A Study on *Moringa oleifera* Supplementation Among Pre-Hypertensive Subjects in Rural Area of Puducherry

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Abstract:

The present scenario alarms that Pre-hypertension is the major cause of death all over the world. (Kearney et al., 2005) gives the prevalence of Pre-hypertension worldwide representing 26.4 percent of adult population in 2000 had Pre-hypertension in which 26.6 percent of men and 26.1 percent of women and it is projected to have 29.2 percent by the year 2025 on and wellness. (i) To assess the Socio- demographic profile, Anthropometric measurement, Clinical data, Bio-chemical parameters, Dietary pattern before and after supplementation among pre-hypertensive subjects in Experimental and Control group. (ii) To compare the Body Mass Index, blood pressure and total cholesterol before and after supplementation in the experimental group and without supplementation in the controlled group. The investigator used Questionnaire and Interview schedule as the tool for conducting the study which consists Personal Details, Anthropometric measurements, health status includes Biochemical parameters, eating habits, Dietary pattern and other relevant details, collected from 30 samples selected by random sampling method. The researcher carried out with selection of common people as the samples who were randomly selected with Drumstick leaves powder (*Moringa oleifera*) supplementation among Pre-hypertensive subjects for a period of 21 days in the selected area in Puducherry. The mean value of total cholesterol level of the Control group of Pre-hypertensive subjects before intervention of value is 172.6±6.91 and after value is175±7.52. There was no significant difference in Standard deviation value, in the Total Cholesterol level of the control group before and after without supplementation. In the Experimental group supplementation showed significant difference in the Total Cholesterol value which had reduced from 161 to 156 mg/dL, before and after supplementation which was observed due to the intake of Drumsticks leaves powder in Pre-hypertensive subjects.

**Keywords:** Pre-hypertensive, supplementation, random, parameter.

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1. INTRODUCTION

Life is to live. Every living being in the universe is looking forward to lead a better life. But, in today’s, technocratic world each one of us running fast to overcome others to win the life’s race. The long-standing stress and anxiety leads to chronic illness such as increase in blood pressure to major systemic illnesses. *Moringa oleifera* is a perennial tree, still considered as among underutilized plant and falls under the Moringaceae family. The plant is also known as drumstick, sahjan or sohanjana in India. All plant parts are having remarkable range of some function and nutraceutical properties (Singh et al, 2012) make this plant a diverse biomaterial for food and allied uses. The leaves, flowers, and fruits, of this plant are used in the preparation of several delicacies in Indian sub-continent. Associated with high nutritional value of its edible portion pave a way in making this plant more popular as an important food source in order to combat protein energy malnutrition problem prevailed in most of the under developed and developing countries of the world. *Moringa oleifera* is one of the best-known medicinal plant. The *Moringa* plant has been consumed by humans (Iqbal et al., 2006). It is one of the richest plant sources of Vitamins A, B, C, D, E and K (Anwar and Bhanger, 2003; Babu 2000; Caceres et al., 1992; Dayrit et al., 1990; Delisle et al., 1997). The vital minerals present in *Moringa* include Calcium, Copper, Iron, Potassium, Magnesium, Manganese and Zinc.

According to Smeltzer Suzanne and Bare G. Brenda (2004), the Seventh report of Joint National Committee on Prevention, Detection, Evaluation and treatment of High blood pressure classifies hypertension into four categories namely, Normal, Pre-hypertension, Stage – 1 hypertension and Stage-2 hypertension. Normal is systolic blood pressure less than 120 mmHg and diastolic blood pressure less than 80 mm Hg. Pre-hypertension is systolic blood pressure between 120-139 and diastolic blood pressure 80-89 mm Hg. In Stage- 1 hypertension systolic pressure is 140-159 and diastolic pressure is 90-99 mm Hg. Stage-2 hypertension is systolic pressure above or equal to 160 and diastolic pressure above or equal to 100 mm Hg.

