**Chapter II**

**REVIEW OF LITERATURE AND STUDIES**

In this chapter the researchers gathered thorough information to present well the related literature and studies. The researchers think and analyze the concept of the research to form a conceptual framework to fully understand the research to be done.

**Related Literature**

**Blood pressure**

It is when your heart beats, it pumps blood throughout your body to give energy and oxygen one’s body need. When the blood moves, it pushes through the side of the blood vessels. The pressure of this pushing is your blood pressure. If your blood pressure is too high, it puts extra strain on your arteries and heart may cause heart attacks and strokes. Also if when your blood pressure to low it may lead to dizziness and weakness but also fainting and a risk of injury from falls. Blood pressure is determined both by the amount of blood your heart pumps and the amount of resistance to blood flow in your arteries. The more blood your heart pumps and the narrower your arteries, the higher your blood pressure. Blood pressure is characterized into two types High blood pressure and Low blood pressure.

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**Low Blood Pressure** (Hypotension)

The condition when the systolic blood pressure of less than 90 millimeter of mercury (mm Hg) or diastolic of less than 60 mm Hg is generally considered to be hypotension.

Hypotension is the opposite of hypertension, which is high blood pressure. It is best understood as a physiological state, rather than a disease. Severely low blood pressure can deprive the brain and other vital organs of oxygen and nutrients, leading to a life-threatening condition called shock. Through often associated with shock, hypotension is not necessarily indicative of it. Low blood pressure can cause not only dizziness and weakness but also fainting and a risk of injury from falls. And severely low blood pressure from any cause can deprive your body of enough oxygen to carry out its normal functions, leading to damage to your heart and brain.

**High blood pressure** (Hypertension)

It is the condition which the amount of strain on blood artery walls is to high enough that it may eventually cause health problems. You can have high blood pressure (hypertension) for years without any symptoms. Even without symptoms, damage to blood vessels and your heart continues and can be detected. Uncontrolled high blood pressure increases your risk of serious health problems, including heart attack and stroke.

High blood pressure generally develops over many years, and it affects nearly everyone eventually. Fortunately, high blood pressure can be easily detected. And once you know you have high blood pressure, you can work with your doctor to control it.

**Pulse Rate/Heart Rate**

It is the speed of the heartbeat measured by the number of contractions of the heart per minute (bpm). The heart rate can vary according to the body's physical needs, including the need to absorb oxygen and excrete carbon dioxide. It is usually equal or close to the pulse measured at any peripheral point. Activities that can provoke change include physical exercise, sleep, anxiety, stress, illness, and ingestion of drugs.

**Sign and symptoms**

**Prevention**

You can take steps to prevent high and low blood pressure. These steps include keeping a healthy weight. Being a physically active and following a healthy eating plan that emphasizes fruits, vegetables and low-fat dairy products. Preparing foods with less salt and sodium. Drinking moderate and avoid smoking. Taking a complete

**Factors affecting the blood pressure**

According to [Dr. Hafeza Shaikh, DO](https://www.sharecare.com/doctor/dr-hafeza-shaikh), Cardiology (Cardiovascular Disease)

*“One factor that affects blood pressure is age. With age, sometimes the resistance and the amount of stiffness that the blood vessels and arteries have can change. This can lead to hypertension, or high blood pressure, over time. Other reasons that people get high blood pressure include a couple of rare diseases that may be inherited, or a person may be born with.”*

According to [Dr. Deborah Raines, MSN](https://www.sharecare.com/user/dr-deborah-raines), Nursing

“Blood pressure is affected by any event or behavior that alters the body’s cardiovascular system specifically: peripheral resistance, vessel elasticity or cardiac output

There are a number of factors that cause changes in the cardiovascular system and thereby affect blood pressure. Many of these factors have a short-term effect on blood pressure, but over time the effect may become long-term.

Some of the factors causing a short-term effect on blood pressure are

* Asleep or awake –
* Body position - lying down results in a low ing of BP while sitting or standing results in an increase in BP
* Emotional state - stress and anger increase BP while being relaxed decreases BP
* Temperature – blood pressure will tend to go up when a person is cold
* Sleep apnea - pauses in breathing while sleeping raise blood pressure
* Smoking – increases blood pressure
* Caffeine – increases blood pressure
* Alcohol – increases blood pressure
* Drugs – increases blood pressure

The last four items, sleep apnea, smoking, caffeine and alcohol over an extended period of time can cause the resting blood pressure to increase to the impact of these factors on the heart muscle and vascular resistance of the circulatory system.”

