lower among those who have anxiety or depressive symptoms, and these individuals have a higher relapse(9). The Centers

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for Disease Control and Prevention (CDC) states that communities have faced various mental health challenges related to COVID-19 associated mitigation activities and morbidity/mortality trends (10).

We aimed to investigate factors related to continuing smoking or vaping by exploring aspects related to the motivation to quit and social, economic, and environmental contributors during the COVID-19 pandemic. Ultimately, the typology of those who smoke and vape is matched to a wide range of environmental and social interventions to help quit long-term. A qualitative study design was adopted to truly identify smokers' beliefs in an LMIC using a small community sample. The key trends among HCWs who vape was identified that connect with levels of motivation to quit.

2. Methods

2.1. Study design

Qualitative focus groups and semi-structured telephonic interviews were conducted with HCWs who confirmed vaping or smoking in the screening survey.

2.2. Participants and recruitment

A purposive approach was used to recruit an HCW sample of those who smoke or vape aged 18 years or older who were not currently engaged in quitting attempts. HCWs were recruited from a variety of medical centers across Pakistan and included a range of screening questions. Signed consent forms were signed and a non-disclosure agreement was virtually signed with the full extent of the study objectives, aims, methodology, and eventual data sharing listed. Recruitment was aimed to continue until theoretical saturation was reached (i.e. where no new meaningful data could be obtained). Institutional emails were mainly used and a form was emailed to newly enrolled participants who, by the snowball technique, recruited additional research participants.

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2.3. Study instrumentation

The survey was titled (TobV-ID) representing **Tob**acco, **V**aping, and COV**ID**-19. All participants who agreed to partake in the study were screened with current smoking and vaping trends, along with administrating a validated Readiness to Quit Ladder; the scale consisted of 10 items with questions ranging to "I will not quit smoking for my lifetime, I have no interest in quitting smoking." All researchers reached a consensus that a score of 5 or below had low motivation to quit and those HCWs with a score of 6 or above had relatively higher motivation to quit. The participants responded to a questionnaire designed to collate data on demographic data and smoking trends among users. A semi-structured interview was developed by all researchers to explore various factors in identifying the attitudes and traits of both smokers who had a high and/or low motivation to quit during the COVID-19 pandemic. The semi-structured interview was flexible with relevant questions to fixate the discussion on relevant topics. The following is the list of the semi-structured interview questions:

1. *How many packs of cigarettes do you smoke daily?*
2. *For how many years have you been smoking/vaping?*
3. *Could you describe situations when you needed a cigarette or had the urge to vape since the COVID-19 pandemic?*
4. *How does smoking make you feel in these circumstances where the deadly virus mainly inhabits the lungs?*
5. *Are you aware of any additional risks smoking/vaping have to your general health during the survival of the healthiest during pandemics like COVID-19?*
6. *Have you noticed any change in smoking or vaping behaviors due to COVID-19?*
7. *Do you have colleagues/friends/close family members who smoke cigarettes?*

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8. *Do you find smoking or vaping to be well within your economic budget per month (probe for any economic difficulties in obtaining cigarette smoking/vaping or other tobacco use)?*
9. *In what situations would you consider tobacco or vaping unacceptable?*
10. *Do you plan to quit in the near or possible future (If no, why not)?*

2.4. Interview procedure

Participants were recruited through word of mouth, emails, and by recruited participants in medical centers. Potential participants were sent a screening survey with current smoking/vaping habits and basic demographic information. The primary author and the research team (experienced public health medical doctors trained in mixed research methods) recruited study participants and conducted one-on-one telephonic interviews for four months in 2021. To participate in this study, HCWs had to meet the following inclusion criteria: (1) identify as a healthcare worker; (2) 18 years or older; (3) report tobacco or vaping use; (4) agree to the informed consent form; (5) agree to have interviews digitally recorded. In addition, peers were invited who met the inclusion criteria and the average interview was planned for 30-60 minutes. No focus groups or live interviews were conducted due to the high risk of COVID-19 transmission. No financial payment was made for their participation and any or all involvement was voluntary.

2.5. Data analysis

All shortlisted interview candidate data were analyzed using thematic framework analysis to allow for themes to emerge based on the interview questions listed earlier. Pre-existing themes that were expected to be prevalent in an LMIC including Pakistan were inferred by all researchers. Digital recordings of the telephonic interview data were transcribed and entered into NVivo 10 (a qualitative software package to manage and code all entered data). The

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created categories were refined using the data received from the transcripts and all data that was closely associated were grouped using a unanimous code. The primary author oversaw the coding and created a preliminary table in a shared spreadsheet that listed first to second-level categories and all potential subheadings that could be qualitatively identified. At this stage, all authors identified relationships between the codes and the relationships aligned to our study. We further re-read the transcribed data and refined the smoking and vaping trends, possibly economic factors, or pandemic-induced psychological contributors. All statements were used verbatim and any discrepancies were actively resolved until a consensus among all the authors was reached.

