# VOICE BASED TOUCH SENSITIVE MEDICAL CONDITION PROPOUNDING SYSTEM FOR ILLITERATES

**A PROJECT REPORT**

***Submitted by***

**M.MENAGA(0810108025)**

**A.MYTHILI VISHALINI(0810108027)**

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ANNA UNIVERSITY OF TECHNOLOGY,COIMBATORE 641047

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## ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE 641047

### BONAFIDE CERTIFICATE

Certified that this project report **"VOICE BASED TOUCH SENSITIVE MEDICAL CONDITION PROPOUNDING SYSTEM FOR ILLITERATES"** is the bonafide work of **Ms. M.MENAGA (0810108025)** and **Ms.A.MYTHILI VISHALINI (0810108027)** who carried out the project work under my supervision.

| | |
|---|---|
| **GUIDE** | **HEAD OF THE DEPARTMENT** |
| **Mr. G.S.Nandakumar** | **Prof .N. Jayapathi** |
| Associate Professor<br>Department of Computer Science and Engineering,<br>Kumaraguru College Of Technology,<br>Coimbatore – 641 049 | Professor and Head<br>Department of Computer Science and Engineering,<br>Kumaraguru College Of Technology,<br>Coimbatore – 641 049 |

The candidates with **University Register Numbers 0810108025** and **0810108027** were examined by us in project examination held on17-04-12

**Internal Examiner** **External Examiner**

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## ABSTRACT

This is a medical diagnosis system that is designed for the use of illiterates. In order to be user friendly, throughout the session, it consists of a recorded voice that will help the user to give input, based on a colour scheme on buttons. The GUI is designed in Tamil. The system is placed inside a cabin to ensure the privacy of the user. When the user enters it, the voice will start the session by asking the user if he wants to have awareness or if he is experiencing some problem and want to know what it is.

If the user wants to have just awareness, then the voice will ask the user to give input as to about which disease he wants to know and displays the appropriate details. If the user has any problem, he will be taken to an animated human body where the user touches the body part where he experiences discomfort. Then the prominent symptoms pertaining to the diseases of that body part will be listed and the voice will read out the symptoms. To denote if he has a particular symptom or not, the user can press either the green or red button correspondingly present along with each symptom in the list. If a prominent symptom is chosen, then the most common disease for that symptom will be considered for questionnaire. If it is diagnosed, result is displayed. Else the next common disease will be selected for questionnaire and the process iterates and finally the diagnosis with the highest probability is chosen.

There is also a statistical report generator which will generate a chart as to what is the relative proportion of the diseases diagnosed so far. This will help in determining the predominant disease of that locality.

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## LIST OF ABBREVIATIONS

| S.NO | ABBREVIATION | MEANING |
|---|---|---|
| 1 | DBMS | Database Management System |
| 2 | HTML | Hyper Text Markup Language |
| 3 | GUI | Graphical User Interface |
| 4 | HTTPS | Hyper Text Transfer Protocol Secure |
| 5 | TLS | Transport Layer Security |
| 6 | SSL | Socket Layer Security |
| 7 | HTTP | Hyper Text Transfer Protocol |
| 8 | ID | Identity |
| 9 | JSP | Java Server Pages |
| 10 | JVM | Java virtual machine |

# CHAPTER 1
# INTRODUCTION

## 1.1 Current Awareness Level of Illiterates

The awareness about medical diseases is very poor among the rural people, especially the illiterates. Since they lack the basic knowledge about any disease, how it manifests, what are its symptoms, what must be done once the disease onsets or what are the precautionary measures to be taken in order to prevent a disease from occurring at all, etc., they do not realize the seriousness of their medical condition until the phenomenon moves into an irreversible state. Therefore it is crucial that they be imparted knowledge about the diseases prevailing in the community. The major impediment to solve this problem through an automated medical diagnosis system is that the illiterate people do not have any knowledge of operating a computer system. At present, there is no system that could educate the people about day to day do’s and don’ts in personal hygiene as well as diagnose and instruct them about the severity of any medical condition, taking into account their ignorance in both the fields. If such a system were to be developed, it should be quite easy for the illiterates to use, in spite of their ignorance in handling a computer system.

## 1.2 Medical Diagnosis

Medical diagnosis (often simply termed diagnosis) refers both to the process of attempting to determine or identify a possible disease or disorder (and diagnosis in this sense can also be termed (medical) diagnostic procedure), and to the opinion reached by this process (also being termed (medical) diagnostic opinion).

A clinician uses several sources of data and puts the pieces of the puzzle together to make a diagnostic impression. The initial diagnostic impression can be a broad term describing a category of diseases instead of a specific disease or condition. After the initial diagnostic impression, the clinician obtains follow up tests and procedures to get more data to support or reject the original diagnosis and will attempt to narrow it down to a more specific level. Diagnostic procedures are the specific tools that the clinicians use to narrow the diagnostic possibilities.

### 1.2.1 Diagnostic Procedure

A diagnosis, in the sense of diagnostic procedure, can be regarded as an attempt at classification of an individual’s condition into separate and distinct categories that allow medical decisions about treatment and prognosis to be made. Subsequently, a diagnostic opinion is often described in terms of a disease or other condition, but in the case of a wrong diagnosis, the individual's actual disease or condition is not the same as the individual's diagnosis.

A diagnostic procedure (as well as the opinion reached thereby) does not necessarily involve elucidation of the etiology of the diseases or conditions of interest, that is, what *caused* the disease or condition. Such elucidation can be useful to optimize treatment, further specify the prognosis or prevent recurrence of the disease or condition in the future.

### 1.2.2 Indication for Diagnostic Procedure

The initial task is to detect a medical indication to perform a diagnostic procedure.

Indications include:

- Detection of any deviation from what is known to be normal, such as can be described in terms of, for example, anatomy (the structure of the human body), physiology (how the body works), pathology (what can go wrong with the anatomy and physiology), psychology (thought and behavior) and human homeostasis (regarding mechanisms to keep body systems in balance). Knowledge of what is normal and measuring of the patient's current condition against those norms can assist in determining the patient's particular departure from homeostasis and the degree of departure, which in turn can assist in quantifying the indication for further diagnostic processing.
- A complaint expressed by a patient.
- The fact that a patient has sought a diagnostician can itself be an indication to perform a diagnostic procedure. Therefore, in, for example, a doctor's visit, the physician may already start performing a diagnostic procedure by, for example, watching the gait of the patient from the waiting room to the doctor's office even before she or he has started to present any complaints.

