



# DIABETES AND TREATMENT PREDICTION USING AYURVEDIC LITERATURE

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**Abstract:** “Ayurveda – the science of life”, when followed properly, is proved to be much more beneficial and having lesser side effects for the management of various diseases. Diabetes, one of the fastest growing disease, is said to be incurable in many ways. The medicines used currently have a lot of side effects. On the other side the classification based in Ayurveda can be/is used for better management.

The texts that are generally followed have many shlokas, e.g., Charak Samhita- 12000. Thus, to make it easier to obtain required shlokas our platform can be used.

Once the symptoms are entered, the output will be in the form of major type- Pittaja/Vataja/Kaphaja Prameha, subtype and related shlokas of the treatment.

Unlike other apps & websites which you can use to get the output, all of them lack aspects like Disease prediction, treatment from various texts, English meaning, etc. but the platform can be used to get everything at just one place.

**Index Terms - Component, formatting, style, styling, insert.**

## I. INTRODUCTION

### 1.1 OVERVIEW

Lifestyle disorder is a general term given to all diseases which arises because of unhealthy lifestyle. Diabetes is the most common among lifestyle disorders affecting people worldwide. Our country India has fastest growing population of diabetics. As per current statistics the number of diabetics is likely to increase from fifteen million in 1995 to fifty seven million by the year 2025. This will ultimately make our country having maximum number of diabetic patients in the world.

We have traditional wealth of number of herbs and other timely tested medicines which has potency to control diabetes if used properly. This project is an honest effort to enumerate ancient treasure of anti-diabetic treatment modalities mentioned in Ayurveda and its efficacy in context to modern era.

The idiom Ayurveda means the science of life. After thousands of years of the ancient Ayurvedic history, was transmitted from oral to the textual form written in Sanskrit, which has further grown into a medicinal science. We can find so many of the herbs explained in the sutra form for so many diseases. Prameha is one of them and it was explained in a very broad manner.

While the allopathy has developed a lot in terms of technology, Ayurveda is hardly explored. The development in technical field of allopathy has led to increase efficiency in healthcare sector, although the side effects occurring due to the complex medicines can be prevented by using Ayurveda.

## 1.2 MOTIVATION

There is an estimate “one thousand four hundred and thirty lakh” people worldwide are suffering from diabetes, i.e., almost five times more than what was the estimate before ten years. This number might probably be double by the year 2025. In spite of this much high rates of prevalence and increasing prevalence all over the world, scientists are still struggling to search an effective and harmless remedy.

At present, around eighty percent of the population of third world countries which equals sixty four percent of total population is provided health care by traditional medicines and therapies, as per the World Healthcare Organisation. While, Allopathy is enough developed, if we can combine past knowledge and present experience, it will be very useful for future. Most of the traditional therapies are plant based and a large number of these plants are studied to test the claimed activity. In Bhavaprakash Nighantu there are more than thirty single plants have been described for the Pramehaghna activity. It is widely accepted that all the Ayurvedic medicine acts holistically and their action is described in a very broad manner. Diabetes is a complex lifestyle disorder that has pre-symptoms developed in various stages, it affects many systems and organs in the human body, a complex medicine is requires to cure with lesser side effects. Clinical observations, intuitions and analysis, and interpretations based on the Tri-Dosha classification can become the guidelines of cure for Diabetes.

## 1.3 PROBLEM DEFINITION AND OBJECTIVES

Ayurveda truly a way of life globally. As the systems like Digital Health Records or platforms like online healthcare information management web/app are well developed for modern medicines, it can be used as the main tool in gathering data of the patients during regular checkups, OPD and ICUs. Thus there is a demand in Ayurveda to develop such technologies.

Since most of the information about Ayurveda is still in the ancient state of books and not fully available on the internet or in the digital forms it creates a major barrier. Unlike in the allopathic medicine the adaption of the information technology has been from the development phase, most of the data, references are available in the digital media. Even the Ayurvedic practitioners records the Patient data and details on the hard copy and hardly in the health information system.

It is sad to believe that there is little effort which is been done to record it electronically Allopathy and Ayurveda have totally different approaches. Ayurveda works on the health and root cause, has lesser side effects. While, allopathy on the other hand works on symptoms.

### Aim:

Creating a platform useful for ayurvedic practitioners and BAMS students for the cure of diabetes.

