IMPLEMENTATION OF NUTRITIONAL INTERVENTION BY DEVELOPMENT OF NUTRIRICH BROWN RICE KICHIDI MIX FOR GERIATRIC SUBJECTS RESIDING IN OLDAGE INSTITUTIONS OF BANGALORE DISTRICT

Abstract

Nutrition intervention was carried on in the old age institutions, which was one of the study area of the research. Brown rice is not only better for us, but it's better for the environment than white rice too. Brown rice production is relatively sustainable, there is no known significant damage to air, water, land, soil, forests, among others. The study aimed at implementation of nutritional intervention by development of nutri-rich brown rice *kichidi* mix for geriatric subjects living in old age institutions located in Bangalore. The mean sensory score of the brown rice *kichadi* mix where BKM 3 variation having 60g of brown rice and 20g of green gram dhal had the best overall acceptability (8.31) in all the parameters: appearance (8.28), colour (8.03), texture (8.12), aroma (8.12) and taste (8.18). Extremely significant difference was observed in taste and overall acceptability and significant distinction was observed in texture. Nutrients composition of the brown rice *kichadi* mix consisted of energy 293. kcal, carbohydrates 73.29 g, protein 12.31 g and fat of 4.07 g. 100g $^{-1}$ and met the ¼th of RDA requirement of the geriatric subjects followed by moisture 6.35 per cent, and negligible quantity of crude fibre 3.96 g and ash 1.17 g. The *kichadi* mix contained fair amount of minerals: calcium 7.94 mg, magnesium 5.93 mg, iron 0.87 mg and zinc of 0.65 mg. Nutritional education using charts prepared based on practice of fine daily activities and importance of nutrients and nutrition taught to the 91 geriatric subjects (31 males and 60 females, respectively). The ready to cook brown rice *kichadi* mix contained most of the food groups and provided for taste by the subjects. Majority of the geriatric subjects participated in the intervention had extremely accepted the product based on taste and consistency.

Keywords: Geriatric subjects, nutrition intervention, brown rice *kichadi* and old age institutions

Comment [L1]: *Kichadi or kichadi??? I supposed the correct term is kichidi*

Introduction

In accordance with the National Policy for Older Persons of 1999, anyone older than 60 are considered elderly or senior citizens. According to the 2011 Indian National *Census*, the aged population is growing gradually and has grown more in the past ten years than in prior decades.

Since our country's independence, children and expectant mothers have been the main targets of our healthcare priorities. The burdens of healthcare issues experienced by the aged population are distinct from those confronted by these groups. The proportion of people over 60 is expected to nearly double, rising from 5.4% in 1950 to 10.1% in 2020. In 1950–1955, the elderly were responsible for 16.5% of all deaths; by 2015–2020, that percentage is expected to rise to 58%. Improve the physical, mental, and social well-being of the elderly while also providing long-term care for any chronic health issues in a manner akin to how mothers and children's health is approached. (National Policy for Older Persons, 2020)

Poor dental health has been shown to have a negative effect on overall dietary intake and food preferences. Fruits, vegetables, and meats that are hard, crunchy, or fibrous are generally avoided by senior people who have dental problems. Poor nutritional status among the older population may arise from avoiding certain micronutrient-rich foods. (World Population Prospects, 2020)

In addition to being healthier for us, brown rice is also more environmentally friendly than white rice. It is recognised that the cultivation of brown rice does not significantly harm the air, water, land, soil, forests, etc. In the modern world, when individuals desire convenience in the kitchen to satisfy time-sensitive requirements, instant foods are necessary in every family. In stores and hyper markets, instant food products take up a significant amount of shelf space in the processed food category. (Hildebrandt *et al.*, 1977)

Convenience meals cut out one or more of the labor-intensive preparation procedures involved with tasks like measuring, mixing, shaping, panning, assembling, among others. Consumer tastes for food have changed as a result of the move towards greater degrees of convenience in foods. (Lamy *et al*., 1999)

Dehydration is typically used to induce instantiation. In addition to making the product lighter and more portable, the removal of moisture increases the product's shelf stability. For the quality of the re-constitution of the quick foods, standardisation of the drying process and the properties of the components employed are crucial. (De Boer *et al*., 2000)

Foods that are ready to eat but are typically in dry form must be combined with water before eating. The most practical combinations are instant ones. Table foods that must be reconstituted

in boiling water and simmered for 2–10 minutes, depending on the food's processing and composition, aid in providing geriatric individuals with a balanced diet and a convenient food which can regularly be provided in old age institutions. (Mahon *et al.*, 2005). Hence, with this background the study was conducted to implement nutrition intervention by development of nutri-rich brown rice *kichidi* mix for geriatric subjects living in old age institutions located in Bangalore.

