



Addressing Hypertension in Rural South Asia: Socioeconomic Determinants and Policy Solutions

Rimsha Faheem

Abstract

Throughout rural South Asia, hypertension has become a significant public health concern. Hypertension, related to high blood pressure, is a medical condition which relatively increases the risk of heart disease and other life threatening health problems. This paper explores in which ways hypertension is prevalent in rural South Asia through exploring socioeconomic and cultural factors that influence the condition and through the discussion of disease management. These problems include challenges surrounding the poor health infrastructure, lack of awareness, and lifestyle choices that allow for hypertension to increase. By looking into these factors, this research paper aims to provide valuable insight to create targeted interventions and policies that will effectively reduce hypertension in rural South Asia. A clear understanding of disease factors will allow for the development and progress of public health policies through resource access improvement and promotion of healthier community lifestyles. Ultimately, this study aims to support ongoing efforts to reduce hypertension and its related health risks in rural South Asia.

Introduction

Hypertension is a health problem that affects an estimated 1.13 billion people worldwide, and this number is expected to continue increasing, especially in low and middle-income countries (Jafar et al., 2018). Hypertension is when the blood pressure found in a human's blood vessels is constantly at a high rate. This causes serious health problems that directly affect the cardiovascular system and can cause various diseases such as heart attacks and strokes. Hypertension is known to be a leading cause of premature death worldwide (Mills et al., 2020). The situation is especially critical in rural South Asia because it covers several number of unique challenges, including poor access to health, poor infrastructure, and very low levels of public awareness (Rahut et al., 2023). Such factors make timely diagnoses and proper treatment a big challenge, hence predisposing citizens to many undiagnosed cases and eventual preventable health complications. Healthcare challenges in rural South Asia are compounded by socio-economic and cultural factors that affect hypertension management. There is an overriding issue of poverty; many rural individuals might not afford routine doctor check-ups or the medications that are part of hypertension control. Low-income groups are more unlikely to seek medical care and tend to delay treatment until hypertension manifests in severe health complications (Chaturvedi et al., 2023). Cultural beliefs and practices also play an essential important role in determining health outcomes. In rural settings, hypertension usually goes unnoticed or gets subdued because it rarely presents immediate symptoms (Kalyani et al.,

2020). Many, therefore, might not seek medical attention until their conditions worsen. The prevalence of hypertension in rural South Asia is alarmingly high. In India, nearly 25% of rural adults have hypertension, yet fewer than half of them are aware of it, and even fewer receive the necessary treatment (Farrukh et al., 2022). Similar trends are seen in rural Pakistan and Bangladesh, where hypertension is widely underdiagnosed, which can lead to dangerous conditions, such as heart disease or kidney failure (Farrukh et al., 2022). Besides, cultural stigma associated with chronic conditions such as hypertension may prevent people from seeking medical care or even publicly discussing their health status. The interaction of these factors based on culture, in combination with a lack of health awareness, forms the high levels of undiagnosed hypertension that characterize rural South Asia.

There is a significant gap in research studies and healthcare interventions related to the management of hypertension in rural South Asia. Most of the reviewed studies involve populations in urban areas, while rural settings remain underrepresented. Further, few studies have evaluated the efficiency of culturally adapted interventions in rural settings. This paper will examine the causes of the high prevalence of hypertension in rural South Asia, emphasizing socioeconomic, cultural, and healthcare challenges. Therefore, The study seeks to highlight some loopholes in the current interventions carried out and use those opportunities to recommend strategies for enhancing hypertension management in these resource-scarce communities.

The current study hopes to contribute to a better understanding of the challenges posed by hypertension management in rural South Asia and to suggest recommendations toward more effective and culturally appropriate healthcare solutions.

Biology of Hypertension

Hypertension, which refers to high blood pressure, is a medical condition that affects the body's cardiovascular and renal systems, specifically the body's blood vessels, heart, and kidneys. Regular blood pressure should be measured at around 120 over 80 millimeters of mercury or 120/80 mm Hg (Riley et al., 2018). The first number represents the systolic pressure, which is the force of the blood flow when blood is pumped out of the heart, and the second number is the diastolic pressure, which is measured between heartbeats when the heart is filling with blood (Arackal & Alsayouri, 2023). For those who suffer from hypertension, blood pressures can measure 130/80 mm Hg or more (Riley et al., 2018). This is extremely dangerous as it majorly impacts the heart, blood vessels, and kidney systems if left untreated.

Hypertension significantly impacts the heart which is a vital organ that the human body needs in order to function properly. Hypertension forces the cardiac muscles to exert more energy into pumping blood through blood vessels that become more constricted and less elastic due to high

blood pressure (Magder, 2018, 2024). Hypertension is also a leading factor for coronary artery disease, which is a condition that slows down blood flow to the heart and increases the risk of sudden heart attacks because it creates a buildup of plaque in the arteries (Baby, 2023). Individuals who suffer from hypertension are 3 to 4 times more likely to develop heart disease compared to those with normal blood pressure (Fuchs & Whelton, 2020). Along with the heart, the blood vessels are also severely affected. The blood vessels become prone to narrowing, which reduces their ability to dilate and leads to vascular remodeling (Zeng & Yang, 2024). This process increases the risk of aneurysms which can rupture and cause life-threatening complications such as strokes. Additionally, hypertension is a leading cause of chronic kidney disease, which can lead to kidney failure and end-stage renal disease, which may require dialysis or a kidney transplant (Evans et al., 2022). The small blood vessels in the kidneys become damaged over time which restricts their ability to filter waste products from the blood and maintain a balance of fluids within the body.

A combination of genetic and environmental factors causes hypertension. An adult who suffers from high blood pressure carries the ability to pass their gene to an offspring, which may cause them to deal with hypertension or increase their risk of developing it (Goodwin & Roland, 2022). Lifestyle related factors also play a role in the development of high blood pressure levels. This is regarding a person's food habits, weight, attention to physical activity, and even alcohol intake (Liangpunsakul et al., 2010). For example, when people have high sodium diets, it can increase their likelihood of raising their blood pressure (Carey et al., 2018). In addition, weight has also been shown to significantly impact blood pressure. When people reach levels of obesity within their weight, it puts a lot of force on the cardiovascular system and increases the blood volume which can eventually lead to hypertension (Shariq & McKenzie, 2020). These are examples of factors that cause hypertension in families even when it is not passed down genetically. This disease can be passed down by family genetics or shared family lifestyle choices.