### Objectives:

1. Create dataset from ancient ayurvedic books, starting from Charak Samhita, related to prameha commonly known as diabetes
2. Create a model that predicts the type of diabetes and treatment in form of shlokas from input as symptoms.

## 1.4 PROJECT SCOPE & LIMITATIONS

1. The platform created will be used by ayurvedic students, mainly studying BAMS. Only Charak Samhita contains more than 12,000 shlokas. The platform will be useful to search required shloka efficiently, helpful to study.
2. The platform can be used by ayurvedic practitioner. The symptoms of the patients can be searched and the type of the diabetes will be known to the practitioners along with treatment shloka which will be helpful for cure.
3. The same platform can be extended to more diseases with data from more ancient texts
4. Ayurvedic patient's data is not yet kept electronically.
5. So, to apply data science for betterment of treatment as done in allopathy is the major challenge.
6. The second major challenge is to make Sanskrit processing better.
7. Ayurvedic texts are relatively much lengthy so to even complete dataset of one disease will take a lot of time

## 1.5 METHODOLOGIES OF PROBLEM SOLVING

1. To create dataset which will be useful to build the proposed model. The dataset is created with the help of Charak Samhita nidana stana and chikista stana chapters having the major 3 types of diabetes and subtypes along with symptoms and treatment shloka.

2. To build the model using a machine learning algorithm to predict type and treatment.

Random Forest Algorithm will be useful for us to build the model as it creates a forest of decision trees whose prediction by the committee is more accurate than that of an individual tree.

## 2. LITERATURE SURVEY

Srikanth, Narayanam et al. (2015) has mentioned in the paper that Diabetes is being the disease/ conditions that does not respond to treatment by medical scholars of India. There has been a progression in medical science. However, there are still some challenges like diabetes management, and it should be given attention to explore the unexplored fields of medical science. Ayurvedic literature describes its relation with dietary, lifestyle, environmental and genetic factor and the treatment is based on the type and stage of disease. It offers a much safer and effective way to manage diabetic condition. Ayurveda focuses on getting rid of etiological factors (causing the development of disease). Some experimental and clinical studies on Regular Diet and exercise along with the use of herbal and herbo-mineral preparations is effective. Ayurvedic approach provides scientific evidence on its effectiveness and safety.

The model that can be used to approach the issue mentioned above would consist of designing research plans that would also follow the Principles of Ayurveda. Properly designed experimental studies can provide us with resources which will lead us to clinical research as said by Srikanth, Narayanam et al. (2015)

As per figures stated by 'World Diabetes Congress' on 14th November 2009, diabetes has affected 5-6% of the population globally and they have predicted that the count will reach 380 million by 2025. Every 10 second a patient dies from diabetes or a disease related to it. Out of all the countries in the world, India has a largest diabetes population with estimated 41 million people, which is 6% of the total adult population. Be it a person of any gender, with increasing age, the probability of getting diabetes also increased. With the age about 60 years, there are approximately 18.3% people having diabetes. Ayurvedic treatment has proven to be a boon to wide suffering diabetes which comprises Pathyakara Aahara-Vihara (healthy eating habits), regular exercise as YogaSana and specific Pranayamic procedures. All the above play a very important role in Panchakarma and Shatakarmic procedures which is further followed for a period and along with that internal medication, herbal and herbo-mineral drugs and some stress reducing practices. But there is need of patients in large numbers as this is only the beginning toward diabetes management Khandelwal, N et al. (2011)

Basic knowledge of Ayurveda and Sanskrit are an essential support to explore the complex Ayurvedic, Sanskrit terms used. Searching Ayurvedic databases continues to be difficult because of no options for searching complex search strings, poorly key worded, and comprehensively not indexed, and the existence of Ayurvedic literature outside electronic databases. The articles also suggest some available reliable platforms. ABIM, DHARA, and AYUSH research portal contain only Ayurveda journals and studies. PubMed and DOAJ are biomedical databases citing the bibliographic information of Ayurvedic articles published in biomedical journals by Aggithaya, Guruprasad et al. (2015)

Article Chauhan, Ashutosh et al. (2015) says that there are many countries like India who are not strong economically can't afford drug-based medicines. It has also proved to have some side-effects. Treatment should begin with some natural means like Ayurveda and drug should be last option in the case. An Ayurvedic Treatment like Panchkarma is capable of removing disease even before it's manifestation. But even though Ayurveda is so good there is lack in Scientific Evidences as well as research. Instead of research in drug-based, Ayurveda should be done. Currently, Ayurveda is not good, there is a need of research and development in the field.

