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## Research Paper

# Aqueous Extract of Herbal Mixture Along with Allopathic Drugs for The Control of Diabetes Mellitus: A Case Report

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## ABSTRACT

**Objective :** The prime aim of our case report was to control diabetes mellitus using aqueous extracted herbal mixture of ginger, cinnamon, clove, black pepper and black tea powder along with allopathic drugs. **Materials and Methods :** A 60 years lady already has been suffering from high blood pressure since 2002. Then she started to suffer by diabetes mellitus since 2014. Allopathic treatment of diabetes mellitus has been started from 2014 to control diabetes mellitus. From June 2021 to April 2023, the consumption of aqueous extract of herbal mixture treatment was continued along with allopathic medicines. Aqueous extract of herbal mixture was prepared from ginger, cinnamon, clove, black pepper and black tea powder in boiling water for 15 min. and filtered extract was used for treatment along with allopathic drugs of diabetes mellitus. The aqueous extract of herbal mixture was consumed daily in morning on empty stomach. **Results :** Biochemical sugar analysis of blood, urine and microscopic examination were performed. According to the present investigation, there was considerably reduction in fasting, post-prandial, HbA1c sugar levels and SGPT. The creatinine and uric acid were under control. Microscopic examination of urine analysis showed colour, appearance, urine glucose, urine protein, pus cells, epithelial cells, RBC, casts, and crystals were normal.

## INTRODUCTION

Diabetes mellitus (DM) is one of the most dangerous diseases from human health point of

view. It is non-communicable and silent killer disease. Symptoms of this disease observed only at elevated level. The data generated by International Diabetic Federation (IDF) in 2026

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reports that 589 million of the adult population has diabetes globally. In USA, 40 million people has diagnosed by diabetes mellitus in 2026. Presently, 74 million people has detected by diabetes in the European Region. The Indian Council of Medical Research (ICMR) estimated that in India 101 million people have diabetes and at least 136 million people are in pre-diabetic stage. Basically diabetes mellitus is a metabolic disorder means body does not produce enough insulin or cannot use insulin effectively. In most of the diabetic cases, blood sugar (glucose) levels are abnormally high [1-3].

Allopathic medicine is the backbone of modern medical healthcare system. Allopathic medicines are applicable to cure almost all diseases and are easily available in the market. Allopathic medicines are coming in the market after doing lot of research and successful testing. Allopathic medicine system has become the major conventional system of the worldwide. This is because this system has tremendous features such as contemporary technology, proficient doctors, patient protection, research and development, easy availability etc. The main characteristic of the allopathic medicine is evidence-based system [4]. Even though the allopathic medicines have several advantages, still these medicines have some disadvantages such as diarrhea or abdominal cramps, breathing shortness, rashes on body or swelling, vaginal itching or discharge, white patches on the tongue etc.

Herbal medicines are generally used to treat illness or to keep the body in order. Basically, herbal medicines composed of complex mixture of biological active compounds and possess wide range of applications particularly in the treatment of diseases like antimicrobial, antidiabetic, antiageing, antiarthritic, antidepressant, antianxiety, antispasmodic, analgesic, anti-inflammatory, anti-HIV, vasodilatory, hepatoprotective, treatment of cirrhosis, asthma,

acne, impotence, menopause, migraine, gall stones, chronic fatigue, alzheimer and memory enhancing activities [5-8].

In this case report, I have presented the combined effect of hot aqueous extracted herbal mixture of ginger, cinnamon, clove, black pepper and black tea powder along with allopathic drugs on diabetes mellitus with 60 year old lady.

## **MATERIALS AND METHODS**

### **Preparation of aqueous extract of herbal mixture**

To a 500 ml beaker, 150 ml mineral water (Aqua guard) was taken and to it Ginger (1579 mg), Cinnamon (318 mg), Black pepper (133 mg), Clove (184 mg) and Black tea powder (1017 mg) were added. The mixture was heated at boiling temperature for 15 minutes. The aqueous herbal mixture solution was filtered. This aqueous extract was consumed orally by mouth in the morning on empty stomach daily.

