HYDROLOGICAL DISASTERS AND HUMAN HEALTH: SCOPING REVIEW

DESASTRES HIDROLÓGICOS E SAÚDE HUMANA: UMA REVISÃO DE ESCOPO

DESASTRES HIDROLÓGICOS Y SALUD HUMANA: UNA REVISIÓN DEL ALCANCE

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ABSTRACT

The objective of this scoping review is to evaluate literature between 2013 and 2023 focused on human health and hydrological disasters. The research databases were: Lilacs, Medline via PubMed, Scopus, Web of Science, ScienceDirect. Eligibility was determined using inclusion and exclusion criteria, and the search strategy included: (Health) AND (Hydrologic Disaster), (Health Risk) AND (Hydrologic Disaster). Initially, 58 articles were selected, but after systematic screening, only 12 were relevant to the topic. The results indicated that the prevalence of post-disaster infectious diseases is a recurring and relevant theme in the literature. In short, scientific collaboration highlighted the need for more comprehensive and multidisciplinary work, with the potential to act in the formulation of public policies and international partnerships, preparation of health managers and professionals, development of plans, research and interventions in the relationship between health and hydrological disasters.

Keywords: Flooding. Health. Infectious Diseases. Stormwater Drainage and Healthcare Professionals.

RESUMO

O objetivo desta revisão de escopo é avaliar literatura entre 2013 e 2023 relacionada objetivamente à saúde humana e desastres hidrológicos. As bases de pesquisa foram: Lilacs, Medline via PubMed, Scopus, Web of Science, ScienceDirect. Para elegibilidade utilizou-se critérios de inclusão e exclusão, e estratégia de busca: (Health) AND (Hydrologic

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Disaster), (Health Risk) AND (Hydrologic Disaster). Inicialmente, foram selecionados 58 artigos, porém após a seleção sistematizada apenas 12 estavam aptos à temática sugerida. Os resultados indicaram que a prevalência de doenças infecciosas pós desastre é um tema recorrente e relevante na literatura. Em suma, a colaboração cientifica foi capaz de indicar a necessidade de trabalhos mais abrangentes e multidisciplinares, com potencial para atuar na formulação de políticas públicas e parcerias internacionais, preparação de gestores e profissionais de saúde, elaboração de planos, pesquisas e intervenções na relação saúde e desastres hidrológicos.

Palavras-chave: Inundação. Saúde. Doenças Infecciosas. Drenagem Pluvial e Profissionais de Saúde.

RESUMEN

El objetivo de esta revisión de alcance es evaluar la literatura entre 2013 y 2023 relacionada objetivamente con la salud humana y los desastres hidrológicos. Las bases de datos de investigación fueron: Lilacs, Medline vía PubMed, Scopus, Web of Science, ScienceDirect. Para la elegibilidad, se utilizaron los criterios de inclusión y exclusión y la estrategia de búsqueda: (Salud) Y (Desastre Hidrológico), (Riesgo de Salud) Y (Desastre Hidrológico). Inicialmente se seleccionaron 58 artículos, pero luego de la selección sistemática solo 12 fueron adecuados para el tema sugerido. Los resultados indicaron que la prevalencia de enfermedades infecciosas después de los desastres es un tema recurrente y relevante en la literatura. En síntesis, la colaboración científica pudo indicar la necesidad de un trabajo más amplio y multidisciplinario, con potencial para actuar en la formulación de políticas públicas y alianzas internacionales, preparación de gestores y profesionales de salud, elaboración de planes, investigaciones e intervenciones en la relación entre salud y desastres hidrológicos.

Palabras clave: Inundaciones. Salud. Enfermedades Infecciosas. Drenaje Pluvial y Profesionales de la Salud.

1 INTRODUCTION

Natural disasters — such as extreme storms, floods, tropical cyclones, wildfires, windstorms, landslides, and droughts — have claimed millions of lives in recent decades and adversely affected the lives of millions more around the world, causing extensive material damage. From 1970 to 2012, 1.94 million deaths and US$2.4 trillion in economic losses were reported globally as a result of 8,335 disasters directly linked to meteorological and hydrological conditions (Patz; Grabow; Limaye, 2014).

