

# A Web Based Fuzzy Expert System for Epistaxis Diagnosis

Mrs. Chanchal Sharma  
Computer Science Department  
SDBCT Indore (M.P.), India

Mr. Tejalal Choudhary  
Computer Science Department  
SDBCT Indore (M.P.), India

**Abstract**—Fuzzy expert system has shown a remarkable system for building of intelligent decision making systems based on expert's knowledge and observations. This work presents an approach for the treatment of patients on the basis of fuzzy rules applied on symptoms that seen in patient. For the identification of disease Epistaxis, firstly fuzzy rules applied based on the symptoms selected by the patient and secondly for the improvement of developed system, expert learning system is proposed by which disease diagnosis accuracy has been enhanced. Through expert learning system, experience Doctors with their knowledge and with the system for enhance the probability of finding disease more accurately. Finally, a system named "Disease Diagnosis" has to be developed for showing the proposed work and our results shows improved interpretation accuracy in diagnosis of epistaxis in patient .

**Keywords**—Fuzzy expert system, Decision making system, Expert learning, Epistaxis

## I. INTRODUCTION

Traditionally to diagnose diseases, a physician is usually based on the clinical history and physical examination of the patient, examining of medical images, as well as the results of laboratory tests. As technology grows day by day with standardization in many fields, still medical diseases diagnosis is considered as an art of doctor's experience only. In medical diagnosis, the person's pathological status is determined with the help of available set of knowledge and the patient's symptoms. It is still an art only because diagnosis is a complex problem and depends on many factors, and its solution still depends on the doctor's abilities that include intuition. Various attempts are made by researchers to make an information technology system which can help in diagnosis of medical problems [1].

Computer-based methods are increasingly used to improve the quality of medical services. Rule based expert system will be used for Medical diagnosis that includes both conventional techniques, such as database management systems, and artificial intelligence (AI) techniques, such as knowledge-based systems or expert systems [2].

With the study about diseases and diagnosis it is observed that it is more difficult to diagnose the patient rather than to

Cure it. For our study, we focus on Epistaxis disease, identify the symptoms and diagnosis them. The current work focuses on assisting doctors for diagnosis of Epistaxis with their respective symptoms and develop a computer expert system for diagnosis of Epistaxis.

## II. DISEASE INFORMATION

In our study, we focus on Epistaxis disease. The complete information about disease is given below:

### EPISTAXIS

Epistaxis is defined as bleeding from the nose, or Epistaxis – nosebleed that means "which is leaking on, drop by drop"

It is a disease that has been a part of the human experience from earliest times. Nosebleeds may be either anterior or posterior in origin. Of the two categories of epistaxis, mundane and severe, the mundane, usually anterior epistaxis is the more common.. Occasionally patients present with severe, life-threatening epistaxis arising from the larger vessels in the posterior and superior nasal cavity. Such bleeds occur primarily in older patients, often with significant co morbidities. Then the bleeding compromises the patient's airway and results in hemodynamic instability. Management can be complex and severely tax the health care provider especially if he is not an otolaryngologist [16]

With anterior nosebleeds blood exits almost entirely from the anterior portion of the nose. With posterior nosebleeds, most of the bleeding occurs in the nasopharynx and mouth, although some blood exits through the anterior nose as well. Posterior epistaxis are often more severe and more difficult to control, and patients may present in a hemodynamically unstable condition as written before. Patients with bleeding disorders may have recurrent nosebleeds and a history of prolonged bleeding, easy bruisability, or multiple bruises in unlikely locations. Alternatively, some patients who present with hematemesis have vomited swallowed nasal blood. [16]

some of the symptoms are Trauma (most common) , Nasal dryness ,Septal perforation, Chemical ,Tumours ,Inflammation Coagulopathies, Granulomatous disorders , Intoxications and Vascular.

