

## EFFECT OF SPROUTS ON NUTRITIONAL STATUS OF 2-5 YEARS AGE GROUPS IN RURAL CHILDREN

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### HOW TO CITE THIS ARTICLE:

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**ABSTRACT:** An interventional study was undertaken with the help of Rural India Self Development Trust, a voluntary organization and the department of community medicine, S. V. Medical College, Tirupati among 2-5 years rural children of KVB Puram, and Pichatur mandals of Chittoor district of Andhra Pradesh in the year 1992. 75gms of sprouted green gram (germinated) was distributed to 295 children (study group) and the parameters, malnutrition signs, anthropometric measurements, were assessed by initial baseline survey, 6months follow-up survey and after 1 year follow-up survey and Hb% assessment in 20% sample after 1 year of study and the results were compared with 76 children (control group). The percentage of children showing malnutrition signs such as angular stomatitis, red and raw tongue, pale conjunctiva, and pale tongue were significantly reduced. The percentage of children with grade 3 malnutrition was decreased. The study and control groups with respect to grades of malnutrition was found to be statistically significant ( $p < 0.05$ ). There was slight reduction of anaemia.

**INTRODUCTION:** The seed is a store house of food energy intended for early growth and development of the new plant. Once the seed has sprouted, the mucus inducing property of most legumes is eliminated. Sprouts (germinating seeds) do not cause gas. Crude proteins converted into essential amino acids, much of starch is transformed into simple sugars making sprouts a pre-digested food. The vitamin content of the seed increases tremendously when sprouted. Sprouts are an essentially good source of Vitamin C and the B vitamins, and a good source of vitamin A and E. By sprouting the seed, its quality and quantity increase five times (1). Sprouting whole pulses makes them easier to digest and enhance their nutritive values. It also aids in iron absorption (2). Sprouts enhance iron absorption by increasing the vitamin c content, by lowering the tannin and phytic acid content (3).the activities of many enzymes amylases (4), proteases (5), cytases etc. increase on germination. There is a decrease in phytate (6).The trypsin inhibitor activity is reduced (7). As the trypsin inhibitor activity is reduced, the digestibility coefficient and biological value of the proteins increase (8). Due to the action of cytase and pectinase, the cell walls are broken and the availability of nutrients increases (9).

A voluntary organization by name Rural India Self Development Trust adopted 17 villages near KVB Puram and Pichatur mandals of Chittoor district in Andhra Pradesh and running a balawadi center in each village approached the SPM department of S.V. Medical college, Tirupati and requested to conduct a study on sprouts as they were planning to provide supplementary feeding (sprouted green gram) to children of balawadi centers. Hence the study was undertaken under the guidance of Late Dr. Srihari Rao, worked as Professor and HOD of SPM, S.V. Medical College, Tirupati in the year 1992.

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**AIMS & OBJECTIVES:** To study the effect of sprouts on nutritional status of 2-5 years age group rural children.

**STUDY DESIGN:** An intervention study.

**STATISTICAL ANALYSIS:** Percentage, mean, chi-square test

**METHODOLOGY:** 295 children of 2-5 years age group belong to 12 balawadi centers were selected randomly as study group and 76 children of the same age group belong to 5 remaining balawadi centres were taken as control group. A base line survey of study and control group was done related to signs of malnutrition, anthropometric measurements (weight, height).

Sprouting of Green gram was done in a separate sprouting room by soaking green gram in water for 10 hrs (from 12 am to 10 pm) and then the water was drained in a fine white cloth and kept in specially designed trays with holes at the bottom. The seeds were allowed to germinate for 10 hrs (from 10pm to 8 am). A two wheeler with a carrier fixed at the back to carry the drum was used for transportation of sprouted green gram.

Each child in the study group was given 75 gms of sprouted green gram (supplementary food) by a measured spoon for a period of 1 year. After 6 months, a follow-up survey and after 1 year, one more follow-up survey was done related to signs of malnutrition, anthropometric measurements, and hb% estimation in 20% sample only after 1 year follow-up. No sprouted green gram was given to the control group. Periodic deforming was done both in study and control groups. A diet survey was conducted in 20% sample of both study and control groups. The difference between the study and control in calorie and protein intake was not significant.

