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The Meibum Lipid Profile and its Relationship with Clinical Dry Eye Measurement in a Sample of Kuala Lumpur Young Adults

[ASM Science Journal](#) • Article • Open Access • 2025 • DOI: 10.32802/asmscj.2025.1565 [Maidin, M.H. Hajar](#)^{a, c, d} ; [Mohd-Ali B.](#)^a; [Mohammed Z.](#)^a; [Mohamed J.](#)^b^a Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur, 50300, Malaysia[Show all information](#)

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Abstract

Tear lipids play a critical role in reducing aqueous evaporation and promoting tear stability, with non-polar lipids (NPoL) being a key subcomponent contributing significantly to this function. Notably, the Asian population exhibit lower tear stability, which may underline the higher prevalence of dry eye disease (DED). This study aimed to characterise the meibum lipid profile and its association with clinical dry eye measurements in a cohort of young adults in Kuala Lumpur, Malaysia. Using reverse-phase high-performance liquid chromatography-electrospray ionising mass spectrometry (RP-HPLC-ESI-MS), a meibum sample from 28 participants was analysed. stratified into dry eye (DE) and non-dry eye (NDE) groups based on prior clinical studies. Fourteen distinct analytes were identified across all samples. The DE group exhibited a significant 12% reduction in NPoL compared to the NDE group ($p < 0.05$). While no significant differences were observed in individual lipid species between the two groups ($p > 0.05$), phosphatidylserine (PS) was an exception, showing a marked increase in the DE group ($p < 0.01$). Cholesterol ester (CE), the sole non-polar lipid

(NPoL) identified, demonstrated a moderate yet significant correlation with tear lipid layer (TLL) thickness ($r_s = 0.61$, $p < 0.05$) and the phenol red thread test (PRT) ($r = 0.66$, $p < 0.05$). Among polar lipid (PoL) species (PS) exhibited moderate correlation with lid wiper epitheliopathy (LWE) ($r_s = 0.69$, $p < 0.01$), McMonnies dry eye questionnaire score (MDEQ) ($r_s = 0.57$, $p < 0.05$), and tear osmolarity ($r_s = 0.56$, $p < 0.05$). Sphingomyelin (SM) showed the strongest correlation with Efron conjunctiva redness ($r_s = 0.73$, $p < 0.01$). Notably, NPoL were inversely correlated with LWE ($r_s = -0.66$, $p < 0.05$) and positively correlated with PRT ($r = 0.56$, $p < 0.05$), suggesting that reduced NPoL may contribute to early signs of DED. The elevated presence of PS in DE cases and its strong association with LWE, MDEQ score, and osmolarity highlight its potential as a biomarker for DED. These findings underscore the importance of lipidomic profiling in understanding the pathophysiology of dry eye disease and its clinical manifestations. © 2025 Akademi Sains Malaysia. All rights reserved.

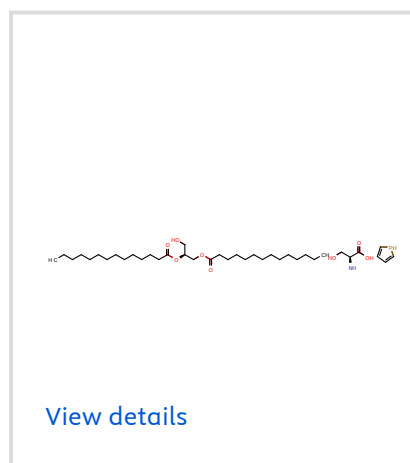
Author keywords

dry eye; meibum; non-polar lipid; polar lipid; tear lipid layer

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