Women Empowerment through Soya Milk Production and Consumption in Tribal Areas of East Pradesh Godavari District, Andhra

K. Suman Kalyani[1] and T.G.K. Murthy[2]

1. Principal Scientist (HSc.), Division of Crop Production, 2. Head, Division of Crop Improvement, ICAR- Central Tobacco Research Institute, Rajahmundry, Andhra Pradesh.

Corresponding author e-mail: sumankalyanik@yahoo.co.in

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ABSTRACT

The health of women and children plays a significant key role in the national development and hence intrinsically linked as an important indicator to their status in the society. Health and nutrition programmes, innovative products and approaches for eradicating the mal-nutrition and improving the health status are essential elements and integrated efforts need to be strengthened for sustainable impact in the society. In order to evaluate the effect of Soya milk in improving the nutritional status of 09-13 years old malnourished Ashram school children and also to assess the economic empowerment of women, a study was conducted in tribal areas of East Godavari district of Andhra Pradesh. About 200 ashram school tribal children were selected as control group and 100 children of same age group from the same school were selected as experimental group to evaluate the mean weights, heights, Body mass Index (BMI) and haemoglobin. As a part of intervention, the soya milk @100ml per child was provided for 12 months in addition to the existing diet provided for the school children. A randomised parallel intervention study was carried out. The anthropometric measurements were analysed before and after the interventions by using t-test. The study shows drastic improvement in weight, height, BMI and haemoglobin levels of ashram school children after consumption of soya milk. The results suggest that the soya milk consumption improved the nutritional status of ashram school children significantly. The family income of the tribal SHG was improved significantly after introduction of soya milk unit as entrepreneurial activity, as a measure of economic development of the tribal women.

Key words: *Malnutrition, Anthropometry, Haemoglobin, Body Mass Index (BMI), Entrepreneurship;*

In rural and tribal India, the women and children are considered as vulnerable groups and are affected by serious health disorders hence suffer from ill-health. The access to health care in tribal areas is still not available due to lack of transportation bottlenecks and poor facilities. The World Bank estimates that India is one of the highest ranking countries in the world for the number of children suffering from malnutrition. The prevalence of underweight children in India is among the highest in the world. Hence the study focuses in improving the health of tribal children by introducing soy milk in their regular diet with an objective to evaluate the effectiveness of soya milk in improving the nutritional status of 09-13 year old malnourished ashram school children and to estimate the economic empowerment of tribal self help group.

The tribal environment is impoverished with poor ecological conditions. Majority of the families live below poverty line with unhygienic and insanitary conditions. The general health and nutritional status of tribal communities is very poor. Tribals take two meals a day. The diet is rich in carbohydrates and deficient in proteins, fats, vitamins and minerals. They consume ambali made of cereal (Rice/Ragi/ Jowar) flour as breakfast in the early hours. Their meal is fairly simple and usually consists of gruel made from jowar or maize, and boiled

or cooked forest tubers. Tribal women brew tadi and jeelugu liquors. Health among tribals is poor because of their irregular food habits. Generally, tribals use herbs and parts of certain plants for curing common diseases. The government has taken measures for up-liftment of tribals for their socio-economic development as per article 46 of the constitution.

The tribal children are malnourished and their health status is affected during their prenatal period itself due to lack of sufficient care which leads to mortality and morbidity. About 75% of the school children are malnourished, under height & weight. Infant mortality (20%) and morbidity (70%) are higher in tribal area when compared to plain area. Vaccination schedule by pregnant women and children is not strictly followed. About 70% of the children are suffering from protein energy malnutrition (PEM), vitamin-A, deficiency, iodine deficiency, worm infestations and scabies. Communicable and water borne diseases viz., cholera, typhoid, diarrhoea, ameobiasis and other protozoan infestations were the major diseases identified. Diseases viz., elephantiasis, malaria are widely prevalent due to the poor environmental sanitation. Ashram schools have been introduced in scheduled areas of Andhra Pradesh by the Integrated Tribal Development Agency (ITDA) in 1961. The tribal children from surrounding tribal area reside and study in these residential ashram schools. These schools follow regular diet pattern viz., morning breakfast, lunch (rice, curry & butter milk) and dinner (rice, sambar and chutney). Each student of the ashram school is allotted @ 20 Rs per day per child.