Assessing the credibility and reliability of our analyses was imperative as subjectivity could be present. First, we ensured that the primary author (who led the first stage of data handling as described earlier) was unaware of any demographic details of the participant. This ensured that a fair reflection of the interview data would be made. Second, we reread all entries individually without any inter-researcher communication to identify themes and sub-themes. This process was carried for a total of four months during the coding process and all interpretations and analyses were rooted in the data. Third, all authors finally engaged with the data together and notes were made throughout the final analyses reflecting on the process and finally collating our themes and making recommendations.

3. Results and Data Interpretation

3.1. Sociodemographic characteristics of all participants

A total of 276 participants were primarily surveyed (Table 1). Non-smokers formed 94.9% of the respondents (n=262), whereas those with low motivation to quit smoking (Group A) formed 3.3% (n=9), and those with high motivation to quit smoking/vaping (Group B) formed 1.8% (n=5). The mean age of all participants was 31.9 years (SD=6.9). The mean age

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of non-smokers was 31.8 years (SD= 31.8); those with low motivation to quit had a mean age of 34.6 years (SD=10.1), and those with high motivation to quit presented with a mean age of 30.2 years (SD=5.5). Of non-smokers, 28.2% were single (n=74), and 71.8% were living with a family member (n=188). Of group A, 44.4% were single (n=4), and 55.6% were living with a family member (n=5). Group B comprised of 60% participants who were single (n=3), and 40% who were living with a family member (n=40). The income per month (in $) of all surveyed participants was 956.5 (SD=42.7). Group A had a standard income of $833.4 (SD=212.4), whereas participants from group B earned a mean wage of $1039 (SD=279.3). Group A members smoked 22.2 cigarettes on average (SD=2.4). Of the 5 respondents in group B who confirmed vaping, the average ml per day was an estimated daily use of their e-liquids or nicotine salts; the mean value was 2.9 ml per day (SD=0.3). Whereas, all members of group B confirmed to smoking as well with a mean value of 6.6 cigarettes a day (SD=1.4). Of the nine members in group A, one respondent attempted to quit cold turkey (11.1%), whereas the other eight did not make any attempts (88.9%). Of group B, two members attempted NRT (40%), and three members tried to quit vaping/smoking cold-turkey (60%).

Characteristic	Non-smokers (n=262)	Group A: Low motivation to quit (n=9)	Group B: High motivation to quit (n=5)
Total participants (N=276)	262, (94.9%)	9, (3.3%)	5, (1.8%)
Male (n, %)	151, (57.6%)	6, (66.6%)	2, (40%)
Age in years (Mean, SD)	31.8 (SD=6.8)	34.6 (SD=10.1)	30.2 (SD=5.5)
Marital status Single (n, %)	74, (28.2%)	4, (44.4%)	3, (60%)

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Living with a family member (n, %)	188, (71.8%)	5, (55.6%)	2, (40%)
Current employment status Employed (n, %) Unemployed (n, %) Student (n, %)	 206, 14, 42,	 7, 1, 1,	 4, 0, (0%) 1,
Income per month in $ (Mean, SD)	956.5 (SD=42.7)	833.4 (SD=212.4)	1039 (SD=279.3)
Vaping/tobacco consumption Cigarettes per day (Mean, SD) Average ml per day (Mean, SD)	- 	 22.2 (SD=2.4) -	 6.6 (SD=1.4) 2.9 (SD=0.3)
Tried to quit due to COVID-19 (n, %) NRT method (n, %) Cold-Turkey (n, %) No attempts made (n, %)	- 	 0, (0%) 1, (11.1%) 8, (88.9%)	 2, (40%) 3, (60%) 0, (0%)

Table 1. Sociodemographic characteristics of all participants

3.2. Individual contributors associated with motivation to quit

Group A consisted of participants who had low motivation to quit during the pandemic with high satisfaction levels among themselves. This group may be defined as the smoking community. The group had a positive association to belonging in their healthcare communities. This group of smokers may be called an ephemeral community. The ban on indoor smoking may hinder this community from smoking in public places, but the vaping community may not face similar barriers towards public consumption. Three settings emerge which are important: workplace, social group settings, and home.

