

Review Paper

Revolutionizing Hypertension Management in Bangladesh: A Leap into the Future with AI Technology

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ABSTRACT

Purpose: There have been questions raised concerning bias in the data, algorithms, and recommendations of these systems as machine learning finds its way into more and more healthcare applications. Put simply, not everyone will experience an improvement in healthcare, even if it does for some. Worldwide, including in Bangladesh, hypertension, also known as high blood pressure, is a serious public health issue. With the increasing prevalence of hypertension and its associated health risks, there is a growing need for innovative and effective approaches to its management and treatment. This study provides an overview of new technologies with AI and their prospective impact on hypertension treatment in the context of Bangladesh. Secondary data was used to assist this work in part. The outcomes of the investigation were analysed using the descriptive review approach. Using the databases PubMed, Google Scholar, ResearchGate, and IEEE Xplore, searches were done for peer-reviewed literature, clinical trials, guidelines, and research articles on this topic. Furthermore, regional publications that are recognised and available via Bangladesh. Results from the study were examined using descriptive or univariate methods. Using new technology and receiving treatment had their blood pressure under control. The study's findings also indicated that older people, women, and families with higher income levels had greater prevalence rates of hypertension and lack of knowledge. This brief serves as a starting point for further research and policy development to exploit the potential impact of new technologies on hypertension treatment in Bangladesh.

Keywords: Hypertension treatment, new technologies, AI, Bangladesh, telemedicine, and mobile applications.

Hypertension, or high blood pressure, is a serious public health issue in Bangladesh and around the world (Mannan, A. *et al.* (2022)^[1]). It is a major risk factor for cardiovascular disease, stroke, and other health complications. This paper provides an in-depth analysis of new technologies and their potential impact on

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hypertension management in Bangladesh (De Silva, H. A. (2019)^[2]). The study explores various innovative approaches, such as telemedicine, wearable devices, and artificial intelligence (including algorithms and IOT), that have the potential to revolutionize the diagnosis, monitoring, and treatment of hypertension in the context of the healthcare system in Bangladesh (Alshamrani, M. (2022)^[3]). This study seeks to give useful insights for policymakers, healthcare professionals, and researchers aiming to improve hypertension management in the country by thoroughly analyzing emerging technologies and their possible impacts on hypertension therapy in Bangladesh. This emphasizes the significance of implementing cutting-edge solutions to solve this crucial health issue and raise the standard of healthcare in Bangladesh. Reveals some information on cutting-edge technology and how it might affect the management of hypertension (Patton, J. *et al.* (2008)^[4]). For information on recent advancements in the management of hypertension in Bangladesh, it is imperative to reference more recent sources. Infrastructure, cost, and access to healthcare issues may make it difficult for Bangladesh to implement these technologies (Hulland, K.R. (2013)^[5]). However, there are huge potential advantages in terms of bettering the management of hypertension, lowering complications, and increasing patient outcomes.

The artificial intelligence (AI) healthcare market, estimated by Statista to be worth \$188 billion in 2030, is expected to grow from its \$11 billion valuation in 2021 (Wong, B.K.M. *et al.* (2024)^[6]). Because of this enormous rise, the way hospitals, pharmaceutical and biotechnology companies, medical providers, and other businesses in the healthcare sector function is probably going to continue to undergo significant changes. The increasing use of AI in the healthcare sector has accelerated transformation due to advancements in machine learning algorithms, more data accessibility, reduced hardware costs, and the availability of 5G. Large volumes of health data, including genetic data, clinical study results, and medical records, may be analysed far more quickly by AI and ML systems than by humans. For the most recent information on how these technologies are being incorporated into the local healthcare system and their impact on the treatment of hypertension in the country, it is vital to consult healthcare practitioners, researchers, and policymakers in Bangladesh (Shafiq, M. *et al.* (2020)^[7]).