### 1.2.3 Different Types of Diagnosis

There are different types of diagnosis. Some of the basic types are :

- Clinical Diagnosis: A diagnosis made on the basis of medical signs and patient-reported symptoms, rather than diagnostic tests.
- Laboratory Diagnosis: A diagnosis based significantly on laboratory reports or test results, rather than the physical examination of the patient. For instance, a proper diagnosis of infectious diseases usually requires both an examination of signs and symptoms, as well as laboratory characteristics of the pathogen involved.
- Radiology Diagnosis: A diagnosis based primarily on the results from medical imaging studies. Greenstick fractures are common radiological diagnoses.
- Principal Diagnosis: The single medical diagnosis that is most relevant to the patient's chief complaint or need for treatment. Many patients have additional diagnoses.
- Differential Diagnosis: A process of identifying all of the possible diagnoses that could be connected to the signs, symptoms, and lab findings, and then ruling out diagnoses until a final determination can be made. There are various methods of performing a differential diagnostic procedure, but in general, it is based on the idea that one begins by considering the most common diagnosis first: a head cold versus meningitis, for example. As a reminder, medical students are taught the adage, "When you hear hoofbeats, look for horses, not zebras," which means look for the simplest, most common explanation first. Only after the simplest diagnosis has been ruled out should the clinician consider more complex or exotic diagnoses.
- Machine Differential Diagnosis: Machine differential diagnosis is the use of computer software to partly or fully make a differential diagnosis.

### 1.2.4 Medical Error

A medical error may be defined as a preventable adverse effect of care, whether or not it is evident or harmful to the patient. This might include an inaccurate or incomplete diagnosis or treatment of a disease, injury, syndrome, behavior, infection, or other ailment. As a general acceptance, a medical error occurs when a health-care provider chose an inappropriate method of care or the health provider chose the right solution of care but executed it incorrectly. Medical errors are often described as human errors in healthcare. Medical errors are associated with inexperienced physicians and nurses, new procedures, extremes of age, complex care and urgent care. Poor communication (whether in one's own language or, as may be the case for medical tourists, another language), improper documentation, illegible handwriting, inadequate nurse-to-patient ratios, and similarly named medications are also known to contribute to the problem. Patient actions may also contribute significantly to medical errors. Falls, for example, are often due to patients' own misjudgments. Human error has been implicated in nearly 80 percent of adverse events that occur in complex healthcare systems. The vast majority of medical errors result from faulty systems and poorly designed processes versus poor practices or incompetent practitioners.

#### 1.2.4.1 Examples of Medical Errors

- Misdiagnosis of an illness, failure to diagnose or delay of a diagnosis. This type of error could be a direct mistake of a doctor or caused when the doctor is acting on incorrect information supplied by some other person.
- Giving the wrong drug or (wrong patient, wrong chemical, wrong dose, wrong time, wrong route).Giving two or more drugs that interact unfavorably or cause poisonous metabolic byproducts.
- Wrong-site surgery, such as amputating the wrong limb.
- Retained surgical instruments.
- In particular, gossypiboma, resulting from a surgical sponge being left behind inside the patient after surgery.
- Patients' implementation of drugs and treatments.
- Using race as a diagnosis, not a factor.
- Transplanting organs of the wrong blood type.
- Incorrect record-keeping.

## 1.3 Telemedicine

Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance. It helps eliminate distance barriers and can improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations. Although there were distant precursors to telemedicine, it is essentially a product of 20th century telecommunication and information technologies. These technologies permit communications between patient and medical staff with both convenience and fidelity, as well as the transmission of medical, imaging and heath informatics data from one site to another.

### 1.3.1 Categories of Telemedicine

Telemedicine can be broken into three main categories:

- store-and-forward,
- remote monitoring and
- (real-time) interactive services.

#### 1.3.1.1 Store-and-forward Telemedicine

Store-and-forward telemedicine involves acquiring medical data (like medical images, biosignals etc.) and then transmitting this data to a doctor or medical specialist at a convenient time for assessment offline. It does not require the presence of both parties at the same time. Dermatology (teledermatology), radiology, and pathology are common specialties that are conducive to asynchronous telemedicine. A properly structured medical record preferably in electronic form should be a component of this transfer. A key difference between traditional in-person patient meetings and telemedicine encounters is the omission of an actual physical examination and history. The 'store-and-forward' process requires the clinician to rely on history report and audio/video information in lieu of a physical examination.

#### 1.3.1.2 Remote Monitoring

Remote monitoring, also known as self-monitoring or testing, enables medical professionals to monitor a patient remotely using various technological devices. This method is primarily used for managing chronic diseases or specific conditions, such as heart disease, diabetes mellitus, or asthma. These services can provide comparable health outcomes to traditional in-person patient encounters, supply greater satisfaction to patients, and may be cost-effective.

#### 1.3.1.3 Interactive Telemedicine Services

Interactive telemedicine services provide real-time interactions between patient and provider, to include phone conversations, online communication and home visits. Many activities such as history review, physical examination, psychiatric evaluations and ophthalmology assessments can be conducted comparably to those done in traditional face-to-face visits. In addition, “clinician-interactive” telemedicine services may be less costly than in-person clinical visit.

## 1.4 Web Application

A web application is an application that is accessed over a network such as the Internet or an intranet. The term may also mean a computer software application that is coded in a browser-supported language (such as JavaScript, combined with a browser-rendered markup language like HTML) and reliant on a common web browser to render the application executable.

Web applications are popular due to the ubiquity of web browsers, and the convenience of using a web browser as a client, sometimes called a thin client. The ability to update and maintain web applications without distributing and installing software on potentially thousands of client computers is a key reason for their popularity, as is the inherent support for cross-platform compatibility. Common web applications include webmail, online retail sales, online auctions, wikis and many other functions. Through Java, JavaScript, DHTML, Flash, Silverlight and other technologies, application-specific methods such as drawing on the screen, playing audio, and access to the keyboard and mouse are all possible. Web developers often use client-side scripting to add functionality, especially to create an interactive experience that does not require page reloading. Recently, technologies have been developed to coordinate client-side scripting with server-side technologies such as PHP. Ajax, a web development technique using a combination of various technologies, is an example of technology which creates a more interactive experience.

