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Feeding Soyaflakes Chiwada to Malnourished Preschool Children and its Impact on Motar Development

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Abstract

To combat malnutrition supplementary feeding programmes are the emerging need in under nutrition for vulnerable segment in the population. Supplementary feeding must be the additional nutrients which are providing for the optional growth and desirable change in health status in particular. Hence, traditional and familiar supplementary foods must be based on the formulation of the required nutrients for the treating of malnutrition, return the child to physiological, immunological and biochemical normality. Organoleptically high score soyflakes chiwada elevaluated for its nutritional components such as moisture (4.1 per cent), ash (2.4 per cent), crude fiber (0.8 per cent), crude protein (21.4 per cent), iron (5.3 mg), calcium (74.0mg), zinc (2.7mg), β carotene (235. ug) and B complex vitamins like B_1 (0.2mg),B_2 (0.1mg)and B_3 (2.01mg) etc. Such soyaflakes chiwada was provided to selected malnourished preschool children. At the @ 50 g/ child/day to preschool malnourished children .They were selected by evaluating weight for height and body mass index. Grade II and III grade of malnutrition .The significant change in the anthropometric measurements such as weight ,arm circumference, skin fold thickness, wrist circumference, mid arm mid muscle circumference had been seen in soy flakes chiwada supplemented group.

Keywords: Soyaflakes chiwada, nutritional quality, anthropometric measurement.

Introduction

Soyabean (*Glycine Max L Merril*) is an important source of quality legume protein. It is one of the nature's wonderful nutritional gifts, which provides a complete proteins with quality of essential amino acids, carbohydrates, unsaturated fat, vitamins and minerals including folic acid, calcium, potassium and iron[1]. Soyabean also contains nutraceutical properties like isoflavones phytoestrogen, soluble phosphate and potassium sulphate. These properties are mostly plays a vital role to prevent the risk of dreaded diseases like breast cancer, oesteoporosis, cardiovascular diseases, kidney stones and help in beating 'menopausal blue[2].

Soyabean is less expensive and highly nutritious. Hence, most of the studies[3,4,5] recommended the use of soyabean in the preparation of snack, weaning and supplementary foods after necessary processing's on it. Soyaflakes chiwada can be the best option for the traditional chiwada after enhancing the nutritional qualities with its addition.

Material and Methods

Local verities of soyabean i.e. MH-CH-58 and readymade riceflakes were procured from local market. The processing techniques like cleaning, washing, soaking, germination, degermination, dehulling, boiling, pressing under controlled condition by use of flaking machine and drying were carried out on soyabean for the preparation of soyaflakes.

Sensory Evaluation: By the use of different combination and variation soyflakes chiwada was prepared. It was evaluated by organoleptically with the help of trained pannal of judges on a nine point Hedonic scale[6].

Nutritional quality assessment of soyflakes chiwada: High scored soyflakes chiwada in sensory evaluation was selected for the nutritional quality analysis. Moisture content, total ash, major nutrient like crude protein, fat, carbohydrates, B complex vitamins including vitamin B_1,B_2 and B_3 , minerals such as iron, calcium, zinc and crude fiber were analyzed by use of methods described in AOAC[7].

Anthropometric Measurement: Anthropometric measurements by applying the parameters such as height (cm), weight (kg), body mass index (kg/m^2), skin fold thickness (mm), Arm circumference (cm), wrist circumference (cm) and mid arm muscle circumference (cm) were measured in the preschool children[8]. All these anthropometric indices were measured for six months by keeping one month of interval.

Statistical Analysis: The variations noticed in the nutritional qualities in the soyaflakes chiwada before and after its storage were calculated with the statistical significant differences by applying' test[9].

Selection of Malnourished Children: Selection of preschool malnourished children was done by evaluating weight for height and body mass index.

Results and Discussion

Before conducting the supplementary feeding progeamme the malnourished children were monitored and evaluated by use of their weight for age, weight for height and body mass index (BMI). These preschool children were separated into different grades of malnutrition. The revalent data was presented in tables 2 and 3 According to weight for age 30.6 per cent children were noted as below normal 55.0 per cent as moderate and 14.4 per cent as normal table 2. As per the ratio found in weight for height, 53.6 per cent children noticed as moderate weight, 29.6 per cent as underweight and only 13.8 per cent treated as normal weight children. Where as in case of BMI, these children were classified as 54.0 per cent in moderate BMI, 25.6 per cent as under BMI, 15.2 per cent as normal BMI and 5.2 per cent as above normal BMI. The average value in below normal, under weight and below normal BMI was taken into account as 'poor' i.e. grade III of malnutrition. Whereas average values which are found in moderate ratio were considered as Grade II of malnutrition. The average values which are observed as normal ratio taken as normal grade I of malnutrition. The per cent of grades reported in table 3 reveals that, 54.2 per cent children noted as in grade II, 28.6 per cent as a 'poor' grade III and only 14.4 per cent shown as normal grade of malnutrition. Among the grade II, hundred numbers of moderate grade of malnutrition children were chosen for the supplementary feeding programmes. These 100 moderate grade preschool children were divided equally into two groups i.e. each groups measured as 50 numbers of children. Before providing the supplementary foods, both the experimental groups' children were dewormed in previous night. The supplementary feeding programme was conducted to malnourished preschool children for six months of period. Formulated and nutritionally evaluated soyaflakes chiwada were provided separately. Soya flakes chiwada was given to group I and group II was not given any supplementary foods, hence they were termed as control group. A standard of ICMR about providing energy, protein and fat was maintained. Accordingly the amount of soyflakes i.e. 50 g. was supplemented in entire period of experiment.

