IMPACT OF MEDICINAL MUSHROOMS POWDER UNDER CONDITIONS OF DIABETES MELLITUS

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ABSTRACT

Oyster mushroom is traditionally used as remedy of diabetes and hypertension. But still there is lacuna in awareness of mushroom about role in curing physiological complaints. The present study aims to observe the impact of medicinal mushrooms powder under conditions of diabetes mellitus. 10 subjects volunteers having diabetes and other health related complaints were selected for the present study in order to study the effect of mushroom powder on the blood sugar level in fasting and after meal, serum creatinine and urine ketone bodies. Mushroom powder was administered orally to the volunteers at a dose of 4gm for the period of interval 05 days, 10 days and 15 days. By using standard biochemical protocols above mentioned physiological parameters were checked. Fruitful results were observed that encourages the consumption of mushroom in our diet.

Key words: Mushroom powder, blood glucose, diabetes, metabolic status.

INTRODUCTION

In nature more than 2,000 species of mushrooms exist, out of which 25 are widely accepted as food and few are commercially cultivated. Mushrooms have high nutritional and functional value and they are also accepted as nutraceutical foods. Their importance is considerable because of their organoleptic merit, medicinal properties and economic significance [1]. Edible mushrooms provide a nutritionally significant content of vitamins (B1, B2, B12, C, D, and E) [2]. As far as nutritional value of mushrooms is concerned, they are quite rich in protein, with an essential amino acids and fiber, poor fat but with excellent important fatty acids content [3]. They also contain polysaccharides, proteins, fats, minerals, glycosides, alkaloids, volatile oils, terpenoids, tocopherols, phenolics, flavonoids, carotenoids, folates, lectins, enzymes, ascorbic, and organic acids in their fruit bodies, cultured mycelium, and cultured broth[4] [5]. Traditionally a large variety of mushrooms have been utilized in many different cultures in order to maintain health, prevention and treatment of diseases through their immunomodulatory properties. It is considered that many mushrooms are like mini-pharmaceutical factories producing compounds with miraculous biological properties[6]. In order to prevent illness and especially against oxidative stress, a balanced diet is the supporting treatment. In this regard, mushrooms have a long history of use in the oriental medicine to prevent and fight against numerous diseases. Since mushrooms contain all the essential amino acids so that it is good source for vegetarian diets for adult; not only this mushrooms have higher protein content than most vegetables. Besides, edible mushrooms contain many

different bioactive compounds with various human health benefits [7] [8]. β-glucans are the main polysaccharides found in mushroom which is responsible for anticancer, immunomodulating, anticholesterolemic, antioxidant and neuroprotective activities. It is also recognized as potent immunological stimulators in humans and have capacity for treating several diseases[9] [10] [11]. Type 2 diabetes is considered a significant proportion among the major diseases epidemically observed in worldwide and its prevalence is continues to grow. Hypertension, cardiovascular disease, renal failure, nervous system dysfunctioning and certain cancers are associated with untreated and uncontrolled diabetes[12]. Every year, diabetes represents a serious health issue worldwide with a significant rise in morbidity and mortality.

Currently world is looking for natural solutions since a number of limitations related to the use of existing synthetic antidiabetic drugs. Commercial drugs are effective in controlling hyperglycemia but they have harmful side effects, high cost and may cause serious complications, such as hypoglycemia, development of insulin resistance, severe cardiovascular risks, and cancer-associated risks. Therefore, there is need to search for active antidiabetic agents from natural sources with great therapeutic potential of edible and medicinal mushrooms for treatment of diabetes. Among them could be using fungal based medicine. Considering this fact, ten diabetes volunteers were selected and an attempt has been made to minimize diabetes and its associated health related issues.

MATERIALS AND METHODS

Bioformulation

Grown oyster mushrooms were shade dried. Dried mushrooms powder was made in blender. Some specific ingredients at specific concentration were added to mushroom powder for formulation.

Testing of formulation on diabetic patients

Diabetic volunteers were administered with 4gm mushroom formulated powder for the time intervals of 05 days, 10 days and 15 days. After these time intervals, their blood and urine biochemical parameters were checked. Blood sugar in fasting, post prandial, blood urea, serum creatinine, urine glucose, urine ketone bodies and urine abnormality were estimated by standard protocols[13].

