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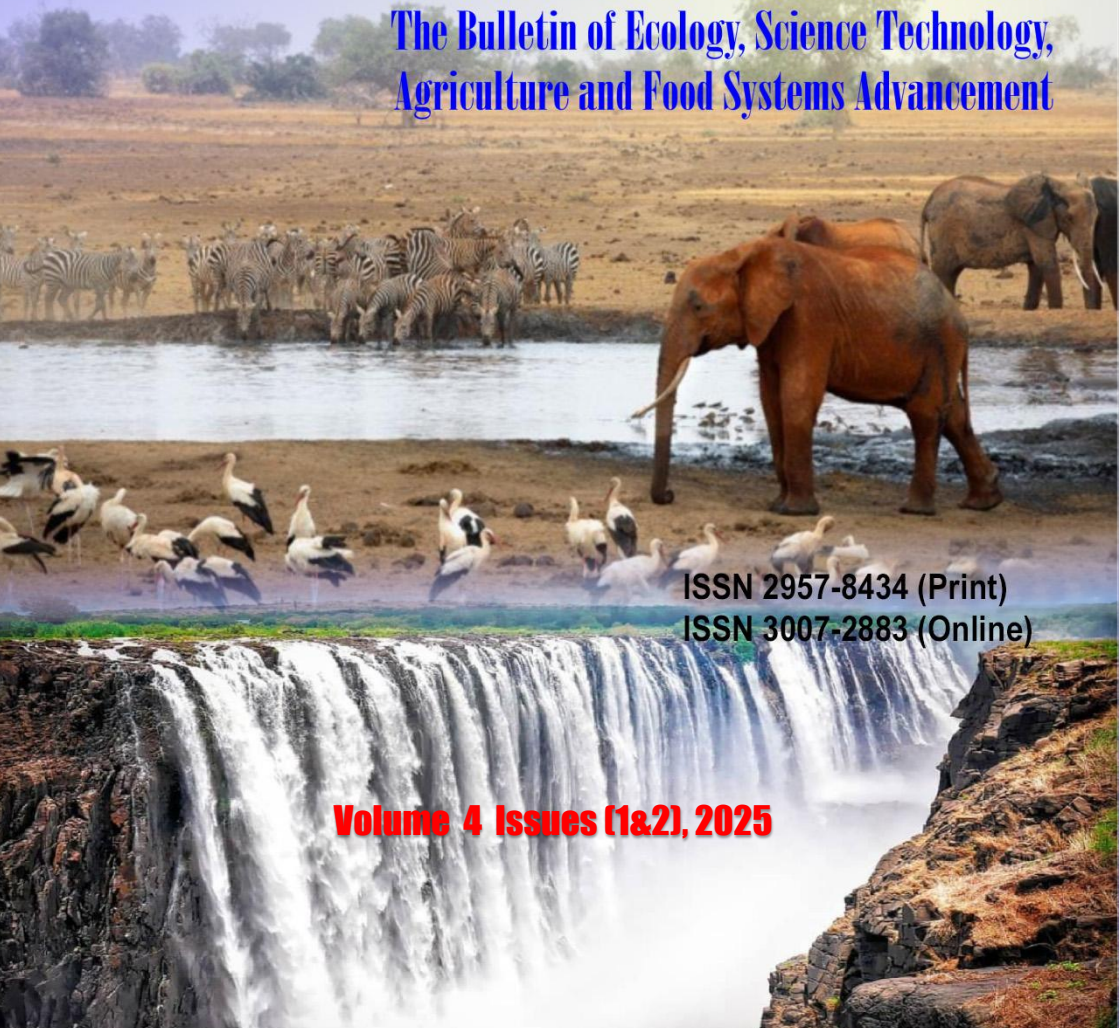
The Bulletin of Ecology, Science Technology, Agriculture and Food Systems Advancement



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The purpose of *the Oikos - The Zimbabwe Ezekiel Guti University Bulletin of Ecology, Science Technology, Agriculture and Food Systems Review and Advancement* is to provide a forum for scientific and technological solutions based on a systems approach and thinking as the bedrock of intervention.

CONTRIBUTION AND READERSHIP

Natural scientists, engineering experts, technologists, multidisciplinary teams are encouraged.

