ISSN : 2231-2374

# RESEARCH HIGHLIGHTS

A Journal of

Avinashilingam

Institute for Home Science and Higher Education for Women

University

(Estd. u/s 3 of UGC Act 1956)

Coimbatore - 641 043, Tamil Nadu, India

Vol. 23, No.3 * Quarterly * July 2013

Research Highlights
Vol. 23, No. 3, 2013

RESEARCH ARTICLES

# EFFECT OF THE MEDICINAL VALUE OF *GYMNEMA SYLVESTRE* (SIRUKURUNJA) ON TYPE II DIABETICS

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## Introduction

In the 21st century, health is a shared responsibility, involving equitable access to essential care and collective defence against transitional threats. Among all forms of life, human life on earth is supreme. To live a satisfied life, good health is essential. Wellness is first and foremost a choice to assume responsibility for the quality of the life. When the standard of living is rising everywhere; the standard of health is at its lowest. This is mainly because modern man suffers from many diseases as he lives far away from nature (Sanathana, 2004).

In view of these there is a rise in the non-communicable diseases such as diabetes, cancer, blindness, mental illness, hypertension, HIV/AIDS, accidents and injuries. The health status of Indians, is still a cause for the grave concern, especially that of the rural population. The problem of rural health is to be addressed both at macro (national and state) and micro (district and regional) levels. This is to be done in an holistic way, with a genuine effort to bring the poorest of the population to the centre of the fiscal policies (Swain, 2006).

Every fourth diabetic subject in the world is an Indian and every fourth adult in Indian urban area is a diabetic. According to WHO projections, the 30 million diabetics in India will go up to 74 million by 2025. WHO has issued a warning that India will be the diabetic capital of the world. Diabetes is characterized by high blood glucose concentration resulting from defects in insulin secretion, insulin action or both (Krause,2004).

Type II diabetes is a metabolic disorder in which the body unable to make enough insulin or to use it properly and is known as "silent killer". Diabetes can cause blindness, kidney disease, heart disease, stroke and nerve damage which can lead to amputation (Handysides, 2007). Due to increasing obesity and altered dietary habits in both western and developing countries, the prevalence of type II diabetes is growing at an exponential rate (Subash, 2006).

Thus today, there is an increasing demand for plant based drugs and pharmaceuticals in the world market. India is among traditional producers and exporters of several medicinal plants (Kurian, 1998). According to WHO herbal medicines serve in the health care of 80 percent of the world population. It also shows that goal of the "health for all" cannot be achieved without

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herbal medicines (Ramachandran, 2005). In diabetics, some herbal alternatives are proven to provide symptomatic relief and assist in the prevention of the secondary complications of the disease.

*Gymnema* sylvestre is a medicinal plant native to the forest of India. It is also known as gurmar. It belongs to the Asclepideaceae family (milkweed). Sarkaraikolli, Sirukurunja is the Tamil version of the herbal plant. Gymnema sylvestre has been used for many conditions including diabetes, indigestion, urinary tract problems, obesity, hypoglycemia, allergies, anaemia, hypercholesterolemia and hyperactivity. With these background the objectives formulated were to

- Study the socio economic status, prevalance and life style pattern, food habits, health status, knowledge and usage of *Gymnema sylvestre*.
- Identify the medicinal value of *Gymnema sylvestre* among Type II diabetics and
- Assess the health benefits of *Gymnema sylvestre*.

## Methodology

Gudiyathram of Vellore district was selected as the area for the conduct of the study. For selection of sample, purposive sampling procedure was followed. Since, in the selected area, the availability of female diabetic subjects were less compared to male diabetic subjects, male subjects were selected for the supplementation study. For the household survey, 100 male Type II diabetics in the age group of 40-60 years were selected. From the selected 100 subjects, a sub sample of 50 constituting 25 each in experimental and control group were selected based on the interest, co-operation and the knowledge of *Gymnema sylvestre*.

Subjects with specified conditions such as Type II diabetes free from other complications and who had never taken *Gymnema sylvestre* was under the observation of the researcher.

Several studies proved that 250 mg of *Gymnema sylvestre* capsule twice a day before breakfast and after dinner is sufficient to control Type II diabetes mellitus. Based on the proved information, the *Gymnema sylvestre* leaves were shade dried and made into a powder and was filled in 250 mg of capsule with the help of measuring spoon. Two capsules of *Gymnema sylvestre* per day were supplemented to the Type II diabetic subjects in experimental group and advised to consume one capsule in the early morning before breakfast and one capsule after their dinner for six months. The systematic case study history was collected along with the clinical examination and regular followups of the subjects.

