

Standardization and Organoleptic Evaluation of Energy Protein Dense Complementary Food

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Abstract: *Malnutrition is a major health problem in developing countries contributing to infant mortality, lowered resistance to disease which stifles development. Protein-energy malnutrition generally occurs during the crucial transitional phase when children are weaned from liquid to semi-solid or solid foods. Children therefore require nutritionally-balanced calorie-dense foods due to increasing nutritional demands of growing body. Present study was aimed to develop and standardize complementary food based on locally available cereal, pulse, oilseed flour with optimum nutrition and evaluate sensory attributes of the formulations. Whole green gram, rice flakes, semolina and groundnut were selected for preparation of complementary food. Recipe of the complementary food mix and gulgule were standardized and subjected to organoleptic evaluation by a panel of 10 semi-trained judges using 9-point Hedonic rating scale. Organoleptic acceptability of developed complementary food mix and gulgule was 7.0 ± 0.05 and 7.26 ± 0.13 , respectively, which shows that they were liked moderately by panel members. The study successfully produced a nutritious and energy-dense diet with acceptable sensory attributes that can be easily prepared at home for meeting energy-protein requirements of infants. It is recommended that similar formulations of complementary foods can be tried out and popularized in the community, which are low cost and nutrient-rich.*

Keywords: Protein-energy malnutrition, nutritionally-balanced, energy-dense, complementary food, organoleptic evaluation

1. Introduction

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, and is nearly double that of Sub-Saharan Africa with dire consequences for morbidity, mortality, productivity and economic growth.¹ The World Health Organization estimates that malnutrition accounts for 54 percent of child mortality worldwide, about 1 million children.²

Despite India's 50% increase in GDP since 1991, more than one third of the world's malnourished children live in India. About 2.3 crore children in India, up to 5 years of age, are suffering from malnourishment and are under-weight, according to a status report on the anganwadi (day care center) programme, officially known as ICDS. This staggering number amounts to over 28% of the 8 crore children who attend anganwadis across India.³

Malnutrition is a condition that results from eating a diet in which nutrients are not enough or are too much such that it causes health problems.³ It is often used specifically to refer to **undernutrition** where there is not enough calories, protein or micronutrients; however, it also includes over-nutrition. If undernutrition occurs during either pregnancy or before the age of two years of age it may result in permanent problems with physical and mental development. Extreme undernourishment, may have symptoms that include: stunting (low height for age), underweight (low weight for age) and wasting (low weight for height).⁴ The first year of life is crucial in laying the foundation of good health and improving the quality of life of children. The World Health Organization (WHO) recommends that infants be exclusively breastfed for the

first 6 months of life. However, after 6 months, breast milk alone will no longer be sufficient both in terms of quantity and quality to meet the nutritional requirements of the child especially for energy and micronutrients notably zinc, iron and vitamin A.⁵

Malnutrition is a major health problem in developing countries contributing to infant mortality, lowered resistance to disease which stifles development.⁶ Protein-energy malnutrition generally occurs during the crucial transitional phase when children are weaned from liquid to semi-solid or solid foods. It thus becomes necessary to supplement breast milk with other foods as the child grows older. The process of complementary feeding starts from 6 months. Nutrition of infants and young children is critical for their survival, cognitive development and growth not only during the childhood but for their whole life span. Malnutrition in young children is attributed to various factors including female illiteracy, ignorance about nutritional needs of infants and young children and poor access to health care. Adequate and regular complementary feeding of infants with home based foods from the age of six months, while continuing breastfeeding, is crucial for their healthy growth and development. Even though commercial complementary foods are available, most of them are priced beyond the reach of the majority of the population in less-developed countries. These foods are mostly manufactured using high technology and are sold in sophisticated packaging. Complementary foods are important as the child needs to be fed 5-6 times a day.⁷

Developing nutrient dense, fully cooked, ready to eat inexpensive supplementary foods from the locally grown food ingredients has been strongly recommended as a viable and sustainable approach to address the problem of under nutrition in developing countries.⁸

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Strategies to improve the availability and accessibility to low cost fortified complementary foods can play an important role in behavioral changes necessary to improve the nutritional status of infants and young children.⁹

There is a need for low-cost complementary foods which can be prepared easily in home and community kitchens from locally available raw materials, using simple technology that is within the reach of the general public in developing countries and does not require sophisticated equipment, and which can be served quickly and conveniently. Such foods can be more nutritious than commercial brands. Increasing work participation of women both in urban and rural areas also has made it necessary that instant foods are available at home for feeding of infants and young children. Thus, present study was aimed to develop and standardize complementary food based on locally available cereal, pulse, oilseed flour with optimum nutrition and evaluate sensory attributes of the formulations.

2. Material and Methods

The present study was carried out in the Department of Foods and Nutrition, College of Home Science, MPUAT, Udaipur. Keeping in view the nutritional benefits of whole green gram, rice flakes, semolina and groundnut for children, they were selected for complementary foods development in the present study. Two recipes were selected i.e. Instant mix and gulgule and the recipe was standardized.