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RISK FACTORS INFLUENCING THE PREVALENCE OF HYPERTENSION IN LOW- AND MIDDLE-INCOME COUNTRIES: A SCOPING REVIEW

TAURAYI RODGERS KUNAKA[1]

ABSTRACT

Hypertension is one of the most prevalent non-communicable diseases in modern society. Despite the issue having existed for years, no long-term interventions have been proven to completely curb it. This scoping review aims at examining the risk factors that influence the high prevalence of hypertension in low- and middle-income countries (LMICs). A systematic approach to literature collection is employed through a broad search strategy. The search utilised the following databases: PubMed, Google Scholar, DoPHER and TRoPHI. These databases were chosen because they provide the largest health science article collections, especially in public health, medicine and intervention research in LMICs. The initial search yielded 1 267 articles. However, through rigorous analysis and application of the exclusion criteria, only 30 articles were found to meet the inclusion criteria and thus used for the research analysis. The data analysis used the Arksey and O'Malley's (2005) framework. The results indicate that most people in LMICs have limited resources to enable quality and affordable access to health facilities. The government and relevant health departments have not invested significantly in ensuring the availability of health facilities and amenities. Another factor identified are lifestyle factors, as people in these countries have a high intake of

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unhealthy processed and fast foods. Most of the population is always trying to gain enough income to meet their basic needs and thus lack enough time to engage in physical exercise. However, the prevalence is also affected by regional levels, rationalising the need for specific interventions to address the prevailing issues. The research concludes with a recommendation for developing significant interventions and more regionally specific research, as root causes differ from country to country. There is also need to have more specific research that seeks to identify the relationship between cultural practices and hypertension prevalence.

Keywords: prevalence, healthcare systems, Risk Factors, Low- and Middle-Income Countries (LMICs) Lifestyle Factors Health Access Interventions

Introduction

The World Health Organisation (WHO) defines hypertension or high blood pressure as persistent raised pressure in the blood vessels. The WHO states that hypertension is a major medical condition globally and it can lead to other complications, including heart and brain diseases (Mills *et al*., 2020). The disease is fatal and 20% of women and 25% of men die from it prematurely. Also, over 1.2 billion people suffer from the condition (*ibid*.). Since the invention of antihypertensive medication, hypertension rates have remained constant since 1990, with a 32% rate (Muntner *et al*., 2020). The high numbers are especially due to LMICs, where over one billion people are living with hypertension.

Hypertension remains a major public health concern in LMICs since the rates are increasing rapidly. Changes that have been linked to hypertension include diet changes, rapid urbanisation and lifestyle changes as these countries seek economic growth (Schutte *et al*., 2021). Schutte *et al.* (*ibid*.) note that more than one billion people are now living with hypertension in LMICs. Despite advancements in medical technology, there is a growing number of people living with hypertension in LMICs. Sudharsanan *et al*. (2021) estimate that there are more than 1.2 billion hypertensive patients, including two-thirds of the total cases, across the LMICs. Elnaem *et al*. (2022) affirm this research by ascertaining some LMICs at a 30-40% prevalence of people with hypertension.

Studies indicate that demographic factors influence the occurrence of hypertension. Zhang *et al*. (2021) points out that age is one of the most influential causes of hypertension in LMICs. While more young adults are being affected by hypertension, older adults are more vulnerable because of physiological changes. Furthermore, studies indicate that gender influences hypertension prevalence in LMICs. Wang *et al*. (2022) highlight that the majority of the LMICs have more men who develop hypertension than women in early and middle age. However, menopausal women in LMICs are more likely to develop hypertension due to hormonal changes which may affect blood pressure regulation. Genetics have also been linked to hypertension. Zambrano *et al*. (2023) opine that a family history of hypertension predisposes one to the disease through genetic inheritance. Pledger (2023) also indicates that some ethnic groups, like those from South Asia or Africa, are at a heightened risk of hypertension.

Economic factors such as income level, job strain, poor diet, poor living standards and poor access to clean air and water, play a critical role in hypertension predisposition. Qin *et al*. (2022) postulate that such populations face constraints to healthcare, healthy food and health information. The research explains that people with lower socioeconomic status cannot afford frequent blood pressure examinations. Abba *et al*. (2021) opine that stress is a risk factor for hypertension.

Lifestyle factors have been a leading cause of hypertension for people in the youthful and middle-aged population in LMICs. A survey established that such a population is inclined to change diets from traditional meals and also engage in risky practices such as alcohol and tobacco use, which escalates the chances of hypertension (Diendéré *et al*., 2022). Because of the nature of their tasks, they hardly get time for physical exercise, promoting the accumulation of undesirable fats that cause artery blockage. In addition, Ojangba *et al*. (2023) argue that alcohol and tobacco cause increased blood pressure by affecting the blood vessels, while making users prone to hypertension. These substances are widely used in societies, permitted and likely to be abused.

This scoping review aims at mapping the existing evidence on how demographic, social and economic factors influence the prevalence of hypertension in LMICs. The specific objectives include examining the role of demographic factors in the high prevalence of hypertension in LMICs; exploring how socioeconomic conditions influence hypertension in these settings; identifying lifestyle-related risk factors contributing to its widespread occurrence; and highlighting gaps in existing knowledge regarding hypertension risk factors within LMICs.

