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Exploring the association between Dengue infection and obesity: a systematic review and meta-analysis

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Corresponding author:
Linh Dang Khanh Vien

d.vien@uq.edu.au

Author Affiliation:
The University of Queensland.

Vien, DKL; Nguyen, TTT; Dao, PT; Do, XH; Do, KQ; Le, HTCH; Luong, CQ; Darssan, D; Phung, TD.

ADMINISTRATIVE INFORMATION

Support - No financial support received.

Review Stage at time of this submission - Formal screening of search results against eligibility criteria.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202630100

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 March 2026 and was last updated on 29 March 2026.

INTRODUCTION

Review question / Objective 1. What is the prevalence of obesity among paediatric and adult patients diagnosed with Dengue infection?
2. Is obesity associated with an increased risk of Dengue infection in both children and adults?
3. Is obesity associated with increased clinical severity of Dengue infection in both children and adults?

Rationale Over the past two decades, dengue infection has become one of the top ten global threats, affecting more than 100 countries worldwide, with a striking 14.6 million cases in 2024. Together with entomological, climatic, and meteorological determinants, multiple individual-level factors are also responsible for the dramatic rise in dengue incidence.
Among individual risk factors, the association between nutritional status, including obesity, and dengue has been established in numerous studies. Obesity is an emerging alarming global health crisis, experienced by one in eight people worldwide. Obesity disrupts both human innate and adaptive immune responses, making hosts vulnerable to infectious agents like Dengue virus, leading to severe outcomes. Indeed, many studies have found evidence that obesity contributed to the increase in the severity of Dengue infection patients. Two systematic reviews published in 2018 and 2023 both give a consistent result that obesity is a risk factor for severe Dengue, with their meta-analyses showing that obese patients had 38% to 50% higher odds of developing severe outcomes. Another systematic review and meta-analysis by Alaa Badawi et al. (2018), analyzing data from 47 studies, revealed that among included studies, an average of 24.5% of dengue patients were overweight or obese, making it the most frequent comorbidity.
However, a critical knowledge gap exists regarding whether obesity plays any role in host susceptibility to dengue infection. It is biologically plausible that obese people are likely to produce more carbon dioxide (CO2) – the most important sensory signal guiding mosquitoes toward humans

– and have a larger body surface, potentially making them more favored targets and thereby increasing the risk of acquiring dengue infection. Therefore, we are conducting this systematic review to synthesize the existing evidence on the relationship between obesity and dengue infection. Understanding this relationship is meaningful for public health, as it can create a dual postive impact on two high-burden global diseases: dengue and obesity. More specifically, the results may help to identify a large, high-risk population for targeted preventive measures, such as future vaccine strategies or health communication promoting healthier and more active lifestyle.

Condition being studied Dengue virus infection, including laboratory-confirmed (NS1, RT-PCR, virus isolation or serological test) cases and clinical/probable cases across the full spectrum of disease severity, in relation to the nutritional status of obesity.

METHODS

Search strategy The search will combine concepts for "Dengue" and "Obesity".
Below is the search strategy for PubMed and this strategy will be adapted for other databases.
("Dengue"[Mesh] OR "Dengue Virus"[Mesh] OR "dengue"[tiab] OR "denv"[tiab] OR "deng"[tiab] OR "break-bone fever"[tiab] OR "break bone fever"[tiab] OR "breakbone fever"[tiab] OR "arboviral"[tiab] OR "arbovirus"[tiab] OR "arboviruses"[tiab] OR “Arthropod-borne viral”[tiab] OR “Flaviviridae*”[tiab] OR “flavivirus*”[tiab])
AND
(“obesity”[Mesh] OR “obes*”[tiab] OR “overweight” [tiab] OR “over-weight”[tiab] OR “over weight”[tiab] OR “-weight”[tiab] OR “fat”[tiab] OR “fatness”[tiab] OR “adipo*”[tiab] OR “nutrition*”[tiab] OR “well-nourished”[tiab] OR “well nourished”[tiab] OR “over-nourished”[tiab] OR “over nourished”[tiab] OR “corpulent”[tiab] OR “comorbidit*”[tiab] OR “-nutrient*”[tiab] OR “body mass index”[tiab] OR “BMI”[tiab] OR “Z-score”[tiab] OR “body size”[tiab] OR “waist circumference”[tiab] OR “waist-hip ratio”[tiab] OR “WHR”[tiab] OR “anthropometr*” [tiab])
NOT ("Animals"[Mesh] NOT "Humans"[Mesh]) AND (eng[la] OR und[la]).

Participant or population Our review will include humans of any age, including both children and adults. No restrictions will be placed on sex, ethnicity, or settings (community or hospital-based).
Animal studies or in-vitro studies without humans will be excluded. Studies focusing exclusively on pregnant women or patients with specific metabolic disorders that confound BMI measurements or patients with other concurrent infections (co-infections) that could bias the clinical severity of Dengue will also be excluded.

