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Effect of commercial formulas over kitchen formulas in enteral feeding-A pilot study

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Abstract
Background and objective: Enteral feeding are a method of feeding a patient who is hospitalized for various clinical conditions. Enteral feeding is done by inserting a tube from the nose into the stomach via the esophagus. The main aim of the study is to check the efficacy of enteral feeding on medical inpatients and to study whether the enteral feeds can meet the required nutrient contents of the patient.
Materials and method: A hospital-based study was conducted for three months (14 March 2022 to 14 June 2022), where 34 subjects both men and women who were on enteral feeding were selected. A semi-structured questionnaire was used to elicit the data on anthropometry measurements. The Problem Oriented Medical Record (POMR) file was used to collect the biochemical and clinical data. BMI was calculated before and after the feed and was compared to check the patient's efficacy.
Result and conclusion: In the current study commercial feeds were used more frequently than kitchen feeds. The commercial enteral feed was effective for 75% of subjects in meeting the nutrient requirement of subjects. The length of stay in the hospital was better among patients on commercial feeds compared to kitchen feeds.

Keywords: enteral feeding, nasogastric feeding, duration of hospital stay, body mass index, total calorie requirement

Introduction

A proper healthy diet is the maintenance of all essential nutrients in the body in a required amount. Diet is one approach in preventing illness [1]. People get hospitalized usually because of acute or chronic illnesses due to which they may not be able to consume orally. Problems like gastrointestinal disease (GI) or stroke, there may be difficulty in eating a patient may be unable to chew or swallow or digest food, therefore, enteral feeds help in acquiring an adequate amount of fluid and nutrition to the body [2]. Gastrointestinal disturbances, severe illness, difficulty in digesting, loss of appetite, organ failures, etc. may cause lack of nutrients in the body which can complicate their health condition even more [1].

This problem may extend from a few hours to a few days. Malnutrition is seen very frequently in hospitalized patients, particularly in the intensive care unit (ICU), condition tends to be more severe in those hospitalized for more than three days, generally due to the acute inflammatory response and consequent catabolic stress. This response is in combination with complications like fatal infections, multi-organ dysfunction syndrome (MODS), prolonged hospitalization period and increased of mortality [3]. Further down these conditions, the concentrations of water-soluble vitamins, some trace elements (*viz.* selenium, iron and zinc), protein transporters and many antioxidants predominantly vitamin C may decrease in the blood while the circulating elements, like copper and manganese, may increase [4].

The prevalence of obesity increases as age increases which is the source of much research. The spectrum of BMI those who are underweight and those with morbidly obese, have an increased risk of mortality. One major concern in the treatment of these elderly obese is that many may have sarcopenic obesity which can be worsened with weight loss where some degree of lean body mass loss is inevitable [5].

During the past thirty years, the importance of biological and molecular effects of nutrients in critically ill patients has been more appreciated. Studies have shown that many ICU patients receive much less energy and protein than their requirements around 49-70% of the required value [6]. It has been proven that energy protein malnutrition is associated with the increased rate of mortality and complications in the disease and delivering an adequate amount of energy and protein for critically ill patients may improve the clinical consequences [7]. Studies have shown recently that nutritional care effectively reduces morbidity and mortality in critically ill patients [8, 9]. It is very essential to nourish patients in different disease by enteral feeding (EF), wherein the foodstuffs and liquid are given in the form of a homogenous liquid termed as formula through a special tube inserted in patient's digestive tract.

A wide range of feed formulas are present in the market with increasing diversity. Feeds are chosen based on the patient's medical condition, unique nutritional requirements, feeding schedule, availability and price [5]. Nutritional delivery through enteral nutrition can cause complications like foods can enter the lungs, also called aspiration, constipation, diarrhea, vomiting, dehydration, electrolyte abnormalities, high blood sugar, vitamins, and mineral deficiencies, and decreased liver proteins. In spite of having the drawbacks, these feeds are essential in disease recovery by providing sufficient nutrients necessary for the patients to overcome the worsening condition [8]. Though in many places, commercial formulas are routinely used for EF, in the current region still homemade formulas are commonly employed as commercial formulas are not covered by insurance. This may pose patients to malnutrition and bring about further costs. Therefore this study, aimed to evaluate the efficacy of EF commercial formulas in comparison with home-made formulas and make further evidence.