### **Case Report**

A 60 year old lady with a history of 20 years of high blood pressure and 12 years of diabetes mellitus referred to NCL medical centre, Pune. Basically, patient is healthy. In January 2014, symptoms of diabetes mellitus were started to observe such as excessive urination, feels thirsty, feel hungry, foot pain, numbness etc. Then patient visited to medical centre and stated all these symptoms to medical doctor. Medical doctor advised for pathological tests of diabetes mellitus. Analysis report clearly indicated that development of diabetes mellitus. Then medical doctor prescribed Glycomet 500 SR 2 tablets per day (morning and evening). This treatment was continued till May 2017. Till that sugar levels were under control. From the manuscript preparation point of view, pathological data from May 2017 to



April 2023 is included in Table 1. In May 2017, pathological tests were carried out as regular yearly health check-up and the report depicted that the fasting, post-prandial and HbA1c sugar levels were increased. Due to increase in sugar level, the medical doctor advised one more tablet of Tiban M (20/500) to control sugar. These medicines were continued till May 2020.

Year 2020 was a COVID-19 year. Particularly on March 24, 2020 lockdown was ordered by Indian government and asked people does not come out from the home. According to this pandemic situation, patient started to think about home remedy for controlling diabetes mellitus using herbal seeds/powder as supplementary medicine along with regular allopathic medicines of diabetes mellitus. According to that from June 2020, five grams of water soaked fenugreek seeds (methi grains) were started to consume as supplementary herbal medicine orally in morning on empty stomach and continued for almost 9 months i.e. till March 2021. In March 2021, the patient was not feeling well. Hence pathological tests were performed as yearly regular check-up at Medical centre. On examination, it was observed that the both sugar levels and HbA1c were increased abruptly. Due to these elevated levels of sugar, a dose of water soaked fenugreek (methi grains) seeds was stopped and Gluconorm SR 500 and

Tiban M 20/500 were replaced with Vylde M (50/500) and Glizid MR 30 respectively. Simultaneously, in June 2021, a dose of hot aqueous extract of herbal mixture based on ginger, black pepper, cinnamon, clove, and tea powder was started to consume orally by mouth along with regular allopathic medicines of diabetes mellitus. In December 2021, again pathological tests were carried out. The reports of diabetes mellitus were quite normal. The same medicines and dose of boiled aqueous extract of herbal mixture were continued till April 2023. In April 2023, pathological tests were performed as yearly regular check-up and obtained results unveiled that considerably improvement in results from diabetes mellitus point of view.

## RESULTS

This research is mainly focused on the control of diabetes mellitus using boiled aqueous extract of herbal mixture along with allopathic medicines. Herbal mixture contains ginger, cinnamon, clove, black pepper and black tea powder. Allopathic medicines prescribed are presented in Table 1. Biochemical sugar analysis of blood and urine analysis are listed in Tables 2 to 3 respectively. The detailed information based on results is summarized as follow.

**Table 1 : Allopathic medicines prescribed**

| Month        | Diabetes Medicines prescribed \$ |                            |
|--------------|----------------------------------|----------------------------|
| January 2014 | Gluconorm SR<br>500<br>1-0-1     | -----                      |
| May 2017     | Gluconorm SR<br>500<br>1-0-1     | Tiban M<br>20/500<br>0-1-0 |
| July 2018    | Gluconorm SR<br>500<br>1-0-1     | Tiban M<br>20/500<br>0-1-0 |
| January 2019 | Gluconorm SR<br>500<br>1-0-1     | Tiban M<br>20/500<br>0-1-0 |



|                                                                                                                                                   |                              |                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------|
| February 2020                                                                                                                                     | Gluconorm SR<br>500<br>1-0-1 | Tiban M<br>20/500<br>0-1-0 |
| May 2021                                                                                                                                          | Vylda M (50/500)<br>1-0-1    | Glizid MR 30<br>0-1-0      |
| March 2022                                                                                                                                        | Vylda M (50/500)<br>1-0-1    | Glizid MR 30<br>0-1-0      |
| October 2022                                                                                                                                      | Vylda M (50/500)<br>1-0-1    | Glizid MR 30<br>0-1-0      |
| April 2023                                                                                                                                        | Vylda M (50/500)<br>0-1-0    | Glizid MR 30<br>0-1-0      |
| § : High blood pressure based allopathic medicines such as Amlodipin 5, Rosuvas 10, Ecospin 75 has been prescribed from August 2002 to till date. |                              |                            |

## BIOCHEMICAL REPORTS (UGAR BASED)

### Fasting and Post-prandial sugar

As above mentioned, water soaked fenugreek seeds treatment was failed for the control of blood sugar levels. In June 2021, hot water extract of mixture of ginger, clove, cinnamon, black pepper and tea powder was started to consume orally as herbal supplementary medicine to control sugar levels. This treatment was continued for almost 6 months. In December 2021, sugar analysis was performed and results observed for fasting, post-prandial sugar levels were 104 and 112 mg/dL for fasting and post-prandial respectively. The analyzed results indicated that sugar level was under control. Similarly pathological tests were performed for sugar analysis of March 2022, July 2022, December 2022, Jan.2023, and April 2023 for fasting and post-prandial sugar levels were 88 and 116, 80 and 104, 92 and 108, 84 and 100, and 99 and 108 mg/dL respectively. The acquired results depicted that both sugar levels were under control.