OBJECTIVES OF THE STUDY

i. To assess the Socio- demographic profile, Anthropometric measurement, Clinical data, Biochemical parameters, Dietary pattern before and after supplementation among pre-hypertensive subjects.

ii. To compare the Body Mass Index, blood pressure and total cholesterol before & after supplementation in the experimental group and without supplementation in the controlled group.

iii. To impart nutritional education awareness programme among both experimental and controlled group of pre-hypertensive subjects.

2. MATERIALS AND METHODS

The study was conducted in Union Territory of Puducherry once the original headquarters of the French in India. Puducherry was selected for the study based on convenience sampling as being the researcher’s hometown. Sultanpet and Arumathapuram was selected in order to identify the sample as the researcher has easy to access and could establish a good rapport and monitor the supplementation of Pre-hypertensive subjects. The study was conducted at rural areas of Puducherry being the native place for the researcher. The data was collected for a period of six weeks by using the prepared tools. The data collection was done by using interview and observational method, using questionnaire framed in English and translated in Tamil to the subjects.

Selection of sample based on purposive method a total of 30 subjects with pre-hypertension those who were willing to participate were selected as the sample. The study population includes subjects both men and women were chosen between age group 35- 45 years to be studied for a month. The research comprises of survey and clinical diagnosis of the subjects. Interview schedule was selected as a tool to elicit information from 30 samples.
A questionnaire was well framed with both close ended and open-ended questions. The questionnaire was framed to elicit general information such as age, gender, religion, marital status, educational qualification, economic status, type of family, habit of alcohol consuming, habit of smoking, biomedical parameters, medication and supplementation, associated symptoms and dietary pattern. Respectively body mass index (BMI) was calculated using formula weight in (Kg)/height in (m²) proposed by World Health Organisation. Anthropometric assessment was conducted to identify the samples with high BMI. The term anthropometric refers to comparative measurement of the human body. The anthropometric measurements commonly used as indices of growth and development for adults include height, weight waist and hip circumference (WHO, 2000).

Body height was measured using a measuring tape, which was fixed to the wall. The subjects were made to stand straight with the head held erect; hair flattened, feet together, knees straight and buttocks and shoulder blades in contact with the vertical surface of the wall. Arms were hanging loosely at the sides with the palms facing the thighs. A mark was made on the wall with a flat object touching the top of the head horizontally. Height was measured using a good measuring tape and was recorded to the nearest 0.1 centimetres.

A portable standard body weighing machine was used to find out the weight of the individual samples. The respondents were made to stand with head straight and they were asked to wear clothing with less weight and the values were noted during the interview schedule. Blood pressure (BP) is the product of cardiac output multiplied by peripheral resistance. In normal circulation pressure is exerted by flow of blood through heart and blood vessels. High blood pressure known as hypertension can result from a change in cardiac output, a change in peripheral resistance or both. Thus, the subject was made to sit in a comfortable position and an automated sphygmomanometer was used to record the systolic and diastolic blood pressure was noted by the researcher.

Biochemical parameter such as Total cholesterol along was collected from the sample as a secondary data due to financial constraints in order to thoroughly study the medical condition of the subjects. Biochemical parameters such as total cholesterol to the pre-hypertensive subjects. Biochemical parameter are an array of biochemical test, usually involving the use of automated instrumentation, performed on individuals admitted to a hospital or clinic.

The tools have been developed based on the objectives of the study and through review of literature. Before starting the study, patient consent form and permission from The Head of Institution and Ethical Committee permission was obtained prior to supplementation.

Among selected 30 samples, 15 subsamples were selected randomly as the experimental group (n=15) and 15 samples as controlled group(n=15).

**Inclusion Criteria:**

Clinical proven with blood pressure monitoring as Pre-hypertensive subjects with the following criteria were selected for the study.

- Age group between 35-45 years of both genders with Pre-hypertension.
- Without any risk factors or other severe clinical complication.
- Not hospitalized subjects.
- BP level not fluctuating drastically.
- Those willing for the study.

**Exclusion Criteria:**

- Subjects who are below 30 years.
- Subjects who are having hypertension with other complications.
- Hospitalized subjects.
- Highly fluctuating BP level.
- Those subjects not willing to participate in the study.
SUPPLEMENTATION OF Moringa Oleifera Leaves Powder

A. DURATION OF SUPPLEMENTATION

Written consent letter in English duly signed by the subsamples was collected to confirm their participation after complete explanation of all procedure, from the experimental group. Experimental groups were monitored carefully and diet as usually during the study supplementation of Drumstick Leaves for a period of 21 days.

