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RESEARCH REACH

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EDITORIAL

Greetings for 2011 from the team of "Research Reach." This January 2011 issue of the journal brings together research articles received from Agra, Bangalore, Chennai and Gujarat. The first research article by Vaid examines the effect of conventional cooking, solar cooking & microwave cooking on the bacterial load and sensory characteristics of selected recipes. Development of newer drought resistant crops can offer tangible solutions to food crisis. The paper by Shilpa *et al* examines the nutritional and physio-chemical qualities of one such crop of groundnut developed by their institute. Health of destitute children is an issue of great concern. The paper by Merlin *et al* presents data on the nutritional status and psychological behavior of 200 such children living in institutions across Chennai. The other research article from Chennai by Chandra and Rukmini presents the results of a pilot study that suggests the possibilities of using white lotus petals for management of NIDDM subjects in future clinical trials. Structured play is a very important component of the preschool curriculum. The research article by Neha Saxena and Ravi Sidhu examines the impact of co-operative and competitive games on behavior among preschool boys and girls.

Dissemination of research news has always been our endeavor. This issue, therefore, includes a compilation of the titles of research conducted at Nirmala Niketan during the academic year 2009-2010. The journal also includes a compilation of current research summaries appearing in the ILSI newsletter and widely circulated by Dr V Prakash, President, NSI

Chief Editor,
Dr. Malathi Sivaramakrishnan.

INSTRUCTIONS TO THE AUTHORS

Research Reach- Journal of Home Science (ISSN 0974 – 617X) is devoted to original Research and Development in all branches of Home Science. It is a bi-annual publication from the Research Centre, College of Home Science, Nirmala Niketan, 49, New Marine Lines, Mumbai – 400020.

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1. Review paper on specific topics of current trends pertaining to Home Science. It should be a mini review with around 15-18 typed pages.
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3. Research notes limited to a maximum of 2-6 typed pages
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- Joanne Cammans (2006) Nutrition, health & related claims http://www.health.sa.gov.au/pehs/Food/survey-health-claims-jan07.pdf accessed on 11thJan 09
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Information / Views / Data published in the journal are of the authors only.

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RESEARCH PAPER Research Reach, J.H.Sci. Vol.10. No.1, 1-6

EFFECT OF DIFFERENT COOKING METHODS ON BACTERIAL LOAD AND SENSORY CHARACTERISTICS OF SOME FOODS

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Quality, the ultimate criterion of the desirability of any food product can be evaluated by sensory and objective methods. Microorganisms found everywhere in every environment have beneficial or harmful effect on food. Application of heat protects food against harmful microorganisms. The present study carried out to see the effect of different cooking methods viz. conventional, microwave and solar cooking on bacterial load and sensory characteristics of cooked foods namely potato *sabji* (curry), spinach *sabji* (curry), *kheer* and *muthiya* showed that solar cooking caused the maximum destruction of bacterial cells, while conventionally cooked foods scored the highest for sensory qualities.

KEY WORDS: Conventional cooking, microwave cooking, solar cooking, bacterial load, sensory evaluation

Quality is the ultimate criterion of the desirability of any food product. Food quality can be evaluated by sensory and objective methods. When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic or psychometric. Every time food is eaten a judgment is made (Srilakshmi, 1996). Sensory characteristics of foods include appearance, colour and flavour (odour, taste, mouthfeel). Texture and quality of food depend on processing conditions (Chetana and Ravi, 2010).

The food we eat is a very good media for growth of microorganisms. Microorganisms are ubiquitous in their distribution; they are found everywhere in every environment, and adapt themselves to almost every growth condition. Their action may be beneficial or harmful. One of the most important methods of protection of food against harmful microorganisms is by the application of heat. Cooking food to the required temperature for a required length of time can destroy all harmful microorganisms in foods (Peckham and Freeland, 1979). Cooking partly sterilizes food. Above 40°C growth of bacteria falls rapidly and in general ceases above 45°C (Thangam, 1984).

A study was carried out to see the effect of different cooking methods viz. conventional, microwave and solar cooking on bacterial load and sensory characteristics of cooked foods namely potato *sabji* (curry), spinach *sabji* (curry), *kheer* (a sweet preparation made from milk, rice and sugar, and having pouring consistency) and *muthiya* (a steamed savory item made from a vegetable, generally bottle gourd/fenugreek leaves/cabbage leaves, and flour, generally bengal gram dhal flour, or a mixture of bengal gram dhal flour and wheat flour).

MATERIALS AND METHODS

Raw material for preparing the samples was procured from the local market and prepared as mentioned in Table 1.

TABLE 1: Preparation of Recipes by Different Cooking Methods

Recipe	Ingredients and amount (1 portion)	Method	Cooking time and endpoint temp.		
			Conventional method	Microwave cooking	Solar cooking
Potato sabji	Potato 250 gm, salt 1.3 gm, oil 18 gm, turmeric powder 50 mg, red chilli powder 450 mg, cumin seeds 700 mg	Potatoes (750 gm) were weighed, peeled, washed, diced and divided into three equal size portions. For each sabji, cumin seeds were added to heated oil. Diced potatoes and the remaining ingredients were added and the sabji was cooked.	Sautéing – 5 min, low heat; 90°C	5 min; 85°C	40 min; 80°C
Spinach sabji	Spinach 125 gm, oil 5 gm, cumin seeds 1 gm, salt 500 mg, turmeric powder 250 mg, cumin-coriander powder 500 mg	Spinach (375 gm edible portion) was washed, cut and divided into three portions. Oil was heated, cumin seeds were added. Spinach and remaining ingredients were added and the sabji was cooked.	Sautéing followed by simmering in covered pan with little water on the lid – 7 min; 78°C	3.5 min; 76°C	30 min; 72°C
Kheer	Rice 20 gm, milk 350 ml, sugar 25 gm	All ingredients were weighed / measured. Rice was washed and soaked in milk for 30 min. Soaked rice and milk mixture was subjected to cooking. When rice was almost cooked, sugar was added and kheer was cooked for about 2 minutes in conventional and microwave cooking, and about 10 min in solar cooking.	Boiling – 20 min; 90°C	18 min; 82°C	45 min; 82°C
Muthiya	Bottle gourd 150 gm, wheat flour 25 gm, bengal gram flour 50 gm, cooked rice 85 gm, groundnut 10 gm, oil 13.5 gm, salt 2.5 gm, ginger 3.5 gm, green chilies 5.0 gm	All the ingredients (three times the amount mentioned in the column of ingredients and amount) were weighed. Bottle gourd was peeled, washed and grated. Ginger and green chilies were washed, non-edible portion removed and made into paste. Groundnut was coarsely ground. All the ingredients were mixed well and divided into three portions. The portions were shaped into muthiya (oval shape) and cooked.	Steaming – 14 min; 82°C	3.5 min; 90°C	35 min; 85°C

(i)Bacterial load study

Cooked samples of potato *sabji*, spinach *sabji, kheer* and *muthiya.* were handled aseptically in sterile glassware to carry out the study of the effect of different cooking methods on bacterial population using standard plate count method (Pelczar et al., 1993). Aseptically handled 1 g sample was added to 10 ml sterile distilled water and mixed well and 0.1 ml of this diluted sample was transferred to the centre of a solidified agar plate and then spread uniformly over the surface of the medium with a sterile bent rod (spreader). The plates were incubated at 37°C for

24-48 hours following which the colonies of bacteria were counted. Average of two replicates was taken.

$$\text{cfu/ml} = \frac{\text{No. of colonies formed x dilution factor}}{\text{Volume sampled}}$$

(ii)Sensory evaluation

The prepared recipes were subjected to sensory evaluation. Sensory evaluation was done by a trained panel consisting of ten members using nine-point hedonic scale (*Like extremely, Like very much, Like moderately, Like slightly, Neither like nor dislike, Dislike slightly, Dislike moderately, Dislike very much, Dislike extremely*). The panel was given sufficient amount of each sample at room temperature in white glass containers of same size and shape. The evaluation was carried out in a quiet, odour-free room maintaining ideal conditions for testing. Each panelist was given an evaluation card and asked to evaluate the samples for different attributes viz. colour, odour, texture, taste and overall acceptability.

RESULTS AND DISCUSSION

i. Bacterial load study

TABLE 2: Bacterial Count (cfu / ml) of Foods Cooked by Different Methods

Recipe	Cooking method		
	Conventional	Microwave	Solar
Potato sabji	6.0×10^1	7.5×10^1	3.0×10^1
Spinach sabji	3.4×10^2	3.9×10^2	1.4×10^2
Kheer	1.0×10^1	3.5×10^1	3.0×10^1
Muthiya	3.3×10^2	5.6×10^2	3.3×10^2

As solar cooking takes longer to cook, continued low but consistent temperature maintained for longer time resulted in greater destruction of bacteria in potato sabji and spinach sabji. Conventional cooking (boiling) resulted in highest destruction of microorganisms in kheer. Conventionally cooked and solar cooked muthiya exhibited equal number of surviving microbes, which was much lower than microwave cooked sample. A study by Pandey et al. (2009) showed a decrease in microbial load of raw milk from 1.6×10^6 cfu to less than 10 on boiling.

Microwave cooking caused quick rise in temperature of food, but the cooking time was shorter in three of the four samples (Table 1), as a result of which internal temperature attained by the food was not maintained for long period as in case of solar cooking. This might have resulted in greater number of surviving cells in all four microwave cooked samples. It is necessary to hold food at high temperature for some time for maximum destruction of microorganisms.

The non uniform heating characteristic of microwave energy has been reported by Co and Livingston (1969). Copson (1962) also postulated that there are regions within a microwave oven where organisms remain unharmed. It was well documented by Goldblith and Wang (1967) and

Lechowich and Beauchat (1964) that death of microorganisms exposed to microwaves was due to thermal effects and not to microwaves per se.

ii. Sensory evaluation

TABLE 3: Mean Hedonic Score of Foods Cooked by Different Methods

Item	Sensory characteristics	Cooking method		
		Conventional	Microwave	Solar
Potato sabji	Colour	8.2	**8.4**	8.0
	Odour	**8.8**	7.8	7.6
	Texture	**8.8**	8.0	7.6
	Taste	**8.8**	8.0	7.6
	Overall acceptability	**8.8**	8.0	7.6
Spinach sabji	Colour	8.2	**8.9**	6.0
	Odour	**8.6**	**8.6**	8.2
	Texture	**8.4**	8.2	8.0
	Taste	**8.6**	7.8	8.0
	Overall acceptability	**8.6**	8.4	7.4
Kheer	Colour	**8.6**	**8.6**	7.4
	Odour	**8.6**	6.8	**8.6**
	Texture	**8.6**	7.2	8.2
	Taste	**8.8**	7.2	8.0
	Overall acceptability	**8.8**	7.4	8.0
Muthiya	Colour	8.4	**8.6**	7.0
	Odour	**8.8**	7.2	8.0
	Texture	**8.4**	8.0	8.2
	Taste	8.4	7.6	**8.6**
	Overall acceptability	**8.4**	7.6	8.2

Potato *sabji*: Microwave cooked sabji scored the highest for colour. Conventionally cooked sabji showed some caramelization of starch. Solar cooked sabji appeared little moist due to condensation of water, and showed little discolouration, probably a result of slow, prolonged cooking. Conventionally cooked sabji was preferred for its pleasant aroma, texture, taste and overall acceptability. The next in order was microwave cooked sabji. Solar cooked sabji scored the least. Heating for comparatively longer time, though in covered container, possibly resulted in greater loss of volatile flavour compounds in solar cooked sabji.

Spinach *sabji:* Microwave cooked sabji retained the colour. Solar cooked sabji developed an unpleasant, and unacceptable olive green colour. Conversion of chlorophyll to pheophytin is responsible for this colour change. Conventional cooking did not have any adverse effect on the pigment of palak. Except for solar cooked sabji, which lost its flovour compounds possibly due to prolonged heating, all other samples had good aroma. Conventionally cooked sabji had the best texture and taste, and the overall acceptability.

Study by Usha et al. (2009) states that as solar cooking takes place at lower temperature, it helps to bring out the natural juices and flavours of food cooked, but the findings of the present study do not agree with their finding.

