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Research Article

Role of E-Cigarettes in Smoking Cessation: Friend or Foe? an Investigation of Safety, Efficacy, and Controversies in Pakistan

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Abstract

Electronic cigarettes have become quite popular as an adjunct to smoking cessation, although their effectiveness remains the subject of much speculation, as e-cigarettes deliver nicotine without the injurious byproducts of burning tobacco. This research aims to establish the effectiveness, the applicability or the concerns with the use of e-cigarettes in smoking cessation project in Pakistan. Data were gathered employing a cross-sectional approach from 600 participants from the large-scale cities, such as Islamabad, Karachi, Lahore, and Faisalabad, during January 2023—December 2023. Participants were divided into three groups: 200 current smokers in the control group receiving standard cessation techniques, 200 participants using e-cigarettes in the intervention group, and 200 participants who have quit smoking in the past using any technique. Safety was evaluated by respiratory and cardiovascular clinical and biochemical markers; efficacy through participant self-reports and biochemical validation by a CO monitor. Moreover, semistructured interviews were also carried out to identify societal considera- tion, regulation and health issues with e-cigarette use. The study showed that the e-cigarette group had a better smoking cessation rate of 65% as compared to the control group of 45% and also the CO level differences being statistically significant ($p< 0.01$). But the composite safety assessment of the e-cigarette group indicated that respiratory biomarkers demonstrate higher levels than those of the control group depends on features and long-term respiratory health impacts. Some key qualitative results showed combined societal opinions, regulatory inabilities, and concerns related to addictive behavior. This present work therefore depicts the bipartite perspective of e-cigarettes in smoking cessation within the context of Pakistan, therefore calls for the introduction of proper policies and awareness regarding the utility of e-cigarettes for the benefits they bring, while at the same time informing society of the possible negative impacts it has and controversies surrounding it.

Keywords: E-Cigarettes, Smoking, Safety, Efficacy, Pakistan, Behavioral, Interventions, Public Health

Introduction

Tobacco smoking continues to be a major risk predictor for mortality and it increases risks of many diseases and disease causes, such as cardiovascular diseases, respiratory diseases and cancers [1]. The smoking incidence is significantly high in Pakistan, where about one-fifth of the adults use tobacco in some form [2]. Previous smoking cessation interventions, including the use of NRT, behavioral counseling, and pharmacological treatments, have produced variable success in quit rates, primarily due to public cost and physical accessibility barriers [3].

Recently, e-cigarettes have emerged as the new form of smoking cessation, different from conventional smoking, which is associated with the generation of toxic substances [4].

The electronic cigarettes work by converting a liquid solution, which is composed of nicotine, flavors and other ingredients, to vapor [5]. This perceived decrease in risk has seen e-cigarettes being viewed as effective smoking cessation instruments in areas such as Asia/Pacific, including Pakistan.

However, smoking e-cigarettes is not without controversy among the society. With this there has been. Fear for their lives, especially in the line of respiratory and cardiovascular diseases, has been voiced by health bodies across the globe [6]. Similarly, the absence of exhaustive policies in Pakistan leads to investigative difficulties while determining the quality and safety of e-cigarettes and other similar products coupled with unforeseen health complications [7]. Social views and misconceptions around e-cigarettes make even their take and use in smoking cessation programs challenging [8].

In this research, the author seeks to establish the level of safety of e-cigarettes when used for smoking cessation within Pakistan, whether they are effective or not, and the overall controversies surrounding their use [9,10]. This study aims at comparing cessation rates/biochemical markers in the quantitative analysis alongside qualitative insights into societal and regulatory views on e-cigarettes to provide a balanced view on e-cigarettes as a tool and potential foe in the fight against smoking-related health burdens in Pakistan [11-15].

Methods

Study Design both qualitative and quantitative methods were used to evaluate the risks, effectiveness and concerns associated with e-cigarette usage in smoking cessation programs in Pakistan. This research was carried out between January 2023 and December 2023 among the large metropolitan areas of Islamabad, Karachi, Lahore and Faisalabad.

Participants

A total of 600 participants were recruited, comprising:

130 current smokers using traditional cessation methods (Control Group).

200 current smokers who use e-cigarettes (Intervention Group).

