Effect Of Fortified Complementary Food On The Nutritional Status Of Pre-School Children

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Abstract: Fortification process in the addition of one or more essential nutrients to a food enhances the nutritional quality and provide health benefits and capable for nourishment of children. Malnutrition and under nutrition widely prevalent among infant and pre-school age children belonging to low income groups of population. The study is an attempt to develop the enriched supplementary food product for pre-school children based on cereal, pulses and oilseeds. 100 children (1-6 years) were selected from selected slum areas of Ranchi town with simple random sampling method. The food product Barfi was prepared and supplemented among the children which was accepted among the children. Result shows that enriching the food increases the nutrient content and easily acceptable among children helpful to overcome malnutrition. There is very much need to impart training and nutrition among mother about enriching preparation of supplementary foods for children.

Keywords: mal nutrition, food fortification, supplementary, deficiency, pre-school children

I. INTRODUCTION

Fortification process enhances the nutritional quality of foods. After fortification of cereal with other foods it will capable for better nourishment of children. Fortification process is the addition of one or, more essential nutrients to a food for the purpose of preventing or correcting deficiency of one or more nutrients in the population or specific population groups and provide health benefits. Malnutrition is widely prevalent among infant and pre-school children belonging to low income groups of the population. Pre-school age (1-6years) is the time of rapid physical growth as well as physiological immunological and mental development. During this year nutritional requirements are at the highest and deficiency of energy or any other essential nutrients can have dire consequences, some of which one long lasting and adverse impact on health status of the children. During infancy period nutritional requirement can be totally satisfied by breast milk. Afterwards supplementary foods need to be introduced to augment energy and protein.

Supplementary foods one therefore, transitional foods consumed between the times when the diet is composed exclusively of mother's milk and after six month the time when it is mostly made up of family foods. During the time they are consumed, supplementary foods make up a large proportion of the preschoolers diet and contribute a significant amount of the nutrients that are necessary for growth and development. Among pre-school age children, the most prevalent forms of nutrient deficiencies are those of protein - energy, iron, calcium and iodine. The severity of deficiencies, the consequences of malnutrition, include growth stunting, wasting susceptibility to infections, behavioral changes and learning disabilities.

Micronutrient deficiencies, reduce children's learning ability and school performance (Jukes et.al.2002). Based on research findings by clugston et.al. (1987), it is estimated that 3% of babies born to iodine-deficient women suffer from cretinism and 10% suffer from severe mental retardation. A meta-analysis of 20 studies demonstrated that in endemic iodine-deficient communities, the IQ of children is reduced by about 13 points. Vitamin A deficiency (VAD) is a risk factor for mortality from measles, diarrhea and dysentery and this likely explains the strong effect. Protein energy malnutrition (PEM) occurs during the transitional phase when children are

weaned from liquid to semi-solid or fully adult foods. High price of commercially available weaning foods, animal proteins and the non-availability of low priced nutritious foods combined with bad feeding practices and late initiation of supplementary food are mostly responsible for malnourishment among children (Suite 2007). Moreover, iron deficiency is the most common and widespread micronutrient disorder worldwide which affected over 2 billion people or about 30% of the world population (WHO, 2013). Population from lower socio-economic group, the majority of the population depends upon cereals for their nutrition and livelihood which have poor nutritional value because of low content of essential amino acid leading to harm consequences such as growth retardation, PEM, anemia etc. children at weaving period and in pre-school age also consume bulk amount of these cereal based food in their daily regular diet which are deficient from several nutrients resulting under nutrition and malnutrition. Thus, fortification/enrichment of food at household level is very effective way to improve health status. Efforts are underway in a number of countries to develop and test practical ways of adding micronutrients to foods at the household level, in particular to supplementary foods for young children especially for pre-schools age. This study is an attempt to develop the enriched supplementary foods for pre-school children based on cereal, pulses and oilseeds.

OBJECTIVES

✓ To develop cereal based supplementary food and calculate nutritional value of food product.
✓ To assess the organoleptic quality of developed food product.

II. MATERIAL AND METHODS

The present investigation was conducted among pre-school age children. 100 children in the age group of one to six years were selected with purposive sampling method from selected slum areas of Ranchi town. The supplementary food product was developed from cereal (rice), pulses (Bengal gram and green gram) and oilseed (ground nuts) and supplemented among children with the help of mother.