Kheer: Slow, prolonged heating in solar cooker resulted in kheer with very light brown tinge thus affecting the score for colour. Conventional and microwave cooked kheer maintained good colour and showed no browning. Conventional and solar cooked kheer scored equal for their pleasant aroma. Though cooked in uncovered pan, and by continuous vigorous boiling, conventionally cooked kheer maintained the aroma. Microwave cooked kheer though cooked in covered container did not have good aroma. Rice in microwave cooked kheer remained slightly hard compared to solar and conventionally made kheer. Kheer made by conventional method was the most acceptable.

Muthiya: Microwave cooked sample retained the colour. Solar cooked sample developed light brown crust making it the least acceptable of the three samples. Deposition of condensed steam on the surface of steamed sample (conventional method) made the colour slightly dull compared to that of uncooked mixture. Conventional steamed sample scored the highest for its aroma. Solar cooked sample tasted the best. The order of liking for overall acceptability was - steamed, solar and microwave cooked sample.

SUMMARY AND CONCLUSION

Acceptability of food is judged by sensory evaluation of food. Sensory qualities and bacterial load of foods depend on the cooking methods. While solar cooking causing the maximum destruction of bacterial cells can be considered the best method for rendering the food safe, conventionally cooked foods scoring the highest for sensory qualities lead to a conclusion that conventional methods can be adjudged the best methods as far as acceptability of the cooked foods is considered.

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NUTRITIONAL AND PHYSICO-CHEMICAL QUALITY EVALUATION OF NEWLY EVOLVED DROUGHT TOLERANT GROUNDNUT GENOTYPES

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The experiment was conducted to know the physico-chemical and nutrient composition of thirteen drought resistant genotypes of groundnuts (*Arachis hypogaea*. L). The moisture content of the genotypes ranged from 1 to 3 per cent, protein, fat, energy, crude fibre and carbohydrate content varied from 21.66g-25.89g, 45.3-50.7g, 493-546K cal, 2.6-3.2 g and 16.35-23.69g respectively. Ash and minerals such as calcium, phosphorus, iron and zinc were also estimated. Ash content ranged from 1.6-2.2g, calcium 80-91g %, phosphorus 320-350g %, iron 2.1-2.7 g %, zinc 3.4-4.0 g %. The results of physicochemical characteristics of groundnut genotypes showed that specific gravity ranged from 0.925-0.903, peroxide value 9.3-6.0 meq/Kg, saponification number 202-189 g % KOH/g, free fatty acids 0.31-0.25 per cent, acid value 0.632-0.513 per cent, iodine value 102-98 Wij's. Physico-chemical and nutrient composition showed significant difference among the genotypes.

Groundnut or Peanut (*Arachis hypogaea* L.) is commonly known as poor man's cashew nut and is the fourth most important oil seed in the world. It is regarded as king of oilseed crops and has its unique characteristics of higher hydrogenated oil and protein content along with its soil fertility restoration ability. These properties furnish the hopes of combating the present day edible oil crisis and banishing the vegetable hunger. Seeds of most of the groundnut cultivars contain about 50% oil (Worthington and Hammons, 1971) and therefore the quality of the oil and groundnut products depend to a large extent on the oil fraction. The oil content of groundnut differs in quantity and the relative proportion of fatty acids, depending on their geographic locations, seasons and growing conditions (Brown *et al*, 1975; Holday and Pearson, 1974; Young *et al*,1974). Ajay *et al*, 2008 reported that average protein content in groundnut varieties was high in rainy (26.71%) than in post rainy season (24.36%) during the harvesting stage.

Development and breeding of drought resistant crops enhances agricultural security during unfavourable weather conditions. The breeding of high yielding drought tolerant groundnut genotypes has been hampered by lack of information on the genetics of physiological traits that contribute to drought tolerance under limited water condition (Hammons, 1973). Identification of the traits involved in the drought tolerance and their insertion in the genetic background of agronomically preferred varieties could enhance and/or stabilize the yield under drought prone situations.

This study sought to determine the nutrient composition and physico-chemical characteristics of twelve newly evolved drought tolerant groundnut genotypes along with control TMV 2 to form

the basis in further breeding activities for quality improvement and to inform the users which genotypes to select for their products.

MATERIAL AND METHODS

Twelve genotypes of groundnuts (GKVK 1,GKVK 3,GKVK 4,GKVK 6,GKVK 7,GKVK 8,GKVK 9,GKVK 11, GKVK 12, GKVK 13, GKVK 14, GKVK 16) and one control sample (TMV 2) were procured from the department of Genetics and Plant breeding, University of Agricultural Science, Bengaluru. Nutritional and physico-chemical characteristics were assessed in comparison with the control sample.

Oil from each genotype was extracted separately using chloroform methanol mixture. The physico-chemical analysis of the seed oil for acid value, iodine value, peroxide value, saponification number, per cent free fatty acids, specific gravity were carried out according to methods of AOAC (1995) and Raghuramulu (2003) .

The method suggested by AOAC (1980) was followed to evaluate the nutrient composition of different genotypes. Dried Groundnut pods were shelled. Good kernels were taken, powdered and used for macro and micro nutrient analysis, done in triplicates.

Physico-chemical analysis

Specific gravity: Specific gravity was estimated using pycnometer (specific gravity bottle) at a particular temperature

$$\text{Specific Gravity} = \frac{WL - WB}{WW - WB} \text{ at } 30^{\circ}C$$

WL: weight of the liquid
WB: weight of the empty bottle
WW: weight of water

Free Fatty Acid: Free fatty acid was estimated volumetrically by titrating the sample in alcohol against NaOH (sodium hydroxide).

The results were reported as per cent free fatty acids expressed as Oleic acid;

$$\text{Acid value} = \%FFA \times 1.99$$

Acid value: Acid value of seed oil was determined according to AOAC Official Method. Per cent age free fatty acids (FFAs) were calculated using oleic acid as a factor.

$$\text{Acid value} = \frac{a \times 0.00561 \times 1000}{\text{Wt in g of substance}}$$

$$\% \text{ Free fatty} = \frac{\text{Acid value}}{1.99}$$

Peroxide Value: Peroxide value was estimated volumetrically by titrating the sample dissolved in acetic acid –chloroform mixture against Sodium thiosulphate solution ($Na_2S_2O_3$) where, starch solution indicated the end of reaction by the change in color of the solution.

$$\text{Peroxide value} = \frac{(\text{Titre-Blank}) \times N \times 1000}{g} \text{ m.eq/kg of sample}$$

where,
N=Normality of $Na_2S_2O_3$ and
g= weight of oil in gms.

Saponification number: Saponification number was estimated volumetrically by titrating the sample treated with alcoholic KOH against 0.5 N HCl where, phenolphthalein indicated the end of reaction by the change in color of the solution.
Since 1 ml of 0.5 N HCl is equivalent to 0.02805 g of KOH, the following equation was used to calculate the Saponification value.

$$\text{Saponification value} = \frac{(\text{Blank-titre}) \times 0.02805 \times 1000}{\text{Wt in g of substance}}$$

Iodine value: Iodine value was estimated volumetrically using Wij's solution (iodine monochloride) against Sodium thiosulphate solution ($Na_2S_2O_3$) and starch indicated the end of reaction by the change in color of the solution.

$$\text{Iodine value} = \frac{(\text{Titre-Blank}) \times 0.01269 \times 100}{\text{Wt in g of substance}}$$

Nutrient composition of groundnut genotypes : The ground samples were finely powdered and were subjected for chemical analysis. The nutrients analyzed were moisture, protein, fat, crude fibre, ash, calcium, phosphorous, zinc and iron in groundnut genotypes by AOAC methods. Carbohydrate and energy were computed.

Estimation of moisture: Samples weighing 100 g were taken and dried in oven at 60^0 C. Then the dried samples were weighed and this value was subtracted from the fresh weight of the sample to obtain moisture.

$$\text{Per cent Moisture} = \left[\frac{\text{Weight of sample Before drying (g)} - \text{Weight of sample after drying (g)}}{\text{Weight of sample before drying (g)}} \times 100 \right]$$

Estimation of protein: The protein content of the dried samples was estimated as per cent total nitrogen by microkjeldhal procedure. Protein per cent was calculated by multiplying the per cent nitrogen by the factor 6.25.

$$\text{Per cent Protein} = \frac{\text{Titre value X Normality of HCl X 14.001 X 6.25}}{\text{Sample weight (g)}} \text{ X 100}$$

Estimation of fat: Fat was estimated as crude ether extract using moisture free samples. The solvent was removed by evaporation and the residue of fat was weighted.

$$\text{Fat content} = \frac{\text{Weight of ether extract}}{\text{Weight of sample taken}} \text{ X 100}$$

Estimation of crude fiber: Crude fiber of the sample was estimated by using moisture and fat free samples and expressed as g/100 g of the sample

$$\text{Per cent of crude fiber} = \frac{\text{Loss in weight on ignition}}{\text{Weight of sample used (g)}} \text{ X 100}$$

Estimation of total ash: The ash content of sample was obtained by dry ashing the samples completely by heating it over a flame. This was expressed as gram/100 g of the samples.

$$\text{\% Total ash} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \text{ X 100}$$

Preparation of micronutrient solution: The micronutrient solution of all the samples were prepared by dissolving the ash obtained after ashing the samples in a muffle furnace in dilute hydrochloric acid

Estimation of calcium: The calcium content was estimated by precipitating the sample as calcium oxalate and titrating the solution of oxalate in dilute acid against standard potassium permanganate.

1ml of N/100 $KMNO_4$= 0.2004 mg of calcium

$$\text{\% calcium (mg)} = \frac{\text{Titre value} \times 0.2004 \times \text{vol. Of } H_2SO_4}{\text{Weight of the sample used for ashing} \times \text{aliquot taken}} \text{ X 100}$$

Estimation of phosphorous: Determination of phosphorous content was carried out by measuring phosphomolybdate formed after treating the ash solution with ammonium molybdate, calorimetrically at 660 nm

$$\text{Phosphorous \%} = \frac{\text{Graph ppm X volume of digested sample}}{10^6 \text{ X weight of sample X Aliquot taken}} \text{ X 100 X dilution}$$

Estimation of Iron: Iron content was equivalent to the color developed after reacting the sample with potassium thiocyanate which was estimated calorimetrically at 540 nm.

Estimation of Zinc: Zinc content of the groundnut samples were estimated by using atomic absorption spectrophotometer and the results were expressed as mg per 100 grams of the groundnut sample

Computation of carbohydrate: Carbohydrate content was calculated by differential method.

Carbohydrate (g/100g)=100–[{Protein(g)+Fat(g)+Ash(g)+Moisture(%)}].

Computation of energy: Energy was calculated by differential method

Energy (k.cal) = Protein ("g) x 4 + Fat (g) x 9 + Carbohydrates (g) x 4

RESULTS AND DISCUSSION

Physico-chemical characteristics of groundnut genotypes

Specific gravity of oil, free fatty acids, acid number, iodine value, peroxide value and saponification number are usually determined with a view to ascertain the quality and to establish the nature of individual fats and oils before they are deemed suitable for either domestic or industrial consumption. The values obtained for all the physico-chemical parameters were within the standard range given for groundnut oil and are presented in Table 1.

The values obtained for all the physico-chemical parameters are within the range given for groundnut oils i.e., Specific gravity of oil: 0.931 - 0.944, Peroxide value : < 15 meq/kg, Saponification no: 188-196 g % KOH/g , Free fatty acids: not >1, Acid no: not >0.8 per cent, Iodine no: 86-107 (Source : PFA 2002, 18th Edition: 298, 302, 315).

