Taxation and tobacco plain packaging effect on Saudi smokers quitting intentions in Riyadh city, Saudi Arabia

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ABSTRACT

الأهداف: دراسة تأثير زيادة ضريبة التبغ وتطبيق التغليف البسيط على نوايا الإقلاع عن التدخين لدى الذكور في المملكة العربية السعودية.

المنهجية: استخدمت هذه الدراسة المنهج الكمي حيث وزعنا استبيانات مغلقة على 1,015 مشاركاً من الذكور من مختلف مناطق مدينة الرياض بالمملكة العربية السعودية. أجري التحليل ثنائي المتغير وتحليل الانحدار اللوجستي باستخدام برنامج SPSS لتحليل البيانات الأولية التي تم جمعها.

النتائج: اظهرت الدراسة ارتباطًا مهمًا بين الضرائب والتغليف البسيط عند الإقلاع عن التدخين نوايا المدخنين. فيما يتعلق بالضرائب، بينما ذكر عدد كبير من المشاركين (46.5%) أنهم لن يقلعوا عن التدخين إذا ارتفعت أسعار السجائر، قال المشاركون الذين كانوا يخططون للإقلاع عن التدخين إن ذلك سيعزز نيتهم (p>0.001). بالإضافة إلى ذلك، أجري انحدار لوجستي لتحديد المتنبئين المستقلين لنية الإقلاع عن التدخين. المشاركون الذين لم يرغبوا في تطبيق مفهوم التغليف البسيط على المملكة العربية السعودية كانوا أكثر ميلاً لأن يكون لديهم نية ترك (نسبة الأرجحية: 2.30 [1.61–3.28]) مقارنةً بأولئك الذين أرادوا تطبيق المفهوم.

الخلاصة: على الرغم من أن السعر الحالي لعلب السجائر مرتفع للغاية من قبل المشاركين، إلا أن فرض ضريبة أعلى جديدة قد يحفز المدخنين الذين لديهم خطط للإقلاع في المستقبل القريب. يبدو أن التغليف البسيط يمثل استراتيجية جديدة فعالة بالإضافة إلى ضرائب التبغ في المملكة العربية السعودية، ومع ذلك، فإن الأمر يتطلب مزيدًا من الوقت والمزيد من البحث لتقييم فعالية الاستراتيجية.

Objectives: The current research aims to study the impact of raising tobacco tax and implementation of plain packaging on male smokers' quitting intentions in Saudi Arabia.

Methods: The study adopts a quantitative approach where close-ended questionnaires are distributed among 1,015 male participants from different regions of Riyadh city, Saudi Arabia. Bivariate analysis and logistic regression analysis are conducted using SPSS software to analyze the collected primary data.

Results: The study found a significant association of taxation and plain packaging on the quitting intentions of smokers. On taxation, while a considerable number of participants (46.5%) stated that they would not quit smoking if the cigarette prices increased, participants who were planning to give up smoking said it would strengthen their intention (p<0.001). In addition, logistic regression was performed to identify the independent predictors of quitting intention. Participants who did not want to apply the concept of plain packaging to Saudi Arabia were more likely to have quitting intention (odds ratio: 2.30 [1.61-3.28]) in comparison to those who wanted to apply the concept.

Conclusion: Although the current price of cigarette packs reported to be very high by the participants, imposing a new higher tax may motivate smokers who had plans to quit in the near future. Plain packaging seems to be an effective new strategy in addition to tobacco taxation in Saudi Arabia, yet, more time and further research are required to assess the effectiveness of the strategy.

