Developing Mobile Knowledge Base System prototype for selected chronic disease (diabetes, hypertension, HIV)

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ABSTRACT

Nowadays, many different types of health problems do exist in the environment that we are living in. Among those, some of them are live with patients throughout their lifetime. Diabetes, hypertensions, HIV, Cardiac, Cancer, etc. are some of them. These types of diseases need continuous healthcare services and lifelong physician consultation.

Ethiopia is a one of the developing country in which the vast majority of the population experience extremely limited access to medical care services, medical institutions and health extension programs especially chronic disease patients which needs continuous healthcare service and lifelong consultation.

These days information technology is growing rapidly and is being apply in different areas. This results in increase in productivity, quality of service and improved efficiency and effectiveness of the organization.

Mobile phone knowledge base system is an intelligent software that deployed or accessed through mobile devices, and it provide a knowledge base system services for clients with poor medical facilities. Like lack of experienced medical personnel and people having insufficient income to get proper medical attention and care.

As a result, objective of the study was to investigate the applicability of rule-based reasoning approach in the development of mobile knowledge-based system for selected chronic disease that can simulate the services of medical experts.

To achieve this objective, knowledge is acquired using both structured and unstructured extensive interviews with domain experts, which are selected purposively from Tikur Anbessa (Black Lion) Specialized Hospital and Adama Hospital and Medical College. Additionally, knowledge is acquired from secondary sources by using document analysis method of knowledge elicitation.

The knowledge acquired is modelled using decision tree structure and decision table that represents sign and symptom, complication and procedures involved in disease diagnoses. Based on the model, the prototype is developed with JESS which is a rule-based engine with scripting environment and can be used to build Java software that has the capacity to “reason” using knowledge that has been supplied in the form of declarative rules. JESS uses an enhanced version of the Rete algorithm to process rules.

The outcomes of this study are an *Amharic* web application and two Mobile applications prototypes in which the first is an android application to deploy on smart phones and the other is a java application that can deployed under any non-smart phones with a java virtual machine. Those

applications enable to provide widespread knowledge base system services for clients through their mobile phones or their computer.

Prototype evaluation with domain experts shows 88.2% user acceptance, which is very good based on per defined evaluation standards or measurement criteria. In addition, the performance of the system is evaluated by using predictive validation techniques with fifty-six test cases. The results of the validation test case indicate that the prototype is about 85.7% accurate.

The prototype knowledge-based system needs further studies to expand its scope and to enhance the performance of it by integrating with other knowledge representation techniques.

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Contents

List of Acronyms and Abbreviations

AIDS: -	Acquired Immunodeficiency Syndrome
CDC: -	Centers for Disease Control and Prevention
CD4: -	Cluster of Differentiation
CVD: -	Cardio Vascular Disease
FBG: -	Fast Blood Glucose
GDM: -	Gestational Diabetes Mellitus
HDL: -	High-Density Lipoprotein
HIV: -	Human Immunodeficiency Virus
IGT: -	Impaired Glucose Tolerance
IFG: -	Impaired Fasting Glucose
JESS: -	Java Expert System Shell
JVM: -	Java Virtual Machine
J2ME: -	Java 2 Platform, Micro Edition
OGTT: -	Oral Glucose Tolerance Test
PCOS: -	Polycystic Ovarian Syndrome
RBG: -	Random Blood Glucose
RPC: -	Remote Procedure Call

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Healthcare problems are crucial to the overall well-being of individuals, societies, and countries. It is because of lack of continuing medical education programs, skill, qualified staff, personnel, economy and infrastructure it is difficult to provide proper treatment to clients especially in developing countries [1]. Different types of health problems are available throughout the world; some diseases live with patients throughout their lifetime. Diseases like diabetes, hypertensions, HIV, cardiac, cancer, etc. are some of them and need continuous healthcare service and lifelong consultation [2]. The vast majority of diseases are self-limiting or can be treated with the knowledge and skills that a qualified medical doctor is trained for.

As the number of people living with chronic disease rises at higher rate and they need continuous health care service and lifelong consultation, there is a need to better manage the patients, and to respond quickly to their problems for appropriate care, treatment, advice and follow-up.

To provide such treatment and improve their life style there should be a technological support on medical and health sector which enables patients' to be engaged in self-management of diseases. Self-management in medical and healthcare service especially for patient with chronic diseases will facilitate and helps to [3]:

- Understand their condition and various treatment options
- Review and monitor a plan of care (e.g. care plan)
- Engage in activities that protect and promote
- Monitor and manage the symptoms and signs of the condition
- Manage the impact of the condition on physical, emotional and interpersonal relationships.

Improvements of technology and self-managements of client in medical and healthcare service have helped people around the world to live longer with a better quality of life. New medical technologies and improvements in health information systems have benefited medical supply and provisions of patient diagnosis and treatment services [4]. One of the technologies which is currently used in medical and health sector environments is knowledge base system. Knowledge base system is an intelligent software application that utilizes acquired expertise from experts and knowledge from different source, in a specific domain to provide expert wise information in

nonexistence of the expert, to its users through a dialog or a conversation conducted between the user and the KBS application [5].

KBS provides a technique to model the reasoning processes of experts and use their knowledge to solve specific problems [5]. It is being increasingly used in medical environments such as hospitals, pharmacy, health extension, laboratories, and intensive care units, with a view to the improvement of the quality of healthcare services and reducing the likelihood of incorrect medical decisions.

Transformation of KBS into a mobile phone-based solution would extend their benefits, facilitate and integration into medical environments. It can also play a major role by providing support in common clinical problems like prediction of diseases, prevention of diseases, diagnosis of diseases, provision of patients with medical information [6].

Mobile phones are nowadays the most popular and widely used means of communication for its compact size, versatility, wireless communication, increasing capabilities and ease of handling [5].

It is frequently referred to as "Constrained Computing Devices" for its limited processing, storage and display capabilities. Whereas nowadays mobile is becoming an important ICT tool not only in urban regions but also in remote and rural areas. The rapid advancement in the technologies, ease of use and the falling costs of devices, make the mobile an appropriate and adaptable tool to bridge the digital divide [5]. Most of the mobile devices are more appropriate tools and have become an inseparable part of our life, so as the need for mobile-based healthcare service become substantial as it integrates healthcare more seamlessly to our everyday life [7].

Mobile phone knowledge base system is a computer program that simulates the judgment and behavior of a human that has expert knowledge and experience in a particular field; that can be deployed or accessed through mobile devices to provide a knowledge base system services. The development of a mobile-based healthcare service for medical consultation and support makes it possible for patients to interact with a doctor-like application with a fast response time [7]. Such system reduces long queues, patients' ups and downs in hospitals and it enhances self-medication of clients through a real-time exchange of information using mobile devices.

1.2 Motivation for the study

Currently, knowledge-based systems are receiving much attention in many fields of areas. Medicine is one of the areas in which knowledge-based systems received much attention mainly because of the potential benefits that can be gained from using these technologies [40].

The existence knowledge base system is critical to automate and to over-come the shortage of human experts in the medical and healthcare services, especially in areas with poor medical facilities, like lack of experienced medical personnel and people having insufficient income to get proper medical attention and care [40].

In our country designing an expert system in the medical domain is found at the infant stage and small number of researches were done on medical expert and those research shows green light on the possibility of implementation knowledge-based system in the medical domain.

This further motivate to the researchers to design and develop knowledge-based system prototype for the selected chronic disease using different algorithm, tools with a mobile and web-based future and it also uses local language to improve the validity and acceptability of the prototype.

1.3 Statement of the Problem

Healthcare services in our country, Ethiopia and in developing countries have few experienced medical staff, less infrastructure and almost no information communication technology support in place [8]. This makes it hard to provide efficient and proper medical attention for clients especially for those who need continuous healthcare service, like person with HIV, Diabetes mellitus, hypertension, cardiac. These constraints, added together with poverty situations of the countries, have made it even more difficult to provide proper and effective medical and healthcare services [1].

Most of urban and rural communities in Ethiopia have extremely limited access to medical care services, hospitals, clinics, pharmacy and health extension due to the reasons, the most prevalent existing problems in healthcare service include the small number of medical staff ,Under qualified medical personnel in the healthcare institution ,Lack of immediate & on time treatments because clients are expected to wait for their turn ,work overloads of medical personnel ,Cannot get medical service at any time and everywhere ,not economical ,no fair share of medical attention. The nature most of chronic disease need continuous healthcare services and lifelong psychological consultations. However, in our country, there are no sufficient numbers of specialists and medical doctors.

Because of this problem, patients are not getting enough diagnoses and treatment specifically, in patient with chronic disease which needs a continuous healthcare services and lifelong psychological consultations. This motivate the researchers to focus on representing and modelling domain knowledge of experts in the field by designing and developing a mobile phone

knowledge-based system prototype so that the research output would serve as a highlight to provide expertise diagnosing and advisory service in the area where highly qualified specialized experts are unavailable. Thus, the significance of conducting this research is showing the applicability of web and mobile knowledge-based system to support chronic patients (patient with diabetes, hypertension and HIV) in the diagnosis and treatments process.

In Ethiopia designing an expert system in the medical domain is found at the infant stage and small number of researches were done on medical expert.

Berhanu Aebissa (2012) worked on the development of KBS for coffee disease and pest control where it is intended for the diagnosis of common diseases and pests occurring in the coffee plant. objective of the study was to develop a prototype knowledge-based system for coffee diseases and pests' diagnosis and treatment in order to provide better information for non-experts (farmers), directly or indirectly, about major pests and diseases that threaten coffee production in Ethiopia, especially at places where there are less number of experts to assist them and, as a consequence, to empower them to take actions on the constraints occurred as required. To implement the system prolog programming language was used and the knowledge is represented in the linguistic form of IF-THEN rules. Finally, the researcher recommended as it will be more attractive and effective if a Web-based version of it is developed as if it would make the diagnostic system accessible to anyone (particularly scattered users) with a computer and an Internet connection and developing an expert system in agriculture area using the mother tongue of the farmer, helps him/her to know the facts and truths and to increase production.

Seblewongel (2011) has conducted a study on developing a prototype knowledge-based system for anxiety mental disorder. Objective of the study was to design and develop a prototype knowledge-based system for diagnosing a patient with anxiety mental disorders with the overall aim of exploring the applicability of knowledge-based system technology to the specific area. This study was made in an effort to explore the application of knowledge-based systems in mental disorder diagnosis and develop prototype knowledge-based system for anxiety disorders diagnosis. The system helps to identify and screen out the disorder type and the primary actions to be taken for the identified disorder accordingly. The researcher used rule-based technique and back ward chaining mechanism to achieve the proposed objective. The findings of the study revealed that the proposed knowledge-based system was applicable to the domain area and the results of the study showed that the system has gained a promising user acceptance. Finally, the researcher recommended as if the prototype should be fully implemented with all its

functionalities and integration of rule-based system with case-based techniques should be made for a better result.

Those researches were designed and developed as standalone system and they were not localized, they do not have good user interface even if those research have those limitation the research show light that initiate other researcher to try different approach, tools and domain to improve prototype result. This study tried to improve their result by using different algorithms, tools, approach and domain and use local language.

This research attempts to give light as alternative means of diagnosing to the conventional way of diagnosing chronic disease. In this regard, the application of knowledge-based system technology, particularly in the area where highly qualified shortage of experts there, is the best solution to solve those problems. This research explores the applicability of using mobile knowledge-based system technology in the domain of chronic disease diagnosis by developing rule-based systems prototype that can diagnose patients with chronic disease specifically diabetes, hypertension and HIV.

In General, shortage of health professionals and their unfair distribution throughout the country and research done before motivate the researcher to focus on representing and modelling domain knowledge of experts in the field so that the research output would serve as a highlight to provide expertise diagnosing and advisory service in the area where highly qualified specialized experts are unavailable.

To achieve the goal of the research this, study an attempt is made to investigate and address the following research questions: -

- How to extract tacit and explicit knowledge on types of disease, symptoms and diagnosis techniques of continuous healthcare service provision of identified chronic disease?
- How to model and represent knowledge acquired from domain experts and codified sources?
- How to build a rule based expert system prototype for mobile phone and web-based system which diagnoses and advises user with chronic disease?
- How to measure the performance and user acceptance of the prototype system

1.4 Objective of the Study

1.4.1 General Objective

The main objective of this study is to design and develop a web and mobile knowledge-based system prototype for diagnosing patients with chronic disease specifically patient with diabetes, hypertension, and HIV to exploring the applicability of mobile knowledge-based system technology to the specified domain.

1.4.2 Specific Objectives

To achieve the general objective, the following specific objectives are formulated.

- To review related literature for better understanding of domain and to acquire the necessary tacit and explicit knowledge from primary and secondary sources
- To select suitable techniques, tools and algorithms used for developing mobile phone and web application expert system prototype for selected chronic disease.
- To model and represent the acquired tacit and explicit knowledge
- To develop web and mobile phone knowledge base system prototype for diagnosing the selected chronic disease based on acquired knowledge.
- To evaluate the performance of the web and mobile phone knowledge base system prototype.

1.5 Scope and Limitation of the Study

As noted by world health organization [10]; most common chronic health problems of developing countries are HIV, cardiac, Diabetes mellitus, Hypertension. All of these chronic health problems need continuous healthcare service and consultation by medical experts. This study therefore focused on exploring the possibility of modeling and developing web and mobile phone knowledge base system prototype for diabetes mellitus, hypertension and HIV healthcare problems that need experts' continuous support and follow-ups.

The reason why this research focuses on diabetes mellitus, Hypertension and HIV diseases diagnosis and treatment is the nature of those disease needs continuous healthcare support throughout thire life time to proved such support it is difficult with in the current system, domine experts also remommeds us to work with selected disease because those disease are largely available in Ethiopian.

To explore knowledge of this study we used multi-knowledge collection methods to gain in-depth understandings of domain, among those domain expert interview and literature review

were most used observations is essential to extract tacit knowledge of domain experts, which are not addressed by interviewing the domain experts.

Moreover, this study is intended to design prototype mobile knowledge-based system which includes the task of knowledge acquisition, knowledge modeling, knowledge representation and knowledge-based system development that addresses selected chronic disease diagnosis and treatment tasks.

For the selected chronic diseases, we collect disease descriptions, cause and symptoms, complication, possible natural treatments; life style modification like diet and physical activities to be done were identified and collected. The developed research prototype provides information about disease causes, signs and symptoms', prevention mechanisms and diagnosis.

The knowledge-based system doesn't deal further with drug management in response to chronic patient diseases. because it needs physical and laboratory examination; it needs detail study on those medications. Additionally, the domain experts are so busy. It is difficult to get the golden time of the experts.

1.6 Significance of the Study

The findings of this study indicate the possibility for the development of a web and mobile phone knowledge base system, which is capable of being deployed in different mobile platforms and communicate through an internet network. In addition, it benefits medical and AI researchers in such a way that experts and researchers can get easily and timely access to medical information, treatment approaches and consultations method. Moreover, being able to use the knowledge base system through a web and mobile phone has different advantages, especially for the healthcare service or medical domain [11]. The most important significances of the study are explained hereafter: -

- It shows the possibility of providing expertise healthcare services in areas that have under qualified medical personnel in specified domain;
- It shows the possibility empowers everyone to a fair share of medical attention, so that even people in areas with very poor medical systems and lack of trained personnel, will be catered for as a mobile phone can work effectively even in very remote area;
- It shows the possibility to provide a low cost of treatment and consulting service like professionally trained medical personnel.
- It explorer the possibility that knowledge base system can provide advices immediately to the user, this is very important in the time-critical cases and it reduce the work overload of the medical staffs.

- It shows possibility of everywhere, any time; healthcare and continuous consultation service with better quality of life service of the society even if the number and quality of medical staff is small in place.

1.7 Research Methodology

The following method and techniques have been employed in order to achieve the general and specific objectives of the study.

1.7.1 Knowledge acquisition

The necessary knowledge in this study was acquired and elicited from Tikur Anbessa Specialized Hospital and adama referral hospital and medical college directly from medical personals and secondary source file such as electronic articles, books, journals were assessed. Furthermore, in this study demonstration and direct observation were considered to acquire the necessary knowledge for designing knowledge base system.

1.7.1.1 Sampling techniques and sample size

Purposive sampling is one of the most common sampling techniques in qualitative research in which participants are decided to preselected criteria relevant to a particular research question. We are used Purposive or judgmental sampling to select domain experts for knowledge acquisition. Because this strategy enables us to select a particular persons or events to get important information that cannot be obtained from other choices [16]. Using Purposive technique 15 expertes were selected 4 of them are medical doctor, 7 of them are health officer and 4 of them are specialities.

The selection criteria of domain experts for the study are based on the profession or expertise, educational qualification level, year of experience and their immediate position in the selected chronic diseases diagnosis.

Interview techniques have been employed to acquire the required knowledge from the selected domain expert. This interview focuses on the common types of chronic disease and its description, causes, sign and symptoms, complications and possible non-drug-based treatments for those disease.

1.7.2 Knowledge Modeling

The Acquired knowledge from knowledge acquisition process is then organized and made ready for use, in an activity called knowledge modeling. Modeling is a process constructs conceptual models of knowledge intensive activities in the knowledge base system development. This study

used decision tree and decision table for knowledge modeling because they are more appropriate for rule-based approach [16].

1.7.3 Knowledge representation

This activity involves preparation of a knowledge modeling and encoding of the knowledge in the knowledge base [13]. In knowledge-based system there are many reasoning mechanisms among that the most commonly used are rule based approach, case-based approach or neural network.

For this research the knowledge representation method, rule based is chosen because it clearly demonstrates the domain knowledge it has features like uniform syntax, simplicity, modularity; knowledge is separated from use and control and due to its procedural Interpretations [19].

There are already defined sets of symptoms that enable to identify the disease, levels of disease as a result rule-based representation method is more appropriate to represent and demonstrate the real domain knowledge in diagnosing chronic disease patients. Additionally, rule-based systems are the most commonly used knowledge representation language in medical sectors [6].

1.7.4 Development Language and Tools

This study modeled and developed a web and mobile phone prototype which can be used for both android and any platforms with JVM (like Nokia, Techno, Blackberry, and others) to diagnose the patient and to manage patient information by medical doctors like application.

We identified and categorized tools and languages used to design and develop web and mobile phone knowledge base system prototype.

- Knowledge base system: - this study used rule-based approach to develop knowledge base system prototype. for rule base development JESS rule engine was used due to of the following reasons: -
  - ✓ JESS is small, light, and one of the fastest rule engines available.
  - ✓ Its powerful scripting language gives an access to all of Java's APIs.
  - ✓ JESS includes a full-featured development environment based on Eclipse platform
  - ✓ It uses an enhanced version of the Rete algorithm to process rules
  - ✓ JESS is also a powerful Java scripting environment, from which the created Java objects, call Java methods, and implement Java interfaces without compiling any Java code.
  - ✓ JESS is the only enterprise-capable rule engine to offer both the convenience of an IDE and an unprecedented level of flexibility and openness that makes it easy for developers

to add the power of heuristic rules into applications that run on everything from handheld devices to enterprise servers.

- ✓ Because it is java rule based expert system tool, so it is easy to integrate or configure this java based expert system with java based distributed web service. ❖ Mobile application this study is developed with
- ✓ J2ME for any mobile platforms with java virtual machine
- ✓ Android programming language for android platforms
- ✓ Distributed system: - RPC technology was used.
- ✓ Web based system: - JSP (java server page) was used.
- ✓ MySQL: - was used for database system

1.7.5 Knowledge Evaluation

Evaluation is mechanism that is determined to measure the correctness of a system with respect to the user needs and requirements [13]. The developed mobile rule-based system prototype is tested and evaluated to ensure the performance of the system in meeting towards established objectives.

The evaluation process is more concerned with system user acceptance and validations of the prototype. User acceptance efforts are concerned with issues impacting how well the system addresses the needs of the user whereas validation efforts determine if the system performs the intended task satisfactorily.

For this study questioner was prepared to evaluate the developed web and mobile-based system prototype; in the questioner is included concepts like, easiness to interact with system; having sufficient data and practical knowledge; capabilities of providing right description and treatments; efficiency, attractiveness and accuracy of the system and significances of the system.

Similarly, the validity of the mobile knowledge-based system is tested using fifty-six test cases which have similar parameter with the rules of the prototype by using predictive validation technique. During this testing procedure, fifty-six are selected purposively and used to test the performance of the prototype. The correct and incorrect results are identified by comparing decisions made by domain experts on those cases and with the system conclusions. Decisions without significance differences between the experts and the prototype knowledge-based system are accepted as good performance for the prototype knowledge-based system. Domain expert evaluators interact with the system by using appropriate cases. Then they evaluated the system by using closed ended questionnaires. And the result showed that the applicability and the user acceptance of the research were very good.

1.7.6 Organization of the Study

This research is organized in six chapters. The first chapter, introduce and briefly discuss about research problems, technological improvement on medical area, objective of the study, methodology used, scope and limitation of the study, system testing to be used and significance of the study. Chapter two, is devoted to literature review. It provides a review of related systems and the lessons learnt from such systems. In addition, it discusses about the concept of artificial intelligence, expert system or knowledge base system, rule-based system technique, algorithm and its functionalities on different areas; especially in health area are describe in the subsections of this chapter.

Chapter three, it deals about the Methodolgy; knowledge engineering; knowledge acquisition procedures and representation and modeling techniques for each selected type of diseases. The characteristics of each disease and its diagnoses algorithms and possible nature (nondrug) based treatment were briefly discussed.

Chapter four of this study is all about knowledge-based system development and system architecture prototype development process. It discusses briefly general simulation, how system works and the achieved web and mobile phone knowledge base system prototype. Chapter five in this chapter briefly describes the prototype system evaluation with different methods. Finally, in chapter five, conclusion and recommendation were done, based on the outputs and limitations on the research.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 CHRONIC HEALTHCARE PROBLEMS IN ETHIOPIA

Weak infrastructure and limited distribution systems in low-income countries result in complicated access to health services, especially in rural areas. Ethiopia is a poor country with weak healthcare systems and infrastructure. Reproductive health, like most aspects of health in Ethiopia, is generally poor, with significant regional disparities in access to services and in health outcomes. Almost 80 percent of morbidity in Ethiopia is due to preventable communicable and nutritional diseases, both associated with low socio-economic development. Improving the general physical infrastructure and strengthening health systems are key to improving health and require major investments and much time [11].

Chronic diseases are the major cause of death and disability worldwide. The total number of people dying from chronic diseases is double that of all infectious diseases (including HIV/AIDS, tuberculosis and malaria), maternal and perinatal conditions, and nutritional deficiencies combined. 80% of chronic disease deaths occur in low and middle-income countries and half are in women. Most of chronic disease are cardiovascular diseases (heart disease and stroke), cancer, chronic respiratory diseases, diabetes, mental disorders, hypertension, vision and hearing impairment, oral diseases, bone and joint disorders, and genetic disorders [30]. In this study the following are chronic disease are considered because of their prevalence and persisting for a long time.

2.1.1 Diabetes

Diabetes Mellitus is metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels. It is classified on the basis of the pathogenic process that leads to hyperglycemia. There are four clinical classes of diabetes [29].

- Type 1 diabetes – results from ß cell destruction due to an autoimmune process usually leading to insulin deficiency.
- Type 2 diabetes – results from a progressive insulin secretory defect on the background of insulin resistance.

- Gestational diabetes mellitus (GDM) – any degree of glucose intolerance with onset or first recognition during pregnancy.
- Other specific types of diabetes – due to other causes such as genetic defects in ß cell function, genetic defects in insulin action, diseases of the exocrine pancreas (e.g. cystic fibrosis), and drug- or chemical-induced causes (e.g. in the treatment of HIV/AIDS or after organ transplantation).

2.1.2 Hypertension

Hypertension is a state of elevated systemic blood pressure that is commonly asymptomatic. It is a major cardiovascular risk factor that is closely associated with lethal complications like coronary artery disease, cerebra-vascular accidents, heart and renal failure. In 90-95% of cases, the cause is unknown while the rest are secondary to renal, endocrine, neurogenic and other abnormalities. Normal blood pressure rises steadily from about 90/60 at birth to about 120/80 in a healthy adult. A blood pressure reading appears as two numbers. The first and higher of the two is a measure of systolic pressure, or the pressure in the arteries when the heart beats and fills them with blood. The second number measures diastolic pressure, or the pressure in the arteries when the heart rests between beats. It's normal for blood pressure to vary from person to person, even from one area of the body to another. Consistently high blood pressure forces the heart to work far beyond its capacity. Along with injuring blood vessels, hypertension can damage the brain, eyes, and kidneys. People with blood pressure readings of 140/90 or higher, taken on at least two occasions, are said to have high blood pressure. For those over age 60, readings of 150/90 or higher indicate high blood pressure. If the pressure remains high, doctor will probably begin treatment. People with blood pressure readings of 180/120 or higher need treatment immediately [30].

What Does the Systolic Blood Pressure Number Mean? When person heart beats, it contracts and pushes blood through the arteries to the rest of the body. This force creates pressure on the arteries. This is called systolic blood pressure. A normal systolic blood pressure is below 120. A systolic blood pressure of 120 to 139 means a person have prehypertension, or borderline high blood pressure. Even people with prehypertension are at a higher risk of developing heart disease. A systolic blood pressure number of 140 or higher is considered to be hypertension, or high blood pressure. The diastolic blood pressure number or the bottom number indicates the pressure in the arteries when the heart rests between beats. A normal diastolic blood pressure number is less than

80. A diastolic blood pressure between 80 and 89 indicates prehypertension. A diastolic blood pressure number of 90 or higher is considered to be hypertension or high blood pressure.

2.1.3 Acquired immunodeficiency syndrome

HIV, or human immunodeficiency virus, is the virus that causes AIDS (acquired immune deficiency syndrome). HIV weakens a person's immune system, reducing his or her ability to fight infections and cancers. The virus damages or destroys the cells of the immune system, leaving them unable to fight infections and certain cancers. A person can get HIV by coming into contact with an infected person's body fluids (blood, semen, vaginal fluids, breast milk), and HIV can be spread through:- Vaginal, oral, or anal sex, Sharing unclean needles to take drugs, Pregnancy (from an infected mother to baby), Blood transfusions. And peoples cannot get HIV from: Touching or hugging someone who has HIV or AIDS, Public bathrooms or swimming pools, Sharing cups, utensils, telephones, or other personal items, Bug bites.

2.2 Overview of Artificial Intelligence & Knowledge Based Systems

The term Artificial Intelligence refers to the activity of building intelligent systems. It is a technology of making computers to simulate human being's intelligence. Most people know the term Artificial Intelligence is concerned about how to build an intelligent machine. This machine should have certain capabilities such as: behaves like a human being, smart, problem solver of unstructured and complex problems as human does, understands languages, learner, and able to reason and analyze data and information [16]. It is that branch of computer science dealing with symbolic knowledge, non-algorithmic methods of problem solving. Moreover, the problem-solving methods themselves are usually not mathematical or data-processing procedures but qualitative reasoning techniques that relate items through judgmental rules, or heuristics, as well as through theoretical laws and definitions. Since AI has different applications, it can be used to develop an expert system and knowledge base system that simulate knowledge of experts for reasoning in a given domain including health.

2.2.1 Expert Systems and knowledge base system

Expert systems are computer programs that are derived from a branch of computer science research called artificial intelligence [17]. It is a software package of decision making or problem solving to achieve an equivalent level of performance - or even more - with a human expert in some specialized field and usually narrow problem area [18]. It is sophisticated interactive computer program which use high quality, specialized knowledge in some narrow problem domain to solve complex problems in that domain [18]. It is often scarce and valuable.

Knowledge Base systems are computer programs that capture some of that knowledge and allow its dissemination to others [19].

Knowledge Base System is a problem solving and decision-making system based on knowledge of its task and logical rules or procedures for using knowledge. Both the knowledge and the logic are obtained from the experience of a specialist in the area (Business/Domain Expert). Expert System and Knowledge Base System is a program that emulates the interaction a user might have with a human expert to solve a problem. The end user provides input by selecting one or more answers from a list or by entering data. The program will ask questions until it has reached a conclusion. The conclusion may be the selection of a single solution or list of possible solutions arranged in order of likelihood [19]. It seeks to capture enough of the human specialist's knowledge so that it will solve the problem directly as well and recommend or make decisions for people, based on knowledge collected from experts in the field, but knowledge base system differs from a conventional computer program. The conventional program is algorithmic in nature and will not entail subjective information, whereas, the knowledge base system tends to behave as human experts in decision making and is highly interactive. It has the ability to capture human decision-making expertise and represent this expertise as a series of rules and facts. It can also be economical by leveraging expert, allowing users to function at higher level and promoting consistency [20]. One of the major privileges of an expert system can be acting as a productive tool, having knowledge of more than one expert for long period of time by generating knowledge from data and/or facts by applying rules [16].

Advantages of Knowledge base

Knowledge base system is more useful in many situations than the traditional computer-based information systems. The following are advantages of knowledge base system [20]:

- Time saving: - the amount of time spent on doing the work manually is reduced.
- Quality improvement: - the quality of decision made increases because there are fewer errors than if the decision performed manually.
- Practical knowledge made available: - knowledge base systems can assist experts in decision making even if they have that knowledge to hand; this improves the accuracy and timelines of the decision made.
- Infallible and complete: - unless there are implementation errors, knowledge base systems will always produce the desired result as they will not leave out any rule (consideration) in the reasoning processes.

- Replication: - human experts are scarce resources. They are physically bound to their geographical locations and can only be available at one place at a time but knowledge base system can be replicated and in effect to be transferred to any other locations to perform other task.
- All day, every day: - human experts have fixed working hours or are only available for a limited time throughout the day. They will also experience fatigue because of working long hours which might have a deleterious effect but Knowledge base system can work 24hr/day 7days/week.
- Updating knowledge: - Knowledge base system can be updated easily by editing the rule base; but human expert takes to retrain.

Disadvantages of Knowledge base system

Most common disadvantages of KBS are [19]: -

- Common sense - In addition to a great deal of technical knowledge, human experts have common sense. It is not yet known how to give knowledge base systems common sense.
- Creativity - Human experts can respond creatively to unusual situations, knowledge base systems cannot.
- Learning - Human experts automatically adapt to changing environments; knowledge base systems must be explicitly updated. Case-based reasoning and neural networks are methods that can incorporate learning.
- Sensory Experience - Human experts have available to them a wide range of sensory experience; knowledge base is currently dependent on symbolic input.
- Degradation – Knowledge base systems are not good at recognizing when no answer exists or when the problem is outside their area of expertise.

2.2.2 Types of Experts System

There are different types of expert system; the most commons types are: - case-based reasoning, rule-based expert systems, Neural Networks [12]. This study follows rule-based approach to achieve the goals of the research.

Rule Based Experts System

A rule-based expert system composed of a set of rules that are a collective of human knowledge in a particular domain. It is a typical expert system which operates on the basic rules provided in the knowledge base and the facts given as input from the user and it is one of the most common used types of expert systems. It has a wide range of applications for diagnostic tasks where

expertise and experience are available but deep understanding of the physical properties of the system is either unavailable or too costly to obtain. In the rule-based systems, knowledge is represented in the form of production rules [20].

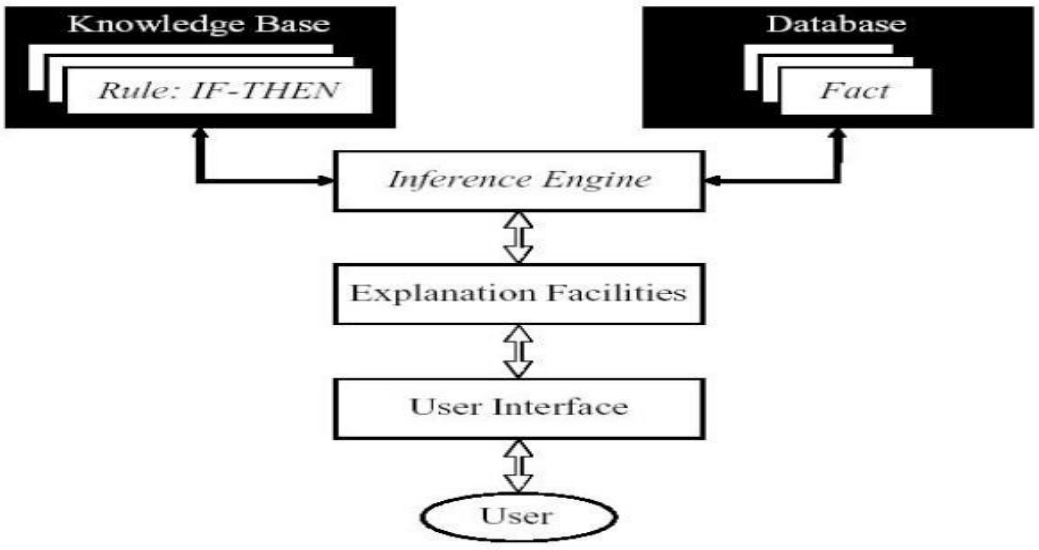

FIGURE 2. 1: BASIC STRUCTURE OF A RULE-BASED EXPERT SYSTEM

As depicted in figure 2.1 typical rule-based system consists of four major components [20]. They are: Knowledge Base, Working memory, Inference engine, and User interface.

Knowledge Base

Knowledge-base is the part of knowledge system where the knowledge acquired from its various sources is kept in the form of rules, frames, logic statements, Meta knowledge or any other representation. It constitutes the problem-solving rules, facts, or intuition that a human expert might use in solving problems in a given problem domain. The knowledge base is usually stored in terms of if–then rules. In the knowledge base, the working memory represents relevant data for the current problem being solved [20].

In a typical knowledge system application, knowledge base may require lots of storage space, especially in case-based reasoning expert systems that rely on cases in their reasoning. The knowledge base of a typical rule based expert system comprises of the rules that operate the expert system. The rules are defined based on the particular domain on which the system operates. The rules may be stored in a database or as strings in a text file. The rules in the text file or database are taken as input by the inference engine to process the user request based on the

facts available in the working memory. The rule base and the working memory are the data structures which the system uses and the inference engine is the basic program which is used.

Working Memory

The working memory is the storage medium in a rule-based system and helps the system focus on its problem solving. It is also the means by which rules communicate with one another. It represents the set of facts known about the domain. In knowledge base system, the WM typically contains information about the particular instance of the problem being addressed. For example, in a medical knowledge base system, the WM could contain the details of a particular patient being diagnosed. The working memory of the rule based expert system comprises of the user input stored in the form of facts or facts loaded from an external file. The facts in the working memory are the facts that determine the present state of the system. The facts in the working memory vary from time to time based on the user input and the operation of the expert system. The facts in the working memory are loaded into the inference engine where it matches the rules loaded into the expert system and fires the appropriate rule.

Inference Engine

The term inference engine refers to the part of knowledge base system that specifies the logical process by which new facts and belief are derived from known facts and beliefs means it tries to derive new information about a given problem using the rules in the rule base and the situation specific knowledge in the WM. It is the transformation of the facts and rules in the knowledge base into a computer program that a common user can run to get certain results and recommendations.

The inference mechanism is basically building of the knowledge base or expert system which understands the user input and matches it with the rules and facts of the knowledge base system. It is like the central processing unit of the knowledge base system. The matching of the rules and facts are carried out in this phase. There is a large amount of matching which has to be done in each cycle of the inference engine. To determine the conflict set, the system has to match every antecedent of every rule against each working memory element. Matching process and in consistency checking are the most time taking process in majority of rule-based systems. Some systems have been observed to spend more than nine-tenths of their total execution time on these processes [20].

Inference engine gets the rules from the knowledge base and the facts from the working memory and pattern matches the facts to the appropriate rule. The rules matched are passed on to the agenda where it matches the most appropriate rule and fires the rule. The inference engine is the

main processing element of the knowledge base system, it selects the parts of knowledge to be applied during its reasoning process to come up with new conclusions regarding the current session. Its purpose is to seek information and relationships from the knowledge base and to provide answers, predictions, and suggestions in the way a human expert would. Hence the inference engine must find the right facts, interpretations and rules and assemble them correctly [20].

Inference engines in rule-based systems can use different strategies to derive the goal (i.e., new fact), depending on the types of applications they are aimed at. The most common strategies are: Forward Chaining and Backward Chaining. And any systems can use either one of these strategies or a combination of both. Some systems allow users to specify which strategy they need for their application [21].

Forward Chaining: - it starts with the facts, and sees what rules apply (hence what should be done) given the facts. In a forward chaining system fact are held in a working memory condition action rules represent actions to take when specified facts occur in working memory. Forward chaining is commonly referred to as data-driven reasoning. It is one of several inferential control strategies that use existing or deduced data to trigger future deduction and conclusions about the data.

Forward chaining in rule-based system begins by triggering all of the rules whose "if clause" are true. Then it uses the facts it has established to determine what additional rules might be executable because their "if clauses" are satisfied [21]. In a forward chaining system, the initial facts are processed first, and keep using the rules to draw new conclusions given those facts. And it is best suited for the tasks of planning, design and synthesis [20].

Backward Chaining: - it is the reverse of forward chaining. It is used to backtrack from a goal to the paths that lead to the goal. It is very good when all outcomes are known and the number of possible outcomes is not large. In this case, a goal is specified and the expert system tries to determine what conditions are needed to arrive at the specified goal. It is thus also called goal driven [21]. In a backward chaining system, the hypothesis (or solution/goal) need to reach is processed first and keep looking for rules that would allow conclude that hypothesis. As the processing progresses, new sub goals are also set for validation. Therefore, it starts with something to find out and looks for rules that will help in answering it given current fact (or requiring new inputs, e.g. Diagnostic tests) [20]. Same rules/facts may be processed differently, using backward chaining engine which starts with possible hypothesis, set this as a goal to prove

or its inverse to disprove (as in resolution). It is initiated when user establishes some goals to be sought and the system identifies one or more rules whose consequents would satisfy the goal [21].

Fact Base

It includes a set of facts used to match against the IF (condition) parts of rules stored in the part of knowledge base, since knowledge base is divided into rule-base and fact base.

User Interface

The User Interface is the component of the expert system where the user interacts with the expert system. The user inputs the expert system with his domain specific description of a new case and the expert system responds with the appropriate advice and explanation to the user. All the interaction between the user and the expert system are carried out in this component of the expert system.

Advantage and Disadvantages of Rule Based System

As noted by [17]: Rule based system has number of advantages some of the main are discussed as follows: -

- Homogeneity: - Because of the uniform syntax, the meaning and interpretation of each rule can be easily analyzed.
- Simplicity: - Since the syntax is simple, it is easy to understand the meaning of rules that are in the knowledge base.
- Modularity: - The independence of rules leads to modularity in the rule base. Hence, it is possible to create a prototype system fairly quickly by creating a few rules.
- Knowledge is separated from Use and Control: - The separation of the rule base from the inference engine separates the knowledge from how it is used to solve the problem. This means that the same inference engine can be used with different rule bases and a rule base can be used with different inference engines.
- Procedural Interpretations: - Apart from declarative interpretation, rule-based systems have procedural interpretations also, which enable them to be viewed as computational models.

And the major disadvantage of rule-based system is listed and discussed bellows [20]: -

- Lack of Methodology: - There is no methodology (i.e., systematic procedure), yet for creating rule-based systems. Most systems are built based on intuition, prior experience, and trial and error.
- Interactions among Rules: - An advantage of the rule-based representation was stated to be the relative independence of the different pieces of knowledge. However, in many systems

peoples cannot assume that the rules do not interact among themselves. In certain cases, ignoring rule interaction could lead to unexpected results.

- Opacity: - Rule based systems provide no mechanism to group together related pieces of knowledge. This makes any structure/relationships in the domain opaque in the rule base.
- Lack of Structure: - The simplicity of rules leads to the drawback that all rules are at the same level. In many domains it would be useful to have rules at different levels in a hierarchy, but the pure production system model does not support this.
- Representing Procedural Tasks: - Some tasks which can be easily represented in terms of procedural representations are not very easy to represent using rule-based representations.
- Inefficiency: - As mentioned earlier a large amount of time is taken in each cycle to match applicable rules in the rule base. For large rule bases, this often leads to increases. However, there is work going on in creating more efficient matching algorithms. In addition, structuring the rule base can also lead to increase in efficiency. The matching procedure can also be made faster by doing the matching in parallel, if a parallel machine is used.

2.2.3 Knowledge Base System Development Phases

Knowledge engineering is an engineering discipline that involves integrating knowledge into computer systems in order to solve complex problems normally requiring a high level of human expertise. It is all about building, maintenance and development of knowledge-based systems in a specific domain [15]. Knowledge is a vital component of engineering design. Significant reductions in costs and development time can be made if knowledge is captured from specialists and stored in a knowledge base. The contents of knowledge base can be used in a number of ways: to disseminate knowledge to other people in an organization; to re-use knowledge in different ways for different purposes; to use knowledge to develop intelligent systems that can perform complex design tasks [22]. Knowledge base system development passes through a series of phase [13]:

Knowledge Acquisition

Knowledge acquisition is the process of eliciting, structuring and representing (formalizing) knowledge from some knowledge source in order to construct a knowledge-based system. It involves the acquisition of knowledge from human experts, books, documents, sensors, or computer files. The knowledge may be specific to the problem domain or to the problem-solving procedures, it may be general knowledge or it may be Meta knowledge. It is the process of

transferring knowledge from the knowledge source to knowledge engineer (knowledge-based system developer) [13].

Knowledge acquisition is a crucial stage in the expert systems development process and recognized as the detrimental and carefully done step in the expert system development [20]. In other words, knowledge acquisition is an important costly and time-consuming task when constructing knowledge-based systems. It is one of the most difficult and error prone tasks that knowledge engineer does while building a knowledge-based system, the quality and performance of the application depends directly on the quality of the knowledge acquired [16].

Knowledge Modeling

Models are used to capture the essential features of real systems by breaking them down into more manageable parts that are easy to understand and to manipulate. Moreover, models help people to appreciate and understand such complexity by enabling them to look at each particular area of the system in turn. Models are used in systems development activities to draw the blueprints of the system and to facilitate communication between different people in the team at different levels of abstraction. More importantly, the modeling process constructs conceptual models of knowledge intensive activities in the knowledge-based system development. During the knowledge acquisition stage, most of the knowledge is unstructured and often in tacit form. The knowledge engineer will try to understand both the tacit and the explicit part of the knowledge and then use simple visual diagrams to stimulate discussion amongst users and knowledge experts [20].

The knowledge engineer then has to construct the conceptual model from what has been discussed during the knowledge acquisition stage. This communicates the knowledge to the information specialist who will transform the model into workable computer programs or codes. Before knowledge-based system can be built, knowledge must somehow be identified and collected, and a model of domain knowledge must be constructed [20]. Experience has shown that eliciting and explicating knowledge is best seen as a modeling activity, also called conceptual modeling [16].

Knowledge Representation

Knowledge Representation is the area of Artificial Intelligence that is concerned with the way knowledge can be represented symbolically and manipulated in an automated way by reasoning programs [20]. It is the field of study concerned with using formal symbols to represent a collection of propositions believed by some putative agent [15]. Structured knowledge

representations were explored as a general representation for symbolic representation of declarative knowledge. It is responsibility of the knowledge engineer to select appropriate knowledge representation scheme that is natural, efficient, and transparent and developer friendly. Acquired knowledge is organized so that it will be ready for use, in an activity called knowledge representation. This activity involves preparation of a knowledge map and encoding of the knowledge in the knowledge base [13].

2.2.4 Expert System Shells

A variety of tools, termed expert system shells, exist to facilitate the development of an expert system, to reduce the development time and to remove the need to develop the entire application from scratch. These tools consist of an inference engine and an interface to assist an expert in the construction of the knowledge base [21]. It allows non-programmers to build an expert system, by inserting facts and rules into a generic expert system architecture which is already built. An expert system uses an algorithm to compare facts (input data) against pre-determined rules (knowledge base). The expert system will then suggest solution(s) to user(s), and/or execute action(s) to fulfill its task [21]. Various expert system shell is available; which are developed using different programming language.