Applications are usually broken into logical chunks called "tiers", where every tier is assigned a role. Traditional applications consist only of 1 tier, which resides on the client machine, but web applications lend themselves to a n-tiered approach by nature. Though many variations are possible, the most common structure is the three-tiered application. In its most common form, the three tiers are called presentation, application and storage, in this order. A web browser is the first tier (presentation), an engine using some dynamic Web content technology (such as ASP, ASP.NET, CGI, ColdFusion, JSP/Java, PHP, Perl, Python, Ruby on Rails or Struts2) is the middle tier (application logic), and a database is the third tier (storage). The web browser sends requests to the middle tier, which services them by making queries and updates against the database and generates a user interface. For more complex applications, a 3-tier solution may fall short, and it may be beneficial to use an n-tiered approach, where the greatest benefit is breaking the business logic, which resides on the application tier, into a more fine-grained model. Another benefit may be adding an integration tier that separates the data tier from the rest of tiers by providing an easy-to-use interface to access the data. For example, the client data would be accessed by calling a "list_clients()" function instead of making an SQL query directly against the client table on the database. This allows the underlying database to be replaced without making any change to the other tiers. There are some who view a web application as a two-tier architecture. This can be a "smart" client that performs all the work and queries a "dumb" server, or a "dumb" client that relies on a "smart" server. The client would handle the presentation tier, the server would have the database (storage tier), and the business logic (application tier) would be on one of them or on both. While this increases the scalability of the applications and separates the display and the database, it still doesn't allow for true specialization of layers, so most applications will outgrow this model.

### 1.4.1 Benefits of Web Applications

- Web applications do not require any complex "roll out" procedure to deploy in large organizations. A compatible web browser is all that is needed.
- Browser applications typically require little or no disk space on the client.
- They require no upgrade procedure since all new features are implemented on the server and automatically delivered to the users.
- Web applications integrate easily into other server-side web procedures, such as email and searching.
- They also provide cross-platform compatibility in most cases (i.e., Windows, Mac, Linux, etc.) because they operate within a web browser window.
- With the advent of HTML5, programmers can create richly interactive environments natively within browsers. Included in the list of new features are native audio, video and animations, as well as improved error handling.

## 1.5 Java Server Pages and Servlets

Java Server Pages (JSP) is a technology that helps software developers serve dynamically generated web pages based on HTML, XML, or other document types. JSP is similar to ASP and PHP, but it uses the Java programming language. To deploy and run, a compatible web server with a servlet container (such as Apache Tomcat) is required. JSP allows Java code and certain pre-defined actions to be interleaved with static web markup content, with the resulting page being compiled and executed on the server to deliver an HTML or XML document. The compiled pages (and any dependent Java libraries) use Java bytecode rather than a native software format. Like any other Java program, they must be executed within a Java virtual machine (JVM) that integrates with the server's host operating system to provide an abstract platform-neutral environment. JSP pages use several delimiters for scripting functions. The most basic is <% ... %>, which encloses a JSP *scriptlet.* A scriptlet is a fragment of Java code that is run when the user requests the page. Other common delimiters include <%= ... %> for *expressions,* where the value of the expression is placed into the page delivered to the user, and *directives*, denoted with <%@ ... %>.

Java code is not required to be complete (self contained) within its scriptlet element block, but can straddle markup content providing the page as a whole is syntactically correct. For example, any Java if/for/while blocks opened in one scriptlet element must be correctly closed in a later element for the page to successfully compile. Markup which falls inside a split block of code is subject to that code, so markup inside an *If* block will only appear in the output when the *if* condition evaluates to true; likewise, markup inside a loop construct may appear multiple times in the output depending upon how many times the loop body runs.

A servlet is a Java programming language class used to extend the capabilities of servers that host applications access via a request-response programming model. Although servlets can respond to any type of request, they are commonly used to extend the applications hosted by Web servers. Thus, it can be thought of as a Java Applet that runs on a server instead of a browser. To deploy and run a Servlet, a Web container must be used. A Web container (also known as a Servlet container) is essentially the component of a Web server that interacts with the servlets. The Web container is responsible for managing the lifecycle of servlets, mapping a URL to a particular servlet and ensuring that the URL requester has the correct access rights.

The servlet API, contained in the Java package hierarchy javax.servlet, defines the expected interactions of the Web container and a servlet. A Servlet is an object that receives a request and generates a response based on that request. The basic servlet package defines Java objects to represent servlet requests and responses, as well as objects to reflect the servlet's configuration parameters and execution environment. The package javax.servlet.http defines HTTP-specific subclasses of the generic servlet elements, including session management objects that track multiple requests and responses between the Web server and a client. Servlets may be packaged in a WAR file as a Web application. Servlets can be generated automatically from Java Server Pages (JSP) by the Java Server Pages compiler. The difference between Servlets and JSP is that Servlets typically embed HTML inside Java code, while JSPs embed Java code in HTML. While the direct usage of Servlets to generate HTML (as shown in the example below) has become rare, the higher level MVC web framework in Java EE (JSF) still explicitly uses the Servlet technology for the low level request/response handling via the Faces Servlet. A somewhat older usage is to use servlets in conjunction with JSPs in a pattern called "Model 2", which is a flavor of the model-view-controller pattern. A servlet is a Java component that can be plugged into a Java-enabled web server to provide custom services. These services can include:

- New features
- Runtime changes to content
- Runtime changes to presentation
- New standard protocols (such as FTP)
- New custom protocols

### 1.5.1 Life Cycle of a Servlet

- During initialization stage of the Servlet life cycle, the web container initializes the servlet instance by calling the init() method. The container passes an object implementing the ServletConfig interface via the init() method. This configuration object allows the servlet to access name-value initialization parameters from the web application.
- After initialization, the servlet can service client requests. Each request is serviced in its own separate thread. The Web container calls the service() method of the servlet for every request. The service() method determines the kind of request being made and dispatches it to an appropriate method to handle the request. The developer of the servlet must provide an implementation for these methods. If a request for a method that is not implemented by the servlet is made, the method of the

parent class is called, typically resulting in an error being returned to the requester.

- Finally, the Web container calls the destroy() method that takes the servlet out of service. The destroy() method, like init(), is called only once in the lifecycle of a servlet.

Three methods are central to the life cycle of a servlet. These are

- init( ),
- service( ), and
- destroy( ).

They are implemented by every servlet and are invoked at specific times by the server.

Let a typical user scenario be considered to understand when these methods are called.

1. Assume that a user enters a Uniform Resource Locator (URL) to a web browser.
    - The browser then generates an HTTP request for this URL.
    - This request is then sent to the appropriate server.
2. The HTTP request is received by the web server.
    - The server maps this request to a particular servlet.
    - The servlet is dynamically retrieved and loaded into the address space of the server.
3. The server invokes the init() method of the servlet.
    - This method is invoked only when the servlet is first loaded into memory.
    - It is possible to pass initialization parameters to the servlet so it may configure itself.
4. The server invokes the service() method of the servlet.
    - This method is called to process the HTTP request.
    - It may also formulate an HTTP response for the client.
5. The servlet remains in the server's address space and is available to process any other HTTP requests received from clients.
6. The service() method is called for each HTTP request.
7. The server may, at some point, decide to unload the servlet from its memory.
    - The algorithms by which this determination is made are specific to each server.
8. The server calls the destroy() method to relinquish any resources such as file handles that are allocated for the servlet; important data may be saved to a persistent store.
9. The memory allocated for the servlet and its objects can then be garbage collected.

