Health Effects of Electronic Cigarettes: An Umbrella Review and Methodological Considerations

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**Objective**

- E-cigarettes are often marketed as a safer alternative to combustible cigarettes, however their health effects, especially those associated with long-term use, remain largely uncertain.
- We conduct an umbrella review of cardiopulmonary and carcinogenic risks of e-cigarette use, distinguishing between their short-term and long-term health effects and considering both the absolute harm of e-cigarettes and their harm/benefits relative to smoking.

**Methods**

- The search for systematic reviews examining cardiovascular, respiratory, pulmonary and carcinogenic effects of e-cigarettes was conducted across five electronic databases through January 25th 2022.
- Methodological quality of systematic reviews is assessed with the AMSTAR-2 quality appraisal tool.¹

  - **AMSTAR-2 critical domains:**
    - Protocol registered before commencement of the review (item 2)
    - Adequacy of the literature search (item 4)
    - Justification for excluding individual studies (item 7)
    - Risk of bias from individual studies being included in the review (item 9)
    - Appropriateness of meta-analytical methods (item 11)
    - Consideration of risk of bias when interpreting the results of the review (item 13)
    - Assessment of presence and likely impact of publication bias (item 15)

**Results**

- Seventeen systematic reviews were included in our review.
- Four reviews were of low, and thirteen of critically low methodological quality.
- There was clear underreporting of e-cigarette device types, duration of use, and smoking status of study participants across reviews.
- Short-term use of e-cigarettes may be associated with acute cardiopulmonary risks, although to a lesser extent compared to cigarette use.
- Long-term e-cigarette use may have cardiopulmonary benefits in those who switched from chronic cigarette smoking, in particular in individuals with asthma and COPD.
- Evidence on intermediate and long-term carcinogenic effects is lacking.

**Conclusions**

- The present umbrella review highlights important methodological weaknesses of existing secondary research
- It underlines the urgent need for systematic reviews with better adherence to established reporting guidelines, consistent definition of duration of e-cigarette use, focus on newer generation devices and accounting for the impact of former or current smoking.

**References**

¹Shea BJ et al., 2017, BMJ, doi: 10.1136/bmj.j4008

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