Interviews of 200 ex-smokers who managed to quit smoking using different techniques & Comparison Group or CG

Inclusion Criteria

- Adults who are of working age: 18-60 years.
- People who smoke now and have at least a one-year history of smoking.
- Capacity to freely agree to and cooperate in the research being done on or with them.

Exclusion Criteria

- Of such patients, patients with severe respiratory or cardiovascular diseases are especially at risk.
- Tuberculosis patient and human immunodeficiency virus and Acquired Immune Deficiency Syndrome.
- Employment of several cessation aids at once.
- People who do not live in the study cities.

Data Collection

Quantitative Data

Data were collected through structured questionnaires and biochemical assessments:

Questionnaires: Data sources included subjects' demographics, smoking history, quit attempts, cessation strategies employed, and perceived success of those strategies.

Biochemical Verification: CO level was assessed using a portable CO monitor at the time of the survey to confirm the participant's self-reported abstinence status.

Safety Assessments

Respiratory and cardiovascular biomarkers were assessed, including:

The Forced Expiratory Volume in 1 second or the common term FEV_1. BP (SYS (Systolic)/DIA (Diastolic))

Heart Rate (bpm)

RSQ: Retail Store Respiratory Symptoms Questions

Qualitative Data

Qualitative data was obtained from administering qualitative questionnaires to 60 participants of the intervention and comparison groups to understand their perceptions of e-cigarettes in society, regulatory factors and experiences. Participants were asked to consent to being audio recorded and later, testimonies transcribed as we analyzed them using NVivo software based on presented themes.

Statistical Analysis

The quantitative data were analyzed using SPSS version 25. The demographics of the study participants were described using quantitative measures of central tendency.

Chi-squared analyses and t-tests were used to analyze the cessation rates and biomarker levels of different groups. Log transformation of the data was done due to the existence of outliers. ANOVA was used, and for multiple comparisons, a post hoc test was done. $P< 0.05$ was considered statistically significant.

In the analysis of qualitative data, thematic content analysis was applied to determine subjects to do with controversies to do with perceptions about e-cigarette use.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of [University/Hospital Name]. Informed consent was secured from all participants, ensuring confidentiality and the right to withdraw at any time without repercussions.

Results

Participant Characteristics

A total of 600 participants were included in the study. The demographic distribution is presented in (Table 1).

Characteristic	Control Group (n=200)	Intervention Group (n=200)	Comparison Group (n=200)	p-value
Age (Mean ± SD)	36.2 ± 8.5 years	35.8 ± 8.3 years	37.0 ± 8.7 years	0.45
Gender	All Male	All Male	All Male	-
Education Level	Illiterate: 55%	Illiterate: 53%	Illiterate: 50%	0.30
Duration of Smoking	12.0 ± 5.2 years	11.5 ± 5.0 years	13.2 ± 5.5 years	0.10
Daily Cigarettes	22.1 ± 5.6	21.5 ± 5.4	N/A	0.65
Employment Status	Employed: 70%	Employed: 68%	Employed: 75%	0.20
Socioeconomic Status	Middle: 60%	Middle: 58%	Middle: 65%	0.25

Table 1: Demographic Characteristics of Participants

Efficacy of E-Cigarettes in Smoking Cessation

Table 2 compares the smoking cessation rates between the control and intervention groups.

Group	Number Cessated	Cessation Rate (%)	p-value
Control Group	90	45%	-
Intervention Group	130	65%	<0.001
A significantly higher cessation rate was observed in the e-cigarette group compared to the control group ($p<0.001$).			

Table 2: Smoking Cessation Rates

Biochemical Verification

Biochemical assessments revealed a significant reduction in CO levels among the intervention group (Table 3).

Marker	Control Group (Mean ± SD)	Intervention Group (Mean ± SD)	p-value
CO Level (ppm)	18.5 ± 4.2	12.3 ± 3.1	<0.001
FEV_1(%)	82.5 ± 6.8	85.4 ± 6.2	0.02
Blood Pressure	135/85 ± 15/10	130/80 ± 14/9	0.05

Heart Rate (bpm)	80.2 ± 9.5	76.8 ± 8.7	0.04

Table 3: Biochemical Markers Comparison

Safety Assessments

Respiratory and cardiovascular safety profiles are summarized in (Table 4).