### Assessing the medicinal value of *Gymnema sylvestre* on type II diabetes

The effect of supplementation of *Gymnema sylvestre* before and after the study period were noted by assessing of the nutritional status, observing dietary calendar, analysing of bio-chemical profile and other health benefits of *Gymnema sylvestre*

### Assessment of nutritional status

The purpose of nutrition assessment are to define accurately an individual's

nutritional status, to determine the level of nutritional support that individual need; and to monitor changes in nutritional status and the effect of nutritional intervention based on the interpretation of clinical information obtained from the diet history, medical history, review of systems and physical examination, including anthropometric measurements and laboratory data (Morrison, 2000 and Srilakshmi, 2006).

The nutritional status of the subjects was assessed based on anthropometric measurements, dietary calendar, biochemical assessment.

**Anthropometric measurement**

Using anthropometric standards to evaluate nutritional status allows classification of patients into categories ranging from undernourished to obese. Interpretation of these measurements varies according to the patient's age and requires standardized methods, accurate equipment, and a well trained observer (Morrison, 2000).

The anthropometric measurements such as height, weight and waist hip circumferences were taken. The details of techniques are given below.

**Measurement of Height**

The height of an individual is influenced both by genetic and environmental factors. The maximum growth potential of an individual is decided by hereditary factors, while the environmental factors, the most important being nutrition and morbidity, determine the extent of exploitation of that genetic potential. The height of the subjects were taken using the non stretchable fibre glass tape. The subject were made to stand erect looking straight on a leveled surface with heels together and toes apart, without shoes.

**Measurement of Weight**

Body weight is the most widely used and the sensitive and simplest reproducible anthropometric measurement for the evaluation of nutritional status. The subjects are made to stand on a platform of the balance with minimal clothing without footwear (Brahman, 2005).

**Body Mass Index (BMI)**

The weight and height measures were used to calculate the subjects' body mass index, a ratio that is used in evaluating obesity status.

$$BMI = \frac{\text{Weight in Kilogram}}{\text{Height in Meter}^2}$$

The Body mass Index is a useful clinical calculation for diagnosing obesity because it is a more accurate measure of body fat than weight alone (Srilakshmi, 2006). Table 1 shows the Body Mass Index classification.

**Table 1. Body mass index**

| BMI | Nutritional Grades |
|---|---|
| 19 and 25 | Normal |
| 25.1 – 29.9 | Overweight |
| Greater than 30 | Obese |
| 30 to 34.9 | Grade I |
| 35 to 39.9 | Grade II |
| Greater than 40 | Grade III |

Before and after supplementation of *Gymnema sylvestre*, the height, weight and BMI of the selected subjects were measured.

### Waist to Hip Ratio

Excess fat around the waist and abdomen is assessed by the waist hip ratio. The hip circumference defined as the maximum circumference of the midsection, taken at the maximum extension of the abdomen. A waist: hip ratio of greater than 1.0 rather than waist measurement alone, is a better predictor of a greater risk of diabetes and cardiovascular disease (Srilakshmi, 2006).Waist to Hip ratio were computed and compared with normal ratio.

### Dietary calendar

Dietary calendar is one of the methods used for assessing the food intake of an individual. For the present study, the food intake of the respondents was analysed by 24 hour dietary recall method for seven consecutive days by giving a dietary calendar. The number of food items consumed by the respondents were taken into consideration as compared to the standard menu (Krause, 2004 and Srilakshmi 2006).

### 3. Analysis of biochemical profile

Biochemical tests are precise and measure individual nutrient concentration in body fluids or detection of abnormal amounts of metabolites in urine (Bamji. *et al.*, 2004). The following parameters are used in evaluating the effect of supplementation after six months.

### Estimation of blood glucose

Test of blood glucose can identify people who may have diabetes mellitus. A fasting and post prandial glucose concentration of greater than 140 mg per 100 millilitres blood on more than one occasion establishes a positive diagnosis (Rolfes, 1998).

### Estimation of serum total cholesterol

The determination of serum total cholesterol concentrations provides a way to identifying people who are in the risk of cardio vascular disease (Williams, 1998).

### Estimation of serum triglyceride

Estimation of serum triglyceride is to identify the people who may have the cardiovascular disease and other complications. Table 2 projects the various methods used for biochemical assessment.

