P-ISSN 1693-9697
E-ISSN 2355-4800
Volume 32
Number 1
April 2025

Journal of Dentistry Indonesia

JOURNAL OF DENTISTRY INDONESIA

UNIVERSITAS INDONESIA
P-ISSN : 16939697 <> E-ISSN : 23554800 Subject Area : Health

0
Impact

2386
Google Citations

Sinta 2
Current Acreditation

Google Scholar Garuda Website Editor URL

Journal of Dentistry Indonesia

EDITORIAL TEAM

EDITOR IN CHIEF

Diah Ayu Maharani (https://www.scopus.com/authid/detail.uri?authorId=32867911000) , (SCOPUS ID= 32867911000) Department of Preventive and Public Health Dentistry, Faculty of Dentistry, Universitas Indonesia, Indonesia

MANAGING EDITORS

Yuniardini Septorini Wimardhani (https://www.scopus.com/authid/detail.uri?authorId=56784363100) , (SCOPUS ID = 56784363100) Department of Oral Medicine, Faculty of Dentistry Universitas Indonesia, Indonesia

Sunarso (https://www.scopus.com/authid/detail.uri?authorId=55191249900) , (SCOPUS ID = 55191249900) Department of Dental Materials Science, Faculty of Dentistry, Universitas Indonesia

EDITORIAL BOARD

Anne-Marie Kuijpers-Jagtman (https://www.scopus.com/authid/detail.uri?authorId=35237602100) , (SCOPUS ID = 35237602100) Department of Orthodontics, University Medical Center Groningen, The Netherlands

Adrian Yap (http://www.scopus.com/authid/detail.url?origin=resultslist&authorId=7103215953&zone=) , (SCOPUS ID = 7103215953) National University of Singapore, Singapore

Anak Iamaroon (http://www.scopus.com/authid/detail.url?origin=resultslist&authorId=6701786341&zone=) , (SCOPUS ID = 6701786341) Faculty of Dentisry, Chiang Mai University, Thailand, Thailand

Benny Mulyono Soegiharto, (https://www.scopus.com/authid/detail.uri?authorId=24478917200) (SCOPUS ID = 24478917200) Department of Orthodontics, Faculty of Dentistry, Universitas Indonesia, Indonesia

Bramma Kiswanjaya (https://www.scopus.com/authid/detail.uri?authorId=26664624100) , (SCOPUS ID = 26664624100) Department of Dentomaxillofacial Radiology, Faculty of Dentistry, Universitas Indonesia

Budi Kusnoto (https://www.scopus.com/authid/detail.uri?authorId=6603330742) , (SCOPUS ID = 6603330742) Department of Orthodontics, College of Dentistry, University of Illinois at Chicago, United States

BSM Samadarani Siriwardena (https://www.scopus.com/authid/detail.uri?authorId=16246416800) , (SCOPUS ID = 16246416800) Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka

Chun Hung Chu (https://www.scopus.com/authid/detail.uri?authorId=7404345729) , (SCOPUS ID= 7404345729) The University of Hong Kong, Hong Kong

Clive Wright (https://www.scopus.com/authid/detail.uri?authorId=56797313100) , (SCOPUS ID = 56797313100) University of Sydney, Australia

Cortino Sukotjo (https://www.scopus.com/authid/detail.uri?authorId=6508194317) , (SCOPUS ID = 6508194317) Department of Restorative Dentistry, College of Dentistry, University of Illinois at Chicago, United States

Diana Cassi (http://www.scopus.com/authid/detail.url?origin=resultslist&authorId=56062239400&zone=) , (SCOPUS ID = 56062239400) Department of Orthodontics University of Modena and Reggio Emilia, Italy

Erik Idrus (https://www.scopus.com/authid/detail.uri?authorId=51763635000) , (SCOPUS ID = 51763635000)Department of Oral Biology, Faculty of Dentistry Universitas Indonesia, Indonesia

Hamid Nurrohman (https://www.scopus.com/authid/detail.uri?authorId=52564067000) , Hamid Nurrohman, (SCOPUS ID = 52564067000) Department of Restorative and Prosthodontics, The University of Texas School of Dentistry, Houston, Texas, USA.

Izzet Yavuz (https://www.scopus.com/authid/detail.uri?authorId=35967243400) , (SCOPUS ID = 35967243400) Faculty of Dentistry, University of Dicle, Turkey, Turkey

Journal of Dentistry Indonesia

Volume 32, Number 2 (2025) August

Articles

Case Report

Literature Review

UNIVERSITAS TRISAKTI

Indrayadi Gunardi <indrayadi@trisakti.ac.id>

MS #1655: Update submitted for "The Accuracy of Detection and Diagnosis of Oral Lesions by Clinical Dental Students"

1 message

Editors of Journal of Dentistry Indonesia <editors-jdi-1655@dcuischolarhub.bepress.com> Tue, Dec 17, 2024 at 6:36 PM

To: =?UTF-8?Q?=22Indrayadi_Gunardi=22?= <indrayadi@trisakti.ac.id>
Cc: The Authors <authors-jdi-1655@dcuischolarhub.bepress.com>, Assigned Editor <editor-jdi-1655@dcuischolarhub.bepress.com>

This is an automatically-generated note to inform you that "Dr. Yuniardini Septorini Septorini Wimardhani" <jdentistry@ui.ac.id> has submitted an update to MS #1655, "The Accuracy of Detection and Diagnosis of Oral Lesions by Clinical Dental Students," in Journal of Dentistry Indonesia.

The reason for update is:
change author email

The changes made are:
"Indrayadi Gunardi" <indrayadigunardi@yahoo.com> removed as an author.
"Indrayadi Gunardi" <indrayadi@trisakti.ac.id> added as an author.

The authors are:
"Carinna Tirtania" <tirtaniacarinna@gmail.com>
"Dewi Priandini" <dewipriandini@trisakti.ac.id>
"Najla Nadiah" <najla@trisakti.ac.id>
"Indrayadi Gunardi" <indrayadi@trisakti.ac.id>
"Hrishikesh Satyamoorthy" <hsathya1@jh.edu>

A preview of the title page and status may be viewed at:
https://scholarhub.ui.ac.id/cgi/preview.cgi?article=1655&context=jdi

---

Editors can access the tools to manage this submission at:

https://scholarhub.ui.ac.id/cgi/editor.cgi?article=1655&context=jdi

Thank you,
The Editors
Journal of Dentistry Indonesia

UNIVERSITAS TRISAKTI

Indrayadi Gunardi <indrayadi@trisakti.ac.id>

MS #1655: Author details have been changed for "The Accuracy of Detection and Diagnosis of Oral Lesions by Clinical Dental Students"

1 message

Dr. Yuniardini Septorini Septorini Wimardhani <editor-jdi-1655-3145072@dcuischolarhub.bepress.com> Tue, Dec 17, 2024 at 6:36 PM
To: Indrayadi Gunardi <indrayadigunardi@yahoo.com>
Cc: Carinna Tirtania <tirtaniacarinna@gmail.com>, Dewi Priandini <dewipriandini@trisakti.ac.id>, Najla Nadiah <najla@trisakti.ac.id>, Indrayadi Gunardi <indrayadi@trisakti.ac.id>, Hrishikesh Satyamoorthy <hsathya1@jh.edu>

This is an automatically-generated note to inform you that the author details have been changed for "The Accuracy of Detection and Diagnosis of Oral Lesions by Clinical Dental Students" in Journal of Dentistry Indonesia.

"Indrayadi Gunardi" <indrayadigunardi@yahoo.com> is no longer associated with this manuscript. Either "Indrayadi Gunardi" <indrayadigunardi@yahoo.com> has been removed as an author or the email has been replaced with an updated address. If the latter, the author in question will also receive a notification message at the new address.

Thank you,
The Editors
Journal of Dentistry Indonesia

UNIVERSITAS TRISAKTI

Indrayadi Gunardi <indrayadi@trisakti.ac.id>

MS #1845: PDF file created for "Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study"

1 message

Yuniardini Wimardhani <editor-jdi-1845-3179240@dcuischolarhub.bepress.com> Fri, Jul 25, 2025 at 3:00 PM

To: Indrayadi Gunardi <indrayadi@trisakti.ac.id>, Rahmi Amtha <rahmi.amtha@trisakti.ac.id>, Firstine Kelsi Hartanto <firstine@trisakti.ac.id>, Niko Falatehan <niko.f@trisakti.ac.id>, Alyah Heriandi <alyahhr@gmail.com>, Angelita Victoria Kurniawan <angelita.victoria.kurniawan@gmail.com>, Najla Nadiah <najla@trisakti.ac.id>, Wiwiek Poedjiastoeti <wiwiek@trisakti.ac.id>, Andrijanto Andrijanto <andrijanto@eng.maranatha.edu>, Elizabeth Fitriana Sari <e.sari@latrobe.edu.au>

This is an automatically-generated note. UI Scholars Hub has completed the conversion from the uploaded Microsoft Word file to an Adobe Acrobat PDF file for "Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study" in Journal of Dentistry Indonesia.

Please review the file and contact dc-support@elsevier.com if there are any problems.

The converted file may be viewed at this page:
https://scholarhub.ui.ac.id/cgi/preview.cgi?article=1845&context=jdi

Thank you,
The Editors
Journal of Dentistry Indonesia

Manuscript Details

Manuscript ID	1845
Manuscript Title	Understanding Differences in Perceptions of E-Cigarettes and Conventional Smoking

Reviewers' Comments

Reviewer #1

General comment	I have thoroughly examined the findings of your study on students' perceptions of cigarette use. I appreciate the opportunity to provide feedback on your manuscript. The results of your study have the potential to make a valuable contribution to the field of smoking behavior research. However, several points require attention in order to enhance the quality of the manuscript.
Title	The research objective is to compare perception between smokers and nonsmokers. I suggest you change the title: Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study
Abstract	1. Kindly include the results of the Rasch model and Wright map analysis as they pertain to your findings. 2. The manuscript currently lists several keywords; however, it would be beneficial to revise them to align with the appropriate MESH terms.
Introduction	1. The background section could be strengthened by incorporating brief references to prior research that has explored perceptions of smoking, thereby providing additional context for the research question. 2. It would be beneficial to include more detailed information regarding e-cigarettes, particularly vaping, and conventional cigarette use, in order to highlight the magnitude of the issue. Additionally, a discussion of previous studies on vaping behavior and its impact on oral health would add depth to the analysis. 3. The introduction effectively outlines the significance of smoking—both conventional and electronic—as a public health concern, especially among young adults. However, further context is needed to explain why focusing specifically on young adults is of particular importance. 4. Consider including any prespecified hypotheses of the study to clarify the research objectives.

Methodology*	1. In your sample size calculation based on G Power analysis, the estimated sample size is 253 students. Please provide further details regarding whether this calculation accounts for potential participant dropouts. 2. Kindly provide more information about the location of the study, specifically the university where the research was conducted, and the faculty from which the participants were recruited. 3. The methodology mentions random sampling; however, the process of randomization is not clearly explained. Please provide a more detailed description of the sampling process. 4. Please elaborate on the assessment of vaping behavior and the procedures used to verify the eligibility criteria for participants. More detailed information on the eligibility criteria would also be helpful. 5. Kindly explain how the questionnaire was distributed to the participants, including any logistical details related to the distribution process. 6. The manuscript utilizes a perception questionnaire, but it is unclear how it was developed. Please provide more details on the development of the questionnaire. If the questionnaire was adapted from prior research and used the Indonesian language, kindly explain the process of cross-cultural adaptation. Additionally, please provide information on the validity and reliability testing of the questionnaire. 7. The manuscript should discuss potential biases and confounding factors, such as sociodemographic variables (sex, age, socioeconomic status) or GPA, which could influence students' perceptions. 8. In the statistical analysis section, please provide more information regarding the type of data and the methods of analysis employed. Additionally, explain the rationale for choosing the Kruskal–Wallis test, as well as the purpose of the Wright map and Rasch model analysis, since not all readers may be familiar with these methods. 9. Please offer a more detailed justification for the categorization of the age variable. 10. I suggest conducting a bivariate analysis to explore the relationship between sociodemographic factors and smoking perceptions across groups. 11. To enhance the robustness of your results, I recommend conducting a post hoc analysis for the Kruskal–Wallis test.
Results*	1. Please report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed. I suggest you to use flow diagram or participants. 2. In Table 3, there is an analysis referred to as Differential Item Functioning (DIF) analysis. However, this analysis is not mentioned in the methodology section. Please provide additional details regarding this analysis in the methodology section to ensure clarity and transparency. 3. Given that the proportion of male and female participants is not balanced, please provide the rationale for analyzing the data based on sex. It would be helpful to explain how this potential imbalance was addressed or why it is still relevant to your analysis.
Case Description	-

Discussion	1. The discussion should begin with a summary of the main findings of the study, and these findings should be interpreted in the context of other studies. 2. What is the potential bias of this study and how the researchers reduce this bias. 3. Although some limitations are mentioned (e.g., the focus on vaping and conventional cigarettes, potential biases in sample selection), there could be more discussion on limitations regarding sampling methods. For example, how representative was the sample in terms of geographic location and socioeconomic status context? 4. Please provide specific and actionable recommendations that would enhance the practical value of the discussion and make it more relevant to policymakers and public health professionals. 5. A deeper dive into gender factor would provide a more nuanced understanding of how gender affects smoking and vaping behaviors and could be valuable for developing tailored interventions. 6. Please discuss generalizability (external validity) of the study results.
Bibliography/References	-

Additional Comments

1. Some sentences could be made more concise to improve readability. Unnecessary repetition of information was avoided.
2. Ensure that the statistical results are reported consistently. This includes the presentation of percentages and p values.
3. Check that all references are cited consistently in the text and that the reference list follows the required citation style.
4. While the grammar is generally good, thorough proofreading to catch minor grammatical and punctuation errors would enhance the manuscript's professionalism.
5. Ensure that the discussion links the study's findings to the broader context and literature, addressing the implications and any potential applications or future research directions.