**Why monitoring of blood pressure is important?**

According to the SCIENTIFIC COMMITTEE ON EMERGING AND NEWLY IDENTIFIED HEALTH RISKS (SCENIHR):

“Raised blood pressure throughout its range is the most significant cause of death and disability in the world (Lopez et al. 2006). Accurate blood pressure measurement is therefore vital in the prevention and treatment of blood-pressure–related diseases. Additionally, in very ill patients, accurate measurement of blood pressure is essential for monitoring cardiovascular homeostasis.”

[Dr. Mehmet Oz, MD](https://www.sharecare.com/user/dr-mehmet-oz), Cardiology (Cardiovascular Disease), **said**

“You should get your blood pressure checked regularly because high blood pressure is a silent killer. There are often no symptoms of this potentially deadly condition. So, while you’re going about your day, high blood pressure could be damaging your arteries, your heart, and other organs. The nasty consequences of leaving high blood pressure untreated include stroke, kidney damage, and even erectile dysfunction.”  
He also added “Your risk of high blood pressure increases with age. If you smoke, are obese, are physically inactive, or have diabetes or high cholesterol, you may also be at an increased risk. The good news is that a blood pressure test is quick and painless and can be done at most any doctor’s office, hospital, or clinic. You may also be a candidate for using a home monitoring device. Talk with your doctor about checking your blood pressure at home.”

**REVIEW OF RELATED STUDIES**

According to their research Lui J, G. Balodis1 , Z. Markovics, J. Lauznis and Dr. Joseph Cafazzo the study of android-based monitoring system with uncontrolled hypertension will get their blood pressure (BP) under control. The patient will merely checked their BP at home even there are no guiding of physician. This technology will be very useful and will provide the needs of the patient. This is a hot topic because of the mobility and that sense of connection between patient and the provider.

The usual way of getting the blood pressure by wearing the ambulatory blood pressure device and they have to remember or write down the measured BP. The solution to this problem is to develop a system that a patient’s blood pressure is measured automatically and transferred to the android devices over wireless network. In this device we need a server that collect the data that will be transfer real time information via wi-fi connection. The BP measurement are will be saved into the database that we will operate. The person that have the software device can be also observed and analyse the data through the server.

**The Design of Smart Sphygmomanometer based on Android Mobile Device**

A research done by Gaoxu Deng, Chen Deng, and Yiming Wang designed the intelligent wearable device based on Android phones. Mainly introduces the design and implementation of hardware and software of the Android mobile phones and STM32 as the core, individual blood pressure and heart rate control and measurement. Implements of the Android WiFi control of blood pressure, blood pressure measurement and abnormal warning s a good way to meet the demand for the hypertension patients on blood pressure measurement, has the characteristics of high performance, low cost and low power consumption.

**Detecting Vital Signs with WearableWireless Sensors**

Tuba Yilmaz , Robert Foster and Yang Hao designed wearable monitoring systems can provide continuous physiological data, as well as better information regarding the general health of individuals. Thus, such vital-sign monitoring systems will reduce health-care costs by disease prevention and enhance the quality of life with disease management. In this paper, recent progress in non-invasive monitoring technologies for chronic disease management is reviewed. In particular, devices and techniques for monitoring blood pressure, blood glucose levels, cardiac activity and respiratory activity are discussed; in addition, on-body propagation issues for multiple sensors are presented.

**Mobile personal health care system for patients with diabetes**

Fuchao Zhou propose a personal diabetes monitoring system which integrates wearable sensors, 3G mobile phone, smart home technologies and Google sheet to facilitate the management of chronic disease - diabetes. The system utilizes wearable sensors and 3G cellular phone to automatically collect physical signs, such as blood glucose level, blood pressure and exercise data like heart rate, breathing rate and skin temperature. It allows users, especially seniors with diabetes, to conveniently record daily test results and track long term health condition changes regardless of their locations. It does so without having to ask users to manually input them into the system. The system also utilizes Google sheet to manage Personal Health Records (PHRs), which not only bridges the gaps between patients and different healthcare providers but enabling accesses to patients’ PHRs anywhere and anytime by taking advantage of the universal accessibility of Google sheet. The system further integrates with GPS, Google Search and Google Map functionalities to facilitate the user to find all hospitals near to his/her current location including address, phone number, directions to the selected hospital and street view of the selected hospital.

**A Remote Patient Monitoring System using Android Mobile Devices**

According to Alex Cors Bardolet aim of his thesis is to validate the use of mobile applications for taking care of the health of patients in a preventive way. First of all, the results of a research of the actual state of art are presented. With this results, a proposition is done. This preposition includes the acquisition and realization of some sensors, the realization of a mobile

application and the programming of a server application. The sensors used includes a ex profeso breath rate sensor and a commercial thermistor used for human temperature measures. All this sensors will be connected trough a device that handles the power and communication. After

that, an Android application have been done to control this device and show the results of the measures. The value of the measures are sent to a remote server in order to store information.