**Table 2. Biochemical Assessment**

| Parameters | Method |
|---|---|
| Blood glucose | O – Toluidine method |
| Serum triglycerides | Calorimetric method |
| Serum cholesterol | Zlatkis, Zak and Boyle method |
| HDL cholesterol | Modified Leffler method |
| LDL cholesterol | Total cholesterol - HDL cholesterol - VLDL cholesterol |
| VLDL cholesterol | Triglyceride / 5 |

* Medical Laboratory Technology. Mukherjee. 2002.

### 4. Other health benefits of *Gymnema sylvestre*

According to Pullaiah (2002) the other health benefits of *Gymnema sylvestre* are it lowers serum cholesterol and triglycerides, dyspepsia, constipation, jaundice, helminthiasis, cardiopathy, amenorrhea. It is used to treat snakebites, stomach complaints, water retention and liver disease. It removes the bad odour from breast milk and beneficial for eyes.

## Results and discussion

### Prevalence and life style pattern

The prevalence rate of diabetes was high with 45 per cent in the age group of 50-60 years and 35 percent in 40-50 years and 20 percent in above 60 years.

Majority of 55 percent diabetics were non-vegetarians, only 30 per cent followed vegetarian type of diet and 15 percent were ova-vegetarian.

With regard to the exercise pattern, cycling and walking were followed daily by 80 percent and 70 percent respectively.

Fifty percent had type II diabetic for a period of 1 to 5 years and 45 percent had more than 5 years, whereas only five percent had type II diabetes less than one year.

Majority of 75 per cent had followed allopathy treatment, while only 10 per cent and 5 per cent had Ayurveda, Homeopathy and Naturopathy treatment respectively.

### Fasting blood glucose level

Fasting blood glucose level of the selected samples of the experimental and control group is given in Table 3 and Figure 1.

**Table 3. Fasting blood glucose level of the experimental and control group before and after supplementation**

| Groups | Fasting blood glucose level (mg/dl) | | | |
|---|---|---|---|---|
| | Initial Mean±SD | Final Mean±SD | Mean difference | 't' value |
| Experimental group (N=25) | 127±29 | 92.5±10.6 | 34.5 | 3.536** |
| Control group(N=25) | 138.9±20.2 | 140.1±21.4 | 1.2 | 0.007NS |

**Significant at (P<0.01); NS- Not significant

The mean fasting blood glucose level of the experimental group before supplementation was 127mg/dl and had reduced to 92.5mg/dl after the supplementation of *Gymnema sylvestre* for six months which is statistically significant at $P < 0.01$ level.

In the case of control group, without supplementation, the mean fasting glucose level before supplementation was 138.9mg/dl and had increased to 140.1mg/dl and the difference was not statistically significant.

A clinical trial recently conducted in the US provides further support for the use of Gymnema in the management of diabetes. Of 65 patients tested over the 6-month trial, Gymnema tablets reduced mean fasting

glucose levels by 11 per cent. Average post-meal glucose levels showed a decline of 13 per cent and glycosylated haemoglobin levels dropped 6.8 per cent (www.mediherb.com).

### Post prandial glucose level

Table 4 and Figure 2 explain the post prandial glucose level of the experimental and control group before and after supplementation.

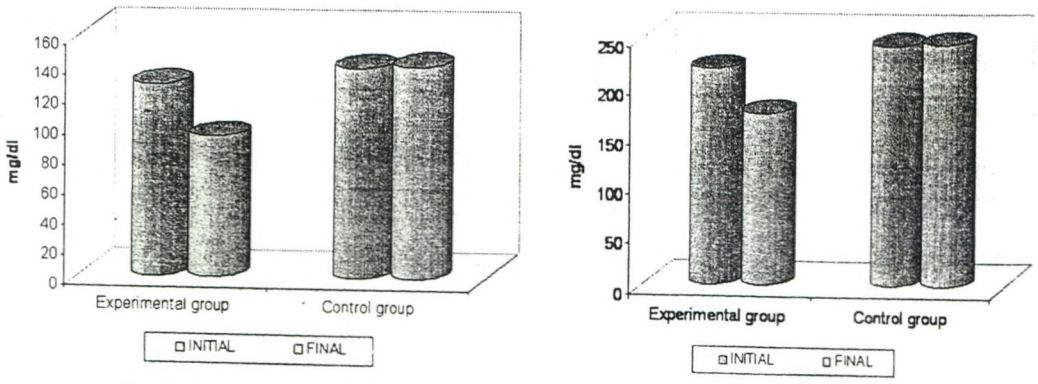
**Table 4. Post prandial glucose levels of the experimental and control group before and after supplementation**

| Groups | Post prandial glucose level (mg/dl) | | | |
|---|---|---|---|---|
| | Initial Mean±SD | Final Mean±SD | Mean difference | 't' value |
| Experimental group (N=25) | 218.6±24.9 | 172.9±6.3 | 45.7 | 10.682** |
| Control group (N=25) | 242±11.52 | 244±12.3 | 2 | 1.0821$^{NS}$ |