Reviewer #2

This article contributes significantly to our understanding of young individuals' attitudes toward smoking, particularly in light of the growing popularity of vaping. The findings have significant implications for public health efforts, and the study's scientific rigor contributes to its legitimacy. However, future study could expand on these findings by resolving the mentioned limitations and investigating additional factors impacting smoking behavior. This manuscript had almost fulfilled the STROBE guideline. The setting is described as a university environment, however, the author could provide more details about the specific context (e.g., urban/rural setting, cultural factors). The manuscript does not explicitly discuss potential biases, such as selection bias (e.g., only university students were included) or response bias (e.g., social desirability bias in self-reported smoking behavior). It is better to be explained.

Editorial Comments

a. Please make sure that your keywords comply with MeSH.
b. Please include in your manuscript where ethics approval has been obtained, the name of the approving body and the approval number/ID.
c. Discussion section: add limitations of this study and suggestions for future study.
d. Please add “Conflict of Interest” and “Funding” sections in your manuscript
e. Please check the references in your manuscript. The manuscript should have a minimum of 30 references, of which, 80% of them should be from primary sources, which are journals, and should be less than ten years old.
f. Please also ensure that your revised manuscript conforms to the journal style, which can be found at the Instructions for Authors on the journal's website: https://scholarhub.ui.ac.id/jdi/styleguide.html

Comment Reviewer
Manuscript ID: **1845**

Reviewer 1

No	Reviewer	Reply comment	Page/Line
	General comment I have thoroughly examined the findings of your study on students' perceptions of cigarette use. I appreciate the opportunity to provide feedback on your manuscript. The results of your study have the potential to make a valuable contribution to the field of smoking behavior research. However, several points require attention in order to enhance the quality of the manuscript.		
	Title The research objective is to compare perception between smokers and nonsmokers. I suggest you change the title: Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study	Thank you for your valuable comments. Revised as suggested.	1 Title
	Abstract 1. Kindly include the results of the Rasch model and Wright map analysis as they pertain to your findings. 2. The manuscript currently lists several keywords; however, it would be beneficial to revise them to align with the appropriate MESH terms.	1. Thank you for your valuable comments. Revised. The item map was changed to the Wright map. The Wright map is one of the Rasch model analysis. 2. Thank you for your valuable comments. Revised. Keywords: perception, smoker, vaper, cigarette smoking	1 Abstract 1 Abstract
	Introduction 1. The background section could be strengthened by incorporating brief references to prior research that has explored perceptions of smoking, thereby providing additional context for the research question. 2. It would be beneficial to include more detailed information regarding e-cigarettes, particularly vaping, and conventional cigarette use, in order to highlight the magnitude of the issue. Additionally, a discussion of previous studies on vaping behavior and its impact on oral health would add depth to the analysis.	1. Thank you for your valuable comments. Added. A previous study by Yong et al. analyzed how perceptions of harm influence smoking cessation behavior, particularly in the context of policy-level patterns. In contrast, the study by Schoren et al. focused on comparing motivational factors among smokers, vapers, and dual users. 2. Thank you for your valuable comments. Added. Despite these perceptions, emerging evidence indicates that e-cigarettes are not without harm, they contain nicotine, volatile organic compounds, and heavy metals, which pose risks to oral,	2 Introduction Par 2 1 Introduction Par 1

	3. The introduction effectively outlines the significance of smoking—both conventional and electronic—as a public health concern, especially among young adults. However, further context is needed to explain why focusing specifically on young adults is of particular importance. 4. Consider including any prespecified hypotheses of the study to clarify the research objectives.	respiratory, and cardiovascular health.5–8 The dual use of conventional and electronic cigarettes has also become increasingly common, further complicating cessation efforts. The impact of vaping behavior on oral health may not be suitable for in-depth discussion in this study, as the primary focus is on individuals' perceptions rather than clinical outcomes. 3. Thank you for your valuable comments. Already stated in the introduction. The growing popularity of vaping has introduced additional challenges, with its appeal as a "safer" alternative remaining inconclusive, as potential health risks are still under investigation. Moreover, the dual use of conventional and electronic cigarettes has also become increasingly common, further complicating cessation efforts. Given these uncertainties, research into young adults' perceptions of both smoking forms is essential for shaping comprehensive public health strategies. 4. Thank you for your valuable comments. Added. It is hypothesized that smokers will demonstrate more favorable perceptions toward smoking compared to non-smokers	2 Introduction Par 1 2 Introduction Par 3
	Methodology 1. In your sample size calculation based on G Power analysis, the estimated sample size is 253 students. Please provide further details regarding whether this calculation accounts for potential participant dropouts. 2. Kindly provide more information about the location of the study, specifically the university where the research was conducted, and the faculty from which the participants were recruited. 3. The methodology mentions random sampling; however, the process of randomization is not	1. Thank you for your valuable comments. Added. To account for potential participant dropouts, the sample size was increased by an additional 30 subjects. 2. Thank you for your valuable comments. Added. the study population was drawn from a single private university (Universitas Trisakti in West Jakarta, Indonesia). 3. Thank you for your valuable comments. Revised. Subjects were selected using purposive convenience sampling and	2 Method Par 1 2 Method Par 1 2 Method Par 2

	clearly explained. Please provide a more detailed description of the sampling process. 4. Please elaborate on the assessment of vaping behavior and the procedures used to verify the eligibility criteria for participants. More detailed information on the eligibility criteria would also be helpful. 5. Kindly explain how the questionnaire was distributed to the participants, including any logistical details related to the distribution process. 6. The manuscript utilizes a perception questionnaire, but it is unclear how it was developed. Please provide more details on the development of the questionnaire. If the questionnaire was adapted from prior research and used the Indonesian language, kindly explain the process of cross-cultural adaptation. Additionally, please provide information on the validity and reliability testing of the questionnaire. 7. The manuscript should discuss potential biases and confounding factors, such as sociodemographic variables (sex, age, socioeconomic status) or GPA, which could influence students' perceptions. 8. In the statistical analysis section, please provide more information regarding the type of data and the methods of analysis employed. Additionally, explain the rationale for choosing the Kruskal–Wallis test, as well as the purpose of the Wright map and Rasch model analysis, since not all readers may be familiar with these methods. 9. Please offer a more detailed justification for the categorization of the age variable. 10. I suggest conducting a bivariate analysis to explore the relationship between sociodemographic factors and smoking perceptions across groups. 11. To enhance the robustness of your results, I recommend conducting a	divided into two groups: smokers and non-smokers. 4. Thank you for your valuable comments. Revised. Subjects were selected using purposive convenience sampling and divided into two groups: smokers and non-smokers. For the smoker group, subjects were recruited if their vaping behavior was confirmed visually by two investigators (AV and AH). For the non-smoker group, eligibility was limited to individuals who had never smoked any form of tobacco product, including conventional cigarettes, electronic cigarettes, or shisha. Inclusion criteria included active students at Universitas Trisakti who were willing to participate (showed by student ID), as evidenced by their informed consent. Additionally, for the smoker group, participants had to currently exhibit a vaping habit. Investigators cross-checked responses during questionnaire distribution and confirmed non-smoking status through direct verbal confirmation 5. Thank you for your valuable comments. Added. The questionnaire was distributed digitally using a barcode system that allowed participants to access the survey directly via their mobile phones. A QR code linked to a Google Form was displayed and disseminated during student gatherings, enabling easy and immediate participation. Participants were instructed to scan the barcode using their smartphone cameras, which redirected them to the online questionnaire. Prior to accessing the form, participants were presented with an informed consent statement and could only proceed after agreeing to participate voluntarily. All responses were automatically collected and securely stored in a Google Drive account accessible	2 Method Par 2 3 Method Par 2

	post hoc analysis for the Kruskal–Wallis test.	only by the principal investigators through a password-protected account to ensure confidentiality and data protection throughout the study period. 6. Thank you for your valuable comments. Revised. The newly perception questionnaire was designed (by IG, RA and AH) with three dimensions tailored for smokers (coded as "P") and non-smokers (coded as "N" for vaping and "K" for conventional smoking). The development of the questionnaire has already been described in the Methods section. Cross-cultural validation was not deemed necessary, as the aim of this study was not to develop a standardized instrument for broader application, but rather to assess specific perceptions using a questionnaire that has already undergone construct validation. 7. Thank you for your valuable comments. The manuscript did not discuss potential biases and confounding factors such as sociodemographic variables (e.g., socioeconomic status) or academic performance (GPA), as these data were not collected. However, given that all participants were students at a private university with a relatively high tuition fee, it can be reasonably inferred that the sample predominantly represented individuals from moderate to high socioeconomic backgrounds. As for academic performance, GPA was not included in the analysis due to findings from previous studies that reported no significant correlation between smoking behavior and GPA scores. Therefore, these variables were not prioritized in the current study design. 8. Thank you for your valuable comments. Added. Group differences were analyzed with	2 Method Par 6 - 3 Method Par 3-4

		SPSS version 22 (IBM, 2013) using the Kruskal-Wallis test for non parametric data such as median score in perception among groups The explanation of wright map in rasch model. The Wright map is a key output in Rasch model analysis that visually represents the correlation between the distribution of participants' perceptions (person measures) and the difficulty level of each questionnaire item (item measures) on the same logit scale. In this study, the Wright map was used to compare perception patterns between smokers and non-smokers regarding vaping and conventional cigarette use. On the map, participants are positioned on the left side based on the strength of their agreement with smoking-related perceptions, while questionnaire items are placed on the right side based on the level of endorsement required to agree with them. Items higher on the scale indicate that they require a stronger perception or agreement to endorse, whereas items lower on the scale are more readily agreed upon. 9. Thank you for your valuable comments. The categorization of the age variable into three groups—under 19 years, 19–20 years, and over 21 years—was guided by developmental, behavioral, and educational considerations relevant to the target population. Individuals under 19 years are typically in the late adolescence stage and are often in the early phase of university life, where initial exposure to peer pressure, social experimentation, and lifestyle independence is heightened. The 19–20 age group represents a transitional phase wherein students may become more autonomous in their decision-	-

		making and are more susceptible to adopting or solidifying health-related behaviors, including smoking or vaping. Participants over 21 years were grouped separately as they are likely to be in more advanced stages of their academic and social development, potentially exhibiting more stable attitudes and behaviors. This categorization allowed for the examination of perception differences across age stages that are meaningful in the context of psychosocial development and smoking behavior trajectories among young adults. 10. Thank you for your suggestion. However, the other variables that were analyzed have already been utilized and reported in a separate publication focusing on smoking perceptions. 11. Thank you for the recommendation. While a post hoc analysis following the Kruskal–Wallis test is commonly used to identify pairwise group differences, we chose not to perform it in this study because the Rasch model analysis already provided a more detailed and nuanced understanding of perceptual differences between groups. Specifically, the Wright Map (Figure 3) clearly illustrates the distribution of item difficulty and person perception levels across groups, allowing for a visual and statistical interpretation of perceptual separation. Furthermore, Table 2 presents probability-based comparisons of each item across age groups and smoking categories, which enhances the interpretive depth beyond what post hoc Kruskal–Wallis tests could offer. As such, the Rasch analysis not only confirmed the presence of significant differences but also offered item-level insights that aligned with	- -