The specific gravity of oils extracted from each genotype were less than one (<1) indicating that it is less than water. GKVK 7 had the highest specific gravity (0.925) compared to that of other genotypes. Peroxide values measure the content of hydroperoxides and are often used as an indicator of primary products of lipid oxidation. In the present study GKVK 14 showed highest peroxide value among the genotypes (9.3 meq/kg) which was within the normal range. Oil of genotype GKVK 14 showed high saponification value (202g % KOH/g) suggesting their utilization in production of liquid soaps and shampoos. Free fatty acids can stimulate oxidative deterioration of oils by enzymatic or chemical oxidation to form off flavor components (Akintaya and Bayer, 2002). GKVK 11 had higher free fatty acid content (0.31%) acid number (0.632%) and iodine number (102) among all the genotypes, but these values when compared with the standard values were found to be within the prescribed range..Iodine number is an index of degree of unsaturation which resists the solubility, hardness and resistance towards oxidation (Yegammai and Gowri, 1995). This variation in physico-chemical characteristics among genotypes may be attributed to inheritance characters besides the influence of soil, climate and

harvesting stages. Peroxide value of oils has been found to be an indicator of oil stability and odour/color changes with storage in previous studies. Differences in physico-chemical characteristics were observed by Adnan *et al.* (1980) in his study on the stability of the oil during storage, as measured by peroxide value, which was much greater within the peanuts than in the corresponding extracted oil Narasimhan *et al.*, (1986) conducted a study on Oxidative rancidity in groundnut oil and its evaluation by sensory and chemical indices. The relationship between Peroxide value and odour as well as flavour was found to be significant.

Table 1: Physico-chemical characteristics of groundnut genotypes

Genotypes	Specific gravity	Peroxide value meq/kg	Saponification Number g % KOH/g	Free fatty acids (%)	Acid number (%)	Iodine number (wij's)
GKVK1	0.912	6.0	198	0.30	0.597	92
GKVK3	0.914	8.2	189	0.28	0.565	89
GKVK4	0.917	7.0	190	0.26	0.534	86
GKVK6	0.908	8.1	194	0.30	0.612	90
GKVK 7	0.925	7.2	198	0.27	0.545	98
GKVK 8	0.909	8.3	189	0.29	0.592	94
GKVK 9	0.915	5.9	191	0.29	0.593	93
GKVK11	0.903	7.7	193	0.31	0.632	102
GKVK12	0.913	6.3	199	0.30	0.602	87
GKVK13	0.918	8.8	198	0.25	0.513	96
GKVK14	0.913	9.3	202	0.28	0.57	95
GKVK16	0.906	7.1	194	0.29	0.582	92
TMV2 (Control)	0.911	7.3	192	0.27	0.538	89
F-value	*	*	*	NS	*	*
SEM±	0.008	0.28	8.47	0.06	0.001	0.55
CD at 5%	0.002	0.83	24.64	0.57	0.004	1.61

* Significant at 5% level NS-Non Significant

Macro and micro-nutrient composition of groundnut genotypes

Analyzed results of macro and micro nutrients are presented in Table 2 and Table 3.
Macronutrients such as moisture, protein, fat and crude fiber were estimated on dry weight basis and carbohydrate and energy were computed. The moisture values were generally low but are within the range expected for most of oilseeds. The low moisture content will afford a long shelf life for dehulled seeds. Higher moisture content would imply higher susceptibility to microorganisms attack. However, given the high fat content of the groundnut seeds, longer shelf life can not be guaranteed by low moisture content alone. Rancidity due to lipid peroxidation may also occur in the absence of improper storage conditions. A moisture content of three per cent of was observed in TMV 2, GKVK 1, GKVK 3, GKVK 6, GKVK 8, GKVK 9 and GKVK 16. Moisture content of 4 to 14 per cent has been reported by Kraszeswski and Nelson (1993) in groundnut seeds.

The fast demographic growth and the low economic resources in developing countries create the necessity to look for new protein sources that can substitute animal proteins and complement the nutritional value of cereal based foods to prevent malnutrition. This is especially important for children and vegetarians. Groundnuts have always been valued for their high protein content. Ajay *et al*, 2008 reported an average protein content of 24.36 -26.71 gm% in groundnut varieties. In the present study protein content in the genotypes ranged from 21.66 to 25.89 g /100 g. GKVK 1 was observed to be superior among the genotypes for its high protein content (25.89 g per cent).

Oil content was high in GKVK 13 (50.7g) and GKVK 4 showed high energy value (546 K.cal). Because of health consideration consumers prefer low calorie foods and beverages. However, all the genotypes fell into medium to high oil content. Genotypes with higher oil content can be recommended for oil extraction. Whereas the genotypes with medium oil content would be used for table purpose in order to help the health conscious population. The results were in agreement with the findings of Dwivedi *et al*, 1993, who in his study reported an oil content of groundnut genotypes ranging from 45-50 g %.

GKVK 1 had the highest carbohydrate content (23.69g %). GKVK 4, GKVK 9 and GKVK 11 genotypes had highest crude fiber content (3.2g %). This may be attributed to the genetic make up of the varieties.

Micronutrients such as total ash, calcium, phosphorus, iron and zinc were estimated. Analysis showed that sufficient amounts of calcium, iron, zinc, phosphorous were present to meet the micro nutrient demand in human diets. Fifty gram of ground nuts can meet approximately $1/4^{th}$ of protein requirements and $1/8^{th}$ of calorie requirements of a sedentary man per day.

Ash content in the genotypes ranged between 1.6 to 2.2 g. Iron, reported to be very important for normal functioning of the central nervous system (Vyas and Chandra, 1993: Adeyeye and Fagbohun, 2005). was found to be in the range of 2.1 to 2.7 g %/100 g in the genotypes . Calcium content of GKVK 8 (91g % / 100 g) was superior to other genotypes which can be recommended for weaning /supplementary foods and also for adolescent children as well as women, since their demand for iron will be high. Calcium is important in blood clotting and

muscle contraction and in certain enzymatic metabolic processes (Aremu *et al*, 2006). Zinc is present in all tissues of the body and it is a component of more than 50 enzymes. In the present study high zinc content was observed in TMV 2 genotype (4.0g %). Phosphorous content in the present study ranged between 320 – 350g % and highest was recorded in GKVK 6. These varietal differences may be attributed to the capacity of uptake and synthesizing of nutrients from the soil. These findings are in accordance with the findings of Aremu *et al*, (2006).

Table 2 :Macronutrient composition of groundnut genotypes on dry weight basis (per 100g)

Genotypes	Ash (g)	Moisture (%)	Protein (g)	Energy+ (K cal)	Fat (g)	Carbohydrate+ (g)	Crude fiber (g)
GKVK1	2.0	3.0	21.61	542	49.7	23.69	3.0
GKVK3	1.9	3.0	24.75	504	46.8	20.65	3.0
GKVK4	2.2	2.0	21.86	546	50.5	22.84	3.2
GKVK6	1.6	3.0	22.14	534	50.6	19.56	2.9
GKVK 7	2.0	2.5	21.66	520	47.4	23.44	2.5
GKVK 8	2.2	3.0	24.03	512	47.8	20.37	2.9
GKVK 9	2.1	3.0	22.93	525	49.6	19.57	3.2
GKVK11	2.0	2.0	25.89	498	46.0	21.01	3.2
GKVK12	2.2	2.0	25.51	504	47.2	19.79	2.9
GKVK13	2.1	3.0	25.05	522	50.7	16.35	2.7
GKVK14	2.0	1.0	23.08	530	49.2	21.92	3.1
GKVK16	2.0	3.0	25.39	493	45.3	21.31	2.9
TMV2 (Control)	2.1	3.0	21.92	540	49.8	22.98	3.1
F- value	*	*	*	*	*	*	*
SEM±	0.06	0.15	0.09	0.57	0.05	0.005	0.05
CD at 5%	0.17	0.47	0.26	1.67	0.16	0.016	0.16

* Significant at 5% level +Computed

Table 3 : Micronutrient composition of groundnut genotypes (per 100g)

Genotypes	Ash (g)	Calcium (g %)	Phosphorus (g %)	Iron (g %)	Zinc (g %)
GKVK 1	2.0	86.5	320.0	2.5	3.85
GKVK 3	1.9	88.0	328.0	2.3	3.80
GKVK 4	2.2	89.0	348.0	2.7	3.70
GKVK 6	1.6	84.0	350.0	2.5	3.40
GKVK 7	2.0	83.0	342.0	2.6	3.50
GKVK 8	2.2	91.0	330.0	2.3	3.80
GKVK 9	2.1	87.0	328.0	2.4	3.90
GKVK 11	2.0	87.0	332.0	2.1	3.70
GKVK 12	2.2	88.0	331.5	2.2	3.75
GKVK 13	2.1	90.0	320.0	2.2	3.80
GKVK 14	2.0	87.0	321.0	2.3	3.90
GKVK 16	2.0	80.0	340.0	2.4	3.70
TMV2 (Control)	2.1	88.0	345.0	2.6	4.00
F- value	*	*	*	*	*
SEM±	0.06	0.55	0.55	0.05	0.05
CD at 5%	0.17	1.61	1.61	0.16	0.15

* Significant at 5% level

CONCLUSION:

Significant variations were observed for the quality attributes studied among the groundnut genotypes. All the genotypes were nutritionally rich and on-par with control. TMV 2 Genotypes GKVK 1(25.89) and GKVK 13 (25.51) with relatively higher protein content can be used as substitute for animal protein to prevent the malnutrition in vegetarian diets. Genotypes with higher oil content namely GKVK 13 (50.7g), GKVK 6 (50.6 g) can be preferentially recommended for oil extraction. The genotypes with less oil content like GKVK 16 (45.3 g), GKVK 11 (46.0 g) would be better choices for table purposes in order to help the health conscious population. However, differences in nutrient values across cultivars are not big enough to make any strong recommendations. This becomes particularly relevant in the context of the

quantity of groundnuts that can be consumed in one serving. GKVK 14 showed higher saponification values suggesting their utilization in production of liquid soaps, shampoos and other industrial applications. Genotypes rich in oils can be used in many other ways, like in fuel, cosmetics, leather dressings, furniture cream, lubricants and also in medicated ointments, plasters, syrups and in medicated emulsion *etc*. Since there is scanty information available on quality attributes of drought tolerant groundnut genotypes, the present study would help future researchers.

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ASSESSMENT OF NUTRITIONAL STATUS AND PSYCHOLOGICAL BEHAVIOUR OF DESTITUTE CHILDREN (8-12 YEARS) AND THE IMPACT OF NUTRITION EDUCATION PROGRAM

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Destitute children deprived of parental care are a vulnerable population with complex needs and health problems. The study was designed to assess the nutritional status (anthropometric, clinical and dietary assessment), physical activity pattern, psychosocial behaviour, and psychological behaviour of 200 destitute children (100 boys and 100 girls) living in institutions in Chennai city. Results reveal that higher percent of children from the age group 8 and 10 years had severe stunting, wasting and moderate malnutrition, with no external signs of deficiencies. The intake of energy and all the nutrients was less than the recommended dietary allowance. Higher percent of destitute children had a sedentary physical activity pattern. Higher percent of girls had abnormal emotional symptoms and conduct problems and boys had abnormal symptoms of peer problem. Alarmingly nine percent of girls and 13 percent of boys experienced severe loneliness. In conclusion, it is very imperative to give nutrition support to destitute children for optimal growth and development. Counseling on mental health and lifestyle modification is required from their caregivers to have sound mental and physical health.

Parental illness and loss affect children's psychosocial, economic and family well-being, limit the children's access to basic social services, undermines their chances of survival and their future. Improving the health of children is one responsibility among many in the fight against poverty. Healthy children become healthy adults: people who create better lives for themselves, their communities and their countries (UNICEF, 2003). Many of the orphaned children experience emotional problems and little is being done in this area of emotional support. There are several reasons. First, there is a lack of adequate information on the nature and magnitude of the problem; secondly, there is a cultural belief that children do not have emotional problems and therefore there is a lack of attention from adults. Thirdly, since psychological problems are not always obvious, many adults in charge of orphans are not able to identify them.

In recent years studies on the nutritional status, psychological behaviour, psychosocial behaviour and physical activity of children living in orphanages are limited. Hence this study was done to bridge the gap and by way of giving nutrition education to children and caretakers it is intended that this need will be taken care of.

MATERIAL AND METHODS

The present study was conducted to assess the nutritional status, physical activity pattern, psychosocial behaviour and psychological behaviour of destitute children and to ascertain the impact of nutrition education program on the knowledge and awareness of nutrition of these children.

Study design

Two hundred destitute children in the age group of 8-12 years were selected at random from the various orphanages in Chennai city. Two hundred subjects underwent Phase I, II and III assessment comprising of anthropometric, clinical and dietary habit data, while a sub-sample of 50 subjects were selected at random to assess their dietary pattern using dietary recall.

