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Treatment of Heatstroke-Induced Coagulopathy: A Scoping Review Protocol V.2

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We use this protocol and it's working

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Keywords: treatment of heatstroke, induced coagulopathy, heat stroke, heat illness, heat stress disorder, elevated core body temperature, intravascular coagulation, measures for heatstroke, disseminated intravascular coagulation, heatstroke, anticoagulation, heat, such as anticoagulation, plasma transfusion, current evidence on treatment, various treatment, clinical research

Abstract

Objective: This study aims to understand the scope and types of evidence regarding treatment and outcome measures for heatstroke-induced coagulopathy in both basic and clinical research. **Introduction:** Heat stroke is a life-threatening condition characterized by elevated core body temperature and central nervous system dysfunction, often leading to multiple organ dysfunction. Coagulopathy is one of the serious complications caused by heat stroke. Although various treatments—such as anticoagulation, plasma transfusion, and supportive care—have been reported, no established treatment or standardized approach currently exists. The available evidence is limited and inconsistent. Therefore, this study aims to conduct a scoping review to map the current evidence on treatment for heatstroke-induced coagulopathy and to identify gaps in knowledge. **Inclusion criteria:** The target population includes any subjects—human or animal—with heatstroke-induced coagulopathy, regardless of age, sex, species, or disease duration. The concept is to examine treatment strategies and outcome measures. The context does not restrict location, region, race, or gender. Literature in all languages and from both published and unpublished sources will be considered. **Methods:** The literature search will combine terms related to heat stroke (including 'heat stroke,' 'heatstroke,' 'heat illness,' 'heat-related illness,' and 'Heat Stress Disorders') with coagulopathy-related terms ('disseminated intravascular coagulation,' 'DIC,' and 'coagulopathy') across MEDLINE (PubMed), Web of Science, and Scopus databases. In the initial screening step, two independent reviewer groups assess all titles and abstracts, excluding irrelevant articles. The second screening follows the same inclusion criteria, with two independent reviewers thoroughly examining full texts.

Guidelines

Heat stroke is a serious condition characterized by extreme elevation of core body temperature and central nervous system dysfunction, often leading to multiple organ dysfunction. Heat stroke sometimes induces a life-threatening coagulation disorder. However, no established treatments or standardized protocols currently exist for heatstroke-induced coagulopathy. A variety of therapeutic interventions have been reported, including anticoagulation, plasma transfusion, and supportive care; however, the evidence remains fragmented and inconsistent across studies. This scoping review aims to comprehensively map the evidence on treatments for heatstroke-induced coagulopathy and identify existing knowledge gaps. The resulting evidence synthesis may offer insights to inform current clinical practice and guide future research directions.

Introduction

- 1 Heat stroke is a serious condition characterized by extreme elevation of core body temperature and central nervous system dysfunction, often leading to multiple organ dysfunction.¹ Heat stroke sometimes induces a life-threatening coagulation disorder. However, no established treatments or standardized protocols currently exist for heatstroke-induced coagulopathy. A variety of therapeutic interventions have been reported, including anticoagulation, plasma transfusion, and supportive care; however, the evidence remains fragmented and inconsistent across studies.²⁻³ This scoping review aims to comprehensively map the evidence on treatments for heatstroke-induced coagulopathy and identify existing knowledge gaps. The resulting evidence synthesis may offer insights to inform current clinical practice and guide future research directions.

Review Question

- 2 The review questions for this study are as follows: (1) What treatments for heatstroke-induced coagulopathy have been reported in basic and clinical research? (2) What outcome measures have been used to evaluate the treatment's effectiveness?