The results of base line data, after 6 months follow-up data and 1 year follow-up data were analysed and compared between study and control groups. The number of children in study group was 295 at the time of baseline survey and the number dropped to 275 at 6 months and 257 at 1 year follow-up surveys and in control group 76 at the time of baseline survey and the number dropped to 72 at 6 months and 71 at 1 year follow-up surveys. This is due to migration of people for work.

**INCLUSION AND EXCLUSION CRITERIA:** The children above 2 years and below 5 years were included in the study and the children below 2 years and the children above 5 years were excluded from the study.

**EHTICAL AND GENERAL GUIDELINES:**

1. There was no ethical committee in S.V. Medical College, Tirupati in the year 1992. Permission was taken from the principal and head of the Department of community medicine.
2. Informed consent was taken from the parents of children who were participating in the study.
3. All the precautions and care was taken in the preparation, transportation and distribution of sprouts to avoid contamination.

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## RESULTS:

TABLE - 1 Total no. of children participated in the study

AGE IN YEARS	BOYS	GIRLS	TOTAL
2 - 3	83	76	159
3 - 4	66	60	126
4 - 5	48	38	86
TOTAL	197	174	371

TABLE -2 Malnutrition signs in children of study and control groups

Malnutrition Sign	Baseline survey		Follow-up survey(6m)		Follow-up survey(1y)	
	Study group (n = 295)	Control group (n =76)	Study Group (n=275)	Control group (n = 72)	Study group (n = 71)	Control group (n = 71)
Depigmented hair (%)	71.5(211)	65.8(50)	20.4(56)	33.4(24)	5.8(15)	30.9(22)
Bitot's spots (%)	1.7(5)	0	0	0	0	0
Pale conjunctiva (%)	88.8(262)	90.8(69)	18.9(52)	70.8(51)	7.0(18)	54.9(39)
Angular stomatitis (%)	66.1(195)	60.5(46)	18.9(52)	43.1(31)	9.3(24)	38.0(27)
Pale tongue (%)	85.8(253)	88.2(67)	9.8(27)	69.4(50)	7.0(18)	53.5(38)
Red and raw Tongue (%)	7.8(23)	6.6(5)	0	0	0	0
Follicular hyperkeratosis (%)	1.4(4)	1.3(1)	0	0	0	0

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Table-3 Grades of malnutrition in study and control groups (Gomez classification)

Nutritional grade	Baseline survey		Follow-up survey(6m)		Follow-up survey(1y)	
	Study group (n = 295)	Control group (n = 76)	Study group (n = 275)	Control group (n = 72)	Study group (n = 257)	Control group (n = 71)
Normal (%)	5.8 (17)	6.5 (5)	7.6 (21)	9.7 (7)	8.6 (22)	8.5 (6)
Grade I (%)	48.5(143)	46.1(35)	46.9(129)	54.2 (39)	50.2 (129)	35.2(25)
Grade II (%)	40.7(120)	46.1(35)	41.5 (114)	33.3 (24)	39.3(101)	50.7(36)
Grade III (%)	5.0 (15)	1.3 (1)	4.0 (11)	2.8 (2)	1.9 (5)	5.6 (4)

Table – 4 Anthropometric measurements in study and control groups  
2 - 3 YEARS AGE GROUP

Survey	Group	Weight		Height	
		Mean	S.D	Mean	S.D
Baseline	Study	9.8	1.54	81.6	5.18
	Control	9.6	1.52	80.2	5.21
Follow-up(6m)	Study	10.6	1.57	84.0	5.23
	Control	10.1	1.56	85.1	5.20
Follow-up(1y)	Study	10.8	1.59	86.3	5.42
	Control	10.4	1.55	87.0	5.38

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## 3 - 4 YEARS AGE GROUP

Survey	Group	Weight		Height	
		Mean	S.D	Mean	S.D
Baseline	Study	11.0	1.65	89.2	5.56
	Control	11.2	1.67	87.8	5.40
Follow-up (6m)	Study	12.6	1.63	94.6	5.59
	Control	12.4	1.43	93.1	6.01
Follow-up(1y)	Study	12.1	1.74	97.1	4.84
	Control	11.9	1.46	96.3	6.84