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"At work, my colleagues who smoke are one group, and those who do not are another. Smoking is considered an act of catching up and negative some of the stresses we faced at the start of the COVID-19 pandemic." [1] (Group A)

"I was an irregular smoker and began vaping a little time before the pandemic was introduced in our country. I switched to vaping entirely and noticed that I consumed far more at home or with friends due to my fear towards the entire situation at the start." [2] (Group B)

3.2.1 Underlying individual actors reducing motivation to quit

The most common individual reasons reducing motivation to quit during the pandemic included the temporary pleasurable effects, lack of work (working from home), stress or anxiety, as a means of communication with their colleagues. All members in Group A stated that while they were biologically addicted to the effects of nicotine, most of them felt a psychological urge to continue their habit of smoking through the pandemic.

"I'd like to believe that nicotine does not have the same effect on me like it used to but I like to start my day with a quick hit and tend to have them throughout the day." [3] (Group A)

In contrast, participants also expressed that they strongly considered quitting during the pandemic. In one case of relapse following a successful quitting attempt for 2 months:

"I dislike being a smoker and I do not like the social image of smokers. I tried quitting for 2 months when the pandemic began, but I ended up smoking one cigarette at home and continued smoking packs throughout the second and third waves of the pandemic." [4] Group B

3.2.2 Underlying individual factors increasing motivation to quit

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The aggravating effects of smoking such as upper respiratory tract infections, sore throats, and smoker's cough were frequently mentioned. The loss of the sense of smell and test could potentially be confused with a COVID-19 infection and one participant expressed some benefits of quitting.

> *"I have felt short of breath for years and I have not been able to exercise frequently. When members of my family and some of my friends had a COVID scare, I could not differentiate my regular symptoms from the infection. I felt under constant threat of the infection"* [5] (Group A)

3.3. Social and environmental contributors during COVID-19

3.3.1. Infographics and social media

Many participants confirmed witnessing a rise in anti-smoking infographics online. They received social media alerts on Facebook, Instagram, and WhatsApp. Certain participants witnessed a rise in video content yet continued to smoke during the pandemic. Group A members saw online posters of electronic cigarettes, risks from smoking, and annual death rates due to cigarette smoking.

> *"Every day when I scroll through my socials, I see a new infographic with the harmful effects of smoking and what it can do to your lungs. I do not think every smoker dies of lung cancer though. I have seen many lives through their 90s. I feel healthy and do not think these daily shares will lead to change anytime soon, be it COVID or no COVID."* [6] (Group A)

Moreover, anti-vaping prevention materials published as online video ads and posters were also reported by one participant.

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"I started vaping three years back and I have never wanted to quit. I once saw an article about popcorn lungs and I will admit that I was a little fearful back then. But I feel healthy and would like to not think about the could-be effects of vaping. I guess we will have to wait and see in the coming years." [7] (Group A)

3.3.2. The tie-in to global anti-smoking campaigns

Users from both groups recalled seeing images of diseased body parts as part of anti-smoking campaigns in the country. The belief behind these campaigns is that hard-hitting tobacco ads may lead to negative emotions among current users and will help in promoting quitting attempts while reducing initiation by the youth. Users also felt that anti-smoking campaigns increased their information and awareness about the availability of cessation services, while their motivation to quit was self-led.

"*I have been a smoker for around 15 years. I have recently noticed an increase in anti-smoking campaigns. There has been a rise in disclaimers before a lot of film content I see online too. I have noticed that the educated youth detests smoking cigarettes but is keen to try vaping*." [8] (Group A)

3.3.3. The unknown relationship of vaping to long-term health (2 B B)

Those who vaped considered it a benign variant of smoking. However, one participant who expressed concerns about quitting vaping reasoned with the long-term unknown consequences of vaping. Concerns about unknown pulmonary reactions were made in addition to the rise of acute deaths due to vaping.

"*In all honesty, the popcorn lung news I saw a few years back seems like a rare occurrence. Vaping has been a benign addiction and has powered me through COVID-19*." [9] (Group B)

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A participant suggested that quitting smoking and vaping is very similar due to nicotine addiction. All users believed that a mental affliction to vaping was present.

> "*Vaping and smoking are two sides of the same coin. Every day I see 2 in 3 people smoking at the hospital. I would rather them vape than smoke carcinogens in the environment*." [10] (Group B)

3.4. The "immunity" reaction

The young participants felt like they were immune to all the long-term health effects of smoking or vaping. The top reason cited among participants younger than 30 included their moderate-to-high quality of health. Additionally, they reported that none of the campaigns truly hindered them from trying smoking or vaping. The older age groups felt the very first urge to smoke due to peer pressure at a younger age or fashion.