Keywords: taxation, plain packaging, tobacco, cigarette smoking

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Globally, tobacco use is the leading cause of preventable death with heavy economic impact on countries each year as costs of smoking-related illnesses in terms of direct medical care and lost productivity.[1] An estimated, 6 million people are killed each year as a result of direct tobacco use and second-hand smoke exposure.[2] Tobacco kills one person every 6 seconds. If no serious actions has been taken, the number of deaths will rise to 8 million people per year by 2030.[3] Smoking is a significant preventable public health problem in Saudi Arabia. Though the Kingdom of Saudi Arabia has a population of around 33 million, it ranks fourth in terms of global tobacco imports.[4] Roughly, 14.9% of Saudi Arabian youth and 12% of adults are tobacco users. Furthermore, the prevalence of smoking among men was 23.7%, while prevalence in females was much lower 1.5% as reported by WHO report on the global tobacco epidemic.[5] Recent report on the global tobacco epidemic by the WHO, labeled raising taxes on tobacco as the most effective way to reduce its use.[1] Increasing the price of popular tobacco packs from $2.67 to $8.27 may lead to smoking cessation in Saudi Arabia.[6] Different anti-smoking measures reinforcement in Saudi Arabia by enactment of anti-smoking laws and collaboration with governmental ministries.[7] Plain packaging appears to be promising effective method if implemented in conjunction with other tobacco control polices to reduce the appeal of smoking and packets.[8] In 2012, Australia was the first of the WHO member countries to implement the plain packaging law. Since then, different member states of WHO, including France, Ireland, and the UK have passed similar laws.[9] The effect of plain packaging extended to outdoor settings such as cafés, restaurants and bars led to behavioral change with a reduction in clearly visible packs on tables.[10] However, such measures have given rise to several concerns with many countries, including the USA and Canada, facing legal difficulties as tobacco companies file lawsuits against the placement of warnings and graphic images of tobacco-related diseases on cigarette packages.[11]

In the light of such challenges, it is essential to first understand the impact of these strategies on the intentions of consumers towards their smoking behavior. Thus, the current study aims to assess the influence of tobacco taxation and implementation of plain packaging on the motivations of Saudi male smokers to quit smoking. This will enable policy makers to consider and maintain the application of higher taxes on tobacco and plain packages as tobacco control measures that will con-tribute to other ongoing measures for reducing the prevalence of tobacco smoking in the Kingdom.

Methods. We conducted a cross-sectional study using a quantitative research approach in Riyadh, Saudi Arabia, from 2018 to 2020. The study was carried out among cigarette smokers in 15 coffee shops that permit either indoor or outdoor smoking in the northern, southern, eastern, western, and central regions of Riyadh.

The target population for our survey only included males who were at 15 selected coffee shops from northern, southern, eastern, western, and central regions of Riyadh.

Inclusion criteria were: Saudi adult males aged 18 years and above and Saudi adult males who are cigarettes smokers. Exclusion criteria were E-cigarettes smokers and those who smoke other types of products such as shisha or water pipe; and former smokers.

A non-probability quota sampling method was adopted, where Riyadh city was divided into 5 geographical locations (northern, southern, eastern, western, and central regions). Fifteen coffee shops, 3 from each region, were selected based on the nearest availability of the Global Positioning System (GPS) to represent all 5 geographical locations of Riyadh city.

The study sample size was estimated according to the following formula:

$$n = (z)^2 \, p \, (1 - p)/d^2$$

Where, n = sample size, Z = 1.96 at 95% level of significance, p = estimated prevalence of Saudi smokers with successful quitting attempts (25.3%),[12] d = margin of error (0.05).

In our study, the calculated n was approximately 290. Based on the above formula and after adjustment for the design effect of 3 and 85% expected response rate, 1,015 participants were invited conveniently to participate in the study while they were at coffee shops. We showed to the participants the IRB approval, and after discussing the study all of them signed the informed consent.

Primary data for this study were collected using an online questionnaire; it was self-administered on iPad devices by cigarette smokers at the selected coffee shops. The questionnaire used was a validated tool that was used in a previously published study, following

permission from the principal investigator.[6] The adopted questionnaire was modified and translated from English into Arabic by the principal investigator according to the WHO guidelines. Some of the questions were also taken from Global Adult Tobacco Survey (GATS), modified cut-annoyed-guilty-eye (CAGE) questionnaire for smoking and Brief Fagerström Test for Nicotine Dependence which are validated tools to screen for nicotine dependence and to assess the intensity of dependence respectively.[13,14]

The questionnaire employed in this study was divided into 3 sections that included demographic data, smoking history, and quit smoking intentions. Pictures demonstrating the concept of plain packaging were shown to participants using iPads when necessary. Permission to use plain packaging images from the Tobacco Control Section, Department of Health, Australian Government, had been obtained. Deed of licence was signed for the release of 10 images with full resolution for use in the study.

In the current study, prior to conducting the full-fledged research and data collection, the questionnaire was piloted among 20 participants to test its feasibility.

