



Effect of Amla Powder and Turmeric Powder Consumption on Geriatric Subjects Suffering from Non-Insulin Dependent Diabetes Mellitus

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Abstract

Diabetes mellitus is the most challenging public health problem of 21st century. International Diabetes Federation, (2015) reported 69.1 million cases of diabetes in India. Worldwide 2011 estimation of prevalence of diabetes in the elderly population (60 years & above) is between 15% to 20% (IDF Diabetes Atlas, 2012). The present study titled “Effect of amla powder and turmeric powder consumption on geriatric subjects (60 years & above) suffering from non-insulin dependent diabetes mellitus” involved multistage random sampling technique. The study was conducted on 18 geriatric subjects residing in Kala Mahal & Pipal Mandi area of Agra city, randomly divided into 2 groups- experimental group (N1=8) and control group (N2=9). 2.5g each of amla powder and turmeric powder was consumed by experimental geriatric non-insulin dependent subjects for 45 continuous days and its effect on fasting and post prandial blood glucose level was recorded and compared with the control group. Demographic, anthropometric and dietary patterns of both groups was also recorded. Statistical tests were applied and it was found that consumption of amla powder and turmeric powder was significantly effective on geriatric subjects (60 years & above) and there was a significant drop in the fasting & post prandial blood glucose level of experimental group on 45th day of feeding trial. In the 24-hour diet recall average consumption of thiamine (mg) was significant at 95% confidence interval ($p < 0.05$) when t-test was applied while energy (kcal), protein (g), carbohydrates (g), fat (g), phosphorus (mg), iron (mg), vitamin A (mcg), riboflavin (mg), niacin (mg) and vitamin C (mg) intake were not significant ($p > 0.05$).

Keywords: Old Age, Amla Powder, Turmeric Powder, Non-Insulin Independent Diabetes Mellitus, Fasting Blood Sugar, Post Prandial Blood Sugar Level.

Introduction

Diabetes mellitus is a heterogeneous group of disease characterized by chronic elevation of

glucose in the blood. It arises because the body is unable to produce enough insulin for its own needs, either because of impaired insulin

secretion, impaired insulin action or both (Holleman, 2014). Medical plants have an ever emerging role to play in treatment of chronic diseases like Diabetes Mellitus, especially in developing countries where resources are 52igger. The treatment of such diseases can be done by exploiting the herbal integrity of India. The plants in part or full can be used for curing any disorder related with diabetes mellitus.

Amla is highly nutritious and is one of the richest sources of vitamin C, amino acids and minerals (Srivasuki, 2012). Amla is a precious gift of nature for mankind. 1 gm of vitamin C per 100ml fresh amla juice is present, and required for synthesis of collagen, which is responsible for keeping the cells of the body together. Walia et al., (2015) concluded that amla is widely used in Indian system of medicine and plays an important role in prevention of diabetes mellitus.

Turmeric (*Curcuma Longa L.*) the ancient and sacred spice of India known as “INDIAN SAFFRON” is an important spice grown in India. It is also known as the “GOLDEN SPICE OF LIFE” and is one of the most essential spices used as an important ingredient in cooking all over the world. Krup et al., (2013) revealed that Curcumin is the main chemical compound of turmeric and proven for its anti- inflammatory, anti-oxidant, anti-mutagenic, anti-diabetic, anti-bacterial, hepato-protective, expectorant and anti-cancerous pharmacological activities.

Objectives

1. To study the demographic characteristics of geriatric subjects (60 years & above) suffering from non-insulin dependent diabetes mellitus.
2. To asses and compare the life style of experimental and control group of non-insulin dependent geriatric (60 years & above) diabetic subjects.
3. To asses and compare the dietary pattern of experimental and control group of non-insulin dependent geriatric (60 years & above) diabetic subjects.

4. To study the effect of Amla powder and Turmeric powder consumption on fasting and post prandial blood sugar level of geriatric subjects (60 years & above) suffering from non-insulin dependent diabetes mellitus.