		the study's psychometric objectives.	
	Result 1. Please report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed. I suggest you to use flow diagram or participants. 2. In Table 3, there is an analysis referred to as Differential Item Functioning (DIF) analysis. However, this analysis is not mentioned in the methodology section. Please provide additional details regarding this analysis in the methodology section to ensure clarity and transparency. 3. Given that the proportion of male and female participants is not balanced, please provide the rationale for analyzing the data based on sex. It would be helpful to explain how this potential imbalance was addressed or why it is still relevant to your analysis.	1. Thank you for your valuable comments. Added flowchart of study. 2. Thank you for your valuable comments. In Rasch analysis, several sub-analyses are available, one of which is Differential Item Functioning (DIF). We believe it is not necessary to elaborate on the detailed methodology of each sub-analysis, as DIF is an integral part of the Rasch framework, similar to how diagnostic accuracy tests encompass multiple measures (such as accuracy, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), likelihood ratios, ROC curves, and AUC) without requiring each component to be methodologically detailed. 3. Thank you for your thoughtful observation. While we acknowledge that the proportion of male and female participants in our study is not balanced (predominance of male respondents,) our decision to analyze the data based on gender remains relevant for several reasons. First, the Differential Item Functioning (DIF) analysis within the Rasch model is designed to detect systematic differences in item responses between subgroups, regardless of group size, making it a robust tool even in cases of sample imbalance. Second, existing literature consistently highlights that gender plays a significant role in risk perception, smoking behavior, and responsiveness to public health messaging, which aligns with our finding that males and females demonstrated different perceptual patterns toward smoking and vaping. Moreover, rather than drawing definitive conclusions about population-wide gender	3 Figure 1 - -

		differences, our goal was to explore emerging trends that could inform gender-responsive interventions, especially given the rising use of vaping products among youth.	
	Discussion 1. The discussion should begin with a summary of the main findings of the study, and these findings should be interpreted in the context of other studies. 2. What is the potential bias of this study and how the researchers reduce this bias. 3. Although some limitations are mentioned (e.g., the focus on vaping and conventional cigarettes, potential biases in sample selection), there could be more discussion on limitations regarding sampling methods. For example, how representative was the sample in terms of geographic location and socioeconomic status context? 4. Please provide specific and actionable recommendations that would enhance the practical value of the discussion and make it more relevant to policymakers and public health professionals. 5. A deeper dive into gender factor would provide a more nuanced understanding of how gender affects smoking and vaping behaviors and could be valuable for developing tailored interventions. 6. Please discuss generalizability (external validity) of the study results.	1. Thank you for your valuable comments. Revised. 2. Thank you for your valuable comments. Revised. A potential source of bias in this study arises from the use of a sample drawn from a single private university characterized by homogenous socioeconomic factors, which may limit the generalizability of the findings to more heterogeneous populations with varying levels of knowledge and behavioral patterns. Future studies should also consider conducting longitudinal research to observe changes in perceptions over time within a more diverse and representative population, particularly as new smoking products emerge in the market. 3. Thank you for your valuable comments. The sample was not fully representative in terms of geographic diversity; however, with respect to socioeconomic status, the population drawn from a single private university in an urban area may reflect a specific subgroup characterized by relatively homogeneous socioeconomic conditions. 4. Thank you for your valuable comments. Added in the discussion section prior limitation. 5. Thank you for your valuable comments. Added in the future recommendation section. 6. Thank you for your valuable comments. Revised in the limitation of study.	6-7 Discussion All paragraph 8 Discussion Par 3 - 8 Discussion Par 2 8 Discussion Par 4 8 Discussion Par 3

	Additional Comments 1. Some sentences could be made more concise to improve readability. Unnecessary repetition of information was avoided. 2. Ensure that the statistical results are reported consistently. This includes the presentation of percentages and p values. 3. Check that all references are cited consistently in the text and that the reference list follows the required citation style. 4. While the grammar is generally good, thorough proofreading to catch minor grammatical and punctuation errors would enhance the manuscript's professionalism. **5.** Ensure that the discussion links the study's findings to the broader context and literature, addressing the implications and any potential applications or future research directions.	1. Thank you for your valuable comments. Already checked. 2. Thank you for your valuable comments. Already checked. The percentage and p-value were consistent. 3. Thank you for your valuable comments. Already checked. All references were cited in the text and the reference follows the citation style. 4. Thank you for your valuable comments. Already checked. 5. Thank you for your valuable comments. Already checked. Added discussion to broader context.	

Reviewer 1

No	Reviewer	Reply comment	Page/Line
	This article contributes significantly to our understanding of young individuals' attitudes toward smoking, particularly in light of the growing popularity of vaping. The findings have significant implications for public health efforts, and the study's scientific rigor contributes to its legitimacy. However, future study could expand on these findings by resolving the mentioned limitations and investigating additional factors impacting smoking behavior.	Thank you for your valuable comments. Future study. Already stated in the discussion section, about additional factors impacting smoking behavior.	8 Discussion Par 4
	This manuscript had almost fulfilled the STROBE guideline. The setting is described as a university environment, however, the author could provide more details about the specific context (e.g., urban/rural setting, cultural factors).	Specific context Revised in the method section about urban area with homogenic cultural factors to minimized the selection bias.	2 Method Par 4
	The manuscript does not explicitly discuss potential biases, such as selection bias (e.g., only university students were included) or response bias (e.g., social desirability bias in self-reported smoking behavior). It is better to be explained.	Response bias. The response bias was already stated in the subject reliability in the specific questionnaire (Smoker questionnaire 0.74, non-smoker questionnaire (vaping) 0.77, non-smoker questionnaire (conventional cigarettee) 0.67). Moderate for 0.67-<0.8. We added the separation for subject analysis.	3 Method Par 1

Editorial

No	Reviewer	Reply comment	Page/Line
	a. Please make sure that your keywords comply with MeSH. b. Please include in your manuscript where ethics approval has been obtained, the name of the approving body and the approval number/ID. c. Discussion section: add limitations of this study and suggestions for future study. d. Please add “Conflict of Interest” and “Funding” sections in your manuscript e. Please check the references in your manuscript. The manuscript should have a minimum of 30 references, of which, 80% of them should be from primary sources, which are journals, and should be less than ten years old. f. Please also ensure that your revised manuscript conforms to the journal style, which can be found at the Instructions for Authors on the journal's website: https://scholarhub.ui.ac.id/jdi/styleguide.html	Thank you for your valuable comments. a. Revised. perception, smoker, vaper, cigarette smoking b. Already stated in the method section. c. Already stated in the discussion section. d. Already stated after the conclusion section. e. Revised from 20 references to 30 references. f. Already following the journal style.	1 Abstract 9-10 references

Journal of Dentistry Indonesia

Volume 32
Number 2 *August*

Article 4

8-31-2025

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Indrayadi Gunardi
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, indrayadi@trisakti.ac.id

Rahmi Amtha
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, rahmi.amtha@trisakti.ac.id

Firstine Kelsi Hartanto
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, firstine@trisakti.ac.id

Niko Falatehan
Department of Prosthodontics, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, niko.f@trisakti.ac.id

Alyah Heriandi
Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, alyahhr@gmail.com

See next page for additional authors

Recommended Citation

Gunardi, I., Amtha, R., Hartanto, F. K., Falatehan, N., Heriandi, A., Kurniawan, A. V., Nadiah, N., Poedjiastoeti, W., Andrijanto, A., & Sari, E. F. Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study. J Dent Indones. 2025;32(2): 96-103

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Authors

Indrayadi Gunardi, Rahmi Amtha, Firstine Kelsi Hartanto, Niko Falatehan, Alyah Heriandi, Angelita Victoria Kurniawan, Najla Nadiah, Wiwiek Poedjiastoeti, Andrijanto Andrijanto, and Elizabeth Fitriana Sari

Journal of Dentistry Indonesia 2025, Vol. 32, No. 2, 96-103
doi: 10.14693/jdi.v32i2.1845

ORIGINAL ARTICLE

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Indrayadi Gunardi[1*], Rahmi Amtha[1], Firstine Kelsi Hartanto[1], Niko Falatehan[2], Alyah Heriandi[3], Angelita Victoria[3], Najla Nadiah[1], Wiwiek Poedjiastoeti[4], Andrijanto[5], Elizabeth Fitriana Sari[6]

[1]*Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[2]*Department of Prosthodontics, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[3]*Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[4]*Department of Oral Maxillofacial Surgery, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[5]*Faculty of Smart Technology and Engineering, Universitas Kristen Maranatha, Bandung, Indonesia*
[6]*Dentistry and Oral Health Discipline, Department of Rural Clinical Science, La Trobe Rural Health School, Bendigo, Australia*
[*]*Correspondence e-mail to: indrayadi@trisakti.ac.id*

ABSTRACT

Objectives: The growing popularity of vaping has introduced additional challenges, as potential health risks are still under investigation. Exploring differences in smoking perceptions between smokers and non-smokers could provide valuable insights into smoking behavior and inform effective intervention strategies. This study aimed to evaluate and compare the perceptions of smoking, specifically vaping and conventional cigarette use, among young adult smokers and non-smokers. **Methods:** An analytical cross-sectional design was employed, with 542 university students included through random sampling, using a questionnaire consisting of 8 items. Data were analyzed using the Kruskal-Wallis test and Rasch model analysis. **Results:** Of the subjects, 259 (48%) used vapes and 283 (52%) were non-smokers. The age distribution was as follows: under 19 years (13.51% vs 38.87%), 19-20 years (46.33% vs 32.16%), and over 21 years (40.15% vs 28.98%). The Wright map indicated perceptual differences between smokers and non-smokers, with smokers showing greater agreement with smoking perceptions (>1 logit). Significant differences ($p < 0.001$) were found in each item across all groups. **Conclusion:** The study identified distinct perceptual differences regarding smoking between smokers and non-smokers, with smokers having a more favorable perception towards smoking. Non-smokers generally showed a stronger aversion to conventional cigarettes compared to electronic ones. These findings underscore the importance of developing targeted smoking cessation programs that address the specific perceptions and attitudes of both groups.

Keywords: cigarette, perception, smoker, vaper

How to cite this article: Gunardi I, Amtha R, Hartanto FK, Falatehan N, Heriandi A, Victoria A, *et al*. Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study. J Dent Indones. 2025;32(2): 96-103

INTRODUCTION

Smoking, whether in the form of conventional cigarettes or electronic alternatives (vaping), remains a significant public health issue, particularly among young adults. This demographic continues to experience high smoking prevalence, posing serious health risks and contributing to various chronic diseases and premature mortality. According to the World Health Organization (WHO) in 2023, 80% of the world's 1.3 billion tobacco users reside in low- and middle-income countries. In Indonesia, the National Health Survey of 2023 reported a smoking prevalence of 27.02% among individuals aged 10 years and older, with some beginning as early as five years old. While tobacco has historically been used in Indonesian culture for herbal remedies,[1] its consumption in conventional cigarettes has long been associated with harmful health effects.[2,3] Despite these perceptions, emerging evidence indicates that e-cigarettes are not without harm, they contain nicotine, volatile organic compounds, and heavy metals, which pose risks to oral, respiratory, and

cardiovascular health.[4–7] The growing popularity of vaping has introduced additional challenges, with its appeal as a "safer" alternative remaining inconclusive, as potential health risks are still under investigation. Given these uncertainties, research into young adults' perceptions of both smoking forms is essential for shaping comprehensive public health strategies. Moreover, the dual use of conventional and electronic cigarettes has also become increasingly common, further complicating cessation efforts.

Exploring differences in smoking perceptions between smokers and non-smokers could provide valuable insights into smoking behavior and inform effective intervention strategies. These groups often hold contrasting views regarding the acceptability, risks, and social implications of smoking.[3] For instance, smokers may view vaping as a less harmful or more socially acceptable alternative to conventional cigarettes, while non-smokers may be more critical of both practices, often highlighting health risks such as oral cancer.[8,9] A previous study by Yong *et al*. analyzed how perceptions of harm influence smoking cessation behavior, particularly in the context of policy-level patterns.[8] In contrast, the study by Schoren *et al*. focused on comparing motivational factors among smokers, vapers, and dual users.[10] By investigating these differing perspectives, public health efforts can better address misconceptions and emphasize the associated risks effectively.[11]

This study aims to evaluate and compare perceptions of smoking, specifically conventional cigarette and vaping use, among young adult smokers and non-smokers. It is hypothesized that smokers will demonstrate more favorable perceptions toward smoking compared to non-smokers. By examining these perceptual differences, the study seeks to identify specific areas that could inform targeted health education and smoking cessation initiatives. A clearer understanding of the factors that influence young adults' attitudes and behaviors toward smoking can guide the development of more effective and tailored public health campaigns. Ultimately, this research aims to contribute to a deeper understanding of smoking-related perceptions and support the creation of evidence-based interventions to reduce smoking rates and improve health outcomes among young adults.

METHODS

An analytical cross-sectional study was conducted among 542 university students in urban area of Jakarta using a questionnaire between July and December 2023. To minimize selection bias related to homogeneous cultural factors, the study population was drawn from a single private university (Universitas Trisakti in West Jakarta, Indonesia). The sample size was calculated using G*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, https://www.psychologie.hhu.de/), with an effect size (w) of 0.289 and an alpha level of 0.05.[7,12] The minimum required number of subjects for each group was determined to be 253. To account for potential participant dropouts, the sample size was increased by an additional 30 subjects.