This chronic condition is often referred to as a "silent killer" within the body. Hypertension's symptoms are unrecognizable until the blood pressure levels become significantly high and life-threatening which require immediate medical attention. Some of these symptoms and indications of extremely high blood pressure levels include headaches, dizziness, blurred vision, shortness of breath, and chest pain (Robinson, 1969). When looking at this problem statistically, over one billion people suffer from hypertension worldwide, and still fewer than 20% have their condition under control due to a lack of regular monitoring (Mills, Stefanescu, & He, 2020). Another biological fact about hypertension is that it affects men more than women. Although a higher proportion of men overall have high blood pressure, 51% of men and 40% of women, hypertension rates are higher among women than men after age 60 (Szabo, 2024). Menopause is when a woman of older age, usually around 50-60, experiences hormonal changes in their body that affect their mood, body, and health. Hypertension is responsible for approximately

45% of all cardiovascular-related deaths (Wu et al., 2015). This represents how serious of an issue hypertension is and how it globally affects people of all genders and ages.

Hypertension is a condition caused by multiple factors that affect the heart, blood vessels, and kidneys. This often leads to severe complications like heart disease, stroke, and kidney failure. The causes of genetic, environmental, and lifestyle factors contribute to its development, and its asymptomatic nature makes regular monitoring a necessity for early detection and treatment. Without proper management, hypertension can lead to life-threatening conditions, emphasizing the need for prevention and early intervention.

Treatments of Hypertension

Hypertension can do severe damage to the cardiovascular systems within the body, and it is essential that people find ways to get treated before their conditions worsen. To reduce the effects or get rid of hypertension, medical professionals recommend a combination of pharmaceutical medications, lifestyle changes, alternative therapies, and newer experimental treatments.

A standard method for treating high blood pressure is using pharmaceutical medications. The medications work by easing the narrowed blood vessels or removing excess salt and fluid within the body (Al-Makki et al., 2022). An example of this type of pill is known as a diuretic, or “water pill”, and this medicine is prescribed to help lower blood pressure. Another example of a common medication is Angiotensin-Converting Enzyme inhibitors, such as lisinopril, which help reduce the body’s blood pressure by blocking certain hormones (Al-Makki et al., 2022). Calcium Channel Blockers also work by blocking calcium from entering the blood vessels and heart cells (Al-Makki et al., 2022). In extreme cases, patients are also prescribed more severe medications that interfere with the bodily systems more. This can include Beta-blockers to reduce the effects of heart disease and prevent heart attacks (Watson et al., 2024). Hypertension patients may require multiple forms of medication depending on their condition. These medications are accessible through proper pharmacies, so not every country would have access to such resources.

While medication is a common application to managing high blood pressure, there are also lifestyle changes that people can take to reduce the chances of increasing their blood pressure levels. What a person eats and their daily diet is a huge part of managing hypertension. One way people use this fact about hypertension is by following a Dietary Approach to Stop Hypertension, or “DASH diet,” to reduce their sodium intake or other dietary factors that can increase blood pressure within the body (Filippou et al., 2020). A meta-analysis found that the DASH diet can reduce blood pressure to 4.4-7.4 mm Hg (Filippou et al., 2020). This decrease is likely an effect of a reduced intake of salt. Another critical change people make in their lifestyle

would be the inclusion of physical activity that exerts the body and keeps the heart pumping. These forms of exercise help the heart become stronger and function better. This can naturally lower blood pressure as the heart would start using less energy to pump blood through the cardiovascular system. Exercise lowers blood pressure by helping the heart and by helping maintain and manage body weight and fat. Even losing 5 to 10% of one's body fat can significantly lower blood pressure (Ryan & Yockey, 2017). While keeping the physical body healthy, it is essential for patients to keep their bodies mentally healthy as well. Activities that help reduce stress include yoga, breathing, and meditation. Studies show that reduced bodily stress is directly linked to lower blood pressure (Ayada et al., 2015). Managing stress is an essential factor for controlling hypertension.

Along with medications and making holistic lifestyle changes, people use alternative therapies to help control their blood pressure levels. Some of these different therapies do not use scientifically proven practices, but people do them to practice health and provide additional support for hypertension control. For example, these treatments include acupuncture and the use of herbal supplements. All of these methods are meant for people who want at home remedies for the problem of hypertension. People may even do this if they have regular blood pressures and want to completely avoid the risks that come with hypertension.

Recently, there has been much research into various new and experimental treatments for hypertension, particularly for those in whom blood pressure remains high even with medication. One approach that shows promise is the use of baroreceptor activation therapy. This involves implanting a device that activates the neck baroreceptors to help manage blood pressure (Iliescu et al., 2014). Early studies have shown this treatment may be helpful for those with difficult-to-treat hypertension. Another emerging treatment is renal denervation (Gupta, 2024). This minimally invasive procedure uses a catheter that sends electrical pulses into the kidneys to reduce nerve traffic critical in raising blood pressure. Though still experimental, this does show promise for certain patients with resistant hypertension. Gene therapy, including other advanced techniques for manipulating high blood pressure genes, is also an ongoing study area. Researchers are looking into how gene editing could fix some of the genetic factors contributing to high blood pressure, though this is still in the early stages (Masi et al., 2024). Overall, rural South Asia carries such treatments within their communities. Still, there are a lot of inequalities and a lack of sound political and economic systems that help citizens get the proper hypertension treatment they may need (Jafar et al, 2018).

Managing hypertension involves a variety of approaches, including pharmaceutical treatments, lifestyle changes, alternative therapies, and new experimental treatments. Medications like diuretics, ACE inhibitors, and calcium channel blockers are commonly prescribed to help control blood pressure. Additionally, adopting a healthy diet, regular exercise, and stress management techniques can make a big difference. Alternative therapies like acupuncture and yoga can

provide additional support, while new treatments like baroreceptor activation therapy and renal denervation offer hope for people with hard-to-treat hypertension. By combining these different methods, individuals with hypertension can better manage their condition and reduce the risks of serious health problems.