STATEMENT OF THE PROBLEMS

In Bangladesh, hypertension is a very common health issue. Many people in Bangladesh, particularly those living in rural regions, have inadequate access to health care services, which contributes to the rising prevalence of undiagnosed or poorly treated hypertension. The introduction of new medical technology is expanding the window of opportunity for better hypertension control and treatment. The diagnosis, monitoring, and control of hypertension in Bangladesh today heavily depends on the application of new technologies and creative techniques and instruments. By enabling patients to receive prescriptions, check their symptoms, and consult with healthcare experts remotely, new technologies like telemedicine can help close this gap. The diagnosis, management, and treatment of hypertension can all be enhanced by introducing modern technology into Bangladesh's healthcare system, which will ultimately lessen the toll that the illness has on both the individual and the system. All population segments must, however, have access to these technologies, and healthcare professionals must receive sufficient training to enable them to be used efficiently. These technological advancements, which enable more accurate, practical, and individualized care of hypertension, include wearables, smartphone apps, telemedicine platforms, and data analytics. By utilizing these technologies, medical professionals and patients can more effectively

monitor blood pressure, modify treatment plans, and encourage lifestyle modifications, all of which will increase the efficacy of managing hypertension and lower the dangers associated with it.

CONCEPTUAL FRAMEWORK

Understanding the Current Scenario

- ❑ **Epidemiological Analysis:** Begin with a thorough analysis of the current status of hypertension in Bangladesh, including prevalence rates, demographic distribution, and associated risk factors.
- ❑ **Healthcare Infrastructure Assessment:** Evaluate the existing healthcare infrastructure, identifying strengths, weaknesses, opportunities, and threats related to hypertension management.

AI Technology Integration

- ❑ **Data Collection and Analysis:** Implement AI-driven systems for collecting and analysing patient data. This includes demographic information, medical history, lifestyle factors, and genetic predispositions.
- ❑ **Predictive Analytics:** By using past data to forecast potential cases of hypertension, AI algorithms can be used to support proactive intervention and preventive measures.
- ❑ **Personalized Treatment Plans:** Develop AI models that can generate personalized treatment plans considering individual patient characteristics, ensuring more effective and targeted interventions.

Telemedicine and Remote Monitoring

- ❑ **Telehealth Platforms:** Integrate telemedicine platforms to facilitate remote consultations, making healthcare services more accessible to individuals in remote areas.
- ❑ **Wearable Technology:** Utilize wearable devices equipped with AI algorithms to continuously monitor and track patients' vital signs, providing real-time data for healthcare professionals.

Patient Engagement and Education

- ❑ **Mobile Apps and Educational Platforms:** Develop mobile applications and educational platforms that leverage AI to deliver personalized health information, medication reminders, and lifestyle recommendations to patients.
- ❑ **Behavioral Analysis:** Implement AI to analyze patient behaviors and preferences, tailoring educational content and engagement strategies accordingly.

Healthcare Professional Empowerment

- ❑ **Decision Support Systems:** AI-powered decision support systems can help medical personnel make better diagnoses, select the best courses of action, and forecast patient outcomes.

- ❑ **Continuous Learning:** Establish a framework for continuous training and education of healthcare professionals to keep them updated on the latest advancements in AI technology and hypertension management.

Regulatory and Ethical Considerations

- ❑ **Compliance with Regulations:** Ensure that the implementation of AI technology complies with local healthcare regulations and standards.
- ❑ **Ethical Guidelines:** Develop and adhere to ethical guidelines for the use of AI in healthcare, including patient privacy, data security, and informed consent.

Monitoring and Evaluation

- ❑ **Performance Metrics:** Define key performance indicators (KPIs) to analyse the effectiveness of the AI-driven hypertension control system.
- ❑ **Feedback Mechanism:** Establish a feedback mechanism involving patients, healthcare professionals, and stakeholders to continuously improve and refine the system.

Scalability and Sustainability

- ❑ **Infrastructure Scalability:** Design the framework to be scalable, allowing for the integration of new technologies and the expansion of services to a larger population.
- ❑ **Financial Sustainability:** Develop a financial model that ensures the long-term sustainability of the AI-powered hypertension management system, considering funding sources, cost-effectiveness, and return on investment.
- ❑ **Model:** Hypertension Management in Bangladesh Future with AI Technology.

METHODS

This work was supported in part by secondary data. The descriptive review method was used to analyze the study's results. A thorough analysis of the body of research, academic papers, and clinical trials was done in order to compile data on the most recent advancements in technology and available alternatives for managing hypertension in Bangladesh. Searches for peer-reviewed literature, clinical trials, guidelines, and research papers on this subject were conducted using the databases PubMed, Google Scholar, ResearchGate, and IEEE Xplore. In addition, regional publications that are acknowledged and accessible through Bangladesh Medical are not accessible online. There has also been thought about the Dental Council.

