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High -Fat Enteral Formula with Avocado Substitution as an Alternative Diet Therapy

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ABSTRACT

Enteral feeding is one solution to meet the nutritional needs of patients who experience decreased appetite, patients with difficulty swallowing or patients with decreased consciousness including in cases of Chronic Obstructive Pulmonary Diseases (COPD). Therefore , things that must be considered in regulating the diet in COPD patients is that energy consumption from carbohydrates needs to be reduced and fat sources are increased. This study is an experimental study using a post-test group design with 3 avocado substitution treatments to increase the nutritional value of fat. The results was no significant difference in the acceptability of each formula (p>0.05). The most preferred formula is formula 3 with a ratio of 50g avocado and sweet orange: 50g. The results of this developed formula produce a light greenish white color, a distinctive aroma of a mixture of milk aroma with the fragrance of avocado and sweet orange, with a liquid texture and a delicious and savory taste that is slightly sweet. The nutritional content of one portion of formula 3 contains 416.75 kcal of energy, 11.86g of protein, 18.5g of fat, and 50.05g of carbohydrate.

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CASE REPORTS

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Key Messages:

- Enteral feeding is also one of the solution For fulfil need nutrition patients who experience decreased appetite, patients with difficulty swallowing or patients with decreased consciousness
- Dietary regulation for COPD patients means that energy consumption from carbohydrates needs to be reduced and fat sources increased.
- substitution as a fruit high in oleic fatty acids and antioxidants, in high-fat enteral formula as an alternative diet therapy in COPD patients with shortness of breath.

INTRODUCTION

Chronic Obstructive Pulmonary Diseases (COPD) is the 3rd most common cause of death in the world, affecting 3.23 million people worldwide, with smoking being the main cause (1). In Indonesia, there are 4,174 people with COPD. In this case, the reported incidence of COPD reached 2,663 cases in men and 1,512 cases in women. With 155 cases, COPD is the most common disease in Indonesia (2). The increase in the number of COPD due to population growth, industrialization, high smoking habits, increasing average age, air pollution. Dietary management of COPD patients is primarily the consumption of appropriate energy, carbohydrates and fats (3). Providing additional carbohydrate energy if excessive increases blood CO_2 levels. The conclusion of the study said. A low-carbohydrate, high-fat diet affects the reduction of blood CO_2 in COPD patients. A low-carbohydrate, high-fat diet improves respiratory symptoms better. High fat is 30 to 45% of total energy. Fat has a low Respiratory Quotient (RQ) value which means that the digestion process requires less oxygen than other nutrients (4), fat is a high-energy food compared to CHO in osmolality and does not cause hyperglycemia. The RQ value of fat = 0.7, protein RQ = 0.8. and CHO = 1. Low carbohydrates: 40-50% of total energy, carbohydrates increase oxygen uptake and produce quite high carbon dioxide. Providing 30-35% carbohydrates can prevent shortness of breath and ketosis (5),(6).

Diet COPD is included in healthy fats, because it is dominated by oleic monounsaturated fatty acids which are strong antioxidants. The avocados are a special fruit because they contain 20-30 times more unsaturated fats compared to other fruits and antioxidant compounds such as vitamins E and C, carotenoids and phenolic compounds (7). Therefore, the addition of avocado fruit to this high- fat enteral formula will be tried to increase nutritional value. In 100 g of edible part, avocado fruit contains 92 calories; 0.96 g protein; 25.18 g fat; 7.6 g carbohydrates; 10 mg calcium; 20 mg phosphorus; 0.9 mg iron; 180.00 SI vitamin A; 0.05 mg vitamin B vitamin C 13.00 mg; 84.30 g water (8).

METHOD

This research is an experimental research using a posttest group design. With 3 avocado substitution treatments to increase the nutritional value of fat in Formulas 1, 2 and 3. The product was developed based on modifications from the previous recipes. Acceptability testing was conducted by giving product samples to 35 respondents of the employees of the UPT RSUD Massenrempulu Enrekang to carry out organoleptic testing using the following scoring: 1 (very dislike), 2 (dislike), 3 (quite/somewhat like), 4 (like), 5 (very like).

Research Procedures and statistical analysis

The research was conducted in several stages, including preparing the formula ingredients, weighing, cooking, and then pouring them into cups, ready to be served to the panelists. The next stage involved the panelists completing a hedonic test form, followed by data processing and analysis, and the preparation of a research report.