B. PROCESSING OF DRUMSTICK LEAVES

Fresh tender leaves were collected, removed the leaves and discarded the stems and stalks and then thoroughly wash 2 to 3 times with enough water and then spread on a new kitchen napkin to absorb the extra moisture and on a paper dried in the shadow (avoided direct sunlight as it may affect the bright green color of the leaves as well as the nutrient content).

- The leaves dried in 1-2 days when the leaves became crisp, the fine grinded drumstick leaves powder was obtained by grinding in a mortar and pestle.
- Drumstick leaves powder immediately absorbs moisture and the product can reabsorb humidity during or after grinding and hence, packed in a zipper pouch, by the researcher.

C. PROCESSING STEPS

Figure 1: Processing of Drumstick leaves into Powder Form

Figure 2: Drumstick Leaves in Powder Form

Studies revealed that Drumstick leaves powder treat Pre-hypertension. Hence, a sample size of 15 subjects from experimental group in Pre-hypertension category without diabetes or any major diseases were supplemented with drumstick leaves powder (Figure 2) for a period of 21 days daily.

It was given in the form of 3 grams of Drumstick Leaves powder boiled with hot water for 5 minutes and was instructed by the researcher who demonstrated and showed them to consume in a 150 ml tumbler which was consumed as a drink (Figure 3) in an empty stomach before breakfast.
The drumstick leaves powder daily measuring 3 grams in an stainless steel teaspoon was distributed to the subjects, because plastic spoon was avoided as it was banned by the Government at that time.

1 day = 3 grams of Drumstick leaves powder
21 days = 63 grams of Drumstick leaves powder

Figure: 3 DRUMSTICK LEAVES IN LIQUID FORM CONSUMED AS A DRINK

Pre-test has been conducted regarding bio-chemical tests for both the groups - control(without supplementation) group and experimental group and Post- test which was done after the supplementation period to the experimental group alone was completed after a period of 21 days.

Biochemical tests and the intake of supplements was subjected to Statistical tests - Mean and Standard Deviation which was followed and is discussed under the heading- Results and Discussion. Based on the facts, Nutritional Awareness Programme was planned for the 30 subjects with Pre-hypertension.

The Nutrition Awareness Programme was done were Audio- Visual method used includes teaching by Power Point Presentation done by the researcher and Pamphlets prepared by the investigator and distributed to the subjects.

3. RESULTS AND DISCUSSION:

The investigator put forth the Questionnaire and Interview schedule towards the sample that in turn cooperated and responded well and the investigator recorded the data's. The results revealed that the samples covered with general information and Socio-economic background and Anthropometric measurements was summarized as follows:

67 percent of the samples were of 40-45 years and 33 percent of the samples were 35-39 years in age group category. About 50 percent of the samples comprising of both genders were equally selected by the researcher. Majority 94 percent of the subjects were found to be Hindus. This could be due to the predominant population of Hindus in Puducherry. Three percent each of the samples belong to Muslim and Christian minority category. 100 percent were married with children and none of them were found to be single or unmarried.

It was found from the present study that 24 percent of respondents were predominantly illiterate. Most of the respondents (33 percent) each were found to have completed Primary school and Secondary school education. Only 10 percent were noticed to have completed college education at undergraduate level. About 47 percent of the respondents had monthly income above ₹6000. Similarly, 43 percent of the respondents come under the range ₹4000-6000. Only 10 percent of the respondents belong to income level of below ₹4000.
About 83 percent were from nuclear family and 17 percent were found to be in Joint family and none of them belong to Joint extended family. About 57 percent both male and female belonged to height range of 150-160cm. 20 percent were found between 161-170 cm, and 23 percent of the respondents were found between 171-180 cm. 57 percent of the respondents were within the range of 61-70 Kilograms body weight and 23 percent were found with weight between 71-80 Kilograms. 20 percent of them below weight in (50-60 Kilograms) were present. Most of the respondents, 53 percent were in the Overweight Body Mass Index category and 47 percent were under Normal Body Mass Index range and none of them were found to be Underweight.