Materials and Methods

Procurement of raw materials: The food commodities like brown rice, green gram dhal, vegetable oil, carrot, beans, onion, fenugreek leaves, pepper powder, cumin seed powder and ginger powder were used to formulate the instant *kichidi* mix. All the ingredients were purchased from local markets of Bengaluru. The diets were prepared by blending all the ingredients in different proportions and processed as indicated in the Fig. 1.

Brown rice and green gram dhal was roasted separately

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Dried vegetables were mixed:
(Carrot, beans, onion, fenugreek leaves)

↓

Powdered Spices were added:
(Pepper, cumin seed, ginger)

↓

Salt was added at the end and all the ingredients was mixed thoroughly and stored

↓

Kichidi mix was cooked by adding five parts of water to one part of formulated kichidi mix

↓

Soaked for 30 minutes and pressure cooked for 15 minutes.

Fig. 1: Flow chart for the preparation of brown rice *kichidi* mix

Plate 1: Product prepared from ready to cook brown rice *kichidi* mix

Plate 2: Sensory Evaluation of the Developed Product

Plate 3: Imparting nutrition education and providing the prepared brown rice *kichidi* mix

Formulation and development of ready - to - cook mix

One type of *kichidi* mix in three variations using brown rice along with green gram dhal and dried vegetables was prepared. The vegetables used in *kichidi* mix preparation were dried in hot air oven at 60℃ for 8 hours and the mix was formulated using standard procedure. The preparation method is provided in the form of flow chart Fig.1. The variation of mixes are shown in the Table 1.

Method of preparation

One part of formulated brown rice *kichidi* mix was taken, to that five parts of water was added, soaked for 30 minutes and pressure cooked for 15 minutes.

Table 1: Composition of brown rice *kichidi* mix variations per 100 g.

Ingredients	Quantity (gm)		
	BKM-1	BKM-2	BKM-3
Brown rice	70	65	60
Green gram dhal	10	15	20
Vegetable oil	5	5	5
Carrot	3.5	3.5	3.5
Beans	3.5	3.5	3.5
Onion	3.5	3.5	3.5
Fenugreek leaves	1.5	1.5	1.5
Pepper powder (50 g)	1.5	1.5	1.5
Cumin seed powder (200g)	1	1	1
Ginger powder (50 g)	0.5	0.5	0.5

BKM- Brown rice *kichidi* Mix

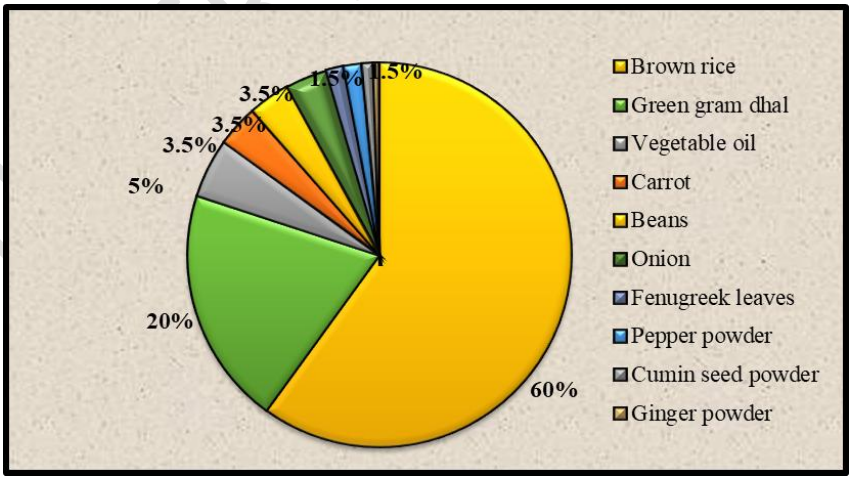

Fig. 2: Per cent composition of raw materials used in the best accepted *kichidi* mix variation

Sensory evaluation of the developed product

Sensory evaluation was carried for developed *kichidi* mix by 16 semi trained panel members from the department of Food Science and Nutrition. Sensory quality attributes were evaluated using a nine-point hedonic scale for their appearance, colour, texture, flavour, taste and overall acceptability.

