Systematic Review

Transdisciplinary Collaborations for flood impact mitigation on human health for sustainable urban development

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ABSTRACT

This study assessed the impact of urbanization on human health with an emphasis on flood hazard mitigation through the lens of transdisciplinary collaborations, as a strategy for achieving sustainable urban development. In place of this, the study highlights the effects of urbanization and floods impact on health, by identifying the health consequences of flood disasters. The goal here was to put together contributions and guidance drawn from the literature on issues under study for a shared problem understanding and solutions. The methodological approach employed in this study was a desktop survey, for systematic literature search, conducted in five databases and Google Scholar from April 4th to 30th May 2018, applying inclusion and exclusion criteria, from which, 44,860 articles were returned, narrowed to 71 articles from which 26 relevant articles were selected. Findings suggest that transdisciplinary collaboration enhance shared learning for sustainable urban development governance. The study further reveals functional overlaps among the collaborating partners on a common goal due to poor coordination. The paper concludes that successful transdisciplinary collaborations for sustainable urban development require articulation and efforts that clearly define the roles of each partner in the collaboration. Succinctly, achieving sustainable urban development is not an easy task, but ideal transdisciplinary collaboration simplified it.

Keywords: Hazard, Urbanization, Collaboration, Floods, Health

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INTRODUCTION

The impact of urbanization on population health is felt across the board. These days over fifty percent of the global population lives in major cities/towns with tendencies of having more dwellers in urban settings, in the coming few years [1, 2]. The rise in the population size of urban dwellers poses a threat to achieving ideal sustainable urban development [3]; bearing in mind the influence of urbanization impact on population health [1, 4]. The trend highlights the significance of urban planning, in the prevention and/or preparation for disaster management in urban settings [5]. Also, the poor health status of the urban's slum dwellers is linked to environmental degradation, due to the loss of natural and physical environmental treasures, on which sustainable urban development thrives and flourished [6].

Environmental determinants of health are multifaceted. The landscape of the urban environment is characterized by basic amenities such as water, food, health, housing, jobs, and education needs, among others [7, 8]. While the threats to urban health include disasters like floods. The aforementioned environmental health determinants landscape have direct and/or indirect effects on the urban population's health. In this regard, disasters such as floods, if not managed well, would adversely escalate disease transmission, and challenge the general well-being of the urban dwellers [9]. Indeed, the threat of flood on population health has reached a point of no return, and the time to act is now. To attain this, the contribution from governance sectors with a stake in urban sustainability should be drawn, to enhanced health promotions and protection efforts through both short and long-term collaborative investments [10].

There are multiple sectors with a stake in urban sustainability. The sectors are public (government), civil society organizations (like non-governmental organizations [NGOs]), academics (scientistss/researchers), and private sectors (corporate business bodies) [11, 12]. These sectors collaborateto conduct essential actions toward the achievement of a a healthy urban environment [13]. In this regard, collaborations for flood impacts mitigation can bring together different sectors to the collaborations, to form a transdisciplinary team that can mitigate the effects of flood for sustainable urban development [11, 14, 15].

Flood exerts devastating effects on population health and urban development. Flood is one of the health relat¬ed impacts on the urban environment, in need of sustainable intervention that can adequately mitigate or eliminate it [14]. The sustainable options for recurrent flood mitigations required collaborative flood risk management in urban settings. Recurring floods are difficult to mitigate but could be managed through the understanding of the connection between environmental hazards and their impact on population health, and emergency response preparedness [16]; [8].

Indeed, It is documented that the involvement of multiple agencies in flood mitigation ameliorate the sufferings of the

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flood victims more efficiently [16], but, the evidence of the adopted approaches is relatively weak [17]; [18]. Additionally, the existing gapin evidence-based research on flood mitigation practices for sustainable urban development is an obstacle to achieving sustainable urban development bjectives [8]. Therefore, understanding flood relationships to population health would help in addressing the challenges it poses to sustainable urban development [19]. This brings to the fore the significance of transdisciplinary collaboration as means of narrowing the existing gaps [8]. Despite these potentialities, available studies have paid little attention to the dynamism of urban floods and their impact on health [20], from the transdisciplinary perspective.

In this regard, the study sought to highlight the effects of urbanization and floods impact on health by outlining the association between environmental hazard, urbanization, and human health, by addressing the following questions: what is environmental hazard? What is urbanization? What is the impact of urbanization on human health? How do stakeholders address urban health issues? What is a flood? What are the impacts of floods on human health? And how floods impact human health is managed?

METHODS

The literature search started from April 11th to 30th May 2018, through PubMed, Web of Science (all databases), Science Direct, ProQuest (environmental), and EMBASE databases. An additional search was performed in Google Scholar to saturate some of the identified literature based on the cited references in the narrowed articles for inclusion.