Intervention The main exposure is obesity. The definition of obesity will primarily follow the recommendations of World Health Organization (WHO), with measurement methods varying across age groups. Distinct country-specific cut-off points for obesity classifications will be included as well. Studies using other anthropometric measures - such as waist circumference, waist-to-hip ratio, or skinfold thickness - or alternative methods to define obesity status will also be considered.

Comparator Individuals who are not obese, such as normal weight or underweight from the same study population, as defined by the same measurement methods used for the exposure group.

Study designs to be included Observational studies including cohort (prospective and retrospective), case-control, and cross-sectional studies will be included. Randomized controlled clinical trials and other experimental studies will also be considered. Case series (total sample size less than 30), case reports, qualitative research, conference abstracts, poster presentations, and non-original studies such as letters, editorials, commentaries, book chapters and reviews articles will be excluded.

Eligibility criteria Outcomes: The primary outcome is any dengue virus (DENV) infection. Laboratory-confirmed (NS1, RT-PCR, virus isolation or serological test) cases or clinical/probable cases (without laboratory testing) will be all included.

Information sources The following electronic databases will be utilized to conduct a comprehensive searches for eligible studies: Pubmed, Embase, CINAHL Complete (EBSCOhost), Web of Science, Scopus, CENTRAL via Cochrane Library, and Ovid (Medline). We will also use Google Scholar to identify studies based on main keywords and review the reference lists of included studies and relevant systematic reviews.

Main outcome(s) The main outcomes of this systematic review are defined according to the three study objectives:
1. Prevalence of Obesity (Objective 1): The pooled prevalence of obesity among patients diagnosed with Dengue infection.

2. Risk of Dengue Infection (Objective 2): The association between obesity and the risk of contracting any Dengue virus (DENV) infection. The outcome measure is the Odds ratio (OR) or the Relative risk (RR) of having a positive Dengue diagnosis (Laboratory-confirmed or clinical/probable) in the obese group versus the non-obese or normal-weight comparator group.
3. Clinical Severity (Objective 3): The association between obesity and the clinical severity of Dengue. The outcome measure is the OR/RR of developing severe clinical manifestations in obese patients compared to their controls.

Quality assessment / Risk of bias analysis Data will be extracted by one person and checked by at least one other person. The Joanna Briggs Institute (JBI) critical appraisal tools will be used to assess the quality of included studies. The advantage of JBI is that they provide more in-depth, detailed and specific checklists tailored to each study design. Each study will be categorized as having a low, moderate, or high risk of bias based on the tool. Disagreements will be resolved through discussion or by a third reviewer.
We will assess the risk of bias due to missing results using funnel plots. If more than 10 studies are included in the meta-analysis, Egger's test will be performed to statistically evaluate funnel plot asymmetry.

Strategy of data synthesis We will first synthesize the findings narratively. The characteristics and results of all included studies will be presented in tables and text to describe the body of evidence. Where appropriate, a meta-analysis will be conducted to quantitatively synthesize the results from the included studies.

Subgroup analysis Subgroup analyses will be performed to explore potential sources of heterogeneity, based on the following criteria: 1) Age group (Paediatric vs. Adult populations); 2) Obesity definition; 3) Dengue severity classification (WHO 1997 vs. WHO 2009 criteria); and 4) Geographical region (e.g. Asia vs Latin America).
If the number of included studies is insufficient for certain subgroups (e.g., n < 3), a descriptive synthesis will be provided instead.

Sensitivity analysis Sensitivity analyses will be conducted to evaluate the robustness offindings by 1) excluding studies with a high risk of bias (as identified during the quality assessment stage); 2) excluding studies that used only clinical diagnosis without laboratory confirmation; 3) using the 'leave-one-out' method (sequentially removing one study at a time) to determine if any single study disproportionately influences the overall results; and 4) restricting the analysis to studies using the same obesity definition.

Language restriction English only.

Country(ies) involved Australia, Vietnam.

Keywords Dengue, Obesity.

Contributions of each author
Author 1 - Linh Dang Khanh Vien.
Email: d.vien@uq.edu.au
Author 2 - Thi Thanh Thao Nguyen.
Email: thithanhthao.nguyen@uq.edu.au
Author 3 - Phuoc Thang Dao.
Email: phuocthangd@student.unimelb.edu.au
Author 4 - Hoang Xuan Do.
Email: dohoangdr@gmail.com
Author 5 - Kien Quoc Do.
Email: kienquoc.do@uq.edu.au
Author 6 - Hong Huynh Thi Cam Le.
Email: hong.le@uq.edu.au
Author 7 - Quang Chan Luong.
Email: lcq33new@gmail.com
Author 8 - Darsy Darssan.
Email: d.darssan@uq.edu.au
Author 9 - Dung Phung.
Email: d.phung@uq.edu.au