The most promising rule-based expert systems are the Java Expert System Shell, the C Language Integrated Production System (CLIPS) and DROOLS. All of them are expert system shell tools that are used to construct rule- and/or object-based expert systems.

CLIPS is a tool that offers a complete environment for developing rule-based expert systems. It uses a LISP-like programming language that is able not only to represent rules and facts, but also to model the knowledge using objects, organized according to object-oriented concepts (i.e. classes with inheritance). Rules can match objects/classes as well as facts, which consist of one or more fields enclosed in parentheses and delimited by one or more spaces.

Rules, defined by using the construct defrule, are expressed with a LHS providing the conditions that must be satisfied to activate the rule, and a RHS, after the "=>" sign, expressing the action. Rule actions change the knowledge by means of assert or retract operations, which respectively insert new fact or remove an existing fact from the knowledge base [23]. It is a rule-based language; it is possible to create a fact list; create a rule sets and an inference engine matches fact against rules. And it has also object-oriented feature due to its capabilities of defining classes, can create different sets of instances and special forms which allow to interface rules and objects [24]. A drool on the other hand developed based on Java and is an open source business logic

integration platform. Drools Expert provides solid integration with Java, allowing easy integration with the language. The rule engine is stout and provides many options for the development of rules for the expert system. Drools Expert uses its own modified version of the RETE algorithm, dubbed RETEOO, which is an object-oriented version of the algorithm. It matches the patterns of rules to the properties of objects and is persistent [21].

JESS is an expert system shell and scripting language written entirely in Sun Microsystem's Java language. Jess supports the development of rule-based expert systems which can be tightly coupled to code written in the powerful, portable Java language. It was created originally based on CLIPS core by Dr. Ernest J. Friedman-Hill at Sandia National Laboratory, CA in 1995. However, JESS essentially acquires its own path mainly influenced by JAVA platform. Similar to CLIPS, JESS can call a procedure or be called by a procedure itself. Like all other expert systems, JESS and CLIPS comprise three sub-systems, including Rule Base, Fact Base, and Inference Engine [21].

The Jess engine can be invoked as an interactive interpreter, where Jess language strings can be typed into a shell and invoked in real-time, or in batch mode, where one or multiple files of Jess code can be executed at once. The Jess engine is implemented in Java, and as well as the shell or interpreter mode, it can also be invoked from Java code at runtime. Jess code is able to call another Java code or be executed in a Java object [21].

In general, an expert system is a set of *rules* that can be repeatedly applied to a collection of facts. Rules that apply are executed based on the facts. JESS uses a special algorithm called *Rete* to match the rules to the facts. It is a very efficient mechanism for solving the difficult many-to-many matching problem; it makes JESS much faster than a simple set of cascading if… then statements in a loop.

JESS was originally conceived as a Java clone of CLIPS, but nowadays has many features that differentiate it from its parent. Using JESS, which allows to build Java software that has the capacity to "reason" using knowledge given in the form of declarative rules. JESS is small, light, and one of the fastest rule engines available. Its powerful scripting language allows access to all of Java's APIs. JESS includes a full-featured development environment based on Eclipse platform [17]. It uses an enhanced version of the Rete algorithm to process rules. JESS has many unique features including backwards chaining and working memory queries, and of course JESS can directly manipulate and reason about Java objects. JESS is also a powerful Java scripting environment, from which is possible to create Java objects, call Java methods, and implement

Java interfaces without compiling any Java code. It is the only enterprise-capable rule engine to offer both the convenience of an IDE and an unprecedented level of flexibility and openness that makes it easy for developers to add the power of heuristic rules into applications that run on everything from handheld devices to enterprise servers [21].

The RETE algorithm computes the conflict set in a rule-based system. It is implemented by building a network of nodes, each of which represents one or more tests found on a rule LHS. Facts that are being added to or removed from the knowledge base are processed by this network of nodes. At the bottom of the network are nodes representing individual rules. When a set of facts filters all the way down to the bottom of the network, it has passed all the tests on the LHS of a particular rule and this set becomes an activation. The associated rule may have its RHS executed (fired) if the activation is not invalidated first by the removal of one or more facts from its activation set. Within the network itself there are broadly two kinds of nodes: one-input and two input nodes. One-input nodes perform tests on individual facts, while two-input nodes perform tests across facts and perform the grouping function. Subtypes of these two classes of node are also used and there are also auxiliary types such as the terminal nodes mentioned above [21].

2.2.5 Medical Expert Systems

The use of expert systems in various disciplines proves an increase in human productivity, financial benefits and a better answer to users' needs. The area of human intellectual endeavor to be captured in an expert system is called task domain. Domain refers to the area within which the task is being performed. Task refers to some goal oriented, problem-solving activity [20]. In the domain of healthcare, it is important that the system is accurate in diagnosing because it deals with a life of a person where a slight error of treatments or diagnosis can cause death which cannot be changed [4]. But there are various techniques on implementing the expert system and almost uses accurate and established algorithms. Due to this it is being increasingly used in medical environments such as hospitals, laboratories, and intensive care units, with a view to improving the quality of healthcare and reducing the likelihood of incorrect medical decisions [4]. Transformation of these systems into mobile solutions would extend their benefits and facilitate their integration into medical environments.

Mobile phones are nowadays the most popular and widely used means of communication for its compact size, versatility, and ease of handling. The availability and use of mobile devices and services have increased significantly in the last few years. Today most of the researchers and

application developers are focused on mobile based application due to its usability and portability [18].

A New Approach for Developing Diagnostic Expert Systems on Mobile Phones

Yasser Abdelhamid and Mohammed El-Helly [6] proposed a standalone expert system application that is totally implemented on the mobile phone. This standalone expert system application for mobile phone has the advantage of being available at any time, and at any place but it has many disadvantages, like updating the knowledgebase or the database will require reinstalling the application on the mobile device, application will be bounded by the hardware capabilities of the mobile device and others. The application uses XML language for data representation of many types of applications for its lightweight; ease of handling, and for being supported by virtually all other programming languages.

Mobile Phone Based Medical Diagnostic System

CBMDS (Cell phone Based Medical Diagnostic System) developed by Ntalasha and Derrick [25] provides easy diagnosis of diseases even in areas where there is insufficient medical staff. The system provides automated help through a cell phone for rural hospitals and those hospitals which are under staffed. The system is used to provide automated help by storing knowledge of diseases, this includes diagnosing a particular disease and the necessary measures to be undertaken, when queried about a particular diagnosis or symptoms obtained from the patient. The medium of access for the system is a cell phone (mobile phone) where a text message written is sent to the application. The system produces the desired output and sends the message back to the cell phone that sent the message before. It used rule-based system approach and execute rules using the pattern matching algorithm used in JESS (Java Expert Shell System) called the Rete Algorithm. The Java Expert Shell was used as the “brain” of the system that does all the reasoning of the system [26].

Mobile Islamic Medication Expert System

Mobile Islamic Medication Expert System is one of the early implementations of expert systems on cell phones Low Tan Jung, RozanaKasbon and HanitaDaud [14]. It contains knowledge about the types of illness or sickness together with their related cures or treatments/therapies, exclusively from the Quran and Hadith. The application was implemented as two packages, GUI package and ES server package. The GUI package allows the patient to enter the symptom(s) then it transmits these entries to the ES running on the server where the knowledgebase, database

and inference engine reside, for making necessary analysis on the symptoms to recommend a suitable treatment. The GUI was implemented on mobile device using J2ME application development platform that was provided by Sun Microsystems' JAVA to target consumer devices and electronic appliances. The ES server package was implemented using JESS which is a rule-based engine with scripting environment and can be used to build Java software that has the capacity to "reason" using knowledge that has been supplied in the form of declarative rules. JESS uses an enhanced version of the Rete algorithm to process rules.

A Mobile Medical Expert System for Health Institutions in Ghana (MMES)

Asabere and Nana Yaw [27] came up with a mobile medical expert system with an idea of reducing the number of patients who have very minor sicknesses and diseases and need not attend a referral Hospital in Ghana. Minor and minimal sicknesses such as headaches, stomach aches/ diarrhea, flu, cold etc. may not necessarily require the consultation of a Medical Doctor physically. The system was focused on how Medical Doctors in Ghana can use a designed Expert System through mobile technology to speed up diagnosis, confirm their own diagnosis, provide advice on found diagnosis and provide advice on certain diseases when diagnosed on a patient. Generally, the system was works as follows: Patients logs into the System with mobile device through cloud server, after registration through the Hospital Administrator. Then the patient initially interacts with the Medical Expert System through a Medical Diagnostics Interface on his/her mobile device. The medical diagnostics interface provides an option to select diseases and clicking of "Treatment button", the next interface if the patient's mMES Prescription and Treatment advice will displayed. After click Medical Doctor Approval, a query of patient's diagnosis and mMES advice is sent to the Medical Doctor's mobile device for approval of mMES advice or non-approval of mMES advice for onward consultation of Medical Doctor physically [27].

A HIV-Link: A mobile phone-based expert consultation platform for HIV/AIDS care in Ethiopia and Uganda

These studies demonstrated an easy-to-use system linking widespread mobile phone availability in rural Africa to a centralized website that permits rapid and clinically useful exchange of information and advice. It was also instructive to medical and government authorities on areas of greatest need for continuing medical education. Although this study was within the setting of HIV, researcher recommended as if it should to be expanded to other disease areas in anticipation

of similarly positive outcomes. This study works on a web-based platform whereby queries via SMS are processed and archived was developed [28].

2.2.6 Local Researches on knowledge-based system

Seblewongel (2011) has done research study on prototype knowledge-based system for anxiety mental disorder. Objective of the study is to design and develop a prototype knowledge-based system for diagnosing a patient with anxiety mental disorders with the overall aim of exploring the applicability of knowledge-based system technology to the specific area. The researcher used rule-based technique and back ward chaining mechanism to achieve the proposed objective. The finding of the study reveals that the proposed knowledge-based system applicable to the domain area and study result show the system gain a promising user acceptance. Finally, the researcher recommended that to fully implement the functionality of the prototype and integrating rule-based system with case-based techniques for a better result.

Solomon Abebe (2010) conducted research study on application of knowledge-based system for settling Tort claims under The Ethiopian Law. This research deals with the development of KBS as an alternative approach for handling tort climates under the Ethiopian law. Common KADS and decision tree modeling techniques are used in the modeling of expertise. Rule-Based reasoning (RBR) approach is adopted to represent the necessary knowledge base of the system.

The knowledge base is developed using SWI prolog which supports backward chaining to make inferences by reading the composed rules in the knowledge base. The testing of the prototype system is done first by using artificial test data and then a sample of thirteen previously decided 35 test cases are taken in law of torts to make comparisons on the decision made by the system and human experts. Therefore, the development of KBS that incorporates predictive capacity to predict judicial decisions by taking precedents (or decided cases) and examining closely the personal attitudes of the presiding judges towards political, cultural, economic, religious, and social factors are demanding to make the system credible in the legal community.

To conclude, some of studies have been developed using rule-based representation technique to reason out the solution of a particular problem. But, the KBSs did not mobile based and localized. Thus, in this study an attempt is made to design a mobile enable KBS using local language.

The aim of this study is to apply the concept of knowledge base systems as a tool on chronic disease like diabetes, hypertension and HIV diagnosis. In diagnosing of chronic patient, it is expected that knowledge-based systems can assist patient to determine a corresponding disease and to recommend the appropriate treatments accordingly. The availability of knowledge base systems

in chronic disease diagnosis is essential to provide, for both users and professionals, the alternative solution method with less time, minimum finance and on time services. Therefore, the proposed knowledge-based systems can help patients during the diagnosis process and to recommend the appropriate non-drug treatments.

CHAPTER THREE
3. KNOWLEDGE ACQUISITION, MODELING AND REPRESENTATION

3.1 KNOWLEDGE ENGINEERING

Knowledge Engineering is the aspect of system engineering which addresses uncertain process requirements by emphasizing the acquisition of knowledge about a process and representing this knowledge in a Knowledge-based System. It is an engineering discipline that involves integrating knowledge into computer systems in order to solve complex problems normally requiring a high level of human expertise [22].

3.1.1 Knowledge Acquisition

A patient-centered consultation involves assessing a patient's clinical signs and symptoms as well as their thoughts, fears, preferences and expectations and their social context to manage plans of client for providing proper disease managements to achieve better healthcare service and better life style outcomes [29]. In target of achieving patient-centered consultation in our country; this study analyzes, design and develop mobile phone knowledge based expert system algorithms for diagnosing and treating each selected chronic disease. This enables client to interact with doctor like mobile application to get proper nature-based treatments, advice and consultations.

Knowledge engineering is all about building, maintenance and development of knowledge-based systems in a specific domain. It has phases such as elicitation, representation, design, and implementation [15]. As it is stated on the first chapter, the objective of this chapter is to acquire knowledge from different sources about the selected chronic disease, such as hypertension, diabetes mellitus, HIV. It also discusses about diagnosis technique and modeling and representing the acquired knowledge.

3.1.2 The Knowledge Acquisition Process

In this study knowledge acquisition process involves gathering the required knowledge, analyzing that knowledge, identifying important concepts focusing on causes and symptoms of each selected chronic disease. In order to acquire required knowledge for this study both primary and secondary sources of knowledge are used. The techniques used to extract relevant knowledge from these sources are: -

- Reviewing related documents and manuals
- Interviewing domain experts

Reviewing Related Documents and Manuals

Document analysis involves collecting and gathering data or information to build knowledge from existing documents. Hence, document is used to acquire and represent explicit knowledge which is found in various secondary sources of knowledge. As a result, relevant technical manuals were used to extract and to acquire knowledge in structured manner which is suitable for constructing knowledge modeling, knowledge representation and finally implementations.

3.1.3 Interviewing Domain Experts

Both structured and unstructured interviews were employed to elicit tacit knowledge from domain experts. During the preliminary investigation, medical doctors, Health officers, Specialists are included to understand the dimensions of chronic disease problems. experts are selected purposively for extensive discussions using structured and unstructured interview to discover relevant tacit knowledge. These experts were principally participating throughout the research work, and they were consulted to confirm the correctness of the acquired knowledge.

These experts were interviewed about the major chronic diseases of the country that affect life society and causes, symptoms of those diseases as well as possible treatments undertaken to control and manage such diseases. Below on table 3.1 the expert profile information is sated

No	Educational level of experts	Number of experts	Specialization	Work Experience
1	BSc	7	Health officers	More than 6 years
2	MED	4	Medical Doctors	More than 7 years
3	MED	4	Specialists	More than 10 years

TABLE 3.1: DOMAIN EXPERTS PROFILES

During the intervisew phase, the main challenge is experts don't have an enough time to share their expertise and experience, which is important to acquire the relevant knowledge. The domains of interview with expert covered issues such as how the expert interact with patient, what are techniques used to identify the pillar symptoms of the patient, the procedures of diagnosing and what are the possible treatment recommended to the patient. during the extensive discussion, the researchers tries to acquire the relevant tacit knowledge which is significant to generate the proposed knwlodge based system.

3.2 Chronic Diseases

Chronic diseases as a domain of research need a continuous medical expert follow-up and consultation; person with chronic disease suffer a lot to get proper follow-up and consultation every time due to limited medical experts and infrastructure limitation in the hospital.

As shown in figure 4.1, this study considered three major chronic diseases; namely, diabetes Mellitus, Hypertension and HIV. We deal with these three chronic diseases due to the recommendation of domain experts as the nature of the diseases chosen is more appropriate for knowledge base expert system.

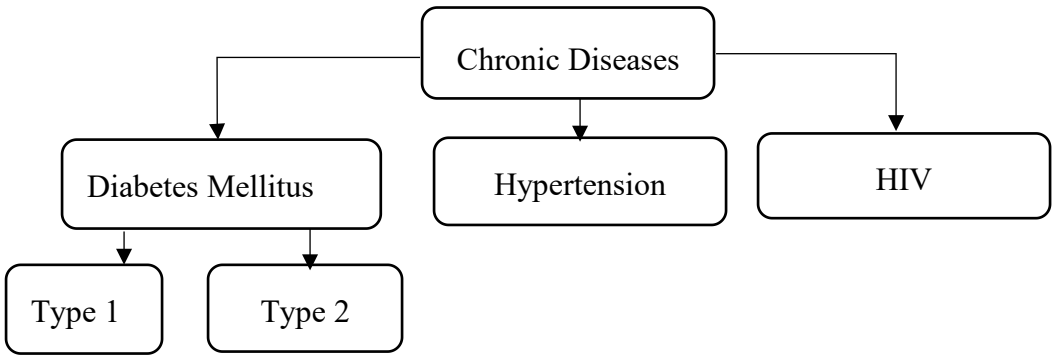

FIGURE 3. 1: CATEGORY OF CHRONIC DISEASE.

3.2.1 Diabetes mellitus

Diabetes mellitus is a chronic metabolic disorder that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces or both. This results in elevated blood sugar (hyperglycaemia) and other metabolic derangements which over time lead to multiple organ damage. The common complications of diabetes include – eye complications, damage to heart, blood vessels, kidneys, nervous system and foot complications leading to amputations. It must be understood that diabetes is not an infectious or a contagious disease. [38]

Symptoms of Diabetes

We identified the following signs and symptoms from primary and secondary sources of knowledge's for diagnosing and treating client. Diabetes mellitus often goes undiagnosed because many of its symptoms though serious are often missed or are treated as common ailments. Recent studies indicate that the early detection of diabetes symptoms and treatment can decrease the chance of developing the complications of diabetes. [38] Common symptoms of diabetes include:

- ✓ Frequent urination
- ✓ Excessive thirst

- ✓ Extreme hunger
- ✓ Unexplained weight loss
- ✓ Increased fatigue
- ✓ Irritability
- ✓ Blurry vision
- ✓ Impotence/ being weak
- ✓ Numbness or tingling sensation of the feet
- ✓ Skin disease
- ✓ Dry mouth

We are identified the following risk factors which will increase the risks of diabetes patient: - [38]

- ✓ Advancing age
- ✓ Family history
- ✓ Excessive body weight
- ✓ Excessive alcohol consumption
- ✓ Physical inactivity
- ✓ Stress
- ✓ Unhealthy diet
- ✓ Pregnancy (Gestational Diabetes mellitus)
- ✓ Chronic use of steroids
- ✓ Viruses
- ✓ Faulty Immune System
- ✓ Physical Trauma/ Any physical damage to the body caused by violence, accident or fracture
- ✓ Drugs

Types of Diabetes

Diabetes can be classified primarily into following three categories: [38]

A. Type 1 diabetes: Insulin Dependent Diabetes Mellitus
B. Type 2 diabetes: Non-insulin Dependent Diabetes Mellitus
C. Gestational Diabetes Mellitus (GDM)

A. Type 1 Diabetes

Type 1 diabetes is caused by destruction of body's insulin-producing cells in the pancreas. Type 1 diabetes patients have to take insulin externally, because insulin is not produced in their body.

Generally, persons below 30 years of age belong to this group. Their body is lean and thin. Ketones are sometimes traceable in their urine. Type 1 diabetes can occur at any age, though it develops most often in children and young adults. Symptoms usually appear suddenly. About 5-10 percent of people with diabetes have Type 1 diabetes.

Symptoms and signs

- ✓ Frequent urination
- ✓ Extreme hunger

- ✓ Extreme thirst
- ✓ Weight loss
- ✓ Weakness and tiredness
- ✓ Nausea and vomiting,

Treatment

- ✓ Diet, exercise
- ✓ All patients need insulin

Signs of an emergency with type 1 diabetes include: - Shaking and confusion, Rapid breathing, Fruity smell to human breath, Pain in person belly and Loss of consciousness (rare). [30]

B. Type 2 Diabetes

Type 2 diabetes generally occur in persons above 30 years of age. Type 2 diabetes has several causes. Heredity, age and weight are important contributing factors. Most people with Type 2 diabetes make enough insulin but are not able to use it properly. Weight loss and exercise can often improve this problem. Type 2 diabetes can develop very slowly.

One may experience only mild symptoms or have no symptom at all. One can have diabetes for several years and yet not even know it. About 90 to 95 percent of people with diabetes have Type 2 diabetes. Most people with Type 2 diabetes are overweight and are over 40 years old.

Symptoms and signs

- ✓ Headaches
- ✓ Blurred vision
- ✓ Dry, itchy skin
- ✓ Dry mouth
- ✓ Recent weight gain or un explained Wight lose
- ✓ Increased hunger
- ✓ Increased thirst
- ✓ Increased urination
- ✓ Tingling or loss of feeling in hands or feet
- ✓ Non-healing infection of skin, vagina and or bladder (UTI),
- ✓ Sexual dysfunction
- ✓ Frequent yeast infections
- ✓ Velvety dark skin changes (like skin of neck, armpit, and groin)
- ✓ Impotency or feeling tired

Often no symptoms are present when Type 2 diabetes is diagnosed.

Treatment

- ✓ Diet and exercise
- ✓ Many people need oral medication.

- ✓ Only some need Insulin

C. Gestational Diabetes Mellitus (Diabetes in Pregnancy)

Gestational Diabetes Mellitus (GDM) is diabetes that develop during pregnancy. It manifests mainly in the latter half of pregnancy. However, it will revert to normoglycemia after completion of pregnancy. Pregnant women face increased risk of congenital malformation of their fetus and complications and even death affecting both mother and fetus. It is managed with diet, and insulin. All women must be checked for diabetes in the sixth month of pregnancy (24-28 weeks). If gestational diabetes is diagnosed, one should follow up with one's physician till the end of pregnancy. Approximately 2 to 3 percent of all women who become pregnant develop gestational diabetes more likely to occur in women who are overweight and or are older. About 35 percent of women who develop gestational diabetes will later develop Type 2 diabetes. Maintaining a healthy body weight decreases the risk.

Hypoglycemic coma

Insulin injection and oral tablets are prescribed to reduce sugar in blood in a diabetic person. However, if sugar falls down rapidly, it is known as hypoglycemia. This may result in following symptoms: [30]

- ✓ Blurring of vision
- ✓ Excessive appetite or hunger
- ✓ Palpitations/ rapid and irregular heart beat
- ✓ Shivering of body/ vibrating slightly
- ✓ Excessive sweating
- ✓ Unsteadiness of limbs
- ✓ Unusual behavior/attitude, and
- ✓ Loss of consciousness/coma.

All patients taking oral hypoglycemic agents or insulin must be aware of these features of this complication. One must take medicines in time which must be followed by food.

Why and how these symptoms are encountered

- ✓ If dosage of medicine (tablet or insulin) is higher than that required for food eaten
- ✓ If intake of food is insufficient
- ✓ The patient does not take food after medicine is taken ✓ If patient delays taking food long after taking insulin, ✓ Excessive physical labor or exercise is done.

What must be done if hypoglycemia is encountered?

When above symptoms are encountered, the patient should immediately mix 4 to 6 tea-spoonful's of sugar into a glass of water and drink it. One may take a glass of fruit juice, couple of pieces of sweet biscuits, hand full of sugar or some sweet fruits. This should be followed by a meal. If the patient is comatose, he/she should be taken to a hospital. He/ she requires intravenous 25% glucose immediately. [38]

Diabetic ketoacidosis: Diabetic Coma

Patient dependent on insulin may encounter diabetic coma. When a patient takes lower dose of Insulin or forgets to take Insulin in time, does not take Insulin deliberately or encounters physical stress like infection, his/her blood sugar rises. Due to lack of Insulin, sugar in blood cannot be utilized properly. The body tries to use its own stored fat, but due to improper assimilation of fat, some harmful chemicals, named ketones, form and accumulate in blood. Consequently, the patient becomes delirious and lapses into unconsciousness. Acetone also accumulates in the body and is passed in urine. This condition is called Diabetic Coma. [38]

Why does blood sugar rise? Blood sugar rise due to any of the following factors

- ✓ If more food is taken than prescribed diet
- ✓ If physical labor or exercise is not done adequately
- ✓ If Insulin is taken at a reduced dose or it is not taken at all
- ✓ If oral medication is not taken
- ✓ If there is attack by any infectious disease or virus, the patient is in severe physical or mental stress, and or
- ✓ Insulin treatment is discontinued due to other treatment.

Symptoms of Diabetic Coma:

Following are some signs and symptoms of diabetic coma:

- ✓ Excessive and repeated urination
- ✓ Excessive appetite and thirst
- ✓ Sickness and fatigue
- ✓ Weakness
- ✓ Headache
- ✓ Blurred vision
- ✓ Drowsiness
- ✓ Nausea
- ✓ Rapid rate of breathing
- ✓ Collapse
- ✓ Smell of acetone in breath
- ✓ Unconsciousness
- ✓ Seizures

As soon as one or more of these symptoms are present, the patient should immediately be taken to a hospital and managed by a physician. This is a medical emergency.

Severe complications may arise from uncontrolled diabetes over a period of time. Long term complications that are encountered due to poor diabetes control are. [38]

- A heart attack or stroke
- Impaired vision and blindness (retinopathy)
- Decreased circulation (peripheral vascular disease)
- Foot problems and amputations
- Nerve problems (neuropathy)
- Kidney disease
- Frequent infections and skin disease.
- Sexual problems including infertility and impotence

- **Heart and Blood Vessel Problems/Stroke**

Diabetes greatly increases risk of development of changes in blood vessel. These changes may lead to heart attack, stroke or may impair blood flow in the legs and feet.

Signs that are indicative of stroke include:

- ✓ Loss of consciousness
- ✓ Feeling dizzy
- ✓ Sudden loss of sight
- ✓ Slurred speech
- ✓ Feeling numb or weak in arm or leg of one side of body

Following symptoms may be caused by serious heart problem:

- ✓ Chest pain or pressure
- ✓ Shortness of breath
- ✓ Swollen ankles
- ✓ Irregular heart beat

To prevent and treat heart and blood vessel problems one should

- ✓ Control blood glucose
- ✓ Cease or never start smoking
- ✓ Control blood pressure
- ✓ Check lipids annually (Cholesterol and Triglyceride). High levels of these require treatment
- ✓ Reduce weight, if over weight
- ✓ Exercise regularly. If one has heart or blood vessel problems, one need special medical advice on physical activity (strenuous exercise may be dangerous.) ✓ Decrease intake of alcohol

❖ Eye Disease: Retinopathy

Over time, uncontrolled diabetes can cause permanent damage to small vessels of eye, especially back of eyes (retina). This damage is called retinopathy.

In its early stages, retinopathy doesn't affect vision. As damage gets worse, blood vessels can leak and if left untreated, can eventually cause blindness. New weak vessels form. Blood leaks from these weak vessels and it can result in blindness. Retinopathy can be treated by using laser therapy and surgery to seal off leaking vessels and remove blood blocking retina.

To reduce chances of developing retinopathy

- ✓ Have annual eye examination done by eye physician.
- ✓ Report any change in vision.
- ✓ Early treatment can prevent or delay vision loss.
- ✓ Keep blood pressure under control.
- ✓ Do not smoke.
- ✓ Check blood glucose regularly and keep it under control.
- ✓ Notify doctor and ophthalmologist for any change in your vision.

Nerve Damage (Neuropathy)

Nerves affect all body functions. Diabetes can damage nerves by injuring the covering of nerves causing a condition called neuropathy. Keeping blood glucose close to normal prevents nerve damage. Regular physical exercise also helps to keep nerves healthy. Systems of body affected by neuropathy include: [38]

- ✓ Feet and legs: Feet and legs are the most common areas affected by neuropathy. Symptoms of nerve damage to feet and legs include numbness, burning, loss of hot/cold sensation, tingling, pain and cramps.
- ✓ Digestive and Urinary tract: Damage of nerve to stomach, intestines or bladder can cause constipation, diarrhoea, nausea, vomiting and inability to urinate properly.
- ✓ Blood pressure: Nerve damage can prevent blood pressure from rising as it should when one changes body positions. Sudden low blood pressure can cause dizziness.
- ✓ Sexual Organs: When small blood vessel and nerve to sexual organ are damaged, man may experience impotence and women, vaginal dryness and loss of sensation. Good long-term control of blood glucose can help prevent or reduce diabetes related sexual problems.

❖ Kidney Disease: Nephropathy

Kidneys filter waste products from body into urine which is excreted. Diabetes cause small vessels in the kidneys to thicken, resulting in kidney damage (nephropathy). Damaged kidney cannot filter body's wastes effectively and these wastes begin to buildup in body causing illness. Eventually, damaged kidneys may fail, making it necessary to have dialysis and / or a kidney transplantation.

Signs and Symptoms of Kidney problems:

- ✓ Early morning swelling around eyes
- ✓ Swelling of legs
- ✓ High blood pressure
- ✓ Protein in urine

Kidney damage can be effectively prevented by controlling blood glucose and blood pressure. Bladder or kidney infections should be treated well. If one has symptoms of urine/bladder infection (cloudy urine, bloody urine, frequent urination, pain and burning during urination, back pain, fever with chills) contact a health worker immediately

Other Health Issues in Diabetes Mellitus: -

Smoking: - quitting smoking is the single most effective way to improve your health and make your life longer and healthier.

Hypertension: - relatively simple methods may help to keep blood pressure at a desirable range (reduction of alcohol and salt intake, weight reduction and regular exercise).

Obesity (overweight): - continuous, regular physical exercise and low-calorie diet should be introduced and maintained indefinitely.

Pregnancy: - If good control cannot be attained by means of diet alone, Insulin should be instituted. No oral diabetes medicines are allowed during pregnancy.

Alcohol: - Alcohol is a major risk factor for causation of several non-communicable diseases. Prolonged use of alcohol result in permanent damage of liver, heart, brain and nerves, insulin producing cells in pancreas, cause ulcer of stomach and several kinds of cancer in different parts of body. Alcohol is an important contributing factor of causation of Type 2 diabetes.

Principles of Diabetes Management

Diabetes is a lifelong disorder. Diabetes cannot be cured. However, it can be kept under control. Diabetes can be controlled by a combination of five different activities. [38]

- ❖ Education
- ❖ Diet modification
- ❖ Drug (Medication)
- ❖ Physical activity
- ❖ Discipline

❖ Education:

This requires the patient as well as family members understanding the disease very well and actively participating in its daily management.

A well informed and motivated patient can (a) learn methods of controlling the disease well, (b) accept changes in his/her life style, and (c) cope with any unwanted complication and emergency.

- **Diet:**

Regular diet intake is one of the basic principles of treatment of diabetes. Simultaneously, proper nutrition that is well balanced meal is necessary to maintain good health. A variety of food in proper amount will provide all nutrient you need.

Diabetics need same food as when diabetes was not contracted. A diabetic will need to take nutritionally well-balanced diet with some regulations to maintain health. The goal is to keep body healthy and to maintain blood glucose level within normal range.

Principles of diet are:

- ✓ **Body weight:** It must be reduced if one is fat, maintain present weight if it is normal, one requires gaining weight if one is thin.
- ✓ **Eat diverse food:** Eat a variety of food. Eat more fiber-rich food (leaves, vegetables with skin, salad without dressing, lentils etc.)
- ✓ **Free food:** Follow the list of food mentioned as food that are not restricted (can be taken freely). These foods are clear soup, salad without dressing, green leaves etc.
- ✓ **Food that can be used in moderation:** Take limited or advised amount of carbohydrate food (cereal and other starchy food) root tuber, pulse, fruit and egg.
- ✓ **Food that need to be avoided:** Take less saturated fat (fat from food of animal origin), butter, ghee, chocolate, jam, jelly, honey and other sweet.
- ✓ **Drink sugar free:** Avoid sweet in any form. One can use non-caloric sweetener like saccharine. Do not add sugar to tea or coffee.
- ✓ **Reduce salt intake:** This help to control blood pressure. Use less salt while cooking. Avoid tinned food that contain extra salt as well as pickle.
- ✓ **Choose food prepared by healthy cooking method:** Grilled, steamed, baked, poached and barbecued or boiled.
- ✓ **Eat regularly:** Food should be distributed as even as possible throughout the day (three main meals and at least two in-between snacks). Do not skip meal.
- ✓ **Restrict alcohol**: Restriction of alcohol is important. Do not substitute alcohol for meal and never drink in empty stomach. Alcohol produces calorie (1gm yield 7 calorie) but it is not food and it is not helpful in nutrition. Alcohol drinking has its effect on low blood glucose. It can mask the usual signal of hypoglycemia.

If you are not able to eat your regular food, you should not fast; you should take a glass of milk with some cereals, etc. at every meal time. Add fruit juice in your diet. If you are on insulin or tablets and if you are not able to eat your meal, you should stop insulin or tablets to avoid hypoglycemic reaction. Consult your doctor immediately. [39]

Food to be taken liberally

- ✓ Clear soup

- ✓ Raw and green leafy vegetables like cabbage, cucumber, onion, mushroom, lettuce, radish, etc.
- ✓ Thin butter milk
- ✓ Spices to taste

Food to be taken in limited amount

- ✓ Cereal - Wheat, Millet, Maize, Rice, Bread Noodle, Roti, Sip
- ✓ Dal, Pulses (Whole pulses: Chana, Rajma, Soya bean instead of split pulses or their dal). ✓ Root vegetable - Potato, Sweet potato, Carrot, Tapioca ✓ Vegetable oil.
- ✓ Lean meat, fish & egg.
- ✓ Fruit like Apple, Banana, Orange
- ✓ Whole wheat powder preferred to refined wheat powder

Food to be avoided

- ✓ Sugar, sweets, candies, jam, jelly, glucose, cake
- ✓ Alcoholic beverage and soft drink
- ✓ Concentrated milk preparations
- ✓ Fried preparations
- ✓ All types of nuts and oil seeds, concentrated milk preparations
- ✓ Cream, Butter, Lard
- ✓ Fatty meat, organ meat like: liver, kidney and brain

Making wise food choices can help you [39]

- ✓ feel good every day
- ✓ lose weight if you need to
- ✓ lower your risk for heart disease, stroke, and other problems caused by diabetes

The diabetes food pyramid can help you make wise food choices.

FIGURE 3. 2: FOOD PYRAMID FOR DIABETIC PATIENT.

- **Starches**

Starches are bread, grains, cereal, pasta, and starchy vegetables like corn and potatoes. They provide carbohydrate, vitamins, minerals, and fiber. Whole grain starches are healthier because they have more vitamins, minerals, and fiber. Eat some starches at each meal. Eating starches is healthy for everyone, including people with diabetes.

Examples of starches are bread, potatoes, tortillas, pasta, rice beans, corn, crackers, yams, pretzels, cereal, and lentils.

- **Vegetables**

Vegetables provide vitamins, minerals, and fiber. They are low in carbohydrate.
Examples of vegetables are lettuce, peppers, celery, broccoli, carrots, chilies, vegetable juice, green beans, greens, spinach, tomatoes, and cabbage.

- **Fruits**

Fruits provide carbohydrate, vitamins, minerals, and fiber.
Examples of fruits include apples, bananas, mango, fruit juice, raisins, guava, strawberries, oranges, papaya, dried fruit, watermelon, berries, grapefruit, peaches and canned fruit

- **Milk**

Milk provides carbohydrate, protein, calcium, vitamins, and minerals.

- **Meat and Meat Substitutes**

The meat and meat substitutes group include meat, poultry, eggs, cheese, fish, and tofu. Eat small amounts of some of these foods each day.
Meat and meat substitutes provide protein, vitamins, and minerals.
Examples of meat and meat substitutes include chicken, eggs, cheese, beef, peanut butter, pork, fish, tofu, lamb, canned tuna or cottage cheese, turkey other fish.

- **Fats and Sweets**

Limit the amount of fats and sweets you eat. Fats and sweets are not as nutritious as other foods. Fats have a lot of calories. Sweets can be high in carbohydrate and fat. Some contain saturated fats, Tran's fats, and cholesterol that increase your risk of heart disease.
Limiting these foods will help you lose weight and keep your blood glucose and blood fats under control.

Examples of fats include salad dressing, butter, avocado, oil, margarine, olives, cream cheese, mayonnaise, bacon,

Examples of sweets include cake, pie, cookies, ice cream, syrup, doughnuts

A meal plan to generating different kinds of calories

1000 Calories	**1200 Calories**	**1500 Calories**
Carbohydrates: 133 g Protein: 56g Fat: 30g	Carbohydrates: 154 g Protein: 63g Fat: 36g	Carbohydrates: 189 g Protein: 78g Fat: 46g
Breakfast: 1 fruit 1 starch ½ milk Free food	Breakfast: 1 fruit 2 starch 1 milk Free food	Breakfast: 1 fruit 2 starch 1 fat 1 milk Free food
Lunch: 2 Meat 1 Starch 1 fruit 1 fat 1 vegetable Free food	Lunch: 2 Meat 1 Starch 1 fruit 1 fat 1 vegetable Free food	Lunch: 2 Meat 2 Starch 1 fruit 1 fat 1 vegetable Free food
Afternoon snack: 1 fruit	Afternoon snack: 1 fruit	Afternoon snack: 1 fruit
Dinner: 2 Meat 1 Starch 1 vegetable Free food	Dinner: 2 Meat 1 Starch 1 vegetable 1 fat Free food	Dinner: 2 Meat 1 Starch 1 vegetable 1 fat Free food
Evening snack: 1 fruit 1 milk	Evening snack: 1 fruit 1 milk	Evening snack: 1 fruit 1 milk

1800 Calories	**2000 Calories**	**2500 Calories**
Carbohydrates: 234g Protein: 91g Fat: 56g	Carbohydrates: 254 g Protein: 103g Fat: 61g	Carbohydrates: 311g Protein: 122g Fat: 79g
Breakfast: 1 fruit 2 starch 1 milk Free food	Breakfast: 1 fruit 3 starch 1 fat 1 milk Free food	Breakfast: 2 fruit 3 starch 2 fat 1 milk Free food
Lunch: 2 Meat 2 Starch 1 vegetable 1 fruit 1 fat Free food	Lunch: 3 Meat 2 Starch 2 vegetables 1 fruit 1 fat Free food	Lunch: 4 Meat 3 Starch 2 vegetables 1 fruit 2 fat Free food
Afternoon snack: 1 fruit	Afternoon snack: 1 fruit 1 starch	Afternoon snack: 1 fruit 1 starch
Dinner: 4 Meat 3 Starch 2 vegetables 1 fruit 2 fat Free food	Dinner: 4 Meat 3 Starch 2 vegetables 1 fruit 2 fat Free food	Dinner: 4 Meat 3 Starch 2 vegetables 1 fruit 2 fat Free food
Evening snack: 2 starch 1 milk	Evening snack: 2 starch 1 milk	Evening snack: 2 starch 1 milk 1 fruit

TABLE 3.2: MEAL PLAN TO GENERATE DIFFERENT AMOUNT OF CALORIES

Drug (Medication):

All diabetics must control diet and be disciplined in maintaining diet and life-styles. Many diabetics, especially older patients may keep their diabetes under control only by regulating their diet and maintaining a disciplined life-style. However, Type 1 diabetics have to take insulin in addition to diet control and maintaining disciplined life. Type 2 diabetics who are not controlled on diet and exercise will need oral medicine for their control. Some of them may need insulin.

Exercise:

Exercise or physical work is very important in controlling diabetes. Exercise relieves stiffness of limb and muscle and helps enhancing circulation of blood. Exercise keeps body fit. It enhances action of insulin and stimulates insulin secretion. Walking for at least 60 minutes every day is a necessity for diabetics.

Exercise boosts fitness level while reducing blood glucose and blood pressure. Regular physical activity is essential for good health. Consult health worker before beginning a new program, especially if you are 40 years or have had diabetes for 10 years or longer

Exercise

- ✓ Helps body to use insulin more effectively.
- ✓ Can lower blood glucose level
- ✓ Strengthens heart and lungs
- ✓ Reduces body fat and increases muscle bulk and strength
- ✓ Assists with weight control
- ✓ Helps cope with stress
- ✓ Improves self-image
- ✓ Helps in reducing risk factors of heart disease
- ✓ Lowers blood pressure

Breaking the physical activity into different groups can help patient to know and to do it with a planned time. Diabetic Patient can do the following physical activity with different time. [38]

- ➢ Aerobic exercise
- ➢ Strength training to build muscle
- ➢ Stretching exercises
- ➢ And it's possible to add extra activity to their daily routine

- ➢ **Aerobic Exercise**

Aerobic exercise is activity that uses large muscles, makes heart beat faster, and makes breathe harder. Doing moderate to vigorous aerobic exercise for 30 to 60 minutes a day most days of the week provides many benefits. It possible even split up these minutes into several parts.

- **Strength Training to Build Muscle**

Strength training is a light to moderate physical activity that builds muscle and keeps bones healthy. When client have more muscle and less fat, it helps to burn more calories because muscle burns more calories than fat, even between exercise sessions. Burning more calories can helps to lose and keep off weight.

Whether client is a man or a woman, they can do strength training with hand weights, elastic bands, or weight machines two to three times a week. It possible do strength training at home, at a fitness center, or in a class. Start with a light weight and slowly increase the size of weights as muscles become stronger.

- **Stretching Exercises**

Stretching exercises are a light to moderate physical activity that both men and women can do. For example, yoga is a type of stretching that focuses on breathing and helps to relax. Even if patient have problems moving or balancing, certain types of yoga can help. For example, chair yoga has stretches it is possible to perform stretch exercise when sitting in a chair. When patient stretch, they increase their flexibility, it lower stress, and help prevent sore muscles.

- **Add Extra Activity to Your Daily Routine**

Increase daily activity by spending less time watching TV or at the computer. Try these simple ways to add light, moderate, or vigorous physical activities in every day:

- ✓ Walk around while talk on the phone.
- ✓ If they have kids or grandkids, visit a zoo or a park with them.
- ✓ Take a walk-through neighborhood.
- ✓ When watch TV, get up and walk around the room during commercials.
- ✓ Do chores, such as work in the garden or rake leaves, clean the house, or wash the car.
- ✓ Stretch out chores. For example, make two trips to take the laundry downstairs instead of one.
- ✓ Park at the far end of the shopping center parking lot and walk to the store.
- ✓ Take the stairs instead of the elevator
- ✓ Stretch or walk around instead of taking a coffee break and eating.

Below here we are identified different types of activity that is recommended for d/t age group.