Socioeconomic Factors of Hypertension in Rural South Asia

Hypertension is a leading attributable risk factor for mortality in South Asia (Yip et al., 2014). While hypertension remains a significant health risk globally, rural South Asia significantly struggles with hypertension as a disease and is unable to take preventive measures due to their lack of access to proper healthcare systems. South Asia is significantly rural (73% Bangladesh, 64% Pakistan, 71% India, 85% Sri Lanka), and the healthcare infrastructures and providers are significantly less professional than other urban settings (Jafar et al., 2018).

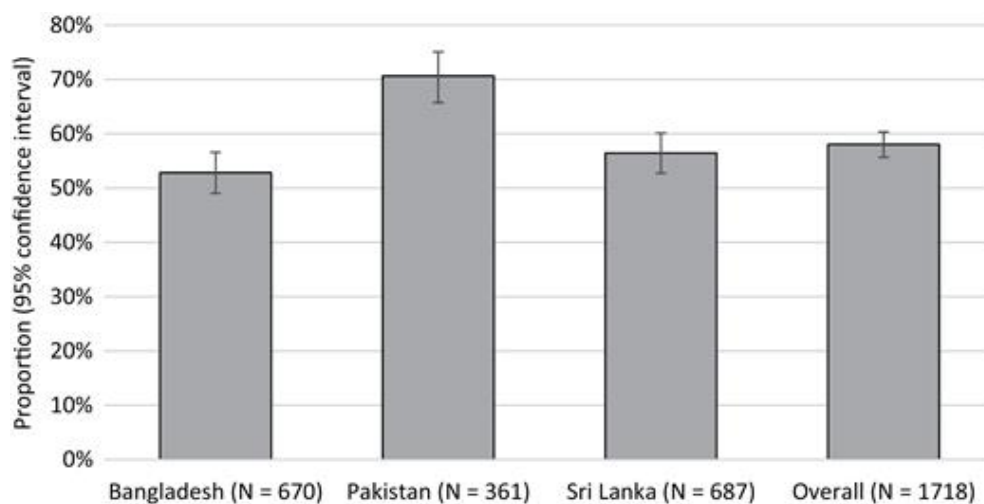


Figure 1. Proportion of Individuals with uncontrolled blood pressure in South Asian countries
Figure Source: (Jafar et al., 2018)

These statistics represent how over half of these countries have rural areas, yet many resources are still more local to the urban areas. This is only one example of the issues that play a role in the increased amount of hypertension in rural South Asia. The prevalence of prehypertension and hypertension among adults (18-49 years) is 43.2% and 14.9% in India, 35.1% and 19.8% in Bangladesh, and 25.2% and 13.8% in Nepal, respectively (Rahut et al., 2023). Adults are highly prone to hypertension globally, but a majority of these adults come from South Asian backgrounds, therefore making them more likely to be diagnosed with this disease. The three major causes for the prevalence of hypertension in rural South Asia are the lack of financial stability, proper healthcare infrastructures, and sodium literacy.

Economic factors are a significant reason why hypertension is so common in rural South Asia, as many people struggle to afford healthcare, healthy food, and lifestyle changes needed to prevent or manage the condition. Compared to urban areas where wealthier people reside, rural locations in Asia are known to have less access to resources and adequate healthcare systems. This lack of access to affordable healthcare systems is problematic because it limits access to medications and treatments for hypertension and contributes to a lack of knowledge and instruction regarding appropriate health check-ups. For example, in Pakistan and Bangladesh, the use of antihypertensive medications is extremely low due to the lack of universal health coverage and the high out-of-pocket costs, with more than 80% of medication expenses being paid by individuals (Jafar et al., 2018). This exemplifies how the high costs of medical treatments due to health care systems not being adequately established allow for poor individuals living in rural areas to have less access to treatment for hypertension. This makes it a significant concern because without proper treatment, citizens will continue to suffer from uncontrolled blood pressure and this can lead to higher mortality rates within these villages. While there are ways to make blood pressure reduction treatments more affordable, rural South Asian healthcare systems are lacking in establishing such programs (Jafar et al., 2020). In countries like Pakistan and Bangladesh, the absence of universal health coverage and the reliance on out-of-pocket payments reduce access to proper treatment, leading to high rates of uncontrolled hypertension in these rural populations (Thippaiah et al., 2022). This portrays how economic issues in rural villages allow for hypertension to go untreated.

The lack of infrastructure in rural healthcare systems makes it even more difficult for health care providers to establish cost-efficient ways to help treat patients with hypertension. Access to healthcare services remains a significant challenge, contributing to high rates of uncontrolled hypertension. The limited availability of essential services, such as regular blood pressure monitoring, specialized care, and access to medications, contributes to the high rates of uncontrolled hypertension in these regions (Fang et al., 2017). A study examining rural communities in Bangladesh, Pakistan, and Sri Lanka found that inadequate healthcare infrastructure and limited access to essential medications were key factors in the poor management of hypertension (Thippaiah et al., 2022). There is a significant lack of healthcare technologies, such as electronic health records or telemedicine, making it difficult for patients to receive adequate treatments (Aldosari et al., 2023). Overall, these rural locations across South Asia have limited access to healthcare technologies, and healthcare infrastructures are unable to provide affordable hypertension treatments, which makes hypertension an increased issue.

Additionally, because of minimal nutrition education, many people within these regions have a very small understanding of how sodium contributes to the development of high blood pressure. A South Asian study found that the rural population consumed a high quantity of salt, unaware of its detrimental impacts on health (Rahut et al., 2023). In fact, literacy about sodium is practically non-existent in most communities; people do not even know how much salt is

consumed in everyday food or how that leads to hypertension (Kalra et al., 2023). Low overall health literacy adds to this lack of knowledge, making rural populations more vulnerable to chronic conditions like hypertension, wherein they cannot make informed dietary choices. Without improvement in education about nutrition and health, these problems will worsen.

