

REVIEW ARTICLE

Heat-Related Climatic Events Influence on Children's Mental Health in Southeast Asia: A Scoping Review

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ABSTRACT

Rising global temperatures present a pressing concern, notably affecting children's mental health through heat-related climatic events. This scoping review examines the impact of heat-related climatic events on children's psychological well-being and identifies research gaps. We found 16 relevant studies by analysing data from Scopus, PubMed, PsycINFO, Proquest, registers, and grey literature using JBI criteria and the PRISMA-ScR Checklist. With 12 studies focussing on Malaysia, Singapore, Indonesia, and other Southeast Asian nations, publications have been rising rapidly since 2017. Half addressed specific mental health outcomes, including stress, anxiety, depression, learning disruption, and neurodevelopmental challenges. The findings underscore the urgent need for comprehensive strategies to mitigate vulnerability and enhance resilience among children in the region. This review highlights critical gaps, offering a foundation for future research and policy development to safeguard children's mental health amidst climate change.

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INTRODUCTION

The recent surge in global temperatures has sparked widespread concerns, resulting in more frequent heat waves and extended droughts due to severe heat exposure. These environmental shifts deeply impact both ecosystems and human well-being, affecting physical and mental health, particularly among vulnerable groups, including young individuals.

As temperatures rise in Southeast Asia, heat waves and droughts are expected to become more frequent,

intense, and widespread (1). Dense urban areas are more susceptible to rising temperatures than rural places (2). Moderate to severe droughts occur often in Vietnam, Malaysia, Thailand, and Indonesia, according to research (3, 4). From 2013 to 2023, the ASEAN Disaster Information Network documented 66 drought incidents in Southeast Asia (5), but, the actual number may be greater because drought onset and end are difficult to identify (6).

Studies (7, 8) show that heat-related climatic events can affect children's mental health directly, indirectly, and overall. High temperatures can harm children's mental and behavioural health (9). Children are more susceptible to physiological strain from high air temperatures due to their reduced body-surface ratio and developing adaptive mechanisms (10). Optimal cognitive performance is linked to specific temperature

ranges, whereas overheating can lead to reduced cerebral blood flow and cognitive ability (11, 12).

Furthermore, research (13, 14) links air pollution to behavioural, emotional, motor skill delay, and cognitive impairments in children. Fine particulate matter exposure during prenatal development increases the risk of behavioural and emotional difficulties like conduct disorder, hyperactivity/inattention, emotional symptoms, and peer problems (13). Neurotoxic air pollution may also impair memory and intelligence. Long dry spells increase air pollution and fine particle matter exposure.

Depression, maternal and child health, and undernutrition are understudied in climate change research, which focuses on air quality and heatwaves (15). We selected Southeast Asia as the focus in bridging the gap because (i) the tropical environment of the region makes it susceptible to heat-related occurrences including continuous dry days and heatwaves (16, 17), (ii) in densely populated Southeast Asia, including the Philippines, Vietnam, and Indonesia (18), children are at significant risk for mental health development due to heat-related incidents, (iii) examining cultural and socioeconomic disparities (19) might uncover unique characteristics that safeguard children's mental well-being, such as parental influence, religious beliefs, and cultural practices, and (iv) limited research on global heat-related events and children's mental health (15) offers an opportunity to fill the literature gap and better understand Southeast Asian children's unique vulnerability. This scoping review aims to explore existing literature on the topic and identify areas requiring further research.

MATERIALS AND METHODS

Scoping Review Question

What empirical data exists about the influence of heat-related climatic events on the mental health and psychological well-being of children in Southeast Asian countries?

Inclusion Criteria

Participants: It includes peer-reviewed children's literature from electronic databases, registries, and grey literature. According to the United Nations (20), for statistical purposes, the definition of children refers to people aged 14 and below. Due to the different definitions of children in the literature, the study covered key terms such as child, preschool, baby, kid, toddler, and foetus. Due to the different definitions of children in the literature, the study covered key terms such as child, preschool, baby, kid, toddler, and foetus.

Concept: Increased temperatures, hot weather,

heatwaves, drought, and urban heat islands (UHI) consequences were investigated in the scoping review. The papers seek mental health and well-being results, encompassing socio-emotional and cognitive functioning.