Phase I

An interview schedule was designed to elicit information from the destitute children regarding the anthropometric measurements, clinical assessment and dietary habits.

a) Anthropometric measurement and index

Anthropometric measurement and index like height and weight was measured and BMI was calculated

1) Measurement of height: The height of the children was measured to the nearest 0.1 cm using a non-flexible measuring tape by making them stand against the wall.
2) Measurement of body weight: A portable weighing scale showing weight in kilograms was used. The reading adjusted to zero before weighing, Body weight is the most sensitive and reproducible measurement for evaluation of nutritional status of children.
3) Calculation of Body Mass Index (BMI), also known as Quetlet index. Using the height and Body weight the body mass index was calculated using the following formula.

$$\text{Body Mass Index} = \text{Weight in kg} / \text{Height in meter}^2$$

b) Clinical examination

Format and interpretation of a systematic examination (head to extremities) were prepared by the investigator. Children's physical appearance was examined by a physician for any classical manifestation of far advanced vitamin or mineral deficiency.

c) Dietary evaluation

Diet is a vital determinant of health and nutritional status of people. Before entering the information in the 24 hour dietary recall, the investigator explained the cup and spoon measures to all the children. Review of a child's usual pattern of food intake was elicited using 24 hour dietary recall. This was done on 50 children who were selected at random. Children's dietary recall was conducted by students trained in nutrition assessment and education in the presence of their institutional care givers

Phase: II

a) The physical activity

Physical activity index assessment tool was developed in 1970s by Sharkey and Gaskill; the index proved to be related to a laboratory test of aerobic fitness (maximum oxygen intake).Physical activity index assessment tool is a reliable instrument, with validity ensuring self report measure of physical activity behaviour of subjects. It is a tool that can be used efficiently in studies to identify insufficiently active subjects who may need physical activity advice. Physical activity assessment tool ensures accuracy and reliability as it measures the frequency, intensity, type and duration of light intensity, moderate intensity and vigorous

activities. As the intensity, duration and frequency of exercise increases the index score increases. Subjects were asked to tick any one of the Intensity of activity which includes sustained heavy breathing activity (score 5), intermittent heavy breathing (score 4), moderately heavy (score 3), moderate (score 2) and light breathing activity (score 1); Duration score includes more than 1 hour of activity (score 4), 30 – 60 minutes (score 3), 20 – 30 minutes (score 2) and less than 20 minutes of activity (score 1); frequency of activity includes daily (score 5), 3 to 5 times a week (score 4), 1 – 2 times a week (score 3), few times a month (score 2), less than once a week (score 1). Using the daily regular activity, the physical activity index is arrived by multiplying frequency, intensity and duration of activities. Scores equal to 100 denotes very active lifestyle, scores 80 – 100 denotes active and healthy lifestyle, scores 60 – 80 denotes active lifestyle, 40 – 60 acceptable lifestyle, 20 – 40 poor lifestyle and less than 20 denotes a very poor sedentary lifestyle (Sharkey and Gaskill, 2006).

b) Psychosocial behaviour

A standardized strength and difficulty questionnaire was used to assess the mental health status of the children. This 25-insurement item contains five subscales: 1) Emotional symptoms, 2) Conduct problem, 3) Hyperactivity 4) Peer Problem and 5) Prosocial Behaviour. Scores from the first four subscales are summed and used to calculate total difficulties score. The questionnaire has been found to have acceptable internal consistency, reliability values and acceptable validity in terms of its effectiveness in independently diagnosing psychiatric disorders (Goodman, 1997).

c) The psychological behaviour

UCLA scale was used to assess the subjective feeling of loneliness or social isolation. Items for the original version of scale were based on statements used by lonely individuals to describe feeling of loneliness (Russell, 1996). The scale for each question was never, rarely, sometimes and often. Subjects were asked to circle the respective scale for each question and the score range given for each question was from 0-4, thereby each subject was assessed for the subjective feeling of loneliness and social isolation.

Phase: III

Nutrition and Health Education program was organized. The program consisted of an informative talk on nutrition and health accompanied by visual aids such as power point presentation and posters which aimed to create awareness on health and nutrition. A pre- post experimental design was used to assess the impact of the nutrition education program on the subjects. A questionnaire consisting of 10 questions each on awareness and knowledge on health and nutrition was given to the destitute children before and after the nutrition education program.

RESULTS AND DISCUSSION

General information of the subjects

Two hundred destitute children (100 girls and 100 boys) in the age group of 8 to 12 years were selected for the study. Higher percent of the subjects (47% of girls and 35 % of boys) were in the age of 12 years, 17 percent of girls and 18 percent of boys were in the age of 11 years, about one tenth of the girls and boys were 10 years old.

PHASE I

a) Anthropometric data

In the present study anthropometric assessment was measured for two hundred destitute children. Subject's height, body weight, and BMI were calculated. Anthropometry is one of the most basic tools for assessing nutritional status, whether over nutrition or undernutrition. A variety of methods are available to measure body fatness and body thinness (World Health Organization, 1995).

Table 1: Percentile distribution of height and weight among girls and boys

Gender	Age (In years)	Percentile body height						
		5th - 3 SD	10th -2 SD	25th -1 SD	50th Median	75th +1 SD	90th +2 SD	95th +3 SD
Girls	8	9	0	0	**2**	0	1	0
	9	4	2	2	**4**	0	0	1
	10	7	0	3	**1**	0	0	0
	11	8	0	5	**1**	2	1	0
	12	23	2	9	**4**	7	1	1
Total		**51**	**4**	**19**	**12**	**9**	**3**	**2**
Boys	8	12	3	7	**2**	0	0	0
	9	2	4	2	**3**	1	0	0
	10	5	2	1	**2**	1	0	0
	11	7	3	3	**3**	0	2	0
	12	13	5	5	**7**	0	2	3
Total		**39**	**17**	**18**	**17**	**2**	**4**	**3**
		Percentile body weight						
Girls	8	10	0	0	**1**	0	1	0
	9	5	3	3	**1**	1	0	0
	10	8	1	2	**0**	0	0	0
	11	7	2	5	**2**	0	1	0
	12	13	2	8	**7**	7	9	1
Total		**43**	**8**	**18**	**11**	**8**	**11**	**1**
Boys	8	22	1	0	**1**	0	0	0
	9	7	2	2	**1**	0	0	0
	10	7	2	1	**1**	0	0	0
	11	10	3	4	**0**	1	0	0
	12	13	1	5	**8**	5	2	1
Total		**59**	**9**	**12**	**11**	**6**	**2**	**1**

From table 1, we can elicit that only 12 percent of girls and 17 percent of boys had correct height for age and belonged to the 50th percentile, according to WHO standard, while higher percent of girls (51%) and boys (39%) had a stature below 5th percentile, indicating that the subjects were stunted for age. About 4 percent girls and 17 percent of boys had a stature below 10th percentile, indicating that the subjects were low stature for age.

From table 1, we can elicit that only 11 percent of subjects both girls and boys had correct weight for age following in the 50th percentile, according to WHO standard, while higher percent of girls (43%) and boys (59%) had a weight below 5th percentile, indicating that the subjects were

severely undernourished and wasted. About eight percent girls and nine percent of boys weighed below 10th percentile, indicating that the subjects were low weight for age. About 11 percent of girls and two percent of boys were at risk of overweight with a weight above 90th percentile, one percent of the subjects from both the gender were obese. Barnett and Blaikie, (1989) in their study found that the nutritional status of children is an outcome of many interrelated factors, including environment, economic status, education, culture and food security.

Table 2: Percentile distribution of body mass index among girls and boys

Gender	Age (In years)	Percentile body mass index							
		5th - 3 SD	10th -2 SD	25th -1 SD	50th Median	75th +1 SD	80th +2 SD	90th +3 SD	95th +3 SD
Girls	8	2	2	2	5	0	1	0	0
	9	3	1	3	3	2	1	0	0
	10	3	0	2	2	4	0	0	0
	11	7	2	3	0	2	2	1	0
	12	5	5	5	5	11	4	6	6
Total		**20**	**10**	**15**	**15**	**19**	**8**	**7**	**6**
Boys	8	14	2	4	1	1	2	0	0
	9	4	4	4	0	0	0	0	0
	10	5	1	2	3	0	0	0	0
	11	8	4	0	4	2	0	0	0
	12	5	1	1	6	11	7	2	2
Total		**36**	**12**	**11**	**14**	**14**	**9**	**2**	**2**

From table 2, we can elicit that about 15 percent of girls and 14 percent of boys had normal body mass index, 10 percent of the girls and 12 percent of the boys were below 10th percentile indicating mild malnutrition, and about 20 percent of girls and 36 percent of boys were below 5th percentile indicating moderate malnutrition. On the other hand eight percent of girls and nine percent of boys were at risk of overweight with a body mass index above 80th percentile, seven percent of girls and two percent of boys were overweight and six percent of girls and two percent of boys were obese with a body mass index above 95th percentile. According to the study conducted by researchers at St. Petersburg–USA Orphanage Research Team, (2005) Children residing in the orphanages were delayed in their physical development. Alpers et al., (1997) in their study conclude that the physical growth of the newly adopted children falls behind by approximately 1 month for every 5 months for children who live in orphanages.

b) Clinical assessment

Results of analysis of variance reveal that there is significant variation in clinical signs and symptoms of deficiency between different age groups with regard to general appearance ($p<0.01$), face ($p<0.05$), teeth ($p<0.01$) and skeleton ($p<0.01$). Clinical examination of general appearance revealed that 10 percent of the subjects were weak and apathetic, 10 percent of the subjects had pale and puffy face indicating deficiency of iron. Examination of the teeth revealed that 10 percent of the subjects had mottled discolored teeth and dental caries, two percent of girls and five percent of boys had pigeon chest which indicates a deficient intake of vitamin D. Higher percent of children below the age of 10 years suffered with far advanced mineral and vitamin deficiencies compared to children in the age of 11 and 12.

c) Nutrient intake

A sub-sample of 50 subjects was selected to study the nutrient intake of the subjects. Nutrient intake of the subjects was elicited using a 24 hour dietary recall method. Mean nutrient intake of the subjects is presented in table 3, 4 and 5.

Table 3: Mean nutrient intake of 8 – 9 year old children

Nutrient	N	Mean	RDA	SD	't' value	Level of significance
Energy	18	1493.24	1950	445.02	-4.35	1%
Protein	18	38.30	41	9.61	-1.19	NS
Fat	18	50.48	25	22.66	4.77	1%
Calcium	18	336.95	400	57.09	-4.69	1%
Iron	18	9.34	26	3.06	-23.14	1%
Vitamin A	18	300.97	600	50.47	-25.14	1%
Thiamin	18	0.96	1	0.24	-0.77	NS
Riboflavin	18	4.70	1.2	4.86	3.06	1%
Vitamin B12	18	4.70	1	1.98	7.92	1%

NS – not significant, 5% - significant at $p<0.05$, 1% - significant at $p<0.01$

Table 4: Mean nutrient intake of 10-12 year old destitute girls

Nutrient	N	Mean	RDA	SD	't' value	Level of significance
Energy	13	1562.53	1970	430.98	-3.41	1%
Protein	13	40.03	57	8.72	-7.01	1%
Fat	13	55.29	22	22.73	5.28	1%
Calcium	13	347.45	600	44.97	-20.25	1%
Iron	13	9.90	19	3.03	-10.83	1%
Vitamin A	13	330.27	600	100.92	-9.64	1%
Thiamin	13	0.99	1	0.20	-0.20	NS
Riboflavin	13	4.16	1.2	4.81	2.22	1%
Vitamin B12	13	4.95	1	1.86	7.64	1%

NS – not significant, 5% - significant at $p<0.05$, 1% - significant at $p<0.01$

Table 5: Mean nutrient intake of 10-12 year old destitute boys

Nutrient	N	Mean	RDA	SD	't' value	Level of significance
Energy	11	1432.26	2190.0	432.90	-5.81	1%
Protein	11	38.19	54.0	8.85	-5.92	1%
Fat	11	47.77	22.0	21.72	3.94	1%
Calcium	11	332.85	600.0	46.88	-18.90	1%
Iron	11	8.93	34.0	47.14	-28.08	1%
Vitamin A	11	298.26	600.0	47.14	-21.23	1%
Thiamin	11	1.00	1.1	0.22	-1.54	NS
Riboflavin	11	5.68	1.3	4.98	2.92	1%
Vitamin B12	11	4.51	1.0	1.88	6.2	1%

NS – not significant, 5% - significant at $p<0.05$, 1% - significant at $p<0.01$

Results of the nutrient intake compared with the recommended dietary allowance (RDA) for destitute children are present in table 3, 4 and 5. The results reveal that there is a significant difference in the mean energy, fat and micronutrient intake of the subjects, when compared to the RDA. Except for protein and thiamine intake, subject's diet was deficient in all the macro and the micronutrients among the 8-9year old children. We can ascertain that there was a 1% significant difference in mean intake of all the nutrients expect thiamine among boys and girls belonging to 10 – 12 years. Markedly mean intake of fat, riboflavin and vitamin B12 was higher than the RDA. The children's diet was significantly deficient in many essential nutrients. At this critical age the deficient intake of essential nutrients will pose a risk for far advanced vitamin and mineral deficiency. The results of the study suggest that an urgent need exists to educate the caretakers of destitute children to provide a balanced diet to improve health and prevent diseases and deficiencies.