Nutrient composition of the developed ready to cook mix

The developed product's nutritional composition was analysed or estimated using standard method (AOAC, 2000) in the laboratory of Department of Food Science and Nutrition, UAS, GKVK, Bengaluru. The product was analysed for the parameters such as moisture, protein, fat, ash, crude fibre, total polyphenols. Minerals such as calcium, iron, magnesium, manganese, phosphorous, potassium, sodium and zinc will be estimated. Carbohydrates and energy were calculated using the formula method.

Statistical analysis. In the present study one-way ANOVA was applied. The data was tabulated and analyzed by keeping in view of the objectives and parameters of the study. All the analyses were performed in triplicate and the data was analyzed using Microsoft EXCEL.

Results and discussion

Development of ready to prepare brown rice *kichidi* mix

One type of *kichidi* mix in three variations using brown rice along with green gram dhal and dried prepared. The vegetables used in *kichidi* mix preparation were dried in hot air oven at 60℃ for 8 hours and the mix was formulated using standard procedure. One part of formulated brown rice *kichidi* mix was taken, to that five parts of water was added, soaked for 30 minutes and pressure cooked for 15 minutes.

Sensory profile of the best accepted *kichidi* mix

Table 2 depicts the mean sensory score of the brown rice *kichidi* mix where BKM 3 variation having 60g of brown rice and 20g of green gram dhal had the best overall acceptability (8.31) in all the parameters: appearance (8.28), colour (8.03), texture (8.12), aroma (8.12) and taste (8.18). Highly significant difference was observed in taste and overall acceptability and significant difference was observed in texture. The combination of cereal, pulse and vegetables provide a sufficient nutrient is also found by Ashby *et al*., (2015).

Comment [L2]: Tables are opened.

Table 2: Sensory score of brown rice *kichidi* mix

Variations	Mean Sensory Score					
	Appearance	Colour	Texture	Aroma	Taste	Over all acceptability
BKM-1	7.75±0.57	7.75±0.68	7.56±0.72	7.62±0.80	7.40±0.75	7.59±0.75
BKM-2	8.00±0.89	7.81±0.54	8.05±0.51	7.81±0.54	7.87±0.61	7.87±0.50
BKM-3	8.28±0.77	8.03±0.64	8.12±0.61	8.12±0.50	8.18±0.65	8.31±0.60
Mean±SD	8.01±0.77	7.89±0.66	7.86±0.62	7.85±0.65	7.82±0.74	7.92±0.68
F-value	NS	NS	*	NS	**	**
SEM	0.189901	0.156724	0.156724	0.157916	0.169926	0.157123
CD	0.54091	0.446409	0.446409	0.449804	0.484014	0.447544