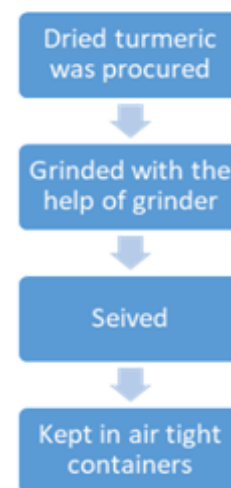
Material and Methods

The methodological aspects of the study are discussed under the following heads:

- A. SELECTION AND PROCUREMENT OF THE HERBS (AMLA AND TURMERIC)
Fresh 10 kg amla fruit was procured from Sabji Mandi of Agra and 1.25 kg dried turmeric was procured from Rawat Pada market of Agra.

- B. DEHYDRATION OF HERBS

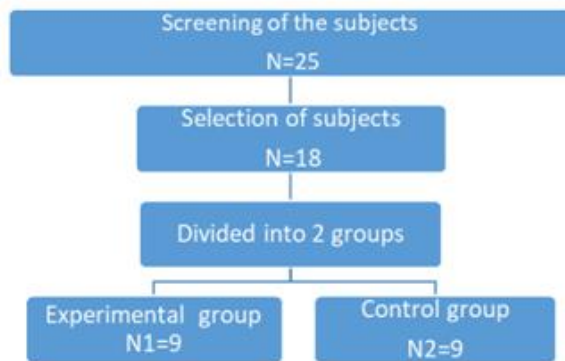
1. Turmeric powder preparation



- ii. Amla Powder Preparation



C. SCREENING AND SELECTION OF SUBJECTS



D. SCHEDULE FOR ADMINISTRATION OF AMLA POWDER AND TURMERIC

E. PACKAGING OF HERBS FOR FEEDING TRIAL IN EXPERIMENTAL GROUP

	No of packets	Weight of packets (gm)
Amla powder	405	2.5
Turmeric powder	405	2.5

F. DEVELOPMENT OF THE SCHEDULE

The schedule consisted of the following sections: general information, family background and history of diabetes mellitus, general health, life style, symptoms related to diabetes, dietary intake, glucose testing of subjects, physical activity, medication, medical care.

G. STANDARIZATION OF TOOLS AND TECHNIQUES USED IN THE STUDY

a) GLUCOMETER: A Johnson and Johnson, ONE TOUCH Select Simple Blood Glucose monitoring system was

POWDER AND RECORDING OF BLOOD SUGAR LEVEL

After screening of the subjects, amla and turmeric powder were given to the experimental group in the fasting stage for 45 consecutive days. First reading for fasting and post prandial blood sugar was recorded on 1st February 2016 further fasting and PP was recorded on 15th February 2016, 1st March 2016, 16th March 2016 and 31st March 2016.

standardized and one touch simple owner's guide instructions for use.

b) RECIPES FOR 24-HOURS DIET RECALL: For dietary analysis of the elderly subjects many recipes like gravy vegetable, dry vegetable, pulses, whole grains, chapatis in different size (raw amount- 25g, 35g, 34g) were standardized.

After the 53iggyery53ized53on of vegetable, pulses and whole pulse, different size of bowls (A,B,C,D) were used for calculating the dietary intake.

RECIPES	BOWLS			
	A (g)	B (g)	C (g)	D (g)
Cereal (rice)	50	75	100	125
Pulses (lentil)	50	75	100	125
Whole pulses (cow's pea)	50	75	100	125
Dry vegetable (gm)	50	75	100	125
Gravy vegetable (gm)	50	75	100	125

Chapatis: For 53iggyery53ized53on of chapatis, different types of cut-outs were made:

CHAPATIS	A	B	C
Raw amount	25	35	45
Cooked amount	35	45	55

H. ADMINISTRATION OF AMLA POWDER AND TURMERIC POWDER FOR 45 DAYS

After amla and turmeric powder preparation and selection of the 18 geriatric subjects, supplementation of amla powder and turmeric powder to experimental group subjects was done in fasting state.