PHASE II

a) **Physical activity pattern**

Physical activity index assessment tool; Physical activity index assessment tool is a reliable instrument, with validity ensuring self report measure of physical activity behaviour of children. Physical activity assessment tool ensures accuracy and reliability as it measures the frequency, intensity, type and duration of light intensity, moderate intensity and vigorous activities.

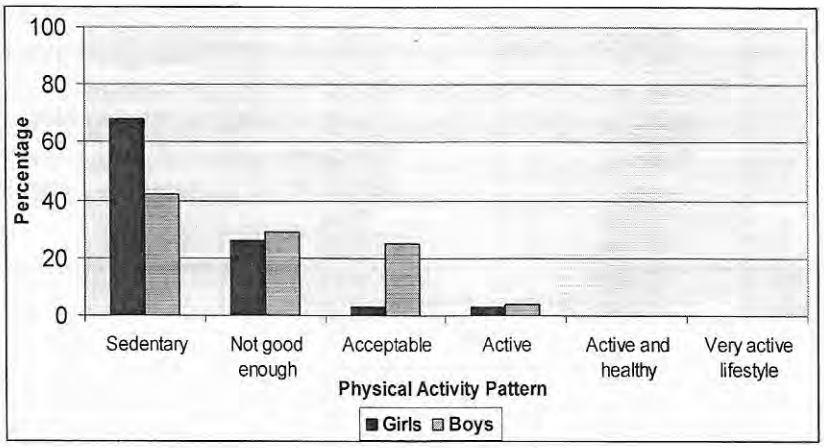

Figure 1: Percent distribution of physical activity pattern of destitute children

From figure 1, we can elicit that higher percent of girls (68%) and boys (42%) had a sedentary physical activity pattern with a very poor fitness score, whereas 26 percent of girls and 29 percent of boys had physical activity pattern not good enough to maintain health with poor fitness score (20-40). Only a very small percent of girls (3%) and 25 percent of boys had acceptable physical activity with a fair fitness score of 40-60, while less than five percent of the subjects (girls and boys) had active physical activity with a good fitness category score of 60-80, markedly none of the destitute children had an active or very active life style and healthy physical activity pattern. This indicates a need for physical activity among destitute children. There is no significant variation in the physical activity pattern between girls and boys.

b) **Psychosocial Behaviour (Mental Health Outcomes)**

Appropriate early social–emotional experience is crucial to a broad range of later social, emotional, and mental skills, even physical development (Landry et al., 2006 and Johnson, 2000).

The assessment of psychosocial behaviour reveals that higher percent of girls (44% and 42%) had abnormal emotional symptoms and conduct problems compared to lower percent of boys (33% and 41%). Seventy one percent of boys had abnormal symptoms of peer problem compared to 61 percent of girls, but most subjects had normal prosocial behaviour. Majority of boys (47%) and girls (40%) had abnormal total strength and difficulty score in their psychosocial behaviour.

It is evident from the table that there is highly significant difference at 1% level of significance in emotional and prosocial behaviour between the girls and boys with a 't' value of 2.53 and 2.60 respectively. There is no significant difference in mental health outcomes like conduct, hyperactivity and peer problem. St. Petersburg–USA Orphanage Research Team, 2005 suggest that infant with a warm, responsive caregiver develops an internal working model of expectations for nurturing, supportive reactions from that caregiver, whom the infant comes to trust and use as a secure base from which to explore the social and physical world. Such experiences in turn promote the development of a sense of worthiness and self-esteem and appropriate long-term

social–emotional development and mental health. Without the early experience of a few warm, caring, socially–emotionally responsive adults, long-term development may be compromised.

Table 6: Comparison of mental health outcomes among destitute children

Psychosocial problems	Gender	N	Mean	Standard deviation	't' value	Level of significance
Emotional symptoms	Girls	100	3.32	2.44	2.53	1%
	Boys	100	4.15	2.20		
Conduct problems	Girls	100	3.34	1.73	1.50	NS
	Boys	100	2.99	1.56		
Hyperactivity	Girls	100	4.30	2.02	1.21	NS
	Boys	100	3.98	1.71		
Peer Problem	Girls	100	4.29	1.95	0.84	NS
	Boys	100	4.52	1.91		
Prosocial behaviour	Girls	100	7.10	2.20	2.60	1%
	Boys	100	7.92	2.26		
Total difficulties	Girls	100	15.25	4.40	0.64	NS
	Boys	100	15.64	4.22		

NS-Not significant 1%-significant at $p<0.01$

c) Psychological behaviour assessment

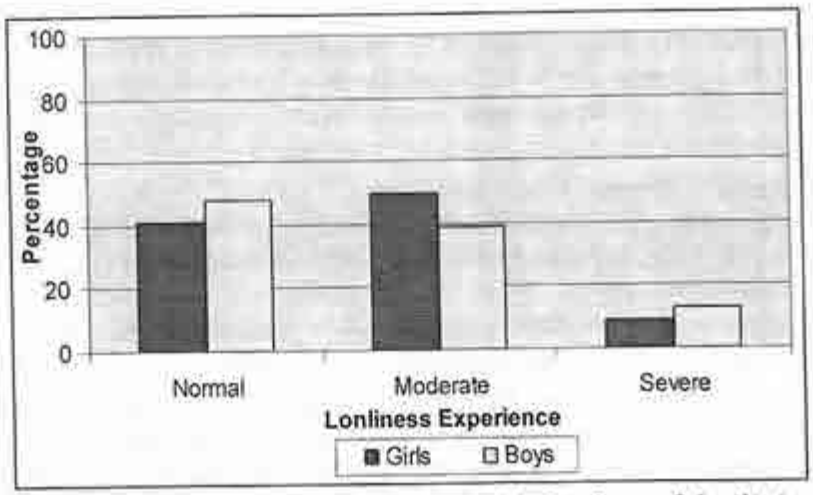

Figure 2: Percent distribution of psychological behaviour of destitute children

It is evident from figure 2 that 50 percent of girls and 39 percent of boys experienced moderate loneliness. Alarmingly 9 percent of girls and 13 percent of boys experienced severe loneliness. Analysis of variance also revealed that there is a highly significant variation at 1% level in psychological behaviour (feeling of loneliness) between boys and girls. There is a highly significant difference at the 1% level in psychological behaviour between girls and boys with a't' value of 3.37. Feeling of loneliness in boys (23.30±6.24) was higher compared to lower scores in girls (20.29±6.38). The scores however, indicate moderate loneliness in boys and girls.

PHASE III:

Nutrition Education Program

Nutrition education program was conducted for destitute children in their institution on heath, balanced diet, important nutrient present in the foods, importance of breakfast, exercise, personal hygiene. To evaluate the impact of nutrition education program pre- post experimental design was used. The data of mean value of pre and post test scores are presented in table 7.

Table 7: Mean value of pre and post test scores on nutrition knowledge and awareness

Gender	Variables	N	Mean	Standard deviation	't' value	Level of significance
Nutrition awareness						
Girls	Before education program	100	6.44	1.22	2.11	5%
	After education program	100	7.69	1.17		
Boys	Before education program	100	6.81	1.24	1.96	5%
	After education program	100	7.99	0.98		
Nutrition knowledge						
Girls	Before education program	100	6.27	1.35	3.61	1%
	After education program	100	7.61	0.94		
Boys	Before education program	100	6.99	1.33	2.62	1%
	After education program	100	7.98	1.02		

1%-significant at $p<0.01$, NS-Not significant

From table 7, it is evident that there is a significant difference in the nutrition knowledge and awareness before and after the nutrition education program among destitute girls and boys. This indicates nutrition education program was effective and useful and improved their knowledge and awareness in nutrition. Manios et al., (2002) concludes that school health education program have the potential to slow the age related decline in physical activity and help pupils establish lifelong, healthy physical activity patterns. Promoting healthy habits and physical activity behaviours during childhood may prevent some of the leading causes of morbidity and mortalityand also decrease direct healthcare costs and improve quality of life.

CONCLUSION

The present study was conducted among destitute children (8-12 years) residing in various institutions in Chennai city. It is evident from the study that higher percent of destitute children were malnourished. The intake of energy and all the nutrients was less than the recommended dietary allowance. Girls had significantly higher intake of all nutrients compared to boys. Destitute children had sedentary life style, abnormal psychosocial problems and experienced moderate feeling of loneliness, thus these children require counseling on mental health and

lifestyle modification from their caregivers to have sound mental and physical health. Nutrition education significantly improved the knowledge and awareness on the destitute children. In conclusion, it is very imperative to give nutrition support to destitute children for optimal growth and development.

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EFFECT OF DEHYDRATED WHITE LOTUS PETALS (*NELUMBU NUCIFERA GAERTN*) ON SELECTED HYPERLIPIDEMIC NIDDM SUBJECTS

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Diabetes Mellitus is a chronic metabolic disorder, with a strong hereditary basis associated with high sugar levels. Hyperlipidemia is one of the major complications associated with Diabetes Mellitus and heart disease. Many nutritional supplements have been used to treat high blood sugar and high lipid levels and one such supplement is the lotus plant (Nelumbu Nucifera Gaertn). It is an aquatic plant with elegant sweet smelling flowers of two colors white and pink. Dehydrated white lotus petals were found to be very effective in the treatment of many ailments such as cough, asthma, sores and high blood sugar. This led the investigator to try out a pilot study on the effect of dehydrated white lotus petals on blood sugar values and lipid profile using a small sample. This study was approved by the ethics committee of Queen Mary's College. Six subjects comprising an equal number of male and female in both the experimental and control groups were selected. To the experimental group dehydrated white lotus petal was given for a period of 90 days and to the control group there was no supplementation given. Biochemical parameters were recorded on 0 day, 45th day, 90th day and after 120 days (30 days after the withdrawal of the supplementation). The present study revealed that after 90 days of supplementation there was a significant reduction in the blood parameters with regard to blood sugar value (fasting, post prandial and HbA1c) and cholesterol values (Total cholesterol, TG, LDL and VLDL) and an elevation in HDL values. The lasting effect of the white lotus petal powder was also observed after 30 days of withdrawal period. Thus it can be recommended that dehydrated white lotus petal supplementation can be used as an effective hypoglycaemic and hypolipidemic agent for further research.

KEY WORDS: hyperlipidemia, NIDDM, dehydrated lotus petal

Hyperlipidaemia indicates increase in the level of one or more lipids in the blood. A total cholesterol level of less than 200 mg/dL (5.17 mmol/L) is normal, level of 200 to 239 mg/dL (5.17 to 6.18 mmol/L) is considered as borderline high, and a total cholesterol level greater than or equal to 240 mg/dL (6.21 mmol/L) is considered as high (hyperlipidemia) (NCEP, 2002).