**Significant at (P<0.01); NS- Not significant

The mean postprandial blood glucose level of the experimental group before supplementation was 218.6mg/dl and after supplementation a marked reduction was noted with a mean difference of 45.7mg/dl which was statistically significant at P <0.01 level.

In the case of control group, the mean post prandial glucose level showed a mean increase of two mg/dl after six months period but the difference was not statistically significant.




Fasting blood glucose level

Post prandial glucose level

Figure 1 & 2

### Serum lipid profile

Serum lipid profile of the selected sample of the experimental and control group is given in Table 5 and Figure 3.

**Table 5. Serum lipid profile of the experimental and control group before and after supplementation**

| Lipids | Mean serum lipid profile (mg/dl) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental group | | | | Control group | | | |
| | Initial Mean± SD | Final Mean± SD | Mean difference | 't' value | Initial Mean± SD | Final Mean± SD | Mean difference | 't' value |
| Total cholesterol | 199.12± 12.46 | 179.96± 10.91 | 19.16 | 13.867** | 219.28± 48.91 | 217.2± 47.9 | 2.08 | 0.1655$^{NS}$ |
| Triglycerides | 93.6± 10.24 | 72.68± 10.11 | 20.92 | 18.326** | 125± 19.79 | 125.9± 20.48 | 0.9 | 0.1700$^{NS}$ |
| HDL cholesterol | 39.16± 5.63 | 41.60± 5.51 | 2.44 | 20.922** | 37.02± 13.51 | 37.9± 12.56 | 1.12 | 0.2483$^{NS}$ |
| LDL cholesterol | 146.28± 7.48 | 136.44± 6.15 | 9.84 | 15.644** | 143.92± 2.92 | 142.76± 2.81 | 1.16 | 1.924$^{NS}$ |
| VLDL cholesterol | 40.44± 5.244 | 33.20± 4.60 | 7.24 | 19.517** | 46.84± 4.86 | 46.24± 4.78 | 0.6 | 1.464$^{NS}$ |

**Significant at (P<0.01); NS- Not significant

### Total cholesterol

The mean serum cholesterol level of the experimental group before supplementation was 199.12mg/dl and it was reduced to 179.96mg/dl after the supplementation of *Gymnema sylvestre* for 6 months and found to be highly significant at P<0.01 level. With regard to control group, no significant change was showed before and after the supplementation period.

### Triglycerides

The mean triglycerides level of experimental group before supplementation was 93.60mg/dl and had decreased to 72.68mg/dl after the supplementation of *Gymnema sylvestre*.

### HDL cholesterol

There was a marked increase of 2.44mg/dl mean HDL cholesterol level, after the supplementation of *Gymnema sylvestre* for six months, the difference showing statistically significance at P(<0.01) level. There was no significant change in the control group.

### LDL cholesterol

The mean LDL cholesterol level of experimental group was reduced from 146.28mg/dl to 136.44mg/dl after the supplementation. The difference shows a statistical significance at P<0.01 level and in the control group there was no significant difference.

### VLDL cholesterol

The mean VLDL cholesterol level of experimental group before supplementation was 40.44mg/dl and had reduced to 33.20mg/dl after the supplementation which showed statistical significance at P<0.01 level. It is clearly observed that the control group did not show any significant change in serum lipid profile after the study period of six months.