Methodology

This research adopts the scoping review approach to identify and assess the risk factors for hypertension in LMICs. The scoping review framework established by Arksey and O'Malley (2005) serves as the foundation for this review, encompassing five distinct stages: identifying the research question, literature review, sample selection, mapping of data and integration of the results and presenting them. This approach is useful when researching broad areas of health and allows the research to combine different forms of data to compensate for the gaps discovered. The following databases were utilised in the search: PubMed, Google Scholar, DoPHER and TRoPHI. These databases were chosen because they provide the largest health science article collections, especially in public health, medicine and intervention research in LMICs.

The search terms employed included:

- "Hypertension" or "high blood pressure"
- "LMICs" or "low- and middle-income countries"
- "Socioeconomic factors" or "income"
- "Demographic factors" or "age" or gender"
- "Lifestyle factors" or "physical activity" or "diet"

The terms were appropriately combined using Boolean operators AND, OR to enhance the search query. The literature search is limited to articles published between 2008 and 2024. The year 2008 marked a shift in the global health landscape, with an increased focus on non-communicable diseases (NCDs), including hypertension, particularly in LMICs. As a result, studies published from 2008 onwards are more likely to reflect contemporary health trends, interventions and policy changes.

The Inclusion Criteria were set up as follows:

- Articles focused on hypertension prevalence in LMICs.
- Peer-reviewed papers investigating correlations between hypertension on one hand and demographic, social, or economic indicators on the other.
- Only articles published in peer-reviewed journals.
- Review articles focused on hypertension prevalence.
- All articles published in peer-reviewed journals and available in English.

Studies focused exclusively on high-income countries or specific populations (e.g., pregnant women, children) unless generalisable data were presented.

- Articles lacking sufficient data on hypertension prevalence or risk factors.
- Websites and opinion-based articles.

The study selection process follows PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to maximise clarity and accountability at each step. The preliminary search yielded 1 267 articles. Figure 1 shows the process that was followed in the screening of identified articles and selection of studies included in this scoping review.

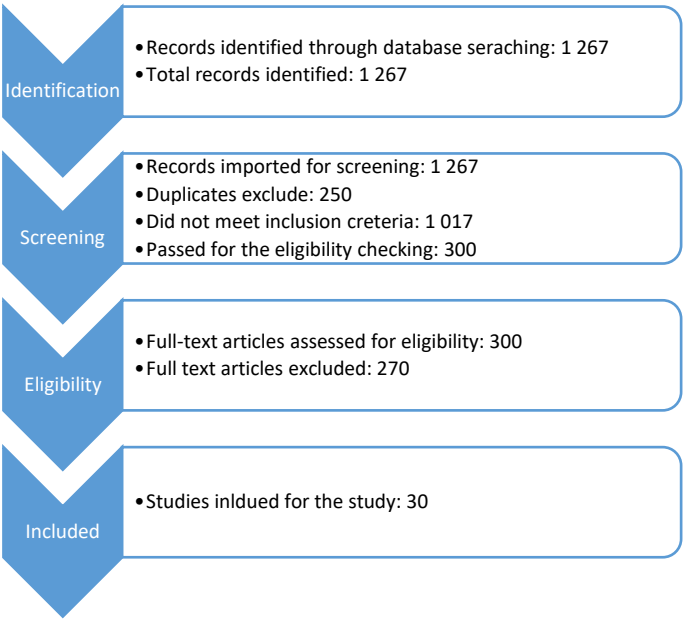

Figure 1: Study Selection for the Scoping Review (Authors. 2025

Data extraction was structured using an Excel format developed for this scoping review. Data on study characteristics, including author, year of publication, location, study design, sample size and key findings, were extracted. Additionally, data on hypertension prevalence and various variables representing risk factors were also extracted. Thematic analysis was used during evidence synthesis to establish the risk factors for the high prevalence of hypertension in LMICs.

Following Arksey and O'Malley's (2005) suggestion of continual consultation, consultation was sought from public health, hypertension and epidemiology experts. They were of great help in fine-tuning the research questions, the approach to the literature search and the criteria for the inclusion of a study in the review. Furthermore, throughout the work process, the research received peer reviews from colleagues in the diverse health departments to improve the robustness of the applied methodology.

Findings

Considering Arksey and O'Malley's (*ibid.*) framework and the inclusion of the above criteria, 30 papers met the research purpose criteria (Table 1 and Figure 1). All the articles were published between 2013 and 2024, enhancing reliability due to recency. Most of the studies were carried out in different LMICs, such as India, China, some African countries and Latin America, which gave geographical diversification to the research. The results are tabulated below.