Subjects were selected using purposive convenience sampling and divided into two groups: smokers and non-smokers. For the smoker group, subjects were recruited if their vaping behavior was confirmed visually by two investigators (AV and AH). For the non-smoker group, eligibility was limited to individuals who had never smoked any form of tobacco product, including conventional cigarettes, electronic cigarettes, or shisha. Inclusion criteria included active students at Universitas Trisakti who were willing to participate (showed by student ID), as evidenced by their informed consent. Additionally, for the smoker group, participants had to currently exhibit a vaping habit. Investigators cross-checked responses during questionnaire distribution and confirmed non-smoking status through direct verbal confirmation. Exclusion criteria included subject who do not complete the questionnaire. All participants provided informed consent before completing the questionnaire. Ethical clearance for the study was obtained from the Ethical Committee of the Faculty of Dentistry, Universitas Trisakti (No. 687/S1/KEPK/FKG/7/2023).

The newly perception questionnaire was designed (by IG, RA and AH) with three dimensions tailored for smokers (coded as "P") and non-smokers (coded as "N" for vaping and "K" for conventional smoking). Smokers received an eight-item questionnaire, while non-smokers received separate eight-item questionnaires on vaping and conventional smoking. The item domains were as follows: 1) Perceived toxicity; 2) Cost; 3) Smoking cessation/satisfaction of addiction; 4) Flavor appeal; 5) Aroma appeal; 6) Breath odor; 7) Modern trends; and 8) Peer influence. Responses were recorded on a Likert scale ranging from score 1–5 (”Strongly agree” to ”Strongly disagree”). The questionnaire was administered in hard copy.

A preliminary study was conducted to assess the validity and reliability of the questionnaires. The sample included 55 smokers (15 males, 40 females) and 83 non-smokers (24 males, 59 females). Rasch model analysis showed the following results:

- Smoker questionnaire: Cronbach's alpha = 0.73, item reliability = 0.97, subject reliability = 0.74 with separation of 1.64, unexplained variance in the 1st contrast = 2.09.
- Non-smoker questionnaire (vaping): Cronbach's alpha = 0.81, item reliability = 0.99, subject reliability = 0.77 with separation of 1.67, unexplained variance in the 1st contrast = 2.01.

- Non-smoker questionnaire (conventional smoking): Cronbach's alpha = 0.65, item reliability = 0.98, subject reliability = 0.67 with separation of 1.58, unexplained variance in the 1st contrast = 2.46.

The questionnaire was distributed digitally using a barcode system that allowed participants to access the survey directly via their mobile phones. A QR code linked to a Google Form was displayed and disseminated during student gatherings, enabling easy and immediate participation. Participants were instructed to scan the barcode using their smartphone cameras, which redirected them to the online questionnaire. Prior to accessing the form, participants were presented with an informed consent statement and could only proceed after agreeing to participate voluntarily. All responses were automatically collected and securely stored in a Google Drive account accessible only by the principal investigators through a password-protected account to ensure confidentiality and data protection throughout the study period.

Data were analyzed using Rasch model analysis and the Kruskal-Wallis test. Wright maps and differential item functioning were calculated using Winstep 4.3.4 (Mike Linacre, https://www.winsteps.com/). The Wright map is a key output in Rasch model analysis that visually represents the correlation between the distribution of participants' perceptions (person measures) and the difficulty level of each questionnaire item (item measures) on the same logit scale.[13] In this study, the Wright map was used to compare perception patterns between smokers and non-smokers regarding vaping and conventional cigarette use. On the map, participants are positioned on the left side based on the strength of their agreement with smoking-related perceptions, while questionnaire items are placed on the right side based on the level of endorsement required to agree with them. Items higher on the scale indicate that they require a stronger perception or agreement to endorse, whereas items lower on the scale are more readily agreed upon.[14]

Group differences were analyzed with SPSS version 22 (IBM, 2013) using the Kruskal-Wallis test for non-parametric data, such as median score in perception among groups. No missing data were reported for this study, and statistical significance was set at $p < 0.05$.

RESULTS

Among the subjects, 259 (48%) were vape users, and 283 (52%) were non-smokers (Figure 1). The highest percentage of smokers was observed in the 19–20-year age group (46.3%), followed by those aged 21 years and older (40.2%) (Table 1).

The item map (Figure 2) revealed perceptual differences between smokers and non-smokers, with smokers demonstrating a stronger agreement with smoking-related perceptions. As shown in Table 2, most items (flavor appeal, aroma appeal, breath odor, trend, and peer influence) were rated as "agreeable" by both smokers and non-smokers concerning conventional cigarettes, though not for non-smokers regarding vaping. Item perceived toxicity indicated that non-smokers (for both vaping and conventional cigarettes) perceived these substances as less toxic. All groups disagreed that vaping was more costly than conventional smoking (cost). Table 3 showed significant differences in perception ($p < 0.01$) across all items among the groups.

Table 4 presents the findings from the differential item functioning analysis, categorized by gender. For item P1, which evaluates the perception that vaping is less harmful than conventional cigarettes, and item P4, regarding the appeal of vaping flavors, female smokers were more likely to agree compared to males. Conversely, for item N3, which assesses the perception that vaping serves as a tool to quit conventional smoking, males were more likely to agree compared to females. Item K6 revealed that females were more inclined to view vaping as a way to improve breath odor compared to males.

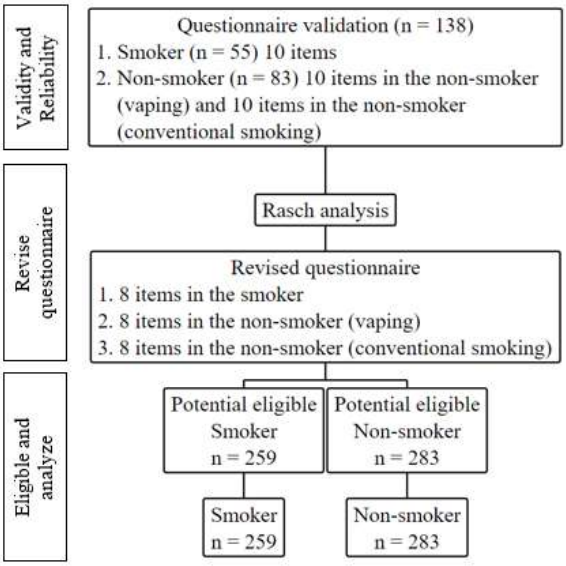
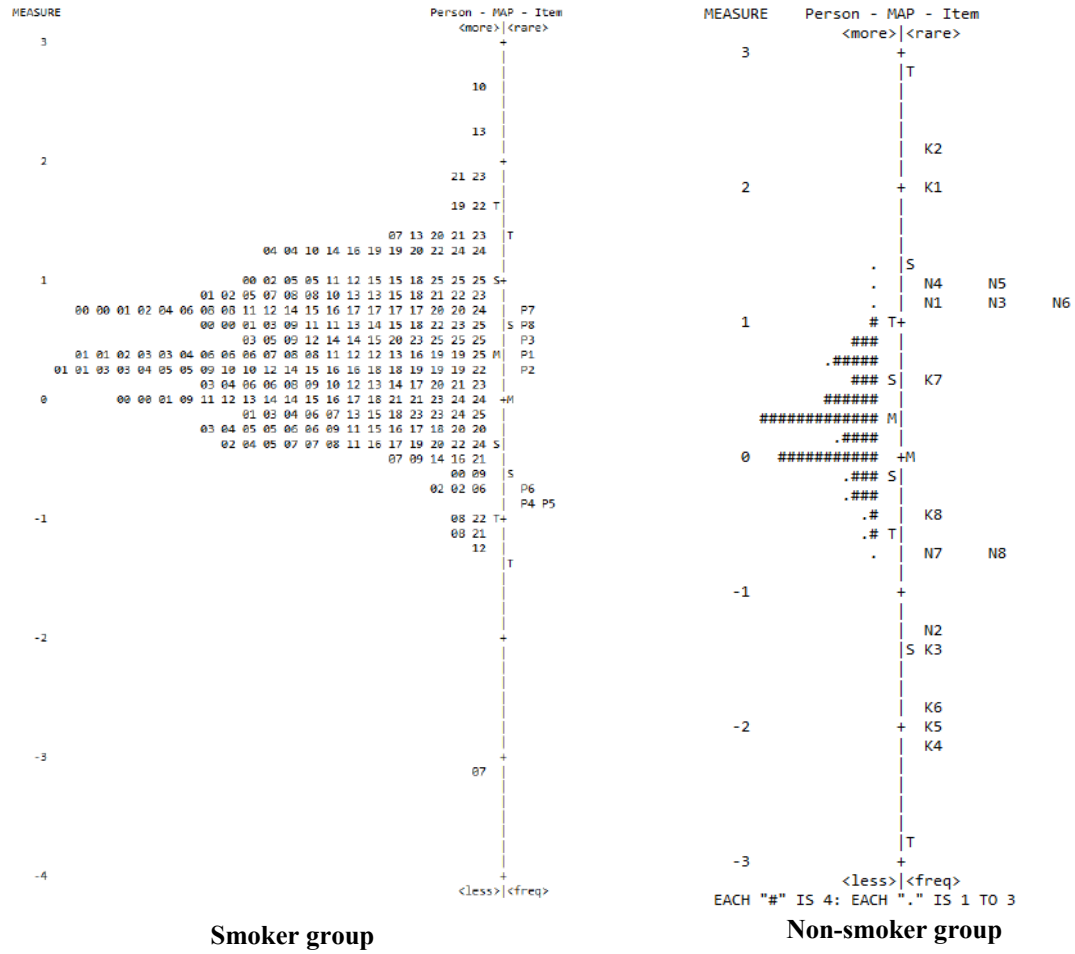


Figure 1. Flow chart of study

Table 1. Subject and age distributions between groups

Variable	Smoker (n = 259) n (%)	Non-smoker (n = 283) n (%)
Sex		
Male	202 (78.0)	68 (24.0)
Female	57 (22.0)	215 (76.0)
Age (years old)		
<19	35 (13.5)	110 (38.9)
19-20	120 (46.3)	91 (32.2)
>21	104 (40.2)	82 (29.0)



Smoker group **Non-smoker group**

P: smoker perception; N: non-smoker perception of vaping; K: non-smoker perception of conventional cigarette; each number on the right side corresponds to a questionnaire item.

Figure 2. Wright map of smoker and non-smoker groups.

Table 2. Characteristics of perception for each item between groups

Item domain	Group	Strongly disagree (%)	Disagree (%)	Doubtful (%)	Agree (%)	Strongly agree (%)
Perceived toxicity	P	13.51	16.22	33.20	23.55	13.51
	N	35.34	25.44	24.73	9.19	5.30
	K	61.84	20.85	12.72	3.53	1.06
Cost	P	20.85	21.24	23.94	20.08	13.90
	N	57.24	19.43	16.96	3.89	2.47
	K	67.14	18.73	10.95	2.12	1.06
Smoking cessation[a]/ satisfy addiction[b]	P[a]	26.25	16.22	19.69	19.69	18.15
	N[a]	42.76	19.43	21.55	10.60	5.65
	K[b]	2.47	4.59	10.95	18.73	63.25
Flavor appeal	P	6.18	6.18	10.04	35.52	42.08
	N	41.34	27.21	18.02	10.95	2.47
	K	1.41	2.12	7.77	16.25	72.44
Aroma appeal	P	5.41	6.18	12.36	33.98	42.08
	N	41.70	25.80	21.20	9.19	2.12
	K	0.71	2.12	9.89	16.61	70.67
Breath odor	P	6.18	5.41	17.76	32.05	38.61
	N	39.93	23.32	22.26	9.54	4.95
	K	1.41	1.41	11.31	15.90	69.96

Table 2. Continues

Item domain	Group	Strongly disagree (%)	Disagree (%)	Doubtful (%)	Agree (%)	Strongly agree (%)
Modern trend	P	20.46	26.25	25.87	17.76	9.65
	N	6.01	5.30	12.01	36.75	39.93
	K	16.61	28.98	27.56	14.13	12.72
Peer influence	P	26.25	18.15	23.94	20.08	11.58
	N	4.95	2.47	12.72	44.88	34.98
	K	35.34	25.44	24.73	9.19	5.30

P: smoker perception; N: non-smoker perception of vaping; K: non-smoker perception of conventional cigarette.

