UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BLOOD GLUCOSE TEST DEVICE VIA GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

This report submitted in accordance with requirement of the UniversitiTeknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Type your Department's course here) (Hons.)

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **BLOOD GLUCOSE TEST DEVICE VIA GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)**

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I hereby, declared this report entitled "Blood Glucose Test Device via Global System for Mobile Communication (Gsm)" is the results of my own research except as cited in references.

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Date   **:** 10thDECEMBER 2015

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Bachelor Degree of Electronic Engineering Technology (Telecommunications) (Hons.). The member of the supervisory is as follow:

………………………………….

(Win Adiyansyah Indra)

ABSTRACT

Blood glucose care is one element in the care blood glucose levels at home. Diabetes is increasing now that this will delay the process of examination of the patient in hospital. For the elderly have to wait too long for their turn. Those who are suffering from diabetes, consists than about the elderly, therefore, this project are designed to facilitate the patient's health, going to hospital if necessary, since the patient will always checking glucose levels from time to time. Then a project designed to help patients control or determine the level of blood glucose at home and that information will be sent to the person responsible for diabetics using the GSM module to the mobile phone via SMS. Arduino board is used to measure blood glucose levels.This project is designed to be user friendly it can carry anywhere or even overseas.

ABSTRAK

Penjagaan glukosa dalam darah adalah satu elemen dalam penjagaan tahap glukosa dalam darah di rumah. Sekarang ini penyakit kencing manis semakin meningkat ia akan melambatkan proses pemeriksaan terhadap pesakit di hospital. Mereka yang menghidap kencing manis, terdiri daripada kira-kira orang tua. Olehitu, projek ini direka untuk memudahkan kesihatan pesakit, pergi ke hospital jika perlu, kerana pesakit akan sentiasa memeriksa paras glukosa dari semasa ke semasa. Untuk warga emas perlu menunggu terlalu lama untuk giliran mereka. Kemudian projek ini ialah untuk membantu pesakit mengawal atau menentukan tahap glukosa dalam darah di rumah dan maklumat tersebut akan dihantar kepada orang yang bertanggungjawab untuk pesakit kencing manis dan ia menggunakan GSM sebagai alat komunikasi dan dihantar ke telefon bimbit melalui SMS. Arduino digunakan untuk mengukur paras glukosa dalam darah. Projek ini direka untuk menjadi mesra pengguna itu boleh menjalankan mana-mana sahaja atau di luar negara.

DEDICATIONS

To my beloved parents, family members, and friends for your supports,

encouragements, understanding, and all the favour. May God bless all of you.

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CHAPTER 1

INTRODUCTION

1.0   Introduction

This chapter is discussed about the project background, the problem project, the objective of the project and project scope.

1.1   Background

The world today is much dangerous disease in itself, diabetes is a dangerous disease. Diabetes require regular treatment phase by the experts. Of the observations that have been made, the statistics diabetes worldwide is increasing year by year. The percentage derived from the observations that have been made, the elderly, which recorded the highest percentage of diabetes. Consequently, much of the equipment is designed to check blood sugar levels to their own knowledge and if the results are not satisfactory, the patient will go on referring doctors or people who are more expert on this disease.

Therefore to make it easier for patient glucose care created. This project will be specially created for all, regardless of the community, especially to those suffering from diabetes. As used in hospital the same system can be used for a person who is not under the continuous observation of doctor, can check people vital signs using the sensors in this project if sensors output starts fluctuating above normal rate hence through GSM network sends an indication to doctor's mobile immediately.

The topic suggests that a blood glucose meter combine with wireless device. The glucose care designed to facilitate the people and it is able to transmit the results of blood sugar levels to relate person. The ardiuno as a tool for testing blood sugar levels using a glucose sensor. When the results of the inspection blood sugar levels by glucose care, are obtained the test results then will be sent to relate person by using GSM.

1.2   Problem Statement

Today, diabetes is often associated with the elderly it may cause problems to the patient for the shuttle to the hospital every week or every month, sometimes the patient takes a long time to wait for their turn to check the level of their diabetes. Of the observations that have been made, a project to make it easier for diabetics to be created, thereby the patient will not be shuttles to the hospital again, the patient will check their own levels of diabetes and the decision will be sent to a doctor or a person related to them for further action.