Lipid levels can be lowered with lifestyle changes, medications, or a combination of these approaches. In most cases, clinicians decide on a trial of lifestyle changes and supplements before recommending medication. One such herbal supplement used to treat high blood sugar and lipid levels is the lotus plant (Nelumbu Nucifera Gaertn) with white colored petals. All parts of the lotus plant—root, leaves, stem, flowers, seed pods, and seeds—are used medicinally and also as a food supplement. The starchy root or rhizome is eaten in China, India, Japan, and other parts of Asia as a vegetable. The large leaves are used to wrap food and even the stamens are dried to make herbal supplements. The seeds are eaten raw or dried and popped like popcorn. In China, the seeds are also boiled into a paste to use in soup or combined with sugar to make pastries. In India, the Lotus seeds are used in cooking. The flower petals are sometimes used as a garnish and consumed (Siwek, 2004). In Korea, dried petals of white lotus and lotus leaves are used. Young

lotus stems are used as a salad ingredient in Vietnamese cuisine. The rhizome is used as a vegetable in soups, deep-fried, stir-fried, and used in braised dishes and the roots are also used in traditional Asian herbal medicine. The lotus flowers are used as a cardiac tonic and a decoction of the flowers are used in the treatment of abdominal cramps and syphilis (MDidea team, 2010).

The lotus plant has good nutritive value. The lotus petals are rich sources of fibre and protein. Nutritional supplements such as white lotus petals are cheap and being natural may not produce any side effects. Essentially all parts of the lotus are edible -- roots, stems, leaves, and seeds. There are about 1475 calories in one pound of lotus flower. The composition of lotus flower is approximately: 72% carbohydrate, 7.8% protein, 0.7% fat, 12.2% fiber, 4.0% water, and 3.3% minerals (mainly sodium, potassium, calcium, and phosphorus) (Rev Sister Lilli, 2004). The lotus petals have been found to be effective in lowering blood sugar and lipid levels in experimental animals. Only limited studies have been conducted using lotus petals. Human studies have not been conducted so far and hence it led the investigator to find out the effect of dehydrated white lotus petals on selected hyperlipidaemic NIDDM subjects (Kamran et al, 1999; Noel, 1997; Ramachandran, 2001).

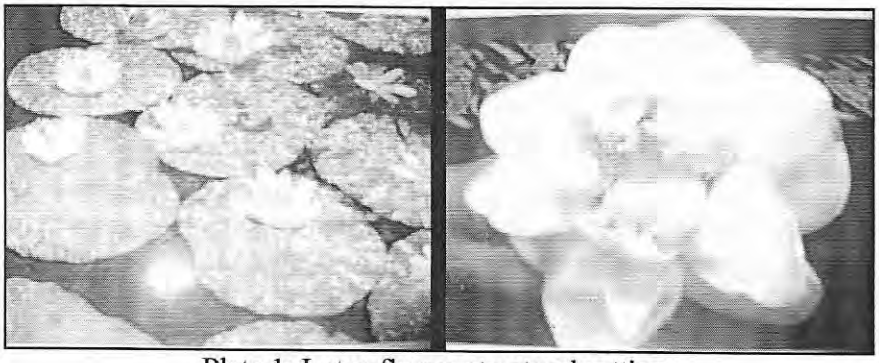

Plate 1: Lotus flower at natural setting.

An attempt has been made by the investigator to find out an indigenous nutrient supplement which will bring about a beneficial effect on the condition of Diabetes mellitus and Hyperlipidaemia. Hence a pilot or a preliminary study was conducted to assess the effect of dehydrated lotus petals on hyperlipidaemic NIDDM subjects as per the advice of clinicians of Government Anna Siddha Hospital, Chennai.

The specific objectives of the study are

1. To analyze the nutrient content of dehydrated white lotus petals
2. To supplement 1.5 g of dehydrated white lotus petals to hyperlipidaemic NIDDM subjects for a period of 90 days.
3. To assess the effect of supplementation of dehydrated white lotus petals on blood sugar levels and lipid levels of selected hyperlipidaemic NIDDM subjects

METHODOLOGY

This study was approved by the ethics committee of Queen Mary's college. The sample size of twelve was approved because the minimum number required for conducting statistical analysis was six in each group comprising experimental and control (Kothari, 2004). The methodology consisted of three phases. The first phase was the selection of the sample, the second phase was the preparation of the supplement and nutrient analysis of the supplement and the third phase was the supplementation trial.

Phase I: Selection of the sample

Hundred adult subjects belonging to the age group of 30 – 60 years of both the sexes residing in Chennai city attending two private clinics were randomly selected. The nutritional status of the selected samples was assessed by anthropometric measurements and diet survey. Purposive sampling technique was used to select 12 hyperlipidaemic NIDDM subjects from their secondary data (biochemical tests). Six of the subjects formed the experimental group (three male and three female) and the other six subjects formed the control group (three male and three female). The criteria for the selection of subjects were:

- They should be between the age of 30 – 60 years.
- They should be on dietary advice.
- They should have moderate Diabetes Mellitus (with blood sugar values not more than 220 mg to 260 mg /dl).
- They should not have any complication due to Diabetes Mellitus and Hyperlipidaemia.
- They should be willing to co-operate for the entire period of supplementation.
- They should be available at specific time periods for obtaining the supplements and for blood collection.

Phase II: Preparation of the supplement

Dehydrated white lotus petals were purchased from a particular vendor in Parry's corner, Chennai as suggested by the clinicians of Government Anna Siddha Hospital. The dehydrated white lotus petals were powdered and capsulated. They were packed as 500mg capsules. These capsules were placed in a polyethylene cover to which a silica gel desiccant was added. Silica gel pack inhibits external humidity from entering the capsule thus it prevents the collapsing of the capsule. The capsuling was done in Anna Siddha hospital, Anna nagar, Chennai. As per the advice of the clinicians a preliminary trial was conducted among six patients. They were administered with increasing concentration of dehydrated white lotus petal powder along with 250 ml of buttermilk at a time i.e., 0.5g, 0.75g, 1g, 1.25g and 1.5 g respectively. This was conducted to assess the tolerance of dehydrated white lotus petal powder. Upto 1.5g concentration the patients did not experience any intolerance, but when the powder was increased further, a few patients experienced mild nausea. Hence 1.5g of dehydrated white lotus petal powder was taken as the tolerance level for human subjects. As per the clinicians advice 1.5g of dehydrated white lotus petal powder was administered as capsules in three divided doses of 500 mg (totally 1.5g) per day in capsulated form.

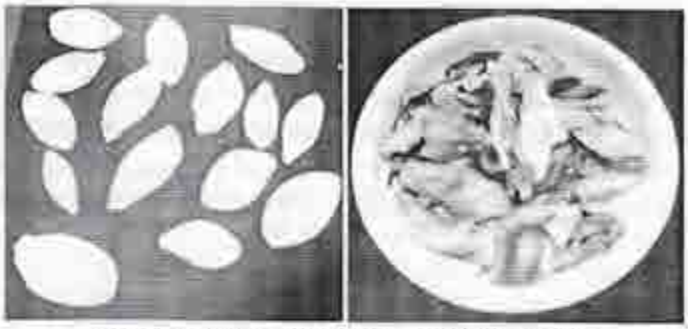

Plate 2: Fresh and dehydrated lotus petals

Phase III: Supplementation Trial (90 days)

The experimental group (three male and three female) subjects, were supplemented with 500mg of dehydrated white lotus petals (one capsule) three times a day (1.5 g of supplement per day) for a period of 90 days and to the control group (three male and three female) subjects no supplementation was given. The selected subjects of the experimental and control group were asked to report for the collection of blood on 0 day, 90th day and after 120 days (30 days after the withdrawal of the dehydrated lotus powder) to see the lasting effect of the supplement. The capsules were distributed to the subjects every month in neatly packed polythene covers.

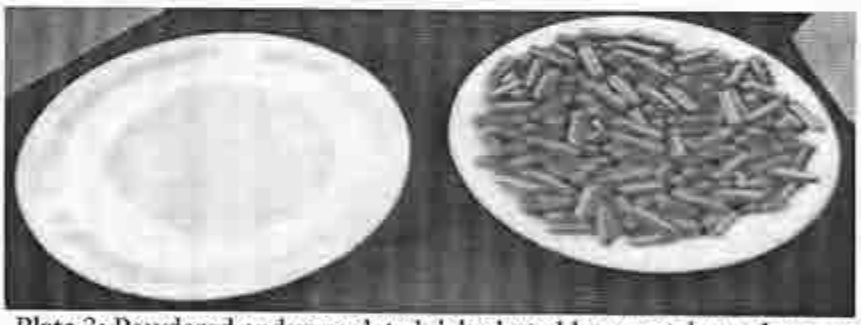

Plate 3: Powdered and capsulated dehydrated lotus petal supplement

The study design was ex- post- facto and pre test – post test experimental design. Ex- post- facto design is a systematic and empirical enquiry in which the scientist does not have direct control of independent variables. In the pre test – post test experimental design both the experimental and control groups are measured at the beginning and end of the study period (Kothari, 2004). Nelson and Somogyi method (1957) was used for the estimation of blood glucose level while Merckotest and photometric test was used to estimate glycosylated hemoglobin level in blood (Kehairno, 1985). Liebermann – Burchard method (1952) was used for the estimation of serum total cholesterol. Dual precipitation technique was used for estimation of lipoprotein fractions (Mishara, 1990).

RESULTS AND DISCUSSION

The results of the study are discussed below.

Nutrient analysis of the dehydrated white lotus petal powder

TABLE 1: Nutrient content of dehydrated white lotus petal powder

Sr.No	Nutrients (gm)	Amount
1.	Moisture	13.61
2.	Carbohydrate	41.22
3.	Protein	12.25
4.	Fat	2.63
5.	Fibre	17.88

The nutrient content of dehydrated white lotus petal powder was analyzed. The moisture level of the supplement is 13.61 gram percent, carbohydrate is 41.22 gram percent, protein is 12.25 gram percent, fat is 2.63 gram percent and fibre is 17.88 gram percent. Winkins method was used for estimation of moisture content, Anthorone Lowry's method was used to estimate carbohydrate and protein respectively (Antia, 1997; Chopra and Chopra, 2001; Davidson et al., 2004).

Though six male and six female subjects were included in the study there was not much difference among them and hence statistical comparisons were conducted among experimental group and control group subjects as a whole and not as male and female subjects.

TABLE 2: Comparison of the mean blood sugar levels of selected Hyperlipidaemic NIDDM subjects belonging to experimental group and the control group

	Experimental Group (N=6)			Control Group (N=6)		
Variable	Day 0	Day 90	't' Value	Day 0	Day 90	't' Value
Fasting Blood Sugar (mg/dl)	152 ± 74.98	131.83 ± 72.52	6.499**	108.67± 26.19	159.33± 33.60	4.842*
Post Prandial Blood Sugar (mg/dl)	226.17 ± 92.73	203.67 ± 83.49	5.787**	226.5 ± 56.03	260.83± 66.22	3.953 NS
Glycosylated Haemoglobin	9.62 ± 1.39	8.95 ± 1.34	10.847**	8.92 ± 0.42	10.37± 0.95	4.544**

** Significant at 1% ($p<0.01$), * Significant at 5% ($p<0.05$) and NS-not Significant.

Based on the Biochemical parameters of the selected subjects, the effect of supplementation of dehydrated white lotus petals (Nelumbu Nucifera Gaertn) on fasting blood sugar, post prandial blood sugar and glycosylated hemoglobin value during the supplementation period was assessed and the mean values presented in table 2.

It was observed from the above table that there was a highly significant reduction at one percent level in the fasting and post prandial blood sugar level and glycosylated hemoglobin values of the experimental group as compared to the control group subjects.

TABLE 3: Comparison of the mean lipid profile of the selected Hyperlipidaemic NIDDM subjects of the experimental group and the control group subjects.

	Experimental Group (N=6)			Control Group (N=6)		
Variable	**Day 0**	**Day 90**	**'t' Value**	**Day 0**	**Day 90**	**'t' Value**
Cholesterol (mg/dl)	213.83 ± 18.35	190.17 ± 9.56	0.645**	255.33 ± 55.59	252.83 ± 38.20	0.228 NS
HDL (mg/dl)	40 ± 2.28	43.83 ± 1.17	4.313**	35.83 ± 5.38	39.17 ± 2.04	1.762 NS
LDL (mg/dl)	145.33 ± 22.60	124.37 ± 10.14	3.560**	180 ± 52	185.7 ± 36.82	0.614 NS
VLDL (mg/dl)	28.5 ± 7.10	21.97 ± 2.57	3.150*	39.47 ± 14.98	27.83 ± 4.41	1.89 NS
TG (mg/dl)	142.5 ± 35.50	109.83 ± 12.83	3.150*	197.33 ± 74.88	139.17 ± 22.05	1.89 NS

** Significant at 1% (p<0 01), * Significant at 5% (p<0.05)and NS-not Significant.

It is observed from table 3 that when comparing the lipid profile of the experimental group with the control group a significant reduction at one percent level in the values of total cholesterol and LDL cholesterol was noticed, whereas VLDL cholesterol and TG values showed a significant reduction at five percent level, HDL values showed a significant increase in the experimental group as compared to the Control group. Statistically significant reduction in lipid parameters were not observed in the Control group.