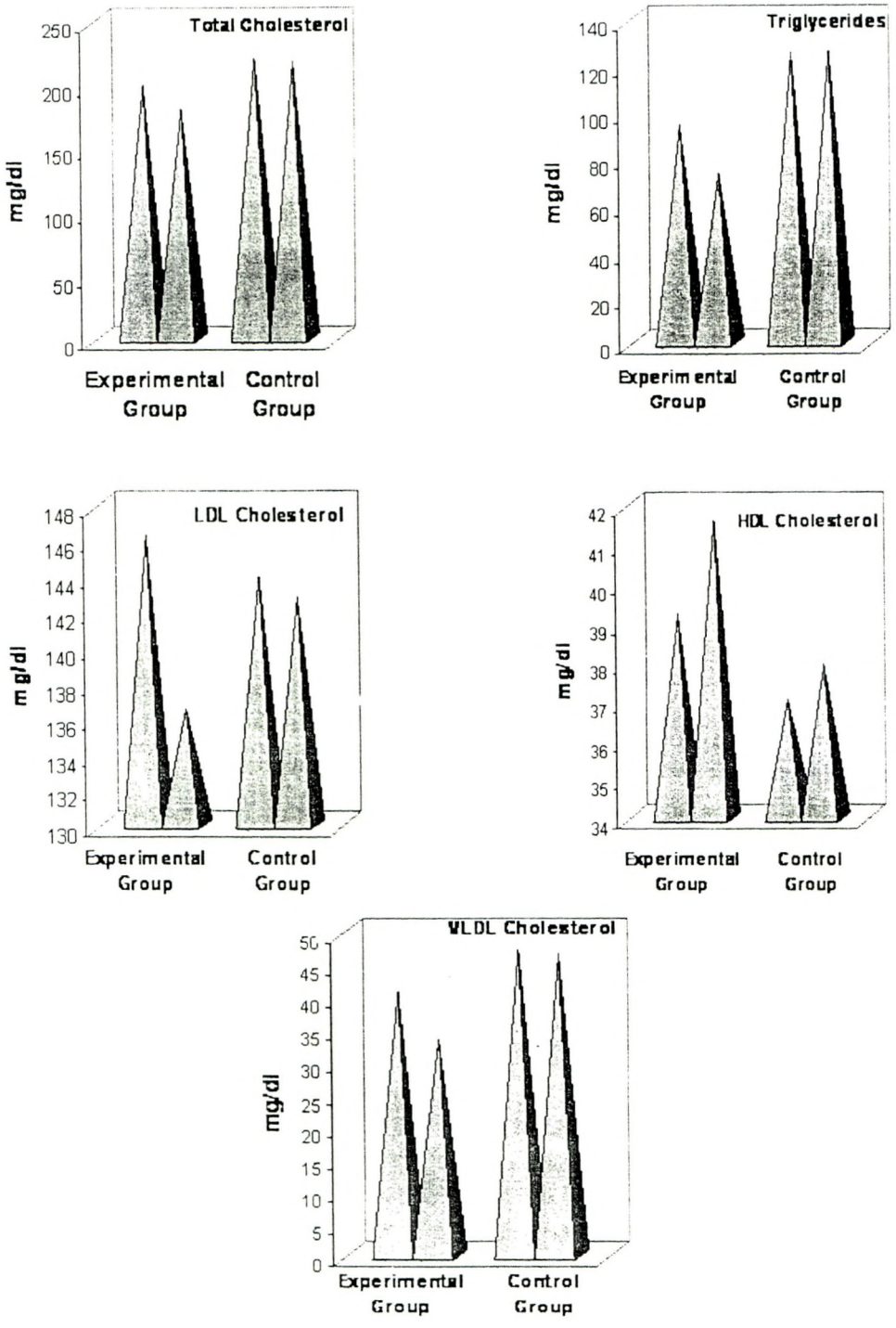

Total Cholesterol
mg/dl
250
200
150
100
50
0
Experimental Group
Control Group
Triglycerides
mg/dl
140
120
100
80
60
40
20
0
Experimental Group
Control Group
LDL Cholesterol
mg/dl
148
146
144
142
140
138
136
134
132
130
Experimental Group
Control Group
HDL Cholesterol
mg/dl
42
41
40
39
38
37
36
35
34
Experimental Group
Control Group
VLDL Cholesterol
mg/dl
50
45
40
35
30
25
20
15
10
5
0
Experimental Group
Control Group
Initial
Final

Figure 3

180

**Other health benefits of *Gymnema sylvestre***

Information of other health benefits of *Gymnema sylvestre* are given in Table 6 and Figure 4.