### 1.6 Web Container

Web container (also known as a Servlet container) is the component of a web server that interacts with the servlets. A web container is responsible for managing the lifecycle of servlets, mapping a URL to a particular servlet and ensuring that the URL requester has the correct access rights. A web container implements the web component contract of the Java EE architecture, specifying a runtime environment for web components that includes security, concurrency, life cycle management, transaction, deployment, and other services. A web container provides the same services as a JSP container as well as a federated view of the Java EE platform APIs.

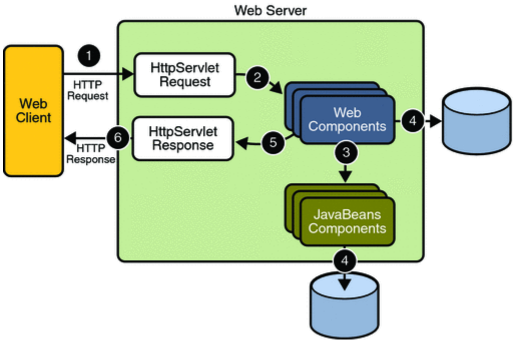


Fig. 1.6.1 Steps in a Web Server Interaction with Client

# CHAPTER 2
# SYSTEM STUDY

### 2.1 Existing system

There are several online medical diagnosis systems available. The stark feature that can be said about these systems is that they all are designed for the use of learned people. Only people who are educated will be able to access these systems. The systems are mostly distributed or centralized system for cooperative diagnosis. It is a sort of telemedicine system that provides synchronous cooperation between two health care professionals. It is based on an existing Metropolitan Area Network or Local Area Network. The architecture can be centralized or distributed. The main problem with a centralized architecture is the communication and processing bottleneck produced when the application has to attend to the different displays. A distributed system overcomes the problem of bottleneck created by the previous architecture. But then the complexity of the system increases proportionately to the number of replicas or the number of locations over which the database is distributed.

The ADM (Aide au diagnostic Médical) project has been started fifteen years ago and was the first telematic project for physicians in France using the MINITEL terminal. The knowledge base contains information on more than 10000 diseases from all pathological fields, using more than 100000 signs or symptoms. The ADM system has two main functionalities for physicians: Consultation of diseases descriptions and list of diseases containing one or more symptoms.

The ADM knowledge base is supported by a relational database management system (DBMS ORACLE) and we developed a Web interface using the Perl language to produce HTML pages for the web server.

**ADM-INDEX system** is an extension of ADM system. It is used to index all medical texts by ADM entities dictionary. In fact, ADM-INDEX is an automatic indexing system applying a conceptual approach which advantage is the detection of concepts whatever the form they appear in the texts. The concepts extraction process in ADM-INDEX is essentially done through three successive processes which are , Morphological, Syntactic and Semantic analysis. We must point out here that the Pragmatic knowledge are taken into account through the semantic analysis.

There yet another project called “Rough Set Techniques for Medical Diagnosis Systems” proposed in Poland. The main functional blocks of the system and their functions are:

- Import the data from existing medical information systems currently in use

- Convert information extracted from narrative text into data understandable by machine learning algorithms. Information extracted in this step should include not only knowledge directly retrieved from the free-text medical reports but also draw conclusions from the retrieved information. Information retrieved during this step will be mapped into values of several binary attributes

- Perform reduction of noisy, unreliable, irrelevant and redundant data

- Select subsets of strong attributes for further data processing

- Post-processing of generated decision rules such as rules pruning and joining

- Visualization of the knowledge discovery in a form easily readable by humans

### 2.1.1. Drawbacks

All the existing systems propose various methods for improving the efficiency of diagnosis. But there is no system that can be used by illiterates which can impart them knowledge and at the same time be user friendly and intuitive to use. There is no system at present that can impart knowledge about health in the remote areas where doctors who can educate the people about the dos and don’ts of daily health and hygiene.

### 2.2. Proposed system

The proposed system is designed especially for the illiterates. It has a well designed GUI with a voice interface that assists the user in giving inputs to the system which are the symptoms that the user experiences. And as the user has given symptoms, it will diagnose the possible medical condition and also suggests the user about the type of doctor to be consulted.

This system is designed as a web application that can support multiple users concurrently; meaning at a time, the system can be used for diagnosis or awareness by a number of people present in different locations. For each user the system accepts the input and propounds the possible medical condition. It uses the standard HTTPS protocol for communication over the internet. This protocol signals the browser to use an added encryption layer of SSL/TLS (Secure Socket Layer/Transport Layer Security) to protect the network traffic. SSL is especially suited for HTTP since it can provide some protection even if only one side of the communication is authenticated. This is the case with HTTP transactions over the Internet, where typically only the server is authenticated (by the client examining the server's certificate). Therefore it provides encrypted secure communication which ensures reasonable protection from eavesdroppers and man-in-the-middle attacks.

It features a database that has five tables. The first one has the list of various symptoms of the diseases of the human body. Each disease is given a unique identity (ID) and so is each symptom. The second table has the disease name and its count of the symptoms present had the disease been included in the questionnaire. The third table has the basic details of the user like their gender, age and occupation which will be used in the process of diagnosis. To identify the user among the numerous users using the system at any instant, the IP address of the user is included in the table. IP address is the numerical label assigned to the device participating in the network that uses the internet protocol for communication. The fourth table has the diseases that have been diagnosed and its count of symptoms stated by the user as present, the date it was diagnosed and the location it was diagnosed. The fifth table has symptoms stated by the user as present, its unique ID and the ID of the disease to which the symptoms belongs to. Both the above mentioned tables have IP address to identify the user among the various users.

The procedure used for diagnosis is “DIFFERENTIAL DIAGNOSIS”. It is a process of identifying all of the possible diagnoses that could be connected to the signs, symptoms, and lab findings, and then ruling out diagnoses until a final determination can be made. There are various methods of performing a differential diagnostic procedure, but in general, it is based on the idea that one begins by considering the most common diagnosis first. So here we first ask the user of the preliminary details. Then there is a human body model through which the user can say in which part of the body he is experiencing discomfort. This he does by touching the corresponding body part of the human body model. Then the prominent symptoms of the diseases most common for that part of the body are presented to the user. Based on the symptom he selects, the most common disease that includes that symptom is selected for questionnaire. If that disease has sufficient symptom count to declare it as a possible medical condition, then that disease is given as the result of diagnosis and the corresponding doctor to be consulted is also displayed. Else the disease with the next highest probability of manifestation is presented for questionnaire and the process continues as before.