The article by Marques, Oge et al. (2015) contains information about integrating information and communication technologies, modern science and engineering techniques with Ayurveda. The article states that latest technologies should be used so that a wider range of audience will get to avail the benefits of Ayurveda. The opportunities mainly in Personal Health Monitoring, Modernization of medicine and a vision where people get to know what exactly it means to be healthy. Development of innovative technological solutions in terms of Ayurveda should be done was also mentioned. There are many challenges with advancement of Ayurveda which includes easy access to Ayurvedic Literature, Automating the maintenance of health records, availability of the records easily; along with that use of latest technologies like image processing, computational model which can assist in many tasks.

Ayurveda, which is most ancient and traditional medical system in India, is just on Paper. The practice is still done without digital records. Singh, Harpreeta et al. (2018) states that the percentage of people cured might get further improved if people start getting Ayurvedic treatment before the disease gets more serious and chronic. Ayurveda can reduce a lot of health-care cost if the disease is treated before getting chronic.

Diabetes is a disorder in which there is a high blood sugar level over a long period. With the progression of the disease, lack of insulin may develop. People who are suffering from diabetes shows majorly the social, economic factors as well as the cultural change, increasing population along with the age. Diabetes is a disease which can't be cured excluding few cases while it can be managed if blood sugar levels are kept to normal. So, when Ayurvedic principles are used wisely with proper reference definitely gives positive outcome for today's complicated disease. Diabetes can be associated with Madhumeha of samhita which is

a type of Vataj Prameha. Treatment given includes 1) Panchakarma 2) Orally tablets mentioned by Vd Prerana P. Jawale et al. (2018)

Basti is selected as per reference of Charak Samhita called as panchatikta panchaprasrutik basti. Since Vata is the main etiological factors in the manifestation of disease. If vata using basti be controlled, half the disease can be cured. It is concluded here that Ayurvedic principles when used wisely and with proper reference can definitely give a good hand in the treatment of today's complicated disease. The problem lies in finding the correct principles for each individual patient which will solve through our platform. Vd Prerana P. Jawale et al. (2018)

The journal Syed Ibrahim Rizvi et al. (2013) talks about the survey conducted by the World Health Organization which states up to 90% of the population in developing countries use plants and its products as a traditional medicine for primary health care. There are about 800 plants which have been reported to show antidiabetic potential. As per Ayurveda, there is a vast collection of plants with antidiabetic potential. Only a few of them have been scientifically proven and a lot more have yet to be explored and proved. Still in curing diabetes by Ayurveda majorly only Charak Samhita is followed which is very much effective and of no side effects, but there is information about many plants in Bhavprakash, which can also be used for the cure and is being used. The similar problem here is about making searching easy and faster.

Ayurveda addresses that how psychological factors can be managed so there is development of Prameha treatments. Apartana and Santarpana are the Ayurvedic treatments recommended for Type 1 and Type 2 diabetes. Apartana means a diet which is calorie restricted whereas Santarpana means a nutritious high calorie diet. Integrating the theory and modalities of Ayurveda in the management of these disorders may prove beneficial. It can be done if the data is together and can be made easy and faster to access to ayurvedic practitioners.

"There are 20 subtypes of Prameha because of the interaction of the three Doshas and 10 Dushyas. Several of these subtypes have sweet urine, whereas some of them have different coloration of urine, highlighting the inflammatory conditions involved in the metabolic syndrome. This disease has close ties to Sthaulya (i.e., obesity). With regard to diabetes mellitus, Sahaja Prameha and Jatah Pramehi correlate with type 1 diabetes; Apathyanimitaja Prameha correlates with type 2 diabetes. Madhumeha is a subtype of Vataja Prameha. The latter is defined as Jatah Pramehi Madhumehino in Charaka Samhita, the ancient Ayurvedic knowledge regarding Prameha can expand the current understanding of obesity, metabolic syndrome, and diabetes." [16] Sharma, H et al. (2011)

Diabetes is the most common among lifestyle disorders affecting people worldwide. Our country India has the fastest growing population of diabetics. As per current statistics, the number of diabetics is likely to increase from 15 million in 1995 to 57 million by the year 2025. This will ultimately make our country having a maximum number of diabetic patients in the world. Regarding treatment of any disease Ayurveda not only emphasizes on proper medication but also concentrates on appropriate Aahar (diet) and Vihar (daily routine) of a patient. This will definitely control diabetes with no side effects. From various researches carried out at different organizations, it is clear that there is a lot of potential in Indian herbal medicine to control diabetes if used sensibly. Pratibha, Kokate et al. (2020)

### 3. SOFTWARE REQUIREMENTS SPECIFICATION

#### 3.1 ASSUMPTIONS AND DEPENDENCIES

##### Assumptions:

1. All the shlokas follow similar format. For diagnosis there will be different symptoms are listed in that shloka and also for the treatment.
2. The platform will only be used by practitioners and BAMS students.
3. All Samhitas will be available online in both Sanskrit and English.