Most of the respondents were observed with Systolic blood pressure which falls between 131 to 140 mm Hg were 57 percent. And 43 percent of the respondents were found with 121 to 130 mm Hg. About 53 percent of the respondent’s Diastolic blood pressure were between 81-85 mm Hg and 47 percent of the respondents were found in the range of 86 to 90 mm Hg of Diastolic blood pressure. 47 percent of the respondents had Total Cholesterol level between 150 to 160 mg/dl and 20 percent were found within 161-180 mg/dl. 13 percent of the respondents were found in the 181-190 mg/dl range.

As family history of the respondents with hypertension was concerned 5 percent(15) of them reported that their parents suffered from this condition. 23 percent of male respondents were consuming alcohol. 27 percent of male were non-alcoholic. 3 percent of male were habit of smoking. 47 percent of male were not habit of smoking.

In the male 93 percent were found suffering from headache and female were 87 percent with the symptom. Palpitation was mostly mentioned by male subjects(47 percent) and female with 57 percent. In male who had dyspnea(40 percent) and 34 percent of female were recorded with the symptom. The female were noticed (67 percent) to suffer from sweating and male with 73 percent. Fatigue were observed in 73 percent of male and 83 percent of female subjects. Confusion symptoms were analyzed in male (73 percent) and 80 percent of females. Nose bleeding symptoms was not seen equally in both male and female with each 13 percent. The symptoms of irregular heart beat arised in female for 47 percent and more in male subjects with 53 percent.

100 percent of the respondents were found to consume Non – vegetarian food. And none of them were Vegetarian, Ova-vegetarian, or Lacto-vegetarian. Most of the respondents almost 77 percent were found to consume normal diet with more salt consumption. 23 percent were seen to consume salt- restricted diet as a preventive measure.

Cereals intake includes: Daily consumption of Cereals were found equal in both male and female (44 percent) in the form of rice. 3 percent were both of them consumed cereals in the form of chapathi twice a day. 3 percent only weekly consumed cereals in the form of millets. Daily consumption of pulses was found male (27 percent) and in female only 6 percent were noticed. Twice a day includes male (27 percent) and female (37 percent). Vegetables daily consumption noted were male denotes 13 percent and female denotes 3 percent and twice a day consumption includes male intake 17 percent of vegetables and female intake as only 37 percent.

Non-vegetarian food item was consumed by majority of females twice in a week or weekly, and males (10 percent) reported to consume daily in the form of fish, prawns or eggs. 34 percent in females consumed oil daily and 29 percent of males in the same manner. 10 and 27 percent of males and females consumed sugar and its products in a daily basis respectively. Fruit intake was noticed more in males than in females and 20 percent, 23 percent of male and female had an intake of nuts in the form of cashewnut, almond or pista monthly by them. Nutrition Awareness programme was
conducted among the (n=30) Pre-hypertensive subjects which proved to be satisfactory and beneficial to the participants.

**Supplementation for Experimental Group and Without Supplementation of the Control Group**

From the 30 Pre-hypertensive subjects a subsample of 15 subjects of both the sexes between the age group 35 to 39 years and 40 to 45 years of age respectively were selected based on selection criteria. Experimental group were in the age group of 35 to 39 years comprising of two male and one female (n=3) and 40 to 45 years age group were with seven female and five female (n=12).

The experimental group was supplemented with 3 gram of drumstick leaves powder boiled with hot water for few seconds and strained, then taken morning with empty stomach before breakfast per day continuously for a period of 21 days. The impact of *Moringa oleifera* supplementation was studied in terms of biomedical parameters namely Blood pressure and Total Cholesterol.

**Nutritive value of Drumstick Leaves (*Moringa oleifera*)**

Before discussing the supplementation the researcher calculated the nutrient value for certain nutrients present in 3 grams of drumstick leaves from “Nutritive value of Indian Foods” as reference values (Gopalan, C et al, 1989).