OBJECTIVES

- ❑ To deliver an overview of emerging artificial intelligence (AI) technologies and their prospective applications to the management of hypertension in Bangladesh;

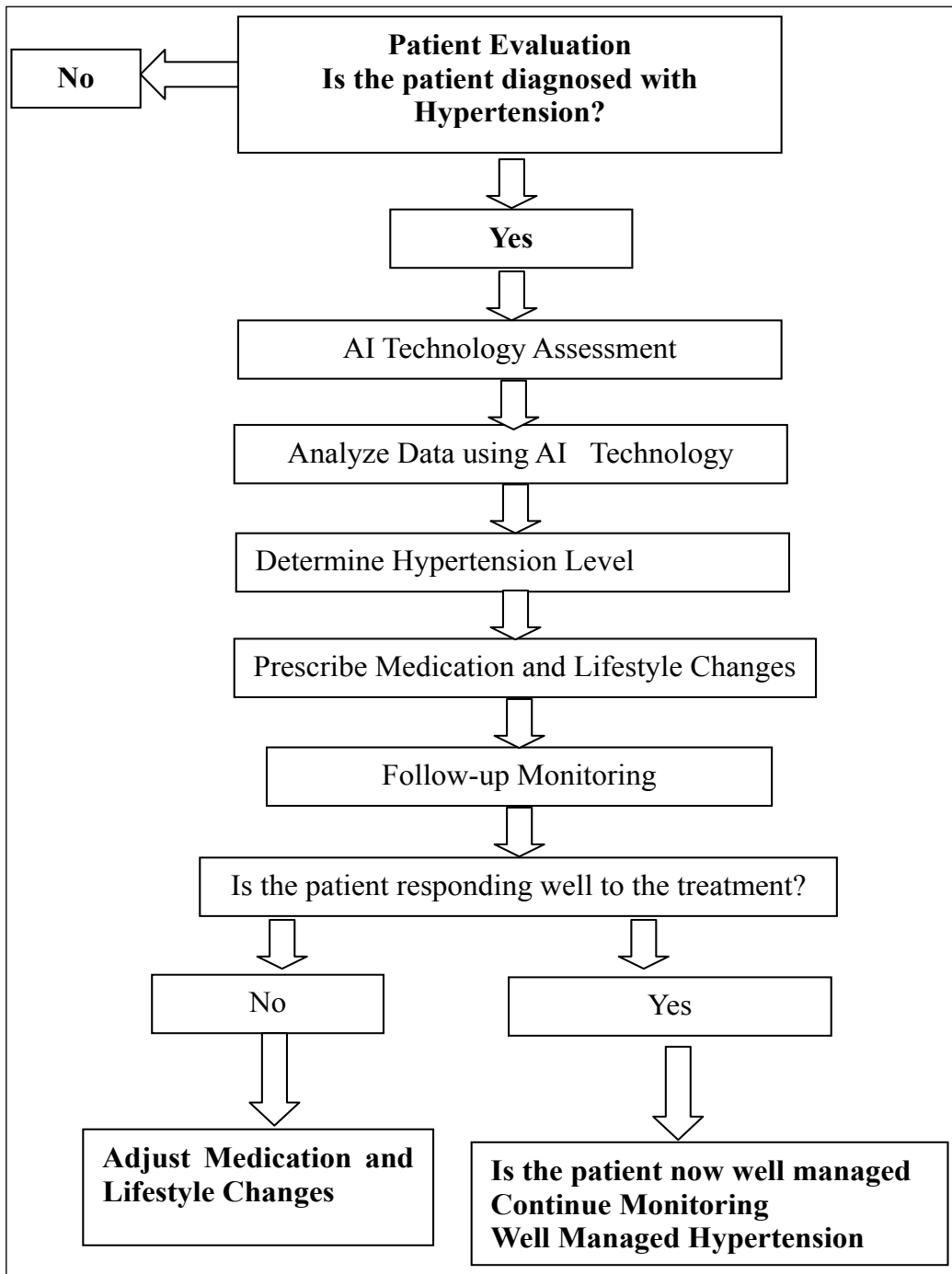


Fig. 1: Bangladesh will use AI technology to manage hypertension in the future

Sarkar, P. *et al.* (2023)^[8]