In children, most have a history of bleeding at home and minimal or no bleeding at all at the time of presentation. Parents and children, who are often frightened by nose-bleeds, frequently overestimate the amount of blood lost. Such bleeds occur primarily in older patients, often with significant comorbidities. Then the bleeding compromises the patient's airway and results in hemodynamic instability. *In children*, most have a history of bleeding at home and minimal or no bleeding at all at the time of presentation. Parents and children, who are often frightened by nose-bleeds, frequently overestimate the amount of blood lost. [16]

### III. BACKGROUND STUDY

To solve the real world complex problem, Expert System is one of the most common applications of artificial intelligence. It is a computer program that simulates the decision and actions of a person or an association that has specialist facts and experience in a particular field. Normally, such a system contains a knowledge base containing accumulated experience and a set of rules for applying the knowledge base to each particular situation. The major features of expert system are user interface, data representation, inference, explanations etc. Advantages of expert system are increased reliability, reduced errors, reduced cost, multiple expertise, intelligent database, reduced danger etc. Disadvantages of expert system are absence of common sense and no change with changing environment [2].

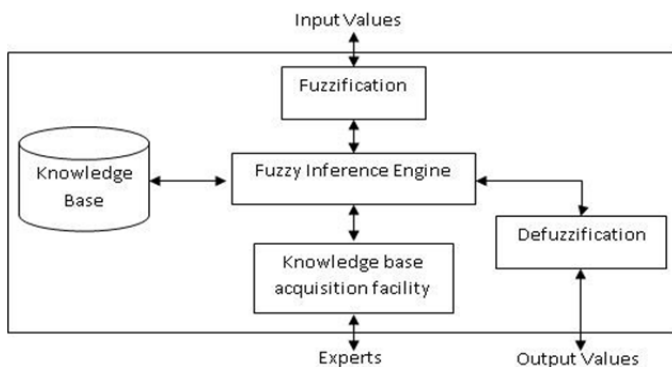


Fig 2.1 FUZZY EXPERT SYSTEM

The components of fuzzy expert system are illustrated in Fig 2.1. In the components of fuzzy expert system, the knowledge base used for the storage of all relevant information like data statics, rules that govern the data, different cases, and their relationships used by expert system. A knowledge database can be used to combine data / knowledge of multiple experts around the world. Rules define the conditional statement that can generate outcomes from different kind of possible conditions. Another important component in fuzzy expert system is fuzzy inference engine

that defines relationships and extract information from the knowledge database and predicts suggestions, answers and probability of finding disease just like expert would do. The inference rules defined inside inference engine must matches with right knowledge base information and so that prediction also goes in the right direction. The next important component of fuzzy expert system is knowledge base acquisition facility. Knowledge base acquisition facility provides efficient and convenient means for gathering and storing knowledge of experts around the world in a corrected way under knowledge base.

Fuzzy logic was introduced first in the year 1965 by Zadeh. His paper on fuzzy sets gave an insight into a kind of logic which is finding an increasing usage in day to day lives. It is a form of multi-valued logic and deals with reasoning. The imprecision of human reasoning needed to be more efficiently handled. In 1971, Zadeh published the concept of quantitative fuzzy semantics which in turn led to the methodology of fuzzy logic and its applications. Fuzzy logic has been applied to many fields ranging from control applications to artificial intelligence. A wide variety of medical applications where its usage is significantly felt include cardiac, neural, lung and diabetes [3].

Mir Anamul Hasan, Khaja Md. Sher-E-Alam & Ahsan Raja Chowdhury In [4] author describe a project work of fuzzy expert system for diagnosing the human diseases, which used to exchange the health information between health care professionals and patients. Author makes a comparative analysis to identify which symptoms are major symptoms for particular diseases, then the uniform structure is made mathematical equivalence is formed which will be used to diagnosis by the fuzzy expert system. Based on the selection of problem area, expert system give symptom from which user needs to select symptoms. Now user has to answer some question that based on the knowledge and add some catalyst factor than on the basis of IF-THEN rule the expert system computes the probabilities of problem diseases and filter before showing. The proposed system is experimented on various scenarios and satisfactory results have been achieved. The system can be used by patient and practitioners for their betterment.

Another work was done by Dipanwita Biswas, Sagar Bairagi, Neelam Panse & Nirmala Shinde in paper titled "Disease diagnosis system" [5]. In this work they developed an expert system for human disease diagnosis. It works on the patient data by combining production rules and a neural network. This results in increase in knowledge representation and maintenance. They used Matlab for system design and they get satisfactory results. For future aspects training of the system can be added to improve the quality of the system. Some more patient data can be used for increasing the system utilization.