Type of exercise	Age < 16	17 – 30
Aerobic Exercise	✓ Walking briskly ✓ Climbing stairs ✓ Dancing ✓ In-line skating or skateboarding	✓ Swimming or taking a wateraerobics class ✓ Playing basketball, tennis, or other sports
	✓ Dusting ✓ Making grass ✓ Badminton ✓ Bowling ✓ Ping-Pong ✓ Swimming ✓ Jogging ✓ Aerobic exercise classes ✓ Bicycle riding (stationary or on a path) ✓ Some activities of gardening, such as raking and pushing a lawn mower ✓ Tennis ✓ Golf (without a cart) ✓ Active recreation, such as hiking, skateboarding, rollerblading ✓ Active games involving running and chasing, such as tag ✓ Jumping rope ✓ Martial arts, such as karate ✓ Running ✓ Sports such as soccer, ice or field hockey, basketball, swimming, tennis ✓ Cross-country skiing	✓ Taking an exercise class ✓ ice skating ✓ In-line skating ✓ Jumping jacks ✓ Active recreation, such as canoeing, hiking, skateboarding, rollerblading ✓ Brisk walking ✓ Bicycle riding (stationary or road bike) ✓ Housework and yard work, such as sweeping or pushing a lawn mower ✓ Games that require catching and throwing, such as baseball and softball

Aerobic Exercise for the remain age group

30 – 50	50 – 60	60 +
✓ Swimming or taking a water-aerobics class ✓ Playing basketball, tennis, or other sports ✓ Taking an exercise class ✓ ice skating ✓ In-line skating ✓ Jumping jacks ✓ Active games involving running and chasing, such as flag football ✓ Bicycle riding ✓ Jumping rope ✓ Martial arts, such as karate ✓ Running ✓ Sports such as soccer, ice or field hockey, basketball, swimming, tennis ✓ Vigorous dancing	✓ Walking briskly ✓ Dancing ✓ Riding a bicycle outdoors or a stationary bicycle indoors ✓ Taking an exercise class ✓ Washing house material ✓ Dusting ✓ Preparing a male ✓ Light gardening ✓ Making grass ✓ Hose painting ✓ Golfing	✓ Walking briskly ✓ Dancing ✓ Riding a bicycle outdoors or a stationary bicycle indoors ✓ Taking an exercise class ✓ Washing house material ✓ Dusting ✓ Preparing a male ✓ Light gardening ✓ Making grass ✓ Ping-Pong
✓ Cross-country skiing		

TABLE 3.3: TYPES OF AEROBIC EXERCISE FOR DIFFERENT AGE GROUP

Strength Trainings to Build Muscle

Type of exercise	Age < 16	17 – 30
Strength Training to Build Muscle	✓ climbing stairs ✓ hill walking ✓ cycling ✓ dance ✓ Yoga ✓ Exercises using exercise bands, weight machines, hand-held weights ✓ Calisthenics' exercises (body weight provides resistance to movement) ✓ Digging, lifting, and carrying as part of gardening ✓ Carrying groceries ✓ Some yoga exercises ✓ Some Tai chi exercises ✓ Games such as tug-of-war ✓ Modified push-ups (with knees on the floor) ✓ Resistance exercises using body weight or resistance bands ✓ Rope or tree climbing ✓ Sit-ups (curl-ups or crunches) ✓ Swinging on playground equipment/bars ✓ Games such as hopscotch ✓ Hopping, skipping, jumping ✓ Jumping rope ✓ Running ✓ Sports such as gymnastics, basketball, volleyball, tennis	✓ lifting weights ✓ heavy gardening, such as digging and shoveling ✓ push-ups, sit-ups and squats ✓ working with resistance bands ✓ Games such as tug-of-war ✓ Push-ups and pull-ups ✓ Resistance exercises with exercise bands, weight machines, hand-held weights ✓ Climbing wall ✓ Sit-ups (curl-ups or crunches) ✓ Hopping, skipping, jumping ✓ Jumping rope ✓ Running ✓ Sports such as gymnastics, basketball, volleyball, tennis ✓ Weight training equipment in gyms

Strength Training to Build Muscle for the reaming age category

30 – 50	50 – 60	60 +
✓ lifting weights ✓ heavy gardening, such as digging & shoveling	✓ climbing stairs ✓ hill walking ✓ cycling	✓ hill walking ✓ climbing stairs ✓ cycling
✓ push-ups ✓ sit-ups and squats ✓ Weight training equipment in gyms	✓ dance ✓ yoga ✓ Weight training equipment in gyms	✓ dance ✓ yoga

TABLE 3.4: TYPES OF STRENGTH EXERCISE FOR DIFFERENT AGE GROUP

Stretching Exercises

Type of exercise	Age < 16	17 – 30
Stretching Exercises	✓ Seated Neck Release ✓ Lying Quad Stretch ✓ Sphinx Pose ✓ Extended Puppy Pose ✓ Pretzel Stretch ✓ Reclining Bound Angle Pose ✓ Standing Quad Stretch ✓ The Routine ✓ The Runner's Stretch ✓ The Standing Side Stretch ✓ The Forward Hang ✓ The Low Lunge Arch ✓ The Seated Back Twist ✓ The Bound Angle ✓ Downward Dog ✓ Crescent Pose ✓ Child's Pose ✓ Side Oblique Stretch ✓ Single Leg Stretch ✓ Triceps Stretch ✓ Seated Side Stretch ✓ Shoulder Stretch ✓ Biceps Stretch ✓ Upper Back Stretch ✓ Chest and Shoulder Stretch ✓ Standing Hamstring Stretch ✓ Quad Stretch	✓ Standing Hamstring Stretch ✓ Piriformis Stretch ✓ Triceps Stretch ✓ Figure Four Stretch ✓ 90/90 Stretch ✓ Frog Stretch ✓ Butterfly Stretch ✓ Seated Shoulder Squeeze ✓ Side Bend Stretch ✓ Lunging Hip Flexor Stretch ✓ Lying Pectoral Stretch ✓ Knee to Chest Stretch ✓ Lunge with Spinal Twist ✓ Morning Stretch for Lumbar Flexion ✓ Morning Stretch for Neck Mobility ✓ Shoulder Shrugs ✓ Morning Shoulder Stretches ✓ Standing Quad Stretch

Stretching Exercises for remaining age group

30 – 50	50 – 60	60 +
✓ Standing Hamstring Stretch ✓ Piriformis Stretch ✓ Triceps Stretch ✓ Figure Four Stretch ✓ 90/90 Stretch ✓ Frog Stretch ✓ Butterfly Stretch ✓ Seated Shoulder Squeeze ✓ Side Bend Stretch ✓ Lunging Hip Flexor Stretch ✓ Lying Pectoral Stretch ✓ Knee to Chest Stretch ✓ Lunge with Spinal Twist ✓ Morning Stretch for Lumbar Flexion ✓ Morning Stretch for Neck Mobility ✓ Shoulder Shrugs ✓ Morning Shoulder Stretches ✓ Standing Quad Stretch	✓ Triceps Stretch ✓ Seated Side Stretch ✓ Shoulder Stretch ✓ Biceps Stretch ✓ Upper Back Stretch ✓ Chest and Shoulder Stretch ✓ Standing Hamstring Stretch ✓ Quad Stretch	✓ Triceps Stretch ✓ Seated Side Stretch ✓ Shoulder Stretch ✓ Biceps Stretch ✓ Upper Back Stretch ✓ Chest and Shoulder Stretch ✓ Standing Hamstring Stretch ✓ Quad Stretch

TABLE 3.5: TYPES OF STRETCHING EXERCISE FOR DIFFERENT AGE GROUP

Sample Recommendation for 8-year-old child with diabetes

He/ she gets 60 minutes of physical activity each day that is at least moderate intensity. He participates in the following activities each day:

Monday: Walks to and from school (20 minutes), plays actively with family (20 minutes), and jumps rope (10 minutes), does gymnastics (10 minutes).
Tuesday: Walks to and from school (20 minutes), plays on playground (25 minutes), climbs on playground equipment (15 minutes).

Wednesday: Walks to and from school (20 minutes), plays actively with friends (25 minutes), jumps rope (10 minutes), runs (5 minutes), and does sit-ups (2 minutes).

Thursday: Plays actively with family (30 minutes), plays soccer (30 minutes).

Friday: Walks to and from school (20 minutes), plays actively with friends (25 minutes), and bicycles (15 minutes).

Saturday: Plays on playground (30 minutes), climbs on playground equipment (15 minutes), and bicycles (15 minutes).

Sunday: Plays on playground (10 minutes), plays soccer (40 minutes), plays tag with family (10 minutes).

He/she meets the Guidelines by doing vigorous–intensity aerobic activities, bone-strengthening activities, and muscle-strengthening activities on at least 3 days of the week:

- **Vigorous-intensity** aerobic activities 6 times during the week: jumping rope (Monday and Wednesday), running (Wednesday), soccer (Thursday and Sunday), playing baseball (Sunday);
- **Bone-strengthening** activities 6 times during the week: jumping rope (Monday and Wednesday), running (Wednesday), soccer (Thursday and Sunday), playing baseball (Sunday); and
- **Muscle-strengthening** activities 4 times during the week: gymnastics (Monday), climbing on playground equipment (Tuesday and Saturday), sit-ups (Wednesday).

Sample recommendation for 16-year-old person with diabetes

He/she gets 60 or more minutes of daily physical activity that is at least moderate intensity. His/her participates in the following activities each day:

Monday: Walks (10 minutes), plays basketball/soccer (50 minutes).

Tuesday: Walks (10 minutes), plays tennis (30 minutes), does sit-ups and push-ups (5 minutes), walks briskly with friends (15 minutes).

Wednesday: Walks (10 minutes), plays basketball/soccer (50 minutes).

Thursday: Walks (10 minutes), plays tennis (30 minutes), does sit-ups and push-ups (5 minutes), plays with children at the park while babysitting (15 minutes).

Friday: Plays Frisbee in park (45 minutes), mows lawn (30 minutes).
Saturday: Goes dancing with friends (60 minutes), does yoga (30 minutes). Sunday:

Hikes (A long walk usually for exercise or pleasure) (60 minutes).

He/she meets the Guidelines by doing vigorous-intensity aerobic activities, bone-strengthening activities, and muscle-strengthening activities on at least 3 days of the week:

- **Vigorous-intensity** aerobic activities 4 times during the week: basketball (Monday and Wednesday), dancing (Saturday), hiking (Sunday);
- **Bone-strengthening** activities 4 times during the week: basketball (Monday and Wednesday), dancing (Saturday), hiking (Sunday); and
- **Muscle-strengthening** activities 3 times during the week: sit-ups and push-ups (Tuesday and Thursday), yoga (Saturday).

Sample recommendation for 45-year-old person with diabetes

He/she gets 60 or more minutes of daily physical activity that is at least moderate intensity. His/her participates in the following activities each day:

Monday: Walks to work (20 minutes), Active recreation, such as hiking, skateboarding, rollerblading (30 minutes), Dancing (10 minutes)

Tuesday: Walks to work (20 minutes), plays tennis (20 minutes), does sit-ups and push-ups (10 minutes), and walks briskly with friends (10 minutes).

Wednesday: Walks to work (20 minutes), Housework and yard work, such as sweeping or pushing a lawn mower (40 minutes).

Thursday: Walks to work (20 minutes), jumping rope (10 minutes), does sit-ups and push-ups (5 minutes), plays with children at the park while babysitting (15 minutes).

Friday: Walks to work (20 minutes), Plays Frisbee in park (20 minutes), lifting weights (20 minutes).

Saturday: Goes dancing with friends (60 minutes), does yoga (30 minutes).

Sunday: Sports such as gymnastics, basketball, volleyball, tennis (60 minutes).

He/she meets the Guidelines by doing vigorous-intensity aerobic activities, bone-strengthening activities, and muscle-strengthening activities on at least 3 days of the week:

- **Vigorous-intensity** aerobic activities 4 times during the week: basketball (Monday and Wednesday), dancing (Saturday), hiking (Sunday);
- **Bone-strengthening** activities 4 times during the week: basketball (Monday and Wednesday), dancing (Saturday), hiking (Sunday); and
- **Muscle-strengthening** activities 3 times during the week: sit-ups and push-ups (Tuesday and Thursday), yoga (Saturday).

Discipline:

Discipline is the key to diabetes management. A diabetic must maintain discipline during his/her entire life.

- ✓ Take balanced food regularly and adequately
- ✓ Exercise regularly and adequately
- ✓ Abide by the health worker's instruction
- ✓ Keep body and environment clean and healthy
- ✓ Take good care of feet.
- ✓ Avoid sweet, sugar, honey and all food sweetened with sugar or honey

- ✓ Do not stop diabetes treatment without consulting the health work
- ✓ In case of any physical problem, inform the health worker

Stress Management

Reducing stress can lower blood glucose and blood pressure and improve overall health. Some relaxation tips to help reduce stress are:

- ✓ Schedule relaxing activities into your day. Try reading a book, working in garden, watching movie or hiking
- ✓ Exercise regularly
- ✓ Laugh, laughter is an excellent stress reducer
- ✓ Rest is important. Your body needs plenty of sleep
- ✓ Follow diabetes care routine

Follow sick day guidelines and see the doctor when:

- ✓ Blood glucose is over 240mg/dl
- ✓ You cannot eat
- ✓ You have persistent vomiting or diarrhea
- ✓ Your fever persists longer than 24 hours.
- ✓ Take your usual dose of regular insulin or oral medicine. You may need extra dose of regular insulin to keep blood glucose under control.
- ✓ Check your blood glucose every 4-6 hour and record result.
- ✓ Check your temperature four times a day.
- ✓ Drink plenty of calorie-free liquid (200-300ml per hour)
- ✓ If you are vomiting, sip about 100 ml of juice or regular soft drink.
- ✓ Eat your regular meal.
- ✓ If you cannot eat your meals, drink regular liquid (with sugar) and replace meal with food that are easy to digest, slice of bread, soup, hot cereal, juice, milk, egg etc.

What should diabetics not do?

- ✓ Do not walk barefoot, even at home.
- ✓ Do not cut corn and callosity (you may gently use a pumice stone to rub them but better ask your health worker's opinion)
- ✓ Do not cut your nail into the corners.
- ✓ Do not leave sharp edge of nail
- ✓ Do not use hot water bottle, heating pad or electric blankets, as these can burn your feet. Reference

3.2.2 Hypertension

Blood pressure is the force being applied against arterial walls as the heart pumps blood throughout the body. Blood pressure rises and falls throughout the day. When blood pressure stays elevated over time, it's called high blood pressure. The medical term for high blood pressure is hypertension. Systolic pressure (top number) represents the force that occurs when the heart is pushing the blood out of the heart into the arteries. Diastolic pressure (bottom number) represents the pressure in the arteries when the heart is filling up with blood (i.e., the peripheral arterial tone).

Essential or primary hypertension is defined as having a blood pressure reading of ≥140/90 mm Hg without a known cause (idiopathic). Hypertension is diagnosed when systolic and diastolic measurements are ≥ 140 mm Hg or ≥ 90 mmHg, respectively.

In order to diagnose hypertension, a person has to take a rest for at least 5 minutes and check the blood pressure separately by at least 2 minutes using proper cuff instruments and methods. Before measuring blood pressure, it's recommended to avoid caffeine, cigarettes, and exercise for at least 30 minutes prior to the test. When taking blood pressure at home, sitting up straight in a chair and placing both feet on the floor is necessary. Additionally, it is mandatory to make sure arm is supported on a table or an even surface before measuring and then place the top of the arm at the level of heart [30].

High blood pressure is a disease of cardiovascular system and is a major modifiable risk factor for coronary heart disease, congestive heart failure, stroke, renal failure, renal dysfunction and eye problems [2].

Hypertension is often called "the silent killer" because it rarely causes symptoms, even as it inflicts serious damage to the body [30].

Primary hypertension. Primary hypertension is known as essential or idiopathic hypertension. More than 95 percent of patients have primary hypertension, with no identifiable cause. Primary hypertension results from the interplay of multiple genetic and environmental factors, including lifestyle influences.

Secondary hypertension. It was found that less than 5 percent of patients have secondary hypertension. The cause of elevated blood pressure can be identified, such as narrowing of the renal arteries, renal parenchymal disease, certain medications, pregnancy, and coarctation of the aorta. [30]

Hypertension is linked with 70% of strokes and 60.5% of kidney diseases and increases the risk of vascular dementia. Therefore, once hypertension has been identified, the patients should be monitored for their blood pressure at regular.

The common risk factors for hypertension include the following:

- ✓ Family history of high blood pressure
- ✓ Poor diet and having too much salt in your diet
- ✓ History of smoking and second-hand smoke exposure
- ✓ Drinking too much alcohol
- ✓ Lack of physical activity
- ✓ Having diabetes
- ✓ Being overweight or obese
- ✓ Age (55 or older for men; 65 or older for women)
- ✓ Stress
- ✓ Ethnicity

Health consequences of high blood pressure may include:

- ✓ Coronary artery disease
- ✓ Heart attack
- ✓ Heart disease s
- ✓ Congestive heart failure
- ✓ Stroke
- ✓ Kidney damage
- ✓ Vision loss
- ✓ Erectile dysfunction in males

What are the symptoms of hypertension?

One of the most dangerous aspects of hypertension is that the existence of the case may not be known that it exists. In fact, nearly one-third of people who have high blood pressure don't know it. The only way to know that blood pressure is high is through regular checkups. If blood pressure is extremely high, there may be certain symptoms to look out for, including:

- ✓ Severe headache
- ✓ Fatigue
- ✓ Confusion
- ✓ Vision problems
- ✓ Nosebleeds / Bleeding from the nose
- ✓ Chest pain
- ✓ Difficulty breathing / Palpitations
- ✓ Nausea or vomiting
- ✓ Irregular heartbeat
- ✓ Dizziness

- ✓ Blood in the urine and
- ✓ Pounding in chest, neck, or ears.

If any of these symptoms are observed, going to a doctor immediately something must to do. Untreated hypertension can lead to serious diseases, including stroke, heart disease, and kidney failure and eye problems. [30]

Symptoms of a hypertensive emergency include [30]:

- ✓ Headache
- ✓ Blurred vision,
- ✓ Increasing confusion,
- ✓ Seizure
- ✓ Increasing chest pain,
- ✓ Increasing shortness of breath and
- ✓ Swelling or edema (fluid buildup in the tissues).

Diagnosis is based on the finding of elevated blood pressure on three separate occasions. most authorities consider blood pressure (BP) !140/90 mmHg as being 'hypertensive'; importantly either an elevated systolic or diastolic pressure qualifies for the diagnosis [31].

Classification of hypertension	Systolic	Diastolic	Recommended review period	Action
Optimal blood pressure	< 120	< 80	Recheck in 2 years	Adopt healthy life style
Normal blood pressure	< 130	< 85	Recheck in 1 years	Lifestyle modification
High normal blood pressure	130–139	85–89	Recheck in 6 months	Lifestyle modification
Grade 1 hypertension (mild)	140–159	90–99	Confirm with 2 months	Lifestyle modification
Grade 2 hypertension (moderate)	160–179	100–109	Evaluate with 1 month	1. Treat with 1 month 2. Lifestyle modification

Grade 3 hypertension (severe)	≥ 180	≥ 110	Evaluate with 1 week	✓ If high blood pressure is confirmed, drug treatment should be commenced ✓ May warrant urgent referral if patient presents features suggestive of malignant hypertension ✓ Lifestyle modification

TABLE 3.6: BLOOD PRESSURE DISTRIBUTION

Medical History: -The history should focus on modifiable lifestyle factors including: - weight change, dietary intake of sodium and cholesterol, level of exercise, psychosocial stressors, and patterns of alcohol and tobacco use. A family history of hypertension, cardiovascular disease, cerebrovascular disease, diabetes mellitus and dyslipidemia should be documented. Assess for symptoms and signs of target organ disease and secondary hypertension via a directed history. Major Cardiovascular Risk Factors are discussed written here after: -

- ✓ Hypertension
- ✓ Age (older than 55 for men, 65 for women)
- ✓ Diabetes mellitus
- ✓ Elevated LDL cholesterol
- ✓ Low HDL cholesterol
- ✓ Estimated GFR less than 60 mL/min
- ✓ Micro albuminuria
- ✓ Family history of premature cardiovascular disease (men younger than 55 or women younger than 65)
- ✓ Obesity (body mass index greater than or equal to 30 kg/m2, waist circumference greater than

40 inches for men and greater than 35 inches in women),

- ✓ Physical inactivity and
- ✓ Tobacco usage, particularly cigarettes.

Target organ damage are listed here: -Heart, Left ventricular hypertrophy, Angina/prior myocardial infarction, Prior coronary revascularization, Heart failure, Brain, Stroke or transient ischemic attack, Dementia, Chronic kidney disease, Peripheral arterial disease and Retinopathy. Hypertensive emergency: **-** means blood pressure is so high that organ damage can occur. Blood pressure must be reduced immediately to prevent imminent organ damage. Organ damage associated with hypertensive emergency may include: [30].

- ✓ Changes in mental status, such as confusion,

- ✓ Bleeding into the brain (stroke)
- ✓ Heart failure
- ✓ Chest pain (unstable angina)
- ✓ Fluid in the lungs (pulmonary edema)
- ✓ Heart attack
- ✓ Aneurysm (aortic dissection)
- ✓ Eclampsia (occurs during pregnancy)

To diagnose a hypertensive emergency, healthcare providers will ask several questions to get a better understanding of medical history of the patient to be treated. They will also need to know all medications that are being taken, including nonprescription and recreational drugs. Additionally, a patient to be treated should tell to healthcare providers; if any herbal or dietary supplements are being taken. Certain tests will be performed to monitor blood pressure and assess organ damage, including: Regular monitoring of blood pressure, Eye exam to look for swelling and bleeding, Blood and urine testing.

Principles of Hypertension management

It is strongly recommended that hypertensive patients be initially treated with and periodically reassessed for adherence to healthy lifestyle habits for both prevention and treatment of hypertension. Lifestyle modifications should be reviewed and reemphasized at least annually.

Lifestyle modification for hypertensive patients includes weight reduction, dietary management, alcohol restriction, stopping smoking, exercise, stress management, and regular medication adherence. [30]

Six lifestyle behaviors: -

- ❖ Limit sodium: - Reducing sodium intake in the control diet group increased blood pressure control 2.3-fold. We recommend a daily intake of less than 1,500 mg of sodium for most persons.
- ❖ Increase vegetables and minimize animal-based fats (DASH diet): - Among subjects with hypertension baseline, the DASH diet increased blood pressure control twofold over control.
- ❖ Weight Reduction and Management: - In multivariable analyses, every 1-kg/m2 increase in body mass index was associated with an 11% increase in heart failure risk. Compared with lean participants, overweight participants had a 49% and obese participants had a 180% increase in heart failure risk, with increasing body mass index a significant predictor of

hypertension. Among patients with severe obesity, a lifestyle intervention involving diet combined with physical activity resulted in clinically significant weight loss and favorable changes in cardio metabolic risk factors.

- ❖ Moderation of alcohol intake: - Limit alcohol use to one serving per day for women, two per day for men, with a maximum of five per week for women and nine per week for men. Overall, interventions to reduce alcohol consumption caused small but statistically significant reductions in both systolic (3.4 mmHg, 95%CI: 0.9 to 6.0) and diastolic (3.4 mmHg, 95%CI:

  1.5 to 5.4) blood pressure.
- ❖ No smoking: - 13.6/1,000 person-years develop preventable heart failure.
- ❖ Review of non-prescription and supplement use: - Over-the-counter medications and supplements can cause increases in blood pressure.

Individuals who adopt this lifestyle, at any age, have significantly lower risk of developing hypertension and subsequent heart failure.

Other measures to reduce CVD risk rather than lowering BP: - cessation of smoking, reduced total fat and saturated fat intake, replacement of saturated fats with mono-unsaturated fats, increased oily fish consumption (1-2 portions per week), Relaxation techniques.

On table 4.5 it shows major interventions of hypertensions such as weight, diet, physical activity, sodium and alcohol intake and major expert recommendation for each intervention moreover it shows expected systolic BP reduction.

Intervention	Recommendation	Expected systolic BP Reduction
Weight reduction	Maintain ideal body mass index (20-25 kg/m^2)	5-10 mmHg pre 10kg weight loss
Diet	Consume diet rich in fruit, vegetables and fiber, but low in fat	8- 14 mmHg
Reduced sodium intake	< 100mmol/day (<6 g of sodium chloride or <2.4 g of sodium per day)	2 - 8 mmHg
Physical activity	Regular aerobic physical activity e.g. brisk walking for at least 30 min at least 5 days/wk.	4 - 9 mmHg

Alcohol moderation	No more than 3 units/day in men No more than 2 units/day in men	2 - 4 mmHg

TABLE 3.7: REDUCTION VARIABLES

The DASH Eating Plan

The DASH eating plan is rich in fruits, vegetables, fat-free or low-fat milk and milk products, whole grains, fish, poultry, beans, seeds, and nuts. It also contains less sodium; sweets, added sugars, and beverages containing sugar; fats; and red meats.

This heart-healthy way of eating is also lower in saturated fat, Trans fat, and cholesterol and rich in nutrients that are associated with lowering blood pressure mainly potassium, magnesium, calcium, protein, and fiber.

The number of servings depends on the number of calories you're allowed each day. Your calorie level depends on your age and, especially, how active you are.

Gender	Age (Years)	Calories needed for each activity level		
		Sedentary	Moderate active	Active
Female	19-30 31-50 51+	2,000 1,800 1,600	2,000-2,200 2,000 1,600-1,800	2,400 2,200 2,000-2,200
Male	19-30 31-50 51+	2,400 2,200 2,000	2,600-2,800 2,400-2,600 2,200-2,400	3,000 2,800-3,000 2,400-2,800

TABLE 3.8: CALORIES NEEDED FOR EACH ACTIVITY LEVEL

Sample Menu Plan

- ✓ The quantity of each meal has to be customized as per calories required based on BMI.
- ✓ If the patient is diabetic, hypertensive or suffering with any other medical ailment, diet has to be altered accordingly.
- ✓ Cooking oil 2tsp/day and No Extra table salt

Early Morning: Milk – 1 glass
Breakfast: 1 fruit, 2 starch, free food
Lunch: 2 Meat, 2 Starch, 1 vegetable, 1 fruit, 1 fat, free food
Evening: 2 starch, 1 milk,
Dinner: 4 Meat, 3 Starch, 2 vegetables, 1 fruit, 2 fats, free food

Exercise

A regular exercise activity can reduce the risk of developing hypertension and can lower the blood pressure in hypertensive clients. Exercise can heighten the client's sense of wellbeing, reduces emotional tension and raises the level of high-density lipoproteins (HDL), enables lipids like cholesterol and triglycerides to be transported within the water-based blood stream and decreases the risk of cardio-vascular morbidity and mortality. [30]

The recommended exercises for patients with hypertension involves walking, jogging or cycling of moderate intensity ranging from 4-52 weeks in length and each session typically lasted 30-60 minutes. walking, swimming, cycling and practicing yoga are also recommended. [30]

The use of physical exercise

- ✓ To control weight
- ✓ To reduce risk factors
  - lower blood pressure
  - reduce blood cholesterol levels
- ✓ To prevent complications
  - prevent atherosclerosis
  - prevent angina, myocardial infarction and stroke
- ✓ To improve quality of life/relieve stress

Do you have any of the following?

- ✓ Cardiovascular disease
- ✓ Bone or joint diseases that will be worsened by physical activity
- ✓ Pain in your chest when doing any activities
- ✓ Dizziness
- ✓ Are you aged over 65 and have not done any intense activity recently
- ✓ Uncontrollable hypertension
- ✓ Any other physical problems that prevent you from exercising

Physical activity benefits patients with hypertension in many ways however, stop exercising immediately if you experience any of the following and consult your doctor:

- ✓ Chest pain
- ✓ Dizziness
- ✓ Fatigue

Stress management

A variety of relaxation therapies, including meditation, yoga, music, rest and psychotherapy can reduce blood pressure. Relaxation can be highly beneficial if practiced routinely in one's everyday life. Techniques involving relaxation are widely used by people to reduce anxiety and cope with stress related problems. Relaxation procedures are active and educational forms of therapy that can decrease the occurrence of tension and anxiety disorders. [30]

Patients with hypertension should be able to:

- ✓ manage food portions and choices when eating out;
- ✓ eat more fruits, vegetable, grain and beans;
- ✓ decrease the fraction of saturated fat;
- ✓ consider effects on blood pressure when making food choices;
- ✓ avoid drinking alcohol (less than 1 ounce per day);
- ✓ take salt at about 6 grams/day or lower in food;
- ✓ reduce weight effectively;
- ✓ manage food choices to control blood pressure;
- ✓ exercise to control blood pressure and weight by walking, jogging or cycling lasting 30-60 minute per session;
- ✓ merge hypertension into daily life successfully;
- ✓ adjust hypertension routines to fit new situations;
- ✓ stop smoking; and
- ✓ control stress by listening to music, taking rest, and talking with family members

Self-regulation behaviors include: [28]

- ✓ understanding reasons for the changes in blood pressure levels;
- ✓ recognizing the signs and symptoms of high and low blood pressure;
- ✓ acting in response to symptoms;
- ✓ attending to symptoms of high and low blood pressure;
- ✓ treating low blood pressure reactions;
- ✓ making decisions based on experience;
- ✓ attending to situations that may affect blood pressure levels;
- ✓ Comparing differences between current and target blood pressure levels.

Special Patient Groups

❖ Hypertension and Stroke

Hypertension remains the most important treatable risk factor for the prevention of stroke and its recurrence. After acute cerebral hemorrhage or infarction, BP levels are usually increased, with more than 80% of patients having levels >160/95mmHg within the first 48-hr of the event.

There are potential pros and cons for both raising and lowering BP in the acute situation. However, to date, very few trials exist of either presser or depressor interventions in the acute stroke period. Treatment to lower BP is appropriate when BP is grossly elevated immediately (<48h) post-stroke (SBP >220mmHg or MAP >130mmHg). Otherwise it is best to start treatment at least 10-14 days later. Thiazides or CCBs are appropriate first line therapies for most subjects as they take some time to have the desired effect.

- ❖ Hypertension in People with Diabetes

Hypertension is twice as common in people with diabetes. It greatly increases the already elevated CVD risk - the risk of coronary disease is increased two-fold in men with diabetes and four-fold in diabetic women. ACE-Is/ARBs are recommended as first line agents in such patients because of their Reno-protective effects.

- ❖ Hypertension in Pregnancy

Hypertension in pregnant women considered as a Special Patient Groups [30].

- ✓ Hypertension occurs in 8–10% of pregnancies, and may precede impending pre-eclampsia (Associated with proteinuria and edema after 20 weeks gestation)
- ✓ Elevated BP/proteinuria at <20 weeks' gestation implies it preceded pregnancy
- ✓ There is often a fall in BP between 12-26 weeks of pregnancy
- ✓ Treatment during pregnancy (and breast-feeding) should be avoided if possible
- ✓ Aim to keep BP "150/100 mmHg; "140/90 mmHg if target organ damage present
- ✓ ACE-Is/ARBs should be avoided in pregnant women or those planning one
- ✓ NICE guidelines suggest that diuretics should not be used during pregnancy
- ✓ Women who are classified as 'high risk' for developing pre-eclampsia should be offered aspirin 75mg od from 12 weeks gestation until delivery (unlicensed indication; informed consent should be obtained and documented).
- ✓ Pregnant women with either severe hypertension (BP>160/110mmHg) or with pre-eclampsia should be admitted to hospital and followed up thereafter in secondary care. This includes formal follow-up in a specialist clinic post-partum. Treating High Blood Pressure in Children Researchers are still trying to determine the most effective way to treat high blood pressure in children. In general, treating high blood pressure in kids is not that different from treating it in adults. Working closely with child's doctor to find which treatment plan will work best for the child is necessary. Here are some general guidelines: [30]

- ✓ Follow the DASH Eating Plan: **-** The Dietary Approaches to Stop Hypertension (DASH) diet plan includes eating less fat and saturated fat as well as eating more fresh fruits and vegetables and whole-grain foods. Limiting salt intake can also help lower a child's blood pressure.
- ✓ Watch Child's Weight: - Being overweight increases the risk of developing high blood pressure. Following the DASH eating plan and getting regular exercise can help the child to lose weight.
- ✓ Avoid Tobacco Smoke: - Tobacco smoke can make blood pressure rise; it can also directly damage child's heart and blood vessels. Protecting child from tobacco smoke -- even secondhand smoke is must.

Taking Medications: -If child's high blood pressure is severe or doesn't respond to lifestyle changes, the doctor may prescribe medication. It may take a while to find combination of drugs that work best to control high blood pressure with the least side effects.

3.2.3 Acquired immunodeficiency syndrome

HIV, or human immunodeficiency virus, is the virus that causes AIDS (acquired immune deficiency syndrome). HIV weakens a person's immune system, reducing his or her ability to fight infections and cancers. The virus damages or destroys the cells of the immune system, leaving them unable to fight infections and certain cancers. A person can get HIV by coming into contact with an infected person's body fluids (blood, semen, vaginal fluids, breast milk), and HIV can be spread through:- Vaginal, oral, or anal sex, Sharing unclean needles to take drugs, Pregnancy (from an infected mother to baby), Blood transfusions. And peoples cannot get HIV from: Touching or hugging someone who has HIV or AIDS, Public bathrooms or swimming pools, Sharing cups, utensils, telephones, or other personal items, Bug bites.

Causes of HIV in Children

Most HIV infections in children are passed from mother to child during pregnancy, labor and delivery, or breastfeeding. However, thanks to preventive treatment regimens, the incidence of mother-to-child HIV transmission is decreasing. Other causes of child HIV include:

- ❖ Blood transfusions: -Blood transfusions using infected blood or injections with unsterilized needles can lead to HIV infection and AIDS in children.
- ❖ Illicit drug use: - In central and Eastern Europe, injected drug use continues to spread HIV among young people living on the streets.

- Sexual transmission:-Although sexual transmission is not a main cause of HIV/AIDS among children, it does occur in countries where children become sexually active at an early age.

Symptoms

Each stage of HIV/ADIS disease symptoms are discussed here after: -

A. The Symptoms of HIV/AIDS - the First Stage

HIV infection comes in three stages. The first stage is called acute infection or seroconversion, and it typically happens within two to six weeks after exposure or becoming infected. This is when the body's immune system puts up a fight against HIV. The symptoms of acute infection look similar to those of other viral illnesses and are often compared to those of the flu. The symptoms may last a week or two and then completely go away as the virus goes into a non-symptomatic stage. The initial symptoms of acute HIV infection may include: Headache, Diarrhea, Nausea and vomiting, Fatigue, Aching muscles, Sore throat, Red rash that doesn't itch, usually on the torso and

Fever.

B. The Period without Symptoms of HIV - the Second Stage

After the first seroconversion period, the immune system loses the battle with HIV and symptoms go away. HIV infection goes into its second stage, which can be a long period without symptoms, called the asymptomatic *(or* latent*)* period. This is when people may not know they are infected and can pass HIV on to others. This period can last 10 or more years. During this period without symptoms, HIV is slowly killing the CD4 T-cells and destroying the immune system. Blood tests during this time can reveal the number of these CD4 T-cells. Normally, a person has a CD4 T-cell count between 450 and 1,400 cells per microliter. This number changes constantly, depending on a person's state of health. For a HIV infected person, the number of CD4 T-cells steadily drops, making them vulnerable to other infections -- and in danger of developing AIDS.

C. HIV Infection and AIDS - the Third Stage

AIDS (acquired immune deficiency syndrome) is the advanced stage of HIV infection. When the CD4 T-cell number drops below 200, people are diagnosed with AIDS. Fortunately, combination medications used to treat HIV -- a "cocktail" – can help rebuild the immune system. These drugs can be expensive and pose challenges with side effects, but it is critical to not stop taking them without talking to doctor. People with low CD4 T-cells may also receive drugs to prevent opportunistic infections. These preventative medications should be taken until the CD4 count has

improved. Some people don't know they were infected with HIV, and only discover their HIV infection after experiencing some of these HIV-related symptoms: Being tired all of the time, Swollen lymph nodes in the neck or groin, Fever lasting for more than 10 days, Night sweats, Unexplained weight loss, Purplish spots on the skin that don't go away, Shortness of breath, Severe, long-lasting diarrhea, Yeast infections in the mouth, throat, or vagina, Easy bruising or unexplained bleeding. Patient needs a doctor if experience any of the above symptoms of HIV/AIDS. These are serious signs of disease, which could be HIV-related.

Symptoms of HIV/AIDS in Children: - Many babies and children living with HIV are known or suspected to have the infection because their mothers are known to be infected. However, sometimes infection is not suspected until a child develops symptoms. Symptoms of HIV infection vary by age and individual child, but following are some of the more common symptoms:

- ❖ Failure to thrive, which is the failure to gain weight or grow according to standardized growth charts used by pediatricians.
- ❖ Failure to reach developmental milestones during the expected time frame.
- ❖ Brain or nervous system problems, characterized by seizures, difficulty with walking, or poor performance in school.
- ❖ Frequent childhood illnesses such as ear infections, colds, upset stomach, and diarrhea.

As HIV infection becomes more advanced, children start to develop opportunistic infections. These are infections that rarely affect healthy people but can be deadly for people whose immune systems aren't working properly. Common opportunistic infections related to HIV include:

- ❖ Pneumocystis pneumonia -- a fungal infection of the lungs
- ❖ Serious infection due to cytomegalovirus (CMV)
- ❖ A condition of lung scarring called lymphocytic interstitial pneumonitis (LIP)
- ❖ Oral thrush or severe diaper rash due to Candida, a yeast infection

HIV/AIDS Risk Factors: - A variety of HIV risk factors can increase chances of becoming infected with a virus called HIV (human immunodeficiency virus). This infection can lead to AIDS (acquired immunodeficiency syndrome), which makes it more difficult for human body to fight off infection and disease. Some risk factors increase HIV risk more than others. Certain behaviors can increase HIV risk. These are some of the most common risk factors:

- ❖ Having unprotected vaginal, anal, or oral sex with someone who is infected with HIV or whose HIV status not know.
- ❖ Having many sexual partners.

- Having sex with a sex worker or an IV drug user.
- Sharing needles, syringes, or equipment used to prepare or inject drugs with someone who is HIV infected.
- Using needles for piercing or tattooing that are not sterile. (An accidental needle stick with a contaminated needle or medical instrument, however, is a very rare cause of HIV transmission.)

Other Possible HIV/AIDS Risk Factors:-Other factors may also increases HIV risk. For example, having sex under the influence of alcohol or drugs may lead to other risky behaviors, such as having unprotected sex. Here are other potential HIV risk factors:

- Having another sexually transmitted disease (STD), such as herpes, chlamydia, syphilis, or gonorrhea. STDs may cause changes in tissue that make HIV transmission more likely.
- Having sex after drinking alcohol or taking drugs.
- Having a mother who was infected with HIV before baby were born.
- Having had a blood transfusion or received blood products before 1985. Since that time, however, all blood in the United States has been tested for HIV.
- Having fewer copies of a gene that helps to fight HIV. Although not yet available, a screening test might one day be able to identify those who are more likely to get HIV and develop AIDS. HIV/AIDS in Pregnancy: - In the last 20-25 years HIV/AIDs has become an indirect major killer of mothers in pregnancy and delivery. The majority of HIV/AIDS women (77%) lives in SubSaharan Africa and constitutes 57% of the adult HIV positive population. In Ethiopia, the average prevalence rate in adults is 2.1 %(7.7% urban and 0.9% 337 rural), among these 59% are female. The HIV prevalence in pregnant women is 7.7% and about 15, 000 children are born with HIV every year. This is as a result of mother to child transmission (MTCT) during pregnancy (5-10%) and labor and delivery (10-15%). Quite significant number could be infected through breast feeding (5-20%). Pregnancy by itself does not affect the course of the disease, but HIV may increase the risk of premature deliveries, small for date uterus and the rate of still birth Factors that influence MTCT include: maternal viral load, nutritional status of the mother, presence of concomitant parasitic infection like malaria, severe immunodeficiency, advanced HIV/AIDS stage, presence of PROM and injury to the fetus and birth canal during labour and delivery. To reduce the rate of MTCT of HIV/AIDS, the Ethiopian government has adopted the four-pronged approaches in its PMTCT strategies, namely: primary prevention, prevention of

unintended pregnancy, prevention of HIV transmission from infected women to their infants, and treatment, care and support of HIV infected women, their infants and their families.

Diagnoses

The only way to know if a persons has HIV or the more advanced stage of the infection, AIDS, is to get tested. The CDC recommends that everyone between ages 13 and 64 have an HIV test at least once.

There are a few types of tests healthcare providers use to diagnose HIV:-

- An antibody screening test (also called an immunoassay) looks for antibodies – proteins of body makes when it fights invaders like the HIV virus. Most people form antibodies the test can detect within 3 months after they're infected, but it can take up to 6 months for a few.
- Another test looks for antibodies and a substance made by the virus, called an antigen. It can find HIV in as little as 2 weeks after a person have been exposed.
- The RNA test, which looks for the virus itself instead of antibodies, can diagnose HIV about 10 days after exposure. It's expensive, though, and doctors don't usually recommend it as a first screening.

No matter which test is used, results that say the virus require follow-up testing to confirm an HIV diagnosis. Some tests take a few days for results, but rapid HIV tests, a type of immunoassay, give results in 30 minutes or less.

Why Should Pregnant Women Be Tested for HIV: - Doctors recommend all pregnant women get tested for HIV? Medications are available to prevent the spread of the virus to the unborn baby. In addition, steps can be taken during delivery to prevent spreading the infection. Some studies show a woman can further reduce the risk of spreading the virus to her baby by having a cesarean section before her water breaks. Moreover, healthcare provider can take steps to help a person stay healthy longer.

What Do the HIV Test Results Mean: - A confirmed, positive test result means infected with HIV Being infected with HIV does not necessarily mean that having AIDS It can take many years for people with HIV to develop AIDS. A negative test result means that no signs of HIV infection were found in blood. A negative test does not always mean that do not have HIV. Signs of HIV may not show up in the blood for several months after infection. For this reason, tested again if a person could have been exposed to HIV or are at risk for HIV infection.

Treatments

HIV (human immunodeficiency virus) causes AIDS (acquired immunodeficiency syndrome). But being HIV-positive does not necessarily means that having AIDS. New treatment regimens have turned being HIV-positive into a chronic condition for many people. With a healthy lifestyle and the right medical care, many HIV-positive people are living long, productive lives. HIV drugs can often slow or prevent the progression of HIV to AIDS. Left untreated, though, HIV can lead to serious illness and death.

What Happens After an HIV Test?

- If HIV test says don't have the virus (a "negative" result), ask doctors how soon should have another screening. It's possible to get a negative result if a person is early infection.
- If HIV test says have the virus (a "positive" result), take heart: Because of medical advancements, many people now live long, active lives with HIV.

The drugs can have side effects. Often, they go away as body adjusts to the medication, but many people have some for a short time, including: nausea, vomiting, diarrhea, fatigue, dizziness, skin rashes, trouble sleeping, pain, numbness, or tingling.

What Can Do to Protect Yourself and Others: - Because HIV is transmitted through infected blood, semen, or vaginal secretions, or through a mother's milk during breastfeeding, these are the most important steps to take to lower a person's HIV risk and the risk to others:

- Use a latex condom or square of latex or plastic wrap ("dental dam") each *and every* time doing anal, vaginal, or oral sex. (If a person have a latex allergy, use polyethylene condoms with oil based lubricants.)
- Learn more about how to practice safer sex.
- Learn about the HIV drug Truvada :-It has been approved for use in those at high risk as a way to prevent HIV infection Truvada: - should be used in conjunction with safe sex practices.
- Don't share needles, syringes, or equipment used to prepare injection drugs or to inject them. HIV can stay in syringes for a month or longer. Seek treatment for drug use, but in the meantime, be sure to use a clean needle each time inject.
- See a qualified professional who uses sterile equipment if a patient plan to get a tattoo or have a body pierced.
- Don't share toothbrushes or razors.
- Talk to a doctor about getting tested for HIV if women are pregnant or planning to become pregnant. And if she is HIV-positive, seek counseling and treatment, which can prevent HIV from being passed to a fetus or infant in most cases.

❖ Do not breastfeed for a newborn and are HIV-positive.

3.3 Conceptual Modeling

Conceptual modeling is the activity of formally describing aspects of the physical and social world around us for purposes of understanding and communication. In addition, conceptual modeling is a technique that helps to clarify the structure of a knowledge intensive business tasks. The knowledge model of an application provides a specification of the data and knowledge structures required for the application. The model is developed as part of the analysis process [32]. Generally, conceptual modeling in this study work is a vital step to understand and structure the problem domain and prepare concept relationships for knowledge representation. The logical relation of the identified concepts and facts are described using decision tree. It is one of a modeling tool that is used in variety of settings to organize and break down cluster of data. Purposefully, decision trees can easily be converted to the form of if-then rules that are suitable and understandable by computer programs. So, the conversion can be executed by a computer program [16]. The structure shown graphically in terms of nodes (objects) and arcs (links or edges) connecting them. Nodes represent objects, concepts or situations. The links show the relationships between nodes. If the links are directed arrows, then the net becomes a directed graph. Relationships give the knowledge contained in the nodes a cohesive structure about which other knowledge may be inferred.