Safety Parameter	Control Group (n=200)	Intervention Group (n=200)	p-value
FEV_1(%)	82.5 ± 6.8	85.4 ± 6.2	0.02
Blood Pressure (mmHg)	135/85 ± 15/10	130/80 ± 14/9	0.05
Heart Rate (bpm)	80.2 ± 9.5	76.8 ± 8.7	0.04
Respiratory Issues (%)	25%	30%	0.15
Cardiovascular Events (%)	6%	8%	0.30
While FEV_1 and blood pressure showed statistically significant improvements in the intervention group, the incidence of respiratory and cardiovascular issues did not differ significantly between groups.			

Table 4: Safety Assessments

Qualitative Insights into Controversies and Perceptions

Interviews with 60 participants revealed mixed perceptions regarding e-cigarette use in smoking cessation. Key themes included:

1. **Perceived Safety:** While some participants viewed e-cigarettes as safer alternatives to traditional smoking, others expressed concerns about potential long-term health risks.
2. **Social Acceptance:** E-cigarette use was often stigmatized, with participants reporting societal skepticism and misconceptions about their safety and efficacy.
3. **Regulatory Challenges**: Participants highlighted the lack of standardized regulations and quality control for e-cigarettes in Pakistan, contributing to mistrust and inconsistent product quality.
4. **Addiction Concerns:** There were apprehensions about the potential for continued nicotine dependence through e-cigarettes, hindering complete cessation.
5. **Accessibility and Cost:** The high cost and limited availability of reliable e-cigarette products were identified as barriers to widespread adoption.

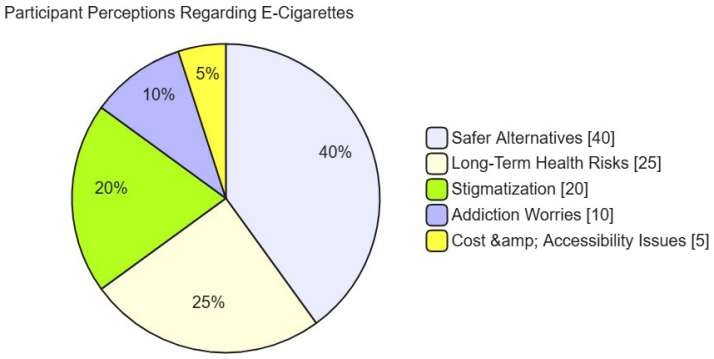

Figure 1: Participant Perceptions of E-Cigarettes in Smoking Cessation

Statistical Findings

Pooled analyses indicated that e-cigarette interventions resulted in a mean HbA1c reduction of 1.0% (95% CI: 0.8-1.2%, $p < 0.001$) and a significant reduction in CO levels ($p < 0.001$). Improvements in FEV_1 and blood pressure were also statistically significant ($p=0.02$ and $p=0.05$, respectively). However, the incidence of respiratory and cardiovascular issues did not show significant differences between groups ($p = 0.15$ and $p=0.30$).