STEPS	DAYS	ADMINISTRATION OF AMLA POWDER AND TURMERIC POWDER
1	Before 15 th day	Stability period without administration of amla powder and turmeric powder
2	0 day	Starting the feeding trial of selected experimental respondents
3	15 th day	2 nd part of feeding trial
4	30 th day	3 rd part of feeding trial
5	45 th day	4 th part of feeding trial

I. MEASUREMENT OF FASTING AND POST PRANDIAL BLOOD SYGAR ON EVERY 15TH DAY OFFEEDING

DAY	BLOOD GLUCOSE LEVEL MG/DL	
	FASTING	POST PRANDIAL
Before 15 th day		
0 day		
15 th day		
30 th day		
45 th day		

J. 24 HOURS DIETARY RECALL FOR SEVEN CONSECUTIVE DAYS

Seven day 24 hours dietary recall method was carried out for collecting dietary information from the elderly persons of experimental group and control group regarding the nature and quantities of food consumed during seven consecutive days. 24-hour diet recall of seven consecutive days was recorded during the interview process using 54iggerly54ized set of utensils. Cooked amount was asked from the respondents and further cooked amount was converted into raw amount.

K. DIETARY ANALYSIS

After collecting the data of 24-hour diet recall of elderly subjects for seven consecutive days, dietary analysis was done. Consumed/cooked food amounts were converted into raw amount. Further energy, protein, fat, carbohydrates, calcium, iron, phosphorous, vitamin A, thiamine, riboflavin and vitamin C were calculated for the raw amount with the help of NSI diet calculator. For the calculation of carbohydrates, Indian Council of Medical Research's Exchange list (2012) was used.

Result and Discussion

1) Observation related to general information of geriatric subjects (60 years & above) in Agra city.

a) Distribution of the geriatric diabetic subjects in the experimental group and control group according to sex.

Sex	Experimental group		Control group	
	No	%	No	%
Male	6	66.67%	5	55.56%
Female	2	22.22%	4	44.44%
Left	1	11.11%	0	0.00%
Total	9	100.00%	9	100.00%

Above table a) shows the distribution of geriatric diabetic subjects in the experimental group and control group according to sex.

Out of total 09 diabetic subjects in the experimental group, male subjects were 66.67% and the female subjects were 22.22%. one subject dropped out from the study thereafter only 08

subjects were left in the experimental group. In the control group, the male subjects were 55.56% and the female subjects were 44.44%.

Patil and Gothankar, (2013) reported higher prevalence of diabetes in males in age group of >60 years while in the females higher prevalence occurred in decade earlies i.e. 51-60 years.

b) Distribution of the geriatric diabetic subjects in the experimental group and control group according to their activity level.

Activity level	Experimental group		Control group	
	No	%	No	%
Sedentary	6	75.00%	8	88.89%
Moderate	2	25.00%	1	11.11%

Above table b) highlights the distribution of geriatric diabetic subjects in the experimental group and control group according to their activity level.

In the experimental group (N1=8), 75.00 %

subjects were engaged in sedentary activities and 25.00% were engaged in moderate activity.

In the control group (N2=9), 88.89% subjects were engaged in sedentary activities and 11.11% were engaged in moderate activities.

2) Observation related to the activity of daily living score (ADL) of geriatric diabetic subjects (60 years & above) in Agra city.

a) Distribution of the geriatric diabetic subjects in the experimental group and control group according to activity of daily living score (ADL Score).

ADL Score	Experimental group		Control group	
	No	%	No	%
Below 40	0	0.00%	1	11.11%
40 & above	28	100.00%	1	88.89%

Above table reveals the distribution of geriatric diabetic subjects in the experimental group and

control group according to activity of daily living score.