Nutrition plays a central role in managing hypertension, especially regarding salt intake. In South Asia, excessive salt consumption is one of the most significant issues, as average daily intake levels are roughly twice the World Health Organization's recommended limit of 5 grams (Ghimire et al., 2021). In South Asia, the average salt intake ranges from 10 grams per day, mostly from adding salt in cooking or when eating at the table (Ghimire et al., 2021). This is an excessive amount of sodium, which plays a significant role in the growing prevalence of hypertension because too much salt can elevate blood pressure over time. Unfortunately, most subjects living in rural South Asia are unaware of the risks of excessive salt consumption, and healthy food is not easily accessible (Kalra et al., 2023). Even though strategies for reducing salt intake have been recommended, no proper policy or program supports healthy eating behavior. Realistically, most of them consume such hypertensive items without the knowledge of risking long-term lives.

Current Policies on Hypertension

Throughout South Asia, there are national programs across countries that are established in order to act as a source of hypertension management. Examples of this include the “National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke” that was established in India in 2010 (Thakur et al., 2020). The goal of this program was to raise awareness for hypertension by providing screenings and an initiative to improve treatment of the rural and urban parts of India (Thakur et al., 2020). Even with the program promoting educational campaigns, rural locations were unable to properly adjust to the program due to the high medication costs and limited healthcare infrastructure (Thakur et al., 2020). Sri Lanka also established a “National Strategy on Prevention and Control of Non Communicable Diseases” in 2016 which released hypertension management programs that were primarily focused on education (Talagala et al., 2024). The Sri Lankan program was extremely effective in increasing access to medications and spreading awareness about reducing sodium intake, but they failed in reaching a majority of rural areas with these programs (Talagala et al., 2024). With multiple other programs being created, there always seems to be a pattern in which rural areas had less access or less effective results in managing hypertension. This goes to show that there is a clear gap for hypertension management in rural areas of South Asia.

In an attempt to fix these gaps between rural and urban access to hypertension management, there have been case studies that examine what hypertension treatment looks like in rural South Asia or what the lack of awareness is doing. In a study done in the rural village Tamil Nadu of

India, they found that even with increased awareness about hypertension, the number of people who were getting treatments were low (Fang et al., 2017). The study shows that only 40% of people who knew they had hypertension were following their treatment plans because of the poor access to healthcare facilities and medication costs (Fang et al., 2017). This is an alarmingly low number considering the dangers of hypertension. This portrays that while treatments are available, there is a lack of infrastructure in ensuring all patients are provided and educated on their necessary treatments. The Essential Health Services initiative in Bangladesh did a survey in rural Bangladesh and found that 60% of patients were aware they had hypertension but only 30% of them were being treated (Khanam et al., 2014). While educational programs are spreading in popularity, there still is a lack of access to medication and pharmaceutical treatments that the patients need. Fortunately, these programs are not completely failing for all rural villages. While a majority of rural villages do not have access to these initiatives, Sri Lanka has been increasingly bringing in better health care infrastructures in the more rural areas in hopes to manage hypertension patients (Talagala et al., 2024). Sri Lanka has been able to successfully manage hypertension in these areas through bringing in healthcare workers that actively monitor blood pressures and also ensure that patients are taking the necessary medications (Talagala et al., 2024). This has allowed for a massive improvement in some districts, but there's still a lack of consistent check-ins with a high demand for more workers.

While government-funded programs are making improvements for rural areas and helping with bringing awareness to undereducated communities in South Asia, there are still flaws within the current policies which do not allow for the programs to reach rural areas properly. Initiatives that have been successful are programs that involve blood pressure monitoring through a mobile phone application (Naik & Singh, 2021). This makes it easier since it allows monitoring to be carried out even in remote areas, which is helpful for people living in rural villages. While this has improved care for some, the app's reach is limited by low digital literacy and the lack of internet access in some rural areas (Akeroyd et al., 2015). While these innovations have been successful, there are additional challenges with medication access, with a low percentage of patients regularly taking their medication (Akeroyd et al., 2015). . Infrastructures are still unstable because the programs are unable to structure clinics in rural areas (Vaughan & Edwards, 2020). Since the clinics are long distances from places, they are less available to civilians in rural locations, which limits their treatment options.

A big barrier with establishing initiatives for hypertension management comes from the lack of trained health workers being available. In India and Bangladesh, the healthcare workers do not have the time or training to diagnose and manage hypertension patients properly (Khan et al., 2021). This means that even if people wanted to seek care, they may not get the proper treatment that they need. Grassroots interventions are very crucial in addressing hypertension in rural areas. In Bangladesh, various programs that train local volunteers to raise awareness

about hypertension and support monitoring have had relative success (Khan et al., 2021). This is because the programs are at the local level and involve leaders within the community who command a certain level of respect among the people. After seeing the different results, it is clear that these programs need an increase in funding, training, and support to reach more people.

There are several major factors that pose crucial barriers to the actual implementation of the hypertension management programmes in rural South Asia. Financing and infrastructure form one of the strongest barriers. These areas lack the most necessary resources to enhance hypertension treatment. While programs may exist within these regions, there is very often a manpower shortage to successfully deliver them (Khan et al., 2021). Other barriers may potentially include cultural resistance where people may have a preference for traditional remedies or are skeptical about modern medicine. However, more research is needed to analyze these influences. Overall, while policies exist throughout rural South Asia regarding hypertension management, there are significant barriers which make these villages vulnerable to the disease.

Recommendations

South Asian countries have policies set in place to manage hypertension, but many of these initiatives do not cater towards the needs of those living in rural populations. In order to ensure hypertension is being treated and managed properly in rural areas, it is necessary to make improvements and administer new policies. These are recommendations on how rural areas can achieve such improvements:

Improving Healthcare Access

As mentioned previously, the access to healthcare services can be limited for rural populations of South Asia. Healthcare centers are located far away from rural villages and a lot of these centers lack properly trained healthcare professionals to deal with hypertension management.

Recommendation: To counter this issue, South Asian governments should create mobile health clinics which will bring telemedicine services to remote areas around South Asia.

