

Effects of E-Cigarette Vaping on Ocular Surface-based Symptoms and Retinal Microvasculature in Adolescents and Adults: A Systematic Review and Meta-Analysis

Erum Habib¹, Muhammad Ali Bin Jabir², Muhammad Imaz Bhatti³, Sahla Waqas³, Hashem Abu Serhan⁴

¹Dow University of Health Sciences, Pakistan, ²Fauji Foundation Hospital, Pakistan, ³King Edward Medical University, Pakistan, ⁴Hamad Medical Corporation, Qatar

Background

- E-cigarette use is increasingly common among adolescents and young adults.
- Concerns have emerged regarding its potential impact on ocular health.
- Clinical studies suggest vaping may disturb tear film stability, worsen ocular surface symptoms, and contribute to early retinal changes..

Methods

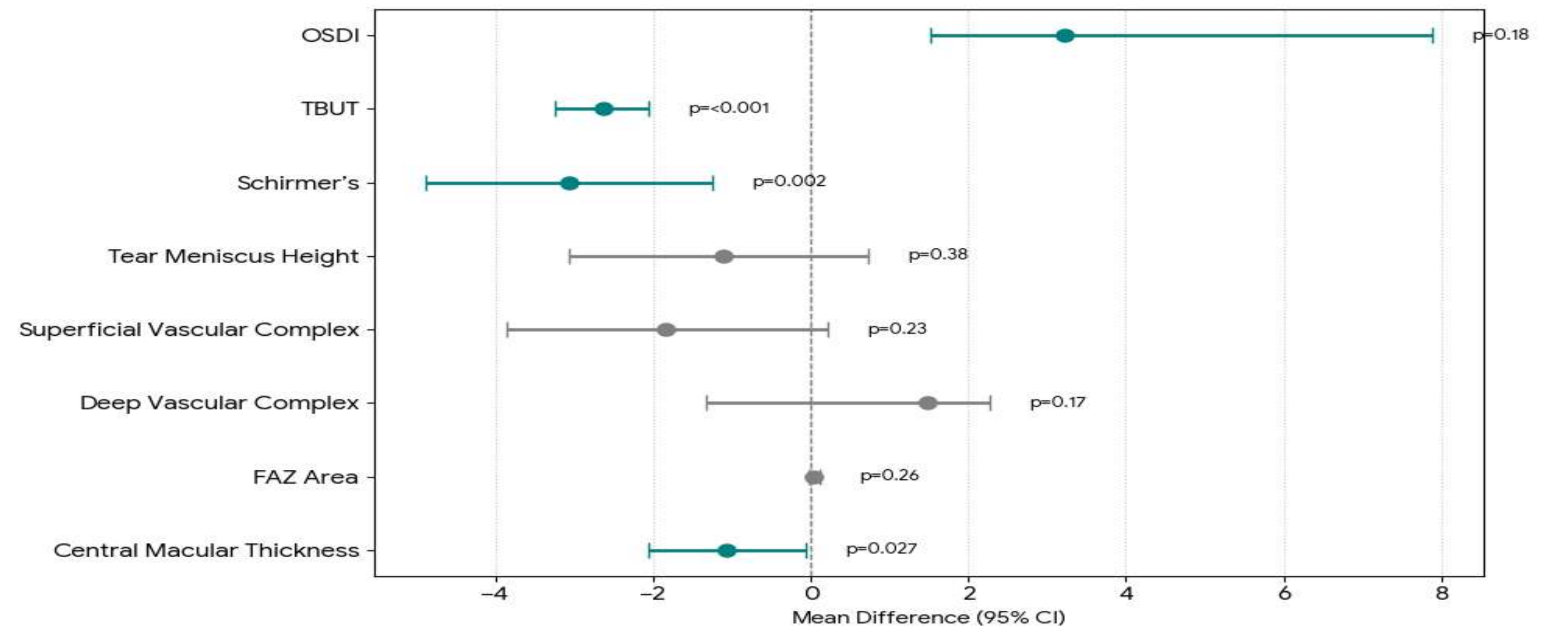
- Databases:** PubMed, Embase, Cochrane Library, Scopus
- Timeframe:** Inception to September 2025
- Analysis:** Random-effects models reporting mean differences (MD) with 95% confidence intervals (CI) Heterogeneity: Assessed using I^2 and χ^2 statistics
- Software:** RevMan 5.4.

Results

Table: Outcomes of e-cigarette users vs never users

Outcome	MD	95% CI	P Value
OSDI	↑ 3.23	1.52 – 7.89	0.18
TBUT	↓ 2.64	3.24 – 2.05	<0.00001
Schirmer test	↓ 3.06	4.89 – 1.24	0.002
TMH	↓ 1.11	3.06 – 0.73	0.38
SVC	↓ 0.87	0.51 – 1.49	0.613
DVC	↑ 1.48	1.32 – 2.28	0.17
FAZ Area	↑ 0.04	0.03 – 1.12	0.26
CMT	↓ 0.87	0.51 – 1.49	0.613

OSDI: Ocular Surface Disease Index; **TBUT:** Tear Break-Up Time; **TMH:** Tear Meniscus Height **SVC:** Superficial Vascular Complex; **DVC:** Deep Vascular Complex; **FAZ:** Foveal Avascular Zone; **CMT:** Central Macular Thickness; **MD:** Mean Difference, **CI:** Confidence Interval



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Conclusion

- E-cigarette vaping is linked to significant ocular surface dysfunction (↑ OSDI, ↓ TBUT, ↓ Schirmer's).
- Central macular thickness is reduced, suggesting early neuroretinal thinning.
- Retinal microvascular parameters show no consistent differences across studies.
- High heterogeneity underscores the need for standardized imaging and longitudinal research..
- Standardized imaging protocols and longitudinal studies are needed to clarify long-term ocular impact and guide preventive strategies.

References