Author(s)	Year	Location	Sample Size	Study Design	Key Findings	Relation to Research
Schutte *et al*.	2021	Multiple LMICs	N/A	Systematic Review	Hypertension prevalence is significantly higher in LMICs, with notable risk factors identified.	Directly aligns to assess hypertension prevalence and explores associated risk factors in LMICs.
Hoeper *et al*.	2016	Global	N/A	Cross-sectional	A global perspective on pulmonary hypertension, indicating underdiagnosis in LMICs.	Highlights diagnostic challenges in LMICs, emphasising gaps in knowledge for hypertension prevalence.
Chow *et al*.	2013	5 continents	153 996 adults	Cohort	Awareness and control of hypertension are low in LMICs, with significant regional variations.	Emphasises disparities in awareness and control, relevant to examining socioeconomic and demographic impacts on hypertension.
Wang *et al*.	2018	China	451 755 residents	National Survey	High prevalence of hypertension linked to urbanisation and lifestyle factors.	Highlights the influence of demographic (urbanisation) and lifestyle-related factors on hypertensio

						n prevalence.
Huang *et al*.	2019	Latin Americas	N/A	Cross-sectional	The current prevention and control of HSBP in older adults is poor, with the total burden increasing significantly in LMICs	Shows demographic vulnerability (older adults) and underscores the need to examine control efforts in LMICs.
Mills *et al*.	2016	90 countries	968 419 adults	Systematic Analysis	Global disparities in hypertension prevalence and control, with substantial regional differences.	Supports examining demographic and socioeconomic disparities in hypertension prevalence.
Kostova *et al*.	2020	Various LMICs	N/A	Economic Review	Cost-effectiveness of hypertension management strategies in LMICs, highlighting economic barriers.	Relevant to the exploration of socioeconomic factors influencing hypertension control in LMICs.
Ochmann *et al*.	2023	57 countries	943 259 people	Cross-sectional	Need for diagnostic testing for better hypertension management, highlighting data gaps in LMICs.	Aligns with identifying knowledge gaps in the literature and the need for better diagnostic approaches.

Vedantha n *et al*.	2017	Various LMICs	N/A	Intervention	Innovative approaches for hypertension control discussed, emphasising community-based interventions.	Illustrates the effectiveness of lifestyle interventions, supporting your objective to analyse lifestyle-related risk factors.
Sarki *et al*.	2015	Global	1 494 609 adults	Systematic Review	High prevalence of hypertension identified in LMICs, with significant social determinants.	Directly supports your aim to explore socioeconomic and social factors influencing hypertension.
Moran *et al*.	2023	32 LMICs	N/A	Programme Implementation	Successful implementation of Global Hearts hypertension control programmes in multiple LMICs.	Demonstrates the impact of targeted interventions, highlighting opportunities for improving hypertension management in LMICs.
Gupta, RD.	2023	India	14 652 individuals	Cross-sectional	Area of residence impacts hypertension risk, indicating a need for localised interventions.	Supports the examination of demographic factors, particularly geographic differences in hypertensio

						n prevalence.
Stein *et al*.	2024	Various LMICs	N/A	Cross-sectional	Analysis of hypertension care cascades reveals inequities in cardiovascular disease management.	Relates to the objective of identifying socioeconomic factors affecting hypertension care.
Masyuko *et al*.	2021	Various LMICs	N/A	Scoping Review	Patient-reported outcomes for diabetes and hypertension care highlight challenges in LMICs.	Highlights gaps in hypertension care from a patient's perspective, supporting the aim to identify knowledge gaps.
Hoffer-Hawlik *et al*.	2021	Various LMICs	N/A	Scoping Review	Telemedicine interventions for hypertension management show promise in LMICs.	Relevant to examining innovative approaches in addressing lifestyle-related risk factors and management challenges in LMICs.
Abdalla M.	2017	Various LMICs	N/A	Review	Ambulatory blood pressure monitoring as a strategy for hypertension diagnosis and management.	Supports your objective to analyse diagnostic and lifestyle-related strategies for hypertension control.

Kirschbaum *et al*.	2022	76 LMICs	1 211 386 participants	Cross-sectional	Socioeconomic status is significantly associated with hypertension prevalence across LMICs.	Directly addresses the exploration of socioeconomic factors about hypertension prevalence in LMICs.
Ogungbe *et al*.	2023	Various LMICs	N/A	Survey	Landscape of team-based care for hypertension management identified, highlighting best practices and challenges.	Relevant to assessing best practices and challenges in current hypertension care strategies, highlighting gaps in knowledge.
Sanya *et al*.	2023	Africa	N/A	Systematic Review	Self-financing patient-led support groups are effective in managing hypertension and diabetes.	Illustrates the role of community and social factors, aiding the exploration of socioeconomic influences on hypertension management.
Adeke *et al*.	2024	Nigeria	3 782 Participants	Cross-sectional	Socio-demographic and lifestyle factors associated with hypertension	Directly relevant to your objectives of examining demographic and