Fig. 3.3 shows general approaches or structure for selected chronic disease treatment by considering possible patients symptoms, prevention and patient history to provide proper treatment.

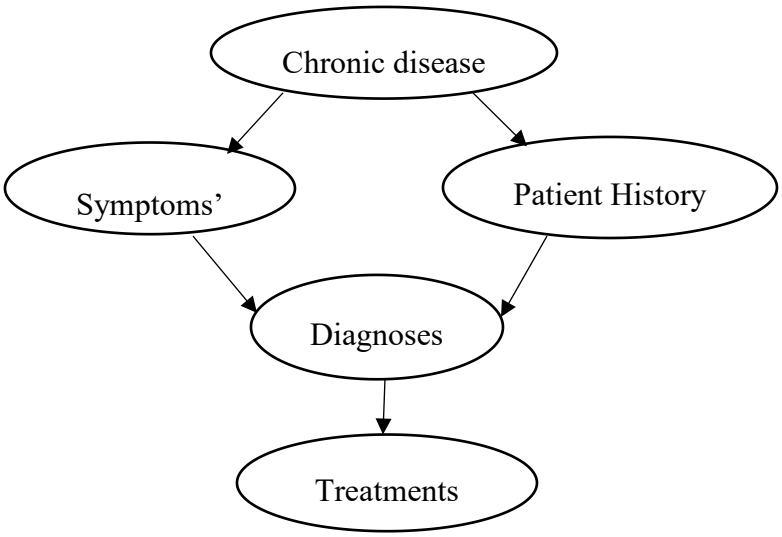

Fig. 3. 3 Structure of Decision Tree

In this study a decisions tree is constructed for each chronic disease diagnoses, type identification, emergency level determination and proper treatment suggestions.

The acquired Diabetes mellitus disease information were described in terms of its types, sign and symptom and common risk factors represents as follows in table 4.6

Types of diabetes		Symptoms	Common Risk factors diabetes
Common		Frequent urination, Excessive thirst, Extreme hunger, Unexplained weight loss, Increased fatigue, Irritability, Blurry vision, Impotence/ being weak, Numbness or tingling sensation of the feet, Skin disease, Dry mouth	Advancing age, Family history, Excessive body weight, Excessive alcohol consumption, Physical inactivity, Stress, Unhealthy diet, Pregnancy (Gestational Diabetes mellitus) , Chronic use of steroids, Viruses, Faulty Immune System, Physical Trauma/ Any physical damage to the body caused by violence, accident or fracture, Drugs
		Urinating a lot, being very thirsty, losing weight without trying, feeling very tired, Nausea and vomiting.	
	Signs of an Emergency	Shaking, confusion, Rapid breathing, Fruity smell to breath, Pain in belly, Loss of consciousness (rare).	
Type 2		Headaches, Loss of consciousness, Slow-healing sores or cuts, Frequent yeast infections, Velvety dark skin changes, Numbness and tingling of the hands and feet, Decreased vision, Impotency or feeling tired, Dry, itchy skin, Recent weight gain or un explained Wight lose, Sexual dysfunction	

TABLE 3.9: DIABETES MELLITUS TYPE AND SYMPTOMS CONCEPTUAL MODEL

Figure 3.4 below shows decision tree to identify and determine type, levels of diabetes based the symptoms of the patient.

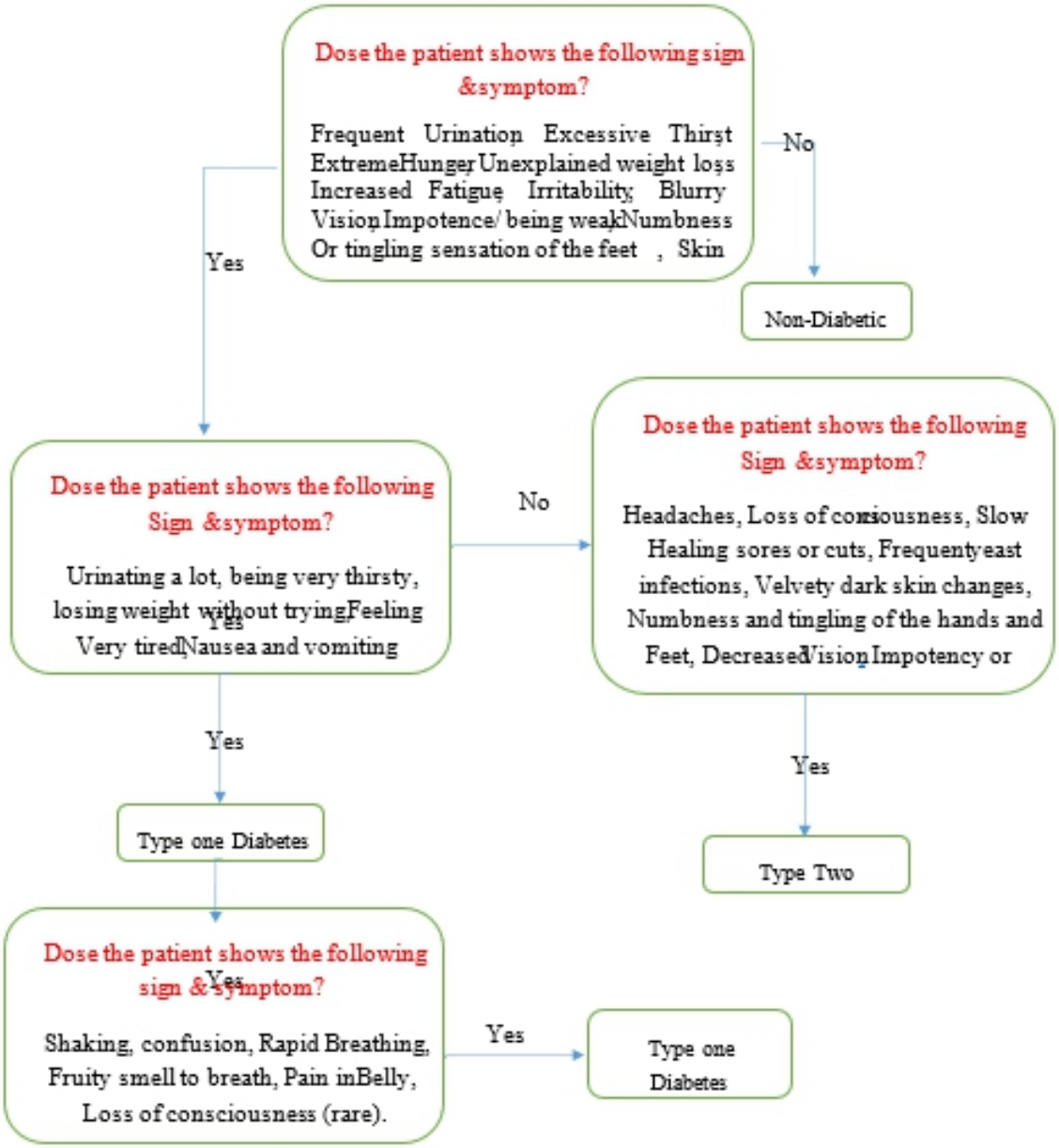

FIGURE 3. 4: DECISION TREE FOR MODELING TYPE AND LEVELS OF DIABETES.

The Diabetes mellitus level by considering the patient symptom is possible as it stated described and showed as follow table 3.10.

Levels of Diabetes	Symptoms
Mild High Blood Sugar	✓ Increased thirst ✓ Increased urination ✓ Weight loss ✓ Fatigue ✓ Increased appetite ✓ Blurred vision
Moderate to Severe High Blood Sugar	✓ Blurred vision ✓ Extreme thirst ✓ Lightheadedness ✓ Flushed ✓ Hot and dry skin ✓ Restlessness, ✓ Drowsiness, or difficulty waking up.

TABLE 3.10: DIABETES MELLITUS TYPE AND SYMPTOMS CONCEPTUAL MODEL

Figure 3.4 shows decision tree for identify and determine Mild High Blood Sugar, Moderate to Severe High Blood Sugar based on the patient sign and symptoms.

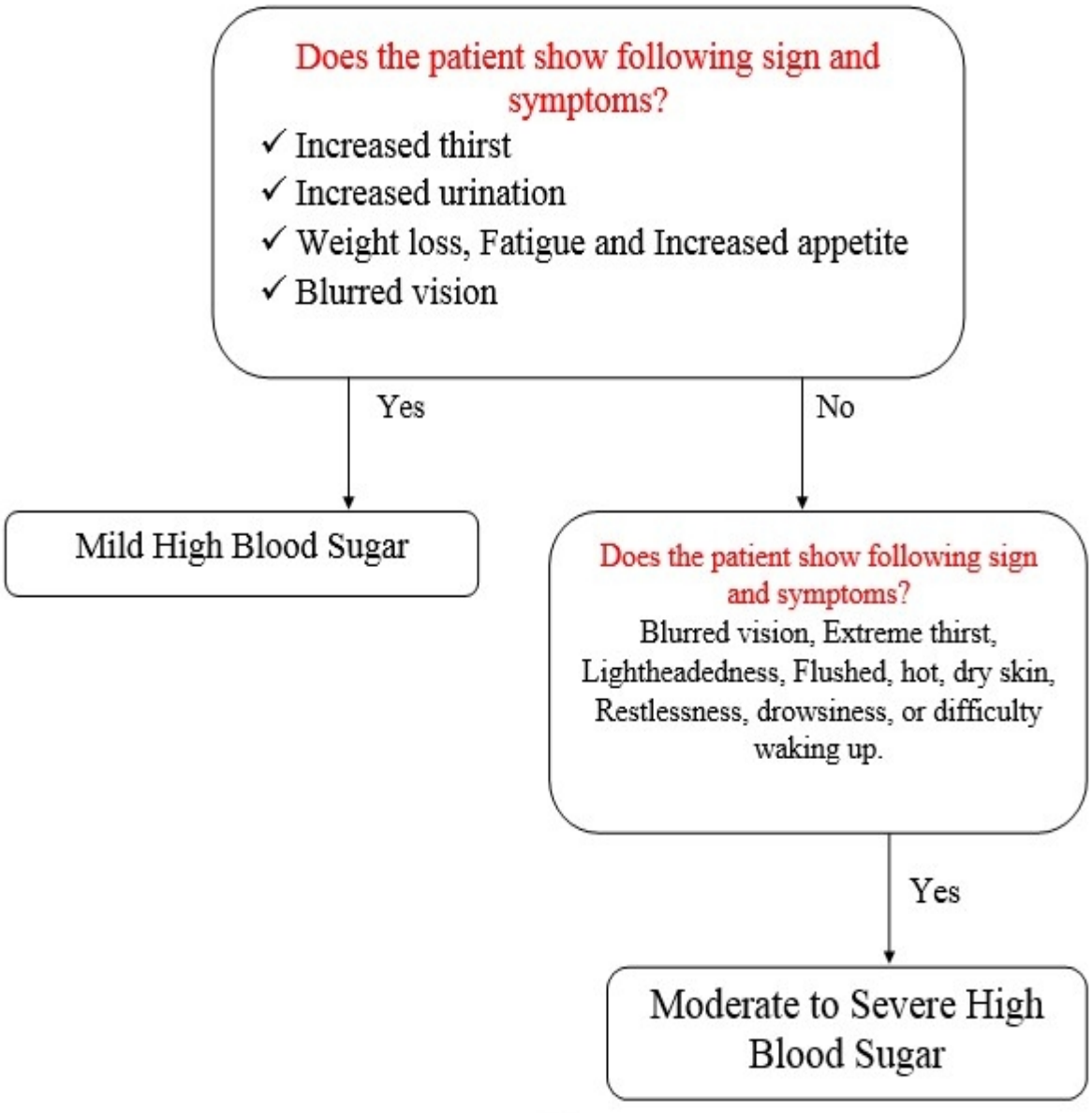

FIGURE 3. 5: DECISION TREE FOR MILD, MODERATE, OR SEVERE HIGH SUGAR.

The complication on Diabetes mellitus by considering the patient symptom is possible as it stated described and showed as follow table 3.11

Complication in diabetic patient	Sign and symptoms	Prevention	Possible solutions
Hypoglycemic coma	Blurring of vision, Excessive appetite or hunger, irregular heartbeat, shivering of body/ vibrating slightly, Excessive sweating, Unsteadiness of limbs, Unusual behavior/attitude, and Loss of consciousness/coma	Control your blood glucose	Mix 4 to 6 tea-spoonsful of sugar into a glass of water and drink it. One may take a glass of fruit juice, couple of pieces of sweet biscuits, hand full of sugar or some sweet fruits. This should be followed by a meal.
Diabetic Coma	Excessive and repeated urination, Excessive appetite and thirst, Sickness and fatigue, Weakness, Headache, Blurred vision, Drowsiness, Nausea, Rapid rate of breathing, Collapse, Smell of acetone in breath, Unconsciousness, Seizures	Control your blood glucose	contact a health worker immediately

Heart and Blood Vessel Problems/Stroke	Loss of consciousness, feeling dizzy, Sudden loss of sight, Slurred speech, Feeling numb or weak in arm or leg of one side of body, Chest pain or pressure, Shortness of breath, Swollen ankles, Irregular heart beat	Control blood glucose, Cease or never start smoking, Control blood pressure, Check lipids annually, High levels of these require treatment, Reduce weight, if overweight, Exercise regularly,	
		Decrease intake of alcohol	
Eye Disease Retinopathy	blood vessels	Keep blood pressure under control, Do not smoke, Check blood glucose regularly and keep it under control	contact a health worker immediately
Nerve Damage	Feet and legs, Digestive and Urinary tract, sex organ will have infected and Blood pressure will happened	controlling blood glucose	contact a health worker immediately
Kidney Disease	Early morning swelling around eyes, Swelling of legs, High blood pressure, Protein in urine	controlling blood glucose and blood pressure	contact a health worker immediately

TABLE 3. 11: COMPLICATION IN DIABETIC PATIENT SYMPTOMS CONCEPTUAL MODEL

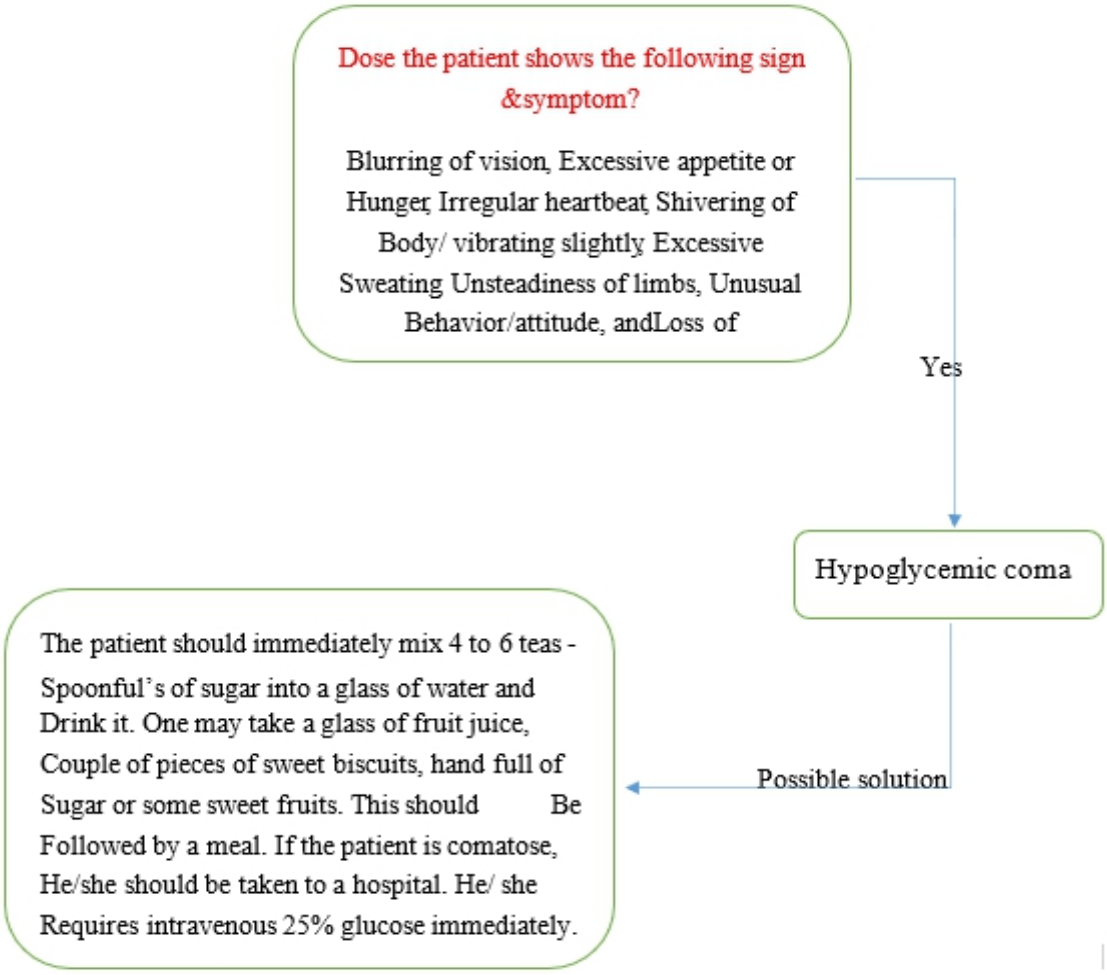

FIGURE 3. 6: Decision tree for hypoglycemic coma

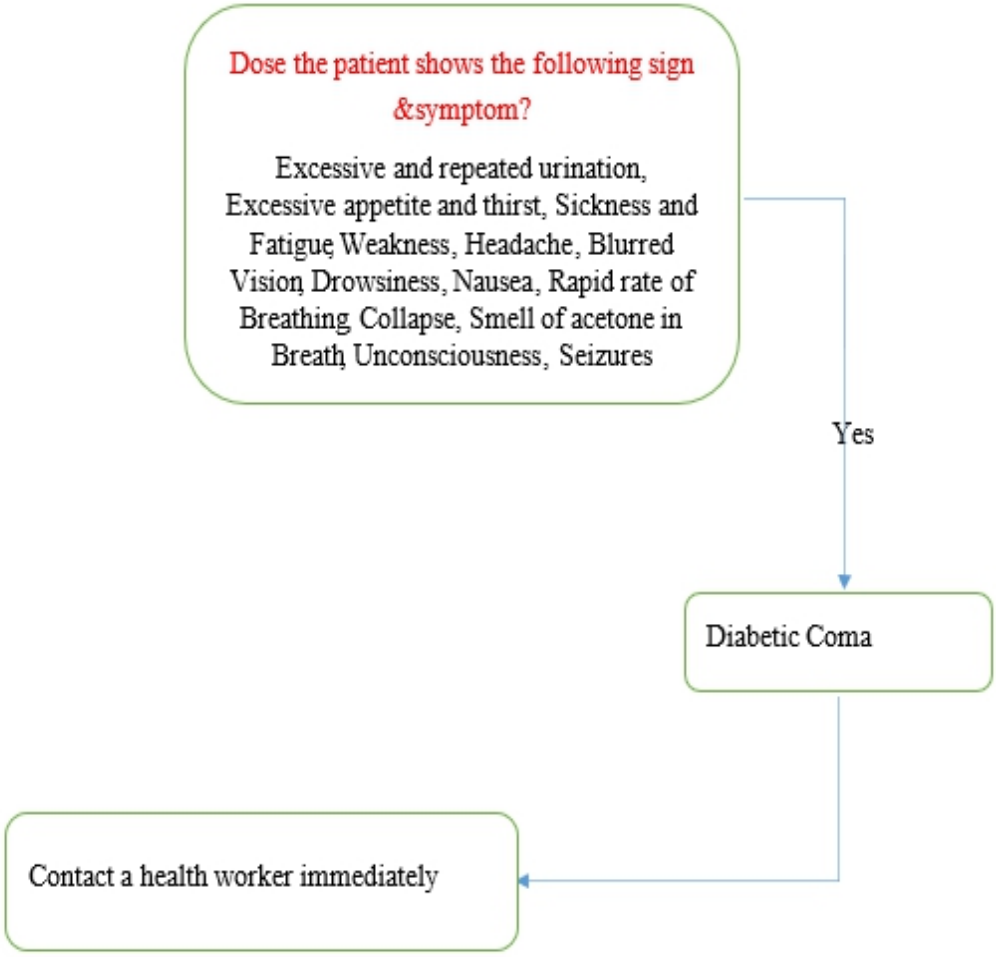

FIGURE 3. 7: Decision tree for Diabetic Coma

The acquired hypertension disease information, symptoms, results of untreated hypertension and hypertensive emergency are identified and represented as follow in table 3.12.

Types of disease	Symptoms	Untreated hypertension leads
Hypertension	✓ Severe headache ✓ Fatigue or confusion ✓ Vision problems ✓ Chest pain ✓ Difficulty breathing ✓ Irregular heartbeat ✓ Blood in the urine ✓ Pounding in chest, neck, or ears.	✓ Stroke ✓ Heart Disease ✓ Kidney Failure ✓ Eye Problems.
Hypertensive Emergency	✓ Headache or blurred vision ✓ increasing confusion, ✓ Seizure ✓ Increasing chest pain ✓ Increasing shortness of breath ✓ Swelling or edema (fluid buildup in the tissues).	

TABLE 3. 12: HYPERTENSION SYMPTOMS CONCEPTUAL MODEL

Figure 3.8 shows decision tree to determine hypertension patient's emergency level, by considering symptoms and risk factors of hypertension patients.

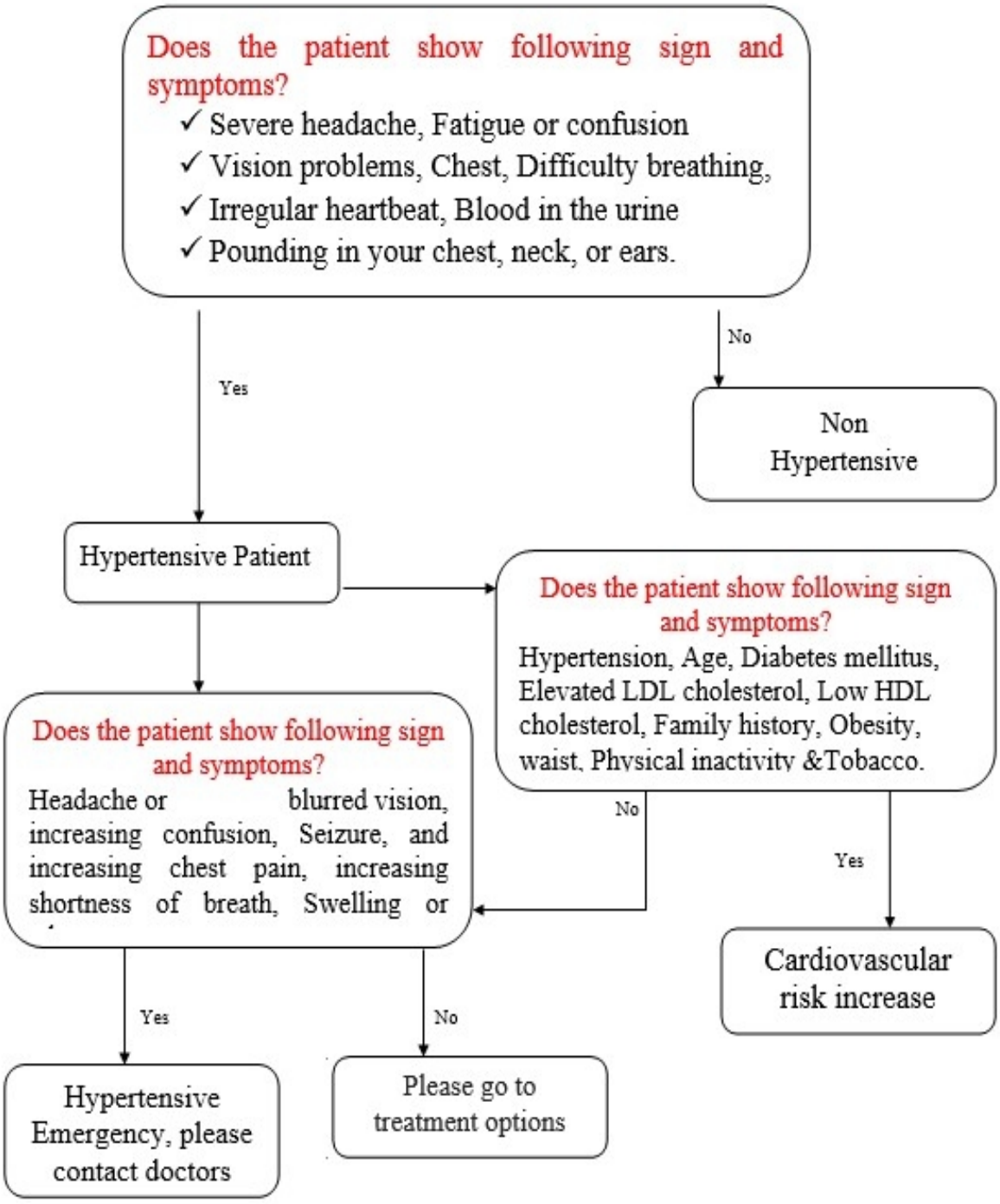

FIGURE 3.8: DECISION TREE FOR DIABETES EMERGENCY CASES

The acquired HIV disease information describe and represents as follow, the stage, sign and symptom and risk factors are identified and represented in a table below.

HIV/ADIS stages	Symptoms	HIV/AIDS Risk Factors
First Stage	✓ Headache ✓ Diarrhea ✓ Nausea and vomiting, ✓ Fatigue, ✓ Aching muscles, ✓ Sore throat, ✓ Red rash that doesn't itch	
Second Stage	✓ The number of CD4 T-cells steadily drops ✓ Making them vulnerable to other infections and in danger of developing AIDS.	
Third Stage	✓ Being tired all of the time, ✓ Swollen lymph nodes in the neck or groin, Fever lasting for more than 10 days, ✓ Night sweats ✓ Unexplained weight loss ✓ Purplish spots on the skin that don't go away ✓ Shortness of breath ✓ Severe ✓ Yeast infections in the mouth, throat, or vagina, Easy bruising or unexplained bleeding and long-lasting diarrhea	
HIV/AIDS in Children	✓ Failure to thrive ✓ which is the failure to gain weight ✓ Failure to reach developmental milestones during the expected time frame ✓ Brain or nervous system problems ✓ Frequent childhood illnesses such as ear infections, colds, upset stomach, and diarrhea.	

TABLE 3. 13: HIV SYMPTOMS AND ITS SYMPTOMS CONCEPTUAL MODEL

Figure 3.9 shows a decision tree to identify and determining HIV and it stage

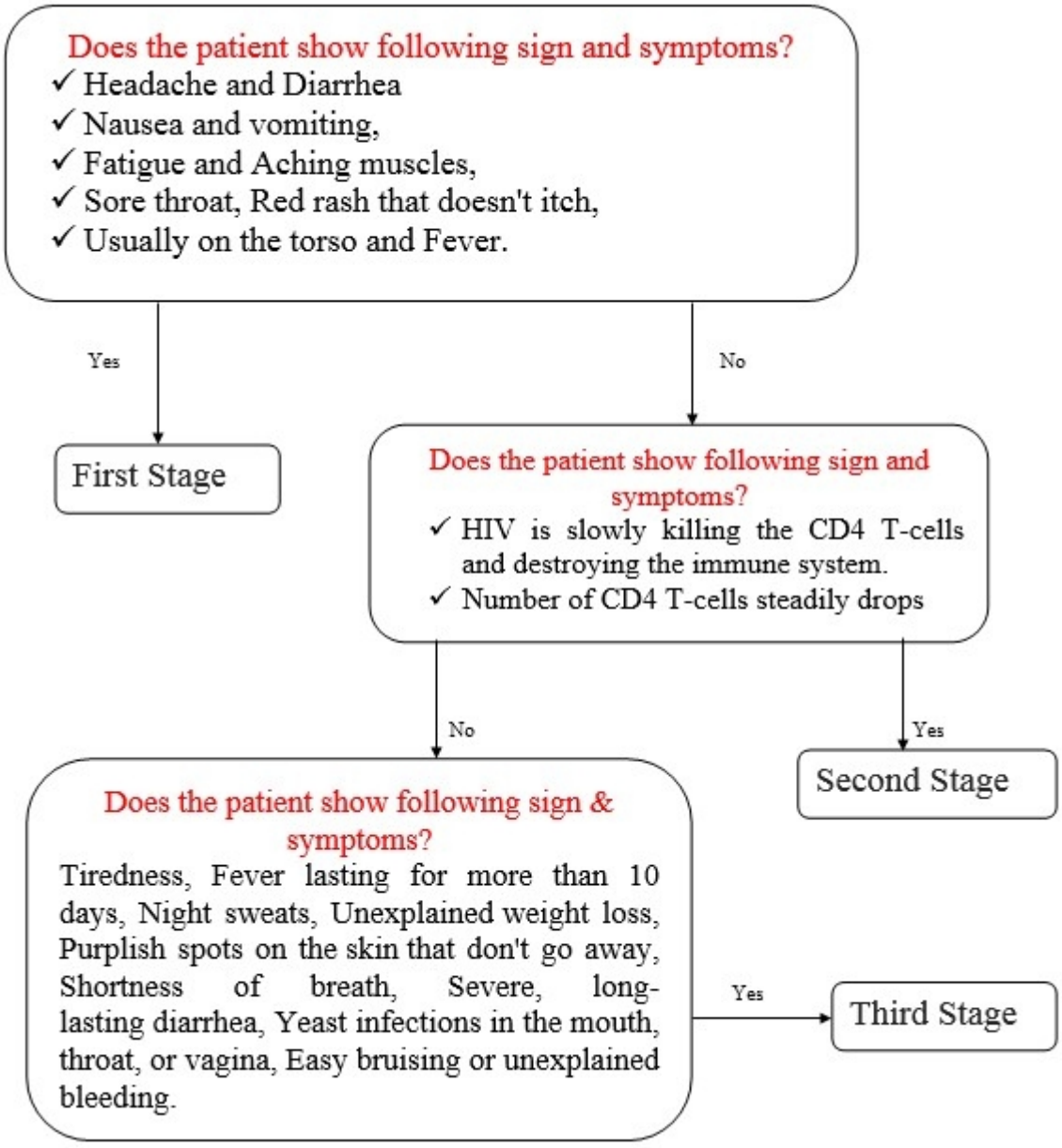

FIGURE 3.9: DECISION TREE FOR HIV AND IT STAGE

CHAPTER FOUR

4.1 KNOWLEDGE BASED SYSTEM PROTOTYPE DEVELOPMENT

The current study attempts to develop web and mobile phone knowledge-based system prototype. This chapter discusses knowledge-based system prototype development that encompasses knowledge representation, design and implementation process. Each identified chronic disease, there by formalizing the identified, structured concepts and facts that are acquired from the domain experts and different secondary sources.

4.1.1 Prototype System Architecture

Here under in the figure 4.1 we present a Mobile phone knowledge-based system prototype architecture for chronic disease

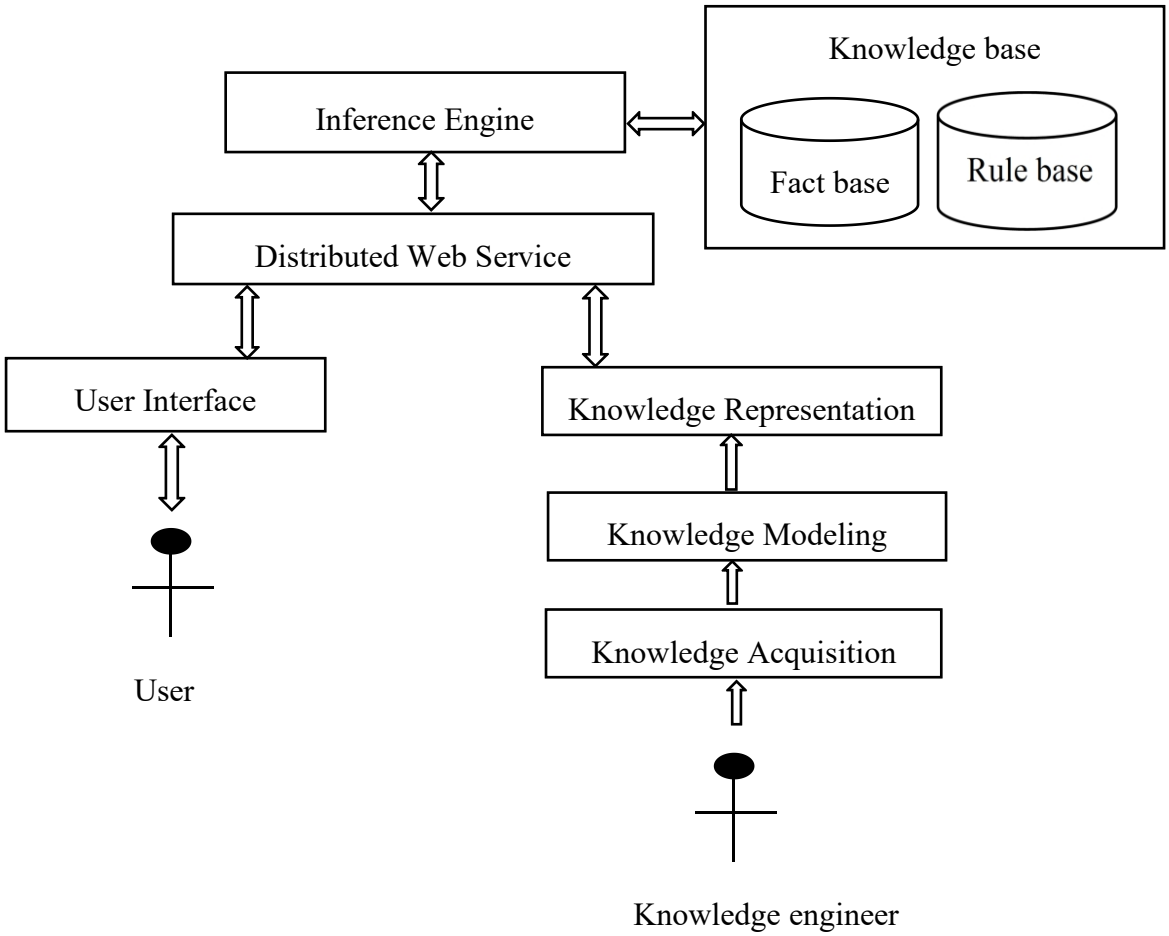

FIGURE 4. 1: PROTOTYPE KNOWLEDGE BASED SYSTEM ARCHITECTURE

As it is shown in the designed prototype system architecture of the study (see 4.1), it shows possibility of using and adding distributed webservice to the system. Each components of the developed prototype system architecture are constituting of: - knowledge base, Database, inference engine, working memory, user interface, and distributed web service. All of them are discussed below.

4.1.1.1 The Knowledge Base

The knowledge base contains the knowledge necessary for understanding, formulating and for solving problems. It is a warehouse of the domain specific knowledge captured from the human expert via the knowledge acquisition module. To represent the knowledge production rules, frames, logic was used [24]. A rule-based system maintains a collection of knowledge nuggets called facts, this collection is known as the knowledge base. It is somewhat akin to a relational database, especially in that the facts must have a specific structure. Since we identified and used Jess, and it facilitate three ways to form facts: ordered facts, unordered facts, and definstance facts [21].

Ordered facts: - it is simply lists, where the first field (the head of the list) acts as a sort of category for the fact. Here are some examples of ordered facts [21]:

(Type_of_Chronic_disease Hypertension diabetes HIV)

(Patient "Abebe chamiso" Male 35)

(Diabetes_Type Diabete_Type_1 Diabete_Type_2)

Unordered facts: - Ordered facts are useful, but they are unstructured. Sometimes (most of the time) it need a bit more organization. In object-oriented languages, objects have named fields in which data appears. Unordered facts offer this capability (although the fields are traditionally called slots.) [21].

(Patient (name “Abebe chamiso") (age 35) (gender Male))

(Diabete_Type_1 (symptom_1 “yes/no”) (symptom_ 2 “yes/no”) (symptom_ 3 “yes/no”))

Before to create unordered facts, first define the slots they have using the deftemplate construct:

(Deftemplate <deftemplate-name> [extends <classname>] [<doc-comment>]

[(slot <slot-name> [(default | default-dynamic <value>)] [(Type <typespec>))]*) The <deftemplate-name> is the head of the facts that will be created using this template. There may be an arbitrary number of slots. Each <slot-name> must be an atom. The default slot qualifier states that the default value of a slot in a new fact is given by <value>; the default is the atom nil.

The 'default-dynamic' version will evaluate the given value each time a new fact using this template is asserted. The 'type' slot qualifier is accepted but not currently enforced by Jess; it specifies what data type the slot is allowed to hold. Acceptable values are ANY, INTEGER, FLOAT, NUMBER, ATOM, STRING, LEXEME, and OBJECT.

As an example, defining the following template:

(Deftemplate Diabete_Type_1

"A diabetes description."

(Slot symptom_1)

(Slot symptom_2)

(Slot symptom_3 (default "if any"))) It

would allow to define facts like this:

(Assert (Diabete_Type_1 (symptom_1 "yes") (symptom_2 "yes") (symptom_3 "no")))

<Fact-0>

Jess> (facts)

F-0 (MAIN: automobile ((symptom_1 "yes") (symptom_2 "yes") (symptom_3 "no"))

For a total of 1 facts.

Typing separate assert commands for each of many facts is rather tedious. To make life easier in this regard, Jess includes the deffacts construct. A deffacts construct is a simply a named list of facts. The facts in all defined deffacts are asserted into the knowledge base whenever a reset command is issued. [21]

Definstance facts: - Knowledge engineer may have noticed that unordered facts look a bit like Java objects, or specifically, like Java Beans. The similarity is that both have a list of slots (for Java Beans, they're called properties) which contains values that might change over time. Jess has a mechanism for automatically generating templates that represent specific types of Java Beans.

Jess can then use these templates to store a representation of a Java Bean's properties on the knowledge base. The knowledge base representation of the Bean can be static (changing infrequently) or dynamic (changing automatically whenever the Bean's properties change.) The Jess commands that make this possible are defclass and definstance. Defclass tells Jess to gen erate a special template to represent a category of Beans, while definstance puts a representation of one specific Bean onto the fact base [21].

An example will probably help at this point. Let's see the following Java Bean class

```
import java.io. Serializable; public class patient
implements Serializable {private String m_name
= "Bob"; public String getName () {return
m_name; } public void setName(String s)
{ m_name = s; } }
```

This Bean has one property called "name". Before we can insert any of these Beans onto the knowledge base, we need a template to represent them: we must use defclass to tell Jess to generate it:

```
(Defclass simple Patient)
(ppdeftemplate simple)
"(Deftemplate MAIN::simple extends MAIN::__fact \"$JAVA-OBJECT$
Patient \"
(Slot class (default <External-Address:jess.SerializablePD>)) (Slot
name (default <External-Address:jess.SerializablePD>))
(Slot OBJECT (type 2048)))".
```

As we discussed above it is possible to construct knowledge base in different manner using jess, the first one is using ordered fact which is simple and unstructured, the second one is using unordered fact which is more secured and structured and it is also support object-oriented concept. For this study we identified unstructured fact to represent and construct the knowledge base, which discussed below; and we combine this unstructured fact base with SQL program using java distributed web service to provide effective and efficient rule based expert system. And also, this study shows how selected chronic disease data are stored and used for the developed rule-based knowledge base system prototype to provide proper treatment. This information is embodied in the expert shell's knowledge base as facts and rules. A rule is basically represented as an ordered pair (<condition>, <action>) or as: If <condition>, then <action>. The <condition> or the "if" part describes a certain situation represented by a set of facts. The <action> or the "then" part describes a new situation represented by another set of facts.

Defrules: - A Jess rule is something like if... then statement in a procedural language, but it is not used in a procedural way. While if... then statements are executed at a specific time and in a specific order, according to how the programmer writes those, Jess rules are executed whenever their if parts (their left-hand-sides or LHSs) are satisfied, given only that the rule engine is running. This makes Jess rules less deterministic than a typical procedural program. Rules are defined in Jess using the defrule construct. A very simple rule looks like this:

```
(Defrule defined_rule
 (Slots)
=>
(Result))
```

This rule has two parts, separated by the "=>" symbol (it can read as "then".) The first part consists of the LHS pattern (Slots). The second part consists of the RHS action (Result). Although it's hard to tell due to the LISP-like syntax, the LHS of a rule consists of patterns which are used to match facts in the knowledge base, while the RHS contains function calls.

Hereafter Sample rules are listed for chronic diseases diagnosis.

Sample Rule 1: - to diagnosis diabetes patient; this rule is developed by considering common symptoms of type 1 and type 2 diabetes.

Rule1: If Excessive thirst
And Extreme hunger
And Unexplained weight loss
And Increased fatigue
And Irritability
And Impotence/ being weak
And Frequent urination
And Dry mouth
And Skin disease
And Blurred vision
And Numbness or tingling sensation of the feet
And Dry mouth

Sample Rule 2: - it works together with sample rule 1; to diagnosis diabetic's patient specifically type 1 diabetes patients.

Rule2: If Urinating a lot
And Being very thirsty

And losing weight

And Feeling tired

And Nausea

And vomiting

Sample Rule 3: - like sample rule 2 it works together with sample rule 1; to diagnosis diabetic's patient specifically type 2 diabetes patients.

Rule3: If Unexplained weight loss

And Headaches

And Loss of consciousness

And Slow-healing sores or cuts

And frequent yeast infections

And recent weight gain or unexplained Wight lose

And Numbness

And Velvety dark skin changes

And tingling of the hands and feet

And decreased vision

And Impotency or feeling tired

And Sexual dysfunction

And Dry

And itchy skin

Sample Rule 4: - to diagnosis diabetic's patient and know whether the patient is on emergency state or not.

Rule4: If Shaking

And confusion

And Rapid breathing

And Fruity smell to breathe

And Pain in belly

And Loss of consciousness

Sample Rule 5: - to diagnosis hypertension patient

Rule5: If Severe headache

And Fatigue

And confusion

And Vision problems

And Chest pain

And Difficulty breathing

And Irregular heartbeat

And Blood in the urine

And Pounding in chest neck, or ears

Sample Rule 7: - to diagnosis hypertension patient to determine the emergency levels of the patient.

Rule6: If Headache

And blurred vision

And increasing confusion And

Seizure

And increasing chest pain

And increasing shortness of breath

And Swelling or edema.

4.1.1.2 The Inference Engine

It tries to derive new information about a given problem using the rules in the rule base and the situation-specific knowledge in the working memory. The inference mechanism is basically building of the knowledge base system which understands the user input and matches it with the rules and facts of the knowledge rule-based system. It is like the central processing unit of the expert system. The matching of the rules and facts are carried out in this phase. Inference engine gets the rules from the knowledge base and the facts from the working memory and pattern matches the facts to the appropriate rule.

In order to execute a rule-based expert system using the method of forward chaining we merely need to fire (or execute) actions whenever they appear on the action list of a rule whose conditions are true. This involves assigning values to attributes, evaluating conditions, and checking to see if all of the conditions in a rule are satisfied [33]. The rules matched are passed on to the agenda where it matches the most appropriate rule and fires the rule. For this study we identified and used Rete forward matching algorithm and we are used JESS engine tools.