Ali.Adeli, Mehdi.Neshat works for the Heart Disease Diagnosis using Fuzzy Expert System [6]. They take database for the system from the Cleveland Clinic Foundation and V.A.

Medical Center, Long Beach. System has 13 inputs and one output. Mamdani inference method is used for calculating the output. Input fields include chest pain type, blood pressure, cholesterol, resting blood sugar, maximum heart rate, resting electrocardiography (ECG), exercise, old peak (previous ST depression induced in patients by exercise relative to rest), thallium scan, sex and age. Basically this system identifies the presence of any heart related disease in the patient the software is designed in Matlab. The system is used and tested by the expert cardiologist and they get 94% result.

Chang-Shing Lee, Senior Member, IEEE, and Mei-Hui Wang [8] shows that all the previous ontologies cannot handle sufficiently and imprecisely, the knowledge available for some of the real world applications due to uncertainty, but with the help of fuzzy ontology, the problem on uncertainty in knowledge and data can be resolve efficiently. They work for diabetes diseases decision support application and developed a novel fuzzy expert system to demonstrate it. Their proposed work compromises of five layers fuzzy expert system that includes knowledge layer, group relation layer, group domain layer, personal relation layer and personal domain layer. These entire layers are used to describe the uncertainty in the knowledge. They apply fuzzy ontology to diagnosis diabetes diseases and developed structure which uses diabetes knowledge. They also developed semantic decision support system, knowledge construction mechanism, semantic fuzzy decision making and generating mechanism. Their proposed system work efficiently for diabetes patients with their decision support application. They conclude that, although the proposed fuzzy expert system can model diabetes domain knowledge, the approach apply for fuzzification in the fuzzy expert system is more important. Their future works defines similar models for other diseases data set or different domain with uncertain information can be constructed with similar fuzzy ontology defined herein with modifying fuzzy inference rules, domain knowledge dataset and learning mechanism.

Omer Dizdar, Ibrahim Koral, Engin Ozakin, Evvah Karakilic, Omer Karadag, Umut Kalyoncu, Fien Coskun and Yahya Buyukasik "Research for bleeding tendency in patients presenting with significant epistaxis," published in BLOOD COAGULATION AND FIBRINOLYSIS [12] In this article the association of inherited coagulopathies, hypertension, aspirin  
And other conditions are defined with the emergency department admission due to epistaxis . It provide the data of patients admitted to the emergency department with epistaxis.

B. Bertrand, Ph. Eloy, Ph. Rombaux\*, C. Lamarque, J. B. Watelet, S. Collet. ENT and HNS Department, Catholic University of Louvain, Cliniques Universitaires UCL de Mont-Godinne, Yvoir, Cliniques Universitaires Saint-Luc, Brussels; ORL Department, Cliniques Saint-Luc, Bouge; ENT and HNS Department, University of Ghent, UZ Gent, Ghent "Guidelines to the management of epistaxis "B-ENT, 2005, 1, Suppl. 1, 27-43 [13] Epistaxis has two major cause one is local cause and other is systematic cause Local cause include Trauma (most common) :-Fracture(s): facial and nasal, of bone(s) and / or cartilage(s) Self-induced digital trauma, foreign body Iatrogenic: nasal / sinus / orbital / skull base surgery ,Barometric changes Nasal dryness :- combination of dry air, septal deformities ,Septal perforation Chemical:- Cocaine abuse Nasal sprays (both steroids and

decongestants) Ammonia ,Others: gasoline, phosphorus, chromium salts, sulfuric acid, etc. Tumours :-Benign: polyps, inverting papilloma, juvenile nasal angiofibroma, septal angioma ,Malignant: squamous cell carcinoma, esthesioneuroblas-toma Inflammation :-Rhinitis: allergic, non allergic Sinusitis Infections: bacterial, viral, fungal Systemic causes include Coagulopathies :-Anticoagulant use: coumadin, heparin ,NSAIDS, aspirin ,Hemophilia ,Von Willebrandt disease, Platelet defects Catamenial and pregnancy ,Hepatic insufficiency and alcohol Scurvy, Hemorrhagic fever (Dengue, Ebola, ...)Granulomatous disorders Wegener's disease, Mid face granuloma ,Sarcoidosis ,Syphilis ,Tuberculosis, Rhinoscleroma Systemic lupus ,erythematosus ,Periarthritis nodosa, Intoxications:- cobalt, phospho-rus, arsenic, lead Vascular:- Hypertension, Circadian, onset Atherosclerosis ,Osler-Weber- Rendu disease or hereditary hemorrhagic telangiectasia (HHT) ,Idiopathic causes