Nowadays many gadget glucose meter is used manually and variety of glucose level monitoring equipment and a variety of brands. In this situation for diabetic or normal person would checks blood sugar levels alone or involving doctors using the tools available in the market. Lack of monitoring glucose levels available are not able to send test results to a particular person. Thus, this project will become one of the project can help people for their convenience to diabetics checks blood sugar level at home and facilitate all parties, and especially for those who work away from the family, with the creation of glucose care, family member or doctor can monitor the patient's progress from time to time, even over long distances. With a combination of glucose care and GSM, it can send the results to a specific person and action will be taken immediately.

1.3   Objectives

The main objective of this project is to build a glucose care to be implemented for monitor diabetics at home. In order to make this project successful, the objectives have been declared these objectives must be achieved in completing this project. Objectives are a guidance of any project, so the objectives have been listed below.

- To find out about arduino and GSM module to create glucose care and knows how it work together.
- To analysis the glucose care project can transmit the result using GSM
- To created the glucose care for help monitor diabetics at home.

1.4   Project Scopes

To achieve the project objectives, the scope of this project is to build a system that will function properly based on the objective and to solve problem faced as much as it can. The scope of this project is to build a glucose care using GSM. There are two part of the project, the first part is hardware and the second part is software.

The first part is hardware it consists of glucose sensor, arduino module, GSM (Global System for Mobile Communication). The cellular should be used with GSM module to display a message from glucose care.

The second part is software it consists of coding for microcontroller are using an arduino module and GSM module. The processing is done by the microcontroller and the level glucose will be display on the LCD at arduino module. The Strips for blood sugar checks can only be used once per test.

CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

2.1   Diabetes

Diabetes is a metabolic illness in which a person had high blood sugar levels. It is caused by insufficient released of insulin by the pancreas or the cells are not reacting to the insulin generated. Generated high blood sugar symptoms common for the patient, to polyuria (pass urine frequently), polydipsia (increases thirsty) and polyphagia (increase hungry). Among Symptoms that can arise when a person had high blood sugar levels. These symptoms are caused by one's own biology.

There are three types of diabetes, the first type of diabetes is most dangerous when the body fails to produce enough insulin, and it is caused by beta cells in the pancreas that produce was destroyed by the immune system. When the disease has been confirmed, the patient must take insulin injections or use an insulin pump. The disease usually starts from childhood or adolescence.

It is the second kind of situation (Marks, 2003) "resulting from impaired insulin utilization coupled with the body" s inability to compensate with increased insulin production "or in other terms is that when cells do not respond to insulin. This type usually strikes adults people and obese people. The third kind of is diabetes during pregnancy. It is caused by high glucose in the blood when a woman is pregnant.

2.1.1.1 Hyperglycemia and Hypoglycemia

According to (Saptari, 2004)Hyperglycemia and Hypoglycemia refer to medical conditions that exhibit abnormally high or low blood glucose/sugar levels. Diabetes is a condition in which the pancreas of the body ceases to produce insulin, which controls blood glucose levels. The causes of diabetes in humans are not yet fully understood, but the widely accepted hypothesis is that it may be genetic and may be caused by a high sugar intake as part of a daily meal serving.

By following (Saptari, 2004) Once diabetes is diagnosed, the blood sugar level needs to be continuously monitored in order to facilitate medicinal insulin intake. Patients with hyperglycemia, in which continuously high blood glucose levels are exhibited, may require continuous blood glucose monitoring. This will require a continuous supply of blood from the patient as current measurement devices invasively monitor sugar levels, which sometimes leads to other complications such as hemorrhaging, blood loss, and other irritable conditions. Non-invasive techniques resolve blood requirement issues. This article explores and implements a non-invasive approach to blood glucose monitoring.

2.1.2 Blood Sugar Level

Low Blood Sugar (Hypoglycemia) = 0-70 mg/dl
Normal Blood Sugar = 70-135 mg/dl
High Blood Sugar (Hyperglycemia) = 135-450 mg/dl

2.1.2.1 Importance of controlling blood glucose level

Blood sugar levels has three categories which hypoglycemia (low blood sugar), blood glucose levels are normal and hyperglycemia (high blood sugar levels). Measurement of blood glucose levels 70mg / dl to 100mg / dl for children and 70mg / dl to 150mg / dl for adults. When the level of glucose in the blood ascending until 150mg / dl it is called hyperglycemias and when glucose levels below 70mg / dl it is called hypoglycemia.