Implementing mobile health clinics will address the issue at hand because this will equip rural villages in South Asia with necessary tools and medicines to help manage hypertension which they previously did not have access to. The telemedicine services will allow rural patients to get blood pressure checks and treatments. Mobile health clinics have shown to be a good investment for places like rural southern Minnesota where implemented mobile health clinics (MHC) and created community initiatives to ensure there is no barriers with lack of technology and infrastructure. As communities and governments invested into the clinics, the more resources they were able to provide for rural areas and the more funding it received (Iqbal et al.,

2021). With the effectiveness shown in rural Minnesota and other rural locations across America, similar initiatives and programs should be implemented into rural South Asia.

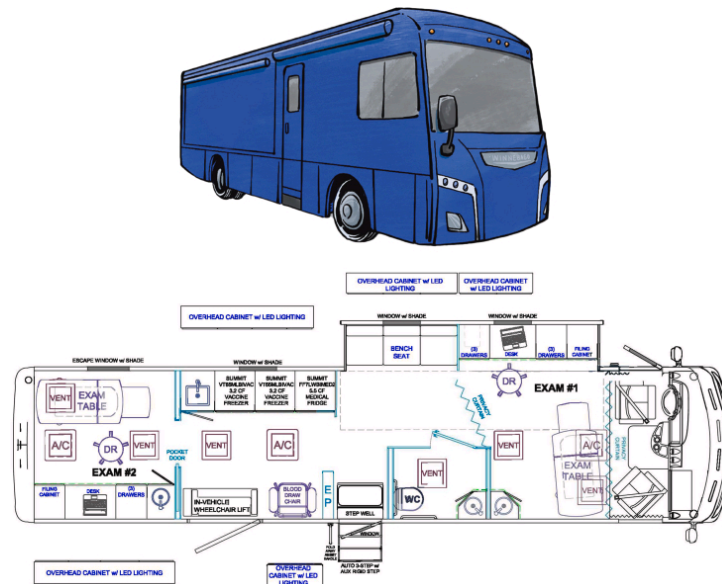


Figure 2. Graphic Representation of Mobile Health Clinic. Figure Source: (Iqbal et al., 2022)

Implementation: Government funding should prioritize mobile clinics and telemedicine. Partnerships with local health organizations and academic institutions can train community health workers (CHWs), ensuring sustainable healthcare delivery.

Education Campaigns and Public Awareness

While educational programs have been implemented within South Asia, there is a lack of programs being targeted towards rural South Asia which makes it difficult for the population to receive proper education and get the help that they specifically need. Many people do not understand the effects of hypertension and this leads to delayed diagnosis and poor treatments.

Recommendation: To counter this issue, national medical awareness campaigns should be launched through rural South Asia through the help of media, healthcare workers, and workshops in order to increase education on hypertension management and symptoms. Educational programs would focus on targeting younger children and young adults who can help promote public health to future and older generations who need help with managing their blood pressure. The curriculums would focus on helping people understand the complications of high blood pressure, symptoms of high blood pressure, and lifestyle choices that will help patients avoid increasing their blood pressure. Studies done in South Asia have shown that when face to face educational programs were implemented for three months there was a strong correlation

between the control of blood pressure within citizens and the hypertension knowledge they were learning (Ashraf et al., 2024).

Implementation: Governments should focus on collaborating with NGOs such as the Hypertension Cardiovascular Outcome Prevention and Evidence in Asia (HOPE Asia) which are networks that aim to bring zero cardiovascular events and aim to have an ultimate decrease in hypertension deaths (Kario et al., 2019). With the help of local workshops, screenings, and collaborations with educational initiatives already in place, rural South Asia can gain access to these programs and bring in better health outcomes for the elderly and those with a family history of hypertension.

Strengthening Community Involvement in Hypertension Management

While policies that establish mobile health clinics and educational programs can be efficient, one of the most efficient ways to maintain hypertension management in rural South Asia can be seen in strengthening community initiatives because this will ensure that there is a trustworthy form of healthcare systems for people who want to take ownership of their health and personal care.

Recommendation: Rural South Asia should establish community-based hypertension management programs that are self sufficient and do not rely on the help from international and national programs which may not always cater to the needs of the local community. Community health workers can work towards educating others in the community to help establish programs that can monitor blood pressure and basic treatment programs. These programs can then take advantage of local peer support networks and community leaders who can help motivate participation and create a proper environment to manage hypertension. Research in India shows that hypertension programs that were community-based had the most potential to provide sustained management for patients with hypertension (Om et al., 2023).

Implementation: Governments should allocate resources for training CHWs and collaborate with local organizations to sustain these programs. Peer support networks can be established through existing community structures like women's groups or religious centers.

Possible Impact

Most South Asian initiatives to control hypertension lack focus on the specific needs of rural communities. The new recommended policies are there to provide ways the government and community can take initiatives already established and cater them to the needs of the rural population. Through improving healthcare access, public education, and community involvement, the prevalence of hypertension and cardiovascular disease- related deaths can be

significantly decreased in rural communities. These changes are important because it will improve health outcomes for citizens by strengthening local healthcare infrastructures and empowering communities to take control of their health. Overall, these policies will create a lasting impact on hypertension prevention and management in rural communities and across South Asia.

Discussion

The paper provides detailed information on hypertension and how it affects rural South Asian communities. Through highlighting what the disease is, its effects, and factors that make it a prevalent issue in rural South Asia, this paper clearly emphasizes how hypertension management can be improved and why it is a significant concern. Hypertension is a medical condition that keeps a patient's blood pressure high. This significantly impacts and puts strains on the vital organs of the heart, blood vessels, and kidney found in the renal and cardiovascular systems. The key risk factors of hypertension can be genetic tendencies, poor diets with high sodium, obesity, and no physical activity. This condition is prone to silently developing without noticeable symptoms, making it extremely important to have regular monitoring for detection and management.

Hypertension can be managed using pharmaceutical, holistic, and emerging approaches. With pharmaceutical management, patients are prescribed medications which target different organs of the cardiovascular system to control blood pressure. Regarding lifestyle changes, it is recommended to follow a low sodium diet, partake in daily physical activities, and start stress managing practices at home like yoga. Other alternative therapies include acupuncture and herbal supplements to provide small amounts of support in the body. An emerging approach can be seen with new therapies like baroreceptor therapy and renal denervation to create hypertension resistance.