Context: The reviews focus on situations in Southeast Asia. Any item containing the word "Southeast Asia" is retrieved and reported.

Source types: This review contains all trustworthy primary research papers, systematic reviews, meta-analyses, reports, and guidelines (public and unpublished) that address the research question. Search phrases on Google, WHO IRIS, and ASEAN portals were used to find grey literature.

Methods

To comprehensively explore existing literature and identify knowledge gaps, we performed a scoping review using the criteria provided by the Joanna Briggs Institute (JBI) (21) and followed the PRISMA-ScR reporting standards.

Search Strategy: From February to June 2023, peer-reviewed articles were sourced from electronic databases (Scopus, PsycINFO, ProQuest, PubMed). The period includes the entire process of data collection. The search included various study types and sources, extending to expert reviews, government reports, and institutional documents. Grey literature was accessed through the ASEAN portal, WHO Iris, and Google. Stringent criteria limited articles to those from 2013 to date, aligning with recent trends in climate change.

Source Selection: Out of 4,864 identified papers, 434 duplicates were removed, and a screening tool, guided by (22) recommendations, narrowed down 4,430 records. After title and abstract screening, 3,854 records were excluded. Snowball sampling supplemented the search, resulting in 16 included studies.

Data Extraction: Relevant data, including author details, publication information, study aims, methodologies, Southeast Asia countries involved, mental health outcomes, and identified gaps, were systematically extracted into a table.

Data Analysis and Presentation: To summarise and visualise the data, descriptive analysis used frequency counts and graphical mapping. Results were presented clearly in a complete table.

ETHICAL CLEARANCE

This study uses publicly accessible data from existing research; hence, no original data is available for sharing.

RESULTS

Out of a total of 4,864 papers, only seven main research papers, six secondary research papers, and three grey literature sources were found to meet the specified criteria for inclusion. Publication trends show an increase: 2017 (n = 1), 2019 (n = 1), 2021 (n = 5), 2022 (n = 8), and 2023 (n = 1). From 2013 to 2020, we were unable to find any peer-reviewed studies; we only discovered primary research publications from 2021 to 2023. Of seven peer-reviewed studies, six were quantitative (23-28), one qualitative (29) and none mixed-method.

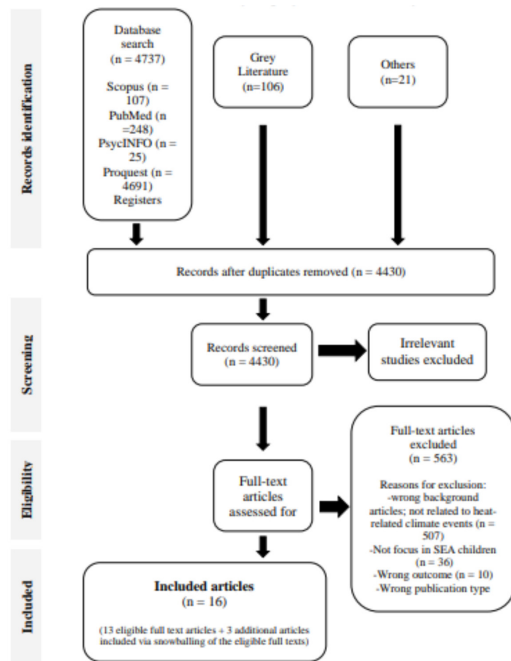


Figure 1: Preferred Reporting Items for Meta-Analyses Extension for Scoping Review flow chart.

Geographical Coverage: Malaysia, Singapore, Indonesia, Vietnam, Thailand, the Philippines, and Myanmar were explicitly referenced. Malaysia led with 57%, followed by Singapore, Indonesia, Vietnam (43%), Thailand, the Philippines (28.5%), and Myanmar (15%). No studies involved Cambodia, Laos, Brunei, or Timor-Leste. WHO's 2019 report included Laos and Cambodia.

