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# RESEARCH HIGHLIGHTS



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vitamins and minerals. Soya contains 45 per cent of protein of high biological value. Though methionine is the limiting amino acid its lysine and threonine content is high, thus making it as a good supplement of cereal protein. Groundnuts are valuable for its calorific value and jaggery with the combination of amla powder for its iron content. Combination of these ingredients contributes good quality and quantity of nutrients and makes this food based supplement as an excellent food item for improving the health status of the growing children. Totally 20 variations, four from each of five formulations were developed. In all the 20 formulations, ingredients were incorporated at different level.

Ingredients used were accurately weighed; all these ingredients except jaggery were carefully roasted to enhance the flavor and texture and finely powdered with jaggery and cardamom. Then the processed ingredients were evenly mixed and made into small balls. The small balls were termed as sweet laddoo. Acceptability study was conducted for the 20 variations of the five formulated mixes using sensory evaluation based on characteristics such as appearance, color, flavor, taste and texture, with the help of score card by a group of ten qualified taste panel members of post graduate students. From the 20 formulated mixes, variation which secured maximum score in the acceptability trials was selected for supplementation study.

No single legume or cereal provides adequate amounts of all nutrients to meet the nutritional requirements of an individual. However, even before knowledge on protein content, protein quality, digestibility and the nutrient requirements of humans became available, it was recognized that mixing legumes with cereals in the diet improve overall nutrition. The present and newly derived knowledge in these areas makes it possible not only better nutritional quality but also the necessary attributes ([www.nutrition.com](http://www.nutrition.com)). Cereals, pulses and oilseeds used in supplements contribute macro and micronutrient content.

An iron rich sweet laddoo incorporated with amla powder (10g of rice flakes was roasted, powdered and mixed with 10g of roasted soya flour, 5g of amla powder and 25g of jaggery) made into 50g of small balls was distributed to the selected girls in the experimental group, daily for a period of 90 days. Effect of supplement was assessed by anthropometric measurement, individual dietary pattern, clinical examination and biochemical estimation, before and after supplementation for a period of 90 days.

#### ii. **Supplementation of health mix on selected study group**

Nutritional status is the condition of health of an individuals as influenced by nutrient intake and its utilization in the body (Sunita and Jain, 2005). Health mix is valuable for its nutrient density of its unique characteristics of being rich in both macro

and micro nutrients. Sub samples selected were grouped into experimental group (N=20) and control group (N=20). The experimental group received the 50g of health mix in mid-morning, daily for three months. Nutritional supplementation was provided for the experimental group during the study period of three months.

#### **Assessing the effect of health mix on nutritional status of the selected study groups**

Nutritional status of an individual can be determined with the help of anthropometric measurements, individual dietary intake, clinical examination of symptoms of nutritional deficiencies and laboratory investigations of bio-chemical estimation. Combination of these methods provide better picture of assessment of nutritional status of the target groups. Hence, all these four parameters were used for assessing the health status of the study groups.

#### **Anthropometric measurements**

Anthropometric measurements are the universally applicable, inexpensive and most sensitive parameters used for assessing the nutritional status of children. It reflects both health and nutritional status and also predicts performance, health and survival of the selected population. Use of anthropometric measurements depends on accurate age as well as appropriate standard for comparison. The most commonly used indicators of nutritional status are listed below:

#### **Height**

The selected children in the study groups were allowed to stand against a wall, bare foot and with heels, buttocks, shoulder and back of the head touching the wall. A non stretchable measuring tape was used to record the height of the subjects in cm. Height of the subjects in the study groups was measured, before and after supplementation period of 90 days.

#### **Body weight**

Body weight is the most widely used simplest, reproducible anthropometric measurement for the evaluation of nutritional status of the population. Weight of the selected subjects in the study groups (experimental and control) was recorded using digital electronic human weighing machine. Subjects were asked to stand on the weighing machine, without touching anything. The readings were carefully recorded nearest 0.1 kg of weight, before and after the nutritional intervention period of 90 days.

#### **Calculation of Body Mass Index (BMI)**

BMI is defined as the individual's body weight divided by the height in metre square and may be accurately calculated using the formula of

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}} \text{ and categorized}$$

as follows ([www.kidshealth.org](http://www.kidshealth.org)).