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Nutritive value in 3 grams of Drumstick leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate(Kcal)</td>
<td>0.375</td>
</tr>
<tr>
<td>Protein(g)</td>
<td>2.01</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>0.05</td>
</tr>
<tr>
<td>Vitamin- A( μg)</td>
<td>203.4</td>
</tr>
<tr>
<td>Calcium(mg)</td>
<td>13.2</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>-</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>7.77</td>
</tr>
</tbody>
</table>

**I Systolic Blood Pressure in Control Group:**

The mean value of Systolic blood pressure level without supplementation of drumstick leaves in control group of Pre-hypertensive subjects before study period is 130.46 ±2.23. The mean value of Systolic blood pressure level without supplementation in control group of Pre-hypertensive subjects after intervention period is 133.94±2.10.

The results of statistics shows the significant value (0.02) is less than 0.05. Hence concluded that there is no decrease in the Systolic blood pressure level without supplementation of drumstick leaves in the control group of Pre-hypertensive subjects.

**II Systolic Blood Pressure in Experimental Group**

The mean value of Systolic Blood pressure level in experimental group of Pre-hypertensive subjects before supplementation of drumstick leaves is 132.5±2.90. The mean value of the Systolic Blood pressure level of drumstick leaves supplemented in experimental group of Pre-hypertensive subjects after supplementation of drumstick leaves is 128.3±2.69.

The results of statistics shows it is significant where the value (0.03) is less than 0.05. Therefore it is concluded that there is significant decrease in the Systolic Blood pressure level of
drumstick leaves supplemented in the experimental group of Pre-hypertensive subjects after supplementation than before supplementation of drumstick leaves.

III Diastolic Blood Pressure in the Control Group

The mean value of Diastolic blood pressure level of drumstick leaves without supplementation in the Control group of Pre-hypertensive subjects before intervention of drumstick leaves is 84.73±1.03. The mean value of Diastolic blood pressure level of drumstick leaves without supplementation in control group of Pre-hypertensive subjects after intervention period is 87.06±0.98.

The results of statistics shows there is significant value (0.001) is less than 0.01. There is no decrease in the Diastolic blood pressure level of drumstick leaves without supplementation in the Control group of Pre-hypertensive subjects

IV Diastolic Blood Pressure in the Experimental Group

The mean value of Diastolic blood pressure level of drumstick leaves in powder form supplemented in the Experimental group of Pre-hypertensive subjects before supplementation is 86.33±1.17. The mean value of the Diastolic blood pressure level of drumstick leaves supplemented in the Experimental group of Pre-hypertensive subjects after supplementation of drumstick leaves is 83.26±1.05.

The results of statistics shows the significant value (0.002) is less than 0.01. Therefore, there is decrease in the Diastolic blood pressure level of drumstick leaves supplemented in the Experimental group of Pre-hypertensive subjects after supplementation than before supplementation of drumstick leaves.

V Mean Total Cholesterol Value Of Control Group

The mean value of Total Cholesterol level of the Control group of Pre-hypertensive subjects before intervention period is 172.6±6.91 and after the intervention value is 175±7.52. to conclude that there is no significant difference in Standard Deviation (SD)value, in association with the Total Cholesterol level of the Control group before and after without supplementation period.

VI Mean Total Cholesterol Value Experimental Group

The Experimental group given with drumstick leaves powder supplementation showed significant differences in the Total Cholesterol value and had reduced from 161 to 156 mean and SD value, in the Before and after supplementation period which was supplemented to the Pre-hypertensive subjects.

4. CONCLUSION

From the study it is clear that, the blood pressure level is dependent of diet, life style pattern etc. Apart from drugs there are various herbs supplemented to reduce the blood pressure level. It is concluded that there is significant difference in both Experimental and Control group with and without consuming Drumstick leaves powder as a drink on Pre-hypertensive subjects. Apart from any supplementation one should follow all other preventive measures like following diet, exercise, regular walking, regular checkup, and awareness about the diseases nature and seriousness. Thus the...
study creates a warning to the Pre-hypertension patients about the nature and complications and diet which has to be followed.

References