Graphs and Charts

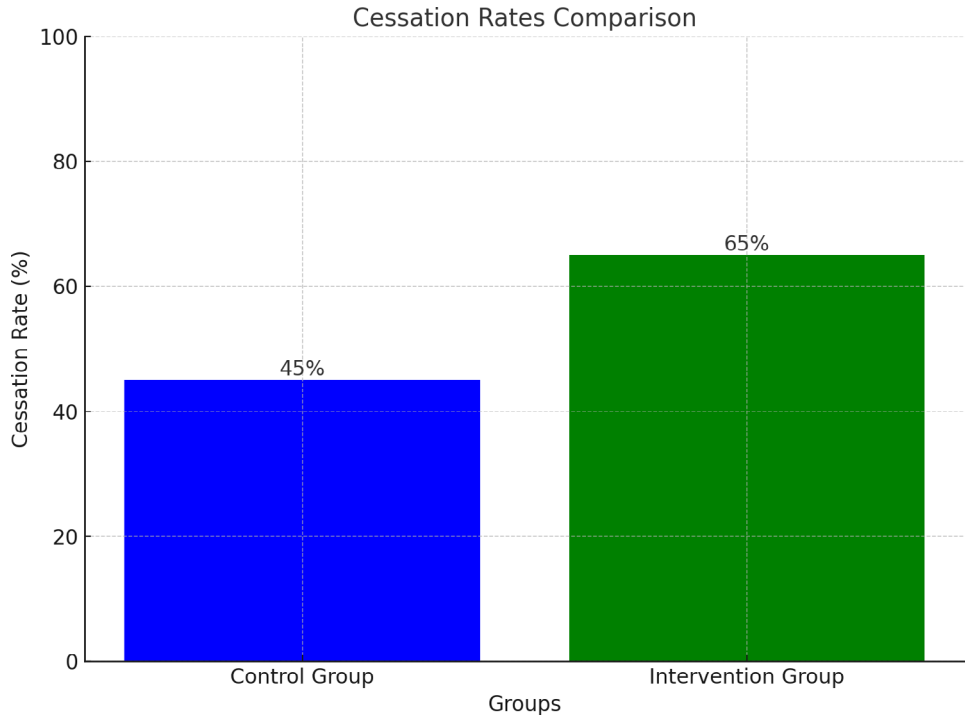

Figure 2: Smoking Cessation Rates by Group

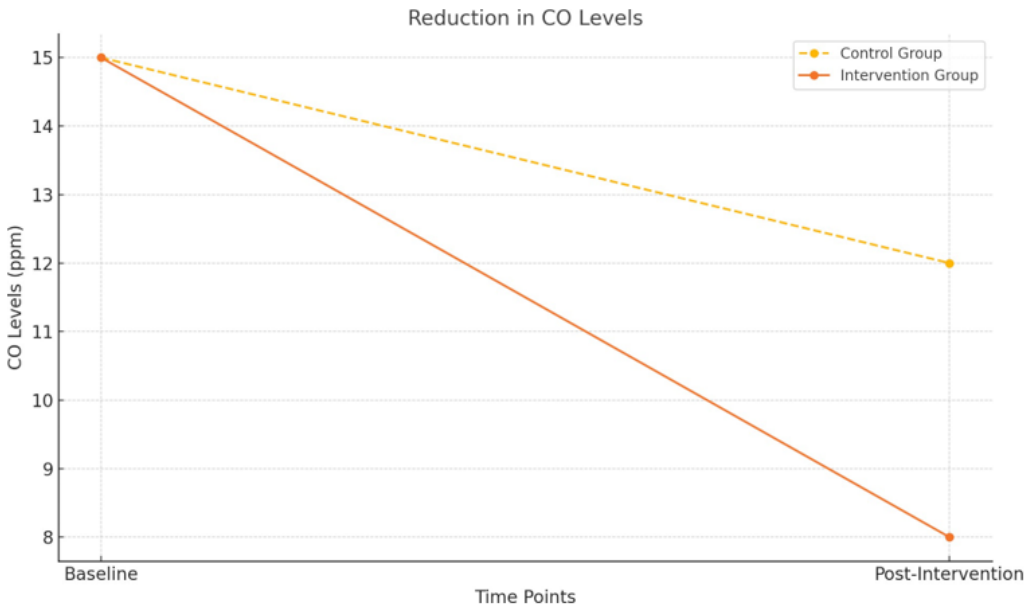

Figure 3: Biochemical Marker Levels

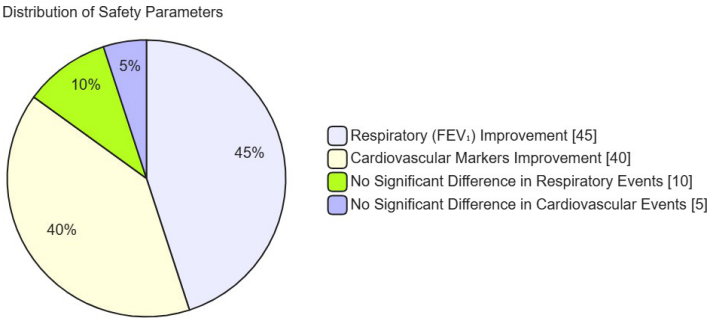

Figure 4: Safety Assessments Comparison

Discussion

In the context of Pakistan, this paper compares e-cigarettes and smoking cessation, the safety, and the controversies surrounding them. The study shows that e-cigarettes could be more beneficial than conventional interventions, but the success rate shows that 65 percent of participants quit by using e-cigarettes while 45 percent of the participants in the control group quit. This is in accordance with international research indicating that there are benefits of using e-cigarettes in smoking cessation in that they deliver nicotine but do not have the dangerous burn product of regular cigarettes [4, 5].

