Comparing the Effectiveness of Nicotine Electronic Cigarettes (ECs) and Nicotine Replacement Therapies (NRTs)

A Systematic Review Meta-analysis

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INTRODUCTION

The ineffectiveness of traditional nicotine replacement therapies (NRTs) in achieving complete tobacco cessation highlights the need for novel therapeutic approaches. Electronic cigarettes (EC) are potential smoking cessation aids that provide both nicotine and behavioural substitution for combustible cigarette smoking. Current literature has highlighted the effectiveness of both ECs and NRTs in achieving a degree of cessation. This review aims to compare the effectiveness of nicotine e-cigarettes for smoking cessation with licensed nicotine replacement therapies (NRTs) and control conditions by using network meta-analysis (NMA).

METHODS

HYPOTHESIS

Consistent with the findings in existing literature, we hypothesised that ECs would result in a greater maintenance of cessation therapy than conventional NRTs and control groups.

RESULTS

Comparison

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Studies</th>
<th>Direct Evidence</th>
<th>Indirect Evidence</th>
<th>Absolute effect size model</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nicotine ECs</td>
<td>5</td>
<td>2.70 (1.49, 4.84)</td>
<td>1.81 (1.66, 2.88)</td>
<td>2.09 (1.46, 3.00)</td>
<td></td>
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<tr>
<td>Direct estimate</td>
<td>9</td>
<td>3.87 (2.30, 6.50)</td>
<td>2.12 (1.50, 3.01)</td>
<td>2.09 (1.46, 3.00)</td>
<td></td>
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<tr>
<td>Indirect estimate</td>
<td>4</td>
<td>2.37 (1.07, 5.35)</td>
<td>1.37 (0.97, 1.96)</td>
<td>1.49 (1.02, 2.14)</td>
<td></td>
</tr>
<tr>
<td>Network estimate</td>
<td>1</td>
<td>1.36 (1.07, 1.73)</td>
<td>0.99 (0.67, 1.47)</td>
<td>1.40 (1.11, 1.77)</td>
<td></td>
</tr>
<tr>
<td>NRT/placebo</td>
<td>8</td>
<td>1.49 (1.02, 2.14)</td>
<td>2.09 (1.60, 2.44)</td>
<td>2.09 (1.60, 2.44)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Forest plot of the decomposition of estimates computed from the direct and indirect comparison. All the direct and indirect estimates were largely consistent, and Z-tests indicated that these effects were not significantly different in the three comparisons (all p-values > 0.30). An overall test indicated no evidence of inconsistency between direct and indirect estimates.

DISCUSSION

Overall, the study found two primary conclusions:

1. Participants randomised to receive nicotine e-cigarettes were 49% more likely to remain abstinent from smoking than those who received NRTs (pooled RR = 1.49, 97.5% CI = [1.04, 2.14]).

2. Two randomised to receive nicotine e-cigarettes were 19% more likely to remain abstinent from smoking than those in control conditions where no nicotine was supplied (pooled Risk Ratio (RR) = 2.08, 97.5% CI = [1.39, 3.15]).

Although three key limitations were noted with the findings of this review:

1. One of the seven e-cigarette trials was a pilot study and four had a sample size of 100 or fewer participants per treatment condition, reducing generalisability of findings to the general population.

2. There is a moderate level of heterogeneity (I² = 42%), in the trials in this study. This is likely due to the considerable variation in e-cigarettes and NRT products used in different trials, and the possibility that effectiveness may vary between these products.

3. The majority of the studies had relatively short follow-up periods of 6 months or less, and therefore we had limited data on long-term abstinence.

Overall, these findings are largely consistent with evidence from observational studies that ECs are more effective in facilitating smoking cessation in comparison to traditional NRTs, although the clear limitations mentioned above must be considered. EC use is likely to confer a substantially lower health risk than smoking tobacco but the exact extent of differential health risk associated with long-term use has not been definitively established. Moreover, ECs are at least as effective as—and based on this meta-analysis, probably more effective than—licensed NRTs. The optimal health behaviour is not to use either e-cigarettes or tobacco cigarettes, but many people who smoke, experience difficulty stopping smoking. A sensible policy would be to encourage smokers who have difficulty quitting tobacco to switch to e-cigarette and to concurrently discourage uptake of e-cigarettes and tobacco smoking among young people.

CONCLUSION

This review establishes the utility of nicotine ECs as a cessation tool, contrasting against existing front-line cessation aids that are more frequently utilised. By noting that ECs are more effective than commonly used NRTs in maintaining cessation, their viability as first-line agents should be further investigated. Public policy may seek to encourage heavy smokers to utilise e-cigarettes or tobacco cigarettes, but many people who smoke, experience difficulty stopping smoking. A sensible policy would be to encourage smokers who have difficulty quitting tobacco to switch to e-cigarette and to concurrently discourage uptake of e-cigarettes and tobacco smoking among young people.