Varinder Pabbi Department of Computer Sciences, Ramgarhia Institute "Fuzzy Expert System for Medical Diagnosis "International Journal of Scientific and Research Publications, Volume 5, Issue 1 January 2015 ISSN 2250-3153 [14]The output of the thesis is coming out to be more reliable and dependable as they have used the fuzzy approach to diagnose the dengue disease. Till date the best work done in this field was of "A New Intelligence - Based Approach for Computer-Aided. Diagnosis of Dengue Fever" who had work upon probabilistic model to predict the occurrence or the non-occurrence of dengue for a patient based on the symptoms generated. This paper suggests that an almost 100% accurate in predicting the type of dengue fever. As per the actual data matched with the results generated by the training tool, it was found that 95+ % of the results generated by the tool were similar to the actual data of the patients. However it may not be the best result but it is sufficient to prove the working.

All these studies was related with the disease diagnosis shows that there are many type of uncertain information which a doctor have to process by their intelligence for diagnosis of a particular disease and all the existing systems were developed for a specific type of disease, and also there is a chance of improvement in accuracy as well.

#### IV. PROBLEM DEFINITION

Researchers said that even the very good doctors in their fields having years and years of Experience are not able to detect the disease quickly and efficiently. He may require multiple feedbacks from the patient for the diagnosis of particular disease. It is always difficult to detect the disease more accurately and speedily. The main key problem identified behind any mis-diagnose of disease are stated below:-

- Lack of communication: - Patient may not able to communicate well with the doctors, hence not giving the right symptoms persisting to them. This can lead to wrong diagnosis of the patient.
- Lack of experience- Doctors to deal with complex disease epistaxis whose diagnosis is very difficult to?
- Lack of pathological test

V. PROPOSED SYSTEM

The objective of the proposed system is to help the physician or doctors for the diagnosis of the Epistaxis disease everywhere around the world where expert’s doctors will be not available. The proposed system diagnosis the complex disease with the help of uncertain information provided by the patients and using the knowledge dataset by expert doctor .

*Disease Diagnosis = (experience of the doctors treating the patient in real world) + (experience of doctor and update the machine)*

Where,

- Experience = data, facts and statistics.
- Experience of the doctor treating the patient in real world = his own data and statistics which is stored in his own brain.
- Experience of all the doctors by expert learning approach of AI

The proposed architecture for the diagnosis of Epistaxis disease shown in Fig 2.1 consists of two main phases. The phase 1 is used for the diagnosis of the disease and the phase 2 is used for the expert learning system where expert doctors can update their machine with knowledge for the improvement of the system.

In phase 1 of proposed system, there are three main stages where fuzzy rules are applied for the stages are:

- Stage 1: - (Symptoms Identification) Where disease symptoms will be selected by the user which patient has to be expecting.
- Stage 2: - (Disease Identification) Medical counseling will be done,by asking question for disease .
- Stage 3: - (Percentage Affected Identification) Based on disease identified, questionnaire is ask by the tools by which calculation will be done giving maximum probability of the disease which patient have suffering from.

In phase 2, Expert Learning System is proposed where expert Doctors can share their knowledge with the system using their authentications

**EPISTAXIS**

Stage 1: - Following are the disease symptoms which are commonly misdiagnosed:

- Trauma (most common)
- Nasal dryness
- Septal perforation
- Chemical
- Tumours
- Inflammation
- Coagulopathies
- Granulomatous disorders
- Intoxications
- Vascular