- ❑ To investigate many facets of AI-powered medical diagnosis efficiency;
- ❑ It explores the current landscape of hypertension in the country, discusses the challenges of managing the condition with AI and
- ❑ To assess the potential of emerging technologies to revolutionize hypertension care

RESULTS AND DISCUSSION

AI can improve the efficiency of healthcare procedures including hypertension:

Artificial intelligence (AI) is being used by healthcare organisations to increase efficiency in a variety of areas, including patient care and back office. This is how to work it, below:

1. **Simplify and manage the Administration work:** It takes a lot of time for healthcare professionals to complete paperwork and other administrative tasks. Employees can spend more time with patients face-to-face and on other activities by having AI and automation aid with many of those tedious duties. As well AI also has the potential to greatly benefit the administration in the health sector by improving efficiency, accuracy, and decision-making processes. For example, Data Management and Analysis, Predictive Analytics, Appointment Scheduling and Resource Optimization, Fraud Detection and Prevention, Clinical Decision Support, Supply Chain Management, Billing and Coding Automation, Security and Privacy, Public Health Surveillance, etc.
2. **Virtual nursing assistants:** AI virtual nurse assistants—which are AI-powered chatbots, apps, or other interfaces; how to utilize it.
 - ❑ **Identify Use Cases:** Define the specific tasks and responsibilities you want the virtual nursing assistant to handle. Common use cases include patient monitoring, medication management, appointment scheduling, and health education.
 - ❑ **Collaborate with Healthcare Professionals:** Engage healthcare professionals, including nurses and physicians, in the planning and implementation process. Their insights are crucial to ensuring that the virtual nursing assistant aligns with clinical guidelines and meets the requirements of patients and healthcare professionals.
 - ❑ **Choose the Right Technology:** Select or develop a virtual nursing assistant platform that suits your healthcare organization's requirements. Consider factors such as integration capabilities with scalability, adherence to healthcare legislation, and electronic health records (EHR).
 - ❑ **Integrate with Electronic Health Records (EHR):** Ensure seamless integration with EHR systems to access and update patient information. Integration enhances the virtual nursing assistant's ability to provide
 - ❑ **Ensure Security and Compliance:** Put strong security measures in place to safeguard patient data and guarantee adherence to HIPAA and other healthcare laws. Security is paramount when dealing with sensitive health data.

- ❑ **User-Friendly Interface:** Develop an intuitive and user-friendly interface for the virtual nursing assistant. This ensures that healthcare providers can easily navigate and utilize the system in their daily tasks.
 - ❑ **Define Protocols for Alerts and Notifications:** Establish clear protocols for alerts and notifications generated by the virtual nursing assistant. Define the criteria for alerts and the appropriate response mechanisms to ensure timely intervention in case of critical health indicators.
 - ❑ **Regular Monitoring and Evaluation:** Continuously monitor the performance of the virtual nursing assistant and evaluate its effects on healthcare workflows and patient outcomes. To determine areas that want improvement, get input from patients and healthcare experts.
 - ❑ **Address Ethical and Legal Considerations:** Ensure that the use of virtual nursing assistants aligns with ethical standards and legal requirements. Address concerns related to privacy, informed consent, and the responsible use of AI in healthcare.
3. **Reduction of dosage errors:** As per the findings published in “Nature Medicine,” as many as 70% of people fail to take insulin as directed. An AI-powered device that runs in the background for the patient could identify mistakes made by the patient when using an insulin pen or inhaler. How to operate it.
- ❑ **Data Integration and Analysis:** Integrate electronic health records (EHR) and patient data to create a comprehensive profile. AI algorithms can analyze this data to identify patterns, assess patient history, and recommend appropriate dosage based on individual characteristics.
 - ❑ **Decision Support Systems:** Implement AI-driven decision assistance platforms for healthcare professionals. These systems can provide real-time recommendations for medication dosages by considering factors such as age, weight, comorbidities, and previous responses to treatments.
4. **Less invasive surgeries:** AI-enabled robots may be utilised to operate in close proximity to delicate organs and tissues in an effort to minimise blood loss, infection risk, and pain following surgery. Here’s how it operates:
- ❑ **Surgical artificial intelligence:** Since artificial intelligence (AI) can manage a wide range of information sources, such as patient risk factors, anatomy, disease natural history, patient values, and cost, it is becoming an increasingly important factor in surgical decision-making. AI also helps patients and surgeons make more accurate predictions about the outcomes of surgical decisions.
 - ❑ **Data science in surgery:** The advent of new technology and their use in operating rooms (ORs) along with the vast amounts of data generated by patient surgery led to the creation of a brand-new branch of study called surgical data science (SDS). By gathering, organising, analysing, and modelling data, SDS seeks to increase the value and calibre of interventional treatment. SDS may receive complicated data from a variety of sources, including patients, healthcare providers, sensors that measure data about procedures and patients, and operators as well as subject expertise.
5. **Fraud prevention:** Every year, the healthcare industry experiences a large \$380 billion fraud, which raises customer out-of-pocket expenses and medical premium rates (Hyman, D. A. (2001)^[9]). Using artificial intelligence (AI) can assist in identifying anomalous or suspicious insurance