Study variables. The variables considered in the questionnaire are taxation on tobacco products, tobacco plain packaging, reasons to quit smoking, attempts to quit smoking, duration of quitting attempts age, marital status, education level and level of income, which is considered as the independent variables while intentions to quit smoking was our primary dependent variable in this study.

Data management and analysis. Data were analyzed using IBM SPSS Statistics for Mac, version 20 (IBM Corp., Armonk, N.Y., USA). Bivariate analysis was conducted, and the *p*-value was used to show the probability of the results. Logistic regression was used for some of the questions to predict the response of quitting intention to the plain packaging application. Data quality is ensured throughout the processes of data cleaning, ordering, and coding, and the identification of confounding variables that may lead to invalid conclusions.

Ethical consideration. Ethics, in any part of human life, determines the values of an individual. In research, it is imperative to follow such ethics that ensures that the study conducted is not based on any untrue or unjust approach that may hurt readers' beliefs. Approval to conduct the research was granted by the Institutional Review Board Committee of the Ministry of Health. Approval for the project was also obtained from the Ethical Committee. Permission to collect data from participants was obtained from the café managers

before approaching the participants. Informed consent was signed by the respondents following an explanation of the objectives of the research and utilization of the results. The information about identity has not been stored and the collected information is fully protected with consideration of the participant's rights and safety. Subjects will not be contacted for follow-up information.

Results. Considering the demographic data collected via the questionnaire, it is inferred from the statistical analysis that the average age of the participants was 28 years old, as demonstrated in **Table 1**. A majority of participants who intended to quit within the next 6 months had incomes less than or equal to SAR3,000 (25.3%) and between SAR7,001-12,000 (26.2%). A majority of the participants (58.1%) were graduates, and 68% of the respondents were single, never married. Demographic data falls in 2 categories. From a total of 960 participants with 94% response rate, 308 were planning to quit smoking in the next 1-6 months, while 652 of the participants denied any such intention. As per bivariate analysis, when determining the relationship between the demographic factors and intentions of the population to quit smoking, it was found that there was no association between age and intention to quit, with a *p*-value of >0.05. No significant association was found between other variables, including income, education level, marital status, and intention to quit.

As per the statistical analysis, most of the respondents were indulging in smoking for more than 8 years, and most of them started smoking after 18 years of age, as shown in **Table 2**. It is evident from the analysis that most of the population started smoking from an early age. A majority of the participants (50.2%) started smoking 31-60 minutes after waking up in the morning. Furthermore, 68.5% of the participants smoked 11 to 20 cigarettes in a day, 19.8% had an intake of 20 to 30 cigarettes, and 11.7% had more than 30 cigarettes per day. These statistics correspond to levels of addiction to tobacco or smoking among the populace.

The Chi-square test revealed that there is a significant association between the number of cigarettes consumed in a day and the intention to quit smoking was *p*<0.001. In addition, there was a significant association between the duration of time in the morning when the participants indulged in smoking and their intention to quit, with a *p*-value less than 0.003.

A majority of the participants 67.9% stated that they had no intention to quit smoking. Among the participants who wanted to quit, 39.5% stated that they want to quit smoking due to health issues. A minority

Table 1 - Distribution of demographic characteristics of the study participants by their intention to quit smoking in Riyadh city.

Characteristics	Total n=960 (%)	Planning to quit in next 1 month or 6 months n=308 (%)	Not planning to quit or plan to cut back n=652 (%)	P-value
Age (mean±SD)	28.1±7.5	28.2±7.8	28.1±7.4	0.87
Income				0.46
≤3000	249 (25.9)	78 (25.3)	171 (26.2)	
3001 - 7000	215 (22.4)	61 (19.8)	154 (23.6)	
7001 - 12000	248 (25.8)	81 (26.3)	167 (25.6)	
12001 - 18000	201 (20.9)	74 (24.0)	127 (19.5)	
18001 - 25000	47 (4.9)	14 (4.5)	33 (5.1)	
Education				0.28#
Uneducated	2 (0.2)	0 (0.0)	2 (0.3)	
Intermediate school	3 (0.3)	2 (0.6)	1 (0.2)	
Secondary school	310 (32.3)	97 (31.5)	213 (32.7)	
University degree	558 (58.1)	187 (60.7)	371 (56.9)	
Postgraduate degree (Master's, Doctorate)	87 (9.1)	22 (7.1)	65 (10.0)	
Marital status				0.58#
Single, never married	654 (68.1)	211 (68.5)	443 (67.9)	
Currently married	293 (30.5)	95 (30.8)	198 (30.4)	
Widowed	2 (0.2)	0 (0.0)	2 (0.3)	
Divorced	11 (1.1)	2 (0.6)	9 (1.4)	
Children[a]				0.58
Yes	237 (54.2)	77 (52.4)	160 (55.2)	
No	200 (45.8)	70 (47.6)	130 (44.8)	