Table 3. Perception differences between groups

Group	Item–median (IQR)								Item Total Mean ± SD	*p*
	1+	2+	3+	4+	5+	6+	7+	8+		
Smoker perception	3 (2)	3 (2)	3 (3)	4 (1)	4 (1)	4 (2)	3 (2)	3 (3)	26.45 ± 5.28	<0.001**
Non-smoker perception about vaping	2 (2)	1 (1)	2 (2)	2 (2)	2 (2)	2 (2)	4 (1)	4 (1)	19.85 ± 5.53	
Non-smoker perception about conventional cigarette	1 (1)	1 (1)	1 (1)	1 (0)	1 (0)	1 (0)	3 (2)	4 (2)	15.27 ± 4.13	

** $p < 0.01$ Kruskal-Wallis test
+ Each item was significantly different between groups, $p < 0.01$

Table 4. Differential item functioning analysis for questionnaire items based on gender

Item	Probability					
	Smoker perception		Non-smoker perception about vaping		Non-smoker perception about conventional cigarette	
	Male	Female	Male	Female	Male	Female
Perceived toxicity	0.24	0.04*	1.00	1.00	0.35	0.69
Cost	1.00	0.86	0.34	0.70	0.73	0.84
Smoking cessation[a]/satisfy addiction[b]	[a]0.59	0.34	[a]0.02	0.27*	[b]0.51	0.81
Flavor appeal	0.24	0.04*	1.00	1.00	0.63	0.77
Aroma appeal	0.48	0.23	0.05	0.34	0.06	0.39
Breath odor	0.60	0.39	0.68	1.00	0.04	0.36*
Modern trend	1.00	0.76	0.48	0.78	0.10	0.43
Peer influence	1.00	0.73	0.78	1.00	0.60	0.76

*probability < 0.05

DISCUSSION

Based on the demographic characteristics of the study subjects, out of 542 participants, 259 were vape smokers, while 283 were non-smokers. Male subjects constituted 78% of the sample, with females accounting for 22%. While vaping was primarily introduced as a healthier alternative, its usage extended beyond just (former) smokers.[10] These findings align with the study by Said et al., which reported that vape users are predominantly male compared to females.[15] This gender disparity may be explained by the higher prevalence of adolescent delinquency among males and parental challenges in providing guidance.[16] Male tend to exhibit higher levels of risk-taking behaviors compared to their female counterparts,[17–19] often driven by a combination of biological, psychological, and social factors. Biologically, elevated testosterone levels during adolescence are associated with increased impulsivity and sensation-seeking.[18,20] Psychologically, boys are more likely to exhibit externalizing behaviors, such as defiance[17] and aggression,[21] which are often linked to experimenting with substances like tobacco and vape products. Socially, boys may face greater peer pressure to conform to risky behaviors,[17,19] particularly in settings where smoking or vaping is perceived as a marker of maturity or social acceptance. In addition, cultural norms and societal expectations in some regions may inadvertently encourage such behaviors in males.[17,19–21] For instance, traditional perceptions of masculinity often associate smoking with independence or toughness, further reinforcing these behaviors. The interplay of these factors creates a scenario where male adolescents are more likely to initiate and sustain habits like vaping or smoking compared to their

female peers. Addressing these underlying causes through targeted interventions, such as parental education, peer mentoring programs, and culturally sensitive health campaigns, is essential for mitigating the gender disparity in smoking behaviors.

In terms of age distribution, vape smokers were most prevalent in the 19–20 age group, followed by those aged 21 years and older and those under 19 years. This is consistent with findings by Ruppel et al., which highlighted that 66.8% of vape users fall within the 18–25 age group.[22] This trend may be attributed to immature cognitive development and a lack of logical reasoning about the health consequences of smoking during this age range.[23]

Rasch analysis revealed perceptual differences between smokers and non-smokers, as illustrated in the item map. Non-smokers were more inclined to agree with perceptions of conventional cigarette use compared to vaping. Specifically, non-smokers disagreed with vaping-related perceptions, such as flavor appeal, aroma appeal, and breath odor, but tended to agree on perceptions of vaping being more cost-effective and trendier. Several perception items were similarly aligned between smokers and non-smokers regarding conventional cigarettes, while non-smokers' perceptions of vaping significantly differed from their perceptions of cigarettes. This difference could be attributed to the longstanding social acceptance and familiarity with conventional cigarettes, which predate the introduction of vaping. Moreover, public health campaigns and warnings over the years have predominantly focused on the dangers of conventional cigarette smoking, making non-smokers more aware of its risks. However, the risks associated with vaping are still emerging and are not as widely disseminated, creating a knowledge gap that influences perceptions.[24] Non-smokers may also associate vaping with younger generations and modern trends, which could contribute to a perception of vaping as a less authentic or socially acceptable behavior compared to traditional smoking.[17,19,21,25] Additionally, the sensory aspects of vaping, such as its often-sweet aromas and wide variety of flavors, might be perceived by non-smokers as artificial and unappealing, contrasting with the more familiar, albeit unpleasant, characteristics of cigarette smoke.[26] This difference in sensory perception could further explain why non-smokers are less inclined to view vaping favorably. These findings underscore the need for tailored public health messaging that addresses the specific misconceptions and perceptions surrounding vaping, particularly among non-smokers, while continuing to emphasize the well-documented risks of conventional cigarettes.

Although all items and total scores showed significant differences between smoker and non-smoker groups based on the Kruskal-Wallis test, this method alone could not fully identify nuanced discrepancies and perception patterns between vape and cigarette users. The Rasch model analysis provided a more precise evaluation of item distribution compared to conventional quantitative methods. The Wright map offered a clear visualization of perception differences regarding vaping and conventional cigarettes within the non-smoker group. Profound differences were observed across multiple perception domains, including cost, cessation or addiction potential, flavor appeal, aroma appeal, breath odor, and trend. Non-smokers tended to disagree with vaping-related perceptions, particularly in terms of flavor appeal, aroma appeal, and breath odor. However, they were more likely to agree with the perception that vaping is cost-effective and aligns with modern trends. Notably, the perceptions of vaping and conventional cigarette use among non-smokers differed markedly. The item distribution within the non-smoker group suggested a stronger inclination to agree with conventional cigarette use compared to vaping, reflecting distinct perceptual patterns between these two types of smoking behavior. This finding also supports previous studies that many youths view vaping as less harmful and prone to addiction than conventional cigarettes.[26,27]

The differential item functioning test further revealed significant gender-based differences in preferences across various domains. Female participants were more likely to agree with perceptions of vaping as less toxic and appealing due to its flavors. Conversely, male participants tended to agree that vaping could serve as a means to reduce dependence on conventional cigarettes. Additionally, females showed a stronger tendency to use vaping due to its favorable impact on breath odor compared to males. This condition highlights gender differences in the predictability of risk-taking behavior, consistent with findings reported by Brand et al. and Lewis *et al*.[18,25]

To enhance the practical implications of this study for policymakers and public health professionals, several targeted strategies are recommended. First, public health campaigns should be tailored to align with the distinct perceptions of smokers and non-smokers identified in this study. For smokers, it should challenge the misconception that vaping is a safer or effective cessation tool, while for non-smokers, the information should be warned of the emerging risks of electronic cigarettes, especially those marketed as flavorful or trendy.[6] Second, integrating perception-based screening tools into school and university health programs may allow early identification of individuals at risk of initiating smoking or vaping, based on their attitudes rather than current behavior.[28] Third, gender-specific interventions should be implemented.[29] Male-focused campaigns might address risk-taking behaviors and social conformity, whereas female-focused strategies should counter the appeal of flavor and perceived benefits to breath odor, given the stronger agreement

among females for these perceptions. Moreover, government regulators should revise vaping product warnings to include perception-corrective messaging that addresses cost misconceptions, addiction potential, and false assumptions about pleasant breath effects.[30] Recognizing the strong influence of peers on smoking initiation, peer-led anti-vaping ambassador programs in educational settings should be developed to transform peer influence into a protective factor. Furthermore, the notable proportion of vape users under the age of 19 in this study underscores the need for regulatory surveillance and preventive programs to be expanded to younger demographics, including those in private educational institutions where access may be less restricted.

This study has certain limitations. The analysis of perceptions could be expanded to include other forms of smoking, such as shisha, cigars, and kretek/filtered cigarettes, to provide a broader understanding of smoking behaviors across different types of tobacco use. A potential source of bias in this study arises from the use of a sample drawn from a single private university characterized by homogeneous socioeconomic factors, which may limit the generalizability of the findings to more heterogeneous populations with varying levels of knowledge and behavioral patterns. Furthermore, cultural norms, parental supervision, and exposure to health education may vary significantly across the subject population. The sample was not fully representative in terms of geographic diversity; however, concerning socioeconomic status, the population drawn from a single private university in an urban area may reflect a specific subgroup characterized by relatively homogeneous socioeconomic conditions. Future studies should also consider conducting longitudinal research to observe changes in perceptions over time within a more diverse and representative population, particularly as new smoking products emerge in the market. Additionally, investigating the psychological and social factors influencing smoking and vaping behaviors—such as peer pressure, cultural norms, and media influence—would provide deeper insights into the motivations behind these habits.

Future research could benefit from adopting mixed-method approaches, integrating quantitative analysis with qualitative data to explore the underlying motivations and deterrents associated with smoking and vaping. This would allow for a more nuanced understanding of the factors driving these behaviors. A qualitative methodology may gain benefit to explore interaction effects in greater depth, particularly understanding of gender-specific motivations, peer dynamics, and perceived social rewards that influence smoking and vaping behaviors. Moreover, studies examining the effectiveness of targeted health education and cessation programs tailored to the identified perceptual differences could contribute significantly to reducing smoking prevalence. Implementing and evaluating interventions in diverse demographic settings, such as schools, workplaces, and community centers, would further support the development of practical and evidence-based public health policies and programs.

CONCLUSION

The study revealed distinct perceptual differences between smokers and non-smokers regarding smoking. Smokers exhibited more favorable perceptions toward smoking, while non-smokers demonstrated a stronger aversion to conventional cigarettes compared to electronic alternatives. These findings highlight the need for tailored smoking cessation programs that address the unique perceptions and attitudes of each group to enhance their effectiveness.

CONFLICT OF INTEREST

None declared.

FUNDING

None declared.

REFERENCES

1. Vychaktami KK, Amtha R, Gunardi I, Zain RB. The effect of herbal medicine in reducing the severity of oral lichen planus: A systematic review and meta-analysis. Dent J. 2022; 55(3):165–73.
2. Gunardi I, Sufiawati I, Goenawan H, Herawati DMD, Lesmana R, Abdullah AG. Research trends in molecular biological studies on oral squamous cell carcinoma: A bibliometric analysis. Oncol Rev. 2023; 17:11585.
3. Nathaniel FA, Amtha R, Gunardi I, Hartanto FK, Sari EF. Enhanced knowledge inversed attitude of oral cancer risk habit associated with sociocultural: A quantitative and qualitative pilot study. J Int Soc Prev Community Dent. 2023; 13(5):380–7.
4. Kelesidis T, Sharma M, Satta S, Tran E, Gupta R, Araujo JA, et al. Ectodomain shedding of proteins important for SARS-CoV-2 pathogenesis in plasma of tobacco cigarette smokers compared to electronic cigarette vapers: A cross-sectional study. J Mol Med (Berl). 2023; 101(3):327–35.
5. Park JA, Crotty Alexander LE, Christiani DC. Vaping and lung inflammation and injury. Annu Rev Physiol. 2022; 84:611–29.
6. Ferrara P, Franceschini G, Corsello G, Namazova-Baranova L, Pop TL, Mestrovic J, et al. The health risks of electronic cigarettes use in adolescents. J Pediatr. 2020; 219:286–287.e3.