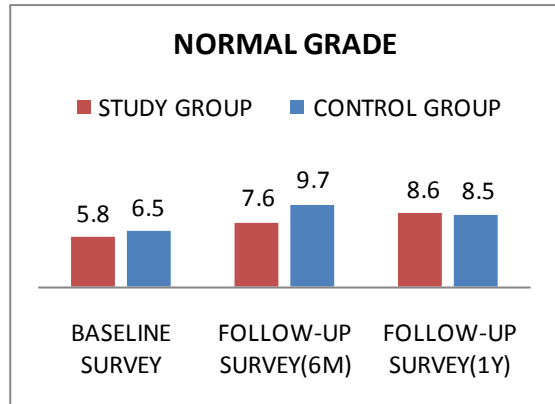
## 4 - 5 YEARS AGE GROUP

Survey	Group	Weight		Height	
		Mean	S.D	Mean	S.D
Baseline	Study	12.8	2.05	96.3	6.61
	Control	12.6	2.01	95.1	6.42
Follow-up(6m)	Study	14.1	1.60	100.6	6.12
	Control	14.2	1.40	102.1	5.57
Follow-up(1y)	Study	14.9	1.77	102.2	7.28
	Control	14.9	1.83	104.1	5.60

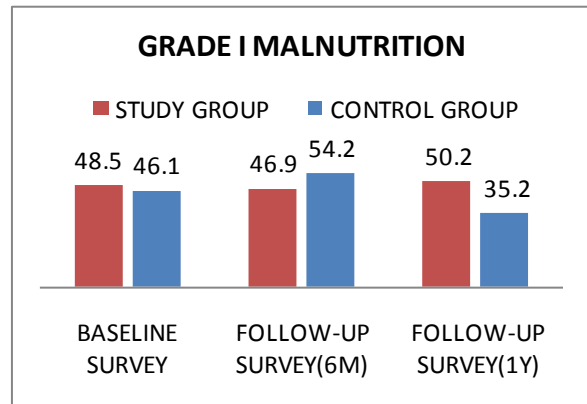
Table – 5 Haemoglobin values in study and control groups(in 20% sample after 1year follow-up)

Haemoglobin values (gms/100ml)	Study group (%)	Control group (%)
< 8	15.7 (8)	71.5(10)
8 – 10	72.5 (37)	28.5 (4)
>10	11.8 (6)	0

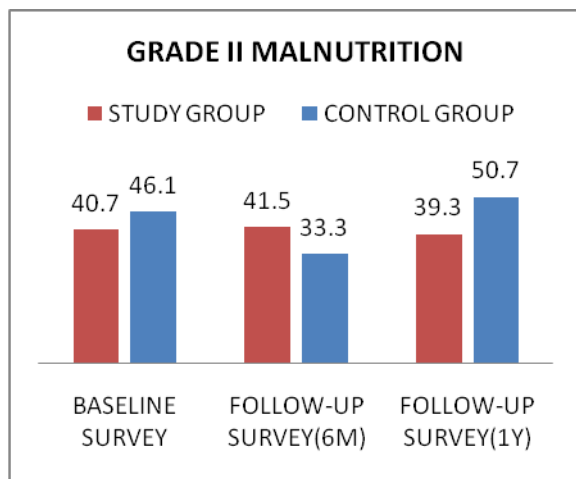
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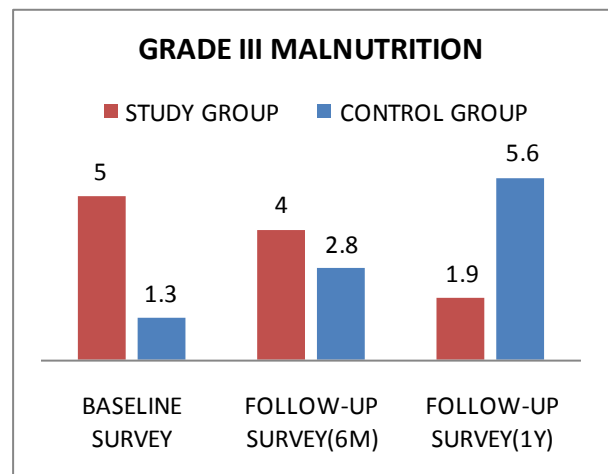
Percentage of children in normal grade malnutrition



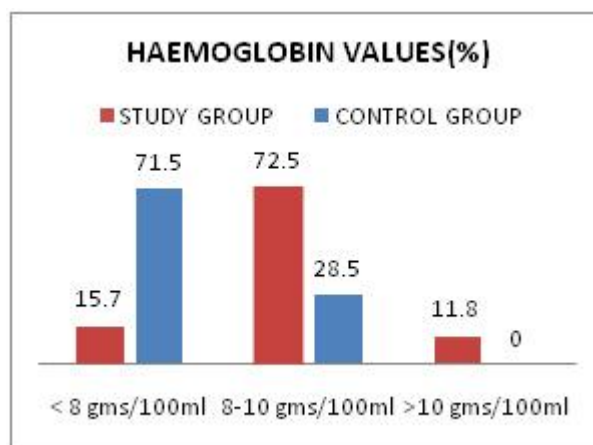
Percentage of children in Grade I malnutrition



Percentage of children in Grade II malnutrition.