The findings of many empirical studies indicate that people's preparedness for disasters and the associated factors are closely related to individual and family socioeconomic characteristics, as well as personal experiences with disasters (Xu et al., 2018). Disproportionate flooding in socially vulnerable communities leads to unequal environmental and public health impacts. Substantial research on natural hazards has demonstrated that individuals living in poverty, the elderly, minority groups, and those without access to transportation are at greater risk of adverse health outcomes associated with disasters (Newman et al., 2022). The health impacts of floods may include drowning, injuries, animal bites, and communicable diseases, as well as chronic illnesses and long-term mental health effects (Zhong et al., 2018; Du et al., 2010).

Studies on the health impacts of natural disasters highlight that such events affect populations unequally and in different ways, both directly and indirectly, with short- to long-term effects depending on the characteristics of the event and the socio-environmental vulnerability of the affected area (Alderman; Turner; Tong, 2012). The World Health Organization acknowledges that the mental health consequences of flooding have not been fully addressed by those involved in disaster preparedness or service provision, although it is widely accepted that natural disasters such as earthquakes, floods, and hurricanes take a significant toll on the mental health of affected individuals — most of whom live in developing countries where the capacity to address such problems is extremely limited (WHO, 2001). Floods have increasingly become serious public health issues, especially in developing countries such as Brazil, where legal advancements have not been matched by effective enforcement and still require the establishment of participatory mechanisms and educational actions as complementary measures (Freitas; Ximenes, 2012).

While natural disasters such as earthquakes, hurricanes, and tsunamis have been the most extensively studied in the health field, other types of disasters — such as floods and droughts — remain under-researched. Moreover, studies on post-disaster diseases and health effects require more scientific evidence on the topic (Sweileh, 2019).

The study by Charnley et al. (2021) identified ten different types of disasters and thirty-nine diseases across six continents, offering a broad, global perspective on post-disaster impacts. The study highlighted the need for a specific scoping review focused on hydrological disasters and their relationship with health, in order to address scientific gaps.

In this context, the objective of this scoping review is to quantify and evaluate the literature on human health and hydrological disasters. This study seeks to answer the question: What does the literature report about Human Health and Hydrological Disasters?

2 METHODOLOGY

This study is a scoping review. The research employs exploratory and descriptive approaches to the data, using both quantitative and qualitative analyses. The scoping review aimed to analyze publications related to human health and hydrological natural disasters.

A scoping review is characterized by specific steps, including the definition of eligibility criteria, database selection, search strategy, screening process, study selection, data extraction, and synthesis of results (Munn et al., 2018). This scoping review was conducted systematically, following the PRISMA-ScR guidelines (Tricco et al., 2018).

The first step was defining the research question using the PCC strategy — Population, Concept, and Context — which is used to structure research questions and enhance the relevance of scoping reviews (Peters, 2016). Based on the research question, the search terms were identified through the Descriptors in Health Sciences (DeCS) and Medical Subject Headings (MeSH) databases. The search strategy included English-language terms drawn from these sources (DeCS, 2024; MeSH, 2023).

The systematic search for studies was carried out up to April 14, 2024, by two researchers independently using the following databases: Lilacs, Medline via PubMed, Scopus, Web of Science, and ScienceDirect. The aim was to find evidence that met the established eligibility criteria. The eligibility of the articles included in the study was based on two main criteria: (1) inclusion criteria and (2) exclusion criteria. The inclusion criteria were: open-access scientific articles available in full; systematic review studies; publications from 2013 to 2023; and written in English. The exclusion criteria included: gray literature (not peer-reviewed or publicly available); studies outside the scope of the research topic; papers that did not contribute to answering the research question; and studies with incomplete or superficially detailed methodology.