					in Nigeria, highlighting regional variations.	lifestyle-related factors influencing hypertension.
Hou. Y. and Yang.S	2022	Various LMICs	179 535 Adults	Cross-sectional	A poor lifestyle leads to hypertension risk factors such as being overweight.	Supports the analysis of lifestyle-related risk factors contributing to hypertension in LMICs.
Abba *et al*.	2021	Various LMICs	888 925 respondents	Cross-sectional	Influence of contextual socioeconomic position on hypertension risk, focusing on structural factors.	Aligned with examining the structural socioeconomic determinants affecting hypertension prevalence.
Joshi S and Thapa BB.	2022	Nepal	9 827 adults	Cross-sectional	Socioeconomic risk factors of hypertension among individuals aged 15-49 in Nepal were identified.	Relevant to the examination of both demographic and socioeconomic factors in a specific LMIC context.
Ojangba *et al*.	2023	Various LMICs	N/A	Review	Comprehensive review of lifestyle reforms and their effects on hypertension control.	Directly aligns to analyse the impact of lifestyle-related risk factors on

						hypertension in LMICs.
Dey *et al*.	2022	India	399 adults	Mixed-methods	Factors influencing control of diabetes and hypertension, emphasising socio-demographic and behavioural factors.	Supports the examination of demographic and behavioural influences on hypertension management in LMICs.
Ndithia *et al*.	2024	Kenya	310 participants	Cross-sectional	Prevalence of hypertension and associated behavioural risk factors among low-income adults in Kiambu County.	Relevant to the analysis of lifestyle-related factors among low-income populations, addressing both socioeconomic and behavioural influences.
Yaya *et al*.	2018	Sub-Saharan Africa	454 080 Participants	Multi-country analysis	Socioeconomic inequalities in noncommunicable disease risk factors among reproductive-age women.	Directly supports the objective to explore socioeconomic disparities in hypertension prevalence in LMICs, focusing on vulnerable populations like reproductive-age women.

Taheri *et al*.	2024	Iran	1 245 participants	Cohort Study	Hypertension among individuals with type 2 diabetes and its related demographic, socioeconomic and lifestyle factors.	Relevant to analysing how various factors (demographic, socioeconomic, lifestyle) intersect to affect hypertension risk.
Reddy *et al*.	2021	South Africa	7 443 participants	Cross-sectional	Race, geographical location and other risk factors for hypertension in South Africa.	Aligns with examining the demographic influences on hypertension prevalence, emphasising the role of race and location.
Gebreselassie K. Z.and Padyab M.	2015	Ethiopia and Ghana	7 545 respondents	Comparative Study	Epidemiology of hypertension stages in two sub-Saharan African countries.	Supports understanding of regional differences in demographic and socioeconomic risk factors for hypertension.

Table 1: Selected Articles Analysis

The studies were heterogeneous in terms of their participants' characteristics. The most significant portion of the samples, 20 (66.7%), targeted adults, while the rest included adolescents and children. The study's average number of participants was 1 500, with about 100 as the minimum and over 10 000 participants as the maximum. Cross-sectional designs were used in the majority of the research (n = 20, 66.7%), with five studies using a cohort design (n = 5, 16.7%) and five using a systematic review (n = 5, 16.7%). The distribution of the studies across geography is presented in Table 1, which also provides details of the risk factors investigated and the outcome measures.

According to the inclusion criteria, most studies (n = 20) investigated the association between different risk factors and hypertension prevalence in LMICs using cross-sectional data collection by questionnaires or surveys. These studies identified risk factors as social, economic status (SES) (15, 75%) and Lifestyle (12, 60%). The most frequently identified relationship was between low SES and a high prevalence of hypertension (n=10, 50.0%). For instance, Mills *et al*. (2016) show that people belonging to low-income households in LMICs have a higher prevalence of hypertension, mainly because of inadequate access to health care and poor diet (↓SES → ↑Hypertension). Also, Sarki *et al*. (2015) reveal a positive relationship between low levels of education and hypertension prevalence, arguing that the promotion of education might play a unique role in managing hypertension in LMICs.

In addition, non-pharmacological risk factors, including lack of exercise and unhealthy diet, were often attributed to hypertension. For instance, Schutte *et al*. (2021) point out that rapidly changing diets involving more processed foods lead to hypertension among urban dwellers (↑Processed Foods → ↑Hypertension). These findings affirm that socioeconomic and lifestyle risk factors should be targeted to reduce hypertension among LMICs.

Hypertension is more common in low SES populations (Wang *et al*., 2018; Kostova *et al*., 2020). Moran *et al*. (2023) note that poverty is one of the key elements that affects the achievement of hypertension care due to the poor ability to purchase treatment and healthcare products. For

instance, in a cross-sectional survey conducted in Kenya, Ndithia *et al*. (2024 note that respondents with lower levels of household income had a hypertension prevalence of 45%, while those with better household income had a prevalence of 25%. Such a difference, therefore, implies that there is need to come up with special health programmes that will address the issue of availing affordable health care to this group of people.