To ensure that good health is very important to control the level of glucose in the blood. Based on the observations that have been made, the cause of diabetes is dependent on a person's lifestyle regardless of age. Hence, health care is very important to avoid health complications will arise.

2.1.2.2 Prevalence of Diabetes in the Malaysian National Health Morbidity Survey III

(G R Letchuman*, 2010)The Malaysian National Health Morbidity Survey III (NHMS III), conducted in 2006, was a cross-sectional household survey of the prevalence of chronic diseases, involving34,539 respondents of age > 18 years old, in all states of Malaysia. Data collection was by face-to-face interview. Those who self-professed not to be diabetics underwent finger-prick glucose test following at least 8 hours of fasting. The overall prevalence of diabetes mellitus (known and newly diagnosed) was 11.6%. The Indians had the highest prevalence of 19.9% followed by Malays 11.9% and Chinese 11.4%. The prevalence of people with known diabetes and newly diagnosed diabetes was 7.0% and 4.5% respectively.

Impaired Fasting Glycaemia was found to be 4.2%. Majority (73.5%) of the patients used government healthcare facilities for their diabetic care. Usage of insulin alone or in combination was low at 7.2% of patients. Only 45.05% of known diabetics have ever had their eye examined. Amputees formed 4.3% of the patients with known diabetes while 3.4% had suffered a stroke event and 1.6% was on some form of renal replacement therapy.
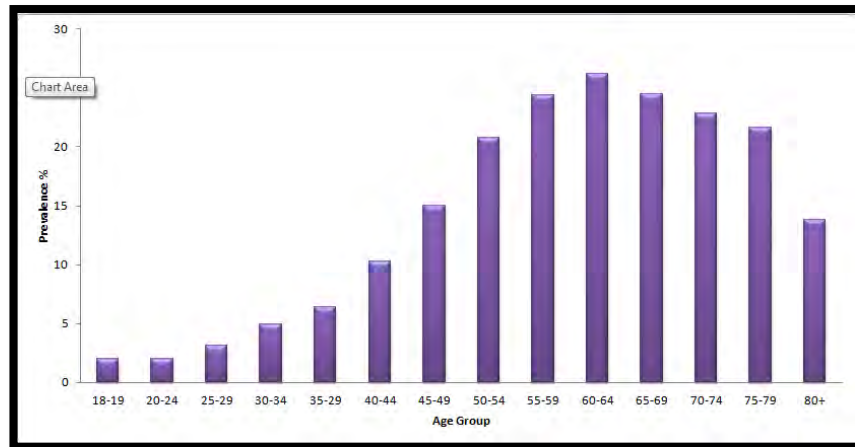
Figure 2.1: National prevalence of Diabetes Mellitus by Age Group.

(G R Letchuman*, 2010)

2.2 Previous Journal Related

2.2.1.1 A Mobile Phone SMS-Based System for Diabetes Self Management

According to (Salameh, 2012) this paper presents a mobile phone SMS-based system for self management of diabetes. The system is designed to be a long term health for patients with diabetes. It allows the patients to get connected to their physician constantly. Through the exchange of SMS massage the patients sent their insulin measurements, insulin intake and the other data to the physician making continuous health monitoring possible. Based on the data sent, return SMS massage can be sent to motivate patients or to remind them of activities such as exercise and health care appointments.

2.2.1.2 Wireless sensor networks to monitor Glucose level in blood

(Dr .S. Padmapriya (Guide) (per 1st) Affiliation, 2013) With advancements in Sensor Technology, the Wireless Sensor networks offer attractive solutions to many problems in process monitoring systems. The WSN has abundant applications in continuous or discrete monitoring systems irrespective of the field.