claim trends, include billing for high-priced services or procedures that were never rendered, unbundling—which is the practice of billing for each step of a procedure separately—and ordering pointless tests to profit from insurance reimbursements.

AI has the potential to improve

AI may be able to diagnose patients more quickly and accurately. Although it's early in its application, employing AI to identify conditions might save treatment costs by up to 50% and improve health outcomes by 40%, according to Harvard's School of Public Health. (Google, (2023)^[10]).

AI's prospects and future in the healthcare sector

Artificial Intelligence presents prospects to mitigate human mistake, support healthcare providers and personnel, and deliver patient care. AI is probably going to be utilised more and more to read medical scans, X-rays, and photographs, diagnose conditions, and devise treatment strategies as AI capabilities advance.

Overview of new technologies for Hypertension

In Bangladesh as well as many other countries of the world, hypertension is a serious health issue. The diagnosis, management, and treatment of hypertension in the nation could change significantly with the introduction of new technologies. An outline of these technologies and their possible effects on Bangladesh's hypertension therapy is provided below:

Telemedicine and Remote Monitoring

Telemedicine has gained prominence in recent years, and it can be especially useful in a country with a large rural population like Bangladesh. Patients can consult with healthcare providers remotely, saving time and travel expenses. Moreover, remote monitoring devices, such as wearable blood pressure monitors, can help doctors track patients' blood pressure and adjust medications as necessary.

Mobile Apps and Health Portals: The use of mobile apps and online health portals can enable patients to track their blood pressure, record dietary habits, and monitor their exercise routines. Healthcare providers can also access this data to provide personalized advice and treatment plans.

Digital Health Records: The adoption of electronic health records (EHRs) allows healthcare providers to access patient data more easily, enabling better coordination of care and ensuring patients' hypertension management history is readily available. This helps in avoiding medication errors and improving patient care.

Medication Adherence Technologies: Poor adherence to prescribed medication regimens is a common issue in hypertension treatment. New technologies, such as smart pill dispensers and medication reminder apps, can improve patient compliance with medication, leading to better blood pressure control.

Home Blood Pressure Monitoring Devices: Patients can now regularly monitor their blood pressure at home because to the availability of accurate and reasonably priced equipment. This can lead to earlier detection of hypertension and better control through timely interventions.

Genetic Testing: Genetic testing can be used to identify those who are more likely to develop hypertension. Based on a person's genetic propensity, it can help guide treatment choices and lifestyle adjustments.

Pharmacogenomics: Personalized medicine through pharmacogenomics can help healthcare providers choose the most effective medications for individual patients based on their genetic profiles, enhancing treatment success and decreasing unwanted effects.

AI Chatbots for Patient Education: AI-powered chatbots can provide patients with information about hypertension, medications, and lifestyle changes. They can answer common questions and offer guidance, helping patients better understand their condition.

Health Information Exchange (HIE) Systems: The sharing of health information across various healthcare providers is made possible by HIE systems. This can improve care coordination and make it easier for patients to access their health records from various healthcare facilities.

mHealth Apps for Medication Adherence

Mobile health applications can be used to remind patients to take their medications and track their adherence to treatment plans. These apps can also provide education on hypertension and its management.

Community Health Initiatives

Technology can support community-based health initiatives in Bangladesh. Mobile applications and SMS campaigns can disseminate information about healthy eating, exercise, and blood pressure management. Social media can be used to create support networks for individuals with hypertension.

