# Physicochemical evaluation of market-sourced vape liquids: Viscosity, label accuracy, and compliance with Medicines and Healthcare products Regulatory Agency guidelines

**Keyun Look[1], Hooi Leng Ser[1], Amar Daud Iskandar Abdullah[1], Elil Renganathan[1], Xinwei Koong[1], Yin Hui Leong[2], Ching Siang Tan[3], Andi Hermansyah[4], Long Chiau Ming[1,4,5]**

[1]School of Medical and Life Sciences, Sunway University, Malaysia, [2]National Poison Centre, Universiti Sains Malaysia, Minden, Penang, [3]School of Pharmacy, KPJ Healthcare University, Nilai, Malaysia, [4]Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia, [5]PAP Rashidah Sa'adatul Bolkiah Institute of Health Sciences, Universiti Brunei Darussalam

## ABSTRACT

**Introduction:** Vaping has gained immense popularity, especially among youth, yet it poses significant health risks, including potential carcinogenic effects, cardiovascular complications, and respiratory issues. One of the controversial issues is the mislabelling of vape products. Given the lack of comprehensive legislation governing vape products in Malaysia, this study aimed to assess the accuracy of label claims and their compliance with the Medicines and Healthcare products Regulatory Agency (MHRA) guidelines. **Materials and Methods:** A total of 28 vape liquids (VLs) from different manufacturers, flavours, and price ranges were selected for analysis. 18 of these VLs were purchased online, while the remaining 10 were obtained from physical vape stores. Information from the labels and packaging was evaluated against MHRA requirements. pH was determined with the Ionix pH100 Benchtop pH Meter, viscosity with the Brookfield DV2T Viscometer, and nicotine and nitrite concentrations with the Cary 5000 UV-Vis-NIR Spectrophotometer. Additionally, ammonia and chlorine were also assessed qualitatively. **Results:** The study revealed significant discrepancies between label claims and the actual contents of the VLs, along with instances of non-compliance with MHRA guidelines. Key findings include: Unclear nicotine concentration in all samples, lack of child-tamper-proof evident cap in 7.14% of samples, pH levels exceeding 7 (basic) in 46.43% of samples and falling below 7 (acidic) in 53.57%, presence of ammonia in 57.14% of samples, inconsistencies between tested and label-claimed PG/VG ratios occurred in 80% of products, and half of the samples exceeded the 20 mg/mL nicotine concentration limit. Furthermore, deviations encompassed undisclosed chemical components and an alarming paucity of data about manufacturers and distributors. **Conclusion:** These findings highlight severe concerns regarding potential health risks for users and emphasize the imperative of informed decision-making for consumers. The clear inconsistencies underscore the necessity for stricter adherence to labelling guidelines to ensure user safety.