Vigilance and Monitoring of Hypertension among Rural Population of Indian Villages

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Abstract

In rural India, stroke due to high blood pressure has become one of the main causes of death. However, there aren't many well-proven healthcare strategies to lower stroke mortality in rural areas with little resources. Blood pressure monitoring is now absolutely necessary, especially for the villagers, who should be informed and given the option to have it done at their doorstep. In this article a technology intervention based solution to deal with this nationwide exigent problem is proposed by means of the intervention of low cost technology. It is described how the current technology and data collecting methodology have changed. Also discussed is the strategies for solving the issue related with hypertension.

Keywords: Rural India , Cardiovascular diseases, Hypertension, Stroke, Early detection, Premature mortality, Technology intervention

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1 Introduction

Around the world, 1.13 billion people have hypertension, according to estimates from the World Health organization (WHO) [1]. The majority (around two-thirds), as per the analysis, reside in low- and middle- income nations like India. Approximately 29.8% of Indians [2] have hypertension, with urban areas accounting for 33.8% of cases and rural areas for 27.6%. Many individuals with high blood pressure are unaware of their condition. Those who are diagnosed with high blood pressure may not have access to care and may not be able

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to effectively manage their condition in the long run. This type of silent illness contributes to premature mortality, disability, vision loss, kidney disease or failure, heart attack, brain stroke, kidney failure, sexual dysfunction, and other such disorders. Blood pressure beyond 140/90 is typically regarded as hypertension; blood pressure above 180/120 is regarded as severe hypertension. Many times, high blood pressure goes unnoticed. If left untreated, it can eventually lead to illnesses like heart disease and stroke.

The situation in Indian villages is not as like cities regarding access to health care services, where over two- thirds of our population lives is worse and depends only and only on primary health care centers as being available to the masses. The countermeasures against this kind of health concern is awareness, management, and prevention.

1.63 million fatalities and 33.9 million disability adjusted life years (DALYs) were attributed to hypertension in India in 2016 [3]. according to estimates. Dietary hazards and high systolic blood pressure accounted for 56.4 and 54.6 percent of CVD DALYs in 2016 [4], respectively, and were the main risk factors for cardiovascular illnesses (CVDs). The Indian government has pledged to reduce premature mortality from non-communicable diseases by one-third by 2030 as part of its Sustainable Development Goals, with cardiovascular diseases (CVDs) accounting for more than half of the reduction. Appropriate hypertension management is thought to be able to prevent up to one-third of cardiovascular fatalities [5].

In terms of measurements and research, blood pressure is the parameter that is most frequently used in medical and physiological practices. Only knowing its maximum and minimum values throughout each cardiac cycle, along with data on other physiological parameters, is a great diagnostic tool for assessing the state of the arteries and a few other elements of cardiac performance. Measurements of blood pressure are an essential part of the successful management and treatment of critically ill patients receiving intensive cardiac care or having cardiac catheterization. Numerous approaches have been developed as a result of the extensive research and development for an automatic blood pressure monitor, but only a small number have been marketed because of specific challenges experienced.

As per the Indian population survey our two third population lives in villages. Most of the villagers depends on farming and manual labour as a source of income for their family livelihood. Villagers are less conscious about their health issues due to lack of awareness, literacy, engagement in the daily farming activities compared to the urban population. Most villages neither have local medical practitioner to consult for nor the easy access of medical facilities like pharmacy, pathology etc. Most of the time villagers ignore the minor health related issues. Under normal scenario they give primary importance to the routine farm related activities and secondary to the health as the farm activities cannot be postponed as it is depends on nature cycle. For normal health issues they usually consult nearby pharmacy, local Asha workers and get medicated and do not get proper consultation by the medical doctors. Unless they suffer critical health related issues they never go to the doctors or health centers.

Stroke can be avoided. Ten modifiable risk factors, comprising 90% of the risk of stroke, have been found by the INTERSTROKE study. With regard to this, hypertension is the main risk factor and contributes to around 50% of the risk of stroke. As a result, controlling hypertension becomes a key goal in the fight against stroke. In addition to being the number one risk factor for death, hypertension kills 9 million people annually around the globe, and the World Health Organization views hypertension control as a "best buy" in order to lower cardiovascular deaths. In spite of this, rural India still has poor screening, diagnosis, and management of hypertension [6,7].

Most people with hypertension are unaware of the problem because they never experience any warning signs or symptoms. Which is why WHO categorized hypertension as the “silent killer.”

For this reason, it becomes very essential that blood pressure is measured regularly specially for the villagers at their doorstep as per their convenience and they should be informed accordingly.

The only way to detect hypertension is to have a trained health worker measure blood pressure. Having blood pressure measured is quick and painless. Although individuals can measure their own blood pressure using automated devices, an evaluation and analysis by a health professional is important for assessment of risk and associated conditions [8,9].

Looking at the importance of such a critical problem in the villages, it is proposed to suggest the intervention of technology to save the life of Indian villagers.

2 Materials and Methods

Although there are many different BP measuring devices available in the market, the proposed design for this type of application must have the following features: portability, usability, and easy patient data transfer. Mobility includes the capacity to move from one village to another and to connect to other electronic equipment such data processing and controlling units, Internet of Things (IOT)-based services, and cloud databases that can be accessed from a distance. With touch screen displays and hierarchical menu driven profiles that may be utilized to enter the patient details and important statistics, ease of use can be achieved. Using currently in use IOT-enabled services, data transmission across everything throughout all locations for a village environment. The best way to address this hypertension and related issue may be to provide basic healthcare services right to the villagers' doorsteps. Therefore, it is imperative that patient care and monitoring be moved outside of the hospital. The main components of an NIBP (non-invasive blood pressure) monitoring system are depicted in Fig. 1. This type of system is appropriate for use in rural areas where residents can receive alerts about their blood pressure from stations that are monitored remotely without having to visit the hospital.