Cultural and economic factors play a major role in the prevalence of hypertension in rural South Asia. Due to the lack of resources and financial stability in these areas, rural populations often struggle with affording healthcare services for blood pressure monitoring, prescribed medications for blood pressure control, and healthy foods that are low in sodium. These economic factors make it extremely difficult for populations to properly manage and receive treatment for high blood pressure. From a cultural lens, rural South Asian diets are often rich in sodium, and they often lack nutritional education to spread awareness about the dangers of high sodium diets. The lack of health literacy makes rural populations more vulnerable to hypertension complications.

There are numerous policies that already exist in South Asia to manage hypertension with the aims of promoting health literacy and improving treatment quality. These programs show mixed

results as urban areas often experience positive effects to these programs while rural areas do not get the necessary attention or implementation that fits their specific needs. Rural populations often face barriers of high medication costs, poor healthcare systems, and a shortage of trained healthcare workers. There have been efforts for mobile phone applications to regularly monitor blood pressure but these rural communities face challenges of limited digital literacy and poor internet access that can decrease its effectiveness for regular monitoring. There have also been prominent grassroots interventions which involve training local volunteers, but these programs can often require a lot of funding and support to reach broader populations. Overall, these solutions can be effective for rural populations if specific barriers are overcome and policies are adapted to fit their needs.

In order to improve hypertension management in rural South Asia, there is a need to implement policy changes, and these recommended changes include the implementation of mobile health clinics, national educational campaigns, and community-based hypertension management programs. If governments were to truly establish these recommendations into their policies and provide proper support and funding, these solutions would be effective. However, these policies face limitations with the high cost of mobile health clinics coming to around 650k dollars (Iqbal et al., 2021), potential internet issues, and any transportation challenges these clinics may face in rural areas. There would also be concerns over gas as it travels to remote locations. Despite these challenges, the social impact of these policies is extremely significant as it would empower communities to improve their health and take care of themselves, which will reduce hypertension and significantly decrease cardiovascular deaths. This will lead to long-term improvements of the quality of life in rural South Asia by providing communities with fundamental healthcare infrastructure and increased health literacy.

For future reference, this research paper could be significantly enhanced with more updated research and more interventions in rural South Asia. Oftentimes research provided was not recent and the interventions did not specifically target rural South Asia. If there was more provided research on what hypertension looks like in rural South Asia, it would solidify the claims made throughout the paper and show the policy effectiveness. Currently, there is a major lack of research done to improve hypertension and many initiatives focus on urban communities making it difficult to see the struggles of rural communities.

Conclusion

The research paper highlights a significant gap in hypertension management for rural populations in South Asia. The need for more policies and interventions aimed towards the needs of these areas is emphasized as a result of this. Even though there are already national programs implemented throughout South Asia to manage hypertension, rural communities continue to face challenges and barriers that limit their access to proper healthcare and trained



professionals. There are proposed solutions such as mobile health clinics, educational campaigns, and community-based programs as a way to improve health outcomes.

Hypertension, being a multifactorial disease, makes management and regulation a very complex situation. The factors ranging from lifestyle habits to genetics truly make it a significant problem that must be addressed in communities that lack the health and digital literacy to understand its negative impacts. The broader implication of this research is to address these gaps as a way to reduce hypertension related deaths and cardiovascular diseases to improve the quality of life for citizens in rural South Asia.

References

- Akeroyd, J. M., Chan, W. J., Kamal, A. K., Palaniappan, L., & Virani, S. S. (2015). Adherence to cardiovascular medications in the South Asian population: A systematic review of current evidence and future directions. *World journal of cardiology*, 7(12), 938–947.
<https://doi.org/10.4330/wjc.v7.i12.938>
- Aldosari, N., Ahmed, S., McDermott, J., & Stanmore, E. (2023). The Use of Digital Health by South Asian Communities: Scoping Review. *Journal of medical Internet research*, 25, e40425. <https://doi.org/10.2196/40425>
- Al-Makki, A., DiPette, D., Whelton, P. K., Murad, M. H., Mustafa, R. A., Acharya, S., Beheiry, H. M., Champagne, B., Connell, K., Cooney, M. T., Ezeigwe, N., Gaziano, T. A., Gidio, A., Lopez-Jaramillo, P., Khan, U. I., Kumarapeli, V., Moran, A. E., Silwimba, M. M., Rayner, B., Sukonthasan, A., ... Khan, T. (2022). Hypertension Pharmacological Treatment in Adults: A World Health Organization Guideline Executive Summary. *Hypertension* (Dallas, Tex. : 1979), 79(1), 293–301.
<https://doi.org/10.1161/HYPERTENSIONAHA.121.18192>
- Anitha, C. T., Akter, K., & Mahadev, K. (2022). An overview of public health education in South Asia: Challenges and opportunities. *Frontiers in public health*, 10, 909474.
<https://doi.org/10.3389/fpubh.2022.909474>
- Ashraf T, Aamir KF, Nadeem A, Hassan MU, Raza H, Rauf MA, Din JU, Shah S, Khan F, Akram Z, Ishaque M, Hanif B. Impact of educational intervention on hypertension management by primary care physician: A randomized control trial. *PEC Innov.* 2024 Apr 28;4:100285. doi: 10.1016/j.pecinn.2024.100285. PMID: 38737890; PMCID: PMC11087987.
- Ayada, C., Toru, Ü., & Korkut, Y. (2015). The relationship of stress and blood pressure effectors. *Hippokratia*, 19(2), 99–108.
- Bera OP, Mondal H, Bhattacharya S. Empowering Communities: A Review of Community-Based Outreach Programs in Controlling Hypertension in India. *Cureus.* 2023 Dec 18;15(12):e50722. doi: 10.7759/cureus.50722. PMID: 38234936; PMCID: PMC10793189.
- Bishwajit G. (2015). Nutrition transition in South Asia: the emergence of non-communicable chronic diseases. *F1000Research*, 4, 8. <https://doi.org/10.12688/f1000research.5732.2>
- Carey, R. M., Muntner, P., Bosworth, H. B., & Whelton, P. K. (2018). Prevention and Control of Hypertension: JACC Health Promotion Series. *Journal of the American College of Cardiology*, 72(11), 1278–1293. <https://doi.org/10.1016/j.jacc.2018.07.008>
- Chaturvedi, A., Zhu, A., Gadela, N. V., Prabhakaran, D., & Jafar, T. H. (2024). Social Determinants of Health and Disparities in Hypertension and Cardiovascular Diseases. *Hypertension* (Dallas, Tex. : 1979), 81(3), 387–399.
<https://doi.org/10.1161/HYPERTENSIONAHA.123.21354>
- Evans, M., Lewis, R. D., Morgan, A. R., Whyte, M. B., Hanif, W., Bain, S. C., Davies, S., Dashora, U., Yousef, Z., Patel, D. C., & Strain, W. D. (2022). A Narrative Review of Chronic Kidney Disease in Clinical Practice: Current Challenges and Future Perspectives. *Advances in therapy*, 39(1), 33–43.
<https://doi.org/10.1007/s12325-021-01927-z>
- Fang, J., Wang, G., Ayala, C., Lucido, S. J., & Loustalot, F. (2017). Healthcare Access Among Young Adults: Impact of the Affordable Care Act on Young Adults With Hypertension. *American journal of preventive medicine*, 53(6S2), S213–S219.
<https://doi.org/10.1016/j.amepre.2017.07.013>