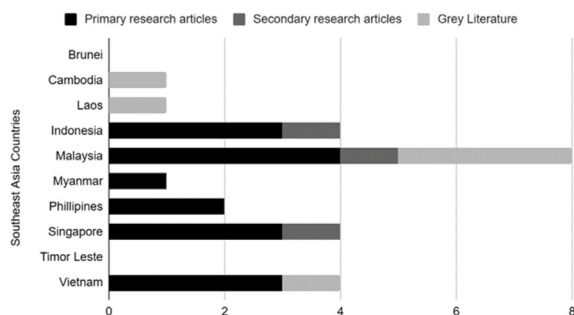


Figure 2: Number of included studies in Southeast Asia region.

Climate Events and Mental Health: Rising air temperature (47%) (2, 23-34), longer dry days (20%) (23, 27, 29, 33-36), air pollution (20%) (2, 25, 28, 30, 31, 36-38), and others (13.3%) such as water (31) and food insecurity (32), and reduced river basins (34) have detrimental impacts on the mental well-being of children.

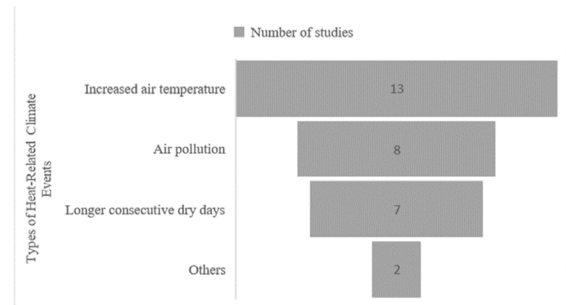


Figure 3: Types of heat-related climatic events that influenced children's mental health.

Mental Health Outcomes: Cognitive and emotional functioning and mental health disorders were the outcomes of half the research. Cognitive and emotional function, brain development, anxiety, and depression were examined in primary research (42.9%) on heat exposure (24, 25, 28). Reviewers (50%) mentioned stress, learning disruption, cognitive and behavioural abnormalities, and neurodevelopmental issues (35, 38). Grey literature reports (66.7%) noted potential hazards of heat exposure on stress, cognitive, and developmental disorders (30, 36).

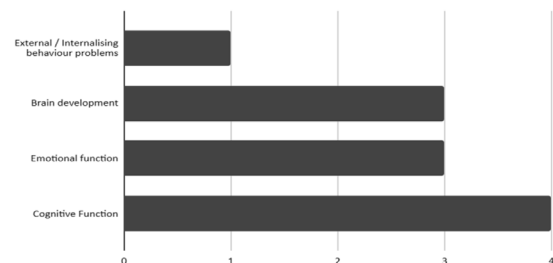


Figure 4: The specified children's mental health outcomes affected by the heat-related climatic events.

DISCUSSION

In Southeast Asia, aside from rising temperatures (39), other factors influencing children's mental health include air pollution and prolonged dry days (no measurable rain for three days or longer) (40). Curiously, anxiety about rising temperatures triggers pro-environmental behaviors, except in countries like Japan, Oman, and Malaysia, where culture and socio-economic factors may play a role (41). Consequently, children's physical and mental health worsen as a result of rising temperatures (12, 13, 42). Hence, further investigation is required to develop effective strategies for the protective factors that safeguard the environmental, physical, and mental well-

being of children, particularly in resource-limited and vulnerable areas (43).

Nonetheless, the lack of extensive exploration in some regions like Cambodia, Laos, Brunei, and Timor-Leste has limited our understanding of the impact of heat exposure on children. Political instability and resource constraints, except for Brunei, may explain the need for further research in these areas (44-46). This could restrict the development of effective mitigation strategies for protecting children from heat-related hazards (47). Regional and international collaboration is required to address these disparities and ensure inclusive research throughout Southeast Asia.

Over the years, a significant gap in understanding Southeast Asian children's personal experiences and social realities related to heat exposure has been highlighted by scarce qualitative research (48). Although quantitative studies have found heat-related cognitive, affective, and neurodevelopmental difficulties (49, 50), these findings alone are inadequate to illustrate the effects on children's mental health. Without qualitative insights, it can be challenging to develop effective interventions. Thus, early interventions and interdisciplinary methods are required to protect children.

CONCLUSION

This scoping review indicates that rising temperatures, air pollution, and longer dry days are the most influential contributors to the mental health of Southeast Asian children. Most studies should focus on the development of climate resilience among children, especially in examining the cultural influences and identifying protective factors. Future research on the impacts of heat on mental health is needed to support children's resilience development.

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