**Table 4. Body Mass Index**

| Category     | BMI range - ( kg/m <sup>2</sup> ) |
|--------------|-----------------------------------|
| Starvation   | Less than 15                      |
| Underweight  | 15 to 18.5                        |
| Ideal weight | 18.5 to 25                        |
| Overweight   | 24 to 30                          |
| Obese        | 30 to 40                          |
| Morbid obese | Greater than 40                   |

Source: (www.keepkidshealthy.com)

In order to obtain the actual dietary intake of the girls in the study groups, 25 per cent of girls in each groups was selected and the food weighment survey was adopted for three consecutive days.

#### Clinical examination

A nutrition focused physical examination, is an important component of overall nutritional assessment as some nutritional deficiencies may not be identified by other assessment approaches. This is the observation of superficial sign of malnutrition. It involves looking for changes in the body which are indicative of a particular deficiency. The investigator carried out the clinical examination with the help of physician for the children in the target groups in order to find out the children who are suffering from obvious signs and symptoms of nutritional deficiencies.

#### c. Bio-chemical estimation

Most of the nutritional deficiencies are characterized by changes in body fluids and tissues. The commonly used biochemical indices for the study were haemoglobin,

serum total protein, albumin, globulin and albumin/globulin ratio. Blood parameters analysed before and after supplementation were compared to find out the effect of supplementation on the selected study groups.

## Results and discussion

### Background information of the study subjects

Socio economic survey revealed that, 77 per cent of the subjects belonged to nuclear family system whereas 23 per cent belonged to joint family system. It is heartwarming to note that the parents of the selected subjects were literate having different levels of education. Thirty six per cent were graduates and 42 per cent had education upto higher secondary school level and 20 per cent had up to high school and two per cent had up to primary school level. The occupational status of the parents of the selected subjects revealed that 19, 63 and 18 per cent of the parents of the selected subjects were engaged in sedentary, moderate and heavy activities respectively. The income classification based on HUDCO (2004) revealed that seven, 45 and 48 per cent of the parents of the selected subjects belonged to low, middle and high income group respectively.

### Identification of girls for supplementation study

The mean height of the selected subjects aged 16, 17 and 18 years was 158.8, 160.6 and 160.2 cm respectively. The mean height of the adolescent girls (16 – 18 years) was below the standard values suggested by NCHS (1987). The mean weight of the

1.47 cm was noted among 16 year girls and maximum difference of 1.65 cm was noted among girls of 17 years. The same trend was noted in the mean height of the girls of 18 years of the selected subjects. The mean initial weight of 16, 17 and 18 years girls were 55.5, 55.2 and 54.3 kg respectively. After supplementation for the period of 90 days, it is clear to note that there was an improvement in gain in weight of the selected subjects in the experimental group and there was no improvement in weight of the selected subjects in the control group. Forty four per cent of the selected subjects belonged to nutritional grade of underweight, 24 per cent were normal and healthy, 21 per cent of them were overweight and 11 per cent were in the nutritional grade of obese. After supplementation, prevalence of underweight was reduced and thereby normal health status was improved.

The haemoglobin level of the selected 154 adolescent girls revealed that 38, 27 and 24 per cent of 16, 17 and 18 years of adolescent girls respectively were healthy and non-anaemic, having normal haemoglobin level of 11 to 13 g/dl. Thirty six, 23 and 3 per cent of adolescent girls of 16 years were mildly, moderately and severely anaemic respectively. The same trend was noticed in 17 and 18 year adolescent girls. It is observed that only meagre per cent of the selected girls were severely anaemic.

#### **Formulation of supplement**

Sixteen varieties of health mix were formulated with various proportions of cereals, pulses with the combination of dry

amla powder. Among the different varieties, the best one was selected for supplementation, based on the quantity of the individual intake, plate waste, facial expression of the girls and acceptability scores of supplement. The supplement contributes 176.45 kcal of energy, 5.105 g of protein, 3.75 mg of iron, 48.5 mg of calcium, 43.05 mcg of  $\beta$ -carotene, 30 mg of vitamin C and less than one mg of thiamine and 0.435 mg of riboflavin.