In order to execute a rule-based expert system using the method of forward chaining we merely need to fire (or execute) actions whenever they appear on the action list of a rule whose conditions are true. This involves assigning values to attributes, evaluating conditions, and

checking to see if all of the conditions in a rule are satisfied. A general algorithm for this might be:

While values for attributes remain to be input

Read value and assign to attribute

Evaluate conditions

Fire rules whose conditions are satisfied

Examples for an inference engine for a rule-based system whose basic components are:

Attributes: X1, X2 , ... , Xn1

Conditions: C1, C2 , ... , Cn2

Rules: R1, R2 , ... , Rn3

Actions: A1, A2 , ... , An4

Only it need to execute an action when a rule containing it is fired. We fire a rule only when all of its conditions are satisfied. Thus, we only check if a rule is ready to fire when one of its conditions has become true. In turn, a condition need be evaluated only when all of its attributes have been defined and one has changed. This is kept track of with a counter assigned to that condition. Going the other way, we can determine which conditions need be checked and maybe evaluated with the aid of a condition list assigned to each attribute. Then, the rules which need checking and possibly firing appear on a rule list allocated to each condition. And, each rule possesses an action list which enumerates the actions to be executed when the rule is fired. Then the various lists are set up and the rules and the relationships between the attributes, conditions, rules, and actions.

In this study during the reasoning processes, the inference engine starts from the patient vital sign and checks the symptoms of the occurrence of the disease to prove types, stage and to provide proper treatment of disease. If certain symptoms exist, then it logically represents as 1; else it represents as 0 based on the combination of facts rule based expert system proved and appropriate description and treatment of the disease provided. The fact base of the prototype knowledge-based system holds basic facts focusing on types and symptoms of each selected chronic diseases.

Functionally, the fact base is used to match against the „"if (condition) part of the rules in knowledge base.

4.1.1.3 The User Interface

In this study, the users interact with the expert system by interactive web and mobile based application and the application interact with patient by enquiring the user a series of questions and the user responds by saying “yes” or “no”, then the system provides proper advice and consultation depending on the knowledge of rule based expert system. Hereafter we depict a list of web and mobile user interface with their descriptions.

Welcome window of MBES: - This is the first window which is displayed for the user after opening a mobile application. This welcome user interface tells how to use the knowledge base system and provides a list of chronic diseases with their respective descriptions and general information about those diseases. For android mobile phone we developed the following page and on those windows a user can clicks on a specific chronic disease, the knowledge base system will retrieve proper description, causes, and general prevention mechanisms of the disease. Furthermore, a login and diagnosing patient page is developed with interactive questions for identified chronic diseases is part of the android mobile application.


6:41
የሞባይል ህክምና
የሞባይል ህክምና የተለያዩ ህክምና አገልግሎቶችን መስጠት ጀምረናል ህክምናውን ለመከታተል እንዲያስችለዎ መመዝገብ ይኖርበዎታል:: የሚያገኙት የህክምና አገልግሎት ከዚህ በታች ተዘርዝረዋል::የበሽታዎችን ምንነት፣ መንስኤዎች ፣ እንዴት መከላከል እንደሚቻል እና ሌሎች መረጃዎችን ለመመልከት የተዘረዘሩት በሽታዎች ላይ ክሊክ ያድርጉ::
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6:41
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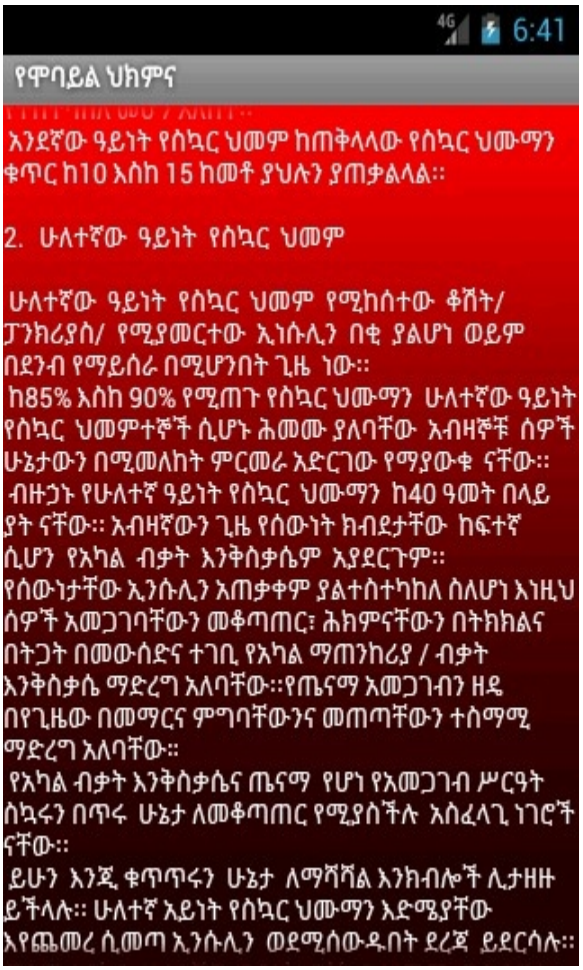
የበሽታው ምልክቶች
የበሽታው መከላከያ መንገድ
የአኖኖር ዘየዎች


6:41
የሞባይል ህክምና
አንደኛው ዓይነት የስኳር ህመም ከጠቅላላው የስኳር ህሙማን ቁጥር ከ10 እስከ 15 ከመቶ ያህሉን ያጠቃልላል።
2. ሁለተኛው ዓይነት የስኳር ህመም
ሁለተኛው ዓይነት የስኳር ህመም የሚከሰተው ቆሽት/ ፓንክሪያስ/ የሚያመርተው ኢነሱሊን በቂ ያልሆነ ወይም በደንብ የማይሰራ በሚሆንበት ጊዜ ነው።
ከ85% እስከ 90% የሚጠጉ የስኳር ህሙማን ሁለተኛው ዓይነት የስኳር ህመምተኞች ሲሆኑ ሕመሙ ያለባቸው አብዛኞቹ ሰዎች ሁኔታውን በሚመለከት ምርመራ አድርገው የማያውቁ ናቸው።
ብዙኃኑ የሁለተኛ ዓይነት የስኳር ህሙማን ከ40 ዓመት በላይ ያት ናቸው። አብዛኛውን ጊዜ የሰውነት ክብደታቸው ከፍተኛ ሲሆን የአካል ብቃት እንቅስቃሴም አያደርጉም።
የሰውነታቸው ኢንሱሊን አጠቃቀም ያልተስተካከለ ስለሆነ እነዚህ ሰዎች አመጋገባቸውን መቆጣጠር፣ ሕክምናቸውን በትክክልና በትጋት በመውሰድና ተገቢ የአካል ማጠንከሪያ / ብቃት እንቅስቃሴ ማድረግ አለባቸው።የጤናማ አመጋገብን ዘዴ በየጊዜው በመማርና ምግባቸውንና መጠጣቸውን ተስማሚ ማድረግ አለባቸው።
የአካል ብቃት እንቅስቃሴና ጤናማ የሆነ የአመጋገብ ሥርዓት ስኳሩን በጥሩ ሁኔታ ለመቆጣጠር የሚያስችሉ አስፈላጊ ነገሮች ናቸው።
ይሁን እንጂ ቁጥጥሩን ሁኔታ ለማሻሻል እንክብሎች ሊታዘዙ ይችላሉ። ሁለተኛ አይነት የስኳር ህሙማን እድሜያቸው እየጨመረ ሲመጣ ኢንሱሊን ወደሚሰውዱበት ደረጃ ይደርሳሉ።

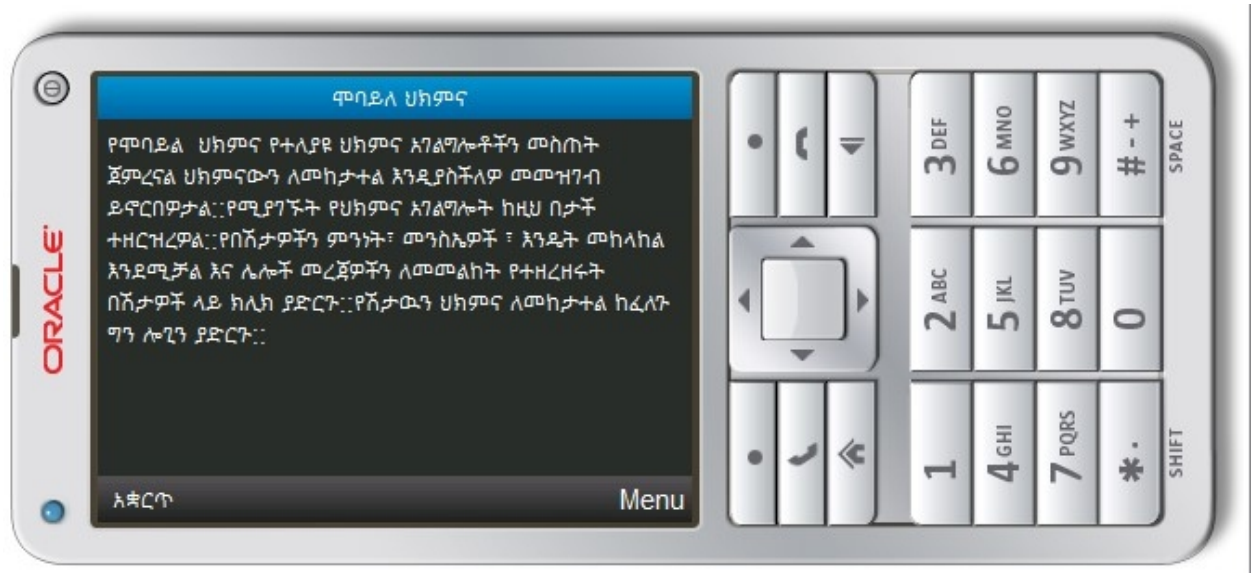

8:46
የሞባይል ህክምና
የይለፍ ስምዎ:
sfsaa
የይለፍ ቁጥር:
•••••
ግባ
ምዝገባ

FIGURE 4. 2: ANDROID MOBILE PHONE APPLICATION SAMPLE PAGES.

For any other mobile with JVM, we developed the following page as like that of the android page and on welcome window it has chronic disease menu when the user clicks on that and he/she will get proper description.

Login and diagnoses page: - if the patient have an account he/she has a privilege to log into the system and diagnoses themselves by interacting with doctor like medical expert system.

When the user log into the system, the system will identify the user and it interact with by asking a series of questions and the user responds back to the system by saying “yes” or “no”. Based on users answer, patient history the expert system responds possible nature-based treatment option. As that of android; Java based application also includes a login and diagnosing patient page with interactive questions to aid the patients through finding the right resolution.


ሞባይለ ህክምና
የሞባይል ህክምና የተለያዩ ህክምና አገልግሎቶችን መስጠት ጀምረናል ህክምናውን ለመከታተል እንዲያስችለዎ መመዝገብ ይኖርበዎታል::የሚያገኙት የህክምና አገልግሎት ከዚህ በታች ተዘርዝረዋል::የበሽታዎችን ምንነት፣ መንስኤዎች ፣ እንዴት መከላከል እንደሚቻል እና ሌሎች መረጃዎችን ለመመልከት የተዘረዘሩት በሽታዎች ላይ ክሊክ ያድርጉ::የሽታዉን ህክምና ለመከታተል ከፈለጉ ግን ሎጊን ያድርጉ::
አቁርጥ
Menu
ORACLE
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*.
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- +
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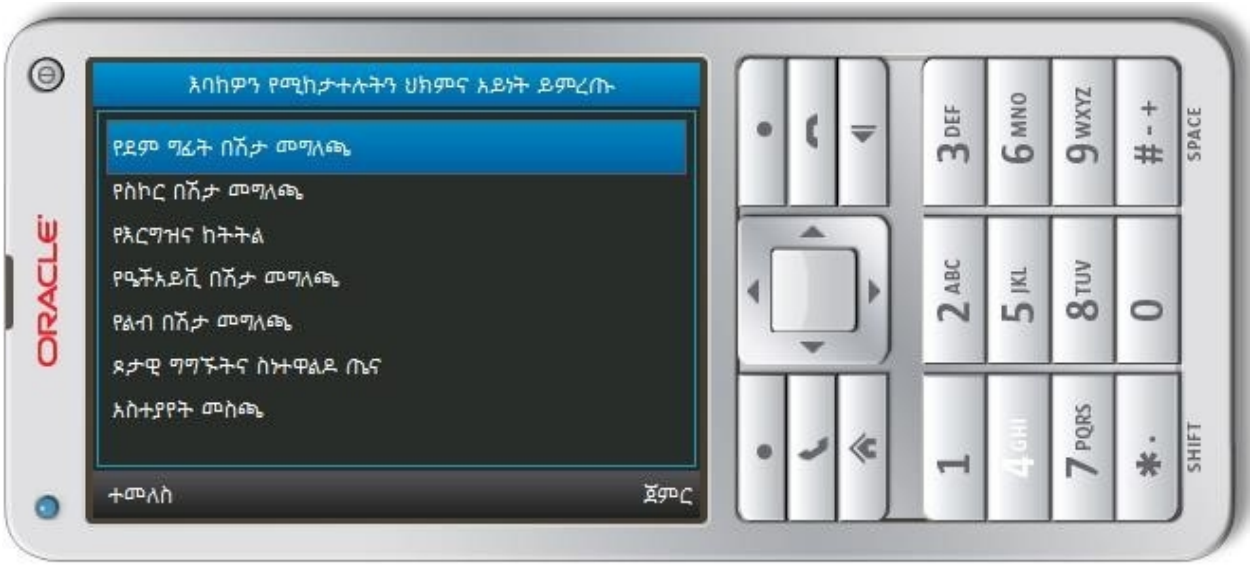
እባክዎን የሚከታተሉትን ህክምና አይነት ይምረጡ
የደም ግፊት በሽታ መግለጫ
የስኮር በሽታ መግለጫ
የእርግዝና ከትትል
የኤችአይቪ በሽታ መግለጫ
የልብ በሽታ መግለጫ
ጽታዊ ግግኙትና ስኑተዋልዶ ጤና
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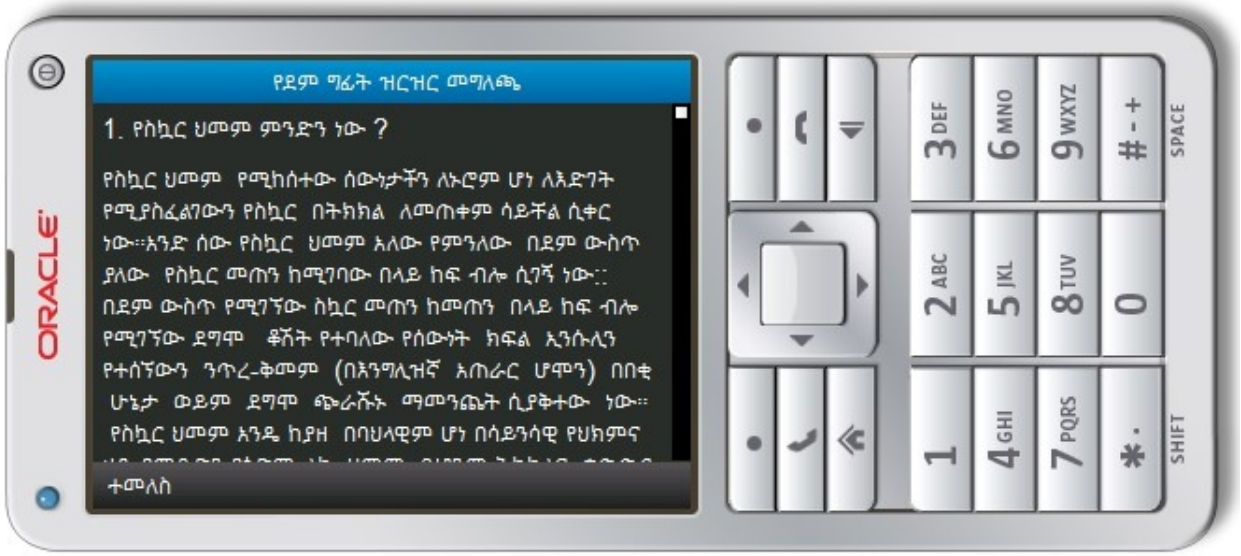
የደም ግፊት ዝርዝር መግለጫ
1. የስኪር ህመም ምንድን ነው ?
የስኪር ህመም የሚከሰተው ሰውነታችን ለኑሮም ሆነ ለእድገት
የሚያስፈልገውን የስኪር በትክክል ለመጠቀም ሳይችል ሲቀር
ነው።አንድ ሰው የስኪር ህመም አለው የምንለው በደም ውስጥ
ያለው የስኪር መጠን ከሚገባው በላይ ከፍ ብሎ ሲገኝ ነው።
በደም ውስጥ የሚገኘው ስኪር መጠን ከመጠን በላይ ከፍ ብሎ
የሚገኘው ደግሞ ቆሽት የተባለው የሰውነት ክፍል ኢንሱሊን
የተሰኘውን ንጥረ-ቅመም (በእንግሊዝኛ አጠራር ሆሞን) በበቂ
ሁኔታ ወይም ደግሞ ጭራሹኑ ማመንጨት ሲያቅተው ነው።
የስኪር ህመም አንዴ ከያዘ በባህላዊም ሆነ በሳይንሳዊ የህክምና
ተመለስ
ORACLE
3 DEF
6 MNO
9 WXYZ
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SPACE
2 ABC
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8 TUV
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4 GHI
7 PQRS
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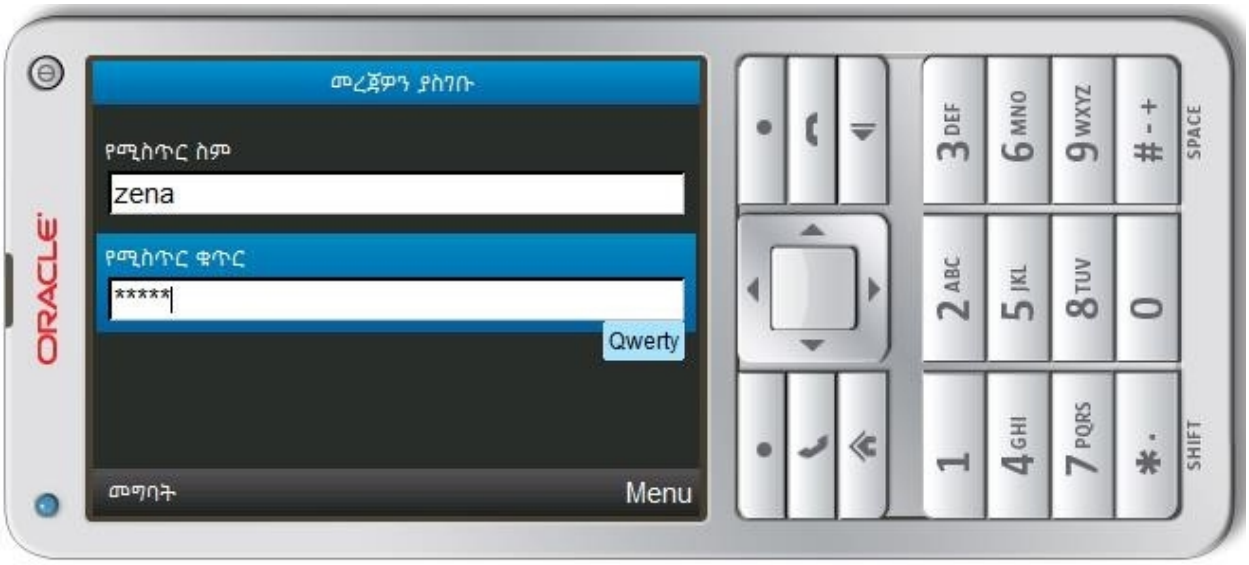
SHIFT


መረጃዎን ያስገቡ
የሚስጥር ስም
zena
የሚስጥር ቁጥር
*****
Qwerty
መግባት
Menu
ORACLE
3 DEF
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9 WXYZ
- +
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2 ABC
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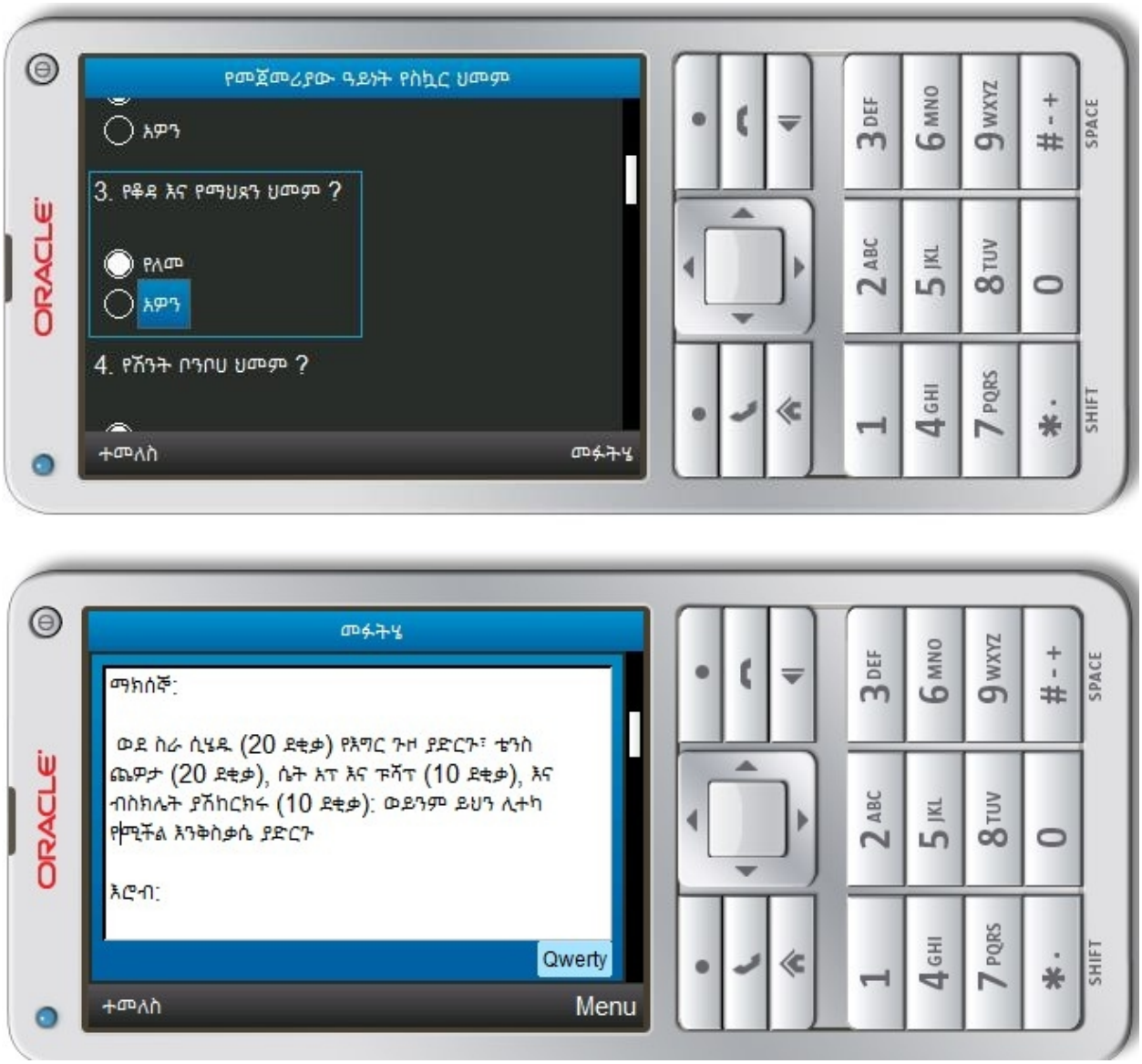

FIGURE 4.3: A WINDOW FOR ANY MOBILE PHONE WITH JVM.

4.1.1.4 Distributed Web Service

A web service is any piece of software that makes itself available over the internet and uses a standardized XML messaging system. It is self-contained, modular, distributed, dynamic applications that can be described, published, located, or invoked over the network to create products, processes, and supply chains. These applications can be local, distributed, or web-based. Web services are built on top of open standards such as TCP/IP, HTTP, Java, HTML, and XML [32].

Design of high performance, scalable and dependable system has become a critical issue because of the increasing use of the Internet in supporting various Web-based services [32].

To design such kinds of system this study used a web service on the developments of the prototype. java based distributed system, is used as a facilitator to create smooth and secure communication between java expert shell engine, SQL database management system and user query. And it also enables us to provide a multiple, secure, efficient service at any time. With the help of this distributed system the stored knowledge on SQL database is retrieved and used as input information to build the knowledge bases of the system. That knowledge is stored on SQL database in structured manner which is appropriate for developments of rule based expert system. This knowledge base is a combination of facts and rules and was done with java expert system shell. In this study the knowledge base is constructed by retrieving structured information from the database and the user interact with this constructed knowledge base to provide proper advice and consultation.

As it is shown in figure 4.1 distributed web service accepts input from user and constructs those inputs into appropriate query. This enables the user to interact the inference engine efficiently. And it also supports the knowledge engineer to manipulate rule and fact base properly while facilitating secure, distributed and timely accessible system.

CHAPTER FIVE

5. PROTOTYPE EVALUATION

After implementing the prototype mobile knowledge-based system the next step is measuring the performance of the system. Evaluation of the prototype knowledge-based system is an important phase that helps to measure the performance of the developed system. It also helps to check whether the objective of this research work is achieved. More importantly, evaluation is carried out to determine users‟ acceptance and applicability of the prototype knowledge-based system in the domain area.

The evaluation and testing issue of the system is summarized by the question “Does developed prototype give acceptable and accurate advisory service to diagnosis patients with selected chronic disease i.e diabetes, hypertension and HIV. To address this question, predictive validation testing method and visual interaction evaluation technique are used. In this research predictive validation method is used to test the performance of the system whereas visual interaction method is used to address user acceptance issues.

Predictive validation test involves the use of historic test cases and comparing the system’s output with known results. Additionally, visual interaction evaluation method allows the user to make comments while interacting with the system. In other words, predictive validation helps to test the ability of developed prototype to diagnose patients with selected chronic disease whereas visual interaction method helps to assess the performance of the system from users’ perspective. The details of the testing and evaluation processes of developed prototype are discussed in the following sections of this chapter.

5.1 User Acceptance Evaluation

To evaluate the prototype system user acceptance, the researchers uses visual interaction along with both close ended and open-ended questionnaires. the questionnaires are helped to assess and evaluate the acceptability and applicability of the developed prototype in the domain area.

Mobile Knowledge based system Visual interaction evaluation method allows the domain expert to directly interact with the system. Direct interaction intends system user to evaluate the performance of the knowledge-based system from the users’ point of view. In addition, this method helps to ensure the performance of the prototype by assessing the feedback acquired from the domain expert towards the developed system prototype.

For the purpose of user acceptance evaluation process, tewenty five domain experts selected as system evaluators. The domain experts are selected purposively from medical, Laboratory, Pharmacy departments in Adama hospital and medical college and Tikur anbessa specialized hospital and medical college. During the mobile knowledge-based system development these domain experts were actively involved in the different stages of study, knowledge acquisition, prototype development and consulting on the content of knowledge.

Different local researchers have been adapted evaluation questionnaires that used to evaluate the knwlodege based system from user's point of view. the evaluation standards are customized from Redeit, Pu et al. and Seblewongel research works.

Closed ended questions prepared and answered based on the given scale of **excellent**, **very good, good**, **fair**, and **poor**. The researcher assigns values in numbers for each scale as excellent=5, very good=4, good=3, fair=2, and poor =1. Based on the given scale, system evaluators provide a value for each closed ended question. Thus, this method helps the researcher to manually examine the user acceptance based on evaluator's response. The user acceptance of the system is measured manually as follows:

No	Question	1	2	3	4	5	Average	Percentage
1	Is the prototype easy to use and interact with it?	0	0	0	12	13	4.52	90.4%
2	How do you rate MBES attractiveness?	0	0	2	10	13	4.44	88.8 %
3	Is the system more efficient in time?	0	0	2	12	11	4.36	87.2 %
4	How accurately does a system reach a decision in diagnosing chronic disease?	0	0	3	11	11	4.32	86.4%
5	Does the system incorporate sufficient and practical knowledge?	0	0	4	11	10	4.24	84.8 %
6	Does the system give right description and treatment for identified chronic disease?	0	0	2	10	13	4.44	88.8 %
7	How do you rate the significance of the system in the domain area?	0	0	0	12	13	4.52	90.4 %
		Total average					4.41	88.2 %

TABLE 5. 1: PROTOTYPE EVALUATION RESULTS

As indicated in table 5.1 above, 48% of the respondents rated ‘easiness of the prototype’ as very good, for the same questions 52% of respondent respond as excellent. In the same way, for question ‘attractiveness of the prototype’ 8% of the respondents rated as good, 40% of them as very good and the rest 52% of them respond as excellent. Similarly, for question ‘efficient in time’ 8% of the respondents rated the criterion as god, 48% respondent evaluated as very good and the remaining 44% of them respond as excellent. At the same time for criteria ‘the accuracy of the prototype to make correct decision’ 12% respondent rated as good, 44% of the respondent respond as very good and the remaining 44% evaluated as excellent. Likewise, for the criteria of ‘does the prototype incorporate adequate knowledge’ 16% of the respondents rated it as good, 44% as very good and the rest 40% as excellent. Again ’10%’ of the respondent rated as good, 40% of the respondent rate as very good for the criteria of ‘ the ability of the system in making right conclusions and right recommendations’ and the rest 52% respond as excellent. Finally, for the question related to ‘significance of the knowledge base system in the domain area 48% of them evaluated as very good and the rest 52% of them respond as excellent.

To summarize table 5.1 above based on the responses of ten system evaluator, the average performance obtained is 4.41 on a scale of 5. This value is the result obtained from the values assigned for each close ended question. The result indicates that about 88.2% of users are satisfied by the performance of the knowledge-based system. It means that the proposed knowledge based system gain about 88.2% of user acceptance.

Therefor acceptability of the developed web and mobile phone distributed knowledge base system prototype based on the assessment in terms of having sufficient data and practical knowledge and capabilities of providing right description and treatments the system is Acceptable. While the functionality and usability, accuracy, efficiency, significances of the system are Strongly Acceptable. Apparently, based on the assessment of the domain experts in terms of its user-friendliness, easiness, efficiency, having sufficient data and practical knowledge, and capabilities of providing right description and treatments the system prototype software is acceptable while the significances of the system and usability is Strongly Acceptable. The result of this study is believed to be one step towards enhancing existing systems. This evaluation also shows users’ acceptance and applicability of the developed system.

The system evaluators were also provided open ended questions to collect expert’s feedback, suggestion and opinions. These questions focus on how the prototype is different from human expert in diagnosing patent health problem. Furthermore, the open-ended questions help evaluators

to provide their feedbacks on the contributions of the system, the uncovered knowledge issues, knowledge content of the system, the limitations and strength of the knowledge-based system.

Table 5.2 below shows the test results by using test cases

Selected cases in each disease	Total number of cases selected for testing	Number of correctly classified cases by the system	Number of incorrectly classified cases	The accuracy of the prototype in %
Diabetes cases	22	19	3	86.36
Hypertension cases	18	16	2	88.89
HIV cases	16	13	3	81.25
Total cases	56	48	8	85.71

Table 5.2 the test results by using test cases

5.2 Decision variation between system and human expert

As discussed in section 5.2 above the decision made by the system have slight difference with decision of human expert during test case validation. There are different contributing factors for the variation of decision made by the knowledge-based system. First, the knowledge-based system is limited to the knowledge incorporated in the knowledge base. The main problem is contextual understanding of patient symptoms. In addition, the knowledge-based system provides recommendation which help general practitioner to identify the patient considering symptoms given by the users.

5.3 Predictive Validation test by using test cases

Section4.1 discussed about the evaluation of system performance using both closed and open-ended questions. System evaluators directly interact with system using these questions in order to forward their feedback and suggestion on the performance of the system.

In this section the performance of the system is tested and validated using test cases. The test cases are used to measure the accuracy of the system. For the purpose of validation process a total of fifitys-five cases are selected. Then the system evaluators categorize those cases into their respective disease based on the given pillar symptoms. To achieve the goal system evaluators were purposively selected according their medical department.

The knowledge-based system testing procedure is carried out by system evaluator to classify the test cases into correct or incorrect classes. System evaluators compare the decisions made by the

system against human expert. Then system evaluators validate the numbers of correct decisions made by the system. The result of the comparison shows that the rule-based system has made close decision in the diagnosing process of patients as human expert did. the case test result provided by system evaluators showed that the knowledge-based system is about 85.7% accurate.

5.4 Accuracy test using test cases

From figure 5.2 above fivity six test cases are select purposively to validate the accuracy of the system. For any case stored in the knowledge base, the system can provide correctlt answer for 48 number of times. Purposively selected test cases are used to challenge the system performance. As a result, for diabtete cases in the above figure 4.2 from the given 22 cases 19 of them are correcte answerd. Similarly, from the given 18 cases only 16 of them are anwerd correctly in the hypertation cases. Finally, the system answerd 13 form 16 correctly in HIV cases and it achieves the maximum performance. The result indicated that all the cases are directly similar with knowledge incorporated in the knowledge base.

5.5 Discussion

The evaluation and testing procedures help to address the question of user acceptance and accuracy of the prototype. Visual interaction and questionnaire methods are used to assess user's acceptance issues and applicability of the prototype. Based on the evaluation results obtained from visual interaction with closed ended questions none of the evaluators respond as poor or fair. As discussed in the above sections the accuracy of the prototype system is calculated as 88.2% and the average evaluation result filled by the domain experts in the domain area is 85.7 %, respectively. The overall performance of the prototype system is 87.7%.

There are some challenges encountered during the study which limits the prototype system to register a better performance for diagnosis and treatment of diabetes, hypertetsion, HIV. Even though tacit knowledge about the diagnosis and treatments of diabetes, hypertasion and HIV is extracted from the domain experts using interviewing method in order to have detail understanding of the domain knowledge, it is challenging to extract the necessary knowledge due to the nature of tacit knowledge.

In general, the testing and evaluation outcomes of the prototype system has achieved the objectives of the study. However, additional study is needed to bring complete implementation and use of mobile knowledge-based system for diagnosis and treatment of selected chronic disease i.e diabtes, hypertentions and HIV.

CHAPTER SIX
6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Many countries including Ethiopia are challenged to provide adequate healthcare service due to difficulties such as, physical distance between doctors and patients, too few skilled healthcare professionals and costs of healthcare equipment and infrastructure. To overcome this basic problem there should be an innovative, efficient, technology-supported intervention.

Knowledge based system technology is a promising area of information technology having its applications in varied sectors including medical sector. Knowledge based systems are not only the means to apply subject matter specialist's knowledge to a particular problem area but are also potentially powerful learning resources to help the novice end users of the knowledge base system to develop their own expertise.

Mobile technology can aid in providing access to information, helping to lower costs, facilitating remote care and increasing efficiencies by connecting patients to their providers virtually anywhere. Providing expert system services through mobiles has many advantages, especially for the medical domain. This paper has modeled and developed a distributed web and mobile phone knowledge-based system for diagnoses and advice chronic disease patients on healthy food and activities, such as physical exercise to manage health problems of the client. This system is able to assist people in being aware of good practices for fitness and good health for chronic disease patients.

As a result, we investigated the use of web and mobile phone knowledge-based system prototype that help to show the appliacabliy of the mobile knwolodege based system in the diagnosis of diabetes hypertension and HIV.

Hence, in this study an effort has been made to design and develop a prototype of a mobile knowledge-based system that can provide advice for patients to facilitate the diagnosis and treatment of patients living with diabetes, hypertation and HIV.

In developing the prototype system, knowledge is acquired using both structured and unstructured interviews with domain experts and from relevant documents by using documents analysis method to find the solution of the problem. The acquired knowledge is modeled using decision tree and decision table that represents concepts and procedures involved in diagnosis

and treatment of diabetes, hypertension and HIV. Then, the validated knowledge is represented using rule-based approach in the development of knowledge base system with object-oriented program as well as database model. We use JESS tool which is a rule-based engine and it uses Rete forward algorithm.

The combination of facts such as the rapid growth of the Internet, the vast financial possibilities opening up in electronic trade, and the lack of truly secured systems make the developed distributed knowledge-based system prototype an important and applicable in domain area of study.

This study modeled and designed as client server architecture, client web and mobile accessible expert system applications through the interface implemented on the computer and mobile respectively and the distributed knowledge-based application is implemented on a remote server. Besides this idea has many advantages including ease of maintenance, upgrading, portability and deployment.

This study produced web application and mobile phone based distributed knowledge-based system application for smart phones and java devices. Those applications provide automated help by storing a knowledge-base of diseases. The system diagnoses a person for a particular disease. According to the knowledge stored in the knowledge base, the patient receives appropriate diagnosis by submitting the symptoms. Beased on the evaluation result this study has met the objectives specified.

Finally, the following conclusions are drawn from the finding with regard to the research questions:

- ✓ Applicability of knowledge-based system for chronic diease patient specially diabtes, hypertension and hiv treatment haven been proved.
- ✓ The system provides advices on the bases of patient disease
- ✓ The proposed knowledge-based system uses user acceptance and test case validation techniques to measure the performance of the system. The result of system performance indicated that user is satisfied with proposed system and the test case validation result showed the system correctly works with slight difference. Therefore, the proposed system registered encouraging then it is possible to say the system address its objective.

Generally, in this research, the applicability of knowledge-based system is proved as useful approach for facilitating in diagnoses selected chronic disease, and the research will initiate interests in to its use in the country.

6.2 Recommendation

Currently in our country Ethiopia there is a critical shortage of medical experts and medical healthcare service due to reasons like lack of quality education, medical equipment's and technology support, etc.

Mobile technology offers interesting ways to help with healthcare access, affordability and service delivery. Smartphones and tablets have spread rapidly in developed and developing nations. In order to encourage mobile health, we recommend several actions to improve the adoption of mobile medical devices and applications. Policymakers should encourage the use of mobile devices for healthcare. Moving to electronic systems for service delivery will save money, improve access, and provide higher levels of quality.

We should encourage the use of mobile systems that monitor patient symptoms and provide realtime advice on treatment and medication because they have the potential to control costs, reduce errors, and improve patients' experiences.

The study achieves its objectives by demonstrating the applicability of rule-based system by developing prototype with hopeful performance and user acceptance.

This thesis research is the promising study for further research works to fully implement the knowledge-based system in the domain area. As a result, the following recommendations are given based on the observed opportunities and uncover areas by this research. These recommendations are made for further investigations to fully implement the functionality of the prototype or to develop a new knowledge-based system in the domain area.

- This rule-based system unable to learn from experience and do not operate with cases which have not matching facts in the rule base of the system. As a result, the development of self learning system should be considered by using appropriate machine learning techniques like neural network, Bayesian networks, etc.
- Medical diagnosis is somewhat complex. It involves both physical examination and Lbaratory status examination. Therefore, further investigation should be done to integrate an intelligent agent that has the capability to perform patient examination and observation of facial expressions of a patient.
- To enhance the performance of the prototype knowledge-based systems, the hybrid strategy approaches should be investigated which combines case-based reasoning. The Inclusion of casebased reasoning helps the system to learn from documented experiences.