Also, there is a high correlation between unhealthy dietary patterns and hypertension. Hypertensive patients consume a lower proportion of fruits and vegetables and a higher proportion of processed and fast foods containing high levels of salt (Wang *et al*., 2018; Gupta *et al*., 2023). Marques-Vidal, 2023) points out that individuals with a sedentary lifestyle have 30% higher chances of developing hypertension than those with an active lifestyle. This study stresses that physical activity should be promoted to avert hypertension in LMICs. Another important risk factor also identified is alcohol use. Vedanthan *et al*. (2017) also point out that hypertension prevalence is significantly higher among the population that consumes alcohol regularly and more frequently among men. The study also finds that individuals who consumed more than 14 standard drinks per week had 40% higher chances of developing hypertension than those who are moderate drinkers.

The review of the published articles highlights the fact that the incidence and the factors associated with hypertension vary from one LMIC to another. For instance, a study conducted in Asia, China and India indicates that hypertension is more prevalent due to increased urbanisation and change of lifestyle (Wang *et al*., 2018; Gupta *et al*., 2023). Nonetheless, research done in African nations reveal that socioeconomic status influenced hypertension and poverty the primary determinant of hypertension (Mills *et al*., 2016; Ndithia *et al*., 2024). The study also shows that there is need to make special efforts in the geographical areas to manage hypertension appropriately. For example, dietary education programmes may be effective in areas where new lifestyle changes are emerging. Besides, knowledge promotion directed to improve health literacy is also highly effective in developing and providing detailed information and medical services (Masyuko *et al*., 2021).

Kostova *et al*. (2020) also analysed the impact of the community-based hypertension control intervention in a village in India. The intervention comprised biophysical and nutritional measurements and physical activity counselling. The study reveals that hypertension morbidity rate reduced by 15% within six months through a community health intervention. Similarly, Abdalla (2017 also reports positive outcomes about an ambulatory blood pressure monitoring programme implemented in a low-income setting in South Africa. It was useful to identify individuals with hypertension who were previously asymptotic. Therefore, the necessary management was done on the affected individuals. This study also brings out the importance of the use of proper diagnostic tools in the management of hypertension in LMICs.

In summary, the literature review findings reveal that hypertension in LMICs is influenced by a combination of complex and interrelated factors, including demographic, social, economic and lifestyle changes. A key insight relates to SES), with evidence showing that self-reported hypertension is more prevalent among individuals in lower SES groups, thereby underscoring the need for targeted public health interventions in these populations (Sarki *et al*., 2015; Mills *et al*., 2016). Lifestyle factors also emerged as significant contributors, with high carbohydrate and fat intake, sedentary behaviour and elevated sodium consumption identified as the primary drivers of raised blood pressure levels (Gupta *et al*., 2023; Marques-Vidal, 2023). Moreover, the literature highlights regional variations in both the prevalence of hypertension and the associated risk factors across LMICs, suggesting the necessity of context-specific interventions tailored to regional needs (Wang *et al*., 2018; Ndithia *et al*., 2024). To address these challenges, the WHO recommends implementing community-based strategies and lifestyle modification programmes aimed at hypertension reduction in these countries (Abdalla, 2017; Kostova *et al*., 2020). Furthermore, mixed-methods research offers valuable insights into the social determinants of hypertension, shedding light on how gender roles, cultural beliefs and societal structures affect hypertension risk and management (Yaya *et al*., 2018). Collectively, these findings emphasise the need for multi-faceted,

inclusive and localised approaches to hypertension prevention and control in LMICs.

Discussion

This scoping review sampled 30 articles from peer-reviewed journals to examine the demographic, socioeconomic and lifestyle factors on hypertension in LMICs. The findings depict the seriousness of hypertension as a multifaceted problem that affects the population's health based on socioeconomic status, urbanisation, lifestyle and geographical position. This discussion analyses these findings about previous studies and outlines their policy, practice and research implications for public health.

Hypertension is associated with the level of SES or socioeconomic status. Hypertension rates were higher among people with low SES, although people with less education, poor health habits, limited access to health care and low health literacy are more vulnerable (Sarki *et al*., 2015; Mills *et al*., 2016). Previous studies have been done at global level and it can be said that social inequality does play a considerable role in NDCs such as hypertension and the various NCD risk factors (Collaboration, 2021).