In the experimental group (N1=8), all the subjects (100.00%) were independent in activities of daily living and in the control group (N2=9), 11.11%

required help in the activities of daily living while 88.89% were independent in carrying out the activities of daily living.

3) Observation related to 24-hr Diet recall of geriatric diabetic subjects (60 years & above) in Agra city.

a) Distribution of the geriatric diabetes subjects in the experimental group and control group according to 24-hr diet recall.

24-hr diet recall	Experimental group	Control group	t-test value	p-value
	Mean ±St. deviation	Mean ±St. deviation		
Energy (kcal)	1487.34±195.36	1579.57±247.17	0.5389	0.6574
Protein (g)	55.23±13.53	58.44±8.38	0.5959	0.5601
Fat (g)	62.38±9.8	69.11±14.97	1.0804	0.297
Carbohydrates (g)	183±19.81	175.90±36.02	0.5364	0.599
Calcium (mg)	1160.76±492.45	1423.04±395.09	1.2183	0.2419
Iron (mg)	14.47±2.94	15.41±2.44	0.7205	0.4823
Phosphorous (mg)	1348.04±333.24	1701.55±395.99	1.9767	0.0668
Vitamin A (mcg)	1122.06±695.19	905.3±649.76	0.6645	0.5165
Thiamine (mg)	1.33±0.28	1.42±0.24	2.1921	0.0446*
Riboflavin (mg)	1.05±0.38	1.11±0.21	0.4095	0.6879
Niacin (mg)	10.82±2.03	11.15±2.13	0.3259	0.749
Vitamin C (mg)	69.53±34.47	95.09±60.38	1.0523	0.3093

Above table highlights the distribution of the geriatric diabetic subjects in the experimental group and control group according to 24-hr Diet recall.

In the experimental group (N1=8), average consumption of energy was 1487.34±195.36 kcal, protein was 55.23 ± 13.53g, fat was 62.38±9.8g, carbohydrates was 183 ± 19.81 g, calcium was 1160.67 ± 492.45 mg, iron was 14.47 ± 2.94 mg, phosphorous was 1348.04 ± 333.24 mg, vitamin A was 1122.06 ± 695.19mcg, thiamine was 1.33 ± 0.28mg, riboflavin was 1.05 ± 0.38 mg, niacin was 10.82 ± 2.03 mg and vitamin C was 69.53 ± 34.47.

In the control group subjects (N2=9), average consumption of energy was 1579.57 ± 247.17 kcal, protein was 58.44 ± 8.38 g, fat was 69.11 ± 14.97 g, carbohydrates was 175.90 ± 36.02 g,

calcium was 1423.04 ± 395.09 mg, iron was 15.41 ± 2.44 mg, phosphorous was 1701.55 ± 395.99 mg, vitamin A was 905.3 ± 649.76 mcg, thiamine was 1.42 ± 0.24mg, riboflavin was 1.11 ± 0.21 mg, niacin was 11.15 ± 2.13 mg and vitamin C was 95.09 ± 60.38 mg.

Average consumption of thiamine (mg) was significant at 95% confidence interval (p<0.05) when t-test was applied.

Diet treatment {50-55% carbohydrate and 30% fat (1200 kcal for women and 1600 kcal for men) for 2 months} could not normalize high systolic blood pressure in type 2 diabetes mellitus patients (Meral and Kacmaz, 2003).

4) Distribution of the non-insulin dependent geriatric diabetic subjects according to comparison of blood glucose level of experimental group and control group