METHOD OF PROCESSING

Rice, Bengal gram, green gram and ground nuts are treated at different ratio to obtain food product.

All ingredients were cleaned, dried and roasted. Roasted raw materials were grinded for use as ingredients for the food product. In a pan all ingredient were mixed together with oil and sugar and food product Barfi was developed and organoleptic tests of the product was done using nine point hedonic scale. Nutritive value of (Protein, fat, calcium, iron, B-carotene and folic acid) Barfi was calculated. Developed Barfi was supplemented among the selected children.

III. RESULT AND DISCUSSION

The result obtained from the present study have been presented as follows:

ORGANOEPTIC CHARACTERISTICS OF DEVELOPED PRODUCT (BARFI)

Replication Treatment	Severely Score					Mean$\pm$S.Em
	R_1	R_2	R_3	R_4	R_5	
T_1	9	8.5	8.5	8.5	9	8.7$\pm$1.88
T_2	8.5	8.5	8	8.5	8	8.3$\pm$1.79
T_3	7.5	8.5	8.5	8.5	7.5	8.1$\pm$1.75
T_4	8.5	9	8.5	9	8	8.6$\pm$1.86

$F=4.5(3,12)$ Significant $P=0.05$
$T_1=50:50$ $T_2=40:80$ $T_3=25:75$ $T_4=75:25$
Table 1: Effect of groundnut flour and Bengal gram flour on the colour of Barfi

Table-1 Shows the average scores based on the hedonic scale for the color of Barfi developed with groundnut flour and Bengal gram flour at different ratio-50:50(T), 40:80(T_2), 25:75(T_3), 75:25 (T_4). The treatment T_1 scores maximum which was prepared with equal quantity of ground nut flour and Bengal gram flour at 50:50 ratio. Then treatment T_4, T_2 and T_3 at different ratio respectively.

From the above ANOVA table it is evident that the calculated value of F due to treatment is greater than the tabulated value of F on (3,12) df at 5 percent probability level. Therefore it is concluded that there was significant difference between four treatment of Barfi (P=0.05).

So it can be concluded that the color of treatment T1 is liked very much by the panel of judges while T4, T2 and T3 were also acceptable and liked moderately in relation to color of Barfi.

Replication Treatment	Scores					Mean$\pm$S.Em
	R_1	R_2	R_3	R_4	R_5	
T_1	9	8.5	8.5	9	8.5	8.7$\pm$1.88
T_2	8	8.5	8	8.5	8	8.2$\pm$1.77
T_3	7.5	8	7.5	8	7.5	7.7$\pm$1.66
T_4	8	8.5	7.5	8	8.5	8.1$\pm$1.75

$F=9.83(3,12)$ Significant $P=0.05$
$T_1=50:50$ $T_2=40:80$ $T_3=25:75$ $T_4=75:25$
Table 2: Effect of groundnut flour and Bengal gram flour on the texture of Barfi

RESULT: Table shows the mean score of barfi in relation to texture which indicates that the treatment T1 scored maximum followed by treatment T2, T4 and T3 respectively.

Anova table shows significant difference (P=0.05) between four treatments of barfi.

So it can be concluded that the texture of the products prepared in different ratio, the treatment T1 is liked very much. Scoring revealed that T2, T4 and T3 were also acceptable and liked moderately by the respondents

Replication Treatment	Sensory Scores					Mean$\pm$S.Em
	R_1	R_2	R_3	R_4	R_5	
T_1	8	8	8.5	8.5	8.5	8.3$\pm$1.79
T_2	8	8.5	8	8.5	8	8.2$\pm$1.77
T_3	8	8.5	8	8	8	8.1$\pm$1.75
T_4	8.5	8.5	8	8	8	8.2$\pm$1.77

F=6.75(3,12) Significant P=0.05
T_1=50:50 T_2=40:80 T_3=25:75 T_4=75:25
Table 3: Impact of groundnut flour and Bengal gram flour on flavor of Barfi

RESULT: The table pertaining to the effect on flavour of barfi prepared with groundnut and Bengal gram flour in different ratio revealed that T1 treatment scored maximum as the ratios are equal, T2 and T4 got equal response by the panel of judges hence are liked moderately while T3 got lowest marks but is acceptable.