The data regarding average anthropometric measurements of all children of experimental period during six months experimental period was given in table 4. It revealed that, the average height (cm) in Group I children was measured as 91.1±2.4. It has shown normal (86.7 per cent) when it compared with their standard normal height. Group II children height noted nearby normal (i.e.89.4 per cent) level. It seems that, the children in all the experimental groups i.e. I^{st} and II^{nd} were longer in height and nearby normal level of their standard height after experimental period. Average Body weight (kg) was noticed maximum increases in Group I (12.0±1.7 kg). It was noted under moderate standard level of the same age group of children. Whereas the children from control group were shown under weight (49.5 per cent) and below their standard level. The average per cent of arm circumference measurements among the children by group I and II had shown a normal values i.e (92.6) and (69.0) respectively. It was found as higher in Group I and lower in control group of children. The growth in the chest circumference was measured as nearby moderate level among soyflakes supplemented group, The average value of head circumference was recorded highest in children of Group I (41.7±4.3 cm).

Head circumference in groups I children were noted as above the moderate standard level i.e. 86.3 and 79.5 per cent respectively. The average measurement of head circumference in children of control group found as below of their standard level. Average skin fold thickness was recorded more in Group I (73.9 per cent) and group II (62.6 per cent) preschool children. Average value of skin fold thickness among children of control group observed poorly. Group I children shown a maximum average wrist circumference (4.8±0.7cm). It was reported under moderate standard level. The average of wrist circumference among children of control group noticed under 'poor' standard category i.e. (59.0 per cent). Group I children shown a maximum average of mid arm muscle circumference (12.2±1.7 cm) and children had 11.2±1.5 cm average mid arm circumference. Children of control group reported mid arm circumference as below their moderate level of standard value. Average body mass index found more in group I children (i.e. 12.8±2.0), which noted as normal level of their standard measurement. Whereas BMI of Group II children shown as 10.6, ±1.5 which reported as nearby their normal standard level. A study conducted by Ghatge N.S.[10] also found a significant improvement in anthropometric measurements in malnourished children after supplementation of soya protein isolates. However, BMI of control group children noted as below their standard level. The average anthropometric measurements of all the children in different experimental groups were compared with their same measurements obtained before supplementation and presented in table's no. 4 to 6

A significant increase in per cent of height was observed in group I children after supplementation (table 5). It showed that, the average height of this group of children before supplementation was noted as 82.9±1.6 cm. It was found significantly increases up to 91.1±2.4cm after supplementation. This average height of the children group I recorded as normal (93.0 per cent) as compared with their standard level. The average height of children in group II was reported as 83.0±1.3 cm before supplementation and found increased significantly up to 89.9±1.1 cm after supplementation. The average height in group II children recorded above their moderate level of standard. A significant increase in height was also noticed in control group children. It shown increase in height from 83.0 to 89.9 cm after the experimental period.

Group I children were recorded as highly significant increased in body weight (kg) after supplementation. Group I children put on body weight from noted increased their body weight from 7.9±1.1 to 12.0±1.7 kg also recorded a faster body weight gain in children after supplementation of soyamilk[11]. Average body weight of children in control group noticed poorly under weight as compared with their standard measurements. No significant difference was reported in the gain of body weight in comparison between before and after experimental period.

The data about average arm, chest, head and wrist circumference of experimental groups before and after supplementation was given in Table 6. It represented that, the average measurement of arm circumference of both the groups of experimental children i.e. I recorded as normal with their standard measurements after supplementation. Highest score of average arm circumference was noticed Group I children i.e. 92.6 per cent 10.5. ±1.4 to 13.8 ± 1.9 Very positive impacts was noticed in the better growth of arm circumference of children after the soya flakes chiwada supplementation. Control group of children shown no significant difference in the arm circumference measurement after six months of experimental period.