7. Amtha R, Rahayu AP, Gunardi I, Nadiah N, Ghani WMN. Profile of oral mucosa changes and perception of e-cigarettes smoker. In Widyarman AS, Rizal MI, Roeslan MO, Marpaung CD. (ed.), Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges. 1st ed. London: CRC Press; 2024. pp. 502–7.
8. Yong HH, Gravely S, Borland R, Gartner C, Michael Cummings K, East K, et al. Do smokers' perceptions of the harmfulness of nicotine replacement therapy and nicotine vaping products as compared to cigarettes influence their use as an aid for smoking cessation? findings from the ITC four country smoking and vaping surveys. Nicotine Tob Res. 2022; 24(9):1413–21.
9. Acharya SK, Shai S, Choon YF, Gunardi I, Hartanto FK, Kadir K, et al. Cancer stem cells in oral squamous cell carcinoma: A narrative review on experimental characteristics and methodological challenges. Biomedicines. 2024; 12(9):2111.
10. Schoren C, Hummel K, de Vries H. Electronic cigarette use: comparing smokers, vapers, and dual users on characteristics and motivational factors. Tob Prev Cessat. 2017; 3:8.
11. Gunardi I, Sari EM, Goenawan H, Lesmana R, Herawati DMD, Muchtaridi, et al. Calcitriol and cisplatin combination decreases expression of MAPK2 and NF-kB/p65 induce apoptosis in oral squamous carcinoma cells. J Int Dent Med Res. 2023; 16(3):1050–5.
12. Amtha R, Gunardi I, Widyarman AS, Herwanto T, Hartanto FK, Vincent-Chong VK. Salivary profile analysis based on oral cancer risk habits: An observational cross-sectional study. Biomedicines. 2024; 12(8):1748.
13. Bond TG, Fox CM. Applying the Rasch Model: Fundamental Measurement in the Human Sciences. 3rd ed. New York: Taylor and Francis; 2015.
14. Gunardi I, Nurina NS, Marcia M, Amtha R. Dentists experience influences knowledge and attitudes toward HIV patients in West Jakarta, Indonesia, and validation of a new questionnaire. Oral Dis. 2020; 26(Suppl 1):127–32.
15. Said M, Ramlan R, Muluki M. Karakteristik pengguna rokok elektrik (vapor) di wilayah Parepare. Jurnal Ilmiah Manusia Dan Kesehatan. 2022; 5(1):459–67.
16. Idrizovic K, Zenic N, Tahiraj E, Rausavljevic N, Sekulic D. Cigarette smoking among 17–18 year old adolescents–Prevalence and association with sociodemographic, familial, sport, and scholastic factors. Med Pr. 2015; 66(2):153–63.
17. Croisant SA, Haque Laz T, Rahman M, Berenson AB. Gender differences in risk behaviors among high school youth. Glob Adv Health Med. 2013; 2(5):16–22.
18. Lewis G, Srinivasan R, Roiser J, Blakemore SJ, Flouri E, Lewis G. Risk-taking to obtain reward: Sex differences and associations with emotional and depressive symptoms in a nationally representative cohort of UK adolescents. Psychol Med. 2022; 52(13):2805–13.
19. Harris CR, Jenkins M. Gender differences in risk assessment: Why do women take fewer risks than men? Judgm Decis Mak. 2006; 1(1):48–63.
20. Grueter CC, Goodman H, Fay N, Walker B, Coall D. Preference for male risk takers varies with relationship context and health status but not COVID risk. Evol Psychol Sci. 2023;1–10.
21. Chein J, Albert D, O'Brien L, Uckert K, Steinberg L. Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. Dev Sci. 2011; 14(2):F1–10.
22. Ruppel T, Alexander B, Mayrovitz HN. Assessing vaping views, usage, and vaping-related education among medical students: A pilot study. Cureus. 2021; 13(2):e13614.
23. Icenogle G, Steinberg L, Duell N, Chein J, Chang L, Chaudhary N, et al. Adolescents' cognitive capacity reaches adult levels prior to their psychosocial maturity: Evidence for a "maurity gap" in a multinational, cross-sectional sample. Law Hum Behav. 2019; 43(1):69–85.
24. Gunardi I, Amtha R, Widyadhana HGV. Perception as mediator between knowledge and attitude of community about COVID-19 in dentistry. e-GiGi. 2021; 10(1):6–15.
25. Brand JA, Henry J, Melo GC, Wlodkowic D, Wong BBM, Martin JM. Sex differences in the predictability of risk-taking behavior. Behav Ecol. 2023; 34(1):108–16.
26. Romijnders KAGJ, van Osch L, de Vries H, Talhout R. Perceptions and reasons regarding e-cigarette use among users and non-users: A narrative literature review. Int J Environ Res Public Health. 2018; 15(6):1190.
27. Amrock SM, Lee L, Weitzman M. Perceptions of e-cigarettes and noncigarette tobacco products among US youth. Pediatrics. 2016; 138(5): e20154306.
28. Minnix JA, Karam-Hage M, Blalock JA, Cinciripini PM. The importance of incorporating smoking cessation into lung cancer screening. Transl Lung Cancer Res. 2018; 7(3):272–80.
29. Stinson J, Wolfson L, Poole N. Technology-based substance use interventions: opportunities for gender-transformative health promotion. Int J Environ Res Public Health. 2020; 17(3):992.
30. Rohde JA, Noar SM, Sheldon JM, Hall MG, Kieu T, Brewer NT. Identifying promising themes for adolescent vaping warnings: A national experiment. Nicotine Tob Res. 2022; 24(9):1379–85.

(Received January 1, 2025; Accepted July 31, 2025)

Perception of Conv ception of Conventional Cigar entional Cigarettes and V ettes and Vaping among aping among Smokers and Nonsmokers: A Cross-sectional Study

by Indrayadi Gunardi

Submission date: 21-Oct-2025 09:06AM (UTC+0700)
Submission ID: 2787464276
File name: Perception_of_Conventional_Cigarettes_and_Vaping.pdf (571.04K)
Word count: 5726
Character count: 31172

Journal of Dentistry Indonesia

Volume 32
Number 2 *August*

Article 4

8-31-2025

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Indrayadi Gunardi
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia,
indrayadi@trisakti.ac.id

Rahmi Amtha
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia,
rahmi.amtha@trisakti.ac.id

Firstine Kelsi Hartanto
Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia,
firstine@trisakti.ac.id

Niko Falatehan
Department of Prosthodontics, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia,
niko.f@trisakti.ac.id

Alyah Heriandi
Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia, alyahhr@gmail.com

See next page for additional authors

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Authors

Indrayadi Gunardi, Rahmi Amtha, Firstine Kelsi Hartanto, Niko Falatehan, Alyah Heriandi, Angelita Victoria Kurniawan, Najla Nadiah, Wiwiek Poedjiastoeti, Andrijanto Andrijanto, and Elizabeth Fitriana Sari

Journal of Dentistry Indonesia 2025, Vol. 32, No. 2, 96-103
doi: 10.14693/jdi.v32i2.1845

ORIGINAL ARTICLE

Perception of Conventional Cigarettes and Vaping among Smokers and Nonsmokers: A Cross-sectional Study

Indrayadi Gunardi[1*], Rahmi Amtha[1], Firstine Kelsi Hartanto[1], Niko Falatehan[2], Alyah Heriandi[3], Angelita Victoria[3], Najla Nadiah[1], Wiwiek Poedjiastoeti[4], Andrijanto[5], Elizabeth Fitriana Sari[6]

[1]*Department of Oral Medicine, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[2]*Department of Prosthodontics, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[3]*Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[4]*Department of Oral Maxillofacial Surgery, Faculty of Dentistry, Universitas Trisakti, Jakarta, Indonesia*
[5]*Faculty of Smart Technology and Engineering, Universitas Kristen Maranatha, Bandung, Indonesia*
[6]*Dentistry and Oral Health Discipline, Department of Rural Clinical Science, La Trobe Rural Health School, Bendigo, Australia*
[*]*Correspondence e-mail to: indrayadi@trisakti.ac.id*

ABSTRACT

Objectives: The growing popularity of vaping has introduced additional challenges, as potential health risks are still under investigation. Exploring differences in smoking perceptions between smokers and non-smokers could provide valuable insights into smoking behavior and inform effective intervention strategies. This study aimed to evaluate and compare the perceptions of smoking, specifically vaping and conventional cigarette use, among young adult smokers and non-smokers. **Methods:** An analytical cross-sectional design was employed, with 542 university students included through random sampling, using a questionnaire consisting of 8 items. Data were analyzed using the Kruskal-Wallis test and Rasch model analysis. **Results:** Of the subjects, 259 (48%) used vapes and 283 (52%) were non-smokers. The age distribution was as follows: under 19 years (13.51% vs 38.87%), 19-20 years (46.33% vs 32.16%), and over 21 years (40.15% vs 28.98%). The Wright map indicated perceptual differences between smokers and non-smokers, with smokers showing greater agreement with smoking perceptions (>1 logit). Significant differences ($p < 0.001$) were found in each item across all groups. **Conclusion:** The study identified distinct perceptual differences regarding smoking between smokers and non-smokers, with smokers having a more favorable perception towards smoking. Non-smokers generally showed a stronger aversion to conventional cigarettes compared to electronic ones. These findings underscore the importance of developing targeted smoking cessation programs that address the specific perceptions and attitudes of both groups.

Keywords: cigarette, perception, smoker, vaper

How to cite this article: Gunardi I, Amtha R, Hartanto FK, Falatehan N, Heriandi A, Victoria A, *et al*. Perception of conventional cigarettes and vaping among smokers and nonsmokers: A cross-sectional study. J Dent Indones. 2025;32(2): 96-103

INTRODUCTION

Smoking, whether in the form of conventional cigarettes or electronic alternatives (vaping), remains a significant public health issue, particularly among young adults. This demographic continues to experience high smoking prevalence, posing serious health risks and contributing to various chronic diseases and premature mortality. According to the World Health Organization (WHO) in 2023, 80% of the world's 1.3 billion tobacco users reside in low- and middle-income countries. In Indonesia, the National Health Survey of 2023 reported a smoking prevalence of 27.02% among individuals aged 10 years and older, with some beginning as early as five years old. While tobacco has historically been used in Indonesian culture for herbal remedies,[1] its consumption in conventional cigarettes has long been associated with harmful health effects.[2,3] Despite these perceptions, emerging evidence indicates that e-cigarettes are not without harm, they contain nicotine, volatile organic compounds, and heavy metals, which pose risks to oral, respiratory, and

cardiovascular health.[4–7] The growing popularity of vaping has introduced additional challenges, with its appeal as a "safer" alternative remaining inconclusive, as potential health risks are still under investigation. Given these uncertainties, research into young adults' perceptions of both smoking forms is essential for shaping comprehensive public health strategies. Moreover, the dual use of conventional and electronic cigarettes has also become increasingly common, further complicating cessation efforts.

Exploring differences in smoking perceptions between smokers and non-smokers could provide valuable insights into smoking behavior and inform effective intervention strategies. These groups often hold contrasting views regarding the acceptability, risks, and social implications of smoking.[3] For instance, smokers may view vaping as a less harmful or more socially acceptable alternative to conventional cigarettes, while non-smokers may be more critical of both practices, often highlighting health risks such as oral cancer.[8,9] A previous study by Yong *et al.* analyzed how perceptions of harm influence smoking cessation behavior, particularly in the context of policy-level patterns.[8] In contrast, the study by Schoren *et al.* focused on comparing motivational factors among smokers, vapers, and dual users.[10] By investigating these differing perspectives, public health efforts can better address misconceptions and emphasize the associated risks effectively.[11]

This study aims to evaluate and compare perceptions of smoking, specifically conventional cigarette and vaping use, among young adult smokers and non-smokers. It is hypothesized that smokers will demonstrate more favorable perceptions toward smoking compared to non-smokers. By examining these perceptual differences, the study seeks to identify specific areas that could inform targeted health education and smoking cessation initiatives. A clearer understanding of the factors that influence young adults' attitudes and behaviors toward smoking can guide the development of more effective and tailored public health campaigns. Ultimately, this research aims to contribute to a deeper understanding of smoking-related perceptions and support the creation of evidence-based interventions to reduce smoking rates and improve health outcomes among young adults.

METHODS

An analytical cross-sectional study was conducted among 542 university students in urban area of Jakarta using a questionnaire between July and December 2023. To minimize selection bias related to homogeneous cultural factors, the study population was drawn from a single private university (Universitas Trisakti in West Jakarta, Indonesia). The sample size was calculated using G*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, https://www.psychologie.hhu.de/), with an effect size (w) of 0.289 and an alpha level of 0.05.[7,12] The minimum required number of subjects for each group was determined to be 253. To account for potential participant dropouts, the sample size was increased by an additional 30 subjects.

Subjects were selected using purposive convenience sampling and divided into two groups: smokers and non-smokers. For the smoker group, subjects were recruited if their vaping behavior was confirmed visually by two investigators (AV and AH). For the non-smoker group, eligibility was limited to individuals who had never smoked any form of tobacco product, including conventional cigarettes, electronic cigarettes, or shisha. Inclusion criteria included active students at Universitas Trisakti who were willing to participate (showed by student ID), as evidenced by their informed consent. Additionally, for the smoker group, participants had to currently exhibit a vaping habit. Investigators cross-checked responses during questionnaire distribution and confirmed non-smoking status through direct verbal confirmation. Exclusion criteria included subject who do not complete the questionnaire. All participants provided informed consent before completing the questionnaire. Ethical clearance for the study was obtained from the Ethical Committee of the Faculty of Dentistry, Universitas Trisakti (No. 687/S1/KEPK/FKG/7/2023).

The newly perception questionnaire was designed (by IG, RA and AH) with three dimensions tailored for smokers (coded as "P") and non-smokers (coded as "N" for vaping and "K" for conventional smoking). Smokers received an eight-item questionnaire, while non-smokers received separate eight-item questionnaires on vaping and conventional smoking. The item domains were as follows: 1) Perceived toxicity; 2) Cost; 3) Smoking cessation/satisfaction of addiction; 4) Flavor appeal; 5) Aroma appeal; 6) Breath odor; 7) Modern trends; and 8) Peer influence. Responses were recorded on a Likert scale ranging from score 1–5 ("Strongly agree" to "Strongly disagree"). The questionnaire was administered in hard copy.

A preliminary study was conducted to assess the validity and reliability of the questionnaires. The sample included 55 smokers (15 males, 40 females) and 83 non-smokers (24 males, 59 females). Rasch model analysis showed the following results:

- Smoker questionnaire: Cronbach's alpha = 0.73, item reliability = 0.97, subject reliability = 0.74 with separation of 1.64, unexplained variance in the 1st contrast = 2.09.
- Non-smoker questionnaire (vaping): Cronbach's alpha = 0.81, item reliability = 0.99, subject reliability = 0.77 with separation of 1.67, unexplained variance in the 1st contrast = 2.01.