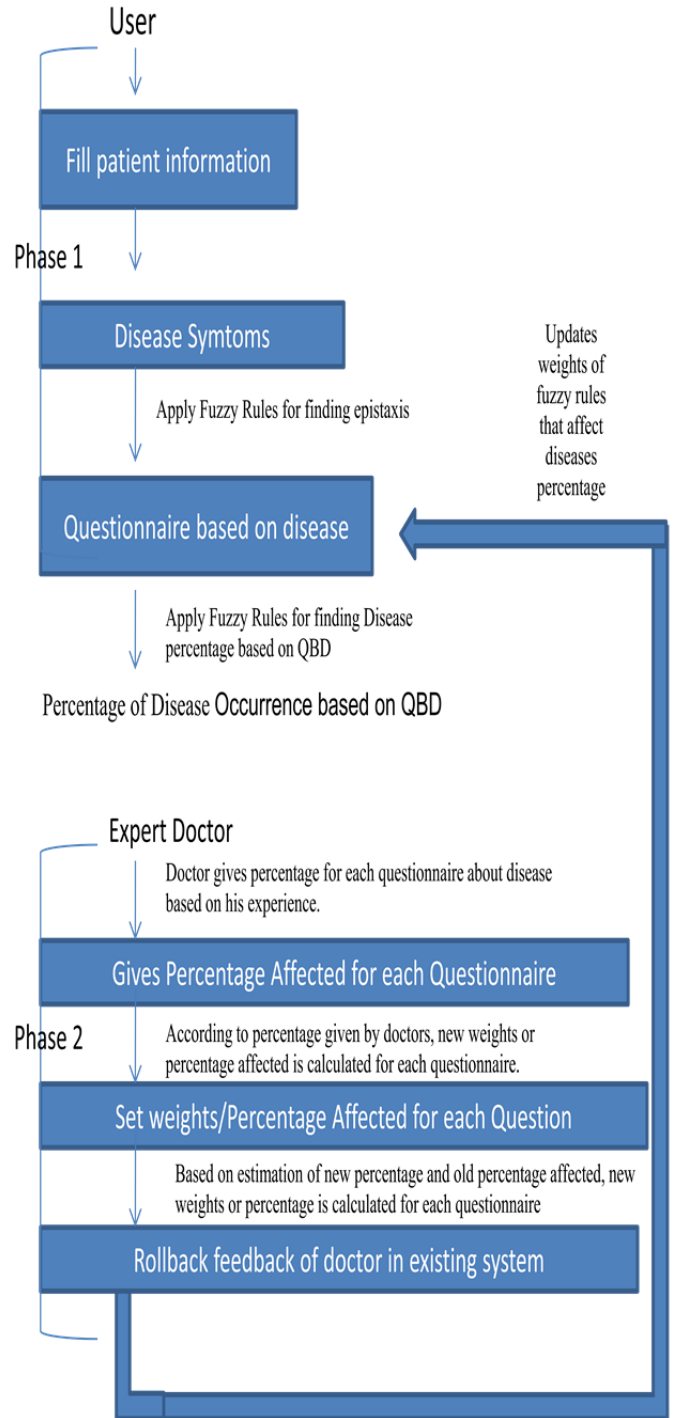


Fig. 2.1 FUZZY EXPERT SYSTEM FOR EPISTAXIS

After entering the above disease symptoms patient will move to the second stage of diagnosis.

Stage 2: - Questions are asked by the patient based on the symptoms selection in stage 1. These questionnaires will be contributing towards the finding of the percentage of disease in the patient.

**Questions: Filtration of Symptoms**

1. Do you have any nasal injury?
2. Whether any foreign particle invaded in nose?
3. Do you suffering from sinus problem?
4. Do you taking any treatment for nasal surgery?
5. An optimal range of humidity was found regardless of the ambient temperature.
6. Whether you did nose piercing?
7. Have u taken drugs such as cocaine?
8. Have you taken chemicals?
9. Are you allergetic to some chemical?
10. Are you working with paints?
11. Have you used Nasal Sprays?
12. Are you suffering from any disease?
13. Do you have cancer or Malignant tumours?
14. Do you have allergy?
15. Are you suffering from fungal infection?
16. Are you addicted to alcohol?
17. Are you taking treatment of dialysis?
18. Any accident has occurred to you?
19. Are you suffering from hereditary disease?
20. Do you have lung infection?
21. Have you taken chemicals?
22. Do you have allergy?
23. Do you have high BP?
24. Platlet formation takes place or not?