**Table 6. Other health benefits of *Gymnema sylvestre***

**Multiple responses N = 25**

| Details | Number of subjects | Percent |
|---|---|---|
| Reduces weight (Obesity) | 15 | 60 |
| Increases haemoglobin (Anaemia) | 12 | 48 |
| Increases defecation (Constipation) | 10 | 40 |
| Reduces cholesterol | 8 | 32 |
| Lowers hypertension (Blood pressure) | 7 | 28 |
| Reduce eye trouble | 5 | 20 |

Majority (60%) had the opinion that, *Gymnema sylvestre* helps in controlling obesity, 48 per cent reported that *Gymnema sylvestre* cures anaemia. Forty per cent had reported that it prevents constipation, 32 per cent suggested that it reduces cholesterol, 28 per cent were reported that *Gymnema sylvestre* is good to reduce hypertension and 20 per cent stated that it is good for preventing eye troubles.

*Gymnema sylvestre* is used for many conditions including diabetes, anaemia, cholesterol, obesity, allergies and problems of urinary tract and digestion problems (www.gymnema.com).

**Other health benefits of *Gymnema sylvestre***

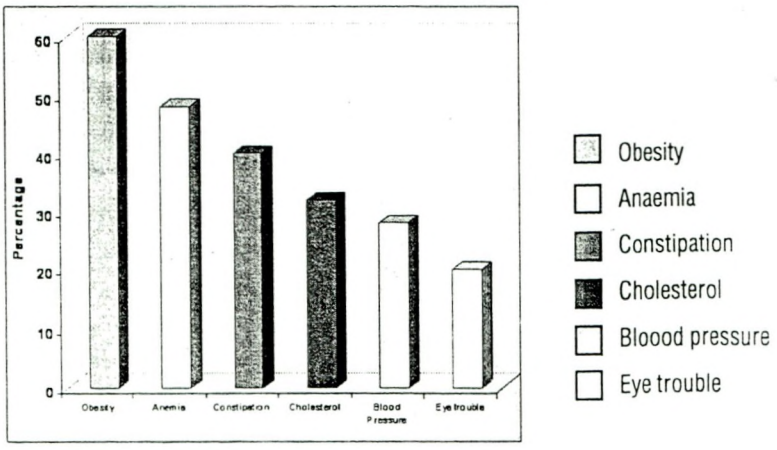



Figure 4

181

**e. Suggestions for the form of use for the consumption of *Gymnema sylvestre***

Table 7 and Figure 5 shows the preference for the form of usage of *Gymnema sylvestre* for consumption.

It is observed that 64 per cent of the subjects were willing to take *Gymnema sylvestre* in the form of tablet. Sixteen per cent of the subjects preferred *Gymnema sylvestre* in the form of juice due to the reason of inability to swallow the tablets and getting irritation. Twelve per cent of the subjects preferred in powder form because of its convenience. Eight per cent of the subjects preferred *Gymnema sylvestre* in the form of chutney.

**Table 7. Suggestions for the form of consumption of *Gymnema sylvestre***

| Suggestions | Number of subjects | Percentage |
|---|---|---|
| Tablet form | 16 | 64 |
| Juice form | 4 | 16 |
| Powder form | 3 | 12 |
| Chutney | 2 | 8 |

**Suggestions for the form of consumption of *Gymnema sylvestre***

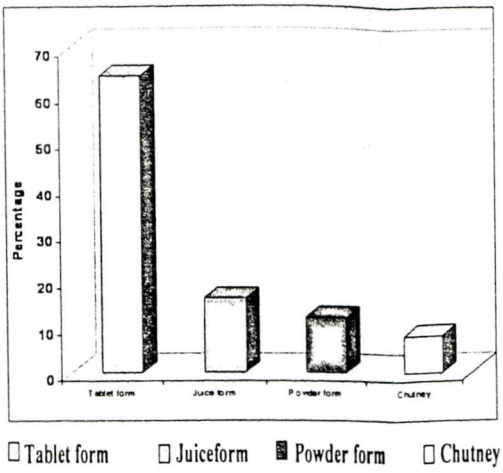



**Figure 5**

## Conclusion

Further, in the days of everchanging lifestyles, the adult population have to overcome many obstacles with busy life schedule, diabetes being the second cause of death in the world. According to WHO every fourth diabetic in the world is an Indian. The leaves of *Gymnema sylvestre* have been used for centuries in the traditional Indian system of Ayurvedic medicine. Gymnema has been used in India for the treatment of diabetes for over 2,000 years. It treats a number of ailments. *Gymnema sylvestre* with no side effects but with great soothing and controlling effects on diabetes mellitus is no doubt the low cost, locally available acceptable means of solution.

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