Following PRISMA-ScR recommendations, the scoping review protocol was registered on the Open Science Framework (OSF) through the link: https://doi.org/10.17605/OSF.IO/ZTXQ9, a public platform for registering scoping review

protocols (Van den Akker et al., 2023). Full-text reading of the selected articles was conducted by two blinded reviewers. The data extracted from the full texts included: author, year, country, participants, keywords, titles, study type, measured outcomes, and findings. The resulting themes from the articles were then categorized. To remove duplicate records, the Rayyan platform—designed to support the scoping review process—was used (Ouzzani et al., 2016).

3 RESULTS AND DISCUSSION

The database search retrieved a total of 4,199 articles, as shown in Table 1. To eliminate duplicates, the Rayyan platform was used. Rayyan identified 2,036 duplicate records, resulting in 2,105 articles to be analyzed according to the research topic and guiding question.

Table 1

Scoping review search strategy by database, for the period from 2013 to 2023

Database	Search Strategy	Total Articles
Lilacs via BVS Regional Portal	(health) AND (natural disasters)	36
	(health risk) AND (natural disasters) AND (fulltext:("1" OR "1")	11
	(Health) AND (Hydrologic Disaster)	0
	(Health Risk) AND (Hydrologic Disaster)	0
MEDLINE via PubMed	(Health) AND (Natural Disasters)	517
	(Health Risk) AND (Natural Disasters)	204
	(Health) AND (Hydrologic Disaster)	06
	(Health Risk) AND (Hydrologic Disaster)	04
Scopus	TITLE-ABS-KEY (health AND " Natural Disasters ")	1.195
	TITLE-ABS-KEY ("Health Risk" AND "Natural Disasters")	89
	TITLE-ABS-KEY (health AND "Hydrologic Disaster")	01
	“Health Risk” AND “Hydrologic Disaster”	0
Web of Science	(Health) AND (Natural Disasters)	539
	(Health Risk) AND (Natural Disasters)	297
	(Health) AND (Hydrologic Disaster)	16
	(Health Risk) AND (Hydrologic Disaster)	11
ScienceDirect	Health AND (Natural Disasters)	779
	“Health Risk” AND “Natural Disasters”	474
	Health AND “Hydrologic Disaster”	17
	“Health Risk” AND “Hydrologic Disaster”	03
Total		**4.199**

Source: prepared by the authors.

In a preliminary analysis of the retrieved studies, it was observed that some articles addressed various types of natural disasters such as hurricanes, tsunamis, and wildfires, which, however, were not the focus of this study. This led to a refinement of the search strategy to better align the selected articles with the study's objective. The strategy (Health) AND (Hydrologic Disaster) and Health Risk AND Hydrologic Disaster was implemented as a solution. The results of this refined search are presented in Table 2.

Table 2

Refined search strategy for studies addressing the relationship between human health and hydrologic disasters

Database	Search Strategy	Total Articles
Lilacs	(Health) AND (Hydrologic Disaster)	0
	(Health Risk) AND (Hydrologic Disaster)	0
Medline via PubMed	(Health) AND (Hydrologic Disaster)	06
	(Health Risk) AND (Hydrologic Disaster)	04
Scopus	TITLE-ABS-KEY (health AND "Hydrologic Disaster")	01
	“Health Risk” AND “Hydrologic Disaster”	0
Web of Science	(Health) AND (Hydrologic Disaster)	16
	(Health Risk) AND (Hydrologic Disaster)	11
ScienceDirect	Health AND “Hydrologic Disaster”	17
	“Health Risk” AND “Hydrologic Disaster”	03
Total		**58**

Source: prepared by the authors.

According to the theme of this study — the relationship between human health and hydrologic disasters — a targeted search for articles was conducted. Table 2 presents the corresponding databases, descriptors, and the number of documents retrieved from each platform.