- Q.6 Whether you did nose piercing?  
IF (piercing = true) then  
x6 = 2.60 % Chance of Epistaxis
- Q.7 Have u taken drugs such as cocaine?  
IF (cocaine = true) then  
x7 = 2.3 % Chance of Epistaxis
- Q.8 Have you taken chemicals?  
IF (chemicals = true) then  
x8= 2 % Chance of Epistaxis
- Q.9 Do you have any nasal injury?  
IF (nasal injury = true) then  
x9 = 2 % Chance of Epistaxis
- Q.10 Platelet formation takes place or not?  
IF (Platelet formation takes place = true) then  
x25 = 21 % Chance of Epistaxis
- Q.11 Are you allergetic to some chemical?  
IF (allergetic = true) then  
x11 = 2 % Chance of Epistaxis
- Q.12 Are you working with paints?  
IF (paints = true) then  
x12 = 1 % Chance of Epistaxis

Diseases Identification (Q.n) = For all n = 1 to 24, listed above

If yes, Found Epistaaxis

If no, Epistaxis is not found

Stage 3: - Based on the results of stage 2, questions from the stage 3 asked to the patients. This questionnaire helps in identifying the probability in terms of percentage of diseases the patient may have.

Q.1 Do you have any nasal injury?  
IF (nasal injury = true) then  
x1 = 3 % Chance of Epistaxis

Q.2 Whether any foreign particle invaded in nose?  
IF (foreign particle = true) then  
x2 = 2.5 % Chance of Epistaxis

Q.3 Do you suffering from sinus problem?  
IF (sinus problem = true) then  
x3 = 2% Epistaxis

Q.4 Do you taking any treatment for nasal surgery?  
IF (nasal surgery = true) then  
x4 = 2 % Chance of Epistaxis

Q.5 An optimal range of humidity was found regardless of the ambient temperature.  
IF (range of humidity = true) then  
x5 = 8 % Chance of Epistaxis

Q.13 Have you used Nasal Sprays?  
IF (Nasal Sprays = true) then  
x13= 2 % Chance of Epistaxis

Q.14 Are you suffering from any disease?  
IF (any disease = true) then  
x14 = 2 % Chance of Epistaxis

Q.15 Do you have cancer or Malignant tumours?  
IF (cancer or Malignant tumours = true) then  
x15= 7.8 % Chance of Epistaxis

Q.16 Do you have allergy?  
IF (allergy = true) then  
x16 = 4 % Chance of Epistaxis

Q.17 Are you suffering from fungal infection?  
IF (fungal infection = true) then  
x17 = 6 % Chance of Epistaxis

Q.18 Are you addicted to alcohol?  
IF (addicted to alcohol = true) then  
x18= 4 % Chance of Epistaxis

Q.19 Are you taking treatment of dialysis?  
IF (dialysis = true) then  
x19 = 3 % Chance of Epistaxis

Q.20 Any accident has occurred to you?  
IF (accident = true) then  
x20= 3 % Chance of Epistaxis

Q.21 Are you suffering from hereditary disease?

IF (hereditary disease = true) then  
 $x_{21} = 5\%$  Chance of Epistaxis

Q.22 Do you have lung infection?  
 IF (lung infection = true) then  
 $x_{22} = 10\%$  Chance of Epistaxis

Q.23 Do you have allergy?  
 IF (allergy = true) then  
 $x_{23} = 2\%$  Chance of Epistaxis

Q.24 Do you have high BP?  
 IF (high BP = true) then  
 $x_{24} = 18\%$  Chance of Epistaxis

- Patient Information
- Disease Symptoms Selection
- Disease Probability Questionnaire
- Results showing chance of disease in terms of percentage.

The design of phase 2 contains the web pages for expert learning system. They are as follows:

- Login Page
- Registration Page
- Expert Learning Page
- Logout Page

Execution of Phase 1 (For Diseases Diagnosis):

- a. Diagnosis of disease starts with the input the basic information about the patient.
- b. After that user of the system select disease symptoms under the supervision of some consultant.
- c. Based on symptoms selection, system asked some question for the confirmation about the disease. User has to give answers of the following question.
- d. Based on the answers of the relevant disease questions, probabilities for particular disease are identified and result is shown to the user.