1. **Dependencies:** At each major step there has to be confirmation from students/practitioners.

#### 3.2 FUNCTIONAL REQUIREMENTS

- 3.2.1 Predict disease with the given symptoms.
- 3.2.2 Compare the given symptoms with the input datasets
- 3.2.3 The system provides login for admin
- 3.2.4 The system allows users to create an account and login

#### 3.3 NONFUNCTIONAL REQUIREMENTS

##### 3.3.1 Performance Requirements:

- 3.3.1.1 The website should be responsive and consistent
- 3.3.1.2 Display the list of symptoms where user can select the symptoms

##### 3.3.2 Safety Requirements:

- The outputs shouldn't be changed.  
Common people shouldn't have access to the system.

**3.3.3 Security Requirements:**

3.3.3.1 Only the admins are allowed to change the credentials.

**3.3.4 Software Quality Attributes**

3.3.4.1 Easy to use for input preparation, operation, and interpretation of the output.

3.3.4.2 Provide consistent user interface standards or conventions with our other frequently used systems.

3.3.4.3 Easy for new or infrequent users to learn to use the system.

**3.4 SYSTEM REQUIREMENTS****3.4.1 Database Requirements:**

3.4.1.1 Database should have rows as subtypes of diabetes.

3.4.1.2 Database to be collected from charak samhita.

3.4.1.3 Database should also consist of Sanskrit shlokas.

**3.4.2 Software Requirements (Platform Choice)**

3.4.2.1 Platform should be an application.

3.4.2.2 It must have choices of samhitas to select from.

3.4.2.3 There should be dropdown for showing symptoms.

**3.5 ANALYSIS MODELS: SDLC MODEL TO BE APPLIED**

The waterfall model defines a classical and sequential approach to software engineering. It is among the earlier models of SDLC mostly applied in significant projects in corporate industries and government organizations. It emphasizes on early project planning in the initial stages to eliminate design flaws before the beginning of software development. Obstacles such as time-consumption and unclear user requirements are identified earlier before other phases begin. Moreover, its intensive planning and documentation ideal for projects concerned with quality control. The waterfall model consists of various nonoverlapping phases such as:

- Requirement Elicitation and Analysis
- Design
- System Implementation
- Testing
- Deployment
- Maintenance

The above stages are cascaded subsequently with the progression of development flowing downwards across the stages hence the name waterfall. In waterfall model unless until one phase is completed another phase is not started. The model is not a modest rectilinear method but in entails sequential iterations defining the implementation activities. Once the product enters the testing phase, it's very difficult to do the changes as per new requirements. Production and document approval through iterations are expensive to require a lot of work. Not recommended for large projects.

Waterfall Model Basic Principles:

- The project is divided into various stages with few overlaps between stages.
- More emphasis is given to planning phase, timeframe, budget, and implementation of the whole project .
- There is strict control over the model cycle of the task through broad reviews, certification and approval user acceptance by the management after implementation phase ends.