METHODOLOGY

Hundred malnourished ashram school children in the age group of 9-13 years were selected randomly and assigned as experimental group. About 200 children in the same age group were selected as control group. A randomised parallel intervention study was used in which 100 experimental children received soya milk@100ml/head/day for a period of 12 months, while 200 control children did not receive soya milk except normal hostel meal. Anthropometric measurements of the children were recorded at every 6 months for both the groups of ashram school. Anthropometric measurements viz., height, weight, haemoglobin levels along with demographic, socio-economic, dietary data of the children were recorded and analysed.

Ashram school children with age range of 9-13 years were selected as the sample for our study. The tribal welfare boys Ashram school from Devarapalli village (ITDA), Maredumilli Mandal from East Godavari district was selected purposefully. The stratified random sampling method was followed to select the children in the age group of 9 to 13 years. The selected children were divided into an experimental group those who received soya milk and control group those, who did not receive soya milk. For both the groups, the anthropometric measurements were recorded at every 6 months interval separately. Anthropometric measurements include height, weight and haemoglobin, BMI of ashram school children.

Nutritive value, processing, preparation of soya milk: Soya milk is a stable emulsion of oil, water and protein. Soy milk is a complete protein and has about the same amount of protein as cow's milk. It can replace animal protein and other sources of dietary fiber, vitamins and minerals (Julia R. Barrett, 2006) 100gms of soya bean contains 36 gms protein, 277 mg calcium, 15.7 mg iron, 280 mg magnesium, 704 mg phosphorous, 6 mg vitamin C, 1.6 mg niacin and 375 µg of folate and many other micro nutrients. A tribal SHG (four members) was selected and trained in extraction, enrichment and supply of soya milk to the ashram school children. Soya milk is produced by soaking the dried and whole soybeans and grinding them with water. The dried soya beans are soaked in water for a minimum of 6-8 hours depending on the temperature of the water. The soaking and boiling (processing) makes the soya easily digestible and it removes the bitterness in soya beans. The rehydrated soya bean is boiled for 20 minutes at 80oC temperature and pressured (1.5 to 2pounds) in the boiler for sterilization. The grinder can be operated for 5 minutes by mixing steam from boiler. The mixture is ground into soft paste. Water is added @ 8 times from boiler and the milk is extracted with the help of strainer. The extract is called soy milk. For every 2 kg of soya grain, 18-20 liters of milk can be prepared with the help soya milk processor. For every 10 liters of milk 1.5 kg sugar and flavour of choice (chocolate/rose / pineapple) can be added. This nutritious protein rich soya milk is supplied to the children @ 100ml every day. The insoluble residue (soya pulp or okara) is filtered and many

types of south Indians recipes viz., vadas, gare etc., can be prepared with this soya pulp. The SHG was trained in extraction, preparation, enrichment and supply of soya milk and milk products to the tribal children.

Statistical analysis:: Anthropometric measurements viz., weight, height & HB were recorded by using a calibrated electronic weighing machine, stature meter (2m) and haemometer (marienfeld) respectively. Blood samples were collected from both the control and experimental children by a registered nurse, using sterile disposable syringe for measuring haemoglobin levels. BMI was calculated by interpreting the weight and height variable by applying the following standard formula.

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height in meters}^2}$$

Changes in the variables (height, weight, HB and BMI) within and between groups were assessed by using t-test analysis. The significance of changes in both groups was recorded for the expected weight increased in children of this age group over 12 months period.

RESULTS AND DISCUSSION

To know the significant difference between the control and the experimental groups, the anthropometric measurements were recorded for both the control and experimental groups of children after every 6 months of interval to know the impact of intake of soya milk on the weight, height, BMI and the HB levels of the tribal children.

The Table-1 reveals the changes in anthropometric measurements of control and experimental groups. Anthropometric data at every six months was recorded and analysed separately. The results show the changes in the variables at the beginning stage and after a period of 6 months and 12 months. At the beginning stage, the mean difference in weight from control group to experimental group is 1.31kg, the mean difference in height is 0.2cm, mean difference in haemoglobin is 0.08gm/dL and mean difference in BMI is 0.69. After 6 months of intervention, the mean difference from control group to experimental group in weight is 5.56 kg, mean difference in height is 1.39cm, mean difference in haemoglobin is 0.43gm/dL and the mean difference in BMI is 2.75. Finally after 12 months of intervention mean difference in weight is 5.85kg, mean difference in height is 1.8cm, mean difference in haemoglobin is 1.01gm/dL and mean difference in BMI is 2.86. There is a gradual increase between the two groups at 6 months and 12 months intervals of intake in weight, height, BMI and Hb levels. The mean differences in the weight, height and haemoglobin level of the ashram school children were increased after consumption of soya milk. Hence, it is evident that there is a drastic increase in weight than other parameters of height, BMI and Hb levels. *Sreedevi et al (2013)* and *Nesamvuni et.al., (2005)* have conducted similar studies of supplementary diets in improving the nutritional status of the tribal children and found that there is a significant improvement in the anthropometry due to supplementary diet.