The ANOVA table shows a significant difference (p=0.05) between the four treatments of barfi regarding the flavour.

So it is concluded that T1 is liked very much by the panel of judges while T2 and T4 and T3 were also acceptable and liked moderately is relation to flavour of barfi.

Replication Treatment	Sensory Scores					Mean$\pm$S.Em
	R_1	R_2	R_3	R_4	R_5	
T_1	8.5	8	8.5	8	8.5	8.3$\pm$1.79
T_2	8.5	8	8	8	8	8.1$\pm$1.75
T_3	7.5	7	7.5	8	8	8.6$\pm$1.65
T_4	8.5	8	8	8.5	8	8.2$\pm$1.77

F=3.66(3,12) Significant P=0.05
T_1=50:50 T_2=40:80 T_3=25:75 T_4=75:25
Table 4: Effect of groundnut flour and Bengal gram flour on the taste of Barfi

RESULT: Table illustrates the average score of barfi with regard to taste. The treatment T_1 which was prepared in equal ratio scored maximum followed by treatments T_4, T_2 and T_3.

The ANOVA table shows a significant difference (p=0.05) between the four treatments of barfi regarding the taste.

So, from the result it can be concluded that T1 was liked very much regarding the taste of barfi while the treatment T_4, T_2 and T_3 were liked moderately.

Replication Treatment	Sensory Scores					Mean$\pm$S.Em
	R_1	R_2	R_3	R_4	R_5	
T_1	8.5	8	8.5	8.5	8.5	8.4$\pm$1.80
T_2	8.5	8	8.5	8	8	8.2$\pm$1.77
T_3	7.5	8	8.5	7.5	8	7.9$\pm$1.69
T_4	8.5	8	8	8	8.5	8.2$\pm$1.77

F=7(3,12) Significant P=0.05
T_1=50:50 T_2=40:80 T_3=25:75 T_4=75:25
Table 5: Effect of groundnut flour and Bengal gram flour on overall acceptability of Barfi

RESULT: The table pertaining to the effect of groundnut flour and Bengal gram flour on overall acceptability of barfi indicates that the treatment T1 scored maximum followed by treatments T_4, T_2 and T_3 respectively.

The ANOVA table shows a significant difference (p=0.05) between the four treatments of barfi regarding the overall acceptability. So, from the result it is clear that all the treatments were acceptable.

NUTRITIVE VALUE OF PRODUCT DEVELOPMENT

Treatment (GGF:BGF)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	β carotene (μg)	Folic acid (mg)
T1 (50:50)	24.25	22.5	139	5.4	94.5	93
T2 (40:80)	28.48	20.08	191	4.84	151.2	148
T3 (25:75)	24.55	13.85	170	4.17	141.7	139
T4 (75:25)	25.2	31.15	108	3.42	47.2	46.5

Table 6: Effect of groundnut flour and Bengal gram flour on the nutritive value of Barfi

Table illustrates the effect on nutritive value of barfi prepared with groundnut flour and Bengal gram flour at different ratio revealed an increase in the concentration of all nutrients.

The concentration of protein was quite similar to each other and found to be highest (28.48g) at 40:80 ratio i.e T2 followed by T4 (25.2g), T3 (24.55g), and T1 (24.25g).

The concentration of calcium, β-carotene and folic acid found to be highest (191mg) at T2 followed by T3, T1 and T4.

The fat content drastically increased in T4 (31.15g) and slightly increased in T3 (13.85) and in T1 and T2, the concentrations were almost same (22.5g and 20.08g).

Result shows the sensory scores of barfi prepared with groundnut flour, Bengal gram and green gram flour at different ratio showed that with regard to colour, flavors, texture, taste and overall acceptability, the sensory characteristics of T1 (50:50) was found to be the best. The other treatments T2, T3 and T4 were also acceptable.

Nutritive value of Barfi with cereal, pulses and oilseed were calculated and it was found that fortification process increases the content of protein, β-carotene and folic acid. Therefore, it is concluded that cereals enriched with other foods enhances the nutritional value of food product.