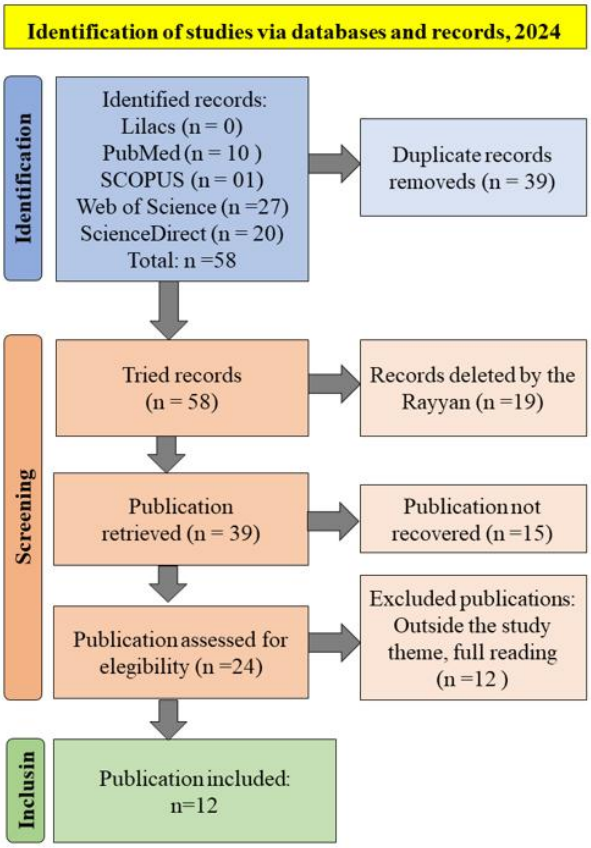
The 58 selected articles were screened using the Rayyan application, which identified 39 duplicates. Consequently, 19 articles were excluded due to overlap among databases. After screening titles and abstracts based on the search strategy and the study theme, 15 articles were excluded for being outside the scope, resulting in 24 articles for full-text reading.

Among the 24 eligible publications, following the full-text analysis, 12 articles were excluded for not aligning with the study topic, leaving 12 articles for inclusion and data analysis (Figure 1).

From the full-text reading of the 12 included articles, data were extracted, and the main themes emerging from these articles were identified (Table 3).

Figure 1

Flowchart of the selected studies, 2024



Source: prepared by the authors.