### HbA1c

Glycated hemoglobin referred as HbA1c. It is another important parameter illustrates about the cumulative average level of blood sugar for a period of the past 2 to 3 months. Most importantly

HbA1c correlates with the risk of long-term diabetes complications. The HbA1c level ranges from 4 to 5.6% for normal person. For the prediabetic patient, it varies from 5.7 and to 6.4% and above 6.5% indicates the presence of diabetes [9]. The HbA1c level for May 2017 was very high i.e. 8.5% (Table 2). The HbA1c sugar level was controlled by allopathic treatment and brought down to 6.4% (February 2020). Combination treatment of allopathic medicines along with overnight water soaked fenugreek (Methi) seeds was started in June 2020. Sugar analysis was conducted in March 2021 and analysis result showed the HbA1c level was abruptly raised to 8.0%. It concluded that water soaked fenugreek seeds are not good for the control of HbA1c sugar level of diabetic patient. Due to the negative results obtained from Fenugreek seeds, changed herbal dose. The new herbal mixture dose consists of aqueous extract of ginger, clove, cinnamon, black pepper and black tea powder along with regular allopathic medicines. In December 2021, fasting blood was analyzed for HbA1c and it was 7.1%. It indicated that there was a considerable reduction in HbA1c%. It was a good indication of improvement in results. The same treatment was continued for another 3 months; the pathological tests were performed as regular annual check-up and observed HbA1c was 6.4% (March 2022). It demonstrated that the reduction in HbA1c.



Similarly in July 2022, December 2022, January 2023, and April 2023 pathological tests were performed and observed HbA1c was 6.5%, 6.8%, 6.4%, and 6.3% respectively. It suggested that there was a considerable improvement in HbA1c results from the diabetic point of view.

**Table 2 : Biochemical sugar analysis of blood**

| Month         | Type of Sugar / Glucose Test |                          |              |                       |                       |                        |
|---------------|------------------------------|--------------------------|--------------|-----------------------|-----------------------|------------------------|
|               | Fasting<br>(mg/dL)           | Post-Prandial<br>(mg/dL) | HbA1C<br>(%) | Creatinine<br>(mg/dL) | Urine Acid<br>(mg/dL) | SGPT<br>(ALT)<br>(U/L) |
| May 2017      | 124                          | 192                      | 8.5          | -                     | -                     | -                      |
| January 2018  | 88                           | 124                      | 7.5          | 0.8                   | 6.6                   | 36                     |
| January 2019  | 96                           | 168                      | 6.3          | 0.8                   | 6.0                   | -                      |
| February 2020 | 80                           | 136                      | 6.4          | -                     | -                     | -                      |
| July 2020     | 88                           | 116                      | 6.7          | -                     | -                     | -                      |
| March 2021    | 132                          | 192                      | 8.0          | 1.2                   | 6.0                   | 26                     |
| December 2021 | 104                          | 112                      | 7.1          | -                     | -                     | -                      |
| March 2022    | 88                           | 116                      | 6.4          | -                     | -                     | -                      |
| July 2022     | 80                           | 104                      | 6.5          | -                     | -                     | -                      |
| December 2022 | 92                           | 108                      | 6.8          | -                     | -                     | -                      |
| January 2023  | 84                           | 100                      | 6.4          | -                     | -                     | -                      |
| April 2023    | 99                           | 108                      | 6.3          | 1.2                   | 6.0                   | 14                     |

### Creatinine

Creatinine is a waste product of creatine. Basically, creatine is a derivative of glycine which supplies energy to muscles. The normal range of creatinine is 0.7 to 1.3 mg/dL for male and 0.6 to 1.1 mg/dL for female [10]. Creatinine results presented in Table 2 and were 0.8 mg/dL for January 2018. It indicated that creatinine was in the range. Similar result was also observed for January 2019. In June 2020, consumption of overnight water soaked fenugreek seeds (methi grains) was started as supplementary herbal

medicine to control diabetes mellitus along with regular allopathic medicines. In March 2021, pathological tests showed the creatinine was 1.2 mg/dL. It was found that it was on slight higher side. It revealed that fenugreek (methi) seeds were not suitable for the control of diabetes mellitus. Pathological tests were again carried in April 2023 and result depicted that creatinine was 1.2 mg/dL.