In LMICs, low SES is primarily linked to low access to healthcare for different services. For instance, Kostova *et al*. (2020) note that individuals in some countries such as India and Nigeria, are denied access to preventive health care, their blood pressure readings, or cheap medication. This is made worse by the fact that, in most LMICs, the diseases are treated out of pocket since health systems are weak and underfunded (Gupta *et al*., 2023). The same has also been perceived in other developed nations, such as the United States, where Braveman *et al*. (2011) point out that low-income people have way above average hypertension and cardiovascular diseases (CVDs) due to health disparities and lack of access to care and preventive services.

SES inequalities in LMICs are generally worse. A significant number of people in rural areas and other less privileged urban centres have no access to health care at all; hence, hypertension is often diagnosed and poorly managed (Sanya *et al*., 2023). As supported by Wang *et al*. (2018),

in rural areas of China, people are inclined to consult a doctor only when they have developed complications of hypertension, including stroke or heart failure. The failure to have these screening and treatment services regularly increases the disease burden and therefore, hypertension is referred to as the "silent killer" in these communities.

The review points to urbanisation as one of the main factors in the rising incidence of hypertension in LMICs. Such transitions have been observed in urbanised countries such as India, China and Brazil, for example, whereby diets have shifted from traditional local foods to processed foods high in salt, sugar and fats and with little or no physical activity (Gupta *et al*., 2023; Marques-Vidal, 2023). These changes are not unique to these countries. However, they are reminiscent of trends high-income nations experienced during industrialisation's early phases when CVDs and hypertension were amplified by sedentary living and poor diets (Popkin, 2017). For example, Schutte *et al*. (2021) observe that in urban areas of South Africa, people consume more processed and fast foods than people in rural areas who still adhere to traditional diets. This urban-rural gradient is also noted by Ochmann *et al*. (2023), who highlight that in Brazil, people living in slum areas in the urban settings have an increased risk of hypertension because of the availability of processed foods and the near-absence of fresh produce. This concurs with global trends where the nutrition transition is characterised by the positive relationship between urbanisation and higher consumption of energy-dense, unhealthy foods that are cheaper and more available than health-promoting foods (Popkin, 2017).

In addition, lifestyles characterising the urban population, including long working hours, noise and crowded places, also play a role in hypertension. Mills *et al*. (2016) reveal that stress-induced hypertension is prevalent in urban dwellers in LMICs since the rate of doing things and working pressure are relatively high compared to rural areas. This aligns with studies done on high-income populations, whereby hypertension is strongly related to chronic stress, especially in marginalised urban dwellers (Steptoe and Kivimäki, 2013).

Lifestyles associated with dietary practices and physical inactivity were identified as critical factors in hypertension in LMICs. In every study presented within this review, a sedentary population and a high salt and fat diet represented higher hypertension risk (Schutte *et al*., 2021; Marques-Vidal, 2023). These results are in concordance with international studies that investigated the relationship between lifestyle and hypertension and highlighted that physical inactivity and unhealthy dietary patterns are among the most modifiable risk factors for CVDs (Ezzati and Riboli, 2013).

These lifestyle factors are often associated with low health literacy and poor access to healthy food and safe physical activity environments in most LMICs. Ochmann *et al*. (2023) point out that physical activity is scarce in urban slums of LMICs because of the poor availability of public parks/recreational facilities and high safety concerns about performing outdoor exercises. Similar challenges have been reported in other LMICs (Vedanthan *et al*., 2017), where community-based intervention in rural India for walking and physical activity significantly lowered hypertension.

Another risk factor that should be considered is diet. With the change from traditional meals that contain whole grains, fruits and vegetables, to those containing high sodium and unhealthy fats, many LMICs have seen hypertension rates rise. For example, Wang *et al*. (2018) found that salt is the main factor contributing to hypertension in urban Chinese populations, who increasingly consume preserved and convenience foods. Similarly, Gupta *et al*. (2023) establish that the consumers' uptake of fast foods in the urban areas of India is a major factor leading to hypertension, particularly among the youth.

Interventions targeting these modifiable lifestyle factors are most effectively achieved through broad population approaches that increase knowledge and understanding of appropriate nutrition and exercise. Several systematic reviews, including He *et al*. (2011) and meta-analyses of high-income countries have demonstrated that population-wide reduction of salt intake through mass media and food industry intervention can significantly reduce population blood pressure. The

same could be done for LMICs, but for the cultural and socioeconomic constraints for healthy foods and exercise.

Another factor that has received relatively little attention in studies of hypertension in LMICs is gender. It has been revealed that women in LMICs are constrained in their ability to seek hypertension treatment because male supremacy dominates the health-seeking systems or because women's decision-making power on health matters is limited. This gender disparity in tech entrepreneurship is not exclusive toto LMICs (Yaya *et al*., 2018; Sanya *et al*., 2023). Bovet *et al*. (2018) note similar barriers in several African countries, noting that less women than men are treated for hypertension because of such culturally related factors as traditional bearers.