- Farrukh, F., Abbasi, A., Jawed, M., Almas, A., Jafar, T., Virani, S. S., & Samad, Z. (2022). Hypertension in Women: A South-Asian Perspective. *Frontiers in cardiovascular medicine*, 9, 880374. <https://doi.org/10.3389/fcvm.2022.880374>
- Filippou, C. D., Tsioufis, C. P., Thomopoulos, C. G., Mihas, C. C., Dimitriadis, K. S., Sotiropoulou, L. I., Chrysochoou, C. A., Nihoyannopoulos, P. I., & Tousoulis, D. M. (2020). Dietary Approaches to Stop Hypertension (DASH) Diet and Blood Pressure Reduction in Adults with and without Hypertension: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Advances in nutrition (Bethesda, Md.)*, 11(5), 1150–1160. <https://doi.org/10.1093/advances/nmaa041>
- Fuchs, F. D., & Whelton, P. K. (2020). High Blood Pressure and Cardiovascular Disease. Hypertension (Dallas, Tex. : 1979), 75(2), 285–292. <https://doi.org/10.1161/HYPERTENSIONAHA.119.14240>
- Ghimire, K., Mishra, S. R., Satheesh, G., Neupane, D., Sharma, A., Panda, R., Kallestrup, P., & Mclachlan, C. S. (2021). Salt intake and salt-reduction strategies in South Asia: From evidence to action. *Journal of clinical hypertension (Greenwich, Conn.)*, 23(10), 1815–1829. <https://doi.org/10.1111/jch.14365>
- Iliescu, R., Tudorancea, I., & Lohmeier, T. E. (2014). Baroreflex activation: from mechanisms to therapy for cardiovascular disease. *Current hypertension reports*, 16(8), 453. <https://doi.org/10.1007/s11906-014-0453-9>
- Iqbal A, Anil G, Bhandari P, Crockett ED, Hanson VM, Pendse BS, Eckdahl JS, Horn JL. A Digitally Capable Mobile Health Clinic to Improve Rural Health Care in America: A Pilot Quality Improvement Study. *Mayo Clin Proc Innov Qual Outcomes*. 2022 Sep 22;6(5):475-483. doi: 10.1016/j.mayocpiqo.2022.08.002. Erratum in: *Mayo Clin Proc Innov Qual Outcomes*. 2024 Aug 11;8(5):417. doi: 10.1016/j.mayocpiqo.2024.07.004. PMID: 36160638; PMCID: PMC9500515.
- Jafar, T. H., Gandhi, M., Jehan, I., Naheed, A., de Silva, H. A., Shahab, H., Alam, D., Luke, N., Wee Lim, C., & COBRA-BPS Study Group (2018). Determinants of Uncontrolled Hypertension in Rural Communities in South Asia-Bangladesh, Pakistan, and Sri Lanka. *American journal of hypertension*, 31(11), 1205–1214. <https://doi.org/10.1093/ajh/hpy071>
- Jafar, T. H., Gandhi, M., de Silva, H. A., Jehan, I., Naheed, A., Finkelstein, E. A., Turner, E. L., & COBRA-BPS Study Group. (2020). Effects of blood pressure lowering in South Asia: The COBRA-BPS study. *New England Journal of Medicine*, 382(8), 717-726. <https://doi.org/10.1056/NEJMoa1911965>
- Jafar, T. H., Gandhi, M., Jehan, I., Naheed, A., de Silva, H. A., Shahab, H., Alam, D., Luke, N., Lim, C. W., & COBRA-BPS Study Group. (2018). Determinants of uncontrolled hypertension in rural communities in South Asia—Bangladesh, Pakistan, and Sri Lanka. *American Journal of Hypertension*, 31(11), 1205-1214. <https://doi.org/10.1093/ajh/hpy071>
- Kalra, S., Kalra, B., & Kapoor, N. (2023). Sodium Literacy. *JPMA. The Journal of the Pakistan Medical Association*, 73(6), 1336–1337. <https://doi.org/10.47391/JPMA.23-42>
- Kario K, Chia YC, Sukonthasarn A, Turana Y, Shin J, Chen CH, Buranakitjaroen P, Naites J, Hoshida S, Siddique S, Sison J, Soenarta AA, Sogunuru GP, Tay JC, Teo BW, Zhang YQ, Park S, Minh HV, Tomitani N, Kabutoya T, Verma N, Wang TD, Wang JG. Diversity of and initiatives for hypertension management in Asia-Why we need the HOPE Asia Network. *J Clin Hypertens (Greenwich)*. 2020 Mar;22(3):331-343. doi: 10.1111/jch.13733. Epub 2019 Nov 26. PMID: 31773883; PMCID: PMC8029896.