Materials and Methods

1. Subjects

The current study was a hospital-based pilot study carried out in Bangalore, where 34 subjects including both men and women on enteral feeding were selected based on inclusion (between 20-70y with co-morbidities like hypertension, diabetes, and chronic kidney disease) and exclusion criteria (<20 y and >70y, unwillingness to participate, and lack of complete height and weight records at the time of admission). The subjects were hospitalized because of head injury, cardiac arrest, diabetic foot injury, and subdural hematuria. The selection of subjects was based on the co-morbidities such as hypertension, diabetes, and chronic kidney disease.

2. Collection of data

A semi-structured questionnaire was used to collect primary data. Secondary data was collected from the POMR file from the hospital. Anthropometric (height, weight, and BMI), biochemical (sodium, potassium, albumin, creatinine, hemoglobin, and blood glucose), and clinical data (diabetes, hypertension, chronic kidney disease; cardiovascular disease) were collected from the POMR file. Data was collected by observating and reviewing documents and records of patients in the ICU (Nursing handover records, paper-based inpatient medical records, and ward admission discharge records).

3. Study design

Patients on RT feeds in ICU were selected. The co-morbidities were assessed and according to the health condition supplements were selected. The Body Mass Index, the total calorie requirement of the patient was calculated. The number of scoops given and the medium in which the supplement is mixed for the patient is calculated based on the nutrient requirement of the patient.

The calorie and nutrient content of the feed provided was also calculated. The difference in the BMI before and after RT feed was calculated. The difference between them was used to ensure whether the patient's nutritional requirement was met through RT feeding. The change in BMI (increase/decrease/same) can also be used to conclude the efficiency of the RT feeding method.

The weight of all patients was recorded using a weighbridge during the ICU admission.

4. Statistical analysis

Data were analysed using SPSS version 16 and reported as mean ± standard deviation for the continuous variables and percentage for discrete variables.

5. Ethical considerations

Written informed consent was obtained from all patients or their relatives. The study protocol was approved by the Institutional Ethics Committee of JSS Medical College, Mysore (ethical code: JSSMC/IEC/050722/41NCT/2022-23). Participants were ensured about the confidentiality of the information, and the data were analyzed using a coded format. No additional charge was received or given to participants, and they were informed that they can withdraw from the study at any time.

Result and discussion

The present study results were an attempt made to study the efficacy of types of formulas available for enteral feed. The demographic profile of the patients are shown in Table 1. Among the selected 34 subjects, 44% were male and 56% were female. Majority of them were under the age group 61-70 years, followed by 51-60 years, and the least from the age group of 31-40 years. The majority of the elderly subjects were found to be associated with the selected co-morbidities. The subjects were filtered with co-morbidities like diabetes, hypertension, and chronic kidney disease. These co-morbidities are seen highly in geriatric patients [9].

Table 1: Demographic profile of the subjects

Variables	Categories	Number (n)	Percentage (%)
Gender	Male	15	44.14
	Female	19	55.86
Age	21-30	3	8.82
	31-40	1	2.94
	41-50	3	8.82
	51-60	11	32.34
	61-70	16	47.04
Diagnosis and Co-morbidities	Meningitis		
	Hypertension and diabetes	10	29.4
	CKD	0	0
	Other	0	0
	Nil	0	0
	Seizure		
	Hypertension and diabetes	3	8.82
	CKD	4	11.76
	Other	0	0
	Nil	1	2.94
	CVA		
	Hypertension and diabetes	1	2.94
	CKD	0	0
	Other	0	0
	Nil	0	0
	Hematuria		
	Hypertension and diabetes	2	5.88
	CKD	1	5.88
	Other	2	2.94
	Nil	2	5.88
	IHD	2	5.88
	Hypertension and diabetes	0	0
	CKD	0	0
	Other	1	2.94
	Nil		
	CVD		
	Hypertension and diabetes	3	8.82
	CKD	0	0
	Other	0	0
	Nil	2	5.88

Table 2: Anthropometric parameters of the subjects

BMI	Gender	n (%)
Underweight	Male	2 (5.88)
	Female	0 (0)
Normal	Male	3 (8.82)
	Female	12 (35.28)
Overweight	Male	10 (29.4)
	Female	5 (14.7)
Obese class I	Male	0 (0)
	Female	2 (5.88)

The majority of male patients were overweight (44.1%), around 6% of the male patients were underweight and 6% of females were found to be in obese class I category. In a

meta-analysis of 13 observational studies showed cardiovascular mortality in non-hospitalized subjects aged 65 and above [10].