Materials for preparation of recipes were made available by the department of Foods and Nutrition, College of Home Science, MPUAT, Udaipur. Whole green gram, rice flakes, semolina and groundnut were first cleaned and then roasted separately. They were grinded separately and flour was obtained.

3. Development of products:

1. Complementary Food Mix

Preparation Time: 25-30 minute, **Cooking Time:** 15 minute

Method:

- Roast rice flakes, semolina, green gram (whole) and groundnut separately in a kadhai.
- Remove husk from groundnut.
- Grind the roasted ingredients in mixer-grinder separately.
- To the roasted ingredients add powdered sugar.
- Mix thoroughly and pack it in an air-tight jar.

Complementary Food Mix recipe, thus standardized, can be served as such or by making a gruel by adding luke warm water or milk (as per the convenience).

2. Gulgule:

Preparation Time: 30-40 minute, **Cooking Time:** 15 minute, **Serving:** 14 pieces

Method:

- 1) In a pan, add semolina and curd, mix well.
- 2) Add sugar and ghee to it then add mashed banana to it.

- 3) Mix well and leave it for half an hour.
- 4) After half an hour, again mix the batter and add cardamom powder.
- 5) In a karahi, heat oil for frying.
- 6) With hands drop the batter in round shape in the karahi and fry until brown in colour.
- 7) Take the gulgule out and put in a paper so that extra oil is soaked.
- 8) Serve it.

Organoleptic evaluation of developed products:

The acceptability of complementary food mix and gulgule were evaluated by a panel of 10 Semi-trained judges using 9-point Hedonic Scale.¹⁰ The judges were asked to record the level of liking or disliking by giving marks for various characteristics of the products. The samples were rated on 9-point Hedonic Scale for quality attributes according to grade descriptions and scoring.

4. Results

Scores for all the sensory attributes i.e. colour, appearance, flavour, texture and taste of developed complementary food mix and gulgule were obtained and are presented in table 3 and 4 respectively. Regarding the mean scores of organoleptic evaluation of the developed complementary food mix, it was observed that the color, appearance and texture of the complementary food mix lied in the category "liked moderately" i.e. 7.2 ± 0.07 , 7.4 ± 0.15 and 7.1 ± 0.24 , respectively. The mean scores for flavor and mouthfeel or taste revealed that the complementary food mix was liked slightly. The mean scores of attributes i.e. colour, appearance, flavour, texture and taste of the developed gulgule were 7.45 ± 0.15 , 7.07 ± 0.22 , 7.35 ± 0.15 , 7.27 ± 0.19 , 7.32 ± 0.35 respectively i.e. liked moderately by the judges.

The mean score of overall acceptability obtained by organoleptic evaluation of developed complementary food mix and developed gulgule were 7.0 ± 0.05 and 7.26 ± 0.13 , respectively, which shows that the developed complementary foods were liked moderately.

5. Conclusion

The results of the present study show that the study successfully produced a nutritious and energy-dense diet with acceptable sensory attributes. Organoleptic acceptability of developed complementary food mix and gulgule revealed that they were liked moderately by panel members after evaluation by using 9-point hedonic scale.

It is recommended that similar formulations of complementary food mixes can be tried out and popularized in the community, which can be prepared at home and are low cost and nutrient rich. This study does not condemn the use of commercial feeds, but it does convey message to the mothers that homemade diet is not a compromised diet but can be as enriching as any other wholesome feed if all the types of fruits, vegetables and cereals are included. The development of weaning foods constitutes another important step in improving the nutritional status of young children of developing countries. These prepared complementary foods,

which could be manufactured locally, may be recommended for marketing through regular commercial channels whenever possible. The local production and distribution to the public of these complementary foods constitute only one element in the control of malnutrition in young children which has long term effects. Provision of weaning foods should not be considered as the complete answer to the problem, but only as one of the many approaches that must be undertaken simultaneously.

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Table1: Recipe for complementary food mix (per 100 g):

Ingredients	Amount (in g)
Rice flakes	20
Semolina	20
Green gram (whole)	20
Groundnut	10
Powdered sugar	30

Table 2: Recipe for Gulgule (per 100 g)

Ingredients	Amount (in g)
Banana (mashed)	10
Semolina	45
Curd	20
Sugar	20
Ghee	5
Cardamom	2 nos.
Oil	For frying

Table 3: Mean Score of Organoleptic Acceptability of Developed Complementary food Mix:

S. No.	Parameters	Study Group Product
1.	Colour	7.2 ± 0.07
2.	Flavor	6.5 ± 0.14
3.	Appearance	7.4 ± 0.15
4.	Texture	7.1 ± 0.24
5.	Mouth feel or Taste	6.8 ± 0.07
6.	Overall Acceptability	7.0 ± 0.05

Table 4: Mean Score of Organoleptic Acceptability of Developed Gulgule:

S. No.	Parameters	Study Group Product
1.	Colour	7.45±0.15
2.	Flavor	7.07±0.22
3.	Appearance	7.35±0.15
4.	Texture	7.27±0.19
5.	Mouth feel or Taste	7.32±0.35
6.	Overall Acceptability	7.26±0.13



Figure 1: Developed Complementary Food Mix



Figure 2: Developed Gulgule