Table 1Enteral Formula with Avocado Substitution Based on Sample/Treatment Groups

Food Ingredients (g)	Avocado And Sweet Orange Treatment		
	Formula 1	Formula 2	Formula 3
Cornstarch	5	5	5
White sugar	25	25	25
Fresh chicken eggs	50	50	50
Whole Milk cream	25	25	25
Olive oil	5	5	5
Avocado, fresh	30	40	50
Sweet, fresh oranges	70	60	50

How to Make the Recipe Modification ; (1) Mix corn starch, sugar sand, milk, to in 200 ml water ripe (2)Stir until flat. Cook on fire currently until ripe (3) Beat the eggs, add a little of the mixture, beat until well mixed then add return into the original mixture and stir continuously until smooth then add the avocado and stir again until the mixture bubbles (4) Remove from heat, mix in olive oil, after rather cold add water orange, Then filter with sterile add boiled water up to 270 ml (5) Insert to in the bottle Already sterilized

Kruskal-Wallis test was selected For see whether There is difference Power thank you to the three group sample, for see differences in the two groups sample The Mann-Whitney test was chosen . The reason for using the Kruskal-Wallis test is because of power data accept consists of on ordinal data (very unlikely) like , no like , quite like , like , really like) which consists of top 3 groups sample .

RESULT

Panelists in the study This consists of employees of the Massenrempulu Regional Hospital UPT consisting of top 3 5 panelists various sex women (97.15 %), men (2.85 %) aged 1 5- 25 years (5.71 %), age 26 - 35 (2 5 , 72 %), age 36 - 45 (40 %) and age 46 -55 years (28 , 57 %) as well part big Not yet recognize taste, color , aroma and texture High-fat enteral formula food substituted with avocado . Results of the efficacy test accept based on four aspect ideals taste , color , aroma, texture can seen in table 2.

Table 2Acceptance Power Tofu Roll Addition Dangke and Carrots

Sample Categories	**Preference Attribute**	**Color**		**Aroma**		**Flavor**		**Texture**	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
F1	• Like	30	86	25	71	27	77	33	94
	• Neutral	5	14	10	29	8	23	2	6
F2	• Like	31	89	26	74	27	77	33	94
	• Neutral	4	11	9	26	8	23	2	6
F3	• Like	31	89	28	80	29	82	31	89
	• Neutral	4	11	7	20	6	18	4	11
Kruskal-Wallis Statistical		0.795		0.914		0.601		0.781	

Table 2 shows that of the three formula groups, the majority of panelists preferred the color aspect, namely 86% in formula 1 (30g avocado and 70g sweet orange) , 89% in formula 2 (40g avocado and 60g sweet orange), 89% in formula 3 (50g avocado and 50g sweet orange).

Kruskal-Wallis test results shows that the three formulas do not have a significant difference in color (p=0.792). Based on the *Mean value Rank* or the average ranking of each formula in the *Kruskal-Wallis test* , the information obtained is that the *Mean value Rank* The color aspect of formula 1 was higher (55.29) than the other two formulas. In general, panelists gave favorable responses to the colors of the three formulas. *Kruskal-Wallis* test showed that there was no difference in the aroma of the three formulas (p=0.914). Based on the *Mean value Rank* or the average ranking of each group in the *Kruskal-Wallis test* , information was obtained that the *Mean value Rank* aroma aspect in formula 3 is higher (54.37) than the other two formulas. Most of the panelists gave a liking rating to the taste of all three formulas, the most in formula 3. The *Kruskal-Wallis test* showed that the taste of the three formulas was relatively the same ($p = 0.601$). Based on the average ranking value of each formula in the *Kruskal-Wallis test* , it was found that the *Mean Rank value* in formula 3 was higher (55.8) than the other two formulas.

Discussion

Acceptance

Acceptability is a concept that refers to the extent to which an individual or group accept , like , and consume something product or service . criteria evaluation For color , aroma, taste, texture , and assessment overall , becomes 1= very not like , 2 = no like , 3 = enough like , 4 = like , and 5 = really like Formula enteral high fat avocado substitutes developed produces 2 7 0 ml of liquid formula each portion . This formula at the time testing shared into 3 types treatment namely formula 1 comparison avocado and sweet orange 30 gr : 70 gr , the 2nd formula is the ratio avocado and sweet orange 40 gr : 60 gr , and the 3rd formula with treatment comparison 50g avocado and sweet orange : 50 gr . The results of the developed formula This produce white color greenish young , and distinctive aroma a mixture of milk aroma (like the aroma of milk custard) with fragrant avocado and sweet orange , with liquid texture with A little thick and delicious and savory taste a little sweet

Making This high fat formula product made from milk base, eggs, flour cornstarch , granulated sugar , oil olives , sweet oranges and additional fruit avocado . Flesh fruit avocado contain compound antioxidants such as vitamins E and C, carotenoids and compounds phenolic. Avocado is one of the lots of fruit in demand Good as material food and product health . Meat fruit avocado can also utilized for produce oil with good properties, rich in sour oleate (omega-9) and sterol. Together with other substances This can give effect positive on control metabolism cholesterol and prevention disease cardiovascular (9).

Organoleptic test results showed that the most preferred *high-fat enteral formula based on color was Formula 1, which had a ratio of 30g avocado and 70g sweet orange.* In terms of texture, Formula 2 was the most preferred, with the avocado substitution. 40 gr and sweet orange 60g). From the taste aspect, the most preferred aroma is formula 3 with a 5.0 % avocado substitution and sweet orange 5 0%.