Table 3: Nutrient contents of different feeds

Nutrients	Type of feed	
	Commercial	Kitchen
Energy (K Cal)	46.9	60
Carbohydrates (g)	5.4	4.4
Proteins (g)	2.9	1.6
Fats (g)	1.4	3.4
Calcium (mg)	399	145
Iron (mg)	5.05	3.1
Sodium (mg)	233.9	33.1
Potassium (mg)	410	211

It can be observed that the calorie content was found to be high in one scoop i.e 15 ml in kitchen feed compared to commercial feeds. Also the other nutrient content including minor nutrients like minerals found to be better in commercial feeds than in kitchen feeds (Table 3). In nasogastric feeding, there are three types of feeds, kitchen feeds, commercial, and clear liquid feeds. In the center where the study was conducted, the commercial formula was used extensively compared to other feeds. They have been found to be better than other feed as it consists of nutrients that are designed for specific clinical conditions. Therefore it was preferred over kitchen feeds and clear liquid feeds.

The efficacy of different types of enteral feeding was concluded by measuring the difference in BMI before and after the feed. The changes that happened in the BMI of the subjects (fig 1).

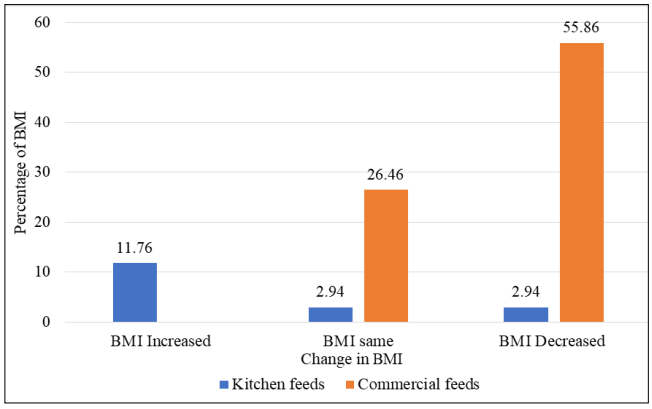

Fig 1: Changes in the BMI of the Subjects on different feeds

From figure 1, it was observed that, 11.76% of subject's had increased BMI in those who were on Kitchen feeds. Majority (55.86%) of the subjects BMI on commercial feeds decreased, and in 26.46% the BMI remained unchanged. The majority of commercial formulas provide a balanced nutritional composition, controlled osmolality, adequate stability and microbiological safety which is very essential in decreasing the risk of disease progression [11].

Efficacy of enteral feeding in medical inpatients

The efficacy of enteral feeding on the selected medical inpatients is shown in Figure 2. However, from the current study, it can be concluded that the commercially available enteral feed was effective among majority of the patients (75%).

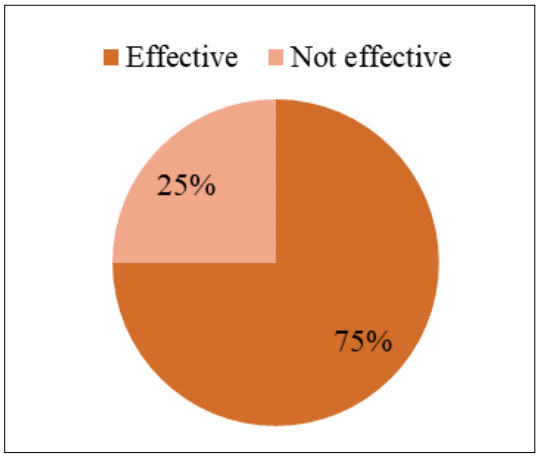

Fig 2: Graphical representation of efficacy of enteral feeding in medical inpatients

Table 4: Duration of hospital stay based on the type of feed

Number of days	Subject on commercial feeds		Subjects on kitchen feeds	
	N	%	N	%
0-15	25	73.5	5	14.7
16-35	1	2.94	3	8.82

Duration of hospital stay based on the type of feed is in table 5. The length of stay (LOS) in hospital was better among patients on commercial feed compare to kitchen feeds. Around 74% of subjects stayed up to 15 days who were on commercial formula. The patients on kitchen feed had increase LOS i.e 16-35 days. Therefore commercial feeds were preferred over kitchen feeds.

Conclusion

The current research work adds to the data on efficacy of different feeds. Enteral feeding is a mode of feeding medical inpatients who are unable to take food orally. A tube is inserted from the nose or mouth into the stomach via the esophagus. Enteral feeding helps the patient obtain all the essential nutrients without taking food orally. This conducted study showed the efficacy of enteral feeding on the selected 34 subjects. For 75% of subjects enteral feeding was successful in restoring and maintaining the nutrient contents. For the rest of the 25% of subjects enteral feeding was prolonged for a larger number of days and there was a reduction in Body Mass Index (BMI). Further studies are needed.

Conflict of interest

The authors declare that there is no conflict of interest with respect to the current study.

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