EXPERIMENTAL RESULTS

Blood and urine parameters of patients before oyster mushroom powder consumption

Blood and urine analysis of patient before oyster mushroom powder consumption was done and results are given in table 1. It was observed from the table 1 that, blood sugar (fasting) and blood sugar (post prandial) of Shivaji Goje was highest which is followed by Jyoti Gawande and Baburao Ghal as compared to other patients in the study. Blood urea of Jyoti Gawande and Baburao Ghal was found to be highest as compared other patients. Serum creatinine of Tulsiram Shelke, Jyoti Gawande, Shivaji Goje, Kanhaiyalal Jaiswal and Baburao Ghal was found to be high. Traces of glucose and ketone bodies were found in urine samples of Tulsiram Shelke, Jyoti Gawande and Shriram Bhavale.

Analysis of blood / urine parameters with 4gm powder consumption for 05 days

Blood and urine glucose level of ten patients with 4gm powder consumption after 5 days was analyzed and results are given in table 02.

From table 02 it is revealed that, during fasting blood sugar level of Shivaji Goje, Jyoti Gawande, Kanhaiyalal Jaiswal and Dadarao Ghal was significantly lowered due to 4gm powder consumption for 05 days. Blood sugar of post prandial in case of Jyoti Gawande, Shivaji Goje, Baburao Ghal and Tulsiram Shelke was found to be decreased due to 04 gm mushroom powder consumption for 5 days. But it is interesting to note that, blood sugar during post prandial of Shivanand Ugile was found to be increased. When parameter blood urea of ten patients was analyzed, it was found to be decreased in case of Jyoti Gawande, Kanhaiyalal Jaiswal and Shivanand Ugile. Serum creatinine of Jyoti Gawande, Shivaji Goje and Kanhaiyalal Jaiswal was found to be decreased due to consumption of 04 gm mushroom powder for 05 days. In case of Jyoti Gawande and Shivram Bhavale after the analysis of urine, glucose traces and ketone bodies were eliminated with 04gm mushroom powder consumption for 05 days. Urine abnormalities were cured in case of Jyoti Gawande, Tejrao Gawande and Kanhaiyalal Jaiswal.

Analysis of blood / urine parameters with 4gm powder consumption for 10 days Analysis of blood and urine parameters of ten patients with 4gm powder consumption for 10 days was carried out and results are given in table 03.

From table 03 it is clear that, due to 4gm mushroom powder consumption up to 10 days by ten patients, all the parameters considered during the study showed fluctuation than normal range. Blood sugar level during fasting was found to be significantly decreased in case of Shivaji Goje, Jyoti Gawande and Kanhailal Jaiswal. Whereas, post prandial blood sugar was also found to be significantly decreased in case of Baburao Ghal, Shivaji Goje, Jyoti Gawande and Dadaro Ghal. Blood urea of Shivaji Goje, Kanhailal Jaiswal and Jyoti Gawande was found to be lowered due to consumption of 4gm mushroom powder consumption up to 10 days. As far as serum creatinine is concerned, it was found to be decreased in Jyoti Gawande and Baburao Ghal, Tulsiram Shelke, Shivaji Goje and Kanhailal Jaiswal. Glucose traces and ketone bodies in urine sample of Tulsiram Shelke, Jyoti Gawande and Shivram Bhavale were found to be absent due to regularly consumption of 4gm mushroom powder for 10 days. Urine abnormalities were also cured in case of Jyoti Gawande, Tejrao Gawande and Kanhailal Jaiswal.

Analysis of blood / urine parameters with 4gm powder consumption for 15 days

After consumption of 4gm mushroom powder for 15 days, ten patients blood and urine samples were analyzed for blood sugar, blood urea, serum creatinine, urine glucose, urine ketone bodies and urine abnormalities and obtained result is summarized in table 04.