Fasting blood glucose level	Experimental group	Control group	t-test	p-value
	Mean ± St.Deviation (mg/dl)	Mean ± St.Deviation (mg/dl)		
Before 15 th day	177.00 ± 26.07	173.22 ± 74.21	1.0643	0.3204
Starting day	202.38 ± 65.66	173.22 ± 61.96	1.0593	0.7594
15 th day	170.63 ± 38.61	169.89 ± 52.23	2.3086	0.1668
30 th day	150.50 ± 30.07	178.78 ± 70.42	3.5426	0.0101*
45 th day	147.00 ± 43.51	205.00 ± 69.06	6.4894	0.0100*
*this result is statistically significant at p<0.05.				
Post prandial Blood Glucose level	Experimental group	Control group	t-test	p-value
	Mean ± St.Deviation (mg/dl)	Mean ± St.Deviation (mg/dl)		
Before 15 th day	302.00 ± 101.33	271.56 ± 98.17	0.5681	0.5790
Starting day	344.88 ± 88.54	250.78 ± 94.16	0.5929	0.4392
15 th day	252.50 ± 55.70	219.33 ± 50.18	1.6419	0.1093
30 th day	240.25 ± 81.94	242.56 ± 66.92	2.9906	0.0041*
45 th day	197.88 ± 39.90	273.78 ± 58.59	3.0981	0.0044*

Above table shows the comparison of the geriatric diabetic subjects in the experimental group and control group according to fasting Blood Glucose and Post Prandial Blood Glucose. Statistically

significant comparison of Fasting Blood Glucose and Post Prandial Blood Glucose of both groups were observed at 30th day and 45th day.

5) Distribution of the geriatric diabetic subjects in the experimental group according to correlation coefficient of Fasting Blood Glucose and Post Prandial Blood Glucose

FASTING BLOOD GLUCOSE LEVEL (mg/dl)		
	Mean ± St. Deviation (mg/dl)	Correlation coefficient ®
Before 15 th day	177.00 ± 26.07	
Starting day	202.38 ± 65.66	
15 th day	170.63 ± 38.61	0.454
30 th day	150.50 ± 30.07	-0.065
45 th day	147.00 ± 43.51	-0.045

POST PRANDIAL BLOOD GLUCOSE LEVEL (mg/dl)		
	Mean \pm St. Deviation (mg/dl)	Correlation coefficient \textcircled{R}
Before 15 th day	302.00 \pm 101.33	
Starting day	344.88 \pm 88.54	
15 th day	252.50 \pm 55.70	0.163
30 th day	240.25 \pm 81.94	0.187
45 th day	197.88 \pm 39.90	0.237

Above table explains, among the subjects, fasting blood glucose correlation coefficient \textcircled{R} of experimental group was positive on 15th day and correlation coefficient was negative on 30th day & 45th day because fasting blood glucose level of one patient decreased too much (on starting day it was 303mg/dl, on 30th day it was 117 mg/dl & on 45th day it was 112mg/dl) while the fasting blood glucose level of 2 patients did not decrease enough (for one patient on starting day it was 176 mg/dl, on 30th day it was 194mg/dl & on 45th day it was 206 mg/dl and for another patient on starting day it was 149mg/dl, on 30th day it was 170mg/dl and on 45th day it was 168 mg/dl) since they were eating sugar 58g once a day. Post Prandial blood glucose of experimental group was positive on 15th day, on 30th day and on 45th day. Mean and standard deviation of fasting glucose level of experimental group respondents on starting day and 45th day were 177.00 \pm 26.07 and 147.00 \pm 43.51, while post prandial blood glucose level of experimental group respondents on starting day and 45th day were 302.00 \pm 101.33 and 197.88 \pm 39.90 respectively

Conclusion

On the basis of the results obtained from the present study entitled "Effect of Amla Powder and Turmeric Powder Consumption On Geriatric Subjects (60 Years & Above) Suffering from Non-Insulin Dependent Diabetes Mellitus" it can be concluded that in old age prevalence of type 2 diabetes mellitus was very high. More males suffered from type 2 diabetes mellitus than females. Out of 18 diabetic respondents, 11 males suffered from type 2 diabetes. Fasting and

post prandial blood sugar level was lowered with the consumption of amla powder and turmeric powder for 45 days. Fasting blood glucose level and post prandial blood glucose level was significant on 30th day & 45th day. On 45th day both fasting and post prandial blood glucose level was statistically significant ($p < 0.05$).

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