> *"Back in the times, we did not have the internet and did not understand the long-term effects of smoking. I remember the first time I tried smoking was because my friends were doing it. I feel healthy and will not be quitting anytime soon. My father was a tobacco user and lived a full life."* [11] (Group A)

However, one theme was common among most of the young participants. They did not feel immune to the coronavirus but felt like they would not have a mortality rate due to the lack of other comorbidities.

> *"I did catch the virus recently but got better in a few weeks. While I am aware of the harmful effects of COVID-19, I do not have any other serious disease and I lead a relatively active lifestyle."* [12] (Group A)

3.5. Pricing and economic contribution

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One of the most important recurring themes during the COVID-19 pandemic has been budgetary constraints to afford e-liquid, vaping kits, replacements, and so forth. However, given the nature of the users included in this study, participants reasoned that the prices of a pack were very affordable in their country and they did not feel any difficulties affording one pack of cigarettes during the pandemic.

> *"While I had variable work schedules, I was employed throughout the pandemic and did not face any issues in buying my regular vaping liquid or coils."* [13] (Group B)

One user stated that one pack of cigarettes could cost anywhere from $0.5 to $10 with wide accessibility.

> *"I was shifting jobs when the pandemic began. With travel restrictions, I stayed at home for a couple of weeks. I switched to buyer cheaper cigarette packs, but they were within my monthly budget."* [14] (Group A)

4. Discussion

There is a lack of clear understanding between COVID-19 and smoking/vaping in the literature. Cigarette smoking has been cited as the strongest risk factor for developing cardiovascular and pulmonary diseases (CVPD) (11). While cigarette smoking has declined in high-income countries (HICs), the major burden of cigarette smokers is in LMICs. A lack of adequate awareness has been cited among young adults regarding the potential cardiopulmonary risks of nicotine and associated products as is evident in our findings as well (12). Furthermore, there has been a new generation of consumers who have shifted to electronic cigarettes (e.g. vapes). The overall prevalence of active smokers who have been hospitalized with COVID-19 ranges between 5.1% to 15.6% (13–16). Several studies have reported a paradoxical effect of smokers (current or previous) appearing less likely to contract COVID-19 infection. Simons et al. found a pooled relative risk (RR) of 0.74 (95%

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CI: 0.58-0.93) for current smokers and 1.05 (95% CI: 0.95-1.17) for previous smokers for contracting COVID-19 infection (17). Nevertheless, these findings may be limited due to an over-representation of current smokers indicating selection bias. As explained in the studies, smokers are more likely of having a cough that collides with COVID-19 infection symptomatology, warranting testing. The paradoxically lower COVID-19 incidence rates identified across studies are also further compounded with a lack of consistent electronic health records of smoking histories among patients (17). Recent studies have reported a significant increase in the severity and mortality for COVID-19 amongst active or previous smokers (18,19). However, evidence has also demonstrated inconclusive outcomes for current or previous smokers (17).

The association of smoking with angiotensin-converting enzyme 2 (ACE2) has been contradictory with Brake et al. reporting an upregulation of the ACE2 expression (20). However, Oakes et al. identified downregulation of ACE2 expression with data reported before the COVID-19 pandemic (21). With upregulation of ACE2, increased viral receptors for COVID-19 infection may lead to increased viral loads but may decrease disease severity; on the other hand, downregulation of ACE2 may be further decreased by COVID-19 infection due to viral binding thereby promoting disease severity (22,23). Various claims regarding the protective effects of smoking on COVID-19 ought to be taken with caution considering there are hypotheses for both protective and detrimental outcomes of smoking with COVID-19 infection (24). Public health efforts to minimize information on the potentially protective effects of smoking seem appropriate considering the lack of adequately mature data on the impact of smoking on COVID-19 incidence and outcomes. Furthermore, healthcare providers play a vital role in emphasizing smoking cessation as part of public health efforts during the COVID-19 pandemic.

5. Conclusion

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The COVID-19 pandemic has contributed as a motivator to quit smoking due to fear of morbidity and mortality in our study. The affordability of smoking and vaping, however, serves to encourage smoking and vaping alongside the increased isolation during the early stages of the pandemic. Social campaigns have encouraged smokers to quit to improve the chances of these individuals to avoid infection and prognosis. To our knowledge, our study is the first to explore qualitative aspects of cigarette and vape usage during the COVID-19 pandemic in an LMIC with an already-high burden of smokers.

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