[a] n is 437, # indicates Fisher's Exact Test

Table 2 - Distribution of smoking characteristics of the study participants by their intention to quit smoking in Riyadh city.

Characteristics	Total (n=960)	Planning to quit in next 1 month or 6 months (n=308)	Not planning to quit or plan to cut back (n=652)	P-value
Duration of smoking (years) (mean±SD)	8.7 (6.4)	8.5 (6.3)	8.8 (6.4)	0.49
Age of initiation (years) (mean±SD)	18.8 (3.7)	19.1 (3.9)	18.7 (3.7)	0.10
How soon after waking up?				0.003
<5 minutes	196 (20.4)	52 (16.9)	144 (22.1)	
5 - 30 minutes	282 (29.4)	77 (25.0)	205 (31.4)	
31 - 60 minutes	482 (50.2)	179 (58.1)	303 (46.5)	
No. of cigarettes				<0.001
11 to 20	658 (68.5)	243 (78.9)	415 (63.7)	
21 to 30	190 (19.8)	44 (14.3)	146 (22.4)	
>30	112 (11.7)	21 (6.8)	91 (14.0)	
Mean no. of cigarettes (SD)	20.6 (10.0)	18.4 (8.9)	21.6 (10.3)	<0.001

of 10.5% of the people wanted to quit for social reasons (**Table 3**).

As shown in **Table 4**, 49.7% of the participants had not tried to stop smoking, while 47% of the participants had initiated measures to reduce smoking in the past 12 months. Among the participants who intended to quit smoking, 66.6% had tried to stop smoking in the past 12 months. With a *p*-value less than 0.001, this

factor, where participants have tried quitting in the past 12 months, has a significant association with their intention to quit. Out of 21 variables, there were 12 variables that were significantly associated with quitting intentions (*p*<0.05), while the other 9 variables had a non-significant association with quitting intentions (*p*>0.05).

When the participants were asked about the present price of cigarette packets, 43.6% of the participants stated that it was very expensive. However, price has no significant association with the intention to quit smoking, with a *p*-value greater than 0.05. Many of the participants (46.5%) stated that they had no intention to quit smoking if the cigarette prices increased. However, participants who were planning to quit, stated that higher prices of cigarettes, would motivate them to quit with *p*<0.001, it was observed that increasing the prices has a significant association with intentions to quit.

When considering the impact of health warnings on current cigarette packs, as per the Chi-square test, it was established that reading health warnings and the clarity of such messages has a significant association with the intention to quit. Further, 48.3% of the participants stated their desire to apply the concept of plain packaging in Saudi Arabia. A significant

Table 3 - Distribution of the study participants by their intention to quit smoking in Riyadh city.

Questions/statements	n (%)
Plan to quit smoking	
I am planning to quit in the next month	123 (12.8)
Am planning to quit in the next 6 months	185 (19.3)
I would like to cut back	313 (32.6)
I am not planning to quit	339 (35.3)
Intention to quit smoking	
Yes	308 (32.1)
No	652 (67.9)
Reasons for planning to quit	
Religious reasons	31 (3.2)
Social reasons	101 (10.5)
Economic reasons	55 (5.7)
Health reasons	379 (39.5)
Others	55 (5.7)

Table 4 - Determinants of intention to quit smoking among the study participants in Riyadh city (Bivariate analysis).