Criteria for inclusion

The inclusion criteria utilized were as follows:

a. Articles published on 1st January 2008 to 31st December 2018, except for two articles, which were considered based on their relevance to the topic under study.

b. Only articles published in the English language.

c. Peer-reviewed articles were the initial choice for inclusion. However, other types of articles like editorials, commentaries, and special publications related to the topic in contention are included.

d. The considered articles were exclusively on the 3 interconnected cycles, thus.

    i. Environment, Health, and Governance

    ii. Planetary Health & Transdisciplinary Collaborations

    iii. Environmental Hazard, Urbanization & Human Health

The selected literature has at least addressed environmental or health governance issues in the context of urban health and sustainable urban development. The literature sort was based on the highlighted content; as such, the study was not exhaustive but selective. The search stages of this study were as follows:

Search technique

To address the questions raised on environmental hazard, urbanization, and human health, a combination of search keywords was, thus; Environmental hazard, urbanization, human health, environmental hazard & urbanization, urbanization and human health, and hazard issues on urbanization health (See Table 1).

The literature search for the review was exclusively

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systematic while the presentation of the text adopts both systematic review and narrative synthesis [21]. Narrative synthesis is particularly relevant in a situation where a statistical approach is not considered, and a combination of findings from multiple studies, focusing on a wide range of questions is adopted [22]. The process of the review began with the removal of duplicate articles, then abstracts and conclusions were checked and reviewed for inclusion. The initial search for Environmental hazard, Urbanization & Human Health literature generates 44,860, then 71, and eventually 57. The selected texts were carefully but critically analyzed and synthesized for the review (see Table 1).

RESULTS AND DISCUSSION

Environmental hazard

Hazard refers to exposure to certain biological, chemical, and physical substances or episodes, capable of causing negative health effects and/or death [4, 23-26]. Environmental hazard impairs the biophysical features of the environment and human health [23, 27]. Most of these impairments are revisable, though some are less remediable and/or irreversible [7].

An environmental hazard is either natural or anthropogenic; four types were identified, thus: Human – e.g. pollution, acid rain; Natural – e.g. earthquakes, flood, soil erosion; Everyday – e.g. water scarcity, and noise; and Behavioural – e.g. electromagnetic, smoking, etc., [27, 28]. Hazard identification is complex and often challenging, sometimes not only due to their categorization but delay in the appearance of conclusive symptoms for accurate diagnosis related to specific risk exposure [4]. As such, environmental hazard management entails the implementation of the right measures, and applying of technical and socio-political approaches [4, 27].

Interestingly, the increase in population and economic activities worldwide exert pressure on urban settings [7, 27]; [4], with all the associated risks to health like a flood [4, 29].

Urbanization

Urbanization denotes the rapid development and expansion of cities and surroundings, marked by increased economic activities. In the year 2015 over half of the global people dwelled in cities with the potentials for an increase in the trend to ¾ by the year 2050 [2]. Due to this trend of urbanization, more expansion is predicted to occur shortly, especially in small and medium towns [2, 30]. Urbanization is linked to unplanned and rapid growth, with slums and sub-standard residences dominating the landscape [2, 31]. Also, rural-urban migration is said to be the main causal factor of urbanization; the reason for that was identified to be the influx of labour, good healthcare services, children's education, and housing among other benefits found in urban settings [1, 32].

Urbanization affects land use, residents' way of life, and loss of green areas; it increases economic activities, pollution, and congestion; which in the end caused ecological destruction and human health challenges, making sustaining urban development difficult [20, 33]. In this regard, urban cities should employ different innovations reflective of transdisciplinary collaboration, to formulate policies that improve health and well-being [32, 34]. Indeed, Barbiero summed up the threat in his famous quote, thus;

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"The world can ill-afford continued complacency, indecision, or neglect regarding urbanization and urban health." –Victor K Barbiero

Health and urbanization

Urbanization presents dual fronts. Health improvement on the one hand, and health risk mitigation on the other; health risk precipitators include floods, pollution, and occupational and traffic hazards [32]. Health issues related to urbanization are multifaceted, with the potentials for disease outbreaks [6, 32, 35], and implications for sustainable urban development [1]. For example, the used of coal, firewood, and biomass stoves by urban dwellers in Low and Middle-Income Countries (LMICs), caused an increased in the urban burden of respiratory diseases like lung cancer, ischemia, and childhood pneumonia [31].

Consequently, urban health status varies, between populations with access to healthcare and those without access [29]. In this regard, it is safe to claim that urbanization is linked to urban morbidity and mortality incidence and prevalence rates for those without access. The needed approach to achieving urban health include the reduction in morbidity and mortality rates, especially those related to disasters, like flood [5], through collaborations that bring together academics, public, private, and civil society sectors, for sustainable urban development [33].