From table 04 it is clear that, fasting blood sugar of Shivaji Goje, Jyoti Gawande, and Dadarao Ghal was significantly decreased due to 4gm mushroom powder consumption for 15 days. In same condition, post prandial blood sigar was significantly lowered in case of Baburao Ghal, Shivaji Goje, Jyoti Gawande and Tulsiram Shelke. Blood urea in Shivaji Goje and Kanhaiyala Jaiswal was significantly hampered which are followed by Jyoti Gawande and Tejrao Gawande. Serum creatinine in case of Jyoti Gawande, Shivanand Ugile and Baburao Ghal was found to be decreased due to having 4gm mushroom powder for 15 days. Initially urine sample of Tulsiram Shelke, Jyoti Gawande and Shivram Bhavale showed traces of glucose but after consumption of 4gm mushroom powder for 15 days, glucose traces were absent. Whereas, ketone bodies were found to be absent in urine sample of Tulsiram Shelke, Jyoti Gawande Shivaji Goje and Shivram Bhavale. Not only that some patients had urine abnormality which was cured in case of Tulsiram Shelke, Jyoti Gawande, Tejrao Gawand, Shivaji Goje and Kanhaiyala Jaiswal.

DISCUSSION

After the consumption of 4gm mushroom powder for the interval of 05 days, 10 days and 15 days blood sugar level of volunteers during fasting and post prandial were checked and it was observed to be significantly decreased while in some cases it was increased. Other parameters such as urine glucose, urine ketone bodies, urine abnormality were also checked and encouraging results were obtained. Similar type of study was carried out[14]. They extracted extracellular polysaccharides from mycelia of *Phellinus linteus* which showed hypoglycemic effects with decreased plasma glucose, total cholesterol and triacylglycerol concentrations. In another experiment, [15]conducted research on normal and obese diabetic mice. Capsules containing water extract of 95% powdered sporocarps of *G. lucidum* and 5% dextrin was used for the tests. Mice were fed with *G. lucidum* extract at a dose of 0.3g/kg for the period of four weeks. They found that, plasma glucose decreased to 68.5 mg/dL in normal mice and 288.4 mg/dL in obese mice. in the next year, [16] conducted a clinical study with participation of 120 diabetic patients in order to evaluate the efficacy of oyster mushroom (*Pleurotus* spp.) on glycemic control. The results concluded that, gradual reduction in hyperglycemia in type 2 diabetic subjects with mushroom supplementation and demonstrated the potential use of oyster mushroom for better glycemic control, positive effects on lipid profiles and a better quality of life. In another study done on mice [17], the water-soluble polysaccharide of the cap powder (300 mg/kg daily) fed for 28 days to diabetic mice gave the best glucose lowering activity of the five extracts and almost decreased the blood glucose levels to that of normal mice. *Cordyceps militaris* can lower plasma glucose via the stimulation of insulin secretion and the extracts decreased the plasma glucose by 21 % and induced additional insulin secretion by 54.5 % after 30 minutes[18].

Oyster mushroom due to their composition and biological properties, are potential sources of new bioformulations for the prevention and treatment of diabetes. More studies are needed to explore this neglected resource for the isolation and production of novel anti-diabetic compounds having medicinal and biochemical potential with therapeutic importance.

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Table 1: Blood and urine analysis of patient before oyster mushroom powder consumption

Sr. no.	Patient	Parameters (mg/dl)				Urine Glucose	Urine Ketone bodies	Urine Abnormality
		Blood sugar (Fasting)	Blood sugar (Post prandial)	Blood urea	Serum creatinine			
1.	Shivanand Ugile	121	183	35	1.1	-	-	-
2.	Tulsiram Shelke	187	395	34	1.2	Trace	+	+
3.	Jyoti Gawande	231	469	42	1.2	Trace	+	+
4.	Tejrao Gawande	146	234	34	1.1	-	-	+
5.	Shivaji Goje	367	497	38	1.2	-	+	+
6.	Kanhaiyalal Jaiswal	168	234	40	1.2	-	-	+
7.	Shriram Bhavale	179	331	28	1.0	Trace	+	-
8.	Dadarao Ghal	168	341	34	1.0	-	-	-
9.	Chandrakala Mule	148	261	28	0.9	-	-	-
10.	Baburao Ghal	210	489	42	1.2	-	-	-

Table 2: Analysis of blood / urine glucose level with 4gm powder consumption for 05 days