From the Results *Kruskal-Wallis* test research shows that there is no significant difference between the three formulas with different treatments , there are no test results ($p<0.05$) In terms of colour, aroma, taste and texture, there is almost no difference between one formula and another.

This research is in line with the results of research (5) which tested on COPD patients who were undergoing treatment at the hospital stated that the results of the hedonic test on the colour attribute were 100% liked by respondents, while the aroma and texture were liked by 75% and the taste aspect was liked by 75%, very much disliked by 12.5%, and disliked by 12.5%. This is very influenced by the subjective of each panelist so that the dislike of this modified recipe could arise because of taste where not everyone will like the taste of avocado with milk. In line with the research of Aziz et al 2022 with the title Alternative Liquid Food Formulation Based on Gotu Kola Flour and Red Dragon Fruit for the Diet of Patients with Diabetes mellitus , the results of the study Based on the ANOVA test , there was no significant difference in the aroma indicator in formulas 1, 2, and 3 with a p value > 0.05. The results did not show any significant difference (p value : 0.186 > 0.05) as well The assessment scale for texture ranges from slightly dislike to neutral, the results were not significant or there was no real difference (p value : 0.052 > 0.05) (10). What is different from Aziz et al's research al 2022, From the ANOVA test table , there is a significant difference in the color indicator in formula 3 (F3) with (p value <0.05) which is 0.003. Likewise, there is a significant difference in the taste indicator of formula 1 with a p value : 0.025 <0.05. The results of the analysis obtained the level of panelists' preference for the Taste indicator (10).

Nutrient content

enteral formula is determined based on the formula's ability to meet nutritional needs, which is influenced by the following factors, namely the energy and protein content/density in the formula (expressed in kcal /ml, g/ml, or ml Fluid /L), Enteral formula must be able to flow in a food pipe measuring 8-14 French . And can sufficient number adequacy nutrition , standard enteral formula is content Energy ± 1.0 – 2 kcal / ml, protein 12 – 20%, fat 30 – 40%, and carbohydrates 40 – 60%. Route of administration enteral feeding with help tube can given through gastric (stomach) route namely Naso Gastric Tube (NGT), duodenal route namely Naso Duodenal Tube (NDT) and also the jejunum namely NJT (Naso Jejunal Tube). NGT is given to patients who do not own disorders of the

stomach and intestines (5). The nutritional value content was analyzed using the Indonesia Food Composition Table (IFCT).

Table 3. Nutritional Content of Formula 3 (high fat formula)

Ingredients	Weight (g)	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)
Cornstarch, flour	5	17.05	0.015	0.00	4.25
White sugar	25	98.5	0.00	0.00	23.5
Fresh chicken eggs	50	77	6.20	5.40	0.35
Whole Milk cream	25	115	4.75	4.75	12.5
Olive oil	5	44.2	0.00	5.00	0
Avocado, fresh	50	42.5	0.45	3.25	3.85
Sweet, fresh oranges	50	22.5	0.45	0.10	5.6
Amount		416.75	11,865	18.5	50.05

Table 4 shows content nutrition in one the intended portion of formula 3 For patients suffering from COPD or congested that is contain Energy 416.75 kcal , protein 11.86 gr, fat 18.5 gr, and KH 50.05 gr. From the table on for Energy there is increase this 1 % related with addition avocado as much as 10%, for protein remains, and for fat there is increase as much as 1% compared to with this formula 2 caused by with increase portion avocado to 50 g, the more avocado added, the higher the energy and fat and carbohydrate there are decline as much as 0.99% is accounted for Because existence decline portion sweet oranges from 60 gr to 50 gr. That matter has in accordance with objective from manufacturing high fat formula enteral feeding. Avocado substitution produce high-fat, low-calorie formula products . This can replace formula commercial Minimize cost organization hospital food .

The limitation of this research is that the formula developed was not subjected to viscosity and osmolarity tests due to limited facilities.

Conclusion

From the results of organoleptic tests conducted on high-fat enteral formula products with avocado substitutes, it was found that results as following: aspects colour, namely 86 % in formula 1 (avocado 30 gr and sweet orange 70 gr) The taste aspect is the majority panelists love the taste of formula 3 products (avocado 50 gr and sweet orange 50 gr) namely as much as 8.2 %. The majority of aroma aspects panelists love the taste of formula 3 product (avocado 30 gr and sweet orange 70 gr) that is as much as 80 %. The texture aspect of the majority of panelists liked the aroma of formula 3 (40g avocado and 60g sweet orange) as much as 94%. It can be concluded that the high-fat enteral formula product with avocado substitute is acceptable as an alternative diet therapy for COPD patients with shortness of breath.

The highest nutritional content is in formula 3, namely energy 416.75 kcal , protein 11.86 g , fat 18.5 g , and KH 50.05 g . Specifically for the analysis of fat nutrients, the highest is in formula 3. The target of the high-fat enteral formula for avocado substitution is patients with a high-fat, low-KH diet.

For further researchers, it is recommended that this be done on hospitalized COPD patients.

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Conflict of Interest: The authors declare no conflict of interest.

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