The system also has an awareness part to it. The user can select from the list of diseases the one about which he wants to know. When selected, the nature, causes, symptoms, remedies and preventive measures for that disease is presented to the user. This will greatly help the user in gaining sufficient knowledge about the diseases like how the disease gets manifested, what are the causes, how to know whether it is present, what to do when the disease actually occurs, how to prevent it from occurring in the future etc.,

The system also has a statistical report generating facility which can assist learned people if they want to know certain things about that locality like what disease has been prevalent in the community in a particular period of time, the percentage of increase or decrease of a particular disease, the number of people who have been affected by a particular disease so far etc.,; all these are based on the diagnosed diseases so far in that locality.

# CHAPTER 3
# SYSTEM DESIGN

## 3.1 List of Modules

- Voice Instructor Construction
- Human Body Modeling
- Diagnose and Symptom Probability Calculator
- Awareness
- Statistical Report Generator

## 3.2 Modules Description

### 3.2.1 Voice Instructor Construction

The voice instructor is constructed by recording voice manually and then embedding it the application accordingly. The voice is recorded using Windows' Sound Recorder and it is converted into appropriate format and it is embedded into the application. It reads out each symptom in the questionnaire and also which button to click for navigation, the result and the type of doctor to be consulted and in case of awareness, the details about the diseases.

### 3.2.2 Human Body Modeling

The human body model consists of an image area map, wherein each body part is treated as a map area. When the user clicks on a particular area it is highlighted, and it links to a symptoms list page which displays the prominent symptom of each disease which can be related to that body part. For example, if the user clicks the chest region, it is highlighted for the user to know that the chest region has been selected and it leads to a page of symptoms prominent to the diseases of the chest like wheezing, clubbing, pain in the left side of chest etc., which are symptoms of diseases like asthma, bronchiectasis, angina respectively.

### 3.2.3 Diagnose and Symptom Probability Calculator

When a symptom from the list of prominent symptoms is chosen, then the disease which is most common for that body part which contains that symptom is selected for questionnaire. If a symptom is present then the symptom along with its unique ID and disease ID is entered into the database table. When the user has gone through all the symptoms of that disease providing a 'yes' or 'no' and when he clicks the next button (which is in Tamil) the symptom count is taken and if it is above the threshold value set for that disease, then it is deemed as being diagnosed. In that case, the result and the type of doctor to be consulted are displayed to the user. Also it is entered into the statistics table with the name, count, date of diagnosis, location and the IP address of the system.

If the symptom count is not sufficient to classify it as being present, then it is entered into the count table along with the count. Then the next common disease is selected and again the same procedure is carried out. This procedure is carried on until the diseases with the selected prominent symptom gets exhausted. When that stage is reached, then the count table is referred and the disease with the highest number of count is selected and the result is displayed.

### 3.2.4 Awareness

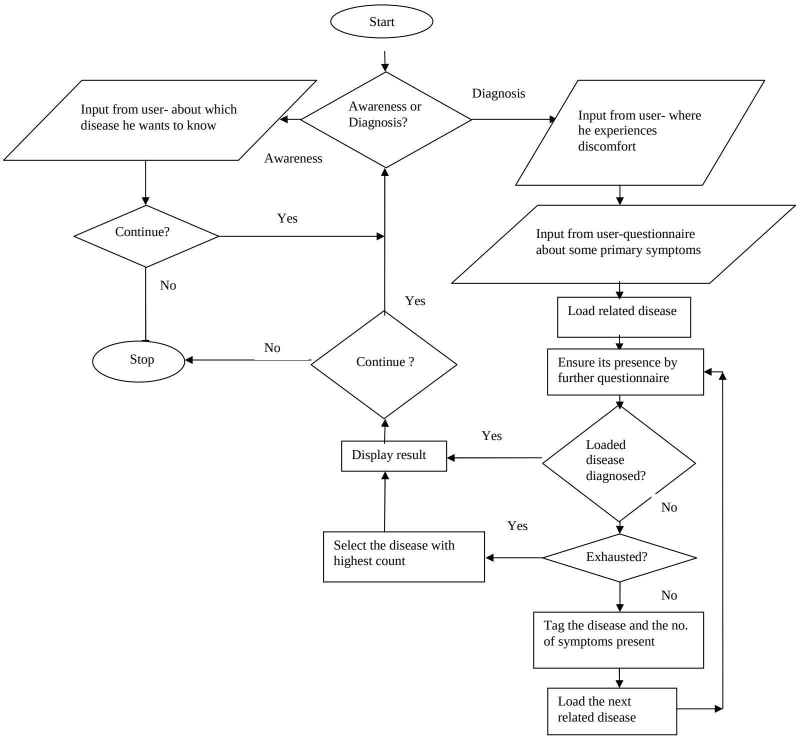
When the user goes to the awareness part of the system, he is presented with a list of diseases and the voice instructor will read that out to him. If he selects a particular disease from it, then the nature of the disease, its causes, symptoms, remedial measures, ways to prevent it or abate it, the type of doctor to be consulted along with a picture of the body part the disease will affect. He goes from one page to next to know about all this and the voice instructor assists him throughout.

### 3.2.5 Statistical Report Generator

The statistical report generator uses JFreeChart is an open source software framework which is used to generate pie chart. It is distributed under the terms of the GNU Lesser General Public License (LGPL), which permits use in proprietary applications. It needs values to be passed to the DefaultCategoryDataSet function which generates the appropriate chart to display the statistics value. For example the pie chart displays the percentage of various diseases so far diagnosed in that locality relative to each other. This will determine which the prominent disease is. It is generated on request by dynamically extracting information from the database.

# CHAPTER 4
# DESIGN METHODOLOGY

## 4.1 Basic Design of the system



Start
Awareness or Diagnosis?
Diagnosis
Awareness
Input from user- about which disease he wants to know
Input from user- where he experiences discomfort
Input from user-questionnaire about some primary symptoms
Continue?
Yes
No
Load related disease
Ensure its presence by further questionnaire
Yes
Stop
No
Continue ?
Yes
Display result
Loaded disease diagnosed?
No
Yes
Select the disease with highest count
Exhausted?
No
Tag the disease and the no. of symptoms present
Load the next related disease

Fig. 4.1.1 Basic Design of the system

### 4.2. Architectural Design

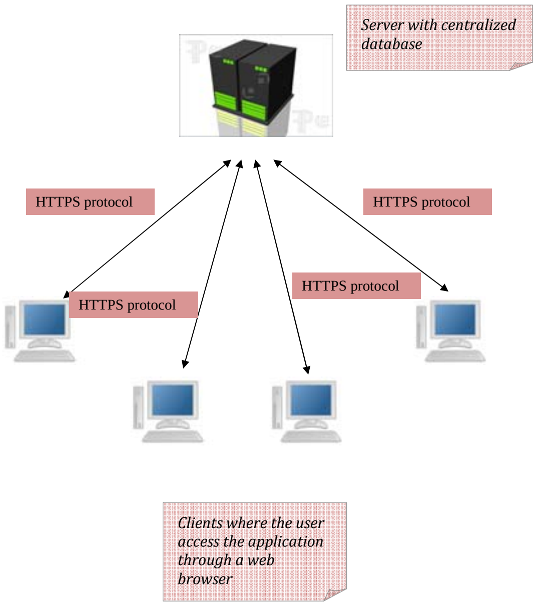

Server with centralized database
HTTPS protocol
HTTPS protocol
HTTPS protocol
HTTPS protocol
Clients where the user access the application through a web browser