The Biocompatible wearable sensors allow vast amounts of data to be collected and mined for clinical trials, reducing the cost and inconvenience of regular visits to the physician. Implying this concept, our project is used to track diabetes using a wireless sensor network as an implant to continuously monitor the patient's blood glucose level. The sensor implanted in the body identifies the level of glucose in blood. The level thus measured needs to be monitored. The most conveniently used method to monitor the implant would be to use a detector to telemeter the collected sugar concentration to an external receiver.

In the case of our project, we aim to replace the detector by transmitting the monitored data as a message to the patient's cell phone itself. This is a simple and an efficient way to make the process less strain full for the patient and also relatively cheaper. Thus the sensor can effectively monitor the glucose level and can also send a notification message to the patient, thereby reducing the need of tedious physical processes by the use of smart futuristic technology.

2.2.1.3 A Ubiquitous Based System for Health Care Monitoring

(S. Monicka1, 2014)IJSRET (July 2014). Mobile phone technology has advanced in recent year. Many innovative applications with mobile phones were implemented apart from the conventional voice data transfer. Short Message Service (SMS) originally developed for sending status information by the service providers has found numerous applications recently including business transactions. This paper describes, a prototype of a wireless health monitoring system capable of sending SMS related to the health status of the patient developed using Arduino and GSM technology. It is a combination of ubiquitous computing with mobile health technology to monitor the well being of patients.

The arduino analyses the data in real-time and determines whether the person needs external help. It interfaces with medical devices and offer suggestions based on the readings.

When anomalies are detected or a threshold is reached, the monitoring system automatically transmits the information to the doctor's hand phone on the mobile network as a SMS message via a GSM and in case of critical conditions it automatically gives SMS or call to the ambulance. It mainly focuses to improve the health of people, reduce in Hospitalization and Assistant Cost and could ease the burden on the health-care system.

2.2.1.4 Blood Glucose Monitoring System Having Wireless Communication Module to Which Time Synchronization Method is ApplieD

(Chang Woo Ryu, 2014). The present disclosure relates to a blood sugar meter system with a wireless communication module, and more particularly, to a time synchronization method between a blood sugar meter system with a wireless communication module synchronization with a cellular network such as a global system for mobile communication (GSM) network and the cellular network. the present innovation provide a blood sugar meter system with a wireless communication module applying a time synchronization scheme including, a global system for mobile communication (GSM) network transmitting network identity and time zone (NITZ) information. And a blood sugar meter metering user's blood sugar data, wherein the blood sugar meter synchronization with an internal time of the metered data and transmits the metered blood sugar data to a server connected to the GSM network.

2.3   Authentication Methods

2.3.1   Glucose Meter

Glucose meter is a medical device for measuring the level of glucose concentration in the blood of patients. It is a tool for home glucose monitoring for people with diabetes or hypoglycemia. The use of glucose meters, it requires a drop of blood obtained from puncture the skin with a scalpel and the blood will be put on the meter test strips to determine the level of glucose in the blood. On-screen meter will display the level of glucose in mg / dl or mmol / l.
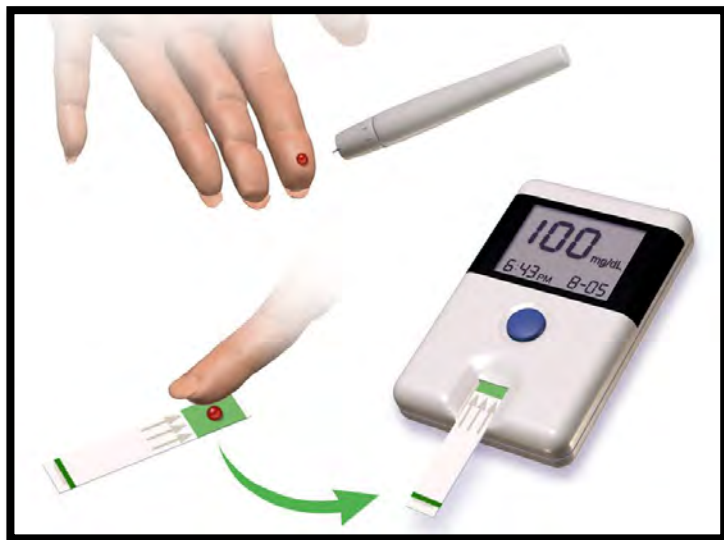

Figure 2.2: Glucose Meter