Low-Cost Diagnostic Tools

The development of affordable diagnostic tools for hypertension, such as smartphone-based blood pressure monitors and point-of-care testing devices

Wearable Health Devices

Wearable technology, including fitness trackers and smartwatches, may continuously monitor vital indicators, including heart rate and activity levels. These devices can help individuals track their physical activity and make lifestyle changes to manage hypertension effectively.

E-Prescriptions

The implementation of electronic prescribing systems can reduce medication errors and improve the accuracy of prescriptions, ensuring that patients receive the right medications and doses.

Remote Monitoring Devices

Remote monitoring devices, including connected blood pressure monitors and scales, can transmit providing healthcare practitioners with real-time data so they can modify treatment strategies as necessary.

Community Health Workers and Telehealth

Utilizing community health workers who are equipped with mobile devices for telehealth consultations can help reach rural and underserved populations in Bangladesh and improve the management of hypertension.

Health Data Analytics and Future Aspects

Analyzing large healthcare datasets can help identify trends and risk factors related to hypertension, which can inform public health strategies and healthcare policies.

Also, more things can be added, such as devices like mobile phones or apps installed on the phone! This device or app always counts heartbeats as well as other activities, and this report is transferred to nearly every hospital by AI (artificial intelligence) systems (Khan, M. *et al.* (2020)^[11]; Singh, R.P. *et al.* (2022)^[12]). As a result, the person can support himself all the time as well he cannot diet with hypertension and other diseases without treatment, etc. In Bangladesh if implements AI health technology, then we will be able to significantly reduce hypertension and death without hypertension treatment (Moriyama, M., *et al.* (2020)^[13]). If installed, the Internet of Things (IoT) will be in Bangladesh's health sectors and designed according to the Smart Bangladesh' vision 2041 (2023)^[14]. How do we see that, or how do we work on that? Everybody will have a mandatory health profile open under the health sector in Bangladesh (de Oliveira Cruz, V. (2019)^[15]. When a sensor device is attached to the body or nearly the body at all times (a watch, mobile phone, microchips, or any kind of nanotechnology) to be able to count heartbeats as well as collect other information from the blood and body. Algorithms will be created based on the problems caused by diseases in the human body, and AI decisions will be automatically sent to the person for necessary measures through the IoT (Internet of Things). If it neglects or fails, then the answer text will automatically transfer the report nearby to the hospital or counterpoint. Also, until action is taken, the alarm will continue automatically through the IoT. Example: Like smart policing. Moreover, if the person neglects or fails to comply with the healthcare suggestions, then the information will automatically pass to the government body. The government can take some measures to investigate the matter or provide opportunities, such as providing opportunities to the deprived or punishing the violators (Cook, R. J. (1993)^[16]). Using this AI system, a union, an upazila, a district, a division, a country, a continent, and even the World Health Organization (WHO), there is no need to invest billions of dollars in health data collection (Osiyemi, A. *et al.* (2020)^[17]; Bram, J.T. *et al.* (2015)^[18]). These surplus billions of dollars can be spent in backward communities by the WHO or other sectors on other projects. As a result, it is possible to significantly reduce the death rate due to high blood pressure (Amery, A. *et al.* (1985)^[19]; Iwai, J. *et al.* (1985)^[20]).

MANAGEMENT AND TREATMENT OF HYPERTENSION BY AI

The treatment of hypertension, or high blood pressure, has evolved significantly over the years, largely influenced by advances in technology and medical research. This is the historical context of emerging technologies and how they may affect the management of hypertension in the future. Currently, nearly 7 million adults in England and Wales—roughly 14% of the adult population—attend primary care hypertension registers (Kitt, J. *et al.* (2019)^[21]). This creates a sizable market for technological tools that support regulation. As of right now, only 50% of people initiating a new antihypertensive medication are still taking it six months later, and 60% of people with hypertension conditions are under control (Fox,

R., *et al.* (2019)^[22]). Although there has been technology for some time to help with management of this population group, a strong body of research supporting it has only lately emerged. This section examines a variety of options, including virtual clinics, telemonitoring, self-monitoring, and artificial intelligence (AI)-assisted care (Andrikopoulou, E. (2023)^[23]).