- Non-smoker questionnaire (conventional smoking): Cronbach's alpha = 0.65, item reliability = 0.98, subject reliability = 0.67 with separation of 1.58, unexplained variance in the 1st contrast = 2.46.

The questionnaire was distributed digitally using a barcode system that allowed participants to access the survey directly via their mobile phones. A QR code linked to a Google Form was displayed and disseminated during student gatherings, enabling easy and immediate participation. Participants were instructed to scan the barcode using their smartphone cameras, which redirected them to the online questionnaire. Prior to accessing the form, participants were presented with an informed consent statement and could only proceed after agreeing to participate voluntarily. All responses were automatically collected and securely stored in a Google Drive account accessible only by the principal investigators through a password-protected account to ensure confidentiality and data protection throughout the study period.

Data were analyzed using Rasch model analysis and the Kruskal-Wallis test. Wright maps and differential item functioning were calculated using Winstep 4.3.4 (Mike Linacre, https://www.winsteps.com/). The Wright map is a key output in Rasch model analysis that visually represents the correlation between the distribution of participants' perceptions (person measures) and the difficulty level of each questionnaire item (item measures) on the same logit scale.[13] In this study, the Wright map was used to compare perception patterns between smokers and non-smokers regarding vaping and conventional cigarette use. On the map, participants are positioned on the left side based on the strength of their agreement with smoking-related perceptions, while questionnaire items are placed on the right side based on the level of endorsement required to agree with them. Items higher on the scale indicate that they require a stronger perception or agreement to endorse, whereas items lower on the scale are more readily agreed upon.[14]

Group differences were analyzed with SPSS version 22 (IBM, 2013) using the Kruskal-Wallis test for non-parametric data, such as median score in perception among groups. No missing data were reported for this study, and statistical significance was set at $p < 0.05$.

RESULTS

Among the subjects, 259 (48%) were vape users, and 283 (52%) were non-smokers (Figure 1). The highest percentage of smokers was observed in the 19–20-year age group (46.3%), followed by those aged 21 years and older (40.2%) (Table 1).

The item map (Figure 2) revealed perceptual differences between smokers and non-smokers, with smokers demonstrating a stronger agreement with smoking-related perceptions. As shown in Table 2, most items (flavor appeal, aroma appeal, breath odor, trend, and peer influence) were rated as "agreeable" by both smokers and non-smokers concerning conventional cigarettes, though not for non-smokers regarding vaping. Item perceived toxicity indicated that non-smokers (for both vaping and conventional cigarettes) perceived these substances as less toxic. All groups disagreed that vaping was more costly than conventional smoking (cost). Table 3 showed significant differences in perception ($p < 0.01$) across all items among the groups.

Table 4 presents the findings from the differential item functioning analysis, categorized by gender. For item P1, which evaluates the perception that vaping is less harmful than conventional cigarettes, and item P4, regarding the appeal of vaping flavors, female smokers were more likely to agree compared to males. Conversely, for item N3, which assesses the perception that vaping serves as a tool to quit conventional smoking, males were more likely to agree compared to females. Item K6 revealed that females were more inclined to view vaping as a way to improve breath odor compared to males.

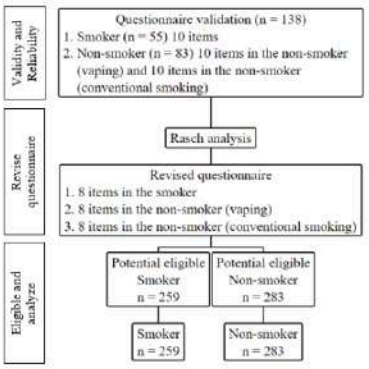
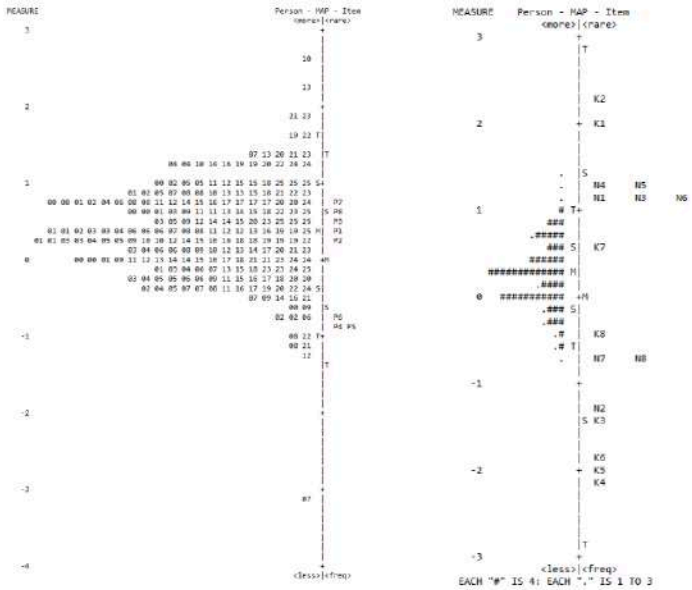


Figure 1. Flow chart of study

Table 1. Subject and age distributions between groups

Variable	Smoker (n = 259) n (%)	Non-smoker (n = 283) n (%)
Sex		
Male	202 (78.0)	68 (24.0)
Female	57 (22.0)	215 (76.0)
Age (years old)		
<19	35 (13.5)	110 (38.9)
19-20	120 (46.3)	91 (32.2)
>21	104 (40.2)	82 (29.0)



Smoker group **Non-smoker group**

P: smoker perception; N: non-smoker perception of vaping; K: non-smoker perception of conventional cigarette; each number on the right side corresponds to a questionnaire item.

Figure 2. Wright map of smoker and non-smoker groups.

Table 2. Characteristics of perception for each item between groups

Item domain	Group	Strongly disagree (%)	Disagree (%)	Doubtful (%)	Agree (%)	Strongly agree (%)
Perceived toxicity	P	13.51	16.22	33.20	23.55	13.51
	N	35.34	25.44	24.73	9.19	5.30
	K	61.84	20.85	12.72	3.53	1.06
Cost	P	20.85	21.24	23.94	20.08	13.90
	N	57.24	19.43	16.96	3.89	2.47
	K	67.14	18.73	10.95	2.12	1.06
Smoking cessation[a]/ satisfy addiction[b]	P[a]	26.25	16.22	19.69	19.69	18.15
	N[a]	42.76	19.43	21.55	10.60	5.65
	K[b]	2.47	4.59	10.95	18.73	63.25
Flavor appeal	P	6.18	6.18	10.04	35.52	42.08
	N	41.34	27.21	18.02	10.95	2.47
	K	1.41	2.12	7.77	16.25	72.44
Aroma appeal	P	5.41	6.18	12.36	33.98	42.08
	N	41.70	25.80	21.20	9.19	2.12
	K	0.71	2.12	9.89	16.61	70.67
Breath odor	P	6.18	5.41	17.76	32.05	38.61
	N	39.93	23.32	22.26	9.54	4.95
	K	1.41	1.41	11.31	15.90	69.96

Table 2. Continues

Item domain	Group	Strongly disagree (%)	Disagree (%)	Doubtful (%)	Agree (%)	Strongly agree (%)
Modern trend	P	20.46	26.25	25.87	17.76	9.65
	N	6.01	5.30	12.01	36.75	39.93
	K	16.61	28.98	27.56	14.13	12.72
Peer influence	P	26.25	18.15	23.94	20.08	11.58
	N	4.95	2.47	12.72	44.88	34.98
	K	35.34	25.44	24.73	9.19	5.30

P: smoker perception; N: non-smoker perception of vaping; K: non-smoker perception of conventional cigarette.

Table 3. Perception differences between groups

Group	Item-median (IQR)								Item Total Mean ± SD	*p*
	1*	2*	3*	4*	5*	6*	7*	8*		
Smoker perception	3 (2)	3 (2)	3 (3)	4 (1)	4 (1)	4 (2)	3 (2)	3 (3)	26.45 ± 5.28	<0.001**
Non-smoker perception about vaping	2 (2)	1 (1)	2 (2)	2 (2)	2 (2)	2 (2)	4 (1)	4 (1)	19.85 ± 5.53	
Non-smoker perception about conventional cigarette	1 (1)	1 (1)	1 (1)	1 (0)	1 (0)	1 (0)	3 (2)	4 (2)	15.27 ± 4.13	

** $p < 0.01$ Kruskal-Wallis test

* Each item was significantly different between groups, $p < 0.01$

Table 4. Differential item functioning analysis for questionnaire items based on gender

Item	Probability					
	Smoker perception		Non-smoker perception about vaping		Non-smoker perception about conventional cigarette	
	Male	Female	Male	Female	Male	Female
Perceived toxicity	0.24	0.04*	1.00	1.00	0.35	0.69
Cost	1.00	0.86	0.34	0.70	0.73	0.84
Smoking cessation[a]/satisfy addiction[b]	[b]0.59	0.34	[a]0.02	0.27*	[b]0.51	0.81
Flavor appeal	0.24	0.04*	1.00	1.00	0.63	0.77
Aroma appeal	0.48	0.23	0.05	0.34	0.06	0.39
Breath odor	0.60	0.39	0.68	1.00	0.04	0.36*
Modern trend	1.00	0.76	0.48	0.78	0.10	0.43
Peer influence	1.00	0.73	0.78	1.00	0.60	0.76

*probability < 0.05

DISCUSSION

Based on the demographic characteristics of the study subjects, out of 542 participants, 259 were vape smokers, while 283 were non-smokers. Male subjects constituted 78% of the sample, with females accounting for 22%. While vaping was primarily introduced as a healthier alternative, its usage extended beyond just (former) smokers.[10] These findings align with the study by Said et al., which reported that vape users are predominantly male compared to females.[15] This gender disparity may be explained by the higher prevalence of adolescent delinquency among males and parental challenges in providing guidance.[16] Male tend to exhibit higher levels of risk-taking behaviors compared to their female counterparts,[17–19] often driven by a combination of biological, psychological, and social factors. Biologically, elevated testosterone levels during adolescence are associated with increased impulsivity and sensation-seeking.[18,20] Psychologically, boys are more likely to exhibit externalizing behaviors, such as defiance[17] and aggression,[21] which are often linked to experimenting with substances like tobacco and vape products. Socially, boys may face greater peer pressure to conform to risky behaviors,[17,19] particularly in settings where smoking or vaping is perceived as a marker of maturity or social acceptance. In addition, cultural norms and societal expectations in some regions may inadvertently encourage such behaviors in males.[17,19–21] For instance, traditional perceptions of masculinity often associate smoking with independence or toughness, further reinforcing these behaviors. The interplay of these factors creates a scenario where male adolescents are more likely to initiate and sustain habits like vaping or smoking compared to their

female peers. Addressing these underlying causes through targeted interventions, such as parental education, peer mentoring programs, and culturally sensitive health campaigns, is essential for mitigating the gender disparity in smoking behaviors.

In terms of age distribution, vape smokers were most prevalent in the 19–20 age group, followed by those aged 21 years and older and those under 19 years. This is consistent with findings by Ruppel et al., which highlighted that 66.8% of vape users fall within the 18–25 age group.[22] This trend may be attributed to immature cognitive development and a lack of logical reasoning about the health consequences of smoking during this age range.[23]

Rasch analysis revealed perceptual differences between smokers and non-smokers, as illustrated in the item map. Non-smokers were more inclined to agree with perceptions of conventional cigarette use compared to vaping. Specifically, non-smokers disagreed with vaping-related perceptions, such as flavor appeal, aroma appeal, and breath odor, but tended to agree on perceptions of vaping being more cost-effective and trendier. Several perception items were similarly aligned between smokers and non-smokers regarding conventional cigarettes, while non-smokers' perceptions of vaping significantly differed from their perceptions of cigarettes. This difference could be attributed to the longstanding social acceptance and familiarity with conventional cigarettes, which predate the introduction of vaping. Moreover, public health campaigns and warnings over the years have predominantly focused on the dangers of conventional cigarette smoking, making non-smokers more aware of its risks. However, the risks associated with vaping are still emerging and are not as widely disseminated, creating a knowledge gap that influences perceptions.[24] Non-smokers may also associate vaping with younger generations and modern trends, which could contribute to a perception of vaping as a less authentic or socially acceptable behavior compared to traditional smoking.[17,19,21,25] Additionally, the sensory aspects of vaping, such as its often-sweet aromas and wide variety of flavors, might be perceived by non-smokers as artificial and unappealing, contrasting with the more familiar, albeit unpleasant, characteristics of cigarette smoke.[26] This difference in sensory perception could further explain why non-smokers are less inclined to view vaping favorably. These findings underscore the need for tailored public health messaging that addresses the specific misconceptions and perceptions surrounding vaping, particularly among non-smokers, while continuing to emphasize the well-documented risks of conventional cigarettes.