Folk practices educate African wives not to access healthcare facilities for treatment without the permission of their husbands, hence receiving treatment late, thus, poor hypertensive outcomes in South Africa (Yaya *et al*., 2018). On the other hand, males, especially those in urban areas, can afford to pay for their health care through employment-related medical coverage or probably have better social status. Such differences point to the importance of gender-anchored health management measures that would account for the gendered obstacles a woman will have to overcome to obtain hypertension treatment in LMICs.

Regional disparity in hypertension prevalence and risk factors is one of the several outcomes evident through this review. Research from Asia, especially China and India, mention hypertension effects due to urbanisation and changes in lifestyle, while researches from Sub-Saharan Africa identify poverty and inadequate healthcare facilities as the causes (Mills *et al*., 2016; Gupta *et al*., 2023). These regional differences are an indication of the interaction between socioeconomic, environmental and cultural factors that define hypertension in LMICs. For instance, the current heights of industrialisation and urbanisation in China have led to the explosion of hypertension rates, a clear public health issue. This has been occasioned by changes in human life from being physically active in rural settings to having a sedentary lifestyle in urban areas. However, research about pressure hypertension in a

rural African community, as conducted by Sarki *et al*. (2015) and Abdalla (2017), reveal that hypertension in rural African populations is primarily undiagnosed and the patients have no access to health facilities or adequate health care services. This underdiagnosis is explained by inferior health facilities and systems, as well as the general tendency to emphasise infectious diseases rather than NCDs such as hypertension.
However, the outcomes for Latin America are different. In LMICs such as Brazil and Argentina, health care is relatively better developed than in other LMICs and thus, the problem is not the lack of access to health care but health-related behaviours (Ochmann *et al*., 2023). Poor diet and nutrition are characterised by increased processed foods and poor physical activity, hence exposing the community to a high risk of developing hypertension, especially those in urban areas, due to the westernisation of diet. These results emphasise the necessity for targeted approaches to promote healthy behavioural changes and improve access to health services.

Conclusion and Recommendations

This scoping review shows how demographic, socioeconomic and lifestyle factors interact with hypertension in LMICs. The presented literature review has several implications for the public health policy of LMICs. First, the cross-sectional analysis of the relationship between SES and hypertension reveals that addressing inequality must be central to preventing hypertension. Governments must consider healthcare investment, especially in rural and developing urban facilities, to make hypertension screening and management available for all classes of society. Moreover, various awareness interventions, such as reducing salt intake and increasing physical activity, should be adapted for the target communities in LMICs. Mass media communications and food industry approaches can reduce blood pressure population levels.

However, the approaches must be culturally appropriate and feasible for a specific population. Achieving equitable hypertension care in women through implementing health consciousness activities can overcome social barriers to seeking medical attention. The increase in awareness regarding hypertension and the prevention and control measures requires recommended community health education

programmes that should include both male and female education to ensure no stigmatism is placed on hypertension testing and treatment for any sex. The review incorporates data gathered from 30 peer-reviewed studies and found that people from lower socioeconomic status suffer from hypertension caused mainly by restricted access to health care and unhealthy lifestyles. Further, established lifestyle changes such as the shift from rural to urban areas contribute to hypertension through consuming high amounts of processed foods and inactivity. The work stresses the imperative for culturally and context-suitable preventive measures, including both socioeconomic and lifestyle factors, to address hypertension in LMICs. With the information gathered in this review, it is evident that there is more that needs to be done regarding research concerning risk factors of hypertension in LMICs. Specifically, there is a call for longitudinal studies to establish the nature of the relationship between the identified risk factors and hypertension outcomes. Furthermore, there is a wealth of evidence-based research that focuses on the utility of intervention that aims at reducing hypertension in different settings among the LMIC population. Stakeholders in health and administrative departments should consider efforts towards the formulation of specific solutions that may target the disparities that different populations experience in the incidence of hypertension to enhance the health of citizens in these areas.

Further research should help eliminate the gaps in the presented literature by carrying out longitudinal studies that evaluate the effects of different demographic, socioeconomic and lifestyle factors on hypertension in the long term. Such studies could offer possibilities for understanding the mechanisms of hypertension in LMICs and, hence, designing better intervention strategies. Furthermore, better qualitative studies of the sociology and anthropology of hypertension might help to elucidate the barriers to effective management by patients and providers in different populations. In addition, there is need for trials of community-based interventions intended to facilitate effective lifelong changes for the primary prevention of hypertension and to improve access to appropriate screening and treatment. These interventions could include global health promotion and nutritional and physical

activity promotion in urban and rural environments. Additional research related to gender differences in the barriers to accessing healthcare services and medication compliance could complement current efforts toward improving the population's health for both men and women. In general, the findings of these studies suggest that additional studies on hypertension and related factors are essential to creating effective strategies for decreasing the prevalence and complications related to hypertension in LMICs.

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