Fig. 4.2.1 Architectural Design

# CHAPTER 5
# SYSTEM SPECIFICATION

### 5.1 Hardware Requirements

| | |
|---|---|
| Processor | : Pentium IV 2.4 GHz |
| Hard Disk | : 80 GB |
| RAM | : 256 MB |
| Touch Screen | : 14” with |

### 5.2 Software Requirements

| | |
|---|---|
| Operating System | : Windows XP and above |
| IDE | : Net Beans IDE |
| Back End | : PhpMyAdmin (a tool of WAMP server) |
| Server | : GlassFish Server Open Source Edition 3.1 |
| Charts | : JFreeChart API |

# CHAPTER 6
# CONCLUSION AND FUTURE OUTLOOK

The proposed system can assist the illiterates in gaining a sufficient knowledge about the diseases that affects them and can gain knowledge as to the nature of the diseases prevailing in their community, how they get manifested, what are their symptoms, what to do when they get that disease, how to prevent it from occurring in the future etc., It also facilitates a diagnosis part wherein it employs a differential diagnosis approach to diagnose a disease when the user comes with various complaints. After diagnosis, the result is displayed along with the type of doctor to be consulted and a pictorial representation of the body part it affects. This will efficiently help as a valuable diagnosis tool in remote areas where health care facilities are very rudimentary. The users will also feel free to use this system rather than consult someone in case they feel shy to share their problems. This will help to diagnose a disease at an early stage itself before the phenomenon becomes irreversible. Also with the data collected from statistical report, it can aid the learned to know the characteristics of a community.

As an enhancement, a photo sensor or some kind of sensor can be used to activate the system whenever a user enters the cabin so that the voice will be triggered by it and the user can start using the system. It can also employ artificial intelligence techniques to enhance the system’s efficiency. When a video terminal can be added to the client side and if another terminal is installed on a hospital, it can serve as a telemedicine tool.

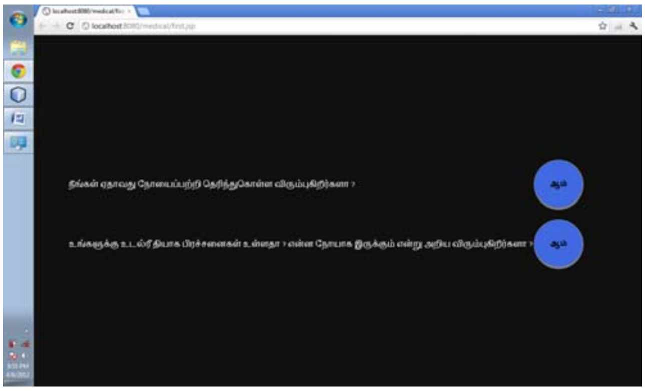
# CHAPTER 7
# APPENDIX

### 7.1 Source Code

```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@page import="java.sql.*" %>
<%@page import="java.io.*" %>
<!DOCTYPE html>
<html>
  <head>
    <meta http-equiv="Content-Type" content="text/html;
charset=UTF-8">
    <style type="text/css">
        p
        {
          font-size:16px;
          color:#FFFFFF;
        }
      </style>
  </head>
  <body bgcolor="#101010">
    <table cellpadding="15" border="1" style="background-color:
#000000;">
    <p>Frequency of Diseases</p>
       <tr>
     <td><p>Name of the disease</p></td>
     <td><p>Number of times diagnosed</p></td>
     </tr>
   <%
   try{
```

```
            Connection con=null;
          ResultSet rst=null;
          Statement stmt=null;
          System.out.println("Frequency of Occurence of Diseases");
          System.out.println();
      Class.forName("sun.jdbc.odbc.JdbcOdbcDriver").newInstance();
         con=DriverManager.getConnection("jdbc:odbc:db_diagnosis");
          stmt=con.createStatement();
          rst=stmt.executeQuery("select dis_name,COUNT(*) as count
  from statistics group by dis_name");
      while(rst.next())
      {
      %>
      <tr>
         <td><p><%=rst.getString("dis_name")%></p></td>
      <td><p><%=rst.getInt("count")%></p></td>
      <%
      }
               }
        catch(Exception e)
                {
                  System.out.println(e);
                 }
      %>
</tr></table></body></html>
```

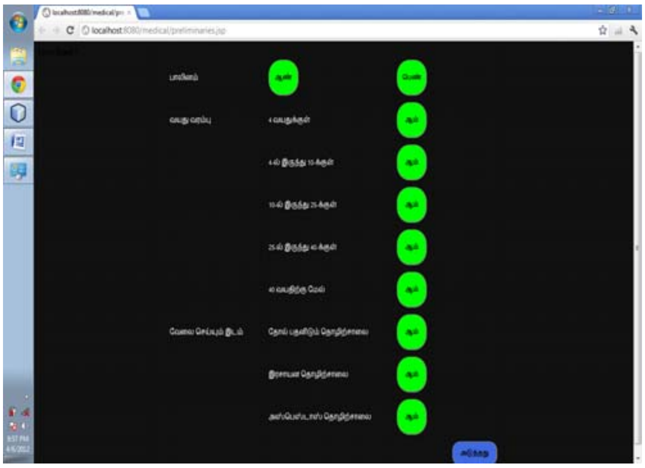
### 7.2 Snap Shots



நீங்கள் ஏதாவது நோயைப்பற்றி தெரிந்துகொள்ள விரும்புகிறீர்களா ?

உங்களுக்கு உடல்ரீதியாக பிரச்சனைகள் உள்ளதா ? என்ன நோயாக இருக்கும் என்று அறிய விரும்புகிறீர்களா ?