Inclusion Criteria

- 3 **Participants**
Any subjects (human or animal) with heatstroke-induced coagulopathy identified through our search strategy, regardless of age, sex, species, race, severity, or duration of the condition.
- 4 **Concept**
 1. Treatments: Treatment of heatstroke-induced coagulopathy in basic and clinical research (e.g., anticoagulant therapy, plasma transfusion, supportive care, and other therapeutic interventions).
 2. Outcome measures: Clinical and experimental outcomes used to evaluate the effectiveness of treatment for heatstroke-induced coagulopathy (e.g., survival, resolution of coagulopathy, and biomarkers).
- 5 **Context**
There are no restrictions regarding patient setting, geographic region, race, or gender. The publication period of the literature is not limited. There are no language restrictions. Both published and unpublished studies will be considered.
- 6 **Types of Sources**
This scoping review will include a wide range of study designs to map the existing evidence comprehensively. Eligible sources include experimental and quasi-experimental studies, such as randomized controlled trials, non-randomized controlled

trials, before-and-after studies, and interrupted time-series studies. Observational analytical studies will also be included, including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies. Descriptive observational studies such as case series, individual case reports, and descriptive cross-sectional studies are also eligible. Qualitative studies that explore experiences, perceptions, or processes related to the treatment of heatstroke-induced coagulopathy will be considered for inclusion. Additionally, systematic reviews and meta-analyses relevant to the research questions will be included if they meet the eligibility criteria. Other literature types, including expert opinions, commentaries, and conference abstracts or proceedings, will also be included. There will be no restrictions based on publication date or publication status.

Methods

7 This protocol was written in accordance with PRISMA-P.⁴ The study follows the Joanna Briggs Institute (JBI) methodology for scoping reviews⁵ and is registered on Protocols.io.

8 **Search Strategy**

The following databases are systematically searched electronically: MEDLINE (PubMed), Web of Science, and Scopus. The full search strategy for each database is developed using keywords contained in the titles, abstracts, and full texts of relevant articles, as well as the index terms used to describe the articles (see **Appendix**). Additionally, the reference lists of all included studies will be screened to identify any further eligible studies. It is possible that languages other than English and Japanese are reviewed with the assistance of machine translation services.

9 **Study/Source of Evidence Selection**

All citations will be uploaded into Rayyan (Rayyan Systems Inc., Cambridge, MA), and duplicates will be removed. Following a pilot test, two independent reviewer groups (represented by TY and KS, respectively) will screen titles and abstracts against the inclusion criteria. Next, full texts of potentially relevant articles will be reviewed for eligibility by two independent reviewers (TY and KS) after the pilot test. Reasons for excluding studies during full-text screening will be documented and reported in the main manuscript. Any disagreements between reviewers at each stage of the selection process are resolved through discussion by TY and KS, or with the assistance of an additional arbitrating reviewer (HN). The search results and the study inclusion process are reported in the final scoping review manuscript and presented in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) flow diagram.⁴

10 **Data Extraction**

Two reviewers (TY and KS) will extract data from the screened papers using a data extraction form created by the authors. The extracted data include details on

participants, concept, context, methods, and key findings relevant to the review question. The draft data extraction form includes information on the author, year of publication, journal name, title, digital object identifier, country of origin, study design, population and sample size, treatment details, outcomes details, individual clinical information of cases for case reports, and other key findings relevant to the scoping review question. The draft data extraction form is modified and revised as necessary during the data extraction process from the screened papers. Modifications are detailed in the scoping review. Any disagreements with the reviewer are resolved through discussion or with the assistance of an additional arbitrating reviewer (HN). If necessary, the authors of the papers are contacted to request missing or additional data.

11 Data Analysis and Presentation

The extracted data will be presented in graphical and/or tabular format. The identified treatments from the included studies will be categorized and summarized based on clinical significance and measured outcomes.

Appendix

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- PubMed: ("heat stroke" OR "heatstroke" OR "heat illness" OR "heat-related illness" OR "Heat Stress Disorders"[MeSH]) AND ("disseminated intravascular coagulation"[MeSH] OR "DIC" OR "coagulopathy")
 - Web of Science: TS= (("heat stroke" OR "heatstroke" OR "heat illness" OR "heat-related illness") AND ("disseminated intravascular coagulation" OR "DIC" OR "coagulopathy"))
 - Scopus: (TITLE-ABS-KEY ("heat stroke" OR "heatstroke" OR "heat illness" OR "heat-related illness") AND TITLE-ABS-KEY ("disseminated intravascular coagulation" OR "DIC" OR "coagulopathy"))

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