Sr. No.	Patient	Parameters													
		Blood sugar (Fasting)		Blood sugar (Post prandial)		Blood urea		Serum creatinine		Urine Glucose		Urine Ketone bodies		Urine Abnormality	
		C	T	C	T	C	T	C	T	C	T	C	T	C	T
1.	Shivanand Ugile	121	66	183	197	35	40	1.1	1.1	-	-	-	-	-	-
2.	Tulsiram Shelke	187	121	395	163	34	36	1.2	1.1	Trace	Trace	+	-	+	+
3.	Jyoti Gawande	231	82	469	131	42	26	1.2	0.9	Trace	-	+	-	+	-
4.	Tejrao Gawande	146	108	234	135	34	34	1.1	1.1	-	-	-	-	+	-
5.	Shivaji Goje	367	182	497	221	38	40	1.2	1.1	-	Trace	+	-	+	+
6.	Kanhaiyalal Jaiswal	168	71	234	111	40	28	1.2	1.1	-	-	-	-	+	-
7.	Shriram Bhavale	179	101	331	123	28	28	1.0	1.0	Trace	-	+	-	-	-
8.	Dadarao Ghal	168	74	341	121	34	32	1.0	1.2	-	-	-	-	-	-
9.	Chandrakala Mule	148	108	261	131	28	38	0.9	1.0	-	-	-	-	-	-
10.	Baburao Ghal	210	165	489	212	42	42	1.2	1.2	-	Trace	-	-	-	+

Table 3: Analysis of blood / urine glucose level with 4gm powder consumption for 10 days

Sr. No.	Patient	Parameters													
		Blood sugar (Fasting)		Blood sugar (Post prandial)		Blood urea		Serum creatinine		Urine Glucose		Urine Ketone bodies		Urine Abnormality	
		C	T	C	T	C	T	C	T	C	T	C	T	C	T
1.	Shivanand Ugile	121	97	183	132	35	28	1.1	1.0	-	-	-	-	-	-
2.	Tulsiram Shelke	187	126	395	333	34	28	1.2	1.1	Trace	-	+	-	+	+
3.	Jyoti Gawande	231	107	469	147	42	26	1.2	0.9	Trace	-	+	-	+	-
4.	Tejrao Gawande	146	86	234	126	34	24	1.1	1.1	-	-	-	-	+	-
5.	Shivaji Goje	367	112	497	169	38	18	1.2	1.1	-	-	+	-	+	+
6.	Kanhaiyalal Jaiswal	168	98	234	130	40	22	1.2	1.1	-	-	-	-	+	-
7.	Shriram Bhavale	179	119	331	177	28	32	1.0	1.0	Trace	-	+	-	-	-
8.	Dadarao Ghal	168	103	341	142	34	32	1.0	1.0	-	-	-	-	-	-
9.	Chandrakala Mule	148	86	261	108	28	28	0.9	0.9	-	-	-	-	-	-
10.	Baburao Ghal	210	146	489	132	42	36	1.2	1.0	-	-	-	-	-	+

Table 4: Analysis of blood / urine glucose level with 4gm powder consumption for 15 days

Sr. No.	Patient	Parameters													
		Blood sugar (Fasting)		Blood sugar (Post prandial)		Blood urea		Serum creatinine		Urine Glucose		Urine Ketone bodies		Urine Abnormality	
		C	T	C	T	C	T	C	T	C	T	C	T	C	T
1.	Shivanand Ugile	121	90	183	110	35	24	1.1	0.9	-	-	-	-	-	-
2.	Tulsiram Shelke	187	122	395	123	34	23	1.2	1.1	Trace	-	+	-	+	-
3.	Jyoti Gawande	231	99	469	149	42	25	1.2	0.9	Trace	-	+	-	+	-
4.	Tejrao Gawande	146	80	234	120	34	20	1.1	1.0	-	-	-	-	+	-
5.	Shivaji Goje	367	85	497	161	38	16	1.2	1.1	-	-	+	-	+	-
6.	Kanhaiyalal Jaiswal	168	91	234	130	40	18	1.2	1.1	-	-	-	-	+	-
7.	Shriram Bhavale	179	100	331	180	28	36	1.0	1.0	Trace	-	+	-	-	-
8.	Dadarao Ghal	168	64	341	151	34	30	1.0	0.9	-	-	-	-	-	-
9.	Chandrakala Mule	148	80	261	85	28	24	0.9	0.9	-	-	-	-	-	-
10.	Baburao Ghal	210	120	489	91	42	31	1.2	1.0	-	-	-	-	-	-