Percentage of children in Grade III malnutrition



Percentage of children with Haemoglobin values

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**DISCUSSION:** The percentage of children showing depigmented hair, pale conjunctiva, and pale tongue was reduced in both study and control groups, but the decrease is more study group than in control group. The difference between study and control group was statistically significant ( $P < 0.05$ ). The percentage of children showing angular stomatitis was reduced in study group than in control group. The difference is statistically significant ( $P < 0.05$ ). 1.7% of children who have shown bitot's spots at the time of baseline survey were not present at the time of 6 months and 1 year follow-up surveys. No child has shown red and raw tongue and follicular hyperkeratosis in both study and control groups at the time of 6 months and 1 year follow-up surveys.

There is a reduction of grade III malnutrition in study group. In control group, it is increased at 6 months and 1 year follow-up surveys. Grade II and Grade III malnutrition combined together 41.2% in study group and 56.3% in control group. The difference between the study and control group with respect to normal +G I and G II +G III malnutrition after 1 year follow-up survey was statistically significant ( $P < 0.05$ ). As per the report of the working party of the ICMR, severe forms of PEM were considerably reduced in the supplemented group with RTE food (9).

Sprouted green gram containing increased amounts of Riboflavin, Niacin (10), Ascorbic acid (11), and by enhancing the absorption of iron (12) probably helped in the reduction of signs of B-Complex deficiency and the signs of anaemia.

There is increase in weight and height of children in both study and control groups at 6 months and 1 year follow-up surveys and the difference is not statistically significant. The pulses do not give much calories usually. 100 gms of green gram gives only 334 calories. We have given only 30 gms of pulse which on sprouting became 75gms. Roughly we have given 100.2 calories.

The percentage of children showing Hb% values, 8gms, 8-10gms, 10gms per 100ml after 1 year follow-up in 20% of sample were 15.7%, 72.5% and 11.8% in study group and in control group 71.5%, 28.5%, 0% respectively. The difference between study and control group is statistically significant ( $p < 0.001$ ). After sprouting the vitamin C content is increased much. The vitamin C decreases the tannin and phytic acid and there by increases the absorption of iron. The vitamin C increase after 24hrs of germination is 7- 12 mgs/ 100gms.

Dr, Francis Pottenger, Jr. found that sprouted legumes and grains contain a complete protein. In tests on rats, sprouts sustained life through the reproductive cycle for many generations, thus proving that they can adequately supply all nutrients needed for healthy growth and reproduction.

Protein enriched cereal foods were used in many times in India and other developing countries to overcome malnutrition among preschool children (13). The calorie content of sprouts can be increased by adding cereal and oily seeds. A study was conducted in Baroda and Pondicherry on acceptability and nutritional status trial on preschool children (1-5 yrs) with malted versus roasted RTE food by using wheat+ Bengal gram+ groundnut, ragi + green gram + groundnut (14).

**CONCLUSIONS:** In our study after giving sprouted green gram the percentage of children showing malnutrition signs such as angular stomatitis, red and raw tongue, pale conjunctiva and pale tongue were significantly reduced. The percentage of children with Grade III malnutrition (as per Gomez classification) was decreased. The difference of Normal + GI and GII + GIII between study and control groups after 1 year of study was found to be statistically significant ( $p < 0.05$ ). There was slight reduction of anaemia after giving sprouted green gram.

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## RECOMMENDATIONS:

1. There is a need to encourage the use of common household methods like germination or sprouting (an intermediate level to malting) at village level which is easier to prepare, simpler and cost-effective.
2. Sprouted green gram can be given as supplementary food to pre-school children. Its calorie value and palatability can be improved by adding malted cereal and oily seeds.

## LIMITATIONS OF THE STUDY:

1. No studies are available exclusively on sprouted green gram for comparison.
2. We have taken a small control group.

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