Determinants of intention	Total (n=960)	Planning to quit in next 1 month or 6 months (n=308)	Not planning to quit or plan to cut back (n=652)	P-value
During past 12 months, have you tried to stop smoking?				<0.001
Yes	451 (47.0)	205 (66.6)	246 (37.7)	
No	477 (49.7)	91 (29.5)	386 (59.2)	
Don't know	32 (3.3)	12 (3.9)	20 (3.1)	
Most recent attempt				0.37
Last week	21 (4.7)	10 (4.9)	11 (4.5)	
More than one week but less than a month	70 (15.5)	35 (17.1)	35 (14.2)	
More than one month but less than six months	157 (34.8)	77 (37.6)	80 (32.5)	
More than 6 months	203 (45.0)	83 (40.5)	120 (48.8)	
Longest duration of quitting attempt in days (mean±SD)	54.0±128.6	67.5±166.9	47.6±105.3	<0.001#
Feeling of cut-down or to control smoking				<0.001
Yes	639 (66.6)	238 (77.3)	401 (61.5)	
No	238 (24.8)	56 (18.2)	182 (27.9)	
Don't know	83 (8.6)	14 (4.5)	69 (10.6)	
Felt annoyed or angry with people who criticize your smoking				0.005
Yes	357 (37.2)	106 (34.4)	251 (38.5)	
No	546 (56.9)	193 (62.7)	353 (54.1)	
Don't know	57 (5.9)	9 (2.9)	48 (7.4)	

Table 4 - Determinants of intention to quit smoking among the study participants in Riyadh city (Bivariate analysis) (continued).

Felt guilty about your smoking				<0.001
Yes	415 (43.2)	191 (62.0)	224 (34.4)	
No	459 (47.8)	90 (29.2)	369 (56.6)	
Don't know	86 (9.0)	27 (8.8)	59 (9.0)	
Ever smoked within half an hour of waking-up (Eye-opener)				0.008
Yes	551 (57.4)	155 (50.3)	396 (60.7)	
No	367 (38.2)	139 (45.1)	228 (35.0)	
Don't know	42 (4.4)	14 (4.5)	28 (4.3)	
Price of pack of cigarette			4 (0.6)	0.46*
Very cheap	5 (0.5)	1 (0.3)	7 (1.1)	
Cheap	14 (1.5)	7 (2.3)	124 (19.0)	
Average	175 (18.2)	51 (16.6)	230 (35.3)	
Expensive	347 (36.1)	117 (38.0)	287 (44.0)	
Very expensive	419 (43.6)	132 (42.9)		
Increasing the pack price will affect your intention to quit				<0.001
Yes	391 (40.7)	155 (50.3)	236 (36.2)	
No	446 (46.5)	120 (39.0)	326 (50.0)	
Don't know	123 (12.8)	33 (10.7)	90 (13.8)	
Ever read/noticed health warnings on current cigarette packets				0.004
Yes	777 (80.9)	268 (87.0)	509 (78.1)	
No	163 (17.0)	36 (11.7)	127 (19.5)	
Don't know	20 (2.1)	4 (1.3)	16 (2.5)	
Health warnings on current cigarette packet was clear and understandable				0.006
Yes	710 (76.4)	245 (80.9)	465 (74.3)	
No	98 (10.5)	34 (11.2)	64 (10.2)	
Don't know	121 (13.0)	24 (7.9)	97 (15.5)	
In last 30 days, have warning labels led you to think about quitting your smoking?				<0.001
Yes	191 (19.9)	92 (29.9)	99 (15.2)	
No	712 (74.2)	198 (64.3)	514 (78.8)	
Don't know	57 (5.9)	18 (5.8)	39 (6.0)	
In last 30 days, have you noticed any advertisements or signs promoting cigarettes in stored where cigarettes are sold?				0.06
Yes	186 (20.9)	71 (24.7)	115 (19.1)	
No	703 (79.1)	217 (75.3)	486 (80.9)	
Ever heard about the plain packaging				0.96
Yes	400 (41.7)	128 (41.6)	272 (41.7)	
No	560 (58.3)	180 (58.4)	380 (58.3)	
After explaining the concept, do you think understood the concept of plain packaging fully?				0.67
Yes	635 (82.5)	201 (80.7)	434 (83.3)	
No	77 (10.0)	27 (10.8)	50 (9.6)	
Don't know	58 (7.5)	21 (8.4)	37 (7.1)	
Will you be able to differentiate the new plain packet from the old one?				0.87
Yes	699 (72.8)	225 (73.1)	474 (72.7)	
No	157 (16.4)	48 (15.6)	109 (16.7)	
Don't know	104 (10.8)	35 (11.4)	69 (10.6)	

Table 4 - Determinants of intention to quit smoking among the study participants in Riyadh city (Bivariate analysis) (continued).