## Uric acid

Uric acid is a waste product found in the blood by purine metabolism in human body. It is strongly associated with functioning of kidney. Normal range of uric acid is 2.5 to 7.0 mg/dL for male and 1.5 to 6.0 mg/dL for female. Lower level of uric acid suggests very good functioning of kidney. On the contrary, high level of uric acid indicates improper functioning of kidney [11]. Pathological analysis data of uric acid is presented in Table 2 and it was 6.6 mg/dL for January 2018. It clearly revealed that uric acid level was on slight higher side. High level of uric acid suggests that functioning of kidney is not proper. Thus, uric acid analysis was again performed in January 2019, March 2021 and April 2023 to cross-check the level of uric acid in blood and the observed uric acid were 6.0, 6.0 and 6.0 mg/dL respectively. It clearly indicated that combination of allopathic medicines and aqueous extract of herbal mixture controls high level formation of uric acid in blood

## Serum Glutamic Pyruvic Transaminase

Serum Glutamic Pyruvate Transaminase (SGPT) is an enzyme and occurs in many tissues like skeletal muscles, heart and liver. But it is most abundantly present in the liver cells. SGPT is also called as ALT means alanine aminotransferase. It is mainly used to measure key liver enzyme to evaluate hepatic health. The normal range of SGPT enzymes situated between 7 and 56 units per litre of blood stream. Higher level of SGPT enzyme predicts liver damage [12]. SGPT level is presented in Table 2 and was 36 units per litre for

January 2018. It indicated that liver functioning was normal. Similar investigations were performed in March 2021 and April 2023 and observed SGPT enzymes were 26 and 14 units per litre respectively. The obtained results clearly indicated that administration of aqueous extract of herbal mixture along with allopathic medicines showed considerably decrease in SGPT level means very good improvement in liver functioning.

## URINE ANALYSIS

Urine analysis test provides information about presence of blood in urine. Generally the blood occurred in urine is due to the infection. Urine infection shows the presence of white blood cells, proteins, and abnormal bilirubin [13,14]. Under urine analysis the following properties such as colour, appearance, pH, urine sugar, proteins, pus cells, epithelial cells, RBC, casts, and crystals were studied and summarized in detail as follows.

### Colour

Normally colour of urine is observed by naked eye. Fresh urine sample of healthy person exhibits pale yellow colour. Colour of urine presented in Table 3 and all fresh urine samples (January 2018, January 2019, March 2021 and April 2023) were displayed pale yellow colour. It illustrated that urine was normal. Appearance of urine gives an idea about any unwanted particles present in urine. After consumption of water soaked fenugreek seeds and aqueous extract of herbal mixture also there was no change colour and appearance in urine.



**Table 3 : Urine Analysis**

| Month        | Chemical Examination |            | Microscopic Examination |                          |                       |                 |                  |            |             |                 |
|--------------|----------------------|------------|-------------------------|--------------------------|-----------------------|-----------------|------------------|------------|-------------|-----------------|
|              | Colour               | Appearance | pH                      | Glucose (Sugar) (mmol/L) | Proteins (gm per day) | Pus Cells (hpf) | Epi. Cells (hpf) | RBCs (hpf) | Casts (lpf) | Crystals (mg/L) |
| January 2018 | Pale Yellow          | Clear      | 5.5 Acidic              | Nil                      | Nil                   | 0.2             | 1.1              | Nil        | Nil         | Nil             |
| January 2019 | Pale Yellow          | Clear      | 5.5 Acidic              | Nil                      | Nil                   | 0.2             | 0.2              | Nil        | Nil         | Nil             |
| March 2021   | Pale Yellow          | Clear      | 5.5 Acidic              | Nil                      | Nil                   | 2.4             | 2.6              | Nil        | Nil         | Nil             |
| April 2023   | Pale Yellow          | Clear      | 5.5 Acidic              | Nil                      | Nil                   | 2.4             | 2.4              | Nil        | Nil         | Nil             |

### pH

Measurement of pH of urine indicates the nature of urine whether it is acidic or alkaline. pH test provides information related to the problem in the urinary tract or kidneys. In general, pH of urine ranges from 4.5 to 8.0. Analysis of pH of urine presented in Table 3 and all fresh urine samples (January 2018, January 2019, March 2021 and April 2023) were exhibited the pH was 5.5. It clearly demonstrates that urine was in acidic nature. Here also, after consumption of water soaked fenugreek seeds or aqueous extract of herbal mixture did not change the pH of urine.