Table 3

Sumaries of the twelve included studies

AUTHOR/ YEAR	COUNTRY	PARTICIPANTS	KEYWORDS	TITLE	STUDY TYPE	DATABASE	OUTCOME MEASURES	MAIN FINDINGS
LIU et al. (2019)	China	All countries and territories worldwide that reported flood-related natural disasters from 1990 to 2019.	Flood disasters; Infectious diseases;Disease burden;Trend; Global	Association of natural flood disasters with infectious diseases in 168 countries and territories from 1990 to 2019: A worldwide observational study	Observational Study	ScienceDirect	From 1990 to 2019, flood-related natural disasters occurred over a cumulative 47,368 days in 168 countries and territories, resulting in a total of 242,516 deaths.	This was the first study to estimate the association between flood-related natural disasters and new cases and deaths from various infectious diseases across 168 countries worldwide from 1990 to 2019.
THERON *et al.* (2022)	South Africa	Six articles included in the final analysis. Data derived from four countries: Uganda, Ghana, Tanzania, and Nigeria.	Climate change;Disaster preparedness;Climate change adaptation;Climate; change resilience; Emergencymedicine	Climate change and emergency care in Africa: A scoping review	Scoping Review	ScienceDirect	The five studies focused on communicable diseases. Specific illnesses contributed to human mobility and outbreaks of infectious diseases.	The findings align with other studies highlighting the urgent need to prepare healthcare systems and professionals to address the health impacts of climate change.
LIANG; MESSENGE (2018)	USA	Emergency physicians and first responders.	Flood;Hurricane;Tsunami;Infectious diseases; Soft tissue infections; Respiratory infections; Gastrointestinal infections; Vector-borne diseases	Infectious diseases after hydrologic disasters	Literature review	ScienceDirect	Most communicable infections emerged among displaced populations in settings characterized by inadequate shelter, overcrowding, poor sanitation, and lack of access to safe food and drinking water.	Infectious diseases have been linked to hydrological events and their consequences. Most communicable infections emerge among displaced populations in settings characterized by inadequate shelter, overcrowding, poor sanitation, and lack of access to safe food and drinking water.
CHARNLEY *et al.* (2021)	UK	A total of 132 studies were selected.	Climate-change impacts; Climate-change mitigation: Natural hazards; Infectious diseases; Risk factors	Traits and risk factorsof post-disaster infectious disease outbreaks: a systematic review	Systematic review	PubMed	The studies covered the period from 1940 to 2019 and included ten different types of disasters and 39 different diseases across six continents.	Reported outbreaks were often disaster-specific; therefore, diseases associated with hydrological events and conflicts were frequently documented.
PATZ; GRABOW; LIMAYE (2014)	USA	Health consequences of climate change; study conducted on the relationship between health and post-disaster events.	Extreme weather events;global climate change;greenhouse gas emissions;health;vulnerable populations	When It Rains, It Pours: Future Climate Extremes and Health	Literature review	ScienceDirect	Geographic location played a significant role in the potential for adverse health effects associated with climate change	Mental health disorders, such as post-traumatic stress disorder (PTSD), can substantially affect the well-being of populations following natural disasters.
NEWMAN *et al.* (2022)	USA	Neighborhoods in the city of Houston, United States.	Landscape performance; green infrastructure;stormwater;resilience; equity	A Framework for Evaluating the Effects of Green Infrastructure in Mitigating Pollutant Transferal and Flood Events in Sunnyside, Houston, TX	Experimental study	Web of Science	Impact of the master plan on flood reduction and contamination control.	Improvements in urban stormwater management and water quality were observed. The master plan incorporated green roofs and rain gardens.
SALVATI *et al.* (2021)	Italy	Buildings assessed through active participation of citizens, municipal technicians, civil protection volunteers, and researchers.	Vulnerability indicators;Digital survey-forms;Urban contexto;Geo-hydrological hazard; Landslide susceptibility; Risk awareness	Acquiring vulnerability indicators to geo-hydrological hazards: An example of mobile phone-based data collection	Experimental study	ScienceDirect	A total of 1,375 building survey forms were compiled using building-specific assessment instruments.	The physical vulnerability of buildings at risk and their surroundings was identified and varied according to hazard type. Most buildings were located in the flat coastal area of the historic city, exposed to pluvial and fluvial flooding.
DÍAZ-DELGADO; GAYTÁN INIESTRA (2014)	Mexico	Mexican emergency plans and hydrometeorological warning systems.	Flood early warning system;humanitarian logistics;flood risk assessment;evacuation plan	Flood Risk Assessment in Humanitarian Logistics Process Design	Observational study	ScienceDirect	Analysis of early flood warning systems and performance measurement of relief operations.	Creation of a necessary database for flood forecasting and to strengthen multidisciplinary and multisectoral teamwork.
SALVATI et al. (2018)	Italy	Data on 1,292 landslides and 771 flood-related deaths that occurred in Italy over a 50-year period (1965–2014).	Deaths;Loss of life;Flood and landslide fatalities;Flood and landslide mortality;Statistical approach;Gender and age analysis;Geo-hydrological disasters	Gender, age and circumstances analysis of flood and landslide fatalities in Italy	Observational study	ScienceDirect	Summarized data from 35 catalogs reporting fatalities caused by geo-hydrological events, including 20 catalogs with information on flood and flash flood-related deaths.	Floods and landslides causing human fatalities in Italy demonstrated mortality dependence on gender and age. Landslides in Italy resulted in significantly more deaths (1,292) than floods (771) during the investigated period.
TIN *et al.* (2024)	USA	Retrospective analysis of natural disasters recorded in the Emergency Events Database from 1995 to 2022.	Natural disasters;Earthquakes;Floods;Mitigation;Response	Natural disasters: a comprehensive study using EMDAT database 1995-2022	Observational study	ScienceDirect	Emergency Events Database (EM-DAT) used to assess all natural disasters occurring between January 1, 1995, and December 31, 2022.	Between 1995 and 2022, 11,360 natural disasters occurred, averaging 398 per year. Asia recorded the highest number of disasters (4,390) and the greatest number of casualties (918,198). Hydrological disasters were the most common subgroup (4,969).
LAMBERTI-CASTRONUOVO *et al.* (2022)	Italy	A total of 145 studies and medical records were selected.	Primary healthcare;Disaster preparedness;H-EDRM;Framework;Health system strengthening	Primary health care disaster preparedness: A review of the literature and the proposal of a new framework	Systematic review	ScienceDirect	As of March 2022, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Checklist.	Development of a set of guidelines for primary healthcare systems to assess and enhance their disaster preparedness.
MANANDHA *et al.* (2023)	China	Urban floods in South Asian countries; 105 publications were selected for analysis.	Climate change; early warning system; flood; hydrological model; land use land cover change; urbanization	Urban Flood Hazard Assessment and Management Practices in South Asia: A Review	Literature review	Web of Science	Evaluation of hydraulic and hydrological modeling approaches.	The main causes of increased flood risk in Asia are climate change and uncontrolled urbanization. Flood impacts can be mitigated through risk mapping.