#### **Effect of supplementation on nutritional status of the study subjects**

##### **Anthropometric measurement**

The girls were identified for supplementation study based on the anthropometric measurement below the NCHS standard values and haemoglobin level below the standard value. The mean height of the selected subjects aged 16, 17 and 18 years was 158.8, 160.6 and 160.2 cm respectively before supplementation. After supplementation, the height of the selected subjects in the age group of 16, 17 and 18 were below the NCHS standard value, it is observed that there was a statistically significant improvement at five per cent level among the experimental group and there was no increment in the height of the selected subjects in the control group.

The mean weight of the selected subjects aged 16, 17 and 18 years was 55.49, 55.19 and 54.30 kg respectively before supplementation. After supplementation, it is evident that there was a statistically significant improvement at one per cent level in the experimental group and there was no

increment in the weight of the selected subjects in the control group. However the weight of the selected subjects in the age group of 16, 17 and 18 were below the NCHS standard value.

## II. Mean food and nutrient intake

The mean food and nutrient intake of the selected subjects were less than the ICMR recommendation inadequate in both experimental and control group. The inadequacy was the most prominent for pulses, vegetables, fruits, green leafy vegetables, fats and oils, milk and milk products.

## III. Clinical examination

The deficiency signs and symptoms such as lack of interest/poor concentration were present in 30 per cent of adolescent girls,

followed by fatigue or weakness, headache, paleness of the eye, dry and rough skin. Dental caries and swollen bleeding gum were present comparatively in lesser number of girls in the study groups.

## IV. Biochemical estimation

Significant improvement at one per cent level was noticed in haemoglobin level of the experimental group of 16, 17 and 18 years whereas in control group it was insignificant. The increment in mean haemoglobin level in experimental group of 18 years was high (2.21 g/dl) when compared to experimental group of 16 and 17 years and it might be due to the iron in addition of vitamin C as an enhancer. This indicates that supplementation of iron with vitamin C is an effective approach to prevent anemia among the selected population.

**Table 1. Biochemical profile of the study subjects**

| Age (yrs) | Group                    | RBC<br>Normal value<br>(4.5-5.5 mill/cumm) |               |                     | Serum Iron<br>Normal value<br>(37-158 µg/dl) |                 |                    | TIBC<br>Normal value<br>(228-428 µg/dl ) |                 |                   |
|-----------|--------------------------|--|---------------|---------------------|--|-----------------|--------------------|--|-----------------|-------------------|
|           |                          | Initial                                    | Final         | 't' value           | Initial                                      | Final           | 't' value          | Initial                                  | Final           | 't' value         |
| 16        | Experimental<br>Mean ±SD | 3.68±<br>0.71                              | 4.82±<br>1.10 | 2.77**              | 79.50<br>±8.22                               | 83.25±<br>8.50  | 3.182*             | 375.75<br>±2.87                          | 414.62<br>±43.2 | 3.1 <sup>NS</sup> |
|           | Control<br>Mean ±SD      | 3.55±<br>0.63                              | 3.65±<br>0.49 | 12.70 <sup>NS</sup> | 61.25±<br>5.69                               | 61.85<br>±5.75  | 0.6 <sup>NS</sup>  | 482.90<br>±27.51                         | 481.95<br>±24.6 | 0.5 <sup>NS</sup> |
| 17        | Experimental<br>Mean ±SD | 3.12±<br>0.62                              | 4.33±<br>0.58 | 2.22**              | 88.33<br>±9.6                                | 91.66<br>±10.40 | 4.30 <sup>NS</sup> | 379.00<br>±4.58                          | 394.33<br>±4.04 | 4.3 <sup>NS</sup> |
|           | Control<br>Mean ±SD      | 3.35±<br>0.77                              | 3.50±<br>0.56 | 12.70 <sup>NS</sup> | 68.63<br>±4.9                                | 69.32<br>±4.81  | 2.3 <sup>NS</sup>  | 486.11<br>±28.30                         | 475.21<br>±31.6 | 0.5 <sup>NS</sup> |
| 18        | Experimental<br>Mean ±SD | 3.20±<br>0.72                              | 4.84±<br>0.60 | 2.300**             | 85.00±<br>719.6                              | 89.00<br>±705.4 | 4.30 <sup>NS</sup> | 334.33<br>±313.7                         | 375.3<br>±391.6 | 4.3 <sup>NS</sup> |
|           | Control<br>Mean ±SD      | 3.40±<br>0.18                              | 3.59±<br>0.18 | 2.44 <sup>NS</sup>  | 68.77<br>±3.49                               | 69.11<br>±3.3   | 0.58 <sup>NS</sup> | 362.0<br>±12.54                          | 360.63<br>15.46 | 1.2 <sup>NS</sup> |