Fig. 7.2.1 Starting of the application



பாலினம்

வயது வரம்பு: 4 வயதுக்குள்; 4-லிருந்து 10-க்குள்; 10-லிருந்து 25-க்குள்; 25-லிருந்து 40-க்குள்; 40 வயதிற்கு மேல்

வேலை செய்யும் இடம்: தோல் பதனிடும் தொழிற்சாலை; இரசாயன தொழிற்சாலை; அஸ்பெஸ்டாஸ் தொழிற்சாலை

Fig. 7.2.2 Collection of preliminary details

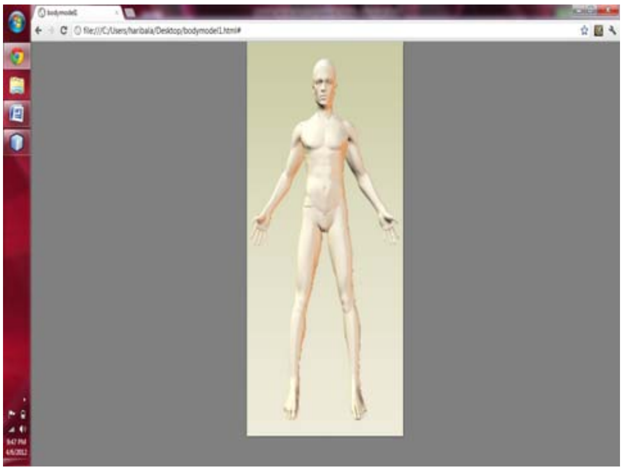


Fig. 7.2.3 Human Body Model – Before Selection of body part

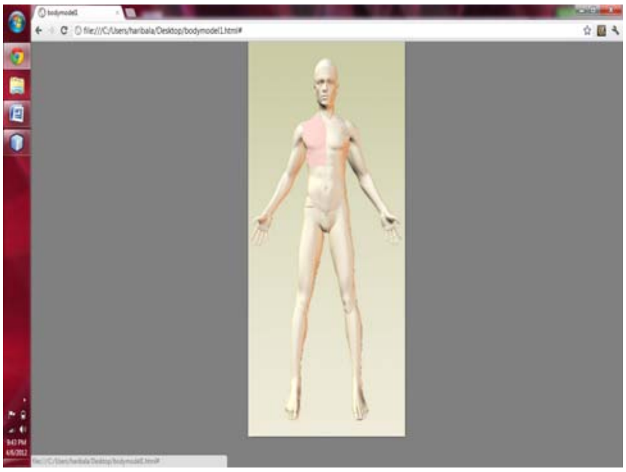
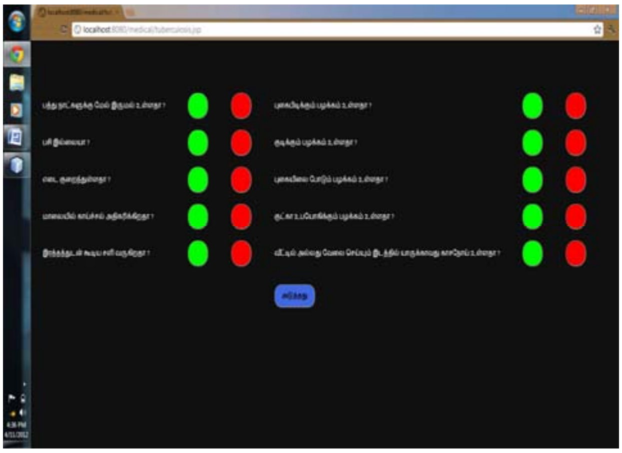


Fig. 7.2.4 Human Body Model – After Selection of body part



localhost:8080/medical/tuberculosis.jsp

பத்து நாட்களுக்கு மேல் இருமல் உள்ளதா ?

பசி இல்லையா ?

எடை குறைந்துள்ளதா ?

மாலையில் காய்ச்சல் அதிகரிக்கிறதா ?

இரத்தத்துடன் கூடிய சளி வருகிறதா ?

புகைபிடிக்கும் பழக்கம் உள்ளதா ?

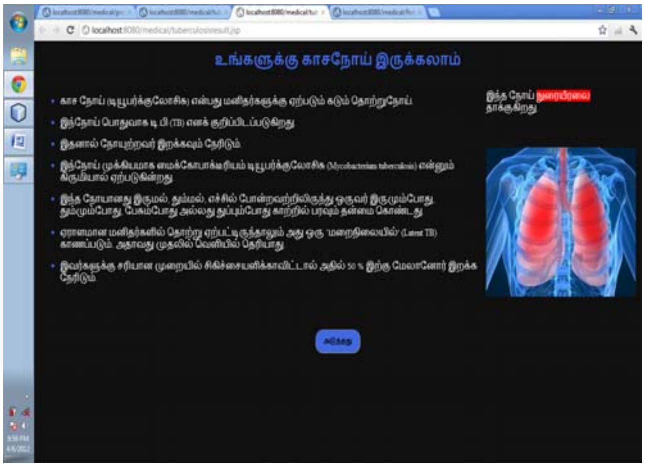
குடிக்கும் பழக்கம் உள்ளதா ?

புகையிலை போடும் பழக்கம் உள்ளதா ?

குட்கா உபயோகிக்கும் பழக்கம் உள்ளதா ?

வீட்டில் அல்லது வேலை செய்யும் இடத்தில் யாருக்காவது காசநோய் உள்ளதா ?

Fig. 7.2.5 Questionnaire of a particular disease



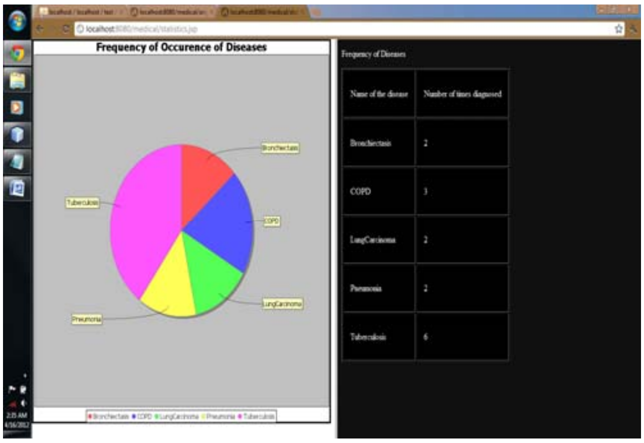
localhost:8080/medical/tuberculosisresult.jsp

உங்களுக்கு காசநோய் இருக்கலாம்

- காச நோய் (டியூபர்க்குலோசிஸ்) என்பது மனிதர்களுக்கு ஏற்படும் கடும் தொற்றுநோய்
- இந்நோய் பொதுவாக டி பி (TB) எனக் குறிப்பிடப்படுகிறது
- இதனால் நோயுற்றவர் இறக்கவும் நேரிடும்
- இந்நோய் முக்கியமாக மைக்கோபாக்டீரியம் டியூபர்க்குலோசிஸ் (Mycobacterium tuberculosis) என்னும் கிருமியால் ஏற்படுகின்றது
- இந்த நோயானது இருமல், தும்மல், எச்சில் போன்றவற்றிலிருந்து ஒருவர் இருமும்போது, தும்மும்போது, பேசும்போது அல்லது துப்பும்போது காற்றில் பரவும் தன்மை கொண்டது
- ஏராளமான மனிதர்களில் தொற்று ஏற்பட்டிருந்தாலும் அது ஒரு 'மறைநிலையில்' (Latent TB) காணப்படும். அதாவது முதலில் வெளியில் தெரியாது
- இவர்களுக்கு சரியான முறையில் சிகிச்சையளிக்காவிட்டால் அதில் 50 % இற்கு மேலானோர் இறக்க நேரிடும்