- Kalyani, C. V., Mirza, A. A., Sharma, S. K., Saxena, V., Rohilla, K. K., & Dakshinamurthy, S. (2020). Undiagnosed elevated blood pressure and its lifestyle related risk factors among adults: Cross sectional survey. *Journal of family medicine and primary care*, 9(9), 4962–4968. https://doi.org/10.4103/jfmmpc.jfmmpc_679_20
- Khanam, M. A., Lindeboom, W., Koehlmoos, T. L., Alam, D. S., Niessen, L., & Milton, A. H. (2014). Hypertension: adherence to treatment in rural Bangladesh--findings from a population-based study. *Global health action*, 7, 25028. <https://doi.org/10.3402/gha.v7.25028>
- Khan, M. N., Oldroyd, J. C., Chowdhury, E. K., Hossain, M. B., Rana, J., Renzetti, S., & Islam, R. M. (2021). Prevalence, awareness, treatment, and control of hypertension in Bangladesh: Findings from National Demographic and Health Survey, 2017-2018. *Journal of clinical hypertension (Greenwich, Conn.)*, 23(10), 1830–1842. <https://doi.org/10.1111/jch.14363>
- Liangpunsakul, S., Crabb, D. W., & Qi, R. (2010). Relationship among alcohol intake, body fat, and physical activity: a population-based study. *Annals of epidemiology*, 20(9), 670–675. <https://doi.org/10.1016/j.annepidem.2010.05.014>
- Magder S. (2018). The meaning of blood pressure. *Critical care (London, England)*, 22(1), 257. <https://doi.org/10.1186/s13054-018-2171-1>
- Masi, S., Dalpiaz, H., & Borghi, C. (2024). Gene editing of angiotensin for blood pressure management. *International journal of cardiology. Cardiovascular risk and prevention*, 23, 200323. <https://doi.org/10.1016/j.ijcrp.2024.200323>
- Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature reviews. Nephrology*, 16(4), 223–237. <https://doi.org/10.1038/s41581-019-0244-2>
- Naik, N., & Singh, K. (2021). Innovations for effective implementation of guideline-based hypertension care in low-income and middle-income countries. *The Lancet. Global health*, 9(5), e571–e572. [https://doi.org/10.1016/S2214-109X\(21\)00083-8](https://doi.org/10.1016/S2214-109X(21)00083-8)
- Rahut, D. B., Mishra, R., Sonobe, T., & Timilsina, R. R. (2023). Prevalence of prehypertension and hypertension among the adults in South Asia: A multinomial logit model. *Frontiers in public health*, 10, 1006457. <https://doi.org/10.3389/fpubh.2022.1006457>
- Riley, M., Hernandez, A. K., & Kuznia, A. L. (2018). High Blood Pressure in Children and Adolescents. *American family physician*, 98(8), 486–494.
- Robinson, J. O. (1969). Symptoms and the discovery of high blood pressure. *Journal of psychosomatic research*, 13(2), 157–161.
- Ryan, D. H., & Yockey, S. R. (2017). Weight Loss and Improvement in Comorbidity: Differences at 5%, 10%, 15%, and Over. *Current obesity reports*, 6(2), 187–194. <https://doi.org/10.1007/s13679-017-0262-y>
- Shariq, O. A., & McKenzie, T. J. (2020). Obesity-related hypertension: a review of pathophysiology, management, and the role of metabolic surgery. *Gland surgery*, 9(1), 80–93. <https://doi.org/10.21037/gs.2019.12.03>
- Sudhakaran P. (2021). Acupuncture for Hypertension Using Traditional Chinese Medicine Concepts. *Medical acupuncture*, 33(1), 15–21. <https://doi.org/10.1089/acu.2020.1422>
- Szabo, L. (2024, June 6). Should blood pressure guidelines be different for women and men? *Scientific American*. <https://www.scientificamerican.com/article/should-blood-pressure-guidelines-be-different-for-women-and-men/#:~:text=High%20blood%20pressure%20raises%20the,than%20men%20after%20age%2060.>

- Talagala, I., Abeysena, C., & Wickremasinghe, R. (2024). Content analysis of policy documents related to non-communicable diseases prevention and control in Sri Lanka: a developing country in the South-East Asia. *F1000Research*, 13, 171.
<https://doi.org/10.12688/f1000research.144221.1>
- Thakur, J. S., Paika, R., & Singh, S. (2020). Burden of noncommunicable diseases and implementation challenges of National NCD Programmes in India. *Medical journal, Armed Forces India*, 76(3), 261–267. <https://doi.org/10.1016/j.mjafi.2020.03.002>
- Vaughan L, Edwards N. The problems of smaller, rural and remote hospitals: Separating facts from fiction. *Future Healthc J*. 2020 Feb;7(1):38-45. doi: 10.7861/fhj.2019-0066. PMID: 32104764; PMCID: PMC7032574.
- Wang, H. P., Yang, J., Qin, L. Q., & Yang, X. J. (2015). Effect of garlic on blood pressure: a meta-analysis. *Journal of clinical hypertension (Greenwich, Conn.)*, 17(3), 223–231.
<https://doi.org/10.1111/jch.12473>
- Wu, C. Y., Hu, H. Y., Chou, Y. J., Huang, N., Chou, Y. C., & Li, C. P. (2015). High Blood Pressure and All-Cause and Cardiovascular Disease Mortalities in Community-Dwelling Older Adults. *Medicine*, 94(47), e2160. <https://doi.org/10.1097/MD.0000000000002160>
- Yip, W., Wong, T. Y., Jonas, J. B., Zheng, Y., Lamoureux, E. L., Nangia, V., & Sabanayagam, C. (2013). Prevalence, awareness, and control of hypertension among Asian Indians living in urban Singapore and rural India. *Journal of hypertension*, 31(8), 1539–1546.
<https://doi.org/10.1097/HJH.0b013e328361d52b>
- Zeng, X., & Yang, Y. (2024). Molecular Mechanisms Underlying Vascular Remodeling in Hypertension. *Reviews in cardiovascular medicine*, 25(2), 72.
<https://doi.org/10.31083/j.rcm2502072>