Source: prepared by the authors.

The twelve studies included in this review presented a diverse range of geographic origins regarding scientific production, encompassing countries such as China, South Africa, the United States, the United Kingdom, Italy and Mexico. This diversity highlights the global interest in investigating the impacts of natural disasters and their consequences for public health.

The analyzed articles were classified into five main thematic areas. The first addresses infectious diseases following floods, highlighting the work of Liu et al. (2019), Theron et al. (2022), Liang and Messenger (2018), Charnley et al. (2021), and Patz, Grabow, and Limaye (2014), who explore how these events can facilitate the spread of diseases. Indirectly, these studies also discuss the premises of global warming as a driver of natural disasters and the socio-environmental and economic vulnerability of affected populations as a critical weak point. The operational challenges faced by public health systems in the wake of natural disasters also receive considerable attention.

The second thematic area focuses on flood risk mitigation, with studies such as Newman et al. (2022), Salvati et al. (2021), Díaz-Delgado and Gaytán-Iniestra (2014), and Manandhar et al. (2023), which discuss strategies to reduce flood-related damages. These studies propose the application of models such as landscape performance associated with other models (Newman et al., 2022), the use of mobile technology for precipitation data collection (Salvati et al., 2021), flood risk assessment through adaptation of hydrological models (Díaz-Delgado and Gaytán-Iniestra, 2014), and the adoption of nature-based solutions integrated into urban planning (Manandhar et al., 2023). What they share in common is a set of palliative responses through inclusive technologies amid the inefficiency of emergency managers due to various factors.

The third category addresses data on deaths caused by floods and landslides, represented by the study of Salvati et al. (2018), which analyzes statistics and patterns related to fatalities by age and gender variables over a 50-year period. Although there is low consistency by age group, male mortality appears to have been predominant for both floods and landslides.

The fourth thematic area covers the types of natural disasters, with emphasis on the study by Tin et al. (2024), which classifies and describes different types of environmental disasters. According to their findings, the most common subgroup of disasters was hydrological (4,969, 43.7%), but geophysical disasters caused the highest number of deaths (770,644, 45.8%), while biological disasters caused the greatest number of injuries (2,544,177, 33.5%), occurring most frequently in Africa (771, 32.2% of total disasters in Africa). The authors suggest that recognizing the historical impacts of the various subtypes

of natural disasters can help different regions better analyze and mitigate specific risks associated with such events.

Finally, the fifth focus area examines the preparedness of primary healthcare professionals to face disasters, addressed in the work of Lamberti-Castronuovo et al. (2022), which discusses training strategies and effective response in critical scenarios. In summary, the authors present the foundations of a disaster-prepared primary healthcare system. They argue that primary healthcare has the potential to help reduce the health effects of disasters by acting in all phases of the disaster management cycle.