### Urine glucose (Sugar)

Glucose (Sugar) in urine analysis is an indication of the amount of sugar present in the urine. Generally it is termed as glycosuria. Mostly, the absence of glucose in the urine considered as normal. The normal range of glucose in urine stays between 0 to 0.8 mmol/L. The presence of glucose in urine presented in Table 3 and all samples (January 2018, January 2019, March 2021 and April 2023) exhibited the absence of glucose in urine. It indicated that urine glucose level was normal.

### Urine Protein

Proteins are important molecules which are essential to work body properly. Proteins are present in the blood and blood circulates proteins to all parts of the body. The blood is cleaned by kidney and in cleaning process small amount of waste protein is found in urine. If kidneys are not functioning properly then there is a chance of leaking of protein in urine. If the high amount of protein leaked in urine suggests improper functioning of kidney. The normal range of protein in urine is less than 1 g per day. The presence of protein in urine illustrated in Table 3 and it was nil for January 2018. Similarly all other fresh urine samples such as January 2019, March 2021 and April 2023 also exhibited the absence of protein in urine. It indicated that urine protein level was normal.

### Pus cells

Presence of pus cells in urine is a medical disorder which causes white blood cells in the urine or pee. The normal range of the pus cells in urine is 0 to 5 hpf (high power field). Pus cells analysis of urine is presented in Table 3 and it was 0.2 hpf for January 2018. It clearly suggested that there was no urinary track infection. Similar investigations



were performed in January 2019, March 2021 and April 2023 and the almost similar observations were obtained.

### Epithelial cells

Epithelial cells that generally come from skin, blood vessels, urinary tract, organs etc. The normal range of epithelial cells present in the urine sample is 15 to 20 cells per high power field (hpf). A small number of epithelial cells present in urine indicates kidney, blood vessels, urinary track are functioning very well. If more than 15 renal tubular epithelial cells per hpf present in urine means your kidneys are not working properly. Presence of large number epithelial cells in urine may be a sign of infection, [kidney disease](#), or another serious medical condition. The epithelial cells in urine analysis presented in Table 3 and it was 1.1 hpf for January 2018. Similar investigations were performed in January 2019, March 2021 and April 2023 and were the 0.2, 2.6 and 2.4 respectively. It depicted that functioning of kidneys was normal.

### Red blood cells

Red blood cells (RBC) present in urine indicates acute or chronic diseases. Generally, healthy person doesn't show presence of RBCs in urine. Threshold value of RBC is up to 4 hpf (high power field) and is considered as normal. RBC cells in urine analysis is presented in Table 3 and it was nil for January 2018. Similar investigations were performed in January 2019, March 2021 and April 2023 and the observations were the same. It illustrated that functioning of kidneys was normal.

### Casts

Generally urinary casts are observed under microscope. Basically, it is nothing but the clusters of urinary particles such as cells, fat bodies, microorganisms etc. [Urinary casts](#) inform about

functioning of kidney. Normal range of casts present in urine stands between 0 to 2 casts per low power field of the microscope. Casts in urine analysis reported in Table 3 and it was nil for January 2018. It revealed that functioning kidneys is normal. Similar investigations were performed in January 2019, March 2021 and April 2023 and the observed casts were nil.

### Crystals

In general, too many minerals observed in urine may clump together with other substances and form solid crystals. Sometime crystals form stones and urinary tract may cause blockages. Normal range of crystals in urine is less than 40 mg/L of urine daily. Crystals in urine analysis is presented in Table 3 and it was nil for January 2018. It illustrates that functioning of kidneys is normal. Similar investigations were performed in January 2019, March 2021 and April 2023 and the observed crystals were nil.

## DISCUSSION

Oxygen is one of the most important elements for the survival of the human body. Human cells use oxygen to generate energy but simultaneously it produces few free radicals. At high concentrations of free radicals they start to generate oxidative stress and this stress start to damage human cell structures. Simultaneously this stress start to develop ailments in human body such as diabetes, cancer, arthritis, aging, autoimmune disorders, cardiovascular and neurodegenerative diseases [15].