Do you wish to apply the concept of plain packaging in Saudi Arabia?				<0.001
Yes	464 (48.3)	187 (60.7)	277 (42.5)	
No	363 (37.8)	72 (23.4)	291 (44.6)	
Don't know	133 (13.9)	49 (15.9)	84 (12.9)	
Do you think the concept of plain packaging will help you in quitting?				<0.001
Yes	294 (30.6)	135 (43.8)	159 (24.4)	
No	452 (47.1)	108 (35.1)	344 (52.8)	
Don't know	214 (22.3)	65 (21.1)	149 (22.9)	
Do you find the new plain packaging more attractive?				0.10
Yes	147 (15.3)	49 (15.9)	98 (15.0)	
No	702 (73.1)	214 (69.5)	488 (74.8)	
Don't know	111 (11.6)	45 (14.6)	66 (10.1)	
Which picture has more effect on your quitting intentions?				0.82
Blindness	109 (11.4)	34 (11.0)	75 (11.5)	
Peripheral vascular disease	487 (50.7)	156 (50.6)	331 (50.8)	
Emphysema	142 (14.8)	50 (16.2)	92 (14.1)	
Throat cancer	155 (16.1)	50 (16.2)	105 (16.1)	
Increase risk of stroke	67 (7.0)	18 (5.8)	49 (7.5)	
Do you suffer from any chronic disease?				0.65
Yes	120 (12.5)	42 (13.6)	78 (12.0)	
No	801 (83.4)	252 (81.8)	549 (84.2)	
Don't know	39 (4.1)	14 (4.5)	25 (3.8)	

Note: * indicates Fisher's Exact Test, # indicates Mann-Whitney Test

Table 5 - Cut-Annoyed-Guilty-Eye (CAGE) questionnaire and Fagerström grading among the participants.

Questionnaire and grading	Total (n=960)	Planning to quit in next 1 month or 6 months (n=308)	Not planning to quit or plan to cut back (n=652)	*P*-value
CAGE questionnaire				
Screened positive	907 (94.5)	297 (96.4)	610 (93.6)	0.07
Screened negative	53 (5.5)	11 (3.6)	42 (6.4)	
Fagerström grading				
Heavy nicotine dependence	127 (13.2)	22 (7.1)	105 (16.1)	
Moderate nicotine dependence	462 (48.1)	134 (43.5)	328 (50.3)	<0.001
Light nicotine dependence	371 (38.6)	152 (49.4)	219 (33.6)	

Values are presented as number and percentage

association between the concept of plain packaging and the intention to quit smoking was established with 30.6% of participants thinking that it will help them to quit smoking. When asked about the impact of graphical images on the quitting intentions, a majority of the participants (50.7%) stated that pictures related to peripheral vascular disease had a greater impact on them.

As per the CAGE questionnaire and Fagerstrom grading analysis (**Table 5**), it was revealed that a majority of the participants with light nicotine dependency had a higher desire to quit smoking. However, no association was found between positive screening from the CAGE questionnaire and the intention to quit. To assess the possible effect of variables on quitting intention, logistic regression was performed to identify independent predictors. Variables with a *p*-value <0.25 in the bivariate analysis were entered in the model for logistic regression. The proportion of participants who intended to quit was higher among those who had not tried to quit smoking in the last 12 months (OR: 3.18 [2.32 - 4.79]) compared to those who had tried

quitting. Participants who did not want to apply the concept of plain packaging to Saudi Arabia had higher odds of quitting intention (OR: 2.30 [1.61 - 3.28]) in comparison to those who wanted to apply the concept. Moderate (OR: 0.39 [0.22 - 0.68]) nicotine-dependent individuals had lower odds of quitting intention as compared to those who had light nicotine dependence. Similarly, those who had not thought about quitting smoking after looking at the warning label on packages in the last 30 days had higher odds of quitting intention (OR: 1.86 [1.28 - 2.70]) than those who had thought about quitting smoking. Individuals who did not find plain packaging attractive (OR: 0.55 [0.35 - 0.87]) and those who did not know whether they had found the plain packaging more attractive (OR: 0.44 [0.24 - 0.80]) had lesser odds of quitting intention as compared to those who found the plain packaging more attractive (**Table 6**).