Execution of Phase 2 (Expert Learning System):

- a. Learning phase starts with the registration and or login process of the expert doctors that authenticate the expert Doctors.
- b. Once authenticated, Doctor has to go on learning page of the system.
- c. On the learning page, Doctors has to give percentage affected based on the experience he/she have, for each questionnaire asked by the system
- d. Once percentage affected was filled by the Doctor, system will calculate new weights/percentage affected for each questionnaire.
- e. The new weights/percentage then used for further diagnosis of the patient.

The executions of both the phases are separate with each other, but share the common knowledge dataset. Phase 2 updates the knowledge dataset and phase1 used the knowledge dataset for the diagnosis of the disease.

As there are two main phases of our proposed system, each phase has been analyzed and experimentally tested. For the proposed system, two main tests conducted, one for each phase of the system, the first test for the phase 1 i.e., disease diagnosis phase, where patient with doctor or physician would input values in the system for a specific case and then system predict about the disease are present or not in the patient, and the second test for the phase 2 i.e. training phase, where training of the knowledge dataset of the proposed system has been carried out with the help of expert doctors. To optimize the proposed system performance, some parameters were modified to achieve relationship between both the phases and also reflect their effects on the overall proposed system performance. Finally, the optimized set of input output parameters are selected and used for future diagnosis of disease in the systems.

The crisp answers of patients, fuzzy values and the linguistic values of each question are shown in table 1.

Question	Max value	Answer	Fuzzy variable/(fv)(x)	Linguistic Variable
1	8	3	0.37	low
2	8	6	0.75	high
3	4	4	1	Very high
4	5	1	0.2	Very low
5	8	3	0.37	low
6	8.5	3	0.35	low
7	8.5	2	0.23	low
8	12.5	6	0.48	middle
9	2.5	1	0.4	middle
10	35	12	0.34	low

#### Probability of Expected Disease

Probability of expected disease shows the chances of disease in terms of percentage for a particular patient may have. Based on the diagnosis of disease in stage 3 for disease, probability is calculated in terms of percentage using the formula below:

$$\text{Probability of expected disease} = (x_1\% + x_2\% + \dots + x_n\%)$$

Where,  $x_1, x_2, x_3, \dots, x_n$  are percentage of disease found in stage 3.

#### Expected Benefits

The expected benefits of this research are a prototype expert system for diagnosis of epistaxis disease, which will be helpful for:

- An assistant or advice for relevant person and expertise in above mention diseases.
- Precise identification of the disease mention above.

### VI. IMPLEMENTATION & RESULT ANALYSIS

The system is design as with user friendly GUI, while keeping in mind to use it as simple as possible and without any extra information. If user just wants to diagnosis disease then he/she also not has to register as well with the system. The system contains two separate phases, one for the disease diagnosis and second for the expert learning through expert doctors. The design of phase 1 contains the web pages for disease diagnosis. They are as follows:

Based on the results obtained, it is clearly found that the developed Fuzzy Expert System gives excellent achievements using training dataset and achieved maximum accuracy while diagnosis the disease for a patients.

## VII. CONCLUSION

The objective of this research work is to develop a expert system for the diagnosis of Epistaxis. It will help mankind by helping doctors with expert knowledgeable. Hence a genuine work has been carried out in this field by developing a web based application, combing all the experience in the form of data and statistics. It will also important that cost of diagnosis should be as low as possible. This website can act as an interface between a poor people for diagnosis of disease and provides a better diagnosis about a disease. It is always in learning stage as well. So the system gives best result in diagnosis disease as the knowledge of the developed system is increases as with doctor share their knowledge with it. It indicates the system always gives better results for the diagnosis of disease with time. Future works should test fuzzification approach used here for other tasks similar to our work, or for other complex diseases datasets available to evaluate capability of the system for producing similar accuracy.