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Appindex A

ስኳር ህመም ምንድን ነው

የስኳር ህመም የሚከሰተው ሰውነታችን ለኑሮም ሆነ ለእድገት የሚያስፈልገውን የስኳር በትክክል ለመጠቀም ሳይቸል ሲቀር ነው፡፡አንድ ሰው የስኳር ህመም አለው የምንለው በደም ውስጥ ያለው የስኳር መጠን ከሚገባው በላይ ከፍ ብሎ ሲገኝ ነው፡፡ በደም ውስጥ የሚገኘው ስኳር መጠን ከመጠን በላይ ከፍ ብሎ የሚገኘው ደግሞ ቆሽት የተባለው የሰውነት ክፍል ኢንሱሊን የተሰኘውን ንጥረ-ቅመም (በእንግሊዝኛ አጠራር ሆሞን) በበቂ ሁኔታ ወይም ደግሞ ጭራሹኑ ማመንጨት ሲያቅተው ነው፡፡ የስኳር ህመም አንዴ ከያዘ በባህላዊም ሆነ በሳይንሳዊ የህክምና ዘዴ የማይድን የዕድሜ ልክ ህመም ቢሆንም ትክክልና ቁጥጥር ከተደረገበት እንደማንኛውም ሰው ጤናማ ኑሮ ሊያስኖር የሚችል ነው፡፡ በተገቢው መንገድ ክትትልና ቁጥጥር ካልተደረገበት ግን የተለያዩ ጠንቆችን ለምሳሌ የዓይን፣ የኩላሊት ፣የነርቭና የልብ ችግሮችን ሊያስከት ይችላል፡፡ በተገቢው ቁጥጥር ከተደረገ እነዚህን ጠንቆች እንዳይከሰቱ ወይም ደግሞ ተከስተውም ከሆነ መገደብ እንደሚቻል በቅርብ ጊዜ የተደረጉ ጥናቶች አመልክተዋል፡፡ የስኳር ህመም በአሁኑ ጊዜ በመላው ዓለም ላይ እየተስፋፋ ያለ ህመም ሲሆን የስርጭቱ መጠንም ወረርሽኝ

ወደሚያስብለው ደረጃ ደርሷል፡፡ የስኳር ህመም በፍጥነት እያሻቀበ የሚታየው ደግሞ በለሙት ሀገሮችና እንደ አገራችን ባሉ በመልማት ላይ በሚገኙ ሀገራት ነው፡፤ የዓለም ስኳር ህመም ፌዴሬሽን እንደሚያስቀምጠው በአሁኑ ጊዜ በዓለም ላይ 387 ሚሊዮን ሰዎች ከስኳር ህመም ጋር የሚኖሩ ሲሆን የመከላከልና የመቆጣጠር እርምጃዎች ጥብቅ ሆነው ካልቀጠሉ ይህ አሀዝ በ2035 እ.ኤ.አ ወደ 592 ሚለሊዮን ያሻቅባል ተተንብዮል፡፡ በኢትዮጵያ የስኳር ህመም ከዛሬ30 ዓመታት በፊት አልፎ አልፎ ብቻ ሲታይ የነበረው ቢሆንም ከቅርብ ዓመታት ወዲህ ግን በሚያስደነግጥ መልኩ እየተስፋፋ ለመሆኑ ወደየጤና ድርጅቶች ለህክምና የሚመጡት ሰዎች ቁጥር ብዛት ሊያስረዳ ይችላል፡፡

የስኳር ህመም በሽንት ይበልጥ ደግሞ በደም ምርመራ ሊታወቅ ይችላል፤ የስኳር ህመም አንዴ ከያዘ በባህላዊ ሆነ በሳይንሳዊ የህክምና ዘዴ የማይድን የዕድሜ ልክ ህመም ቢሆንም ክትትልና ቁጥጥር ከተደረገበት ግን እንደማንኛውም ሰው ጤናማ ኑሮ ሊያስኖር የሚችል ነው፡፡ በተቃራኒው ደግሞ በተገቢው መንገድ ክትትልና ቁጥጥር ካልተደረገበት የተለያዩ ጠንቆችን ያስከትላል፡፡

ኢንሱሊን ማለት በሰውነታችን ውስጥ የሚገኝና ሰውነታችን እጅግ የሚፈልገው ዓይነተኛ የንጥረ ቅመም አይነት ኢንሱሊን የሚጠቅመን ከምግባችን የምናገኘውን ስኳርንና ሌሎች ምግቦችን ወደ ግሉኮዝ እንዲቀየር የምያስችል ቅመም ነው ::ግሉኮዝ ደግሞ ለሰውነታችን ኃይል በመስጠት የሰውነታችን ውስጣዊ ሥራ እንዲከናወንና እንድንቀሳቀስ፣እንድናስብ፣ ወዘተ የሚያስችል ኃይል ሰጭ ነው።

በስኳርብዛት ሕመም ተጠቂ ከሆኑት መካከል1/3ኛ የሚያህሉት በሽታው እንዳለበቻው አያውቁም ፡ ፡ በደንብ ካልተከታተሉትና እንክብካቤ ካላደረጉለት የስኳር ብዛት በሽታ ዓይነ ስውርነትን፣ የልብ ሕመምን፣የአንጎል ሕመም ን፣የኩላሊት ሕመምና እግርን እስከማጣት አደጋ ያደርሳል። እንዲያውም አእምሮን በመሳት አካላችን እስከመስለልና አስከ ሞት አደጋም ያደርሳል።

ስኳር ብዛት ያለባቸው ሰዎች የሚመገቡትን ምግብ በመቆጣጠር፣ የደም ስኳር መጠናቸውን በየጊዜው በማወቅ፣ክኒን/እንክብል መድኃኒታቸውን በመውሰድና እንዳስፈላጊነቱ ኢንሱሊንም በመወጋት እራሳቸውን ይንከባከባሉ፡፡ ስኳር ብዛት ካለብዎት ሕመምዎን ተገተው መንከባከብና መጠበቅ አለብዎት፡፤ የስኳርዎን መጠን በአግባቡ ከተቆጣጠሩ ጤናማ ሆነው ለረጅም ዕድሜ ሊኖሩ ይችላሉ፡፡የሕክምና መመሪያዎችን በማከበር በንቃት፣ በትጋትና በመልካምባሕሪና ተግባር በሽታችንን መቆጣጠርና ማዳናም እንችላለን።

በሰውነታችን ውስጥ ምን ያካሄደላል

አንድን መኪና ለመንዳት ነዳጅ እንደሚያስፈልገው ሁሉ የሰውነታችን ሕዋሶችም ለመኖር፣ለመተንፈስ ፣ ለማየት እንዲሁም ለማሰብ ኃይል ያስፈልጋቸዋል፡፤ ይህ ኃይል ወይም ነዳጅ የሚገኘው ከምንበላው ምግብ ሲሆን በአንጀታችን አማካኝነት ይፈጭና ግሉኮስ ወደሚባለው የስኳር ዓይነት ተለውጦ ወደ ደም ሥራችን እንዲጓዝ ይደረጋል፡፤ ስኳርም ከአንጀታችን ወደ ደም ይተላለፍና በደም ዝውውር አማካኝነት ወደ ተለያዩ የሰውነት አካላት ገብቶ በኃይል ሰጪነት ያገለግላል፡፡

በተፈጥሮ ቆሽት /የእንግሊዝኛ አጠራሩ ፓንክርያስ/ የምንለው የሰውነታችን ክፍል በደም ውስጥ ያለውን ስኳር ወደ ተለያዩ ሕዋሶች የሚያደርስ ኢንሱሊን የተሰኘ ንጥረ ቅመም ያመርታል፡፡ ቆሽት የሚገኘው ከጨጓራ በስተጀርባ ሲሆን በሰውነታችን ውስጥ የተለያዩ ጠቀሚ ተግባራትን ያከናውናል፡፡ ከላይ እንደተጠቀሰው አንደኛው ሥራው ኢንሱሊንን ማመንጨት ነው፡፡ ኢንሱሊን ስኳርን ከደም ወደ ተለያዩ ህዋሳት እንዲገባ በመርዳት በደም ውስጥ ያለው የስኳር መጠን እንዲስተካከል ይረዳል፡፡ የስኳር ህመም ከተከሰተ ግን ቆሽት /ፓንክሪያስ/ ኢንሱሊን ጭራሽ ማምረት ያቅተዋል አሊያም ደግሞ ኢንሱሊንን በበቂ ሁኔታ ማመንጨት ያቅተዋል ስለማይችል በደም ውስጥ የሚገኘውን ስኳር በጥቅም ላይ ማዋል ስለማይችል በድም ውስጥ የሚገኘውን የስኳር መጠን ከፍ እያለ ይሄዳል፡፡

የስኳር ህመም መንስኤ ምንድን ነው

የስኳር ህመም መንስኤ ምን እንደሆነ በውል አይታወቅም፡፡ ከላይ ለማብራራት እንደተሞከረው የስኳር ህመም የሚከሰተው ቆሽት ኢንሱሊንን በሚገባ ሳያመነጭ ሲቀር ነው፡፡ ምንም አንኳ በስኳር ህመም ላይ ከረጅም ጊዜ ጀምሮ ጥናቶች እየተደረጉ ቢሆንም ቆሽት ኢንሱሊን የማምረት ተግባሩን ለምን በሚገባ እንደማያካሂድ እስከአሁን ሊደረስበት አልተቻለም፡

የስኳር ህመም በእርግማን፣በልክፍት ወይም ብዙ ጣፋጭ በመብላት የሚመጣ አይደለም፡፡ የስኳር ህመም መከሰት ሊያጋልጡ የሚችሉ ሁኔታዎች በቅርብ የቤተሰብ አባል የህመሙ መኖር (ሁልጊዜ ግን በዘር ሀረግ አይተላለፍም)፣ የኢንዱስትሪዎች መስፋፋትና የህዝቡ ከገጠር ወደ ከተማ መፍለስ፣ ጭንቀትና ውጥረት የተሞላበት ኑሮ፣ ጤናማ ያልሆኑ አመጋገብ መከተል፣ የአካል ብቃት እንቅስቃሴ አለማድረግ እና የሰውነት ክብደት መጨመርና ከልክ በላይ መወፈር ይጠቀሳሉ፡፡

የስኳር ህመም ማንን ይይዛል

የስኳር ህመም እድሜ፣ ብሔር፣ወንድ ፣ሴት ፣የኑሮ ደረጃ ሳይል በሁሉም ሰው ላይ ሊከሰት የሚችል ህመም ነው፡፡

ለስኳር ህመም ይበልጥ ተጋላጭ ማነው

የስኳር ህመም በማንኛውም ሰው ላይ ሊከሰት ይችላል፡፡ ይሁንና እድሜያቸው ከ40 ዓመት በላይ የሆኑ፣የሰውነት ክብደታቸው ከፍተኛ የሆኑ ፣የአካል ብቃት እንቅስቃሴ የማያደርጉና በቤተሰባቸው ውስጥ የስኳር ህመም ያለባቸው ፣ የደም ግፊት ያለባቸው፣በደም ውስጥ የቅባት መጠኑ (ኮሊስትሮል) ከፍ ያባቸው ሰዎች ፣ ከዚህ ቀደም በእርግዝና ጊዜ የስኳር ህመም የታየባቸውና ከዚህ ቀደም በእርግዝና ጊዜ የስኳር ህመም የታየባቸውና ከዚህ ቀደም ክብደታቸው ከአራት ኪሎ ግራም በላይ የሆኑ ህጻናትን የወለዱ ሴቶች ይበልጥ ለስኳር ህመም የተጋለጡ ናቸው፡፡ ከላይ ከተጠቀሱት ሁኔታዎች መካከል አንዱ እንኳ የታዩባቸው ሰዎች ቢያንስ በዓመት አንድ ጊዜ የስኳሩን ሁኔታ ለማየት የደም ምርመራ ማድረግ ይኖርባቸዋል፡፡

ቅድመ ስኳር በሽታ **(Pre diabetes)**

ምልክት ሳይሠጡ ሳያስጠነቅቁ እያዋዙ ብቅ ከሚሉ በሽታዎች አንዱ የስኳር በሽታ ነው፡፡ አደጉ በሚባሉ አገራት አዋቂ ከሆኑ በኋላ፣ የስኳር በሽታ የሚከሰትባቸው ሰዎች ባሕርይ ለየት ያለ ነው፡፡ ያም በተለይ በሰውነት ገዘፍ ያሉና፣ ሰውነታቸው ላይ ያልተስተካከለ ውፍረት የሚታይባቸው ሰዎች ላይ ነው፡፡

ቅድመ ስኳር በሽታ በደም ውስጥ የስኳር መጠን ሲለካ፣ መጠኑ ከፍ ያለ ሆኖ ግን የስኳር በሽታ የሚባል ደረጃ ሳይደረስ ሲቀር ነው፡፡ በቂ ክትትልና ጥንቃቄ ካልተደረገ፣ ይህ ሁኔታ በአስር አመታት ወይም ባነሰ ጊዜ ውስጥ ወደ ስኳር በሽታ ይሻገራል፡፡ ይህ ቅድመ ስኳር በታየበት ጊዜ ምልክት ባይሰጥም፣ ከስኳር በሽታ ጋር ተያይዘው ብቅ የሚሉት የልብና የደም ሥር በሽታዎች አብረው በጊዜ እየጀመሩ ሊሆን ይችላል፡፡ ስለዚህ ማስጠንቀቂያነቱ ከስኳር ያለፈ ስለሆኑ በቂ አትኩሮት ሊሠጠው ይገባል፡፡

ከዚህ ጋር በተያያዘ፣ ይህንን ጉዳይ ቀደም ብለው ከነቁበት፣ ጤንነትዎን በመንከባከብ፣ ዋናው የስኳር በሽታ እንዳይከሰት የማድረግ ዕድል አለዎት፡፡ ያም አንግዲህ፣ ጤናማ አመጋገብ፣ መደበኛ የሆነ የሰውነት እንቅስቃሴ ማድረግ፣ ጤናማ የሰውነት ክብደት በመጠበቅ በደም የስኳር መጠን ዝቅ እንዲል ማድረግ ይችላሉ፡፡

ቅድመ ስኳር ምንም ምልክት ላይኖረው ቢችልም፣ በቆዳ ላይ የሚታይ አንድ ምልክት ግን ከዚህ ሁኔታ ጋር ሊያያዝ ይችላል፣ በተጨማሪም ለስኳር በሽታ መከሰት ምልክት ይሆናል የሚባል ነው፡፡ በቆዳ ላይ ጠቆር በማለት በጉልበት፣ በክርን፣ በአንገት፣ በብብት፣ የእጅ ጣቶች ላይ የሚታይ ነገር ነው፡፡ ለማንኛውም ይህ ምልክት ኖረም አልኖረም አስፈላጊውን ጥንቃቄ ማድረግ ተገቢ ነው፡፡

ቅድመ ስኳር ሁኔታው ደግሞ ወደ ስኳር በሽታ ከተሸጋገረ የሚታዩ ምልክቶችና ስሜቶች አሉ፡፡ እነሱም፣ የውሀ ጥም መጨመር፣ ቶሎ ቶሎ ሽንት መሽናት፣ ድካም ስሜት፣ አይን ብዥ ማለትን ያካትታሉ፡፡ ይህ አይነት ስሜት ጤናማ ስላልሆነ ወደ ሀኪም መሄድ የግድ ይሆናል፡፡

ለመሆኑ ለቅድመ ስኳር የሚያጋልጡ ሁኔታዎች አሉ ወይ? እነዚህን ሀኔታዎች በጥሞና መመልከት ተገቢ ነው፡፡ ቤተሰበ ወይም ጓደኛን መምከርም አስፈላጊ ነው፡፡ ሁኔታዎቹ፤

- ✓ የሰውነት እንቅስቃሴ የማያዘወትሩ ከሆነ
- ✓ የሰውነት ክብደት ከመጠን በላይ ካለፈ
- ✓ ዕድሜ ከ45 አመት በላይ ከተሻገረ
- ✓ በቤተሰብዎ ውስጥ ዋናው የስኳር በሽታ ያለበት ሰው ካለ
- ✓ አፍሪካዊ ዝርያ ካለብዎት
- ✓ በሴቶች በኩል፣ ከዚህ ቀደም ከእርግዝና ጋር በተያያዘ የስኳር በሽታ ተከስቶ ከሆነ፣ ተወለደው ልጅ ከዘጠኝ ፓውንድ ወይም ከ4.1 ኪሎ ግራም በላይ ከሆነ
- ✓ የደም ግፊት ካለብዎት
- ✓ እንደገናም በሴቶች በኩል፣ polycystic ovary syndrome የሚባል ሁኔታ ካለባቸው፣ (ሁኔታው የውር አበባ መዛባት፣ በሰውነት ላይ ከሚገባው በላይና በሴቶች ላይ ሙብቀል የማይገባበት ቦታ ፀጉር ሲበቅል፣ ከመጠን በላይ ውፍረትን የሚያካትት ነው፡፡)
- ✓ ኮለስተሮል መጠን ደግሞ፣ ጤናማ (HDL) የሚባለው የኮለስትሮል መጠን ከፍ ማለት ሲገባው በማነስ ከ35 በታች ሲሆንና፣ ትራይግላይሰራይድ (Triglyceride) የሚባለው በደም የሚለካ የጮማ መጠን ከ 250 በላይ ሲሆን
- ✓ እንቅልፍ ደግሞ ትንሽ ወይም ከመጠን በላይ ሲሆን፣ ማለትም፣ ከስድስት ሰኣታት በታች የሆነ በቂ ዕንቅልፍ አለማግኘት፣ አለዚያም ከበቂ በላይ ወይም ከዘጠኝ ሰኣታት በላይ የሚተኙ ከሆነ ✓ ራስን መሞከሪያ, የደም ልውውጦች; ✓ የአእምሮ እና የአካል ጉዳቶች.
- ✓ የቫይረስ ኢንፌክሽን.

እንግዲህ ከላይ የተጠቀሱት ሁኔታዎች ካሉብዎት፣ ለቅድመ ስኳር አጋላጭ ሰለሆኑ፣ ወደ ሀኪምዎ ጎራ ብለው ምርምራ እንዲረግ መጠየቅ አለብዎት፡፡ በዚህ አጋጣሚ፣ ለዚሁ ሲሉ ወደ ሀኪም የሚሄዱ ከሆኑ፣ ለስምንት ሰኣታት ሳይመገቡ በባዶ ሆድ መሄድ
ምርምራው ባንድ ቀን እንዲጠናቀቅ ይረዳዎታል፡፡

ይህን በሚመለከት በላቦራቶር ምርመራ የስኳር መጠንን በሚመለከት የትኛው መጠን ጤናማ የትኛው መጠን በሽታ እንደሚባል እንመልከት፡፡
A1c Test (Hemoglobin A1c, Hgb A1c) ይህ የደም ምርመራ፣ የስኳር በሽታ ለማወቅና ለመከታተል፣ በተጨማሪም ቅድመ ስኳር ሁኔታ መኖሩን ለማወቅ የሚሠራ ነው፡፡ ብቻውን ወይም ከሌሎች ምርመራዎች ጋር አብሮ ይሠራል፡፡ ለዚህ

ምርመራ ባዶ ሆድ መሆን አያስፈልግም፣ በማንኛውም ጊዜ መሠራት ይችላል። መጠኑ የሚጠቁመው፣ በቀይ የደም ሴሎች ውስጥ በሶስት ወራት ውስጥ የነበረውን አማካኝ የስኳር መጠን ነው። በዚህ ምክንያት የስኳር በሽታው ላለባቸው ሰዎች፣ የስኳር መጠኑ በቁጥጥር ሥር እንደሆነ ለማሳየት ለክትትል ይታዘዛል።

Fasting blood glucose (FBS) ይህ ደግሞ በባዶ ሆድ ማለትም ለስምንት ሰኣታት ምግብ ሳይበሉ የሚሠራ የደም ምርመራ ነው።በተለይም በጠዋት ከተሠራ ጥሩ መረጃ ይሠጣል።

Oral glucose tolerance test (OGTT) ይህ ምርመራ ባሁኑ ጊዜ ለነብሰ ጡር ሴቶች የሚታዘዝ ነው። ምርመራው የደም ሲሆን፣ በአፍ ስኳር ከተወሰደ በኋላ ጊዜ እየጠበቁ ደም በመውሰድ የስኳር መጠኑን በመለካት የሚሠራ ነው። ከላይ ከተጠቀሱት የምርመራ አይነቶች ጠንከር ያለ መረጃ ወይም የተሻለ መረጃ ይሠጣል። ምርመራው ውስብስብ ያለ ነው። ሰዎች ባዶ ሆድ (ስምንት ሰኣታት) ከሆኑ በኋላ፣ 75 ግራም ስኳር በውሃ ተበጥብጦ እንዲጠጡ ይደረግና፣ ከሁለት ሰኣታት በኋላ በደም ምርመራ የስኳር መጠን ይለካል። ሰለኣተረጓጎም ሠንጠረዡን ይመልከቱ። ባጠቃላይ ከፍተኛ የፕሮቲን መጠንና መጠነኛ የሆነ የካርቦሀይድሬት ምግብ የቅድመ ስኳር ሁኔታን ያሻሻለ መሆኑን ይዘግባል ::

ይህ ጉዳይ ለምን አሳሳቢ እንደሆነ ለመረዳት በአሜሪካ ብቻ ወደ 86 ሚሊዮን የሚሆነ ሰዎች ቅድመ ስኳር ሁኔታ አለባቸው። በኢትዮጵያም ቢሆን አሳሳቢ በሆነ ደረጃ የስኳር በሽታ ሲከሰት ነው የሚታየው።

የስኳር ብዛት በሽታ ዓይነቶች

የስኳር ህመም ዓይነቶች በርካታ ሲሆኑ ዋና ዋናዎቹ የሚከሉት ናቸው።

1. የመጀመሪያው ዓይነት የስኳር ህመም

የመጀመሪያው ዓይነት የስኳር ህመም የሚከሰተው ቆሽት /ፓንክሪያስ/ ኢንሱሊን ማምረት ሲያቆም ነው። ይህ አብዛኛውን ጊዜ የሚከሰተው ከ30 ዓመት በታች በሆኑ ወጣቶች ላይ ሲሆን በልጆችና ከተወለዱ ትንሽ ጊዜ በሆናቸው ሕፃናት ላይም ሊታይ ይችላል። ሕመሙ ሲከሰት ድንገተኛና ፈጣን ሂደት ይኖረዋል።

የመጀመሪያ ዓይነት የስኳር ህመም ያለባቸው ሰዎች በሕይወት ለመቆየት በየቀኑ የኢንሱሊን መርፌ መወጋት ይኖርባቸዋል። የሚወሰደው የኢንሱሊን መጠን ከሚወሰደው ምግብና ከአካል ብቃት እንቅስቃሴ ፕሮግራሞች ጋር ጥንቃቄ በተሞላበት መንገድ የተስተካከለ መሆን አለበት። አንደኛው ዓይነት የስኳር ህመም ከጠቅላላው የስኳር ህሙማን ቁጥር ከ1015 ከመቶ ያህሉን ያጠቃልላል።

2. ሁለተኛው ዓይነት የስኳር ህመም

ሁለተኛው ዓይነት የስኳር ህመም የሚከሰተው ቆሽት/ፓንክሪያስ/ የሚያመርተው ኢነሱሊን በቂ ያልሆነ ወይም በደንብ የማይሰራ በሚሆንበት ጊዜ ነው። ከ85% – 90% የሚጠጉ የስኳር ህሙማን ሁለተኛው ዓይነት የስኳር ህመምተኞች ሲሆኑ ሕመሙ ያለባቸው አብዛኞቹ ሰዎች ሁኔታውን በሚመለከት ምርመራ አድርገው የማያውቁ ናቸው። ብዙኃኑ የሁለተኛ ዓይነት የስኳር ህሙማን ከ40 ዓመት በላይ ያት ናቸው። አብዛኛውን ጊዜ የሰውነት ክብደታቸው ከፍተኛ ሲሆን የአካል ብቃት እንቅስቃሴም አያደርጉም። የሰውነታቸው ኢንሱሊን አጠቃቀም ያልተስተካከለ ስለሆነ እነዚህ ሰዎች

አመጋገባቸውን መቆጣጠር፣ ሕክምናቸውን በትክክልና በትጋት በመውሰድና ተገቢ የአካል ማጠንከሪያ / ብቃት እንቅስቃሴ ማድረግ አለባቸው፡
፡የጤናማ አመጋገብን ዘዴ በየጊዜው በመማርና ምግባቸውንና መጠጣቸውን ተስማሚ ማድረግ አለባቸው።

የአካል ብቃት እንቅስቃሴና ጤናማ የሆነ የአመጋገብ ሥርዓት ስኳሩን በጥሩ ሁኔታ ለመቆጣጠር የሚያስችሉ አስፈላጊ ነገሮች ናቸው፡፡ ይሁን እንጂ ቁጥጥሩን ሁኔታ ለማሻሻል እንክብሎች ሊታዘዙ ይችላሉ፡፡ ሁለተኛ አይነት የስኳር ህሙማን እድሜያቸው እየጨመረ ሲመጣ ኢንሱሊን ወደሚሰውዱበት ደረጃ ይደርሳሉ፡፡

ምንም እንኳን ሁለተኛው ዓይነት የስኳር ህመም ወዲያውኑ ሕይወት አደጋ ላይ የሚጥል ባይሆንም ከአንደኛው ዓይነት የስኳር ህመም ጋር ስናወዳድረው በብዙ መልኩ ይበልጥ አደገኛ ሆኖ የምናገኘው ሕመሙ የሚዳብረው ቀስ በቀስ በመሆኑና ህመሙ እንዳለ ለመጠቆም መቻልም ከባድ ስለሆነ ነው፡፡ በደም ውስጥ ያለው የስኳር መጠን ለረዥም ጊዜ በሰውነት ውስጥ ከቆየ በሰውነት የተለያዩ ክፍሎች ላይ የከፋ ጉዳት ያስከትላል፡፡

3. *ሦስተኛው ዓይነት የስኳር ህመም*

ሦስተኛው ዓይነት የስኳር ህመም እርግዝና ጋር ተያይዞ የሚከሰት ሲሆን የሚታየውም በእርግዝና ወቅት ብቻ ነው፡፡ እርግዝና ወቅት ብቻ ነው፡፡ እርግዝና ነክ የስኳር ህመም ብዙውን ጊዜ የሚከሰተው እርግዝና ከጀመረ ከ24-28 ሳምንት በኋላ ነው፡፡

ይህ ዓይነቱ የስኳር ህመም ከእርግዝና በኋላ የሚጠፋ ሲሆን በአንዳንድ ሴቶች ላይ ግን ከወሊድ በኋላም ለቀጥል ይችላል:፡ ከወሊድ በኋላ የስኳር ህመም ቢጠፋም ህመሙ ወደ ፊት እርግዝና ጊዜም ሆነ ከእርግዝና ውጪ ሊከሰት ስለሚችል ይህ ሁኔታ ያጋጠማቸው ሴቶች ለስኳር ህመም ክትትልና ቁጥጥር ማድረግ ይኖርባቸዋል፡፡

ቀላል ሊባል የሚችል የስኳር ህመም እንደሌለ ሊታወቅ ይገባል፡፡ መለስተና የስኳር ህመም ወይም ደግሞ ትንሽ ስኳር አለችብኝ የሚባል ነገር የለም፡፡ ስኳር ህመም ሁልጊዜም ጥብቅ ቁጥጥርና ክትትል የሚሻ ህመም ነው፡፡

የስኳር ህመም ምልክቶች ምንድን ናቸው

በደም ውስጥ ያለው የስኳር መጠን ሲጨምር (ሃፐርግላይሴሚያ) ግልጽና የማያሻሙ ምልክቶች ያሉት ሲሆን እነዚህ ምልክቶች ሲታዩ ፈጥኖ ወደ ህክምና ባለሙያ በመሄድ መመርመር ያስፈልጋል፡፡ እነዚህም አሁንም ውሃ ማለት /ከፍተኛ የውሃ ጥም/፣ ቶሎ ቶሎና ብዙ መሽናት ፣ከፍተኛ የረሀብ ስሜት፣ድካም፣ኃይል ማጣት ፣ ምክንያቱ ያልታወቀ የክብደት መቀነስ ናቸው፡፡ ሌሎች ምልክቶች ደግሞ የማየት ችሎታ ለውጥ /ብዥብዥ ማለት/፣ የእግርና የእጅ መደንዘዝ ፣ ግብረ ሥጋ ግንኙነት ለማድረግ አለመቻል፣ሰውነት ሲቆረጥ፣ሲቆስል ፣ ሲያብጥና ሲያሳክክ ቶሎ ያለመዳን፣ በሴቶች ላይ ደግሞ ማህጸን አካባቢ ማሳከክና ነጭ ፈሳሽ መውጣት አልፎ አልፎ የሰውነት መቆነጣጠጥና ውስጥ ውስጡን የሚሄድ ዓይነት ስሜት መሰማት ሁኔታዎች ናቸው፡፡ ሁን እንጂ በአንዳንድ የስኳር ህመምተኞ ላይ ምንም ዓይነት የሕመም ምልክቶች አይታዩባቸውም

ዋናዎቹ የአይነት አንድ የስኳ በሽታ ምልክቶች የሚቀጥሉት ናቸው ።

- ✓ አዘውትሮ መሽናት
- ✓ በብዛት ውሃ መጠጣት
- ✓ የአፍ መድረቅ
- ✓ በብዛት መራብ
- ✓ በብዛት ክብደት መቀነስ (መክሳት)

- ✓ አዘውትሮ በሆነው ባልሆነው መበሳጨት
- ✓ የድካም ስሜት
- ✓ የአይን ግርዶሽእነዚህ ምልክቶች በድንገት ወይም ጊዜ ሳይወሰዱ ሊከሰቱ የሚችሉ ይሆናሉ።

ቀጥሎ የሰፈሩት የአይነት ሁለት የስኳር በሽታ ዋነኛ ምልክቶች ናቸው። የግፊት መጠኑ በጣም ከፍተኛ እየሆነ ሲመጣ

- ✓ ከላይ የሰፈሩት የአይነት አንድ ምልክቶች ሁሉም ወይም በከፊል ለዚህም የሚያገለግሉ ናቸው። ሆኖም ግን በአይነት ሁለት በሽታ እነዚህ ምልክቶች የሚታዩት መለስ ባለ ሁኔታ ነው።
- ✓ በተደጋጋሚ ተላላፊ በሆኑ የበሽታ አይነቶች (infections) መያዝ
- ✓ ከቁስል በቶሎ ለመዳን አለመቻል
- ✓ እግርና እጅ ከሚያቃጠልና ከሚያደንዘዝ ስሜት መሰቃየት
- ✓ በተደጋጋሚ በቆዳ፤ በአፍ (ወይም በጥርስ) እና በኩላሊት በሽታዎች መያዝ
- ✓ ሽንት ቶሎ ቶሎ መሽናት(አንዳንዴ በየሰአቱ) በተለይ ማታ ማታ
- ✓ ከፍተኛ የሆነ የውሃ ጥም
- ✓ ከፍተኛ የርሃብ ስሜት(ከበሉ በኋላ እራሱ)
- ✓ የድካም ስሜት
- ✓ ብዥታ
- ✓ ያልተጠበቀ ክብደት መቀነስ
- ✓ ማቅለሽለሽ አንዳንዴ ማስታወክ
- ✓ በሴቶች ተደጋጋሚ የብልት infection
- ✓ አፍ መድረቅ
- ✓ የቀላል ቁስሎች ቶሎ አለመዳን ✓ ማሳከክ በተለይ ብልት አካባቢ
- ✓ የብስጭት ወይም ሌላ ስሜት ለውጦች

ሌላ መጠቀስ ያለበት ጉዳይ ብዙ የሆኑ የአይነት ሁለት የስኳር በሽተኞች ከላይ የተጠቀሱትን ምልክቶች በግልጽ ሳያሳዩ ለረጅም ጊዜ ሊቆዩ እንደሚችሉ ነው። የደማቸው የስኳር መጠን ከፍ ያለ ቢሆንም እነዚህ በሽተኞች መያዛቸውን ሳያውቁ በበሽታው ሊጉዱ የሚቸሉ ናቸው::
በርግዝና ወቅት የሚፈጠረው የስኳር ሕመም ብዙውን ጊዜ ከሁለተኛው አይነት የስኳር በሽታ ጋር ተቀራራቢ የሆኑ ምልክቶችን የሚያሳይ ነው። ከዚህ ጋር በመገናዘብ በሽተኞቹ በብዛት በውሃ መጠማትን፤ ሽንት መሽናትንና መራብን የመሳሰሉ ምልክቶችን ያሳያሉ። ይህ ሕመም በትክክል መኖሩ የሚታወቀው ግን የደምና የሽንት ስኳር (የጉሉኮስ) መጠን ምርመራ በሚደረግበት ጊዜ ነው::

ስኳር በሽታ አንድ የሕክምና ዓይነት **(Type I Diabetes Mellitus)**

የስኳር በሽታ አንድ የሕክምና ዓይነት ከዚህ በፊት እንደገለጽነው በሰውነታቸው ውስጥ ኢንሱሊን ስለሌለ የኢንሱሊን ሆርሞን በመርፌ መልክ መስጠት ግዴታ ነው። የሚሰጠው ኢንሱሊን መጠን ወይም ክብደት እንደበሽታው አስፈላጊነት ከፍ እና ዝቅ ማለት ይችላል። ይህንን የጤና ባለሙያ አይቶ የመድሃኒት መጠን (Dose) የሚያስተካክል በመሆኑ እዚህ ላይ አናነሳም። ኢንሱሊን የሚወስድ ሰው/ ታካሚ/ በትክክል ካልተወጋ ኢንሱሊኑ በትክክል መስራት አይችልም።

ኢንሱሊን ማስቀመጥ ያለብን እንዴት ነው? መጀመሪያ ኢንሱሊኑ ለበሽተኛው እንደተሰጠ ወዲያው የተመረተበት ጊዜ ያለፈበት አለመሆኑን ለይተን ማየት አለብን። ኢንሱሊን ከፍተኛ ሙቀትም ሆነ ቀዝቃዛ እንዲሁም የፀሐይ ብርሃን ቀጥታ ቢወጣበት የመስራት ችሎታው ይደከማል። ስለዚህ ስናቀዘቅዘው (Fridge) ከቤት ያለን እንደሆነ ትንሽ የሚያቀዘቅዝ ቦታ ውስጥ እንጂ ፍፁም በረዶ የሚያደርግ (ከላይ በረዶ የሚፈጥር ቦታ) ማስቀመጥ የለብንም። መኪና ውስጥ እና በመሳሰሉት ሞቃታማ ቦታ ማስቀመጥም የመድሃኒቱን ፈዋሽነት ይጎደዋል። በመጨረሻም ልንወጋ ስንል በስሪንጅ ከመቅዳታችን ቀለሙ ያልተለወጠ መሆኑን መለየትአለብን፤ የምንወጋበትን መርፌ (Syringe) ንፁህ ቦታ ማስቀመጥ፣ ጫፉ ከቆዳችን በስተቀር ከማንኛውም ሌላ ነገር ጋር እንዳይነካካ መጠበቅ (መከደን)፣ ከሌሎች ታማሚዎች ጋር በፍፁም አለመጠቀም (መርፈውን አለመጋራት) ግዴታ ነው።

ኢንሱሊንን እንዴት መወጋት አለብን? መጀመሪያ የተነገረን የኢንሱሊን መጠን (Dose) ከእቃው ውስጥ መቅዳት ነው፤ ከዚያም የመርፌው ጫፍ ወደ ሰማይ በማዞር አንድ ወይም ሁለት ጊዜ በእጅ ጣት መምታት ነው። ይህም የምንወጋባቸውም የሰውነት ክፍሎች ከውስጡ (Arm)፣ የእግር ታፋ (Thigh)፣ መቀመጫ (Buttock) እና ሆድ ላይ (ከእምብርት ትንሽ ራቅ ተደርጎ) ነው። ስንወጋ የመርፌውን አቅጣጫ በቆዳው ላይ 45 ዲግሪ (450C) ወደ ጎን አስተኝቶ መሆን አለበት። ይህም ኢንሱሊን በቆዳ ስር እንጂ ጡንቻ ውስጥ መፍሰስ ስለሌለበት ነው። የሁለተኛ ስኳር በሽታ አይነት ሕክምና **(Type II Diabetes Mellitus)**

የሁለተኛ ስኳር በሽታ አይነት ህክምና ከላይ እንደገለጽነው ብዙውን ጊዜ የሚዋጡ መድሃኒቶች (Oral hypoglycemic agent) ከሆኑ የሚሰጠው መድሃኒት መጠን (Dose) ያለውን ሁኔታ መሰረት በማድረግ የሚያክመው ባለሙያ እና ህመምተኞቹ (ታካሚዎቹ) ተወያይተው የሚወስኑት ነው። አንዳንድ ጊዜ ደግሞ በመድሃኒት መቆጣጠር ሳይቻል ሲቀር ኢንሱሊን ወደ መወጋት ይኬዳል። ይህም ኢንሱሊን ከላይ በተገለፀው ሁኔታ ይወሰዳል። የስኳር በሽታ ህመምተኞች **(Diabetes Mellitus)** ማድረግ የሚገባቸው ጥንቃቄ

የስኳር ህመምተኞች ለሚወስዱት መድሃኒት ላይ በተጨማሪ በኑሮዋቸው ሁኔታ ላይ አንዳንድ ጥንቃቄዎች እና ለውጦችን ማድረግ አለባቸው፤ ከእነዚህም፡-

- ✓ ጥፍር በሚቆረጡበት ጊዜ በከፍተኛ ጥንቃቄ እንዳይቆርጣቸው ጥፍሩን ወደ ታች አስቀርተው መቁረጥ፣ ይህም ቢቆስል በቀላሉ ስለማይድን ነው፣
- ✓ ጫማ ካደረጉ ሰፊ ወይም ቀደም ሲል ያደርጉ በነበሩት የጫማ ቁጥር ላይ አንድ ቁጥር በመጨመር ማድረግ
- ✓ በሚጓዙበት ጊዜ ባዶ እግር እና እግርን የሚያሳዩ ጫማዎች ከማድረግ መጠንቀቅ፣
- ✓ እግር በሚታጠቡበት ጊዜ በቀዝቃዛ ውሃ መታጠብ፣
- ✓ በእግራቸው ላይ ቁስል ያለ ወይም የሌለ መሆኑን በየጊዜው ማየት አለባቸው፣
- ✓ በልዩ ልዩ ምክንያቶች በእግር ላይ ቁስል ከወጣ እንደ ሌሎቹ በራሱ ለመዳን ረጅም ጊዜ ስለሚወስድ ሀኪም ቤት መሄድ አለባቸው፣
- ✓ በውስጣቸው ስኳር ካላቸው እንደ ሻይ፣ ጣፋጭ የለስላሳ መጠጥ እና የመሳሰሉት መቆጠብ አለባቸው፣
- ✓ ጮማ እና ቅቤ ከበዛበት ምግብ መቆጠብ፣ ይህም ምግቡ ራሱ እንደ ልብ እና የደም ስሮች ባሉት የሰውነታችን አካል ላይ ችግር ስለሚያመጣ ይህ በሽታ ባለባቸው ሰዎች ላይ ደግሞ ስለሚበረታባቸው ነው፤
- ✓ በልዩ ልዩ ምክንያቶች (በተለይም መድሃኒት ወስደው ምግብ ሳይበሉ መቅረት) በሰውነት ውስጥ ያለው የስኳር መጠን ዝቅ ካለ የማስላብ፣ የድካም፣ እየሮጠ እንዳለ ሰው የልብ ምት መጨመር እና ራስን የመሳት ምልክቶች ካያችሁ በፍጥነት ስኳር ያለበትን ነገር (እንደ ከረሜላ እና ለስላሳ) በትንሹ መውሰድ ነው። ምልክቱ እንደተስተካከለ ማቆም አለብን። በተደጋጋሚ ይህ ምልክት ቢመጣ ምናልባት እየወሰዱ ያሉት መድሃኒት መጠን (Dose)ከፍ ሊል ስለሚችል ሀኪም ቤት ሄደን ማስተካከል አለብን።

<u>የስኳር ህመምና መቆጣጠሪያ መንገዶቹ</u>

አዲስ የአመጋገብ ስርዓት የስኳር በሽታን ለመከላከል አይችልም የስኳር በሽታ መከላከል ለአረጋውያን እንኳን በየቀኑ አካላዊ እንቅስቃሴ ማድረግ አለባቸው. አካላዊ ትምህርት, ኤሮቢክስ, አካል ብቃት, ወዘተ. በቀን ለግማሽ ሰዓት ማግኘትህን እርግጠኛ ሁን በደም ውስጥ የስኳር መጠን ሲያንስ የሚታዩ ምልክቶች

- ✓ ከፍተኛ ረሀብ
- ✓ ላብ ማላብ እና ማንቀጥቀጥ
- ✓ የደበዘዘ ዕይታ
- ✓ ራስ ምታትና ድብርት ይጠቀሳሉ

(i) በደም ውስጥ የስኳር መጠን ሲከሰት/ምልክቶቹ ሲታዩ/

የስኳር መጠን በደም ውስጥ መቀነስ ምልክቶቹ መታየት በሚጀምሩበት ወቅት በአፋጣኝ የስኳር መጠንን መለካትና ከ70 በታች ከሆነ

- ✓ ለስላሳ መጠጣት ወይም ከረሜላ መብላት
- ✓ 2 የሻይ ማንኪያ ስኳር ወይም ማር መውሰድ
- ✓ በ4 ሻይ ማንኪያ ስኳር የፈላ 1 ብርጭቆ ሻይ መጠጣት
- ✓ የተወሰነ ፍራፍሬን መውሰድ
- ✓ ከላይ ከተጠቀሱት አንዱን ወዲያ መውሰድ ያስፈልጋል

የስኳር ህመምን መቆጣጠር

የስኳር ህመምን የመቆጣጠር ዓላማ በደም ውስጥ ያለውን የስኳር መጠን ወደ ትክክለናው ለማምጣት ያም ማለት በደም ውስጥ ያለው የስኳር መጠን ከ90- 130 ሚሊግራም /ኤሲ ሊትር መካከል እንዲሆን ማድረግ ነው፡፡ የእርስዎ ሚና

የስኳር ህመምን በመቆጣጠር ረገድ እርስዎ ሚና በጣም ከፍተና ነው ::ክትትል በሚያደርግልዎ ዶክተርና ሌሎች የጤማ ባለሙያዎች እርዳታ በታገዝ ራስን እንዴት መንከባከብ እንዳለብዎትና በህይወት ባሉበት ዘመን በሙሉ የስኳር ሕመምን ዕለት ዕለት መቆጣጠር የሚችሉት እንዴት እንደሆነ መማር ያስፈልግዎታል፡፡ ለቁጥጥር የሚረዱ መሰረታዊ ነገሮች ጤናማ አመጋገብ

በስኳር ህመም ህክምና የምግብ ቁጥጥር ያለው ሚና ከፍተና ነው፡፡ ቁጥጥሩን ተግባራዊ ለማድረግ ደግሞ የግለሰቡ/ቧ ጥረት ላቅ ያለ ድርሻ አለው፡፡ የስኳር ሕመምተኛ ምግብ ተብሎ ለእያንዳንዱ ሰው የሚሰጥ ዝርዝር ወይም ደግሞ ለስኳር ህሙማን ሁሉ የሚስማማ አንድ ወጥ መመሪያ ሊሰጥ አይችልም፡፡ ማንኛወውም ሰው ሊከተለው የሚገባ ጤናማ የሆነ ተብሎ የሚመከረው አመጋገብ ሥርዓት ለእርስዎም ያገለግላል፡፡ ምግብና መጠጥ በደም ወስጥ ያለውን የስኳር መጠን ይጨምሉ፡፡ ምግብን በሚመርጡበት ጊዜ ዋነኛው ግብዎ መሆን ያበት በደም ውስጥ ያለውን የስኳር መጠን እንዳይበዛ ወይም ደግሞ እንዳያንስ መጠንቀቅ ነው፡፡

ምን ያህል መጠን ያው ምግብ እንደሚወስዱና መቼ መመገብ እንዳለብዎት ማወቅ ወሳኝ ነው እያንዳንዱ ሰው ፍላጎት የተለያየ ስለሆነ ከስኳር ህመም ጋር የሚኖር ሰው የምግብ ባለሙያዎቸን ቢያማክር ጥሩ እንደሆነ ይታመናል፡፡ የተከለከሉ የምግብ ዓይነቶች

- ✓ ከወተትና የወተት ተዋፅኦ - ሙሉ ቅባት ያለው ወተት፤ የረጋ ወተት
- ✓ ከአይብና ፎርማጆ አይነት - ጠንካራ ቢጫ ፎርማጆ
- ✓ ከስጋ ተዋፅኦ - ጮማ ያለበት ስጋ፤ የዳክዬ ስጋ ጉበት፤ ከላሊት ምላስ ፤የከበት ብልቶች፤ ቅመምና በጨው ታከተው ቀዝቅዘ የሚበላ የሾርባ ምግብ፤ በእንፋሎት የደረቀ የአሳማ ስጋ፤ በከፊል የበሰለ የስጋ ተዋፅኦ ፤ ተጠቅልለው የተጠበሱ አሳማ ስጋ ውጤቶች
- ✓ ከዓሣ የምግብ አይነት - ዓሣ የማይመስሉ የባህር እንስሳዎች ፣ የሚበላ ሽርጥ አሳ፣ ሎብስተር፣ ክራብስ፣ የተጠበሰ የዓሳ ውጤት
- ✓ ከእንቁላል የምግብ ዓይነት - በዘይት የተጠበሰ እንቁላል
- ✓ ከቅባት ተዋፅዖ - ንፁ ቅቤ ፣ የአሣማ ጮማ ፣ ደረቅ የዳቦ ቅቤ፣ ለመጋገር ሆነ ለሌላ ምክንያቶች የምንጠቀምባቸውን ቅቤ ይጨምራል፡፡
- ✓ ከፍራፍሬ አይቶች - ኮኮናት/የዘንባባ ገውዝ
- ✓ ከአትክልት አይነቶች - በዘይትም ሆነ በቅቤ የበሰሉ አትክልቶች

- ✓ ከሾርባ ምግብ - የስጋ ፣ አጥንት፣ የእንጉዳይና የቲማቲም ሾርባዎች
- ✓ ለስለሳ /የታሸጉ ምግቦች / ስኳር ላቸውን ማንኛውም ለስላሳ ቸኮሌትና የወተት ጁስ
- ✓ ከተለያዩ የምግብ ዓይነቶች - ቶሎ የሚደርሱ ምግቦች፣ በርገር ፣ፒዛ ፣ድንች ፣ ጥብስ ፣ ሳምቡሳ የተፈቀዱ የምግብ አይነቶች

- ✓ ከወተትና የወተት ተዋፅኦ - ቅባታቸው ከውስጣቸው የተወገዱ ወተት እና እርጎዎች
- ✓ ከአይብና ፎርማጆ የምግብ አይነቶች - ቅባት የሌለው ፎርማጆ
- ✓ ከስጋ አስተዋፅዖ - ቀይ በቀጭኑ የተቆረጠ ስጋ፣ የዶሮ ቆዳን ሳይጨምር የዶሮ ስጋ ፣ የሶያ ውጤቶች የለውዝ ውጤቶች ፣ ምስር
- ✓ ከዓሣ የምግብ አይነት - ነጭ የሆነ ዐሳ ፣ ትልቅ ስጋው የሚበላ ዓሳ (ሳልሞን)፣ትንንሽ አሣዎች(ሰርዲን)
- ✓ ከእንቁላል የምግብ አይነት - የተጠበሰና የተቀቀለ እንቁላል በሣምነት ውስጥ ከሁለት ወይም ከሦስት ጊዜ ያልበለጠ
- ✓ ከየተክል ተዋፅኦ - አጃ ፣ በቆሎ፣ ስንዴ (ፓስታ) ፣ ሩዝ፣ ስራስር ምግቦች(ድንች ፣ ቀይስር)
- ✓ ከፍራፍሬ አይነቶች - ጊዜው ያላለፈ ማንኛውም ፍራፍሬ
- ✓ ከአትክልት አይነቶች - ጊዜው ያላለፈ ማንኛውም አትክልት (ፍሪጅ የቀዘቃ)
- ✓ ከሾርባ አይነተ- የአትክልት ሾርባ (የባቄላ) (የምስር) (የገብስ)
- ✓ ለስላሳ (የታሸጉ ምግቦች) አይነቶች - ከስኳር ነፃ የሆኑትን ብቻ
- ✓ ከቅባት (ጮማ) አስተዋፅዖ - የማይረጉ ፈሳሽ ቅባቶች