Although all items and total scores showed significant differences between smoker and non-smoker groups based on the Kruskal-Wallis test, this method alone could not fully identify nuanced discrepancies and perception patterns between vape and cigarette users. The Rasch model analysis provided a more precise evaluation of item distribution compared to conventional quantitative methods. The Wright map offered a clear visualization of perception differences regarding vaping and conventional cigarettes within the non-smoker group. Profound differences were observed across multiple perception domains, including cost, cessation or addiction potential, flavor appeal, aroma appeal, breath odor, and trend. Non-smokers tended to disagree with vaping-related perceptions, particularly in terms of flavor appeal, aroma appeal, and breath odor. However, they were more likely to agree with the perception that vaping is cost-effective and aligns with modern trends. Notably, the perceptions of vaping and conventional cigarette use among non-smokers differed markedly. The item distribution within the non-smoker group suggested a stronger inclination to agree with conventional cigarette use compared to vaping, reflecting distinct perceptual patterns between these two types of smoking behavior. This finding also supports previous studies that many youths view vaping as less harmful and prone to addiction than conventional cigarettes.[26,27]

The differential item functioning test further revealed significant gender-based differences in preferences across various domains. Female participants were more likely to agree with perceptions of vaping as less toxic and appealing due to its flavors. Conversely, male participants tended to agree that vaping could serve as a means to reduce dependence on conventional cigarettes. Additionally, females showed a stronger tendency to use vaping due to its favorable impact on breath odor compared to males. This condition highlights gender differences in the predictability of risk-taking behavior, consistent with findings reported by Brand et al. and Lewis *et al.*[18,25]

To enhance the practical implications of this study for policymakers and public health professionals, several targeted strategies are recommended. First, public health campaigns should be tailored to align with the distinct perceptions of smokers and non-smokers identified in this study. For smokers, it should challenge the misconception that vaping is a safer or effective cessation tool, while for non-smokers, the information should be warned of the emerging risks of electronic cigarettes, especially those marketed as flavorful or trendy.[6] Second, integrating perception-based screening tools into school and university health programs may allow early identification of individuals at risk of initiating smoking or vaping, based on their attitudes rather than current behavior.[28] Third, gender-specific interventions should be implemented.[29] Male-focused campaigns might address risk-taking behaviors and social conformity, whereas female-focused strategies should counter the appeal of flavor and perceived benefits to breath odor, given the stronger agreement

among females for these perceptions. Moreover, government regulators should revise vaping product warnings to include perception-corrective messaging that addresses cost misconceptions, addiction potential, and false assumptions about pleasant breath effects.[30] Recognizing the strong influence of peers on smoking initiation, peer-led anti-vaping ambassador programs in educational settings should be developed to transform peer influence into a protective factor. Furthermore, the notable proportion of vape users under the age of 19 in this study underscores the need for regulatory surveillance and preventive programs to be expanded to younger demographics, including those in private educational institutions where access may be less restricted.

This study has certain limitations. The analysis of perceptions could be expanded to include other forms of smoking, such as shisha, cigars, and kretek/filtered cigarettes, to provide a broader understanding of smoking behaviors across different types of tobacco use. A potential source of bias in this study arises from the use of a sample drawn from a single private university characterized by homogeneous socioeconomic factors, which may limit the generalizability of the findings to more heterogeneous populations with varying levels of knowledge and behavioral patterns. Furthermore, cultural norms, parental supervision, and exposure to health education may vary significantly across the subject population. The sample was not fully representative in terms of geographic diversity; however, concerning socioeconomic status, the population drawn from a single private university in an urban area may reflect a specific subgroup characterized by relatively homogeneous socioeconomic conditions. Future studies should also consider conducting longitudinal research to observe changes in perceptions over time within a more diverse and representative population, particularly as new smoking products emerge in the market. Additionally, investigating the psychological and social factors influencing smoking and vaping behaviors—such as peer pressure, cultural norms, and media influence—would provide deeper insights into the motivations behind these habits.

Future research could benefit from adopting mixed-method approaches, integrating quantitative analysis with qualitative data to explore the underlying motivations and deterrents associated with smoking and vaping. This would allow for a more nuanced understanding of the factors driving these behaviors. A qualitative methodology may gain benefit to explore interaction effects in greater depth, particularly understanding of gender-specific motivations, peer dynamics, and perceived social rewards that influence smoking and vaping behaviors. Moreover, studies examining the effectiveness of targeted health education and cessation programs tailored to the identified perceptual differences could contribute significantly to reducing smoking prevalence. Implementing and evaluating interventions in diverse demographic settings, such as schools, workplaces, and community centers, would further support the development of practical and evidence-based public health policies and programs.

CONCLUSION

The study revealed distinct perceptual differences between smokers and non-smokers regarding smoking. Smokers exhibited more favorable perceptions toward smoking, while non-smokers demonstrated a stronger aversion to conventional cigarettes compared to electronic alternatives. These findings highlight the need for tailored smoking cessation programs that address the unique perceptions and attitudes of each group to enhance their effectiveness.

CONFLICT OF INTEREST

None declared.

FUNDING

None declared.

REFERENCES

1. Vychaktami KK, Amtha R, Gunardi I, Zain RB. The effect of herbal medicine in reducing the severity of oral lichen planus: A systematic review and meta-analysis. Dent J. 2022; 55(3):165–73.
2. Gunardi I, Sufiawati I, Goenawan H, Herawati DMD, Lesmana R, Abdullah AG. Research trends in molecular biological studies on oral squamous cell carcinoma: A bibliometric analysis. Oncol Rev. 2023; 17:11585.
3. Nathaniel FA, Amtha R, Gunardi I, Hartanto FK, Sari EF. Enhanced knowledge inversed attitude of oral cancer risk habit associated with sociocultural: A quantitative and qualitative pilot study. J Int Soc Prev Community Dent. 2023; 13(5):380–7.
4. Kelesidis T, Sharma M, Satta S, Tran E, Gupta R, Araujo JA, et al. Ectodomain shedding of proteins important for SARS-CoV-2 pathogenesis in plasma of tobacco cigarette smokers compared to electronic cigarette vapers: A cross-sectional study. J Mol Med (Berl). 2023; 101(3):327–35.
5. Park JA, Crotty Alexander LE, Christiani DC. Vaping and lung inflammation and injury. Annu Rev Physiol. 2022; 84:611–29.
6. Ferrara P, Franceschini G, Corsello G, Namazova-Baranova L, Pop TL, Mestrovic J, et al. The health risks of electronic cigarettes use in adolescents. J Pediatr. 2020; 219:286–287.e3.

7. Amtha R, Rahayu AP, Gunardi I, Nadiah N, Ghani WMN. Profile of oral mucosa changes and perception of e-cigarettes smoker. In Widyarman AS, Rizal MI, Roeslan MO, Marpaung CD. (ed.), Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges. 1st ed. London: CRC Press; 2024. pp. 502–7.
8. Yong HH, Gravely S, Borland R, Gartner C, Michael Cummings K, East K, et al. Do smokers' perceptions of the harmfulness of nicotine replacement therapy and nicotine vaping products as compared to cigarettes influence their use as an aid for smoking cessation? findings from the ITC four country smoking and vaping surveys. Nicotine Tob Res. 2022; 24(9):1413–21.
9. Acharya SK, Shai S, Choon YF, Gunardi I, Hartanto FK, Kadir K, et al. Cancer stem cells in oral squamous cell carcinoma: A narrative review on experimental characteristics and methodological challenges. Biomedicines. 2024; 12(9):2111.
10. Schoren C, Hummel K, de Vries H. Electronic cigarette use: comparing smokers, vapers, and dual users on characteristics and motivational factors. Tob Prev Cessat. 2017; 3:8.
11. Gunardi I, Sari EM, Goenawan H, Lesmana R, Herawati DMD, Muchtaridi, et al. Calcitriol and cisplatin combination decreases expression of MAPK2 and NF-kB/p65 induce apoptosis in oral squamous carcinoma cells. J Int Dent Med Res. 2023; 16(3):1050–5.
12. Amtha R, Gunardi I, Widyarman AS, Herwanto T, Hartanto FK, Vincent-Chong VK. Salivary profile analysis based on oral cancer risk habits: An observational cross-sectional study. Biomedicines. 2024; 12(8):1748.
13. Bond TG, Fox CM. Applying the Rasch Model: Fundamental Measurement in the Human Sciences. 3rd ed. New York: Taylor and Francis; 2015.
14. Gunardi I, Nurina NS, Marcia M, Amtha R. Dentists experience influences knowledge and attitudes toward HIV patients in West Jakarta, Indonesia, and validation of a new questionnaire. Oral Dis. 2020; 26(Suppl 1):127–32.
15. Said M, Ramlan R, Muluki M. Karakteristik pengguna rokok elektrik (vapor) di wilayah Parepare. Jurnal Ilmiah Manusia Dan Kesehatan. 2022; 5(1):459–67.
16. Idrizovic K, Zenic N, Tahiraj E, Rausavljevic N, Sekulic D. Cigarette smoking among 17–18 year old adolescents–Prevalence and association with sociodemographic, familial, sport, and scholastic factors. Med Pr. 2015; 66(2):153–63.
17. Croisant SA, Haque Laz T, Rahman M, Berenson AB. Gender differences in risk behaviors among high school youth. Glob Adv Health Med. 2013; 2(5):16–22.
18. Lewis G, Srinivasan R, Roiser J, Blakemore SJ, Flouri E, Lewis G. Risk-taking to obtain reward: Sex differences and associations with emotional and depressive symptoms in a nationally representative cohort of UK adolescents. Psychol Med. 2022; 52(13):2805–13.
19. Harris CR, Jenkins M. Gender differences in risk assessment: Why do women take fewer risks than men? Judgm Decis Mak. 2006; 1(1):48–63.
20. Grueter CC, Goodman H, Fay N, Walker B, Coall D. Preference for male risk takers varies with relationship context and health status but not COVID risk. Evol Psychol Sci. 2023;1–10.
21. Chein J, Albert D, O'Brien L, Uckert K, Steinberg L. Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. Dev Sci. 2011; 14(2):F1–10.
22. Ruppel T, Alexander B, Mayrovitz HN. Assessing vaping views, usage, and vaping-related education among medical students: A pilot study. Cureus. 2021; 13(2):e13614.
23. Icenogle G, Steinberg L, Duell N, Chein J, Chang L, Chaudhary N, et al. Adolescents' cognitive capacity reaches adult levels prior to their psychosocial maturity: Evidence for a "maurity gap" in a multinational, cross-sectional sample. Law Hum Behav. 2019; 43(1):69–85.
24. Gunardi I, Amtha R, Widyadhana HGV. Perception as mediator between knowledge and attitude of community about COVID-19 in dentistry. e-GiGi. 2021; 10(1):6–15.
25. Brand JA, Henry J, Melo GC, Wlodkowic D, Wong BBM, Martin JM. Sex differences in the predictability of risk-taking behavior. Behav Ecol. 2023; 34(1):108–16.
26. Romijnders KAGJ, van Osch L, de Vries H, Talhout R. Perceptions and reasons regarding e-cigarette use among users and non-users: A narrative literature review. Int J Environ Res Public Health. 2018; 15(6):1190.
27. Amrock SM, Lee L, Weitzman M. Perceptions of e-cigarettes and noncigarette tobacco products among US youth. Pediatrics. 2016; 138(5): e20154306.
28. Minnix JA, Karam-Hage M, Blalock JA, Cinciripini PM. The importance of incorporating smoking cessation into lung cancer screening. Transl Lung Cancer Res. 2018; 7(3):272–80.
29. Stinson J, Wolfson L, Poole N. Technology-based substance use interventions: opportunities for gender-transformative health promotion. Int J Environ Res Public Health. 2020; 17(3):992.
30. Rohde JA, Noar SM, Sheldon JM, Hall MG, Kieu T, Brewer NT. Identifying promising themes for adolescent vaping warnings: A national experiment. Nicotine Tob Res. 2022; 24(9):1379–85.

(Received January 1, 2025; Accepted July 31, 2025)

Perception of Conv ception of Conventional Cigar entional Cigarettes and V ettes and Vaping among aping among Smokers and Nonsmokers: A Cross-sectional Study

ORIGINALITY REPORT

6%	6%	4%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	irep.iium.edu.my Internet Source	2%
2	Luki Astuti, Sri Lelyati Chaidar Masulili, Indrayadi Gunardi, Benso Sulijaya, Yuniarti Soeroso. "Periodontal Pathogens Correlate with Rheumatoid Arthritis Disease Parameters: A Systematic Review Based on Clinical Studies", Dentistry Journal, 2025 Publication	1%
3	doaj.org Internet Source	<1%
4	e-journal.unair.ac.id Internet Source	<1%
5	market.biz Internet Source	<1%
6	anesth-pain-med.org Internet Source	<1%
7	cyberleninka.org Internet Source	<1%
8	www.openaccessrepository.it Internet Source	<1%
9	www.frontiersin.org Internet Source	<1%
10	www.diva-portal.org	

Internet Source

<1%

Exclude quotes	On	Exclude matches	< 15 words
Exclude bibliography	On		