Free radicals are mainly responsible for the development of diabetes mellitus. Diabetes mellitus is occurred due to misbalance between generation and decomposition of free radicals. Basically, Free radicals are a group of atoms, molecules, or molecular fragments possessing one or more unpaired electrons in the outer shell of



aromatic nucleus. Excessive production of free radicals decompose biomolecules e.g. lipids, proteins, DNA etc. Free radicals are highly active due to the presence of unpaired electron in their structure [16]. Mainly, there are two types of free radical reactive species e.g. Reactive oxygen species (ROS) and Reactive nitrogen species (RNS). Reactive oxygen species (ROS) includes Superoxide radical ( $O_2^{\bullet-}$ ), Hydroxyl radical ( $OH^{\bullet}$ ), Peroxyl radical ( $ROO^{\bullet}$ ), Alkoxyl radical ( $RO^{\bullet}$ ), Hydroperoxyl radical ( $HO_2^{\bullet}$ ), Lipid peroxyl radical ( $LOO^{\bullet}$ ) and Reactive nitrogen species (RNS) comprises Nitric oxide radical ( $NO^{\bullet}$ ) and Nitrogen dioxide radical ( $NO_2^{\bullet}$ ). In general, free radicals are generated in human body by two ways such as internal or external sources. In the human body, Mitochondria, NADPH oxidase, Lipoxygenases are main internal sources of free radicals whereas environmental pollutants, cigarette smoke, radiation, certain drugs, industrial solvents, alcohol, ultraviolet light, pesticides, and anesthetic solvents are the external sources of free radicals [17].

Antioxidants play very important role in controlling diseases such as Diabetes mellitus, High blood pressure, Cancer, Alzheimer, Parkinson etc. Antioxidants are defined as the natural or synthetic materials that protect body cells from free radicals. Basically, antioxidants are chemicals that bind with free radicals and nullify their effects. Antioxidants have lot of importance from human health point of view. This is because they reduce free radicals, stimulate the growth of normal cells, protect cells from abnormal aging, helps to fight against age related molecular degeneration, supports immune system of the body etc. Principally, they worked as free radical scavengers and also they can prevent and repair damage of cells caused by free radicals [18].

Phenolic compounds play very important role in human health. This is because they possess anti-aging, anti-inflammatory and antioxidant

properties. In addition to that, there are several relevant antioxidant enzymes to counter oxidants. According to structural formula of phenolic compound, they exhibit at least one hydroxyl group substitution on aromatic ring. Phenolic compounds include polyphenols, flavonoids, phenolic acids and tannins which inhibit  $\alpha$ -glucosidase and  $\alpha$ -amylase. Basically, these enzymes are responsible for the digestion of dietary carbohydrates to glucose. These phenolic compounds are also useful to chelate heavy metal ions namely iron and copper ions. These metal ions form chelates with functional groups such as hydroxyl and carboxyl [19].

### Allopathic treatment

In 2014, the symptoms of diabetes mellitus were observed and were confirmed by pathological tests. Thus, medical doctor prescribed Gluconorm SR 500 for diabetes mellitus control along with high blood pressure medicines. The variety types of allopathic drugs are used to treat diabetes mellitus such as biguanide, sulfonylureas,  $\alpha$ -glucosidase inhibitors, thiazolidinediones, gliptins etc. The medicines prescribed during a period of 2017 to 2023 based on the treatment of diabetes mellitus are listed in Table 1. Most commonly used allopathic drug is Metformin to treat the first-line therapy for diabetes mellitus. This is because of extensive safety margin, decreases hepatic glucose production and mildly affects peripheral resistance [20].

### HERBAL TREATMENT ALONGWITH ALLOPATHIC MEDICINES

#### Fenugreek seeds

Lock-down process of COVID-19 was started in India in March 2020. According to that situation, we started to think about the herbal based supplementary medicine along with allopathic



medicines for the control of diabetes mellitus as home remedy. According to literature search, fenugreek seeds are highly useful from diabetes control point of view. Basically, it classified as a family of *Trigonella foenum-graecum*. The oral consumption of fenugreek seeds is highly useful for diabetic patients to control sugar levels. The chemical composition of fenugreek seed was performed by Yasothai R. (2012) [21] and it composed of crude protein, crude fibre, nitrogen free extract, neutral detergent fibre, acid detergent fibre, hemicelluloses, calcium, phosphorus, zinc and iron. The analysis report of aqueous extract of fenugreek seeds suggest that it contains alkaloids, flavonoids, carbohydrates, phenolic compounds and tannins, terpenoids, saponins, amino acids, protein, glycosides, steroids etc [22].

In June 2020, patient started to consume orally 5 g of overnight water soaked fenugreek seeds (methi grains) as supplementary herbal medicine along with regular allopathic medicines of diabetes mellitus. Fenugreek seeds (methi grains) treatment was continued for almost 9 months. In March 2021, pathological tests were performed as regular yearly check-up and sugar analysis results of fasting and post-prandial sugars were 132 and 192 mg/dL respectively. The obtained results indicate that sugar levels were on higher side. Hence medical doctor replaced Gluconorm SR 500 and Tiban M 20/500 by Vylde M (50/500) and glizid 30 tablet respectively by keeping the other regular allopathic medicines same.