BMI below 18.5 are considered as malnourished group according to the National Centre for Health Statistics (NCHS,2000). The children below 5th percentile are graded as malnourished children. Table 2 indicates that at the beginning stage, 57.5% of control group and

Table 1: Effect of soy milk on anthropometric differences of control and experimental groups at different stages.

Variable		Beginning stage			After 6 months of Intervention			After 12 months of Intervention		
		Control (n=200)	Exp. (n=100)	MD	Control (n=200)	Exp. (n=100)	MD	Control (n=200)	Exp. (n=100)	MD
Weight	Mean	22.93	24.24	1.31	24.66	30.22	5.56	25.94	31.79	5.85
(kg)	SD	4.79	5.03		4.09	4.8		4.36	4.6	
Height (cm)	Mean	128.44	128.64	0.2	131.65	133.04	1.39	131.79	133.59	1.8
	SD	10.54	10.70		10.19	9.74		10.38	9.34	
HB%(gm/dL)	Mean	9.44	9.52	0.08	9.62	10.05	0.43	9.94	10.95	1.01
	SD	0.93	0.89		0.98	0.60		0.74	0.35	
BMI	Mean	13.81	14.50	0.69	14.24	16.99	2.75	14.90	17.76	2.86
	SD	1.59	1.23		1.8	1.21		1.56	1.17	

SD-Standard deviation; Means are significantly different. MD-Mean Differences; Exp.=Experimental ;

Table 2: BMI levels of Ashram School Children before & after intervention

BMI level (health status)	Percentile	Control		Experimental	
		Before Intervention	After Intervention	Before Intervention	After Intervention
Underweight (Poor)	Below 5th percentile (< 18.5)	115 (57.5%)	119 (59.5%)	51 (51%)	0
Normal (Healthy)	5th – 85th percentile (18.5 - 24.9)	85 (42.5%)	81 (40.5%)	49 (49%)	96 (96%)
Overweight	Above 85th - 95th percentile (25 - 29.9)	0	0	0	4 (4%)

Table 3: Mean difference of anthropometric difference in control and experimental groups after soya milk intervention

Variable	Mean Difference of Control Group		Mean Difference of Experimental Group		Mean Difference between control & experimental groups	
	At 6 months	At 12 months	At 6 months	At 12 months	At 6 months	At 12 months
Mean Weight(kg)	1.73	3.01	5.98	7.55	4.25	4.54
Mean Height(cm)	3.21	3.35	4.4	4.95	1.19	1.6
Mean HB(gm/dl)	0.18	0.5	0.53	1.43	0.35	0.9
Mean BMI	0.43	1.09	2.49	3.26	2.06	2.17

Table 4: Test of significance in anthropometric variables of control and experimental groups

Variable	Control group	Experimental group	P	t- value
Weight (kg/12 months)	25.94 ± 4.36	31.79± 4.6	0.001	10.75**
Height (cm/12 months)	131.79 ±10.38	133.59±9.34	0.15	1.46
HB (gm/dl)	9.94±0.74	10.95±0.35	0.001	12.84**
BMI	14.90±1.56	17.76±1.17	0.001	16.13**

t-test calculated values compared with t critical value of 1.96 at 5% LOS.
**t-test calculated values compared with t critical value of 2.59 at 1% LOS.

Table 5: Socio-economic empowerment of SHGs

Family Annual Income	Before intervention (Rs)	After intervention (Rs)
Agriculture	10,000	10,000
Minor forest produce	5,000	5,000
Other sources	-	20,000
Total Annual family Income	30,000	50,000

51% of the experimental group fall below 5th percentile before intervention. After conducting intervention, control group stayed almost similar where as experimental group have improved their BMI levels and almost 96% of the children were normal in weight (18.5-24.9).