Discussion. It is inferred from the study that most of the participants consumed 11-20 cigarettes per day and had no intention to quit smoking. It was also found that most of the participants started smoking from the age of 18 years. Alqarni[15] also had determined that most people acquire the habit of smoking during adolescence. As per the current analysis, there is a significant association between the number of cigarettes consumed in a day and the intention to quit smoking. In addition, there was a significant association between the duration of time in the morning after waking up when the participants started smoking and their intention to quit. The results of the current study also revealed that the current prices of cigarettes, though high, do not affect the consumption levels of people;

however, higher prices would motivate people to quit smoking, thereby revealing that tobacco taxation has a positive impact on the smoking behavior of the people. This result aligns with a study conducted by Callison & Kaestner,[16] which found that increases in cigarette taxes lead to small decreases in cigarette consumption; however, sizeable tax increases, on the order of 100%, will reduce smoking by 5%. The results of the current study are also in line with those of a survey conducted by Campaign for Tobacco Free Kids,[17] which found that raising tobacco taxes generates revenue and discourages people from smoking.

As per the analysis, no association was observed between the demographic factors (age, income, education, marital status, children) and intention to quit smoking. When considering the impact of health warnings on current cigarette packs, it was established that reading health warnings and the clarity of such messages has a significant association with consumers' intention to quit smoking. Further, a majority of the people wanted to apply the concept of plain packaging in Saudi Arabia. A significant association between the concept of plain packaging and the intention to quit smoking was established. Hassounah et al[18] also found that smokers' response to the implementation of plain packaging in Saudi Arabia was strong and loud on both social and traditional media channels. The evidence confirms that plain packaging has an impact on perceived taste and quality. Different warning texts can be used for smoking-related health risks with lung diseases and cancer being the strongest motivational quitting message.[19] In our study the majority of the participants reported pictorial image of peripheral vascular diseases as it may affect their intentions to quit.

Table 6 - Binary backward stepwise logistic regression analysis - determinants of intention to quit smoking among the study participants in Riyadh city.

Variables	Adjusted OR (95% CI)	P-value
During past 12 months, have not tried to quit smoking	3.18 (2.32 - 4.79)	<0.001
In the last 30 days, warning labels on cigarette packages have not led to think about quitting	1.86 (1.28 - 2.70)	0.001
Do not wish to apply the concept of plain packaging to Saudi Arabia	2.30 (1.61 - 3.28)	<0.001
Do not know whether they found the plain packaging more attractive	0.44 (0.24 - 0.80)	0.007
Did not find the plain packaging more attractive	0.55 (0.35 - 0.87)	0.01
Moderate nicotine dependence	0.39 (0.22 - 0.68)	0.001
Heavy nicotine dependence	0.65 (0.37 - 1.11)	0.12

Variables with a p-value <0.25 in the bivariate analysis were entered in the model for logistic regression. The model was statistically significant with an omnibus Chi square *p* value of <0.001, Nagelkerke R square value of 0.19 and a classification accuracy of 71.6%.

Wakefield, Hayes, Durkin, and Borland[20] observed that plain pack smokers perceived their cigarettes as inferior in quality, giving less satisfaction than branded packs, and were more likely to have thoughts about quitting smoking at least once a week. They also found that plain pack smokers support the policy more than branded smokers. It is concluded that those smoking from plain packs perceived their cigarettes to be of inferior quality, which further affected their intentions to quit smoking.

Study limitations. We acknowledge several limitations to our study as the idea of plain packaging was applied in Saudi Arabia in the middle of the data collection phase, which may affect the level of awareness about the concept. Furthermore, we utilized plain packaging images, which may or may not have an impact on smokers' quitting intentions when compared to the actual plain cigarette packs.

In conclusion, the present study, based on Saudi Arabia, has revealed that most people start smoking cigarettes at the early age of 18 years. Although the current price of cigarette packs reported to be very high by the participants, imposing a new higher tax may motivate smokers who had plans to quit in the near future. Plain packaging seems to be an effective new strategy in addition to tobacco taxation in Saudi Arabia, yet, more time and further research are required to assess the effectiveness of the strategy.

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