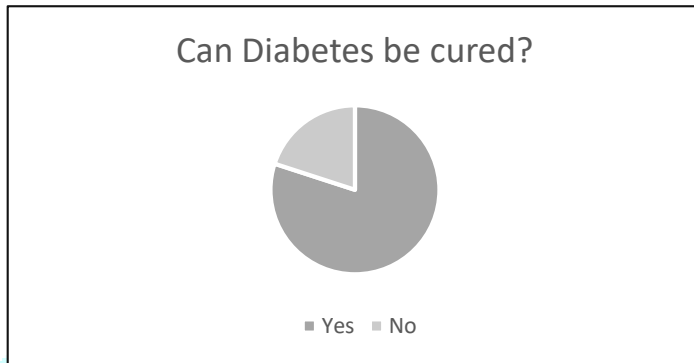
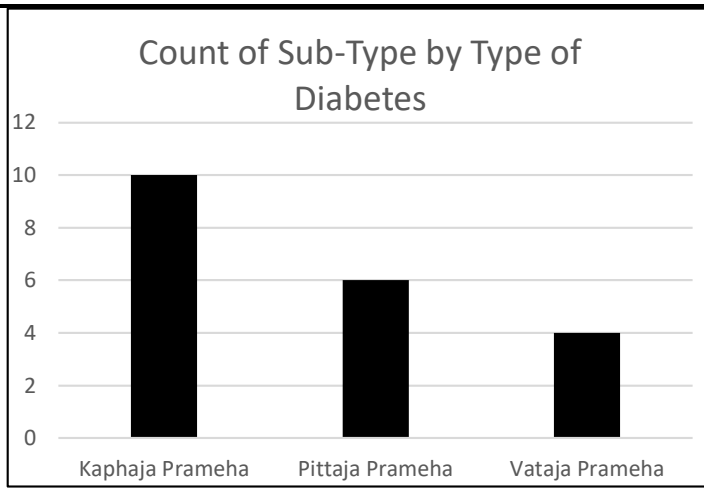
**4. SYSTEM DESIGN****4.1 SYSTEM ARCHITECTURE**

The Bachelor of Ayurvedic Medicine and Surgery (B.A.M.S.) students and Ayurvedic practitioners have to go through many lengthy texts to find the required shloka. Created a platform to provide simplicity in searching. For that database is collected right from Ayurvedic Literature - Charak samhita consisting symptoms and treatment of diabetes. The jupyter notebook was used to process the dataset and build a model. Once the symptoms are entered, the type- one from three Doshas, subtype, and shlokas related to treatment. The webpage is being created as a platform using tkinter and is deployed it on Amazon Web Services EC2 instance.

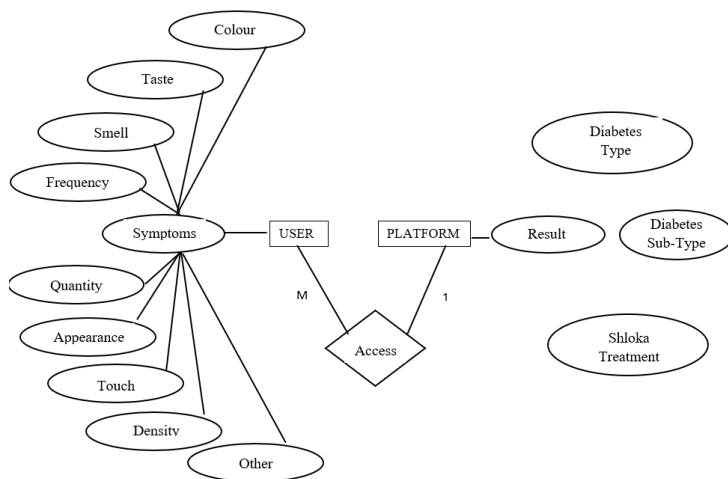
**Dataset:**

Dataset is created by collecting symptoms and treatment from Charak Samhita. It consists of columns: type, subtype, colour, taste, smell, frequency, quantity, appearance, touch, other symptoms, treatment(shlokas), Microscopic Examination, Progressive step.

The other related shlokas are also collected. Type consists of three dosha siddhanta -vatta, pitta, kapha. Symptoms are collected from nidanastana and another dataset is collected from chikistastana.