Average measurement of chest circumference was found maximum in Group I children; it was found increased from 65.8 to 73.5 per cent I e. 33.6 ± 1.4 to 38.5± 1.6. The positive change in average of chest circumference among the children of group I seen as significantly increased after supplementation. Average of chest circumference in control group of children found slightly increased but this was noted at non significant level.

Head circumference of preschool children in group I children found increased their head circumference from 37.0 to 41.7 cm after supplementation. There was no significant change noticed in head circumference among children of control group after experimental period.

Average increased in wrist circumference in group I from 4.6 to 4.8 cm. after supplementation. A significant increase of wrist circumference was observed in I groups. Whereas no change was noticed in growth of wrist circumference among control group of children.

Average values of skin fold thickness, mid arm muscle circumference (MAMC) and body mass index (BMI) of all the experimental groups of children were shown in table 7. The average of skin fold thickness before supplementation in group I children was 8.6± 1.2 and found increased up to 10.2 ± 1.4 mm after supplementation. In group II children Control group children have shown no any significance difference in skin fold thickness values as compared with before and after the experimental period.

The average value of mid arm muscle circumference (MAMC) in preschool children of Group I shown increased from 74.4 to 81.0 per cent after supplementation. No change was noticed in MAMC values after experimentation in control group children.

The group I children reported above moderate level of BMI (i.e.82.1 per cent). Decreased level in BMI was noticed in control group. It was found significantly decreased BMI from 75.5 to 67.9 per cent level after experimental period.

Conclusion

On the whole, it can be concluded that, supplementary feedings through soyflakes chiwada have positive effect on all the anthropometric measurements. Height, body weight, arm, head, chest and wrist circumference shown increased from below to normal level of their standard measurements also reported improvement in all the anthropometric parameters of children after implementation of supplementary feeding programme

Skin fold thickness, MAMC and BMI was also noticed increased to their normal standard mark. Control group found steady, slow and non significant change in all the anthropometric indices after experimental periodin supplemented group.

Table-1
Nutritional quality of soyaflakes chiwada with its storage stability

Sr. No	Nutritiolities	Soyaflakeschiwada(100)g			Storage stability					
		Raw form	Finis-hed form	't'test	Polythene package			Tetra package		
					Upto1 month	1 to 2 months	't'test	Upto1 month	1 to 2 months	't'test
1.	Moisture(%)	6.6	4.9	0.8NS	4.8	4.6	0.104NS	4.8	4.7	0.05NS
2.	Ash(%)	2.4	2.3	0.64NS	2.3	2.27	0.015NS	2.3	2.29	0.00NS
3.	Crude protein(g)	28.3	27.7	0.80NS	27.7	26.9	0.418 NS	27.7	26.5	0.62NS
4.	Crude fat(g)	9.1	15.3	2.69*	15.3	15.0	0.157NS	15.3	14.9	0.20NS
5.	Carbohydrate(g	49.5	48.3	0.54NS	48.0	47.2	0.41NS	48.0	48.0	-----
6.	Energy(kcal)	394.8	489.5	4.55**	487.0	485.0	1.04 NS	487.0	484.0	1.570S
7.	B Carotene(ug)	219.4	202.2	2.64*	202.0	201.0	0.523NS	202.0	201.5	0.26NS
8.	Vitamin B_1(mg)	0.33	0.31	0.26NS	0.31	0.30	0.0052NS	0.31	0.29	-----
9.	Vitamin B_2(mg)	0.29	0.26	0.12NS	0.25	0.25	0.010NS	0.25	0.24	0.005S
10.	Vitamin B_3(mg)	2.09	2.01	0.109NS	2.01	2.01	0.005NS	2.01	2.00	0.005S
11.	Crude fiber(g)	1.30	0.80	0.60NS	0.80	0.80	----	0.80	0.80	----
12.	Iron (mg)	5.50	5.30	0.104NS	5.30	5.30	0.052 NS	5.30	5.20	0.157S
13.	Zinc(mg)	2.80	2.70	0.052NS	2.70	2.70	0.026NS	2.70	2.64	0.02NS
14.	Calcium(mg)	100.11	99.11	1.21NS	100.11	100.11	1.21NS	100.11	1.21	1.21NS

*Significant at 1 per cent level, ** Significant at 5 per cent level, NS Non significant

Table-2
Screening of preschool children through weight/age, weight/height and bmi

Sr. No.	Weight / age				Weight/ height					BMI				
	Below normal	Moderate	Normal	Total	Under weight	Moderate weight	Normal weight	Above normal weight	Total	Poor BMI	Moderate BMI	Normal BMI	Above normal BMI	Total
Frequency	153	275	72	500	148	268	69	15	500	128	270	76	26	500
Per cent	30.6	55.0	14.4	100.0	29.6	53.6	13.8	3.0	100.0	25.6	54.0	15.2	5.2	100.0