At the end, some indications are pointed about how this project could be further developed after discussing the prototype with several professionals of the medicine.

**Design of Wireless Mobile Monitoring of Blood Pressure for underserved in China by Using Short Messaging Service**

A research done by Jiang, Zhuangzhi, Jun, and Prabhu, aims to provide an affordable medical service for community residents by designing an interactive medical monitoring system. This system consists of three units: 1) Smart sensor unit, which is wearable on patient’s arm in order to register the required BP and transfer it by SMS module. 2）The server unit, which enables medical staff in the CHC/P to remotely observe patient’s BP condition through a computer within an existing network. At the same time, the server unit can be connected to the big hospitals through existing internet, and the specialists in big hospitals will give some advises if needed. 3) The terminal unit, which allows Patient/User to access and query the medical bio-data recorded in the server as well as for the information notification (such as alarming function). BP measurement methodology is based on Oscillometric method.

In this design, the terminal unit can be a mobile phone, a Personal Digital Assistant (PDA) or a computer with an SMS receiver. The server will not send a message unless the BP value is abnormal, so it will not affect user’s normal life.

**Abnormal Heart Rate Detection Device Warning via Mobile Phone Network**

A reseach done by Adisorn Sirikham(2010), created a device designed to send rate of heartbeat and warning signal via mobile phone network when 13 abnormal heart rate is detected. The hardware system consists of 3 main parts. The first is heartbeat signal receiving part which detects cardiac electrical signal on the skin. The second part is processing unit part that computes heart rate by using the data from the first part. And the last part is warning sender part that sends heart rate and warning signal to patient’s physician or relative when the system found that the heart rate is abnormal.

**MICROCONTROLLER BASED HEART RATE MONITOR USING FINGERTIP SENSOR**

According to LIENA ELRAYAH ABDELKHAIR KHAIRELSEED presented the design and development of an integrated device for measuring heart rate using fingertip to improve estimating the heart rate. As heart related diseases are increasing day by day, the need for an accurate and affordable heart rate measuring device or heart monitor is essential to ensure quality of health. However, most heart rate measuring tools and environments are expensive and do not follow ergonomics. Our proposed Heart Rate Measuring (HRM) device is economical and user friendly and uses optical technology to detect the flow of blood through index finger.

The goal of this thesis is design low-cost device which measures the heart rate of the subject by clipping sensors on one of the fingers and then displaying the result on a text based LCD. Miniaturized heart rates monitor system based on a microcontroller. It offers the advantage of portability over tape-based recording systems. The thesis explains how a single-chip microcontroller can be used to analyze heart beat rate signals in realtime. the Hardware and software design are oriented towards a single-chip microcontroller-based system, hence minimizing the size. The important feature of this project is the use of Fourier transforms to compute heart rate on real-time. It then processes to provide the information of bradycardia and tachycardia of heart rates and notified the user if the heart rate exceed the maximum allowable. It will be shown that the device meets diverse and conflicting requirements, including reliability, minimum loading effects, and low battery power consumption.

Qualitative and quantitative performance evaluation of the device on real signals shows accuracy in heart rate estimation, even under intense of physical activity. We compared the performance of HRM device with Electrocardiogram signal represent in oscilloscope and manual pulse measurement of heartbeat.

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| |  | | --- | | **Conceptual Framework of the Study**  Output  Process  Input     * Blood Pressure and Heart Rate Monitoring System * Documentation * Planning and Designing of the system * Gathering of materials and selection of software to be use * Circuit Construction * Programming * Assembling and interfacing * Testing and evaluation * Concept about Blood Pressure and Heart Rate * Information about thesis design * Consideration of materials and software to be use * Knowledge about microcontroller * Knowledge about the sensor programming | |
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Inputs are the concepts about blood pressure and heart rate and information about the thesis that will contribute to the development of the system, consideration of materials and software to be use made by the researchers was based on the knowledge gain by the researchers including the knowledge in the sensors and microcontroller. In the process state planning and designing of the system and gathering of the materials and selecting of best software application are determined for programming of the software part of the system. On the other hand, circuit construction is for the hardware part of the system and assembling and interfacing is for the individual components of the system will able to communicate to each other. Afterwards, testing and evaluation are done for to see if the system is able to comply to the desired function of the whole system. And for the last, monitoring of the blood pressure and the heart with along with the proper documentation will be the final output.