Self-monitoring: Self-management, or the technique of combining self-monitoring with pharmaceutical self-titration, is another option. Studies carried out prior to the current generation of mobile devices have demonstrated that in both hypertension and high-risk populations, self-management can result in better blood pressure control through medication optimization.

Self-monitoring of blood pressure is becoming a more popular method of controlling hypertension and can help regulate blood pressure. Compared to in-clinic measures, it is a more accurate indicator of end-organ damage and is well-tolerated by patients. Trials including self-monitoring have demonstrated better management of blood pressure, primarily when combined with other co-interventions such as pharmacist intervention or nurse-led education. Self-monitoring has a drawback in that it depends on effective communication between patients and doctors; it's estimated that 50% of patients don't disclose to doctors that they self-monitor or don't meaningfully share readings with them. The use of AI in the healthcare sector facilitates data collecting and sharing. Healthcare professionals may find it simpler to effectively and efficiently handle patient data with the help of AI.

Telemedicine: The advent of telemedicine and digital health technology has the potential to revolutionize hypertension management. Patients can now monitor their blood pressure at home using connected devices, and healthcare providers can remotely monitor and adjust treatment plans. This technology enhances patient engagement and can lead to better outcomes. Remote data transfer, in this case automated BP reading data transmission, is being discussed. It can be coupled with additional parameters including oxygen saturation, heart rate, and data transfer from the patient's place of employment or residence to a medical facility, such as a hospital pacemaker/defibrillator or primary care clinic. There are a number of telemonitoring systems that vary in how they gather, transmit, and report data as well as whether or not they have extra features like medication or blood pressure monitoring reminders. In the last few years, randomized controlled trials have been conducted to investigate if home blood pressure telemonitoring can improve the control of hypertension and related health effects. All studies found excellent levels of technology acceptability by physicians and patients, good telemonitoring programme adherence, and confirmation that the technology can potentially improve patient outcomes and hypertension control, according to a comprehensive meta-analysis and may reduce healthcare costs, particularly when long-term follow-up is considered.

The 'virtual clinic/visit': A system-level substitute for the application of such technologies and organised, asynchronous online exchanges between a patient and a doctor to provide longer-term medical treatment is the "virtual clinic/visit." Levine found no statistically significant adjusted differences in systolic blood pressure control, frequency of specialist visits, emergency department presentations, or inpatient admission for primary care patients managed for hypertension with virtual versus real-life in-person encounters.

Emergence of Blood Pressure Measurement: The first crucial step in understanding and treating hypertension was the development of the sphygmomanometer in the late 19th century. This simple device allowed for the accurate measurement of blood pressure. It became the cornerstone for diagnosing and monitoring hypertension.

Pharmacological Advances: The mid-20th century saw the development of various antihypertensive drugs, such as diuretics and beta-blockers. The discovery and refinement of these medications significantly improved the management of hypertension. Continuous research and technological innovations have led to the development of more effective and targeted medications over the years (Paul, P.K. 2021).

Echocardiography and Imaging Techniques: The introduction of echocardiography and other advanced imaging techniques in the mid-20th century enabled physicians to better assess the impact of hypertension on the heart and other organs. This technology helped in identifying complications and guiding treatment decisions.

Genomics and Personalized Medicine: Advances in genetics and genomics have opened up new possibilities for personalized medicine in hypertension treatment. Understanding an individual's genetic predisposition to hypertension can lead to tailored treatment plans and more effective medications.

Wearable Devices and Health Apps: The proliferation of wearable devices like smartwatches and fitness trackers has made it easier for individuals to track their health metrics, including blood pressure. Health apps and wearable technology can provide continuous data for both patients and healthcare providers, enabling early intervention and better control of hypertension (Paul, P.K. *et al.* 2023).

Targeted Therapies and Medical Devices: Ongoing research into novel therapies and medical devices, such as renal denervation, is exploring alternative methods for managing hypertension, especially for individuals who don't respond well to traditional medications. These technologies offer the potential for more precise and long-lasting treatment.

Regulation and Quality Control: Regulatory agencies like the FDA play a crucial role in evaluating and approving new technologies and treatments for hypertension. Their oversight ensures that new technologies are safe and effective before they are widely adopted in clinical practice (Paul, P.K. *et al.* 2018).

Patient Education and Empowerment: Advances in information technology and patient education have empowered individuals to take a more active role in managing their hypertension. Online resources, mobile apps, and telehealth services provide patients with valuable information and support.