## REFERENCES

- [1] Jimmy Singla, "The Diagnosis of Some Lung Diseases in a PROLOG Expert System", International Journal of Computer Applications, Sep 2013, Vol. 78, No. 15, Page No. 37-40.
- [2] Mohammed Abbas Kadhim, M. Afshar Alam, Harleen Kaur, "Design and Implementation of Fuzzy expert System of Back Pain Diagnosis", International Journal of Innovative technology & Creative Engineering, Sep 2011, Vol. 1, No. 9, Page No. 16-22.
- [3] S. Krishna Anand, R. Kalpana and S. Vijayalakshmi, "Design and Implementation of a Fuzzy Expert System for Detecting and Estimating the Level of Asthma and Chronic Obstructive Pulmonary Disease", Middle-East Journal of Scientific Research, 2013, ISSN 1990-9233, Vol. 14 No. 11, Page No. 1435-1444.
- [4] Mir Anamul Hasan ,Khaja Md Sher-E-Alam and Ahsan Raja chowdhury "Human Disease Diagnosis Using a fuzzy expert System" Journal of computing, June 2010, Vol.2, Issue 6.
- [5] Dipanwita Biswas, Sagar Bairagi , Neelam Panse & Nirmala Shinde, "Disease Diagnosis System", International Journal of Computer Science & Informatics, 2011, Volume-I, Issue-II
- [5] [6] Ali.Adeli, Mehdi.Neshat, "A Fuzzy Expert System for Heart Disease Diagnosis", International MultiConference of Engineers and Computer Scientists, 2010, Vol. I.
- [6] P.K. Anooj, "Clinical decision support system: Risk level prediction of heart disease using weighted fuzzy rules", Journal of King Saud University - Computer and Information Sciences, January 2012, Volume 24, Issue 1, Page No. 27-40.
- [7] Chang-Shing Lee, Senior Member, IEEE, and Mei-Hui Wang, "A Fuzzy Expert System for Diabetes Decision Support Application", IEEE Transactions on Systems, Man, and Cybernetics – Part B: Cybernetics, Feb 2011, Vol. 41, No. 1.
- [8] Mohammad A. M. Abushariah, Assal A. M. Alqudah, Omar Y. Adwan, Rana M. M. Yousef, "Automatic Heart Disease Diagnosis System Based on Artificial Neural Network (ANN) and Adaptive Neuro-Fuzzy Inference Systems (ANFIS) Approaches", Journal of Software Engineering and Applications, 2014, Vol No. 7, Page No. 1055-1064.
- [9] Gudadhe, M., Wankhade, K. and Dongre, S., "Decision Support System for Heart Disease based on Support Vector Machine and Artificial Neural Network", IEEE International Conference on Computer and Communication Technology, Allahabad, Sept 2010, Page No. 741-745.
- [10] Eugena Roventa and George Rosu, "The Diagnosis of Some Kidney Diseases in a PROLOG Expert System", Third international workshop on Soft Computing Application IEEE, 2009.
- [11] Vadrevu Sree Hari Rao, Senior Member, IEEE, and Mallenahalli NareshKumar, "A New Intelligence-Based Approach from Computer-Aided Diagnosis of Dengue fever", IEEE transactions on information technology in biomedicine, Jan 2012, Vol. 16, No. 1, Page No. 112-118.
- [12] Omer Dizdar,Ibrahim Koral, Engin Ozakin, Evvah Karakilic, Omer Karadag, Umut Kalyoncu, Fien Coskun and Yahya Buyukasik "Research for bleeding tendency in patients presenting with significant epistaxis," published in BLOOD COAGULATION AND FIBRINOLYSIS
- [13] B. Bertrand, Ph. Eloy, Ph. Rombaux\*, C. Lamarque, J. B. Watelet, S. Collet. ENT and HNS Department, Catholic University of Louvain, Cliniques Universitaires UCL de Mont-Godinne, Yvoir, Cliniques Universitaires Saint-Luc, Brussels; ORL Department, Cliniques Saint-Luc, Bouge; ENT and HNS Department, University of Ghent, UZ Gent, Ghent "Guidelines to the management of epistaxis "B-ENT, 2005, 1, Suppl. 1, 27-43
- [14] Varinder Pabbi Department of Computer Sciences, Ramgarhia Institute "Fuzzy Expert System for Medical Diagnosis "International Journal of Scientific and Research Publications, Volume 5, Issue 1 January 2015 ISSN 2250-3153