** Highly significant, * Significant and NS Non-Significant

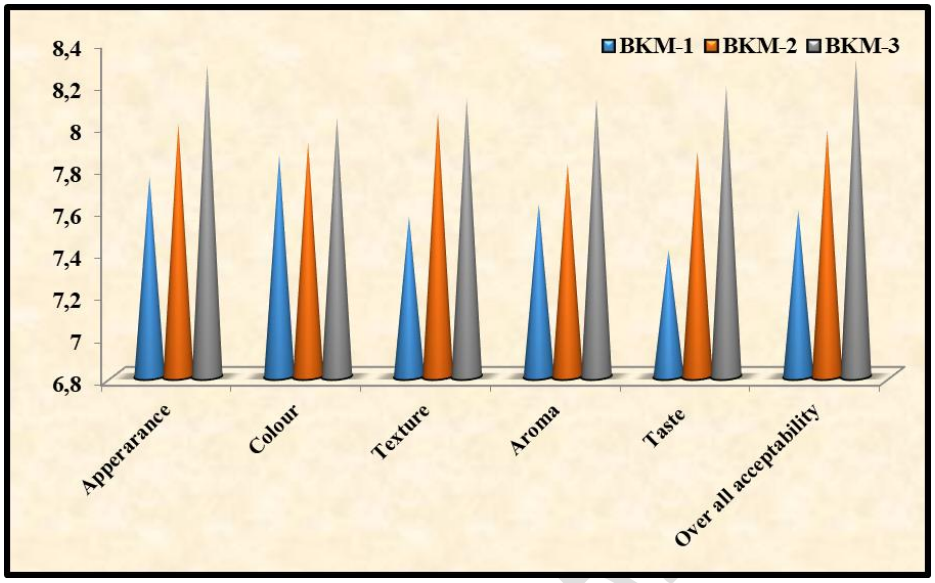

Fig. 3: Sensory score of the best accepted variation of *kichidi* mix

Nutritive value of the best accepted *kichidi* mix

Table 3 represented the nutrients composition of the brown rice *kichidi* mix where it has good quantity of major nutrients: energy 293.54 kcal, carbohydrates 73.29 g, protein 12.31 g and fat of 4.07 g meets the ¼th of RDA requirement of the geriatric subjects followed by moisture 6.35 per cent, and negligible quantity of crude fibre 3.96g and ash 1.17g. The *kichidi* mix contained fair amount of minerals: calcium 7.94mg, magnesium 5.93 mg, iron 0.87mg and zinc of 0.65mg. The similar study had been conducted and developed ready to cook *pulav* mix with good mineral composition for defence by Premavalli (2000).

Table 3: Nutritive value of the best accepted brown rice *kichidi* mix

Nutrients	Quantity (100 g)
Energy* (kcal)	293.
Carbohydrates*(g)	73.29
Protein (g)	12.31
Fat (g)	4.07
Crude fibre (g)	3.96
Moisture (%)	6.35
Ash (g)	1.17
Iron (mg)	0.87
Calcium* (mg)	7.94
Magnesium (mg)	5.93
Zinc (mg)	0.65

Comment [L3]: Tables are opened

Nutritional intervention and acceptance of the developed product by the geriatric subjects

Nutritional educational materials such as charts were prepared on importance of good practices of daily activities and tips to have healthy food habits. The educational materials was scripted in Kannada language for feasibility of understanding consisted of importance of food pyramid, proper meals intake, nutritional needs and health aspects of the geriatric subjects. Ready to cook *kichidi* mix was developed with three variations, one of the variations composed of 60g of brown rice, 20g of green gram dhal and keeping other ingredients was kept constant and also the care was taken and the *kichidi* mix was formulated using non-irritant ingredients which also has low pro inflammatory effect on the appetite of the elderly. The product developed was softened in consistency for easy palatability and green chillies were avoided to avoid dietary inflammation. The educational materials prepared was used for educating elderly subjects and the institutions and then the product developed was prepared and served during the nutritional intervention training in the old age institutions to check for acceptability (Table 4). The similar study was conducted by development of ready to cook vegetable khichadi mix by microwave drying technology with slightly low nutritional composition compared to the present study and consumer preference was done for all the age groups by Khandekar *et al. (*2015).

Table 4: Acceptance of the developed brown rice *kichidi* mix by the geriatric subjects

Parameters	Respondents			
	Male (n=31)		Female (n=60)	
	N	%	N	%
Consistency				
Thin	28	90.32	56	93.33
Thick	-	-	-	-
Watery	03	9.67	04	6.66
Taste				
Like extremely	29	93.54	55	91.66
Like moderately	02	6.45	05	8.33
Dislike	-	-	-	-

Comment [L4]: Same for all tables

Nutrition intervention was carried on in the old age institutions, which was one of the study area of the research. Nutritional education using charts prepared based on practice of fine daily activities and importance of nutrients and nutrition taught to the 91 geriatric subjects (31 males and 60 females respectively).

The ready to cook brown rice *kichidi* mix was prepared which contained most of the food groups and provided for taste by the subject's majority of the geriatric subjects participated in the intervention had extremely accepted the product based on taste and consistency.

Conclusion: In response to this growing concern, this research paper endeavours to explore and implement a novel nutritional intervention strategy specifically designed for geriatric subjects residing in old age institutions within the Bangalore District. The intervention, known as the "Nutri Rich Brown Rice *Kichidi* Mix," seeks to address the nutritional deficiencies commonly observed in this population while also catering to their culinary preferences and dietary constraints.

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