How do stakeholders address urban health issues?

Managing urban health issues is a multi-stakeholder task and process. Urban health issues are addressed in different ways, thus; transdisciplinary collaborations or disciplinary allegiance, focus conferences, symposiums and workshops, and community conversations among others [27, 36, 37]. Moreover, participatory governance, strategic planning, sustainable mitigation experience, and expertise help in addressing urban health issues [23, 27, 38]. Consequently, achieving urban health requires sustainable knowledge articulation and shared learning integration [14, 37]; [39], strong leadership, and political commitment to resilience urban health risk mitigation [14, 37].

Transdisciplinary collaboration is an approach that guarantees positive outcomes. Generally, transdisciplinary collaborations coordinate and energize sustainable urban health governance [38]; [40, 41]. The following are examples of governance sectors with a stake in urban development, thus; biotech and pharmaceutical firms (private for-profit); flood control advocates (civil society); researchers and consultants (academia); foundations and initiatives (health philanthropists); health information dissemination outlets (media) [38, 42-44]. Surely, contribution from these diverse actors occurs in collaboration, through participatory governance arrangement, towards urban protection from the effects of flood disaster.

Floods impact on human health and Way Forward

Flood accounts for several health issues in urban settings. Globally, floods are the most common cause of disaster-related morbidity and mortality [10, 18, 26]. Floods refer to overflows of water out of its confines' capacity, due to heavy rainfall, melting ice, and/or snow [17, 45]. Physical location, built environment, and topography are some of the

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flood precipitators [26]. Effects of floods come directly through contact with the water or indirectly by the destruction; it incurs [17, 26, 46, 47]. Floods vary depending on the cause, as in precipitation (heavy rain, hail, or snow); rising water levels (sea and freshwater); release of stored water (failure of protective structures); and failure of natural waterways (reduced absorption due to landslides or blocked drainage) [17, 25].

There are different types of floods that impact health. The impact of floods can be direct or indirect. For example, the direct effects include hypothermia, drowning, injuries, and deaths, while the indirect effects involve the loss of structure, logistic supplies, communicable disease, injury complications, psychological trauma, starvation, and disability among others [17, 18, 45]. The severity and gravity of floods' impact on health depend upon certain factors. For instance, the sudden onset of flood caused drowning and damaged structures by debris. Also, the location of the floods determined the gravity of the consequences, for example, those proximal to it suffer more injuries and/or deaths. Another factor is the demographic status of the victims like age; old age and children have poor compliance ability, which makes them more susceptible to it. However, infrastructural strength and degree of preparation indicate a positive response ability and disaster management capacity [17, 25].

Flood produces negative impacts on the urban surroundings. Regions confronted by floods disasters, suffered from the effects of social, economic, and health related to the degree of impact it exerts [17, 41]. In this, regard, the management makes use of health risk knowledge and understanding, and the strength of health systems in handling the flood situation [10, 17]. Fast experience of an attempt at flood mitigation suggests that the mitigation approach should focus on complexity rather than uncertainty. In place of this, mitigation efforts should utilize recorded flood events and consequences, their predictability, and prior experience to guide risk and disaster management preparation [14]. Additionally, geographical tools like Remote Sensing (RS) and Geographic Information systems (GIS) techniques should be used in enhancing the mapping of areas vulnerable to flood risk [41, 48].

Finally, mitigating the effect of flood on urban environs requires understanding in context, the relationships between urbanization, urban planning, and disaster preparation and management [49]. Therefore, efforts to achieve sustainable flood mitigation in urban environments should first understand flood pathways of the given location and the remediation processes, within the broader domain of environmental management and planning [44].

CONCLUSION

Urbanization remains a strong force in exposing city populations to environmental hazards like floods. The quality of sectors and stakeholders in an urban environment is crucial to reducing flood impact on health. Transdisciplinary collaborations for flood impact mitigation require coordination mechanism that encourages disciplinary integration through participatory engagements. The study highlights that flood impact mitigation for sustainable urban development defies disciplinary thinking,

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and as such, demand for collaborations between the sectors with a stake in the environment and health as an entity. In this regards contributions from the academia, public, private, and civil society sectors are found to be essential in flood impact mitigation. Succinctly, achieving this feat points to the conduct a further study transdisciplinary to assess how best to coordinate the mitigation of flood impact among the sectors with a stake in environmental hazard, urbanization, and population health, for informing policies and practices that will ensure the attainment of sustainable urban development.

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Table 1: Search technique & articles selection

Theme	Search words	Returned	Narrowed	Selected
Environmental Hazard, Urbanization & Human Health	Hazard	05	05	03
	Environmental Hazard	33,735	16	04
	Urbanization	7,372	29	07
	Human health	3,748	04	0
	Floods	0	17	12
	Total	**44,860**	**71**	**26**

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