(ii) በመኣድ ወቅት መመገብ የሚችሉት ምግቦች

- ✓ ከአትክልቶች፡ ጎመን፤ ቆስጣ፤ ጥቅል ጎመንና አበባ ጎመን ፤ ቲማቲም፤ ዱባ ፤ ካሮት፤ ፎሶሊያና ሽንኩርት
- ✓ ከፍራፍሬ፡ ሎሚ፤ ሀብሃብ ፤ የወይን ፍሬ
- ✓ ከፈሳሽ፡ አምቦ ውሃ፤ ቅባት የሌለው ሾርባ ፤ ስኳር አልባ (ስኳር የሌለው) ሻይና ቡና
- ✓ ከማጣፈጫዎች፡ ቅመማ ቅመም፤ ጨው፤ በርበሬ፤ ኮምጣጤና ሚጥሚጣ
- ✓ ከስጋ፡ የበግ የበሬ የዶሮ ስጋ ዓሣ አይብ እንቁላል ወዘተ የመሳሰሉት ናቸው፡፡
- ✓ ፋይበር (ቃጫ)፡- የበዛባቸው ምግቦች ያልተፈተገ ገብስ፤ ሩዝና በቆሎ፤ የማይረጋ ዘይት መጠቀም ይችላሉ

በአግባቡና በጥንቃቄ ሊወሰዱ የሚገባቸው ምግቦች

- ✓ ከአገዳ እህልና ከጥራጥሬ ዘር፡- በቆሎ፤ አጃ፤ ማሽላ፤ ባቄላ፤ ሽንብራ፤ አተር፤ ምስር፤ ቦሎቄ
- ✓ ከሥራ ሥር ድንች
- ✓ ከፍራፍሬ፡- ብርቱካን፤ ሙዝ፤ ፓፓያና አናናስ
- ✓ ከተዘጋጁና በከፊል ከተሰናዱ ምግቦች፡- የገብስ ቂጣ፣ የገብስ ቆሎ፣ ሽሮ፣ ክክ፣ የገብስ ዳቦ ህሙማኑ ወተትና የወተት ተዋፅኦ (ከሬሙ የወጣለት) በቫይታሚን ሲ እና ሌሎች ቫይታሚኖች ሚኒራሎች የበለፀጉ ፍሬዎችን ቢጠቀሙ ይበረታታሉ፡፡

አንዳንድ ምግቦች ስኳር ላለባቸው ሰዎች ምርጥ እና እንዲየውም ከአንዳንድ የአኗኗር ዘይቤ ለውጥ ጋር ሰውነት እራሱ ደም ውስጥ ይለውን የስኳር መጠን እንዲቆጣጠር ይረዳል ተብሎ ይታሰባል።

እነሱም ምግቦች የሚከተሉት ናቸው።

1. *ፖም*:- ፖም በጣም ብዙ የጤና ጥቅሞች አሉት ተብሎ ከተበየነለት ቆይቷል። ፖም በተፈጥሮው ዝቅተኛ ካሎሪ እና ከፍተኛ ፋይበር አለው። ፋይበር ደግሞ እንዳይርብ፣ መጥፎ ኮለስተሮልን ለመዋጋት እና ደም ውስጥ ያለው ስኳር ወደ ሁለቱ ጫፎች እንዳይወላውል ይረዳል።

በዛ ላይ ደግሞ ፖም ብዙ በሽታዎችን እንድንዋጋ የሚረዳንንና ለሰውነታችን በብዙ መልኩ የሚጠቅመንን anti oxident በበለጸገ መልኩ ይዟል።

2. አቮካዶ:- አቮካዶ በ monounsaturated fat የበለጸገ ስለሆነ digestion ቀስ ብሎ እንዲካሄድና ከምግብ በኋላ ደም ውስጥ ያለው የስኳር መጠን ጣሪያ እንዳይመታ ይቆጣጠራል።

   እንዲየውም እንደ አቮካዶ አይነት ጥሩ fats ያሏቸው ምግቦች የደም የስኳር መጠን ጭራሽ ተመልሶ በተፈጥሮ ጤነኛ እንዲሆን ትልቅ አስተዋጽኦ ያደርጋሉ ተብሎ ይታሰባል።

3. ገብስ:-

   ለምሳሌ ያህል በነጭ ሩዝ ፋንታ ገብስ መብላት ደም ውስጥ ያለውን ስኳር 70% ይቀንሳል። እሱ ብቻ ሳይሆን ገብስ በ ፋይበር የበለጸገ ስለሆነ የደም ስኳር መጠን ለሰዓታት ወይም ለረጅም ጊዜ ዝቅ ብሎ እንዲቆይ ይረዳል። ስለዚህ ገብስ ስኳር ላለበት እጅግ ምርጥ ምግብ ነው ተብሎ ይታወቃል።

4. ባቄላ እና ዘሮቹ:-

   ባቄላ፣ አተር እና ሽምብራ አይነት ጥራጥሬዎች አንደኛ በፋይበር የበለጸጉ ናቸው። ሁለተኛ ደግሞ በ ፕሮቲንም የበለጸጉ ስለሆኑ የደም ስኳር መጠንን ዝቅ አድርጎ ለመጠበቅና እንዳይርብ አስተዋጽኦ ያደርጋሉ

5. እንቁላል(በመጠኑ):-

   እንቁላል በፕሮቲን የበለጸገ ምግብ ከመሆኑም በላይ እንቁላል የፕሮቲኖች ወርቅ ተብሎ ተሰይሟል። በቀን አንድ ወይም ሁለት እንቁላል መብላት ኮለስትሮልንም ከፍ አያደርግም። ስለዚህ እንቁላል በፕሮቲን የበለጸገ ስለሆነ ቶሎ እንዳንራብ ይረዳል።

6. አሳ:-

   የስኳር በሽታ ዋነኛው መዘዝ የሚባለው የልብ በሽታ ነው። አሳ ደግሞ በሳምንት አንዴ ብቻ እንኳን መብላት ሰው በየትኛውም አይነት የልብ በሽታ የመያዙን እድል 40% ይቀንሳል።

7. የአበሻ አይብ:-

   የአበሻ አይብ ከአብዛኞቹ አይቦች የሚለየው ቅቤው የውጣለት መሆኑ ነው። አይብ በካልሲዩምና በፕሮቲን የበለጸገ ነው። እንደ አይብ አይነት የወተት ምርቶችን በበቂ መጠቀም insulin resistance (የስኳር በሽታ ዋነኛው ችግር) ይዋጋል።

8. ለውዝ እና የለውዝ ዘሮች ለውዝ በ monounsaturated fats የበለጸገና ከሰውነት ቶሎ የማያልቅ ምግብ ነው። እና እነዚህ ያሉት ባህሪይዎች ለስኳር እጅግ ተስማሚ ናቸው:

9. የወይራ ዘይት:-

   በአንዳንድ የጤና አካያ ሲታይ የወይራ ዘይት ፈሳሽ ወርቅ ነው ተብሎ በብዙዎች ተሰይሟል። የወይራ ዘይት ከፍተኛ anti inflamatory ባህሪይ አለው። ይህ ደግሞ ስኳርን እና የልብ በሽታን የሚዋጋ ባህሪይ አለው ማለት ነው።

10. ስኳር ድንች:- ለምሳሌ ያህል በድንች ፋንታ ስኳር ድንች መብላት ደም ውስጥ ያለው ስኳር 30% ያህል ከፍ እንዳይል ያግዛል። ስኳር ድንች በበሽታ ተከላካይ ፋይበር የበለጸገ ነው። ከዛ ውስጥ 40% የሚሟሟና ኮለስተሮልን የሚቀንሱና digestion በፍጥነት እንዳይካሄድ የሚረዱ ናቸው። ሌላ ደግሞ በ አሬንጅና ቢጫ carotenoids የበለጸጉ ሲሆኑ እነሱም ሰውነታችን ለ insulin respond እንዲያደርግ ይረዳሉ። ከዛ በተረፈ በ chlorogenic acid የበለጸጉ ሲሆኑ እነሱም የስኳር በሽታ መንስኤ የሆነውን insulin resistance ይዋጋሉ።

11. ቀይ ስጋ በመጠኑ:- ቀይ ስጋ በ ፕሮቲን የበለጸገ እና ሰውነታችን ጮማ ከሚሆን በቂ የአካል እንቅስቃሴ ካደረግን በጡንቻ እንዲተካ ይረዳል።

የስኳር መጠን በደም ውስጥ ለሚበዛባቸው ስኳር ፤ ማር ከረሜላ ብስኩት ጀላቲ ቴምር ማርማላታ ዘቢብ ቼኮሌት ኬክና ስኳር ነክ ምግቦች፣ ጣፋጭና የአልኮል መጠጦች ፈፅሞ የተከለከሉ ናቸው፡፡ ዋና ዋናዎቹ የአመጋገብ መርሆች የሚከተሉት ናቸው፡፡

- ✓ በደም ውስጥ ያለው ስኳር የመብዛት ሁኔታ ሳያንስ ተመሳሳይ ሁኔታ ላይ ይገኝ ዘንድ ሶስት ጊዜ በተወሰነ ሰዓት ልዩነት ተመሳሳይ ይዘት ያላቸውን ምግቦች ሳያበዙ በትንሹ ይውሰዱ ::
- ✓ በፍጥነት ወደስኳር የሚለወጡትን ወይም ንፁህ ስኳር ያለባቸውን ምግቦች በጣም ይቀንሱ ወይም ችራሹኑ ይተው፡፡
- ✓ ቅባታቸው አነስተኛ የሆነ ምግቦችን ይምረጡ፡፡ ስብና ቅባት የበዛባቸውን ምግቦች ያስወግዱ፡፡ ምግብን በሚያበስሉበት ጊዜም በጣም ትንሽ ቅባት /ዘይት ፣ቅቤ/ ይጠቀሙ :: የረጉ የአትክልት የዘይት አይነቶቸን ሳይሆን ፈሳሽ የሆኑትን የዘይት አይነቶች ብቻ ይጠቀሙ፡፡
- ✓ አሰር የበዛባቸውን ምግቦች ማትም ያልተፈተጉ እህሎቸንና ጥራጥሬዎችን በብዛት ይመገቡ፡፡ የተፈተጉ እህሎችና ጥራጥሬዎች ቶሎ ወደ ስኳርነት ይቀየራሉ፡፡
- ✓ ምግብ የሚወሰድበትን ጊዜ መድሃኒት ከሚወሰድበት ጊዜ ጋር ያዛምዱ፡፡
- ✓ በየቀኑ ፍራፍሬና አትክልት /ቅጠላቅጠል ለመመገብ ይሞክሩ፡፡
- ✓ ሰውነትዎ ከሚፈለገው መጠን በላይ አይመገቡ፡፡ ምን መመገብ እንዳለብዎት ማወቅ አስፈላጊ የሆነውን ያህል የሚመገቡት ምግብ መጠንም ለስኳር ቁጥጥር ወሳኝነት አለው፡፡
- ✓ በጣም ትንሽ ጨው ይጠቀሙ፤
- ✓ የአልኮል መጠጥ አጠቃቀምዎ በጣም ውሱን ይሁን፡፡
- ✓ ክብደት ላለመጨመር ይጠንቀቁ፡፡ ይህን ከተቆጣጠሩ ክብደት በቆሽት/ፓንክሪያስ/ ላይ የሚያሳድረውን ጫና ለመቀነስ ይችላሉ፡፡

ለስኳር ህመም ጠቃሚ የሆነ አመጋገብ

በኔፐልስ በተካሄደው ሁለተኛ ዩንቨርስቲ ውስጥ በ 2014 የታተመ አንድ ጥናት እንደሚያሳየው ዝቅተኛ ካርቦሃይድ የሚድትራንያን አመጋገብ በ 2-ዓይነት የስኳር ህመም ላለባቸው ሰዎች በከፍተኛ መጠን የመርፌ ደረጃ ይደርስበታል. ከአንድ አመት አመጋገብ በኋላ, የ 15% ተሳታፊዎች የስኳር በሽታቸውን መቆጣጠር ችለዋል. በተቃራኒው ደግሞ ዝቅተኛ የስብ መጠን መመገብ ውጤታማ አልነበረም. ከአንድ አመት በኋላ ዝቅተኛ ስብ የደም አመጋገብ የሚከተሉ ተሳታፊዎች ብቻ የኃጢያት ስርጭትን አግኝተዋል.

የገዥው አካል ሀሳብ ketogenic ስለዚህ መርህ መኖትን መቀነስ ብቻ ሳይሆን የስኳራትን ፍጆታ ለመቀነስ ወይም ለማጥፋት ነው. የኬቲኖቲክ አመጋገብ ምሳሌ እዚህ አለ ሰኞ

ቁርስ

- ✓ 30 g የተሰራ የካሮዎች, የ 1 ጠርሙስ የኦቾሎኒ ዘይት

- ✓ ጥፍጥ በቆንጥል: የ 120 ጀል ራጅ, የ 50 ጂ ጎት የእንጉዳይ ፍሬዎች, የ 3 የጠረጴዛ ድሬዝ ፍራፍሬ. እራት

- ✓ ቲማቲም (50 ግራም) በሳባ ውስጥ, የ 2 የጠረፍ የወይራ ዘይት
- ✓ የመጥመቂያ ሽርሽር: የ 200 ጂ ስግብግቦች, የ 2 የጠረጴዛ ድሬም ማራባት, የ 30 ግራም ጥሬ የአበባ ዱቄት.

ማርዲ

ቁርስ

- ✓ የአርኮኬከ ሰላጣ (50 ግ), ሶርዲዶች, የወይራ ፍሬዎች, የ 2 የሾርባ የስብል ኦፍ ዘይት

- ✓ የተጠበቀው ዶሮ (1 ኩንጣጣ) + አረንጓዴ ጥጥሮች (50 ግራም), ቅቤ ቅቤ, ፓሶስ. እራት

- ✓ የፍራፍሬ ዝርያዎችን (50 g), የ 2 የሾርባ ቦርሳ ማይኒዝ

- ✓ 2 እንቁላል ሻንጣ: ከ 2 የጠረጴዛ ድፍረቱ ክሬም ጋር መጋገር

- ✓ 1 የ yogour ስጋ.

ረቡዕ

ቁርስ

- ✓ ማይሬል ሪሌቲክስ: - 50 g ቅልቅል ሚካሬሌ, የ 1 ዘቢብ ጎመን ዘይት, የሎሚ ጭማቂ
- ✓ 2 ጠቦት ለትንሽ የተጠበሰ 50 + g curried አትክልቶች: zucchini, ብሮኮሊ, ጎመን, የኮኮናት ዘይት 1 tablespoon, 1 / 4 የሻይ ማንኪያ እርድ
- ✓ 1 ካሬ ቸኮሌት ከ 85% ኮኮዋ በላይ.

እራት

- ✓ ሳልሞኒን (150 ግ) በወይራ ዘይት እና በሎም
- ✓ ቲማቲሞች (50 g) በ 2 የሶላር የወይራ ዘይት, 30 g mozzarella

ሐሙስ

ቁርስ

- ✓ ቀንድ ሰሊጥ (50 ግራም) በዎልፎኖች እና በሰማያዊ ቅብል (30 g), የ 2 የሾርባ ማንኪያ ቄንዲ ዘይት

- ✓ ፓርማሲያን, የበለስላጣ ሰላጣ እና የተጠበቁ ሻፖዎች

እራት

- ✓ ሾርባዎች (50 g), የ 2 የሾርባ የስብል ዘይት
- ✓ የቺዝ ነጭ ዱቄት: የ 1 የእንቁላል ስኳር, 2 የጠረጴም ፍሬን ጥሬ ክሬን, የ 40 ግ ካውንቲ, የ 1 እንቁላል ነጭ በበረዶ ውስጥ.

ዓርብ

ቁርስ

- ✓ የአልሞንድ እና የቀይ አበባ ዱቄት ሾርባ: - 50 ጋ የዱቄት ዱቄት, የ 25 ኤ ጋ የአልሞንስ, የ 15 እና የኮኮናት ወተት, ካሪ, ቼንደር
- ✓ የተጠበሰ-የተጠበሰ አትክልት ቅርጫት
- ✓ Panna ቅርጾችን ቫኒላ እና ከረንት: 9 cl መግረፍ ክሬም, 30 g ከረንት, 1 / 2 ሉህ gelatin, stevia መካከል 1 የሻይ ማንኪያ, አንዳንድ ዘሮች አንድ ቫኒላ ከቢዮኮ ከ እንዲወጣ.

እራት

- ✓ 1 ቦኮሌ, 1 የሶላዴ ዱቄት ዘይት እና የሎም ጭማቂ
- ✓ የ 2 እንቁላል ሻንጣ: ከ 2 የጠረጴዛ ድፍረቱ ክሬም ጋር መጋገር ቅዳሜ

ቁርስ

- ✓ የዶሮ ስኳር ከኮኮናት ተክል ጋር
- ✓ ሽሪታኪ ከፔሶ ጋር
- ✓ የሎሚ ክሬም: 10 cl መግረፍ ክሬም, የእንቁላል አስኳል 1, stevia መካከል 1 የሻይ ማንኪያ, 1 / 4 ሎሚ ያለውን grated ከሚያሟጥጥና (ሀ ውኃ መታጠቢያ ውስጥ ግሏል).

እራት

- ✓ እንጉዳዮች (50 g) የታሸጉ እና የአትክልት ቅባት በኩሬ (የ 2 ምበቶች, ወፍራም ክሬ ሾርባ)
- ✓ 1 / 8 የክብድ ገበታ (30 ግ).

እሑድ

ቁርስ

- ✓ ቱና tartare: 50 g ቱና በደቃቁ, minced shallot 1, rapeseed ዘይት 1 tablespoon, 1 ማንኪያ የሎሚ ጭማቂ
- ✓ ቅቤ • ደንዝዘው ስቲክ (rapeseed ዘይት) + g 30 አተር braised 1 ማንኪያ, ሰላጣ 2, 1 / 2 ሽንኩርት ሲሰጥ

እራት

- ✓ 1 ዱባ, 2 መጥበሻ ዱቄት
- ✓ 1 የዶሮ ጡት, 2 የጠረጴዛ ዘይት ፍራፍሬ, ፓፕሪክ.

የ 2 ዓይነት የስኳር ህመም ካለዎት ማንኛውም አመጋገብ ከመከተልዎ በፊት ለሐኪምዎ መነጋገር አስፈላጊ ነው. በተጨማሪም, ጤንነትዎን ለመጉዳት የኬቲቶኒክ አመጋገብ ሁሌም መከታተል አይቻልም.

አካላዊ እንቅስቃሴ

የአካል ብቃት እንቅስቃሴ ማደረግ በደም ውስጥ ያለውን የስኳር መጠን ይቀንሳል፡፡ አካለዊ እንቅስቃሴ ማድረግ ለማንኛውም ሰው ይበጃል፡፡የስኳር ህመም ካለብዎ ደግሞ የተለየ ጠቀሜታ ይኖረዋል፡፡ አዘውትረው የአካል ብቃት እንቅስቃሴ የሚያደርጉ ከሆነበደም ውስጥ የሚገኘውን የስኳር መጠን ለመቆጣጠር ከመርዳቱም በላይ የሰውነት ክብደት

እንዳይጨምሩም ያግዝዎታል፡፡ እንቅስቃሴ ላይ በሚሆኑበት ጊዜ የሰውነት በደም ውስጥ ያለው ስኳር በፈጣን ሁኔታ ይጠቀምበታል፡፡

በተጨማሪም እንቅስቃሴ የሰውነት ህዋሳት ኢንሱሊን የሚፈልጉበትን ሁኔታ በመቀነስ በደም ውስጥ ያለውን የግሉኮስ መጠን የተስተካከለ ለማድረግ የሚያስፈልገው የኢንሱሊን መጠን እየቀነሰ እንዲሄድ ያደርገዋል፡፡ የሰውነት እንቅስቃሴ ሁሉንም ዓይነት የአካል እንቅስቃሴዎች ለምሳሌ፡- የእግር ጉዞ፣ የቤት ውስጥ ሥራዎን ፣ አትክልት መኮትኮትና ሌሎች ስፖርታዊ እንቅስቃሴዎቸን ይጨምራል፡፡

መድሃኒት መድሃኒት በመውሰድ በደም ውስጥ ያለውን የስኳር መጠን መቀነስ ይቻላሉ፡፡ ለአንደናው ዓይነት የስኳር ህመም ኢንሱሊን በመርፌ የሚወድበት ምክንያት ኢንሱሊን ፕሮቲን በመሆኑ በአፋችን ከወሰድነው ምግብን ለመፍጨት የሚያስፈልጉት ፈሳሾች ይዘቱን ስለሚያጠፉት ነው፡፡ እርስዎና የጤና ክትትል የሚያደርጉሎት ባለሙያዎች መቼና ምን ያህል መጠን ኢንሱሊን በየቀኑ መወጋት እንሚኖርብዎት ይወስናሉ፡፡ ዓላማዎ ጤናማ የሆነ ቆሽት /ፓንክሪያስ/ የሚሰራውን ስራ በተቻለ መጠን በመኮረጅ ኢንሱሊንን ከምግብ አወሳሰድ እቅድዎ ጋርና ከአካል ብቃት እንቅስቃሴ ጋር የተጣጣመ ማድረግ ነው፡፡

ሁለተኛው ዓይነት የስኳር ህመም ሲይዝዎት በምግብና በአካል ብቃት እንቅስቃሴ አማካንነት በደም ውስጥ ያለው ያለው የስኳር መጠን ለመቀነስ ካተቻለ ዶክተርዎ በሶስት መንገድ ሊሰሩ የሚችሉ እክበሎችን ሊያዝልዎት ይችላሉ፡፡

- ቆሽት/ፓንክሪያስ/ ብዙ ኢንሱሊን እንዲያመርት ሊያነቃቁት ይችላሉ፡፡
- ወይ ደግሞ ሰውነት ያመረተው ኢንሱሊን በተሻለ መንገድ እንዲሰራ ሊያደርጉት ይችላሉ፡፡
  አለበለዚያም ምግብ የመፈጨት ሂደቱን ሊያዘገዩ ይችላሉ፡፡

የሚወዱት እንክብሎችም ሆነ የምግብ ቁጥትር ወይም የአካል ብቃት እንቅስቃሴ በደም ውስጥ ለውን ስኳር መጠን ተቀባይነት ወዳለው መጠን ለማውረድ ካልቻሉ ሁለተኛው ዓይነት የስኳር ሕመም ያለባቸው ሰዎች ኢንሱሊን መጀመሩን አስፈላጊ ሆኖ ያገኙታል፡፡

ተማሪዎች ለመምህራን፣ ሰራተኞች ለቅርብ የሥራ ባልደረቦቻቸው የስኳር ህመም እንዳለባቸው ቢያሳውቁ ችግር ሲገጥማቸው እርዳታ እንዲያገኙ ያስችላቸዋል፡፡ ማንኛውም የስኳር ህመምተና የስኳር ህመም እንዳለውና የሚወስደውን የመድሐኒት ዓይነትና መጠን የሚገልጽ መታወቂያ ቢየዝ/ብትይዝ በአጋጣሚ ህሊናውን/ዋን ቢስት/ብትስት የሕክምና እርዳታ በአፋጣኝ እንዲያገኝ ይረዳዋል/ይረዳታል፡፡ እንክብል ሆነ ኢንሱሊን የሚወስድ ህመምተና ሁልጊዜም ቢሆን ስኳር ወይም ከረሜላ መያዥ ይኖርበታል /ይኖርባታል፡፡

የስኳር ማነስ ማሰጠንቀቂያ ምልክቶች ሲሰሙ በቶሎ ራስን ለመርዳት ይህ ይጠቅማል፡፡ አንድ የስኳር ህመምተኛ በተደጋጋሚ የስኳወ ማነስ ምልክቶች ከተሰማው/ከተሰማት የሚወሰደውን የመድሃኒት መጠን ማስተካከል ሊያስፈልግ ስለሚችል የህክምና ክትትል የሚያደርግለትን ባለሙያ ማማከር ይኖርበታል/ይኖርባታል፡፡

የአካል ብቃት እንቅስቃሴ ማዘውተር የስኳር ህመምን ለመከላከል ከሚረዱን መንገዶች ቀዳሚውን ቦታ ይይዛል፡፡ የአካል ብቃት እንቅስቃሴን ማዘውተር የሰውነት ክብደትን ለመቆጣጠር ፣ ትርፍ ክብደትን ለመቀነስ ፣ የደም ግፊት መጠናችንን ለማስተካከል ፣ ጤናማና የተስተካከለ የልብ ምት እንዲኖረን ለማስቻል ፣ በደማችን ውስጥ ያለውን የስኳር መጠን ለማስተካከል በተለይ የሰውነት ህዋሶች ኢንሱሊንን በተገቢው መንገድ ተቀብለው እንዲጠቀሙበበት ለማስቻል እንዲሁም የተመጣጠነና የተስተካከለ የሰውነት አቋም እና አዎንታዊ ስነልቦና እንዲኖረን ይረዳናል ፡፡ ጤናማ

አመጋገብ የተመጣጠነ ጤናማ ምግብ ለጤናችን እጅግ ያስፈልገናል ። ጤናማ አመጋገብ ለልብ ህመምና ለሌሎች ተላላፊ ህመሞች የመጋለጥን ስጋቶች ይቀንስልናል ። ማንኛውንም እንቅስቃሴ ከመሥራታችን በፊት ከሀኪም ጋር መመካከር ያስፈልጋል። ለስኳር ህመም ላለባቸው ሰዎች ከሚመከሩ የሰውነት እንቅስቃሴዎች መካከል

የእግር ጉዞ /በተቻለን መጠም በሳምንት ለ3 ጊዜ በቀን ከ20-30 ደቂቃ/ መጓዝ። በጉዞ ወቅት የጥጥ ካልሲዎችና ለእግር ጉዞ የተስማሙ ጫማዎችን መጠቀም ያስፈልጋል። ከእግር ጉዞ በተጨማሪ ዋና፣ ዳንስ፣ መረብ ኳስ ፣ ቅርጫት ኳስ የመሣሠሉት የሰውነት እንቅስቃሴዎች ጠቃሚነታቸው የጎላ ነው። በየሳምንቱ የኃይል ፍጆታዎች ደስታዎን ካላገኙ በሚከተለው ላይ ሙከራ ማድረግ ይችላሉ:

1. በፓርኩ ውስጥ በእግር መጓዝ;
2. በውኃ ገንዳ ውስጥ ትምህርቶች;
3. ቴኒስ በመጫወት ላይ;
4. ብስክሌት መንዳት;
5. በሱቅ, በሻይ,
6. ከልጆቻቸው ጋር ንቁ ተጫዋቾች;
7. ወደ ገበያ, ወደ ኤግዚቢሽንና የባህር ዳርቻዎች ይራመዳል. ሌሎች ተያያዥነት ያላቸው አጋላጭ ሁኔታዎች

የሚከተሉት ናቸው ፡- ሲጋራ ማጨስ፡- ሲጋራ ማጨስ ለተለያዩ ህመሞች ተጋላጭነት በመጨመር ረገድ ተወዳዳሪ የለውም ። በስኳርም ህመምና ከስኳር ህመም ጋር ተያይዘው ለሚመጡ የጤና ጉዳቶች መጋለጥ ብቻም ሳይሆን ሲጋራ ማጨስ በሆድ አካባቢ የስብ ክምችት እንዲኖር በማድረግ የሰውነት ህዋሶች ኢንሱሊንን መቀበል እንዲያቆሙ ያደርጋል ። ሲጋራ የሚያጨሱ ሰዎች ማጨስ እንዲያቆሙ ይመከራል ። ሲጋራ ማጨስ በምናቆምበት ጊዜ የሰውነት መጨመር ቢያጋጥመን ቢችልም ይህንነ ጤናማ አመጋገብ በመከተል ማስተካከል እንችላለን። ጭንቀትና ድብርት ፡- ከስኳር እና ከልብ ህመም ጋር ግንኙነት እንዳላቸው ጥናቶች ጠቁመዋል ።

የእንቅልፍ ስርዓት መዛባት ፡- አጭር የእንቅልፍ ሰዓት ማለትም ከ ስድስት ሰዓት ያነሰ በተቃራኒው ደግሞ ረጅም የእንቅልፍ ሰዓት ማለትም ከ ዘጠኝ ሰዓት የበለጠ ለ ሁለተኛው አይነት የስኳር ህመም ከሚያጋልጡ መንስኤዎች መካከል እንደሆኑ የቅርብ ጊዜ ጥናቶች ዕያመላከቱ ነው ። የእንቅልፍ መብዛት የምንመገበው ምግብ እንዲፈጭ የሚያገለግሉ ንጥረቅመሞች እንዲዛቡ ያደርጋል ። ለረጅም ሰዓት መተኛት ለድብርት ወይም የእንቅልፍ ሰዓት የአተነፋፈስ ሂደት መዛባት ምልክት ሊሆን ስለሚችል የህክምና እርዳታ የሚያስፈልግ ጉዳይ ሊሆን ይችላል። ከመጠን ያለፈ ውፍረት እና የእንቅልፍ ሰዓት የአተነፋፈስ ስርዓት መስተጓጎል ጥብቅ ቁርኝት አላቸው ። የደም ግፊት መጠንን መቆጣጠር

የደም ግፊት መጨመር ለከፍተኛ ችግርና ስትሮክ ስለሚዳርገን ሁልጊዜ በመለካት የደም ግፊት መጠን መሆኑን ማረጋገጥ ያስፈልጋል።

- ✓ በምግብ ውስጥ የጨው መጠንን መቀነስ፣
- ✓ የታዘዘን መድኃኒት በአግባቡ መውሰድ

- ✓ የስኳር እና የደም ግፊት መጠንነ በየጊዜው መለካት አስፈላጊ ናቸው፡፡ ትኩረት ሊሰጣቸው

የሚገቡ የስኳር ህመም ጉዳቶችና ጥንቃቄዎቹ

የስኳር ህመም በአግባቡ ክትትልና ቁጥጥር ካልተደረገለት በህመምተኛው ላይ ከፍተኛ ጉዳት ሊያስከትሉ ችግሮችን ይዞ ይመጣል፡፡ ከእነዚህም መካከል

ሀ. የኩላሊት ችግር፡- በደም ውስጥ የስኳር መጠን ሲበዛ ኩላሊት ላይ ጫና በመፍጠር ለኩላሊት ህመም ያጋልጣል፡፡ በመሆኑም የደም ውስጥ ስኳርን መቆጣጠር፣ ውኃ በደምብ መጠጣትና አልኮል አለመጣጥ ያስፈልጋል፡፡

ለ. የዐይን ችግር፡- የስኳር መጠን በደም ውስጥ ሲበዛ የዕይታ ሥርዓትን ያዛባል ለዲያቤቲክ ሬቲኖፓቲለተሰኘ የዓይን ህመም ያጋልጣል፡፡የዓይን ጤናችን ለመጠበቅ የስኳር ታማሚ በየጊዜው የዓይኑን ጤና መመርመርና መጠበቅ አለበት፡፡

ሐ. የነርቭ ችግር፡- የስኳር መጠን በደም ውስጥ ሲበዛ በጊዜ ሒደት የነርቭ ህዋሶችን ይጎዳል፡፡ ይህ ደግሞ በእግርና በመሣሠሉት የሰውነት ክፍሎች የስሜት ማጣት በማጋለጥ በክንድ፣ በእጅና በእግር ላይ ከፍተኛ ጉዳት እንዲደርስ ምክንያት ይሆናል፡፡

መ. የእግር ጤንነት ችግር፡-የስኳር ህመም ካልተቆጣጠሩት ለማይድን የእግር ቁስለትና ጋንግሪን ያጋልጣልና እግር እንዲቆረጥ ያደርጋል፡፡ በመሆኑም ምቹ የእግር ካልሲዎችና ጫማዎች/ ባዶ እግር መሔድ የተከለከለ ነው/ በማድረግ፣ በቀዝቃዛ ውኃ ብቻ በመታጠብ እግርን ዘወትር በመንከባከብ ጤናን መጠበቅ ያስፈልጋል፡፡

ሠ. የድካም ስሜት መሰማት፡- የስኳር ህመም ከፍተኛ የድካም ስሜትን ያስከትላል፡፡ የሰውነት ክብደት መጨመር በራሱ ለስኳር ህመም ከማጋለጥ ባለፈ የድካም ስሜት እንዲበረታ ያደርጋል፡፡ ስለዚህ የሰውነት ክብደት መቆጣጠር አስፈላጊ ነው፡፡

Appindex B

የደም ግፊት ምንነት

በአማካኝ ሰውነታችን ከ 5-6 ሊትር የሚሆን ደም ይገኛል። ይህ ደም ለሰውነት የሚያስፈልጉ ንጥረነገሮችን እንደ ኦክስጅንና ምግብን ለማመላለስ የሚጠቅም የሰውነት ፈሳሽ ነው። ደም ወደተለያዩ የሰውነታችን ክፍሎች የሚሰራጨው በልብና በደም ቧንቧዎች አማካኝነት ነው። ደም በልብ አማካኝነት በተወሰነ ግፊት መጠን ወደ ሰውነታችን ደም ትርምስ የተፈጨውም ደም በደም ቧንቧዎች አድርጎ ወደተለያዩ የሰውነት ክፍል እንዲድርስ ያደርጋል።

የደም ግፊት ከሚወስኑ ወሳኝ የሰውነት ክፍል ውስጥ ልብ እና የደም ቧንቧዎች ከፍተኛ እና ዋነኛ ሚና ይኖራቸዋል የልብ ምት መጨመር እና የደም ቧንቧዎች መጥበብ ለደም ግፊት መከሰት ዋነኛ ምክንያቶች ናቸው:: ልባችን ደምን ወደ ተለያዩ ክፍሎች ለማሠራጨት ሲል በደም ቅዳ (Artery) ቧንቧዎች ላይ የሚፈጥረው ግፊት /ጫና/ ሲሆን ይህም ልኬት በ2 ቁጥሮች ይገለፃል፡ ፡ የላይኛው ልኬት systole /ሲስቶል/ ሲባል የሚፈጠረውም የልብ ጡንቻዎች በሚኮማተሩበትና ደምን በሚረጩበት ጊዜ ነው፡፡ የታችኛው ልኬት ዳይስቶል (Distole) ሲሆን የተኮማተሩበት የልብ ጡንቻዎች ሲለጠጡ የሚፈጠር ግፊት ነው፡፡ የደም ግፊት መጠን ከእድሜ እድሜ ከቦታ ቦታ ቢለያይም በአማካኝ አንድ ሰው ይኖረዋል ተብሎ የሚጠቀሰው የደም ግፊት ልኬት በተለምዶ 120በ80 ነው ይህ የደም ግፊት ልኬት (normal)ተብሎ ሲወሰን ከዚህ ያነሰ የደም ግፊት መጠን ያነሰ ወይም በመጠኑ ከፍ ያለ ቢሆንም መጠነኛ ወይም ልከኛ ግፊት ሊሆን ይችላል። ለምሳሌ ያክል የደም ግፊት መጠን 110በ70 ወይም 100 በ60 ልኬት ያለው ሰው ይህ ልኬት (normal) ነው:: በተመሳሳይ የደም ግፊት 130በ80 ወይም 135 በ70 ያለውም ሰው እንዲሁ ልከኛ ወይም ኖርማል የሚባል ነው። ለመጠቅለል ያክል 120በ80 የሚባለው የደም ግፊት ልኬት አነስተኛው እና ከከፍተኛው ኖርማል ልኬት የተወሰደ አማካኝ ልኬት ነው። እንግዲህ ከዚህ በመነሳት የደም ግፊት ህመም ማለት ማንኛውም የደም ግፊት ልኬት ከፍተኛ በሚሆንበት ጊዜ የሚፈጠር ህመም ነው። የልኬቱ መጠን ከጥናቶች፣ ከሀገር ሀገራት ቢለያይም የደም ግፊት መጠን ከ140 በ90 በላይ እና እኩል እንደ ደም ግፊት ህመም ይታያል።

ከፍተኛ የደም ግፊት መጠን ከላይ ለመጠቆም እንደተሞከረው የስርጭት አድማሱን እያሠፋ የሚገኝ ሲሆን በመላው ዓለም ላይ ከአንድ ቢሊዮን በላይ አዋቂ ሠዎች ማለትም ከአጠቃላየ የአለም ህዝብ 26 በመቶ ያህሉ የችግሩ የችግሩ ሠለባዎች ሆነዋል፡፡

	የላይኛው የደም ግፊት መጠን (Systolic pressure) (mmhg)	የታችኛው የደም ግፊት መጠን (Diastolic pressure) (mmhg)
1. ትክክለኛው የደም ግፊት መጠን	ከ90-119	ከ60-79
2. ቅድመ ከፍተኛ የደም ግፊት መጠን	ከ120-139	ከ80-89
3. የመጀመሪያ ደረጃ ከፍተኛ የደም ግፊት መጠን	ከ140-159	ከ90-99
4. ሁለኛ ደረጃ ከፍተኛ የደም ግፊት መጠን	ከ160 በላይ	ከ100 በላይ

የደም ግፊት **10** መንስኤዎች

የልብ በሽታ በዓለም አቀፍ ደረጃ ትልቁ እና ድምፅ አልባ ገዳይ ከሆኑ በሽታዎች አንዱ ነው፡፡ የደም ግፊት (ወይም ከፍተኛ የደም ግፊት) ማለት ደም ልባችን በከፍተኛ ግፊት በደም ቧንቧዎች አማካኝነት ወደሌላው የሰውነት ክፍል ሲረጭ ነው ይህም ከተለመደው የደም መርጨት ተግባር በላይ ሲሆን ይከሰታል፡፡ ይህ ያልተለመደ የደም ግፊት ልብ ላይ ውጥረት በመፍጠር ያለጊዜ ሞት መንስኤ ይሆናል፡፡

1. የጨው መብዛት አንዱ መንስኤ ነው የአሜሪካ የልብ ማኅበር እንደገለጸው, ጨው (ወይም በቀን ከ 1,500 ሚሊ ግራም መውሰድ), ከመጠን ያለፈ መውሰድ ከፍተኛ የደም ግፊት, የስኳር በሽታ, እንዲሁም የልብና በሽታዎችበየትኛውም ዕድሜ ላይ, ሊያስከትል ይችላል.
2. የእድሜ ጣራ ሌላው መንስኤ ነው ሰወች በዕድሜ, ሲገፉ የደም ግፊት በተፈጥሮ ይጨምራል. ሆኖም ግን, ጥሩ ያልሆነ የአመጋገብ ሥርዓት, ከመጠን በላይ መጠጣት, ወይም ስብ እና ስኳር የበዛባቸው ምግቦች, ዕድሜ ጋር ከፍተኛ የደም ግፊት እንዲከሰት ምክንያት ይሆናል፡፡3.
3. በእንቅልፍ ወቅት የአየር ማጣት መንስኤ ነው በእንቅልፍ ወቅት የኦክስጅን መጠን ማነስ የልብና የደም ዝውውር ሥርዓት ላይ ችግር የሚፈጥር ሲሆን አየር በደንብ ለማግኘት በሚያስችል ሁኔታ መተኛት ይመከራል
4. ውፍረት ሌላው መሰረታዊ መንስኤ ነው ውፍረት ጋር የተያያዘ የደም ግፊት ችግር የሚከሰት ሲሆን የምንመገበውን ፕሮቲን ምግቦች መቀነስ ይመከራል
5. ለእስፖርታዊ እንቅስቃሴዎች ማድረግ የማያስችል ህይወት ሌላው መንስኤ ነው፡፡ ሰዎች ቢያንስ ቢያንስ ለተወሰኑ ደይቃዎች መንቀሳቀስ ይኖርባቸዋል ሲል ይመክራል
6. እጾች እና አልኮል መንስኤ ናቸው የአልኮል መጠጥ ከመጠን በላይ መውሰድ ወይም ለመዝናናት ዕፅ መጠቀም ልብ እና የደም ቧንቧዎች ላይ ውጥረት እና ጉዳት ያስከትላል.
7. ጣፋጭ ምግብ የተለያዩ ጣፋጭነት ያላቸውን ምግቦች አዘውትሮ መመገብ ለበሽታው ያጋልጣል፡
8. ሲጋራ ማጨስ ሌላው ምክንት ሲሆን ሲጋራ ባለማጨስ ወይም ከሚጨስባቸው ቦታወች በመራቅ መከላከል ይቻላል፡፡
9. የሆርሞን ሁኔታዎች አንዳንድ የሆርሞን በሽታወች በተለይ ኩሺንግ ሲንድሮም የስቴሮይድ ሆርሞኖች ይበልጥ በሰውነት ውስጥ እንዲፈጠሩ ያደርጋል ይህም ለደም ግፊት በሽታ ያጋልጣል
10. የኩላሊት በሽታ ሌላው ምክንያት ነው የደም ግፊት አንዱ ዋነኛ ምክንያት የኩላሊት ህመም ነው ከፍተኛ የደም ግፊት መጠን ዓይነቶች

የደም ግፊት ዓይነቶት በዋነኛነት የመጀመሪያ (primary) እና ሁለተኛው (secondary) በመባል ይታወቃል፡፡ የመጀመሪያ (Primary) የሚባሉት እስካሁን ድረስ በግልጽ መነሻ ምክንየታቸው እነዚህ ናቸው ለማለተ የሚያስችል መረጃ ያልተገኘላቸውና ምክንያታቸውም ይሄ ነው ብሎ ነቆሶ ለማውጣት አስቸጋሪ የሆኑት ሲሆን ከ90-95% የሚሆኑት ለከፍተኛ የደም ግፊት መጠን የተጠቁ ሠዎች በዚህ ምድብ ውስጥ ይካተታሉ እነዚህ የመጀመሪያ (primary) ከፍተኛ የደም ግፊቶች

አንድ መንስኤ የሌላቸው ሲሆን በተለያዩ መንስኤዎች መስተጋብር ምክንያት ይፈጠራሉ በተለይም ከGene /ዘረ መል/ ጋር ተያይዘው የሚከሠቱ ለውጦች እንደምክንያትነት ይቀርባሉ ነገር ግን በተጨባጭ የትኛው ዘረ-መል ችግሩን ያስከትላል የሚለው ጥያቄ እስካሁን ምላሽ አላገኘም፡፡

ሁለተኛው የደም ግፊት ዓይነት Secondary /ሁለተኛ/ የሚባለው ሲሆን ይህ ከፍተኛ የደም ግፊት አየነት በምን ምክንያት እንደተከሠተ መንስኤዎቹ በግልፅ የሚታወቁና እነዚህ እነዚህ ናቸው ተብለው መገለፅ የሚችሉ ናቸው ይህ አይነቱ ከፍተኛ የደም ግፊት መጠን ከ5-10% የሚሆኑትን ህሙማን ያጠቃል እነዚህን የሚታወቁ መንስኤዎች ለመቆጣጠርም ከፍተኛ የደም ግፊት መጠኑን መቆጣጠር ይቻላል፡፡ ከመንስኤዎቹም ውስጥ የሚከተሉት ይገኙበታል፡፡

- ✓ በኩላሊትና በአካባቢው በሚገኙ የደም ቧንቧዎች ላይ የሚከሠት የጤና ችግር ለከፍተኛ የደም ግፊት መፈጠር ምክንያት ሊሆን ይችላል፡፡ በተለይም የተጠራን ደም ለኩላሊታችን የሚያደርሠው የደም ቧንቧ በተያዩ ምክንያቶች ከጠበበ /በስብ ግግር ሊሆን ይችላል/ ወደ ኩላሊታችን የሚደርሠው የደም መጠን ይቀንሣል በዚህም ምክንያት ኩላሊታችን (Renin) ሬኒን የተባለውን ኬሚካል ሆርሞን ያመርተል ይህ ኬሚካልም ሌላ ኢንጂዮቴንሲን (Angiotensin) ከተባለ ሆርሞን ጋር በመሆን የተለያዩ የደም ቧንቧዎችን ሊያኮማትሩና በውጤቱም የደም ግፊት መጠንን ከፍ ሊያደርጉ ይችላሉ::
- ✓ ከፍተኛ የሠውነት ክብደት መጠን1- በከፍተኛ ውፍረት ምክንየት አላስፈላጊ የስብ ክምችት ይኖራል፡፡ ለዚህ ትርፍ አካል ደም ለማዳረስ ሲል ልባችን ከወትሮውና ከትክክለኛው መጠን በተለየ የስራ ጫና ይኖርበታል ይህም ለደም ግፊት መጨመር ምክንያት ሊሆን ይችላል ይህ ከልክ ያለፈ ውፍረት የኢንሱሉን መቋቋም (Resistance) ሊፈጥር ይችላል፣ የተለያዩ ጐጂ የስብ ዓይነቶች በደም ስሮች ውስጥ እንዲጠራቀም ያደርጋል በአጠቃላይ የመጨረሻ ውጤቱ የግፊት መጠን መጨመር ይሆናል፡፡ እነዚህ በከፍተኛ የክብደት ክልል ውስጥ የሚገኙ ሰዎች በመኝታ ወቅተ በሚፈጠር መታፈን ምክንያት በተደጋጋሚ ለኦክሲጅን እጥረት ስለሚጋለጡ የአድርናል ዕጢ ሆርሞኖችን ሊያመነጭና የደም ግፊት መጠን ሊጨምርባቸው ይችላል፡፡ ዕድሜያቸው ከ20-45 ዓመት ያሉ ከፍተኛ የሠውነት ክብደት ያላቸው ሰዎች ከ5-6 እጥፍ በከፍተኛ የደም ግፊት የመጋለጥ እድል እንዳላቸው ጠቁሟል፡፡
- ✓ የስኳር ህመም .. ለዚህ ህመም ምክንየት በተለያዩ የደም ስሮች ላይ የሚደርሱ ጉዳዮች ችግሩን ሊያስከትሉ ይችላሉ፡፡
- ✓ ሠውነታችን የእለት ተዕለት እንቅስቃሴውን በአግባቡ ለመውጣት የተለያዩ ሆርሞኖችን ያመርታል ነገር ግን አንዳንድ ጊዜ የእነዚ ሆርሞኖች መጠን ከተገቢው መጠን መጨመር ከፍተኛ የደም ግፊት ያስከትላል ለምሣሌ የአልደስትሮን (Aldosterone) እና የፖራታይሮይድ (parathyroid) ሆርሞን መጠን መጨመር
- ✓ Pheochuomocytomd /ፊዋክሮምሣይቶማ/ የተባለውና የነርቭ ህዋሣትን ግንኙነት የሚያቀላጥፍ ኬሚካሎችን ለከፍተኛ መጠን የሚያመርት ዕጢ በሠውነት ውስጥ መፈጠር
- ✓ እርግዝና … በእርግዝና ወቅት የደም ግፊት መጠን በከፍተኛ ሁኔታ ሊጨምር ይችላል
- ✓ የታይሮይድ ዕጢ ላይ በሚከሠቱ ችግሮች ምክንያት የሚያመርተው የሆርሞን መጠን ሲዛባ ከፍተኛ የደም ግፊት ይከሠታል ✓ ከፍተኛ መጠን ያለው አልኮሆል በየቀኑ መጠጣት እንዲሁም ሲጋራ ማጨስ የደም ግፊት መጠንን ይጨምራሉ በተጨማሪም ከእነዚህ ሱስ ተጠቃሚው እናቶች የሚወለዱ ህፃናት ወደፊት ለከፍተኛ የደም ግፊት መጠን ሊጋለጡ እንደሚችሉ አንዳንድ ጥናቶች ይጠቁማሉ በተጨማሪም የእናት ጡት ወተትን በአግባቡ አለማግኘትም ከችግሩ ጋር ሊያያዝ ይችላል
- ✓ በተለያዩ ደም አስተላላፊ ቧንቧዎች ላይ የሚፈጠር የስብ ክምችትና የተለያዩ አደጋዎች
- ✓ ለተለያዩ ህመም ህክምና ተብለው የሚወሠዱ መድኃኒቶች የደም ግፊት መጠንን ሊጨምሩ ይችላሉ በተለይም ስቶሮይድስ(steroids)
- ✓ የተከላከሉና አደገኛ ዕፆች ችግሩን ያስከትላሉ ለምሣሌ Cocaine (ከኬይን) እና Amphetamine አምፌታሚን ይገኝበታል
- ✓ ከፍተኛ መጠን ያለው ጨው መጠቀም
- ✓ አንዳንድ ጊዜ በዘር ሀረግ ውስጥ የችግሩ ሠለባ ካለ ከሌላው በተለየ መልኩ በስፋት ሊከሠት ይችላል አፍሪካ አሜሪካዊ ዝርያ ያላቸው ሠዎች ለከፍተኛ የደም ግፊት የመጋለጥ እድላቸው ከፍተኛ ነው፡
- ✓ የአድሬናል ዕጢ ላይ የሚከሠቱ የተለያዩ የጤና ችግሮች
- ✓ አንዳንድ የባህላዊ ህክምና ቅጠላ ቅጠሎችና ስራ ስሮች የደም ግፊት መጠንን ሊጨምሩ ይችላሉ፡፡ የደም ግፊት መኖሩን

እንዴት ማወቅ ይቻላል ?