The oscillometric measurement principle is the foundation of the majority of BP monitoring devices. The patient cuff is automatically inflated using an air pump. The membrane-type pump is housed in a casing filled with foam rubber to reduce noise. The pneumatic unit has damping chambers to (i) stop a pump-induced rapid pressure increase, (ii) slow down a measurement-induced rapid pressure shift, and (iii) smooth out bleed valve-induced rapid pressure pulses. A safety valve operates normally at 330 mmHg and avoids unintentional cuff from over pressurization. The pressure in the cuff is released through a bleed valve. Pulse width modulation controls the valve's opening between 100% (completely open) and 0%. (Valve fully closed). An exhaust valve is offered to swiftly deflate the cuff. A driver circuit regulates the solenoid (magnetic) valves and the air pump. A watch dog timer stops an inflation from lasting too long. Microprocessors control both the pump's functioning and the operation of the valves.

The existing BP measuring devices needs to be modified as per the application which demands portability, usability, and easy patient data transfer. The main important feature of the proposed system is the ability to upload the patient data along with their details over the cloud data base for further analysis and tracking of measurements over time. An Internet of Things (IOT)-capable module is used for this data transfer. This real time data base can be remotely accessed by the nearby primary health centers, Asha workers or trained NGO volunteers [10].

It is proposed to conduct the measurement of BP and data collection in the village by the trained volunteers in the village itself at their doorsteps by a young student recommended by school Head master, principal, sarpanch, police patil, Asha worker, any NGO working in the village.

Data analysis will be done by the faculty at the monitoring stations. During the real time data analysis which will be done at monitoring stations, hypertensive cases which needs immediate attention and further monitoring will be sorted out and those villagers will be alerted by means of a mobile message at early stage so that future complications due to high BP can be avoided. Once the hypertensive cases are identified, they will be provided with suitable medication by nearby primary health centers, Asha workers or trained NGO volunteers. Further monitoring of such patients will be carried out on the regular basis. Also the diagnosis will be verified by a doctor in the clinic, who will also treat patients according to recommended protocols and monitor their progress. Once each month, community health worker will visit patients at home to check on medication compliance and offer suitable advice. on cutting back on salt intake, quitting smoking, and giving up alcohol. The EUC arm will advise households about the drawbacks of tobacco usage and how to stop using it. Out of this study, it is also feasible to determine the reasons of hypertension and unhealthy habits like salt consumption, tobacco and alcohol etc. established by the villagers, and relevant awareness-raising techniques can be implemented to eradicate issues related with hypertension.

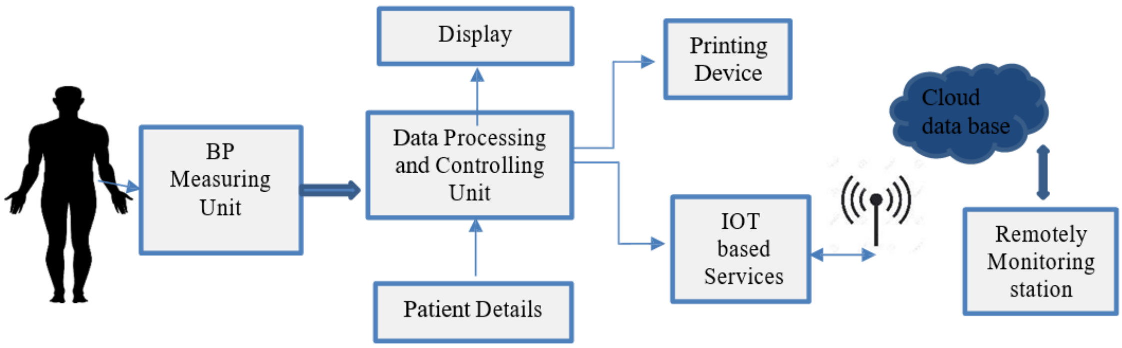

Figure 1. Block diagram of blood pressure monitoring system

3 Results and Discussions

In rural India, there are a number of obstacles to the prevention and management of stroke and associated risk factors. These illnesses continue to have low levels of awareness. Diabetes and hypertension frequently have no symptoms, which delays diagnosis. Only a small percentage of individuals acquire a confirmed diagnosis following screening, and screening facilities are not generally accessible. The lack of affordability, accessibility, and prioritisation of care makes it difficult to maintain continuity of care, which results in less-than-optimal control of many illnesses.

The simplest solution to this problem can be the early detection of hypertensive cases and connecting them to the appropriate medical professional. It will certainly help to reduce premature mortality to great extent. The ultimate goal of this study is to employ technology for the public, particularly those who are from rural India and without access to even the most basic medical facilities. It will also be expanded to the other communities depending on how successfully this work turns out.

4 Conclusion

According to studies from numerous government and non-government organizations, it is no longer possible to ignore or postpone the national health priority of diagnosing, treating, and controlling hypertension. Government and social organizations need to address it right away with an appropriate action plan. This kind of study make it possible to identify the causes of hypertension and the unhealthy habits developed by the villagers, and also allow for the implementation of appropriate awareness-raising strategies to address hypertension-related problems nationwide.

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