According to Liu et al. (2019), their study was the first to evaluate the association between flood disasters and infectious disease mortality cases across 168 countries worldwide, covering the years 1990 to 2019. The study revealed that infectious diseases most frequently reported in the aftermath of floods were diarrhea, cholera, dengue, malaria, and acute respiratory infections. Theron et al. (2022) reported outbreaks of infectious diseases in three disasters over the five years prior to publication, involving healthcare units. These results align with other studies (Silva et al., 2021; Fernandes et al., 2019) suggesting urgent attention to prepare health systems and professionals to deal with the health effects of climate change.

An important finding from post-hydrological disaster studies is that most transmissible infections arise among displaced populations living in inadequate shelters, overcrowded conditions, poor sanitation, and lack of access to food and potable water (Charnley et al., 2021; Liang and Messenger, 2018). Another public health issue highlighted by Patz, Grabow, and Limaye (2014) is mental health disorders, such as post-traumatic stress, which can substantially affect the well-being of populations displaced or affected by climate change.

Flood disasters can increase exposure to groundwater and overflow of sewage treatment systems in certain regions. The study by Newman et al. (2022) emphasizes the need to improve urban stormwater management and water quality through green infrastructure. Additionally, the authors highlight the importance of implementing green roofs and rain gardens in urban master plans to reduce risks and post-disaster impacts. Díaz-Delgado and Gaytán-Iniestra (2014) suggest establishing a database for flood forecasting and strengthening multidisciplinary, multisectoral teams responsible for finding practical solutions to flood disasters.

Tin et al. (2024) conducted a comprehensive study using an emergency events database covering all natural disasters from 1995 to 2022, totaling 11,360 natural disasters with an average of 398 per year. Asia recorded the highest number of disasters (4,390) and the highest number of victims (918,198). Hydrological disasters were the most common

subgroup (4,969). The main causes of increased flood risk in Asia are related to climate change and uncontrolled urbanization, and their impact can be reduced by risk mapping to accurately predict potential areas (Manandhar et al., 2023).

Lamberti-Castronuovo et al. (2022) claim to have conducted the first systematic review proposing a framework for disaster preparedness in Primary Health Care (PHC). The research lays the foundation for practical recommendations to assess and improve PHC disaster preparedness. Preparedness characteristics cited include policy planning, unified disaster management strategy, continuity of care, integration of routine services with emergency services, community-level disaster preparedness strategies, and vulnerability assessment during the preparation phase. According to the authors, each PHC facility should adopt a disaster response plan, with multidisciplinary collaboration fundamental to building optimal preparedness strategies, along with appropriate medical and laboratory equipment and supplies.

Despite the limited number of studies associating health with hydrological natural disasters, it was possible to outline an overview of publications on the topic. With climate change driven by increasing anthropogenic impacts each year, studies relating environmental health are increasingly necessary. Therefore, future research on this subject should be encouraged, especially focusing on the preparedness of health systems and professionals in planning, managing, and responding to natural disasters, which will become more frequent worldwide.

4 CONCLUSION

In the search for a relationship between hydrological disasters and health, it was found that the prevalence of infectious diseases following such disasters is a recurrent and relevant theme in the literature. Disasters can act as facilitators for a range of diseases that are of major concern in public health.

The impacts of flood disasters and the mitigation of risks to affected populations were the second most recurrent theme in the literature. This highlights the need for strategic measures to reduce the damage caused by floods. Fatalities (mortality) as a consequence of floods were also addressed, along with the classification and occurrence of different types of disasters.

The preparedness of primary healthcare professionals to face disasters was also discussed, presenting strategies for training and effective response in critical scenarios.

In summary, it is possible to observe that the review gathered, although in an isolated manner, causes, consequences, and potential solutions for mitigating the impact of

hydrological disasters. This reinforces the urgent need to integrate and compile this relevant information for various sectors that have been experiencing considerable losses due to hydrological disasters. There is also a need for comprehensive frameworks that can encompass all these themes to produce more technical outcomes that can serve as a basis for public managers' actions.

However, the review results indicated that international scientific collaboration has succeeded in highlighting the necessity for broader and multidisciplinary efforts capable of contributing to the formulation of public policies and more effective international partnerships, the preparation of managers and health professionals, and the development of plans, research, and interventions related to health and hydrological disasters.

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