Tiban is an anti-diabetic medicine and basically it contains teneligliptin drug. Teneligliptin is an anti-diabetic drug and it inhibits [dipeptidyl peptidase-4 enzyme](#). This drug controls the serious complications of diabetes such as kidney damage and blindness. Most importantly it reduces liver glucose production and releases more insulin from the pancreas [23]. Glizid 30 (Glicazide 30) drugs are coming under class of medicines called as sulfonylureas. It is specifically used to control

blood sugar levels in case of diabetes mellitus. Important thing is that, this drug prevents serious complications of diabetes like kidney damage, blindness, nerve problems and loss of limbs. The prime role of Gliclazide 30 is to increase the amount of insulin production resulting lower blood glucose levels [24].

### **Aqueous extract of herbal mixture treatment along with allopathic medicines**

Consumption of overnight water soaked fenugreek seeds experiment was failed to control sugar levels. Then we started to think about alternative herbal supplementary medicine to control the diabetes mellitus. Literature search was performed to see the herbal powder or seeds to control the diabetes mellitus. According to literature search, we decided to prepare a new formulation derived mixture of ginger, clove, cinnamon, black pepper and black tea powder. These herbals were boiled in aquaguard purified water for 15 min. and filtered aqueous extract was consumed orally by mouth, because all these herbals possess very good antioxidant and antidiabetic properties.

### **Ginger**

Basically, ginger is a potential herb and classified under class of Zingiberaceae family. It is used worldwide due to its excellent properties such as antibiotic, antimicrobial, antioxidant, anti-inflammatory etc. Principally, this herb improves immunity power of the body and helps to eliminate toxic products from the body. Presently, this herb is used in the treatment of Cancer, Alzheimer, blood circulation, blood pressure, cholesterol etc. Chemical composition of ginger displays approximately 50% carbohydrates, 9% protein and free amino acids, 6 to 8% fatty acids and triglycerides, 3 to 6% ash and 3 to 6% crude fibre. From the micronutrients content point of view, it consists of number of useful micronutrients like



potassium, magnesium, copper, manganese and silicon. Potassium and manganese are highly useful micronutrients which help to increase immunity power and fight against disease. Ginger composed of main antioxidant called as gingerol. Basically, it is a phenolic compound. On degradation, it forms other products such as shogaols, zingerone, paradol etc. Bioactive compounds like zingerone and shogaols are found in small amounts in fresh ginger whereas it is found in large amounts in extracted products [25].

### **Cinnamon**

Cinnamon is a sweet spice and mostly used as food flavors. This spicy herb has main composition of camphor in root, cinnamaldehyde in bark and euganol in leaf. Cinnamon possesses useful properties of medicine. It also exhibits health benefits properties such as antioxidant, anti-inflammatory, antidiabetic, antimicrobial, anticancer, lipid-lowering, and cardiovascular disease lowering. It has also some additional health useful properties to cure neurological disorders such as Parkinson and Alzheimer's diseases. The phytochemical analysis of cinnamon bark displays the presence of alkaloids, flavonoids, coumarin, tannins, terpenoids, saponin, glycoside, anthocyanin and phenolic compounds [26].

Mineral determination data of cinnamon showed composition of metals such as iron (7.0 mg/g), zinc (2.6 mg/g), calcium (83.8 mg/g), chromium (0.4 mg/g), manganese (20.1 mg/g), magnesium (85.5 mg/g), potassium (134.7 mg/g) and phosphorus (42.4 mg/g). Cinnamon also exhibits important minerals like iron (Fe) which is useful for red blood cells production, potassium (K) is essential for body fluids and cell, control blood pressure and heart mechanism, and magnesium and cobalt induce enzyme work. Daily consumption of small amount of cinnamon helps to improve digestion, control glucose level and defects system in body [27].

### **Clove**

Clove is most important herbal bud and exhibits antioxidant, antimicrobial, antibacterial, antifungal, antiviral and anticarcinogenic properties. The major compounds of the clove buds are 3-allyl-6-methoxyphenol, eugenol acetate, 2-pentanone, 4-hydroxy-4-methyl and caryophyllene. Mainly, it consists of 70 % to 90 % eugenol as major constituent in clove oil and 15 % to 20 % of the total weight of the dried clove flower buds. The major mineral content (per 100 gm) in clove is potassium 1.020 to 1,296 mg, calcium 632 mg, magnesium 259 mg and iron 11.8 mg.