\*\* - Significant at 1% level

\* - Significant at 5% level

NS - Not significant

After supplementation, significant improvement in RBC count of the experimental group of 16, 17 and 18 years was noticed at one per cent level. The mean difference of RBC count for the experimental group of 16 years was increased whereas in control group, there was no significant improvement in RBC count. In serum iron level, supplementation brought five per cent significant improvement in experimental group of 16 years whereas in control group,

it is found to be insignificant. Maximum increase in serum iron was noticed in experimental group of 17 and 18 years. Statistical analysis of initial and final TIBC values of the experimental and control group of 16, 17 and 18 years was found to be insignificant.

Table 2 shows the information regarding the level of serum ferritin and mean corpuscular volume, before and after supplementation of 90 days.

**Table 2. Level of serum ferritin and mean corpuscular volume of the study subjects**

| Age (yrs) | Group                    | Serum ferritin<br>Normal value (4.6-20 ng/ml) |                          |                    | MCV<br>Normal value (82-92 Cu.mm) |                    |                    |
|-----------|--------------------------|---|--------------------------|--------------------|-----------------------------------|--------------------|--------------------|
|           |                          | Initial                                       | Final                    | 't'Value           | Initial                           | Final              | 't'Value           |
|           |                          | 16  | Experimental<br>Mean ±SD | 30.72±<br>32.85    | 32.70<br>±34.87                   | 3.18 <sup>NS</sup> | 69.250±<br>26.24   |
|           | Control<br>Mean ±SD      | 25.84±<br>2.69                                | 26.21±<br>2.57           | 2.4 <sup>NS</sup>  | 36.76±<br>3.55                    | 135.73±<br>3.75    | 0.72 <sup>NS</sup> |
| 17        | Experimental<br>Mean ±SD | 14.133<br>±0.77                               | 15.40<br>±1.55           | 4.30 <sup>NS</sup> | 84.00±<br>4.582                   | 88.80±<br>3.36     | 4.30 <sup>NS</sup> |
|           | Control<br>Mean ±SD      | 18.75±<br>19.3                                | 19.34±<br>1.50           | 0.50 <sup>NS</sup> | 74.96±<br>2.82                    | 74.76±<br>2.85     | 0.4 <sup>NS</sup>  |
| 18        | Experimental<br>Mean ±SD | 14.16<br>±3.61                                | 15.56±<br>1.36           | 4.30 <sup>NS</sup> | 88.00±<br>1.73                    | 90.83±<br>3.17     | 4.30 <sup>NS</sup> |
|           | Control<br>Mean ±SD      | 13.64±<br>3.32                                | 13.71±<br>0.45           | 0.07 <sup>NS</sup> | 68.77±<br>3.49                    | 69.11±<br>3.30     | 0.58 <sup>NS</sup> |

\*\* - Significant at 1% level NS - Not significant

Serum ferritin has no significant improvement in both experimental and control groups. The statistical analysis of the data revealed that there was no significant improvement in the selected target groups. In mean corpuscular volume level, supplementation brought one per cent significant improvement in experimental

group of 16 years whereas in control group, it was found to be insignificant. Maximum increase in serum iron was noticed in experimental group of 17 and 18 years.

The above data showed that, in experimental group, the biochemical profile especially iron status was improved

significantly at one per cent level whereas in control group, there was no significant improvement in biochemical profile of the selected subjects in the study groups. The increment in biochemical parameters of the experimental group was mainly due to the protein and iron content of the sweet laddoo used for supplementation study.

### Conclusion

Hence, it is essential to include foods contribute macro and micro nutrients constantly in their daily diet for healthy life. The maintenance of the nutritional status of the body helps to meet the need for growth and development of the youth and also for the preparation of "Future Motherhood".

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## 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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