Table-3
Grading of malnutrition in preschool children

Sr. No.	Grades of malnutrition				
	Grade III(Poor)	Grade(Moderate)	Grade IIINormal)	Abovenormal(obese)	Total
Frequency	143	271	72	14	500
Per cent	28.6	54.2	14.4	2.8	100

Table-4
Average anthropometric measurement of experimental groups

Sr.No.	Anthropometric measurement	Group I Mean ± S.D.	Group II Mean ± S.D.
1	Height (cm)	91.1 ± 2.4(86.7)	89.9 ± 2.3(85.6)
2	Body weight (kg)	12.0 ±1.7(69.4)	8.5 ±1.1(49.5)
3	Arm circumference (cm)	13.8 ±1.9(92.6)	10.3 ±1.4(69.0)
4	Chest circumference (cm)	38.5 ±4.1(75.3)	36.2 ±2.0(70.5)
5	Head circumference (cm)	41.7±4.3(86.3)	38.4 ± 2.9(79.5)
6	Skin fold thickness (mm)	10.2 ±1.4(73.9)	8.6 ±1.2(62.6)
7	Wrist circumference (cm)	4.8 ±0.7(61.6)	4.6 ±0.6(59.0)
8	Mid Arm muscle circumference (cm)	12.2 ±1.7(81.0)	11.2 ±1.5(75.1)
9	Body mass index	12.8 ±2.0(82.1)	10.6 ±1.5(67.9)

Group I - Experimental group supplemented with soyaflakes chiwada, Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage.

Table-5
Average height and body weight of experimental groups before and after supplementation

Sr. No	Anthropometric measurement	Group I Mean ± S.D.			Group II Mean ± S.D.		
		BS	AS	't'value	BS	After 6 month	't' value
1	Height (cm)	82.9 ±1.6(78.9)	91.1±2(87)	2.6*	83.±1.3(81.0)	89.9±1.1(86)	2.4*
2	Body weight (kg)	7.9 ±1.1(45.7)	12.0±1.7(69.4)	3.1**	8.1±1.1(47.3)	8.5±1.1(49.)	0.91NS

Group I - Experimental group supplemented with soyaflakes chiwada, Group II- No supplementation i.e. control group. Figures in parantheses indicate percentage. *significant at 5 per cent level, **significant at 1 per cent level. NS Non Significant, BS – Before supplementation, AS – After supplementation

Table-6
Average arm, chest, head and wrist circumference of experimental groups before and after supplementation

Sr. No.	Anthropometric measurement	Group II Mean ± S.D.					
		BS	AS	't' value	BS	After 6 month	't' value
1	Arm circumference (cm)	10.5±1.4(70.5)	13.8 ±1.9(92.6)	3.4**	9.1 ±1.4 (61.1)	10.3 ±1.4 (69.0)	1.8 NS
2	Chestcircumference (cm)	33.6±1.4 (65.8)	38.5 ±1.4 (75.3)	2.9*	34.0±4.0 (66.5)	36.2 ±2.0 (70.5)	1.8 NS
3	Head circumference (cm)	37.0 ±3.1 (76.6)	41.7±4.3 (86.3)	2.9*	36.2 ±2.1 (74.9)	38.4 ±2.9 (79.5)	1.51 NS
4	Wrist circumference (cm)	4.6 ±0.6 (59.0)	4.8 ±0.7 (61.6)	2.7*	4.6 ±0.6(59.0)	4.6 ±0.6 (59.0)	0.00 NS

Group I - Experimental group supplemented with soyaflakes chiwada, Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage. *significant at 5 per cent level, **significant at 1 per cent level, NS Non Significant, BS–Before supplementation, AS – After supplementation

Table-7
Average skin fold thickness, mid arm muscle circumference and body mass index of experimental groups before and after supplementation

Sr. No	Anthropometric measurement	Group I Mean ± S.D.			Group II Mean ± S.D.		
		BS	AS	't'value	BS	After 6 month	't' value
1	Skin fold thickness (mm)	8.6 ±1.2(62.8)	10.2±1.4(73.)	2.7*	8.5±1.2(62.0)	8.6±1.2(62.6	0.4 NS
2	Mid Arm muscle circumference (cm)	11.1±1.5(74.)	12.2±1.7(81.)	2.7*	11.0±1.5(73.)	11.2±1(75.1)	0.8NS
3	Body mass index	11.6±1.6(74.)	12.8±2.0(82.)	2.8*	11.8 ±1.(75.5)	10.6±1(67.9)	2.71*

Group I - Experimental group supplemented with soyaflakes chiwada. Group II - No supplementation i.e. control group.Figures in paran theses indicate percentage. *significant at 5 per cent level, ** significant at 1 per cent level, NS Non Significant, BS – Before supplementation, AS – After supplementation

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