### **Black Pepper**

The black pepper is known as black gold or king of spices. This is most commonly used spice in the world because it has very high commercial, economic, nutritional, and medicinal value. Traditionally, this herb is also mainly used for the treatment of various diseases such as cough, cold, dyspnoea throat diseases, intermittent fever, dysentery, stomach-ache, worms and piles etc. The chemical composition of black pepper shows mainly phenolic compounds like flavonoids, carotenoids, terpenoids etc. Black pepper shows the chemical composition such as 37.4% carbohydrate, 25.5% proteins, 23.6% fibres, 4.7% moisture, and 5.3% fats. Mineral composition of black pepper displays includes 0.66% potassium, 0.20% calcium, 0.16% phosphorus and 0.16% magnesium [28]. Piperine is a most important alkaloid found in black pepper which helps to increase the absorption of selenium, vitamins, and other nutrients. According to analysis report, the amount of piperine present in black pepper was around 3.92%. Important property of the black pepper is stimulate saliva secretion, which increases the production of digestive juices, responsible for breaking down proteins, increasing



digestibility and reducing the possibility of heartburn and other gastrointestinal issues [29].

### **Black tea powder**

Black tea powder is most popular drink in the world. Tea drinks are prepared from dried leaves of tea plant. It contains considerable amounts of proteins, amino acids, fibres, lipids, sugars, vitamins, minerals, alkaloids, polyphenols, flavins and saponins. It exhibits antioxidant and cancer prevention properties. The black tea also found some important minerals such as calcium, magnesium, sodium, potassium and manganese [29].

### **CONCLUSION**

The allopathic medicines are most important medicines from health point of view. From the diabetes mellitus control point of view, Metformin is prime allopathic medicine. But continuous consumption of the metformin becomes less effective. In that case, supplementary allopathic medicines need to be included. Basically, allopathic medicines have lot of side effects, and the inclusion of additional allopathic medicine will increase more side effects. To control the side effects the allopathic drugs, herbal based extracts are highly useful. In this research study, aqueous extract of herbal mixture based on ginger, cinnamon, clove, black pepper and tea powder were used to control diabetes mellitus along with allopathic medicines. These herbal drugs help to control diabetes mellitus. Most important thing is that, allopathic medicines work only on single target whereas herbal medicines work on multiple targets at a time. Allopathic medicines produce results immediately where as herbal medicines give results slowly. From the diabetes mellitus point of view, the consumption of aqueous extract of the herbal mixture along with allopathic medicines showed considerable control on sugar

level. According to the present investigation, there was considerably reduction in fasting, postprandial, HbA1c sugar levels and SGPT. The creatinine and uric acid were also under control. Microscopic examination of urine analysis showed color, appearance, urine glucose, urine protein, pus cells, epithelial cells, RBC, casts, and crystals were normal. Present research article suggest that this information may be highly useful to health care professionals to develop new evidence based herbal medicine to control diabetes mellitus. From the conclusion point of view, lot of research study is needed to apply the above aqueous extract of herbal mixture to control diabetes mellitus. Present herbal mixture is highly useful to control diabetes, but along with this herbal mixture the patient has to take proper diet, execution of exercise and sufficient sleep which will help to control diabetes effectively.

### **CONFLICT OF INTEREST**

The author declares that there is no conflict of interest.

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### AI USE STATEMENT

The author declares that no artificial intelligence (AI) or AI-assisted tools were used in the writing, data analysis, or creation of figures for this manuscript. All aspects of this research, including manuscript preparation, method generation, data collection, data analysis and manuscript writing, were performed solely by the author without assistance from AI technologies.

### AUTHORSHIP CONTRIBUTION

Nayaku Chavan was responsible for conceptualization, investigation, data collection, data analysis, and original manuscript writing.

### ABBREVIATION

HbA1c - Glycated hemoglobin, SGPT - Serum Glutamic Pyruvate Transaminase, RBC - Red blood cells, IDF - International Diabetic Federation, DM - Diabetes mellitus, ICMR - Indian Council of Medical Research, NCL - National Chemical Laboratory, ALT - Alanine aminotransferase, DNA - Deoxyribonucleic acid, ROS - Reactive oxygen species.

### DATA AVAILABILITY

All data generated or analyzed during this study are included in this published article.

### SUPPLEMENTARY MATERIALS

No supplementary material is associated with this article.

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