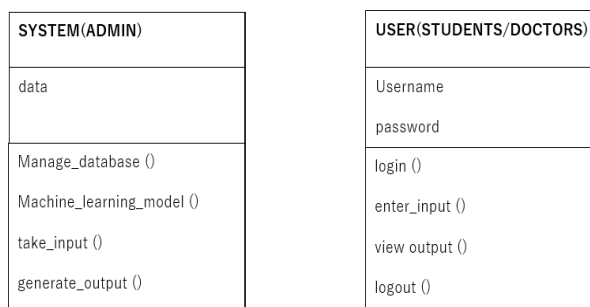


#### 4.4 ENTITY RELATIONSHIP DIAGRAM

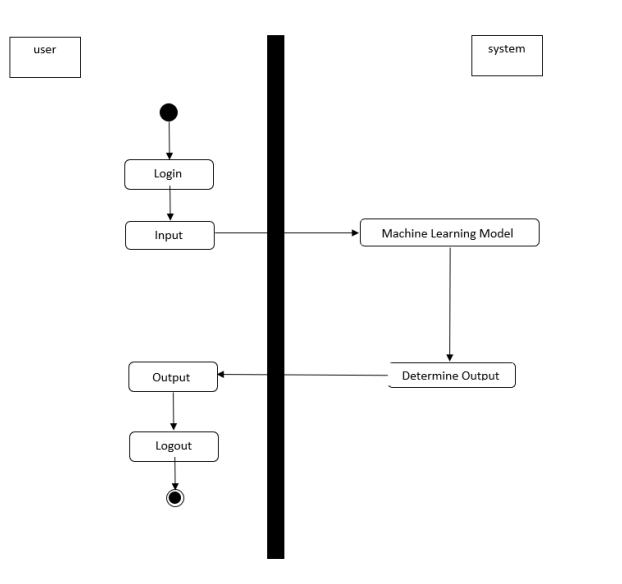


#### 4.5 UML DIAGRAMS

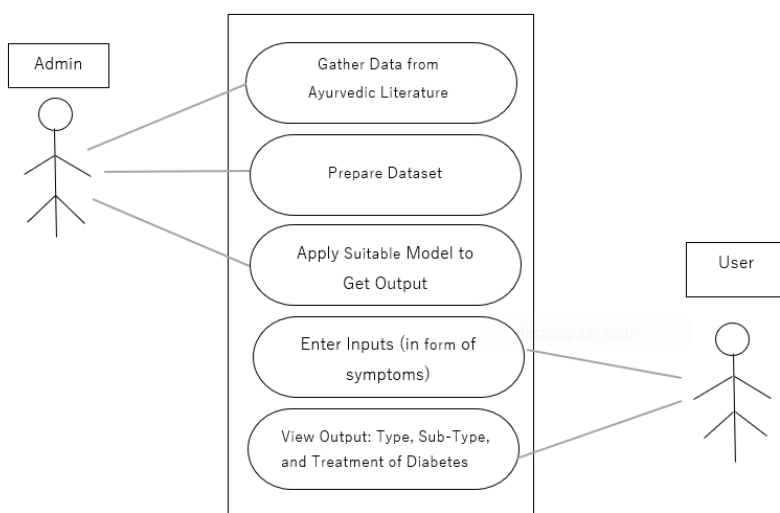
Class diagram:



Activity diagram:



#### 4.5 USE CASE DIAGRAM



### 5. PROJECT PLAN

#### 5.1 PROJECT ESTIMATE

The budget will be dependent on software and hardware equipments used. The platform will be averagely expensive.

#### 5.2 RISK MANAGEMENT

##### 5.2.1 Risk Identification

All the risks that are possible during implementation are discussed. People, size, technology, tools, organization, customer are the factors considered. Accordingly, next steps are taken.

##### 5.2.2 Risk Analysis

Once the risks are predicted analysis is done on basis of classification into product, project, business risks.

##### 5.2.3 Overview of Risk Mitigation, Monitoring, Management

Related to risk planning, through risk mitigation, the team developed strategies to reduce the possibility or the loss impact of a risk. As a part of Risk mitigation produced a situation in which the risk items are eliminated or otherwise resolved. After risks were identified, analyzed, and prioritized, and actions were established, it was made sure that team essentially and regularly monitor the progress of the product and the resolution of the risk items, taking corrective action when necessary.

### 5.3 PROJECT SCHEDULE

#### 5.3.1 Project Task Set

Major Tasks in the Project stages are:

1. Firstly, we plan to create dataset which will be useful to build the proposed model.
2. The dataset will be creating with the help of Charak Samhita nidana stana and chikista stana having the major 3 types of diabetes and subtypes along with symptoms and treatment shloka.
3. We will build the model using a machine learning algorithm to predict type and treatment. We will be using Weka to determine the correct model.
4. As of now, we feel that Random Forest Algorithm will be useful for us to build the model as it creates a forest of decision trees whose prediction by the committee is more accurate than that of any individual tree
5. After the successful of one samhita we will be following the same process for other books also.

### 5.4 TEAM ORGANIZATION

#### 5.4.1 Team structure

The team consists of three students pursuing B.Tech Computer Engineering. The team is guided by Prof. Shweta Tiwaskar. After discussion, team divided into two. One student focused on dataset creation and others focused on model building and platform requirements and creation.

#### 5.4.2 Management reporting and communication

Three Formal Technical Reviews are done guided by other experts in the domain. Other communication was based as per the project planning.