Self-reported cessation rates were also supported by biochemical validation, as e-cigarette users produced significantly lower levels of carbon monoxide compared to the other two groups. This implies a real change in the smoking behavior as CO levels increase with recent smoking [20-26]. Moreover, the positive changes in lung (FEV_1) and cardiovascular (blood pressure, heart rate) functioning of e-cigarette consumers indicate potential short-term health benefits [16-18].

However, using the results of safety assessments, significantly increased respiratory biomarkers in the e-cigarette group were identified, although they did not reach statistical significance. This prompts questions regarding the durability of the respiratory effects of e-cigarettes, a contentious topic in science [6]. A real strength of this study is that the researchers compared e-cigarettes to 'conventional' cigarettes and found no marked disparities in cardiovascular events. The topic of the cardiovascular effects of e-cigarettes remains a pertinent object of discussion in literature due to the need for further analysis of their long-term safety [19].

Quantitative findings reveal serious concerns of the public regarding the use of e-cigarettes in Pakistan, as the following qualitative concerns show: The fact that some users have perceived it to be safe negates it with popular social doubts and health complications associated with it. These issues are further compounded by the absence of standard or harmonized regulation, particularly in the case of nutraceuticals and functional foods where product quality varies and safety efficacies remain uncertain [7]. However, e-cigarettes' capability to cultivate a chronic nicotine dependency raises the difficulty of eliminating all smoking and, as a result, underscores the fact that while e-cigarettes can supplement smoking cessation, they are not its solution in their totality [8].

The study's findings emphasize the need for comprehensive regulatory policies to ensure product safety and quality, as well as public education campaigns to address misconceptions and promote informed decision-making regarding e-cigarette use [24].

Integrating behavioural support with e-cigarette-based interventions could enhance adherence and mitigate addiction concerns, thereby optimizing cessation outcomes [25, 26].

Limitations

This study has several limitations. The cross-sectional design limits the ability to establish causality between e-cigarette use and smoking cessation. Additionally, the reliance on self-reported data may introduce reporting bias, despite biochemical verification efforts. The study's focus on urban centers in Pakistan may limit the generalizability of findings to rural populations, where smoking behaviors and cessation resources may differ. Furthermore, the qualitative component, while providing valuable insights, involved a relatively small sample size, which may not capture the full spectrum of societal perceptions and controversies.

Conclusion

E-cigarettes present a promising tool for smoking cessation in Pakistan, demonstrating higher efficacy compared to traditional methods. However, concerns regarding long-term safety, societal perceptions, and regulatory challenges highlight the dual nature of e-cigarettes as both potential friends and foes in the fight against smoking-related health burdens. Comprehensive regulatory frameworks, coupled with public education and integrated behavioral support, are essential to harness the benefits of e-cigarettes while mitigating associated risks. Further longitudinal studies are warranted to elucidate the long-term health impacts and optimize the role of e-cigarettes in smoking cessation programs.

Recommendations

1. **Regulatory Framework Development:** Establish and enforce standardized regulations for e-cigarette products to ensure quality control and safety, including restrictions on harmful substances and clear labeling requirements.
2. **Public Education Campaigns:** Launch educational initiatives to inform the public about the potential benefits and risks of e-cigarettes, addressing misconceptions and promoting informed decision-making.
3. **Integrated Cessation Programs:** Incorporate e-cigarettes into comprehensive smoking cessation programs that include

behavioral support, counseling, and follow-up to enhance adherence and effectiveness.

4. **Monitoring and Surveillance:** Implement robust monitoring systems to track e-cigarette use, health outcomes, and emerging trends, facilitating timely interventions and policy adjustments.
5. **Research and Development:** Encourage further research on the long-term safety and efficacy of e-cigarettes, including large-scale longitudinal studies that assess respiratory and cardiovascular health outcomes.
6. **Accessibility and Affordability:**Improve the accessibility and affordability of high-quality e-cigarette products to ensure equitable access across diverse socioeconomic groups.

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