Results of Withdrawal study:

TABLE 4: Biochemical parameters of the experimental group subjects on 0 day, 90th day and 120th day

	Experimental Group (N=6)		
Variable	**0 day**	**90th day**	**120th day**
Fasting Blood Sugar (mg/dl)	152 ± 74.98	131.83 ± 72.52	132.33 ± 73.68
Post Prandial Blood Sugar (mg/dl)	226.17± 92.73	203.67± 83.49	204.33 ± 83.71
Glycosylated Haemoglobin	9.62 ± 1.39	8.95 ± 1.34	8.9 ± 29.13
Cholesterol (mg/dl)	213.83 ±18.35	190.17 ± 9.56	187.50 ± 10.31
HDL (mg/dl)	40 ± 2.28	43.83 ± 1.17	43.83 ± 1.17
LDL (mg/dl)	145.33 ± 22.60	124.37± 10.14	121.67 ± 11.06
VLDL (mg/dl)	28.5 ± 7.10	21.97± 2.57	22.00 ± 2.84
TG (mg/dl)	142.5 ± 35.50	109.83 ± 12.83	110.00 ± 14.18

Table 4 showed that there was not much difference between the blood values of the subjects on day 120 as compared with day 90. Hence the effect of the supplement was found to be helpful even after its withdrawal after thirty days.

SUMMARY AND CONCLUSION

Thus it can be suggested that supplementation with dehydrated white lotus petal powder in capsulated form acts as a good hypoglycaemic agent and a moderately good hypolipidaemic agent for short term studies of 90 days. The withdrawal effect of the powder also showed a good reduction in blood picture with regard to sugar and lipid profile. Thus it is recommended that dehydrated white lotus petal can be used as a supplement on its own or in combination with other supplements for hyperlipidaemic and diabetic subjects though further research needs to be done on this aspect.

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GENDER DIFFERENCES IN THE BEHAVIOR OF PRESCHOOL CHILDREN DURING AND AFTER COOPERATIVE AND COMPETITIVE GAME SESSIONS

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The present study investigated the differences between cooperative and competitive behavior of boys and girls during and after playing cooperative and competitive games. The sample consisted of 39 children (4 to 6 years old) from four classes in two preschools. To study the above said parameter, cooperative and competitive version of the same game was prepared and played. Behaviors were measured during and after play. On the basis of responses obtained, it was found that cooperative behavior increased and aggression decreased during cooperative games; conversely, competitive games were followed by increases in aggressive behavior and decreases in cooperative behavior in boys as well as girls. Similar effects were also found after play periods. There was no significant difference in cooperative and competitive behaviors of boys and girls. As the researcher observed that there was no significant difference in quantity of cooperative and competitive behavior but the difference was in quality of cooperative and competitive behavior. Girls were involved in verbal cooperation and competition, while boys showed more physical cooperation and competition than girls.

KEY WORDS: Cooperative games, Competitive games, Preschool children.

Play is a universal behavior of children that has been documented since ancient times (Janssen, 1996). Children begin to understand their world through play. They develop socialization skills and concept of self by playing with other children. Although play is for fun and excitement, when winning becomes more important than enjoyment, then this primary function of play may get lost thereby affecting its usefulness. The structure of the game therefore determines whether the game is going to be fun or whether it is going to be an activity which may finally cause frustration and aggression when the player becomes unsuccessful. Thus how the child feels is to a great extent dependent on what the structure of the game has been and the structure of the game can be cooperative or competitive.

A cooperative game is a game with no winners or losers and no exclusion to depict penalties. There is a group task to be performed and success is achieved if players help each other. In contrast, a competitive game is a game in which one person can succeed only if others fail, (Kohn, 1992). Penalties are often given in the form of time bound exclusion from the game. In competition, the most excellent performer or underhanded child is the winner and gets maximum satisfaction from his performance.

Children often show aggressive behavior which may be in the form of social cruelty also. Thompson (1998) reveals that social cruelty is expressed by teasing, name-calling, threatening and bullying and it varies by age and gender. "It peaks between fourth and ninth grade, Girls start

earlier, and boys start later. Girls also tire of it earlier." According to Simmons (2003), this difference is because girls are expected to be nice.

Children today are exposed to a very strong electronic media. Their circumstances are changing and a social revolution is on full swing. So, it becomes vital to review the gender differences of behavior in the continuously changing scenario. Games are the easiest way to affect the behavior of children and are a place where rules, behaviors, and consequences are explored, changed, and learned so the impact of games on behavior in regard of gender differences was the key question to answer through this research.

In the present study, what result they made in task was not a matter of concern, but how they interacted to do the task was evaluated. Thus, a qualitative assessment along with the quantitative assessment was also done to observe the behavior of children during and after game sessions which could be cooperative and competitive in nature.

The present study had the following objectives

1. To study the gender differences in cooperative behavior during and after playing cooperative and competitive games.
2. To study the gender differences in competitive behavior during and after playing cooperative and competitive games.

METHODOLOGY

Subjects and Setting

This preliminary investigation was conducted on 18 boys and 21 girls of middle socio economic status selected purposively from two preschools targeting the children aging 4-6 years.

Procedure

Teachers were informed of the general procedure of the study and were given a list of cooperative and competitive version of games. They were instructed how to play the games and how to explain the rules to the class. Initially, the teacher introduced the game and explained the rules to the children. Children played four games, both in competitive and cooperative form. An explanation of one game (musical chair) can clarify the procedure employed. The teacher explained how to play musical chairs in its competitive as well as cooperative form. If the game was competitive, she indicated that the child who was left without a chair when the music stopped would be eliminated; if the cooperative version was being played, then all the children were to pile on the remaining chairs and no elimination of subject was done. The behavior of children was observed for 30 minutes during and 30 minutes after game play.

The sequence of experiment was as follows:

I Phase: - Baseline behavior was observed for one week to assess percentage of cooperative and competitive behavior in selected sample.

II Phase (Cooperative Phase): - Cooperative version of games was played for one week. The behavior of children during and after play session was observed.

III Phase (Competitive Phase): - The Competitive version of same games was played for one week and the behavior of children during and after playing these games was observed.

IV Phase (Cooperative Phase): - Again cooperative version of the same game was played for one week. The number of positive and negative behaviors (i.e. cooperative and competitive behavior) was observed. The baseline session was primarily competitive in nature therefore the game sessions were baseline (competitive) followed by cooperative session followed by competitive session and concluded by cooperative session. Thus the design of research was basically two intermittent sessions of competitive and cooperative play. Since in society at large competition and cooperation are both important, and neither can be excluded hence a balance of two sessions of each nature was designed for research.

Target Behaviors

Prior to data collection, a checklist was prepared which included all behavioral acts which emerged during and after play sessions in pilot study. These behaviors were categorized as positive (cooperative) and negative (competitive). Children's behavior was identified on the basis of this checklist and scored.

Table 1: Checklist for Assessment of Cooperative & Competitive Behavior

	Positive Behaviors (Cooperative Behavior)	**Negative Behaviors** (Competitive Behavior)
(a)	**Sharing and Assisting** • Executing a task with another child • Working together toward a common goal • Sharing Material • Explicitly helping another child	**Physical Behavior** • Hitting, Kicking, • Biting, Scratching, • Jumping on, Bumping on • Throwing an object at another child • Pulling, Grabbing
(b)	**Physically supporting another child** • Engaging in physical contact of an affectionate nature (e.g. linking arms, holding hands, embracing, kissing, or patting a child on back)	**Destructive Behavior** • Kicking doors, wall, or furniture • Overturning furniture • Knocking materials off shelves • Breaking, Destroying Toys / Equip
(c)	**Verbal Behavior** • Giving a child instruction on how to do something • Verbally offering to help or to share • Agreeing to a request made by another child	**Threatening** • Stating dislike or negative feelings about another child • Verbally resisting instructions • Name calling • Verbal Attempts to exclude another child from an activity.

Observation and Recording

A non participatory observation was done in the play ground and classroom, avoiding eye contact and social interactions with the children. Behavior of children was observed for 30 minutes during game play and 30 minutes after game play. Thus in total 60 minute observations per day were done. Assistance of two observers was taken after establishing inter-observer reliability which was 80% and 84% for first and second observer respectively.

Tools

Games were selected to study the behavior of children; to study the above said parameter, cooperative and competitive version of the same game was prepared. The pattern of conducting the game determined whether the game was competitive or cooperative in nature. The selected games for the study were Musical Chairs, Ball Throw, Crossing the Room with Obstacles, and Finding Hidden Objects in Room.

Scoring

Each observed positive or negative behavior was scored 01 thus total number of behaviors was calculated by summing the positive and negative behavior. Total numbers of behaviors were noted in both session of each phase. Non occurrences of behavior (empty intervals) were not used in the calculations. The percentage of cooperative/competitive behavior was calculated.

Statistical Assessment

The researcher divided the number of cooperative/competitive behaviors observed in each phase by the total number of behavior observed and multiplying it with hundred. This gave the percentage of cooperative and competitive behavior of the child.

RESULTS AND DISCUSSION

It was found that girls displayed more cooperative behavior (47.13%) than boys (40.11%) while boys were more competitive (59.88%) than girls (52.86%) during baseline behavior In II phase, girls showed more cooperative behavior (78.48%) than boys (74.56%). Boys were slightly more competitive (25.43%) than girls (21.51%) while playing cooperative games. In III phase, boys showed less cooperative behavior (31.37%) than girls (35.10%) and showed more competitive behavior (68.62%) than girls (64.89%) while playing competitive games. At last, in IV phase when cooperative games were played again, similar trend of behavior was found. This shows that girls are marginally more cooperative and less competitive than boys. The difference in the boys and girls is not remarkable enough to be appreciated.

Table 2: Percentage Cooperative and Competitive Behaviors among Boys and Girls during and after Game Sessions

Phases		Cooperative		Competitive	
		Boys	Girls	Boys	Girls
I	Baseline	40.11	47.14	59.89	52.86
II	First Cooperative Phase	74.57	78.49	25.43	21.51
III	Competitive Phase	31.38	35.10	68.62	64.90
IV	Cooperative Phase	74.19	76.60	25.81	23.40

Table 3: Difference in Mean Cooperative Behavior scores of Boys and Girls in Four Game Sessions

	Baseline		Cooperative		Competitive		Cooperative	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Mean	15.67	18.05	26.39	28.67	11	11.33	25.39	26.81
S. D.	4.40	3.90	3.29	5.57	4.21	3.07	3.85	5.55
't'	1.77		1.58		0.27		0.93	
P	NS		NS		NS		NS	

Table 4: Difference in Mean Competitive Behavior scores of Boys and Girls in Four Game Sessions

	Baseline		Cooperative		Competitive		Cooperative	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Mean	23.39	20.24	9	7.86	24.05	20.95	8.83	8.19
S. D.	6.32	4.34	3.92	2.81	6.05	4.22	3.64	2.72
't'	1.78		1.02		1.82		0.61	
P	NS		NS		NS		NS	

From the tables it is clear that in all four phases girls were found to have scored slightly higher than the boys for the amount of cooperative behavior shown and boys were found to have scored slightly higher than the girls for the amount of competitive behavior shown. Since all the obtained t values (1.77, 1.58, 0.27, 0.93) for cooperative and (1.78, 1.02, 1.82 and 0.61) for competitive behavior are insignificant, it may be said that there is no significant difference in the cooperative and competitive behavior displayed by girls and boys in the four game sessions. It may be said that the format of the game influenced the behavior of both genders in the similar way.