If the supplementary foods prepared from cereal, fortified with pulses and other food items increases the nutrient content, thus helpful to overcame under nutrition and malnutrition prevalent among children.

IV. CONCLUSION AND SUGGESTIONS

It is evident that cereal fortified with pulses forms important sources of protein along with groundnut and other food items enhances the nutritional value of food. Due to lacking of these nutrients children suffers from nutritional deficiency diseases especially in low-socio economic groups. If mothers are aware about enriching/fortified the supplementary foods for their children helpful for combating under nutrition and malnutrition. Result obtained from the present study reveals that the food preparation Barfi developed at different ratio result in the increased concentration of nutrient especially protein which in very important nutrient for the growth and development of children. There is need to impart training and knowledge about food fortification/ enrichment process among women belonging to poor economic conditions from either rural areas or slum areas.

REFERENCES

[1] Anastasiades, A. Thanou, S. and Loulis, D. (2000). "Rheological and physical characterization of pre-gelatinized maize starches'. Journal of food Engineering. 52:99-107.
[2] Annanomous. (2009). "Information about dietary

supplements." Sited from vm.cfsan.fda.gov/idms/ supplement.html.

[3] Antia, F. P. and Abraham, Philip. (2007). IVth edition. Printed in India by De - Unique, New Delhi. 193-186.

[4] Aykroyd, W. R. (1982). Legumes in human nutrition, revised edition. FAQ, Rome, 1982.

[5] Baired, D. (1991). "Chemistry and technologies of cereals and pulses". Abstract: carbohydrate research 341 (12): 2 (3- 2082. Barthakur, Sharmistha. (2006). "Transcript profiling and functional analysis of gene expression in thylakoid bound ascorbate peroxidase from wheat". Abstract: International conference on Post - Harvest Technology and Value addition in Cereals, Pulses and Oilseeds. November 27- 30, 2006. Kanpur, 119.

[6] Beaton. (1995). Food and agriculture organization /WHO. Preventing specific micronutrient deficiencies. Theme paper prepared for the international conference on nutrition Rome: FAQ WHO, 1995.

[7] Bhattacharya, Sila And Bhattacharya, Suvendu. (1994). "Rheology of cooked debranned maize flour suspensions". Journal of food engineering, 27 (1): 97 - 105.

[8] Blackmon, J.W. and Reynolds. B. D. (1986). "The crop potential of Apios Americana". Sited from www.google.com.

[9] Chandrasekhara and Ranganathan, S. (1956). "Progress in meeting protein needs of infants and pre - school children". National academy of sciences — national research council, Washington. D. C., 843.

[10] Chaudharv, H. B. (2006). "Effect of environment and genotypes of quality of wheat". Abstract: International conference on Post - Harvest Technology and Value addition in Cereals, Pulses and Oilseeds, November 2 — 30, 2006. Kanpur. 28.

[11] Cheney, M. C. (1993). "Iron deficiency anaemia". WHO tech. rept. Series no. 182, Geneva. 102 -103.

[12] Cravioto, J.; Delcardie, E. R. and Birch. (1966). 'Nutrition growth and neuro integrative development: an experimental an ecologic study. Pediatrics', 38:319- 320.

[13] Das, S.K. (2006). "Effect of drying parameters on quality of groundnut seed and oil". Abstract: International conference on Post Harvest Technology and Value addition in Cereals, Pulses and Oilseeds, November - 30. 2006, Kanpur, 49.

[14] Erickson (2007). "Child development and parenting". Sited from mental Help.net.

[15] Gandv. Webster, Joan. And Madden, Angela. (2007). "Oxford handbook of nutrition and Dietetics". 1st edition. Printed in India by Rajshri photolithographers, Delhi,.246.

[16] Jukes et.al. Nutritional education In: UnAcc/SCN ed: Nutrition: A foundation for development. Geneva: ACC/SCN, 2002.

[17] Suite (2007) weaning food characteristics, guidelines and the role of soy foods. World initiative for soy in human health: St. Louis, USA.

[18] WHO (2013), Micronutrient deficiencies: http//www.who.int/nutrition/topics/ida/en/index/html/05.0 3.2013