இந்த நோய் நுரையீரலை தாக்குகிறது

Fig. 7.2.6 Result displaying the details of the diagnosis

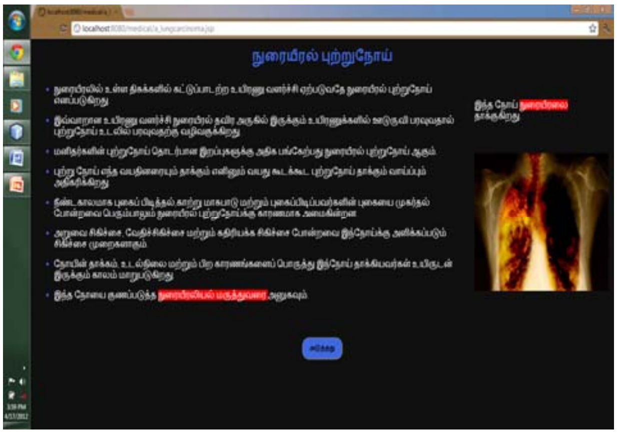

Frequency of Occurence of Diseases
Bronchiectasis
COPD
LungCarcinoma
Pneumonia
Tuberculosis
● Bronchiectasis ● COPD ● LungCarcinoma ● Pneumonia ● Tuberculosis

localhost:8080/medical/statistics.jsp

Frequency of Diseases

| Name of the disease | Number of times diagnosed |
|---|---|
| Bronchiectasis | 2 |
| COPD | 3 |
| LungCarcinoma | 2 |
| Pneumonia | 2 |
| Tuberculosis | 6 |

Fig. 7.2.7 Chart showing the proportion of each diagnosed so far in a locality

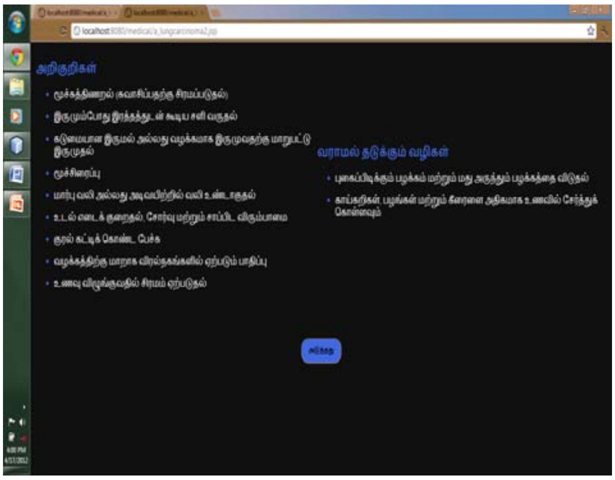


நுரையீரல் புற்றுநோய்

- நுரையீரலில் உள்ள திசுக்களில் கட்டுப்பாடற்ற உயிரணு வளர்ச்சி ஏற்படுவதே நுரையீரல் புற்றுநோய் எனப்படுகிறது
- இவ்வாறான உயிரணு வளர்ச்சி நுரையீரல் தவிர அருகில் இருக்கும் உயிரணுக்களில் ஊடுருவி பரவுவதால் புற்றுநோய் உடலில் பரவுவதற்கு வழிவகுக்கிறது
- மனிதர்களின் புற்றுநோய் தொடர்பான இறப்புகளுக்கு அதிக பங்கேற்பது நுரையீரல் புற்றுநோய் ஆகும்
- புற்று நோய் எந்த வயதினரையும் தாக்கும் எனினும் வயது கூடக்கூட புற்றுநோய் தாக்கும் வாய்ப்பும் அதிகரிக்கிறது
- நீண்டகாலமாக புகைப் பிடித்தல், காற்று மாசுபாடு மற்றும் புகைப்பிடிப்பவர்களின் புகையை முகர்தல் போன்றவை பெரும்பாலும் நுரையீரல் புற்றுநோய்க்கு காரணமாக அமைகின்றன
- அறுவை சிகிச்சை, வேதிச்சிகிச்சை மற்றும் கதிரியக்க சிகிச்சை போன்றவை இந்நோய்க்கு அளிக்கப்படும் சிகிச்சை முறைகளாகும்
- நோயின் தாக்கம், உடல்நிலை மற்றும் பிற காரணங்களைப் பொருத்து இந்நோய் தாக்கியவர்கள் உயிருடன் இருக்கும் காலம் மாறுபடுகிறது
- இந்த நோயை குணப்படுத்த நுரையீரலியல் மருத்துவரை அணுகவும்.

இந்த நோய் நுரையீரலை தாக்குகிறது

Fig. 7.2.8 Awareness of a disease part 1



அறிகுறிகள்

- மூச்சுத்திணறல் (சுவாசிப்பதற்கு சிரமப்படுதல்)
- இருமும்போது இரத்தத்துடன் கூடிய சளி வருதல்
- கடுமையான இருமல் அல்லது வழக்கமாக இருமுவதற்கு மாறுபட்டு இருமுதல்
- மூச்சிரைப்பு
- மார்பு வலி அல்லது அடிவயிற்றில் வலி உண்டாகுதல்
- உடல் எடைக் குறைதல், சோர்வு மற்றும் சாப்பிட விரும்பாமை
- குரல் கட்டிக் கொண்ட பேச்சு
- வழக்கத்திற்கு மாறாக விரல்நகங்களில் ஏற்படும் பாதிப்பு
- உணவு விழுங்குவதில் சிரமம் ஏற்படுதல்

வராமல் தடுக்கும் வழிகள்

- புகைப்பிடிக்கும் பழக்கம் மற்றும் மது அருந்தும் பழக்கத்தை விடுதல்
- காய்கறிகள், பழங்கள் மற்றும் கீரைகளை அதிகமாக உணவில் சேர்த்துக் கொள்ளவும்

Fig. 7.2.9 Awareness of a disease part 2

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2.P.J.Mehta's Practical Medicine for students and practitioners by Late Dr.Pradip J. Mehta, 14th Edition, Distributed by The National Book Depot, Mumbai.

3.http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2247971/pdf/procascamc00001-0434.pdf

4.http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4731125&abstractAccess=no&userType=inst