Baseline competitive behavior of boys (m=23.39) and girls (m=20.24) was higher than cooperative behavior of boys (m=15.67) and girls (m=18.05). The obtained t values 1.77 and 1.78 are insignificant indicating that both boys as well as girls are similar with respect to cooperative/competitive tendencies at baseline level. It was quite interesting to note that girls were also competitive. This result is not in agreement with evolutionary biologists who have long argued that girls are less interested than boys in competing .Trivers's theory (1972) also proposed that compared to boys; girls are less competitive than boys. Perhaps in the contemporary competitive world parental desires and expectations are equally high for daughters. Daughters also perceive competition and fight on equal footing with boys.

The mean scores on cooperative behavior of boys was higher while playing cooperative games (m=26.39) rather than while playing competitive games (m=11). Similar trend was also seen in girls where mean scores on cooperative behavior was higher while playing cooperative games (m=28.67) rather than while playing competitive games (m=11.33). Again, while playing competitive games the cooperative behavior of both boys (11) and girls (11.33) was lower than their competitive behavior (mean of boys is 24.05 and that of girls is 20.95). Similar results have

been reported by Hinitz (1994). This shows that cooperative and competitive games have a strong impact on behavior of boys as well as girls.

Table 5: Difference in Quality of Behavior shown by Boys and Girls in Four Game Sessions

	Cooperative Behavior score				Competitive Behavior score			
	Physical Behavior		Verbal Behavior		Physical Behavior		Verbal Behavior	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Mean	12.69	8.67	7.36	12.54	11.49	5.64	4.81	8.73
S. D.	4.68	3.95	3.47	3.55	2.91	3.29	3.41	3.82
't'	2.87		4.59		5.89		3.38	
P	.01		.01		.01		.01	

The analysis of quantified data reveals that there was no significant difference in quantity of cooperative and competitive behavior. However difference was seen in quality of cooperative and competitive behavior. Girls were involved in verbal cooperation and competition, while boys showed more physical cooperation and competition than girls during and after competitive game sessions.

It may be argued that observed gender differences in aggression are due to socially inculcated expectations. Perhaps there is more permission for rough-and-tumble among boys, while girls are still – even in these days of presumed egalitarianism – taught to hide emotions. Even when angry, girls do not feel entitled to show it. As a result, Simmons (2001) explains, girls engage in psychological aggression of two types: Relational aggression (using friendship as a weapon, as in "I won't be your friend") and Social aggression (trying to hurt the social status or self-esteem of another person). The results of present study are also in agreement with this. During competitive game sessions, on losing, the girls become aggressive and indulged in activities like breaking friendship, excluding peer from activity, spreading rumors, talking behind the peer's back and revealing peer's secrets without his/her permission.

Verbal skills of girls develop early, that is why girls involve in verbal behavior while boys develop these skills later so they involve in physical behavior. Overall, gender differences in cooperative and competitive behavior tend to be minor, the main difference exists in the form of expression of cooperative and competitive behavior.

CONCLUSION

It is clear from the results that the cooperative and competitive games have a very strong and similar impact on behavior of boys as well as girls therefore a relative higher proportion of cooperative then competitive games at nursery school level would be the ideal design. The movement from competitive games to cooperative games would promote better team spirit, sportsmanship, empathy and cooperative spirit both in and outside classroom. There is indeed a strong need to rethink the pattern of games so that there is a balance maintained in both forms of the game.

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LIST OF THESIS TITLES (2009-2010)

College of Home Science, Nirmala Niketan, Mumbai-400 020

FOODS, NUTRITION AND DIETETICS

1. Anti-diabetic functional food product development using (*syzygium-cumini*) jamun whole fruit extract.
   Madiyala Jyoti & Dias Nina

2. Assessment of the nutritional status of children with intellectual disability.
   Damania Hetal & Hasija Vibha

3. Nutritional status of and prevalence of iron deficiency anemia in adolescent girls(11-21 years) residing in urban slum areas of Dharavi, Mumbai.
   Ajgaonkar Meeta & Mitra Anuradha

4. Prevalence of obesity and iron deficiency anemia (IDA) in youth (15-25 Years) of urban Mumbai and the effect of dietary and supplementary intervention on anemic individuals
   D'Souza Melita & Ibrahim Geeta

5. Development of phytosterol-fibre enriched whey beverage.
   Fernandes Sneha & Machado Perpetua

6. Development of flaxseed oil powder.
   Lima Rochelle & Varghese Mary

7. To study the effect of diet modification and chromium supplementation in management of women with polycystic ovarian syndrome (PCOS) having insulin resistance.
   Jamal Amzu & Ibrahim Geeta

8. One week carbohydrate wash-out : an indicator of the efficacy of the ketogenic diet or modified atkins diet for patients with intractable epilepsy
   Martins Andrea & Varghese Mary

9. Effect of citrate TBHQ & a combination of citrate & TBHQ on the Totox value of soybean oil stored at ambient temperatures in transparent polyethylene terephthalate bottles.
   Disawala Delnaaz & Yardi Veena

10. Markers of metabolic syndrome among children and adolescents
    Janoos Shirin & M. Subhadra

HUMAN DEVELOPMENT

1. Lifepaths of human development alumnae of the college of home science, Nirmala Niketan: tracking those who completed a B.Sc. degree during 1998-2009.
   Lakhwara Shweta & Bakshi Anuradha

2. Lifepaths of Human Development alumnae of the college of Home Science, Nirmala Niketan : tracking those who completed an M.Sc. degree during 1997-2009.
   Chitre Akshada & Bakshi Anuradha

3. Career-related aspects in human development and allied areas for those who graduate with a B.Sc., M.Sc, or Ph.D. in Human Development from a Home Science college..
   Agrawal Aparna & Bakshi Anuradha

4. Quality of selected mother-child (8months-28months) programs in Mumbai.
   Parekh Nidhi & Prabhu Subhadra

5. Evaluation of quality of life coping strategies and coping effectiveness of women (18-30 years) with polycystic ovarian syndrome (PCOS)
   Tellis Christina & Almeida Nirmala

6. Emotional inteligence competencies: their importance in making career choice in medicine, engineering and management.
   Savla Riddhi & Maheshwari Payal
7. Evaluation of the quality of career guidance centres in Mumbai
   Marques Aziel & Almeida Nirmala.

8. Efficacy of a workshop based on the education package developed by Shah and Divecha (2004) for parents of children with learning disabilities.
   R. Vidyalaxmi & Divecha Rhonda

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TEXTILES AND CLOTHING

1. A comparative Study: effects of dye fixing agents on the reactive dyes used on cotton fabrics with different constructions.
   Intwala Deepti & Madan Ritu

2. Application of U.V. resistant finish on uniform fabrics for Mumbai traffic police
   Gazdar Narissa & Rathi Deepa

3. Designing and product development of sportswear using bamboo knits.
   V.Varsha & Karnad Vishaka

4. Sensitizing college students towards environment concern through product development based on scrap utilization
   Goyal Sweta & Rathi Deepa

5. Development of value added finishes on home textiles
   K.Lalthatpuii & Goyal Pratima

6. Designing and developing ladies ensemble using bagru prints and stoles through digital printing with miniature painting motifs on natural fabrics
   Verma Amrita & Dedhia Ela

7. Designing fabrics on handlooms using fibre and weaving waste of silk
   Adsumilli Swaroopa & Dedhia Ela

NUTRITION RESEARCH SNIPPETS

(Courtesy ILSI, India & Dr. V Prakash)

Honey on A Toast Can Cure Hangover

Researchers from the Royal Society of Chemistry claim to have found that taking honey, the natural sweetener, is a great way to help the human body deal with the toxic effects of a hangover. According to them, the fructose in the honey which is also found in golden syrup-is essential to help the body break down alcohol into harmless by-products. Serving the honey on toast adds potassium and sodium to the meal which also help the body cope with the alcohol, say experts.

Source: The Royal Society of Chemistry

Moms Who Take Iron Have Smarter Kids

Children in rural Nepal whose mothers were given iron and folic acid supplements during pregnancy were smarter; more organized and had better fine motor skills than children whose mothers did not get them, according to U.S. researchers.

Source: Johns Hopkins University Bloomberg School of Public Health

DHA for Nursing Moms

Premature infants, especially those born prior to the third trimester, are prone to a number of developmental challenges. A deficiency in docosahexaenoic acid (DHA), an omega 3 fatty acid, can prove critical for brain growth and development. Premature infants can suffer from immature gastrointestinal systems, which increase the risk of malnutrition, opening a veritable Pandora's Box of health problems.

Study by Canadian researchers has shown that an early supplementation with DHA to lactating mothers with low dietary DHA was successful in increasing DHA status in very preterm infants

In summary, the study demonstrated that DHA levels in the breast milk of mothers who received supplements were almost 12 times higher than levels in the milk of mothers in the control group. In addition, plasma DHA concentrations in mothers and babies in the DHA group were two to three times higher than the control group.

The results underline the urgent need for recommendations addressing dietary DHA intake during lactation of mothers of very preterm infants to reach optimal DHA level in milk to be delivered to the baby for optimal growth and neurodevelopment, since the human milk DHA content in mothers not consuming fish during this period is most probably insufficient.

Source: Isabelle Marc, MD, PhD, an assistant professor in the Department of Pediatrics at Laval University in Quebec, Canada, and clinician researcher at Centre Hospitalier Universitaire de Québec. Nutraceuticals World July 22, 2010

Curcumin benefits Osteoarthritis Patients

A proprietary curcumin extract may relieve pain and increase mobility in osteoarthritis (OA) patients at a dose much lower than prior studies on similar endpoints, according to a new study.

Source: Panminerva Medica (2010 June;52(2 Suppl 1):55-62).

PUFA Deficiency Impacts AMD

A deficiency in long-chain and very long-chain polyunsaturated fatty acids (LC-PUFAs, VLC-PUFAs) may adversely affect eye health and influence the development of age-related macular degeneration, according to a new study

Source: Moran Eye Center at the University of Utah, (J Lipid Res. ePub 5 Aug 2010. DOI: 10.1194/jlr.M007518).

Capsaicin May Help Lower Blood Pressure

According to a new study on rats Capsaicin, the compound that gives chilies their fiery heat, also causes blood vessels to relax. The researchers suggest that follow-up studies on humans is necessary, as well as research on the amount of capsaicin-containing chilies one would have to eat in order to maintain desired blood pressure.

Source: Zhiming Zhu of Third Military Medical University in Chongqing, China Cell Metabolism.

Study Suggests Dairy Fatty Acid Cuts Type 2 Diabetes Risk

Researchers claim to have identified a fatty acid in dairy products that may reduce risk of type 2 diabetes.

Scientists examined data from a study that followed 3,736 adults from 1992 to 2006. They found that those adults with the highest circulating levels of trans-palmitoleic acid – the fatty acid found in dairy – were exposed to the lowest risk of diabetes. 20 per cent adults with the highest trans-palmitoleic acid levels were found to have a 60 per cent lower risk of developing diabetes compared to the people at the bottom 20 per cent of the sample. This represents an almost three-fold difference in risk of developing diabetes among individuals with the highest blood levels of this fatty acid.

Source: Dariush Mozaffarian Harvard School of Public Health, Annals of Internal Medicine

Eating Lunch at Office Desk Could Increase Weight

Researchers have found in a new study that eating at one's desk makes one far more likely to snack later in the day, which could make one fatty. They have based their findings on an analysis of the ways in which memory and attention influence one's appetite.

Source: Bristol University

Encapsulation May Slow Fat Digestion

Encapsulating oils with alginates may slow the digestion of the lipids in the intestines and help formulate foods with controlled fat release and weight management potential, says a new study .

Scientists used radioactive labelling of the carbon in octanoic acid added to sunflower oil which was subsequently encapsulated by alginate. This allowed them to measure the digestion of fats as labelled carbon dioxide (13CO2) , produced in the breath during digestion.

Source: Unilever and University of Nottingham

Colour And Roughness Influence Whole Grain Bread Liking: Study

While the benefits of consuming whole grain products have been well-researched and communicated, consumer liking can be a major barrier to consumption. Lightening the colour of whole grain breads could make products more appealing to consumers who would otherwise be more inclined to buy refined wheat bread products, indicates a new study.

Source: University of Minnesota in the US Food Navigator.com

We Gratefully Acknowledge ILSI (International Life Sciences Institute) India NewsLetters widely circulated through email by Dr V Prakash, President, NSI

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