የደም ግፊት ምልክት ከሚያሳዩ እና አደገኛ ከሚባሉ የህመም አይነት ውስጥ ይመደባል። በዚህም የተነሳ (silent killer) እየተባለ ይጠራል። የደም ግፊት የራሱ የሆነ የህመም ምልክት ባይኖረውም በህመሙ ምክንያት ተያይዘው ከሚመጡ መዘዞች ጋር የሚኖሩ የህመም ምልክት ሊያሳይ ይችላል። የከፍተኛ ደም ግፊት ምልክቶች

እነዚህም እንደ ደም ግፊት ምልክት ወይም መኖሩን የሚጠቁሙ ተብለው ሊወሰዱ ይችላሉ። ለምሳሌ የስትሮክ ህመም፣ የልብ ህመም ምልክቶች፣ የአይን ህመም ምልቶች፣ የኩላሊት ስራ መስነፍ ምልክቶች ወ.ዘ.ተ ናቸው። የደም ግፊት መኖሩን እና አለመኖሩን በቀላል ዘዴ ማወቅ የሚቻል ሲሆን ይህ በደም ግፊት መለኪያ መሳሪያ መለካት ነው። ህመሙን ለማወቅ ወይም ለማረጋገጥ በተደጋጋሚ መለካት አስፈላጊ ነው።
ምክንያቱም የደም ግፊት ከወትሮው በተለያዩ ምክንያቶች ከፍ ሊል ስለሚችል ነው። ይህ ደግሞ የተሳሳተ መረጃ ስለሚሰጥ ነው። ለምሳሌ ያክል አንድ ሰው በድንጋጤ በከፍተኛ ጭንቀት ውስጥ የሚኖረው የደም ግፊት ከፍ ሊል ይችላል። በተጨማሪም እንደ ቡና፣ ሲጋራ፣ እና የተለያዩ አደንዛዥ እፆች የደም ግፊትን ከፍ ያደርጋሉ።

ከዚህ በመነሳት ሰዎች የደም ግፊታቸውን ለመለካት ሲያስቡ ከላይ የተጠቀሱትን ነገሮች አለመኖራቸውን፣ አ ለ መ ጠ ቀ ማ ቸ ው ን እ ን ዲ ሁ ም ያሉ ከሆነ ግምት ውስጥ ማስገባት ያስፈልጋል። ይህ ካልሆነ የሚገኘው ልኬት የተሳሳተ ሊሆን ይችላል። ሰዎች ከላይ የተጠቀሰውን አስወግደው (በግዜያዊነት) ነገር ግን የደም ግፊት ልኬቱ ከፍተኛ ከሆነ በተደጋጋሚ በመለካት የተገኘውን ልኬት እውነተኛነቱን ማረጋገጥ ይቻላል።

ከፍተኛ የደም ግፊት በአብዛኛው ጊዜ ምልክቶችን የሚያሣይ ሲሆን ህሙማኑ ለሌላ የጤና ችግር ወደ ጤና ተቋማት ሲሄድ በአጋጣሚ ምርመራ የሚገኝ የህመም ዓይነት ነው አብዛኛው ህሙማን ችግሩ እንዲለበት ለረጅም ጊዜ ስለማያውቅ ህመሙ ቀስ በቀስ ስር እየሰደደ ተያያዥ የጤና ችግሮችን ማስከተሉ አይቀርም አንዳንድ ጊዜ የግፊት መጠኑ ከፍተኛ ሲሆን አንዳንድ ተያያዥ ምልክቶች መከሰታቸው አይቀርም ከእነዚህም ውስጥ የሚከተሉት ይገኙበታል፡፡

- ✓ በተደጋጋሚ ጊዜ የሚከሠቱ ከባድ የራስ ምታት በተለይም ስሜቱ በኋለኛው የጭንቅላት ክፍልና ማጅራት አካባቢ ሊሆን ይችላል ስሜቱ ጠዋት ጠዋት ከባድ ሊሆን ይችላል
- ✓ ድንዝዝ የማለት ስሜት
- ✓ በእይታ ላይ የሚፈጠሩ አንዳንድ መዛባቶች ብዥ የማለት ሁኔታ ሊኖር ይችላል
- ✓ ማቅለሽለሽና ማስመለስ
- ✓ ተደጋጋሚ ነስር
- ✓ የማዘር ስሜት፣ ማጥወልወል
- ✓ ጆሮ አካባቢ የተለያዩና የሌሉ ድምፆች ሊፈጠሩና ሊሠማን ይችላል

የግፊት መጠኑ በጣም ከፍተኛ እየሆነ ሲመጣ

- ✓ በደረት አካባቢ ከፍተኛ ህመም
- ✓ ለመተንፈስ መቸገር
- ✓ የልብ ምት መቸገር
- ✓ በተደጋጋሚ ራስን መሣት
- ✓ ደም የተቀላቀለበት ሽንት
- ✓ የአስተሣሰብ መዛባትና የመደናገር ስሜት ✓ የመሣሰሉት ሁኔታዎች ይከሠታል

እነዚህ ከላይ ያየናቸው የህመሙ ምልክቶች አልፎ አልፎ የሚከሠቱና ጥቂት በሚባሉ ህሙማን ላይ የሚኖሩ ናቸው እነዚህ ምልክቶች አልታዩም ማለት ከፍተኛ የደም ግፊት ችግር የለብንም ማለት አይደለም፡፡ ህመሙ በአጠቃላይ የተለያዩ ምልክቶችን የማያሣይና ውስጥ ውስጡን የሚጐዳ በመሆኑ በየጊዜው ወቅቱን የጠበቀ ምርመራ ማድረግና የጤንነት ሁኔታን መከታተል ያስፈልጋል፡፡ ስር የሠደደ ከፍተኛ የደም ግፊት

ከላይ ለመግለፅ እንተሞከረው ከፍተኛ የደም ግፊት ውስጥ ውስጡን ስር እየሠደደ በተለያዩ የሠውነት ክፍሎች ላይ የተለያዩ ጉዳዮችን ያስከትላል ህመሙ በአብዛኛው ምልክቶችን ስለማያሣይ ህመምተኛው ይህ ችግር እንዳለበት አይረዳም፡፡ ከ30-50

በመቶ የሚሆኑት ህሙማን ከ8-10 ዓመት ባለው ጊዜ ውስጥ ለተለያዩ ውስጣዊና ውጫዊ አካል ጉዳቶች ሊዳረጉ እንደሚችሉ ጥናቶች ያሣያሉ፡፡ የችግሩ ስር መስደድ የሚከተሉትን አደገኛ የጤና ችግሮች ሊያስከትል ይችላል

- ✓ ከትልቁ ደም ቅዲ ቧንቧ (Aorts) እና የተለያዩ ሆድና እግር አካባቢ ደምን ከሚያሠራው የደም ቧንቧዎችና ስሮች በኩል የደም መፍሠስ ሊኖር ይችላል፡፡
- ✓ ለከፍተኛው የደም ግፊት ምክንያት ስር የሠደደ የኩላሊት በሽታ ሊከሠት ይችላል
- ✓ የተለያዩ ዓይነት የልብ ህመሞች ብሎም በአጠቃላይ በከፍተኛ ሁኔታ የልብ ስራ መስተጓጎል
- ✓ ወደ ተለያዩ የሠውነት ክፍል የሚሄደው የደም ፍሠት መጠን መቀነስ
- ✓ ወደ አንጐል ውስጥ የደም መፍሠስና ተያያዥ የጤና ችግሮች (Stroke)
- ✓ የአይን የተለያዩ ክፍሎች መጐዳትና የእይታ መስተጓጎል
- ✓ የተለያዩ የደም ስሮች መጐዳትና መጥበብ
- ✓ በሣምባ ላይ የፈሣሽ መቋጠርና መጠራቀም
- ✓ የአዕምሮ በአግባቡ መስራት አለመቻልና የማሠብ ችሎት መቀነስ የመሣሠሉት ሁኔታዎች ይከሠታሉ አንዳንድ ጊዜ የደም ግፊት መጠኑ ከ180 በ110 በላይ ሊሆን ይችላል ይህም ለህመምተኛው ኢስኒ ሁኔታን የሚፈጥር ሲሆን በቶሎ እርምጃ ካልተወሰደ የሚከሠተው ችግር ከፍተኛ ነው፡፡ የከፍተኛ የደም ግፊት ህክምናና መከላከያ መንገዶች

የደም ግፊት ህመም በዋናነት በሁለት መንገዶች ማከም ይችላል። አንደኛው የተለያዩ የደም ግፊት መድሃኒቶችን በመውሰድ ሲሆን ሌላኛው የአኗኗር ዘይቤን በማስተካከል የሚደረግ ህክምና ነው።

የደም ግፊት ህክምና እና ሁለቱን የህክምና አማራጮች በማጣመርም የሚደረግ ህክምና ነው። በመድሀኒት የሚደረግ ህክምና ዋናው አላማ የደም ግፊት በተለያየ መድሀኒት አይነቶች ግፊቱን መቀነስ ነው:: የመድሀኒቶቹ ስራ ወይም የልብ ምትን በተፈለገው መጠን የሚቀንሱ ወይም የደም ቧንቧዎችን የሚያሰፉ ሊሆኑ ይችላሉ።

አንድ ሰው ከአንድ በላይ የደም ግፊት መድሀኒት ሊወስድ ይችላል ይህንንም የ ሚ ወ ስ ነ ው ሀ ኪ ሙ ሲሆን የግፊት ቁጥጥሩን የመድሀኒት አይነቱንም ወይም መጠኑ ሊጨምር ወይም ሊቀንስ ይችላል። ከመድሀኒቶቹ ጎን ለጎን የአኗኗር ዘይቤን ማስተካከል እጅግ በጣም አስፈላጊ ነው። ለዚህም የጨው መጠን በምግብ ውስጥ መቀነስ፤ የቅባት ምግብን መቀነስ በቂ የአካል ብቃት እንቅስቃሴ ማድረግ፥ ልከኛ የሰውነት ውፍረት መያዝ፤ የሲጋራና የአልኮል መጠጥን ማቆም የመሳሰሉት ናቸው። ህመሙ ያለው ሰው በተወሰነ እና በቋሚነት የደም ግፊት ክትትል የሚያስፈልጋቸው ሲሆን ከእነዚህም ውስጥ:-

- ✓ የአይን ምርመራ
- ✓ የኮሌስትሮን ምርመራ
- ✓ የስኳር ህመም ምርመራ ከዋና ዋናዎቹ ውስጥ ናቸው።

በተጨማሪ ማንኛውም የደም ግፊት ያለው ሰው መድሀኒቱን በአግባቡ እና በሰዓቱ እንዲሁም በሀኪሙ የታዘዘውን እውቅና ውጪ የደም ግፊት መድሀኒት አያቋረጥም ፡መጠን ወይም አይነት አይጨመርም አይቀነስም።

ከፍተኛ የደም ግፊት መጠንን አስቀድሞ እንዳይከሠት ለመከላከል የሚረዱ የተለያየ አማራጭ መንገዶች ያሉ ሲሆን እነዚህን በአግባቡ ተግባራዊ ማድረግ ችግሩ ሣይከሠት ለመከላከልና ትያይዘው ከሚመጡ የተለያዩ አደጋዎች ለመጠበቅ ያስችላል፡፡

እነዚህ የደም ግፊት መጠን መጨመርን ለመከላከል የሚያስችሉ መንገዶች ከዚህ የሚከተሉት ናቸው፡፡

1. በየጊዜው ተከታታይነት ያለው እስፖርታዊ እንቅስቃሴ ማድረግ

በሣምንቱ አብዛኛው ቀናት ውስጥ ከ30-60 ደቂቃ ለሚደርስ ጊዜ እስፖርታዊ እንቅስቃሴዎችን ማድረግ የደም ግፊት መጠንን ከ4-9 mmhg ያህል ለመቀነስ ያስችላል የግፊት መጠኑን ለውጥ ለማምጣት ረጅም ጊዜ የማይረጅ ሲሆን እስፖርቱን በጀመርን በጥቂት ሣምንታታ ውስጥ የደም ግፊት መጠናችን ይቀንሣል በቅድመ ከፍተኛ ግፊት መጠን ክልል ውስጥ ማለትም

የላይኛው ከ120-139 የታችኛው ደግሞ ከ80-89 mmhg ክልል ውስጥ የምንገኝ ከሆነ እስፖርት መስራቱ ወደ ከፍተኛው የደም ግፊት መጠን ምድብ ውስጥ እንዳንገባ ይረዳናል፡፡ የተለያዩ የጤና ባለሙያዎችን በማማከር የእስፖርታዊ እንቅስቃሴዎቹን አይነትና ኘሮግራም ማውጣት ይቻላል፡፡ አንዳንድ ጊዜ ከልብ ጋር በተያያዘ የጤና ባለሙያዉ ጋር በደምብ መመካከርና መወያየት ይኖርብናል በተጨማሪም ሣምንቱን ሙሉ ያልሠራነውን እስፖርት ለማካካስ ብለን ባንድ ጊዜ ደራርበን ከባባድ እስፖርታዊ እንቅስቃሴዎችን ማድረጉ ከጥቅሙ ይልቅ ጉዳቱ ያመዝናል፡፡ ዋና፣ ብስክሌት መንዳት፣ ሶምሶማ ሩጫና ረዘም ያሉ ወኮችን ማድረጉ ከፍተኛ ጠቀሜታ እንዳለው ጥናቶች ያመለክታሉ፡፡

2. የአመጋገብ ጥንቃቄ ማድረግ

የቅባትና የስብ መጠናቸው ከፍተኛ የሆኑ ምግቦችን አዘውትሮ መመገብ ከፍተኛ የደም ግፊት መጠን እንዲከሠት በር ከፋች መንገድ ነው፡፡ የሣቺሬትድ ስብ (saturated fat) እና ኮሌስትሮል (cholesterol) መጠንን ቀንሶ መጠቀም የደም ግፊት መጠንን እስከ 14 mmhg ለመቀነስ እንደሚያስችል ጥናቶች ጠቁመዋል፡፡ በአመጋገባችን ውስጥ አብዛኛውን ጊዜ አትክልትና ፍራፍሬዎች እንዲሁም ጥራጥሬዎችን ማዘውተሩ ለጤነነት በጣም ጠቃሚ ነው በፖተሲየም (potassium) ይዘታቸው የበለፀጉ እንደ ሙዝ ሐብሐብ፣ ብርቱካን፣ ቆስጣ፣ ዝኩኒ የመሣሉትን ምግቦችን መጠቀም የደም ግፊት መጠንን በትክክለኛው መጠን ውስጥ ለመጠበቅ እንደሚያስችል ይታመናል በአሠር የበለፀጉ ምግባችን በማዘውተር ውሃ በብዛት በመጠጣት ይህንን የጤና ችግር በአግባቡ ለመቆጣጠር አማራጭ መንገዶች ናቸው፡፡

3. የምንወስደውን የጨው መጠን መመጠን

የምንወስደውን የጨው መጠን መመጠን ከ2-8 mmhg የሚደርስ የደም ግፊት መጠንን ለመቀነስ እንደሚያስችል ይታወቃል በየቀኑ ከ2.3 ግራም በታች ሶዲየም መጠቀም ያለብን ሲሆን ይህም ከ1 ሻይ ማንኪያ በታች ማለት ነው፡፡ ይህ መጠን ደግሞ የደም ግፊታቸው ከፍተኛ የሆነ እንደሁም ዕድሜያቸው ከ57 ዓመት በላይ የሆኑ ሰዎች ደግመ ከ1.5 ግራም በታች ማለትም ግማሽ የሻይ ማንኪያ ወይም ከዛ በታች ብቻ ጨው መጠቀም ይኖርባቸዋል፡፡ የታሸጉ ምግቦችን የምንጠቀም ከሆነ በደንብ በማሸጊያቸው ከፍተኛ የጨው መጠን አላቸው እነዚህን ምግቦች በምናበስልበት ጊዜ የምንጠቀመውን የጨው መጠን መቀነስ ወይም መተው አለብን፡፡

4. የአልኮሆል መጠንን መቀነስ

አልኮሆልን አብዝቶና አዘውትሮ መጠጣት የተለያዩ የጤና ችግሮችን እንደሚያስከትል የማይካድ ሀቅ ነው፡፡ የተለያዩ ጥናቶች እንዳሣዩት ወንዶች በየቀኑ የተጣራ 30ml አልኮሆል ሴቶች ደግሞ 15ml እና ከዛ በላይ የሚጠጡ ከሆኑ ለከፍተኛ የደም ግፊት የመጋለጥ እድላቸው ሰፊ ነው ከ65 ዓመት በላይ የሆኑ ሰዎች ደግሞ ከዚህም ያነሠ መጠን መጠቀም ይኖርባቸዋል፡፡ ይህም ማለት ወንዶች ከ2 ጠርሙስ ቢራ ወየም ከ300ml ወይም ከ60ml የተጣራ ውስኪ ሴቶችና ዕድሜያቸው ከ65 ዓመት በላይ የሆኑ ሰዎች ደግመ ከዚህ በግማሽ ያነሰ መጠን በላይ በየቀኑ የሚወስዱ ከሆነ ለከፍተኛ የደም ግፊት መጠን እንደሚጋለጡ በየጊዜው የሚወጡ የጥናት ውጤቶች ያመላክታሉ፡፡ አልኮልን ከተገለፀው መጠን በላይ በከፍተኛ ሁኔታ በየቀኑ የምንጠቀም ከሆነ ቀስ በቀስ መቀነስና ማቆም ይኖርብናል በተለይም የተለያዩ የደም ግፊት መጠንን የሚያስተካክሉ መድኃኒቶተን የምንወስድ ከሆነ በፍፁም አልኮል መጠጣት የለብንም፡፡

5. ሲጋራ አለማጨስ

በምናጨስበት ጊዜ በሲጋራ ውስጥ የሚገኘው ኒኮቲን የደም ግፊት መጠንን እስከ 10mmhg በሚደርስ መጠን ከፍ ያደርገዋል ይህም ማለት በቀን ውስጥ በተደጋጋሚ የምናጨስ ከሆነ የደም ግፊት መጠናችን ከፍተኛ ሆኖ ይቀጥላል ማለት ነው፡፡ በተለይም ደግመ የደም ግፊታቸው ከፍተኛ ሆኖ በዛ ላይ ሲጃራ የሚያጨሱ ሰዎች ላይ የሚደርሰው ጉዳት ከፍተኛ ነው፡፡ በተጨማሪም ባናጨስም እንኳን ሌሎች ሲያጨሱ የሚወጣው ጭስ ለጉዳት ሊዳርገን ይችላል ስለሆነም ይህንንም መጠንቀቅና መከላከል ይኖርብናል፡፡

6. ቡና እና ሌሎች ካፌን የሚይዙ መጠጦችን መቀነስ

ከፍተኛ የደም ግፊት መጠን ያላቸው ሠዎች ቡናን አዘውትረው መጠቀም እንደሌለባቸው የጤና ባለሙያዎች ያሣስባሉ፡፡ ቡና በተጠጣ በአጭር ጊዜ ውስጥ ጊዜያዊ የደም ግፊት መጠን መጨመርን ያስከትላል ነገር ግን ይህ የመጠን መጨመር ጊዜያዊ ይሁን ለረጅም ጊዜ የሚቆይ በትክክል የሚያሣይ መረጃዎች የሉም በተጨማሪም በስኳር የበለፀጉ የለስበሣና አንዳንድ የኢነርጂ መጠጦችም በተመሣሣይ በውስጣዝው ካፊስ ሲለማይዙ የደም ግፊትን የመጨመር ኃይል አላቸው፡፡

7. ከፍተኛ የሠውነት ክብደት መጠንን መቀነስ

የደም ግፊት መጠን ከሠውነት ክብደት መጨመር ጋር ተያይዞ ይጨምራል በመሆኑም ከፍተኛ የሠውነት ክብደት መጠንን መቀነስ የደም ግፊት መጠኑም እንዲቀንስ ይረዳል 10 ኪ.ግ ያህል ክብደት መቀነስ የደም ግፊት ከ5-20 በሚደርሰ መጠን እንዲቀንስ ያደርጋል፡፡ ከጤና ባለሙያዎች ጋር በመሆን እንዴት ወደ ትክክለኛው የክብደት ክልል መምጣት እንደምንችል መመካከርና የተለያዩ የአመጋገብ ስርዓቶችንና እስፖርታዊ እንቅስቃሴዎችን ማድረጉ ውጤቱ ከፍተኛና ጠቃሚ ነው፡፡

8. ጭንቀትና ተያያዥ የጤና ችግሮችን ማስወገድ

ጭንቀት የደም ግፊት መጠን በጊዜያዊነት እንደሚጨምር ከሚያደርጉ ምክንያቶች ውስጥ አንዱ ነው፡፡ በመሆኑም የተለያዩ ለዚህ ችግር የሚያጋልጡን ምክንያቶች ለይቶ በማወቅ ከተቻለ ማስወገድ ካልሆነም ሣንጨናነቅ በአግባቡ እነዚህን ነገሮች ለማለፍ መሞከር ያስፈልጋል ነገር ግን ነገሮች ከአቅማችን በላይ ከሆኑ የስነልቦና ጤና ባለሙያዎችን ማማከርና የተለያዩ ዕርዳታዎችን ማግኘት እንችላለን፡፡

9. የቤተሰብና የጓደኛን እርዳታ ማግኘት

እነዚህ አካላት የተለያዩ እገዛዎችን ለማድረግ ጤንነታችንን እንድንከባከብና እንደንቆጣጠር ያስችሉናል የተለያዩ እስፖርታዊ እንቅስቃሴዎችን ለብቻ ከማድረግ ይልቅ ከተለያዩ ሠዎች ጋር ማድረጉ የበለጠ በሞራል እንድንቀሣቀስና እንዳናቋርጠው ለማድረግ ይረዳናል፡፡ የደም ግፊትዎ ዝቅተኛ መሆኑን ማወቅ

ስለ ከፍተኛ የደም ግፊት ብዙ ስለሰማን እና ቁጥጥር ካልተደረገ ምን ሊፈጠር ይችላል ነገር ግን የደም ግፊትዎ ዝቅተኛ ዝቅ ከሚያደርገው ከሆነ ችግሮች ሊከሰቱ ይችላሉ. የትኛው ምልክቶች ሊጠብቁ ይችላሉ, እንዲሁም ከፍተኛ መጠን ካለው (ዝቅተኛ የደም ግፊት ካለዎት) ምን ሊከሰት ይችላል?

በቂ የደም ዝውውር ሳይኖር የሰውነት ሕዋሳት ሁለቱንም የኦክስጂን እና የሴሎች አሠራር ለማሟላት የሚያስፈልጉትን ንጥረ ነገሮች ይጠቀማሉ. በሕዋስ ውስጥ የማይታወቅ እና በመጨረሻም ህዋስ ውስጥ የሚሞቱ ሕዋሳት ወደ ሕዋሳት (ቲሹ ሃይፖዚሲ) ተብለው የሚጠሩት ሕዋሳት በቂ ያልሆነ ኦክስጅን ይሰጡታል.

ከላይ እንዳየነው, ዝቅተኛ የደም ግፊት ለተለያዩ ሰዎች የተለየ ትርጉም ይሰጣል. አንዳንድ ሰዎች የ 86/50 የደም ግፊት ሊኖራቸው ይችላል እና ግምታዊ ወጭ የሌለባቸው ሊሆኑ ይችላሉ. ለምሳሌ, በአካላዊ ሁኔታ ላይ የሆነ ሰው. ይህ የደም ግፊት መጠን በጣም አስፈላጊ የሆነውን የሰውነት ክፍሎች በቂ ያልሆነ ውሕደት ሊያስከትል ይችላል.

ዝቅተኛ የደም ግፊት ምክንያቶች

ብዙ የደም ግፊት ሊያስከትሉ የሚችሉ በርካታ ሁኔታዎች አሉ, ነገር ግን በጣም ከተለመዱት በጣም የተለመዱት ሰዎች ከፍተኛ የደም ግፊት መድሃኒት ሲወስዱ ነው. ብዙ የደም ግፊትን ሊያስከትሉ የሚችሉ የተለያዩ ዘዴዎች አሉ:: ዝቅተኛ የደም ግፊት (አስደንጋጭ) ሊያስከትሉ የሚችሉ ሌሎች ሁኔታዎች ከፍተኛ የሆነ የበሽታ መከላከያ (ፍሳሽ ነቀርሳ), አደገኛ የአለርጂ (የአለርጂክክሽሪያክ ነቀርሳ) , የነርቭ መዛባት (ኒውሮጂን ድንጋጤ), እና ሌሎችም

ለደም ግፊት ዝቅተኛ የሆኑ በርካታ የሕክምና ሁኔታዎች አሉ ይህ በደም መፍሰስ, የደም ሥሮች ማራዘም እና ሌሎች አካሄዶች ምክንያት ሊከሰት ይችላል::

ዝቅተኛ የደም ግፊት ምክንያቶች የሚከተሉትን ሊያካትቱ ይችላሉ::

- ✓ የደም ግፊት መድኃኒቶች
- ✓ የሰውነትሽ ፈሳሾች (እንደ ዲዩሪክ, ትውከት, ተቅማጥ, እና ተጨማሪ ያሉ የመተጣጠብን ምክንያቶች)
- ✓ የልብ ችግር (በተለይ በደም ውስጥ ያለ በቂ ደም የሚሰራጭባቸው)
- ✓ የደም መፍሰስ (ከቀዶ ጥገና, አሰቃቂ, የጀርባ አከርካሪ እና ተጨማሪ)
- ✓ የታይሮይድ ችግሮች
- ✓ አድሬል የአቅም ማጣት
- ✓ አለፍ አለፍ ብሎ (ከባድ አለርጂ)
- ✓ ኒውሮሎጂካል (ኒውሮጂን ኦርቶአቲክ ሃይፖታቴሽን)
- ✓ መድሃኒቶች (እንደ ናርኮቲክስ, ማደንዘዣዎች)
- ✓ ቀዶ ጥገና
- ✓ ሃይፖቮልሚክክሽሪያ (ከደም መከሰት, የውስጥ ደም መፍሰስ)

የአነስተኛ የደም ግፊት ምልክቶች አብዛኛውን ጊዜ የሚወሰኑት የደም ግፊት ምን ያህል ፈጣን እንደሆነ ነው. የደም ግፊት በፍጥነት ቢቀንስ, ሰውነትዎ ድንገተኛ ሁኔታ ሲከሰት ምልክቶቹ ድንገት ሊመጡ ይችላሉ (ይህም እርስዎ ሊወጡ ይችላሉ.) በተቃራኒው ዝቅተኛ የደም ግፊቱ ቀስ በቀስ ከቀነሰው ደካማ እና ደካማነት ሊሰማዎት ይችላል, ነገርግን ግን የደም ግፊት ዝቅተኛ ነው.

የደም ግፊት ዝቅተኛ ምልክቶች ምልክቶች የሚከተሉትን ያካትታሉ:

- ✓ እንደ እርስዎም ስሜት የሚሰማዎት ወይም የሚሰማዎት ስሜት በሚፈነዳ ጀልባ ላይ ቆሞ ነው
- ✓ የቀለም እይታ
- ✓ የብዥታ እይታ
- ✓ መቁረጥ
- ✓ ድካም
- ✓ ግራ መጋባት እና ሌሎች በአዕምሮ ሁኔታ ወይም "በመጥፋት ላይ ያለ ስሜት"
- ✓ የአተነፋፈስ መዛባት ለውጦች (ፈጣን እና ጥልቀት የሌለው ትንፋሽ በከፍተኛ የደም ግፊት ክፍል የተለመደ ነው)
- ✓ ፈጣን የልብ ምት (የልብ ምት ፍጥነት የደም ግፊትን ለመቀነስ ካሳ ይከፍላል)
- ✓ ድግግሞሽ ,ማቅለሽለሽ
- ✓ ድንገት የበረዶ ወይንም ብስጭት
- ✓ ኮማ እና ሞት (ከባድ በሚሆንበት ጊዜ) ለዝቅተኛ የደም ግፊት (ሃይፖስቴሽን) ኢያያዝ

የደም ግፊት ዝቅተኛ ከሆነ የከፋ ችግር ካጋጠመው ትክክለኛውን ምክንያት ለማወቅ ሌላ ተጨማሪ ሥራ ያስፈልጋል. የደም ግፊት መድኃኒቶች ምክንያታቸው ከሆነ, እነዚህ ይቋረጣሉ.

የደም ማነስ በሽታ ምልክቶች

ደም ማነስም ከደም ብዛት ያልተናነስ ከፍተኛ ጉዳት ያስከትላል።አንዳንድ ጊዜ ለረጅም ጊዜ ተቀምጠው ቆይተው ሲነሱ አልያም ተመግበው ከመቀመጫዎ ሲነሱና ረዘም ላለ ጊዜ ሲቆሙ የማዞር አጋጣሚ ይከሰታል።የህክምና ባለሙያዎችም ሰዎች ለደም ግፊት የሚሰጡትን ትኩረት ያክል ለደም ማነስም ሊሰጡ እንደሚገባ ይመክራሉ። እነዚህ ደግሞ የደም ማነስ መከሰቱን ማሳያ ምልክቶች ናቸው፤ የመፍዘዝና በአግባቡ ማስተዋል አለመቻል፡- ይህ ምልክት ከቀላል ራስ ምታት ጋር ከተከሰተ የደም ማነስ ችግር ሊሆን ይችላል። የደም ማነስ ሲከሰት ወደ አዕምሮ የሚፈሰው የደም መጠን እንዲቀንስ ያደርጋል፣ ይህ ደግሞ ወደ አዕምሮ የሚሄደውን የኦክስጅን መጠን በማሳነስ የመፍዘዝ ስሜትና በአግባቡ እንዳያስተውሉ ያደርጋል።ይህ አጋጣሚ በአብዛኛው ማለዳ ከእንቅልፍዎ እንደነቁ ከአልጋ ላይ ፈጥነው ሊወርዱ ሲሞክሩ ሊስተዋል ይችላል።

ከፍተኛ ድካም፡- ደም ማነስ ሃይልዎን በማሳጣት ለከፍተኛ ድካም ይዳርጋል፤ በሰውነት ውስጥ የሚኖር የደም ዝውውር ዑደት ሃይልና እና አቅም ላይ የራሱ ተፅዕኖ አለው።

ፈጣን የልብ ምት፡- ወደ ልብ ዝቅተኛ የሆነ የደም ፍሰት ካለ ከወትሮው በተለየ ሁኔታ እንዲኮማተር ያደርገዋል፤ ይህን መሰሉ የደም እጥረት ሲከሰት ደግሞ ባልተለመደ መልኩ ፈጣን የልብ ምት እንዲከሰት ያደርገዋል።ይህም ፈጣን አተነፋፈስ እንዲኖር በማድረግ ምናልባትም ያልተለመደ የሰውነት ሙቀት መቀያየር እንዲኖር ሊያደርግም ይችላል።ከልብ ጋር የተያያዘ ነገር በሙሉ አደጋው የከፋ ሊሆን ስለሚችል፥ መሰል አጋጣሚ ሲከሰት በተቻለ መጠን ወደ ህክምና ተቋም ማምራት ተገቢ ይሆናል።

የእጅ መዳፍና ቆዳ መርጠብና መቀዝቀዝ፡- ከአካል ብቃት እንቅስቃሴ ውጭ መሰል አጋጣሚ ከተከሰተ በደም ማነስ መጠቃትዎን ማሳያ ሊሆን ይችላል።ሁኔታው በተለይም ከፈጣን የልብ ምት እና ጥልቅ አተነፋፈስ ጋር ጋር ከተዋሃደ ደግሞ መታየት ይኖርብዎታል።

ትኩረት ማጣት፡- በሰውነት ውስጥ ከተከሰተው የደም ማነስ ጋር ተያይዞ አዕምሮ በቂ የደም መጠን አይደርሰውም፤ ይህ ደግሞ በአዕምሮ ውስጥ የሚገኙ ህዋሳትን አክስጅን በማሳጣት ስራቸውን በአግባቡ እንዳይሰሩ ያደርጋቸዋል።በዚህ ጊዜም በአግባቡ ማስተዋልና መመልከት አለመቻል ስራን በትክክል አለመከወን ይከሰታል፥

እንግዳ የሆነ የውሃ ጥም ስሜት፡- ከወትሮው በተለየ መልኩ ሰውነት ፈሳሽ ያጠረው ያክል አሁንም አሁንም ውሃ የመጥማት ስሜትም ሌላው የዚህ ችግር ማሳያ ተደርጎ ይወሰዳል። ይህ ስሜት ሰውነትዎ በርካታ መጠን ያለው ፈሳሽ ወደ ደም ውስጥ እንዲገባ መፈለጉን ማሳያና ደም ማነሱን ማመላከቻም ነው።

የተጋረደ እይታ፡- ውስጥ የደም ማነስና ያንን ተከትሎ የሚመጣው የኦክስጅን እጥረት አይን ትክክለኛውን ስራ በአግባቡ እንዳይሰራ ያደርገዋል፥ በዚህም የተጋረደ እይታና ብዥታ ይከሰታል።

ከዚህ ባለፈም ማስመለስ፣ ድብርትና መጫጫን፣ መፍዘዝ፣ ራስ ምታት፣ የአንገት አካባቢ እንደልብ አለመታዘዝ፣ ከበድ ያለ ሳል፣ በጀርባ የላይኛው ክፍል ላይ የሚሰማ ህመምና የስርዓተ ምግብ አለመፈጨትም የዚህ ምልክት ሊሆኑ ይችላሉ።

ማለዳ እንደነቁ በፍጥነት ከአልጋ ወርዶ ለመቆም አለመሞከር፣ ውሃ በብዛት መጠጣት፣ ሲቀመጡ እግርን አለማጠላለፍ፣ በቫይታሚን ቢ12 እና ፎሊክ አሲድ የበለጸጉ ምግቦችን ማዘውተር፣ የአካል ብቃት እንቅስቃሴ፣ በቂ እረፍትና መኝታ፣ ሲጋራና አልኮል ማስወገድ፣ ጥራጥሬ፣ አትክልትና ፍራፍሬን በብዛት መመገብ ደግሞ ለዚህ መፍትሄዎች ናቸው። ዝቅተኛ ግፊት ላይ ምን ምልክቶች ይታያሉ?

1. በአጠቃላይ አንድ ሰው በአጠቃላይ አለመረጋጋት ይሰማዋል. በዚህ ጉዳይ ላይ ትልቁን, እንቅልፍን, የሰዎች ግድየለሽነት ተስተውሏል. የወቅቱ ትኩረት ትኩረትን መቀነስ, የቁጣ ስሜቶች ሊኖሩ ይችላሉ.
2. በሞቃት የአየር ጠባይ ውስጥም እንኳ በጣም ከባድ እና ኃይለኛ በሆኑ የእጅ እና የእግር ቅርጽ የተሞሉ ናቸው, በጣም ይቀላሉ, ስለዚህ በቂ ያልሆነ የደም ዝውውር ተጎድቷል.
3. የሰውነት ክፍያን ስለሚያመጣው በሽታ ተጨባጭ ሁኔታ የፓምፕስ መጨመር ወይም ፍጥነት ሊኖር ይችላል. አንድ ሰው በፍጥነት የልብ ምት ሲያወጣ ጠንካራ የልብ ምት ይናገራል.
4. ብዙ የደም ግፊትን ለመቀነስ የተጋለጡ ብዙ ሰዎች ላብጥ ይፈጥራሉ.
5. የደም ግፊት <u>ማሳያ</u> ምልክቶች አንዱ <u>ሴፋላጂያ ነው</u> . በዚህ ሁኔታ, በአብዛኛው ጊዜ ግራ የሚያጋቡ, ግልጽ ህትመት የሌለበት ህመም ናቸው. ነገር ግን አንዳንዴ የስሜት ህዋሳት ስሜታዊ እና ስሜታዊ ገጸ-ባህሪያት ሊኖራቸው ይችላል.
6. ሌላው ዝቅተኛ የደም ግፊት የሚያሳየው ምልክቶች ደግሞ የማቅለሽለሽ ነው. በዚህ ሁኔታ ማቅለሽለሽ እና ማስታወክ በዚህ አንፃር በአእምሮ ውስጥ ያለ የደም ዝውውር ችግር ነው. በዚህ ሁኔታ አንድ ሰው የማቅለሽለሽ ስሜት ሊያሳጣ አይገባም, ትውክ ማድረግ በፅናት ሊጀምር ይችላል.

የደም ግፊት መለኪያ መሳሪያዎች ለሁለት የሚከፈሉ ሲሆን እነዚህም ማንዋል (manual) ወይም በእጅ የሚሰራ ሲሆን ሌላኛው ዲጂታል የሚባለው ነው። ይህም ዲጂታል የሚባለው ኮምፒውተራይዝድ እና በኤሌክትሪክ ሀይል የሚሰራ ነው። የኤሌክትሪክ ሀይሉን ከባትሪ ወይም በቀጥታ በሶኬት ገመድ ሊሠራ ይችላል። የሚያገኘው የደም ግፊት ልኬት መጠንንም በማሽኑ ላይ በተገጠመ ስክሪን የሚያሳይ ነው።

የዲጂታል የደም ግፊት መለኪያ መሳሪያ የራሱ የሆነ ጥቅም እና ችግሮች ያሉት ነው። ከችግሮቹ በዋናነት የተሳሳተ ልኬት መጠቆሙ ነው። ለዚህም እንደ ምክንያት የሚጠቀሰው የሀይል መቆራረጥ ነው። የሀይል መቆራረጡም በባትሪ መድም ወይም ለረዥም ጊዜ ማሽኑን ከመጠቀም የሚመጣ ነው።

ሌላኛው የደም ግፊት መለኪያ መሳሪያ በአብዛኛው በሆስፒታሎች እና በጤና ተቋም የምናገኘው ነው። ይህ መለኪያ በክንድ ላይ በማስቀመጥ በእጃችን በሚገኘው ፊኛ መሳይ መሳሪያ አየር (pressure) በመስጠት ግፊቱን በሰዓት መቁጠሪያ መሳይ ወይም በሜርኩሪ ሲስተም በመጠቀም የተገኘውን ልኬት የሚያሳይ ነው። የዚህ ልኬት መሳሪያ ልኬቱ አስተማማኝ ተደርጎ ይወሰዳል ነገር ግን ይሄን ቢሆን የራሱ የሆነ ደካማ ጎኖች ያሉት ነው።