To know the difference between control and experimental groups separately, parallel intervention study was carried out. The Table 3 reveals the mean differences in the anthropometric data for both control and experimental groups. The mean difference in weight for control group was increased to 1.73kg by 6 months and 3.01kg at 12 months of interval. This may be due to the age factor of the control group. Regarding experimental group, the mean difference in weight is 5.98kg by 6 months and 7.55kg at 12 months of interval. The mean difference in weight between experimental and control groups at 6 months is 4.25kg and at 12 months it is about 4.54kg. The reason behind the weight improvement in experimental group may be due to the intake of soya milk.The mean difference in height for

control group at 6 months is 3.21cm and at 12 months it is 3.35 cm. The mean difference in height for experimental group at 6 months is 4.4cm and 4.95 at 12 months. The mean difference in height between experimental and control groups at 6 months is 1.19cm and at 12 months it is 1.6 cm. This difference can be attributed and due to the intake of soya milk. The mean difference in haemoglobin level for control group is 0.18 gm/dL at 6 months and 0.5 gm/dL at 12 months and for experimental group, the mean difference in haemoglobin at 6 months is 0.53gm/dL and 1.43 gm/dL at 12 months. The mean difference in haemoglobin between experimental and control groups at 6 months is 0.35 gm/dL and 0.93gm/dL at 12 months. This difference in Hb may be due to the intake of soya milk. The mean difference in BMI for control group is 0.43 at 6 months and 1.09 at 12 months and for experimental group mean difference in BMI is 2.49 at 6 months and 3.26 at 12 months. The mean difference in BMI between experimental and control groups at 6 months is 2.06 and 2.17 at 12 months. The difference in BMI between control and experimental groups may be due to the intake of soya milk. Thus, it was found that there is significant change in the mean differences of height, weight, Hb and BMI of experimental and control groups at 6 months and 12 months of interval due to the intake of soya milk. The study conducted by *Kristen (2003)* supports the present work as the protein content of soya has the ability to improve the anthropometric measurements of the growing children.

Table 4 reveals the analysis and test of significance in anthropometric variables viz., weight, height, Hb and BMI of the children using t-test. The mean weight of control group is 25.94kg whereas for experimental group, it is 31.79kg ($p<0.001$ at 1% level of significance). Regarding the mean height of control group is 131.79cm and for experimental group, it is 133.59 cm and hence no significant. Generally the average height of the tribal children is very low and hence it was not significant in t-test analysis. The mean haemoglobin level of control group is 9.94gm/dL and for experimental group, it is 10.95gm/dL ($p<0.001$ at 1% level of significance). Regarding mean BMI for control group is 14.90 and for experimental group is 17.76 ($p<0.001$ at 1% level of significance). It is concluded that there is significant difference in weight, Hb and BMI levels between control and experiment groups through t-test of significance. Thus, it is evident that the soya milk consumption has improved the weight, haemoglobin and BMI levels of the tribal children. *Labadarios (2000)* and *Kristen (2003)* have conducted similar studies on the impact of soya milk on the school children and it is evident that there is an improvement in the nutritional status of the children.

Table 5 portrays the improvement of socio-economic status of tribal farm families after establishment of soya milk extraction units. The four tribal women have started earning @ Rs. 2000/- each per month in addition to the existing family income, thus by enhancing the annual family income upto Rs. 20,000/- @ Rs.2000 pm for 10 months in a year. Hence it is evident that the tribal women have empowered economically by improving their socio-economic and communication skills by interacting with school teachers and other staff members of the school. *Rathod and Pooja (2015)* have also indicated that economic empowerment leads to socio-cultural, psychological and political empowerment of women.

The figure 1 depicts that the improvement of BMI of the ashram school children before and after intervention. The experimental children moved from below 5th percentile to the normal level (above 18.5 to 24.9th percentile) which is healthy category and depicted in the graphs. Several studies were in support with the present study by indicating that significant anthropometric changes were observed in school children after introduction of supplementary diets. *Sreedevi and Nirmala (2013)* and *Oelofse (2001)* have conducted similar studies of supplementary diets in improving the nutritional status of the tribal children and found that there is a significant improvement in the anthropometry due to supplementary diet.

CONCLUSION

The study proved that the consumption of soya milk has improved the weight, height, BMI and haemoglobin levels in 9-13 year-old ashram school tribal children. Thus, it is suggested that the soya milk would be an effective and suitable supplementary diet for school going children for their physical growth parameters. It is also suggested that the tribal women groups can take up soya milk extraction as an entrepreneurial activity as homestead unit for economic empowerment.