Challenges of Implementing New Technologies in Bangladesh

Access to New Technologies: While innovative technologies have the potential to transform hypertension management, their accessibility in Bangladesh remains a significant concern. Many rural and underserved areas lack the infrastructure, funding, and expertise to adopt these technologies, leaving a large portion of the population without the benefits of modern healthcare.

Cost-effectiveness: For many Bangladeshis, particularly those from low-income backgrounds, the expense of new medical technologies can be unaffordable. Finding ways to make these technologies affordable, either through government subsidies or partnerships with private companies, is a pressing issue.

Healthcare Infrastructure: The healthcare infrastructure in Bangladesh needs substantial improvement to effectively implement and manage new technologies. This includes upgrading hospitals, training healthcare professionals, and ensuring reliable power sources to support technology-dependent treatments.

Digital Literacy: As new technologies are often digital and data-driven, addressing the issue of digital literacy becomes vital. Both healthcare providers and patients need to be educated on how to effectively use and interpret data from these technologies (Paul, P.K. *et al.* 2012).

Patient Engagement: Encouraging patients to actively participate in the management of their hypertension is crucial. This involves not only providing access to technologies but also educating patients on their usage and benefits. Cultural and educational barriers must be considered in patient engagement strategies.

Data Privacy and Security: The use of technology in healthcare generates large volumes of sensitive patient data. Ensuring the privacy and security of this data is a significant challenge, as data breaches can have severe consequences for patients and erode trust in the healthcare system.

Regulatory Framework: Establishing a robust regulatory framework for the use of new technologies in hypertension management is necessary to ensure their safety and efficacy. This includes clear guidelines for device approval, data protection, and healthcare standards.

Interoperability: Various healthcare facilities and providers must work together seamlessly for effective hypertension management. Ensuring interoperability between different technologies and systems is essential to avoid data silos and improve patient care continuity.

Cultural and Social Factors: Cultural beliefs and social norms can impact the adoption of new technologies. Addressing these factors through culturally sensitive healthcare strategies is essential for widespread acceptance and success.

Research and Development: Encouraging local research and development efforts can help tailor new technologies to the specific needs of the Bangladeshi population, potentially making them more effective and affordable.

To effectively treat and manage hypertension using new technologies in Bangladesh, it is imperative to tackle these challenges comprehensively. Collaborative efforts between the government, healthcare providers, tech companies, and the community will be essential to overcome these hurdles and improve healthcare outcomes for all Bangladeshis.

CONCLUSION

Significant new possible consequences for Bangladesh's treatment of hypertension exist. Utilizing technology to enhance early identification, monitoring, and management of hypertension might lessen the strain that the condition places on the medical system and enhance public health in general. But in order for these technologies to be useful, they must be applied carefully, taking into account factors like pricing, accessibility, and data protection—especially for Bangladesh's bigger population. The degree to which these technologies are adopted, the state of healthcare in Bangladesh, their accessibility, cost, and affordability will all have an impact on how these technologies may affect the treatment of hypertension there. Even if these technologies have a lot of potential, it is crucial to make sure that a variety of people, especially those living in rural and impoverished areas, can use and benefit from them. Maintaining blood pressure regulation is the only way to enhance the work environment, guarantee a happy family, and maintain motivation. In order to maximize the benefits of new technologies on the management of hypertension, patients and healthcare providers should be informed about how to use them properly. This includes taking regular blood pressure readings, heeding prescription advice from medical professionals, leading an active life-style, eating healthily, quitting smoking, and consuming alcohol in moderation.

RECOMMENDATION

- ❑ Encourage the adoption of AI technology in the healthcare sector to enable more individualized and effective management of hypertension.
- ❑ Stress the significance of strong data security protocols to safeguard patient data, particularly when integrating AI in healthcare.
- ❑ Encourage patients and healthcare providers to trust one another by adhering strictly to data privacy legislation and standards.
- ❑ Make recommendations for workshops, capacity-building projects, and ongoing education initiatives to keep medical staff members abreast of the most recent developments.
- ❑ Encourage the regular evaluation of the efficacy, efficiency, and moral implications of AI applications in the medical field.
- ❑ Emphasize possible financial savings, better patient outcomes, and the healthcare system's long-term gains.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

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