

Dietary Modification Of “BUBELLA” Pudding (Guava, Starfruit, and Pumpkin) As a Snack for Diabetes Mellitus Patients with Atherosclerotic Cardiovascular Disease at the Outpatient Clinic of Dr. Soedomo Regional General Hospital, Trenggalek

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Abstract. Diabetes Mellitus with Atherosclerotic Cardiovascular Disease (DM-ASCVD) is a degenerative disease with a high prevalence of 10.9% and is one of the leading causes of death worldwide. Diet is one way to modify DM-ASCVD risk factors to prevent and reduce risks such as obesity, dyslipidemia, hypertension, and hyperuricemia. One such dietary modification for DM-ASCVD is BUBELLA pudding, which is based on low-glycemic local food, high nutrient and rich in fiber. **Objective :** This study aimed to develop and implement dietary modification in the form of BUBELLA pudding as an alternative snack for outpatients with DM-ASCVD and to evaluate nutrient intake, blood pressure and fasting blood pressure. **Methods:** This study was a development study of dietary modification product using a quantitative descriptive approach. Pudding was made in 3 different formulas and then organoleptic testing was carried out by 15 semi-trained panelists. The selected pudding formula was implemented as a snack for outpatients with DM-ASCVD. Monitoring and evaluation included nutrient intake, blood pressure, and fasting blood glucose. **Results:** The selected BUBELLA pudding formula was formula B with the highest average hedonic score of 4.3 and contained 88.45 calories of energy, 3.4 grams of protein, 1.05 grams of fat, 19.03 grams of carbohydrates, and 5.6 grams of fiber. Providing 2 portions of BUBELLA pudding a day, accompanied by nutritional education was able to optimize the energy intake, protein, fat, carbohydrates, and fiber, and was able to lower blood pressure and fasting blood glucose of respondents. **Conclusion:** BUBELLA pudding can be used as an alternative snack for outpatients with Diabetes Mellitus and Atherosclerotic Cardiovascular Disease (DM-ASCVD).

Keywords: BUBELLA pudding ; dietary modification; DM-ASCVD; monitoring and evaluation; outpatient care;

1. Introduction

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. According to the 2018 Basic Health Research (RISKESDAS) report published by the Ministry of Health, the prevalence of DM increased to 10.9% [1]. Atherosclerotic cardiovascular disease (ASCVD), including coronary heart disease, cerebrovascular disease, peripheral vascular disease, congenital heart disease, rheumatic heart disease, deep vein thrombosis, and pulmonary embolism, has become the leading cause of death worldwide, accounting for approximately 32% of all deaths. Of the deaths caused by these diseases, 85% are attributed to heart attacks and strokes [2].

Diet is one of the strategies for modifying cardiovascular disease risk factors to prevent and reduce the risk of cardiovascular disease, including obesity, dyslipidemia, hypertension, diabetes mellitus (DM), and hyperuricemia [2]. Nutritional therapy for DM is defined as a therapeutic approach involving modifications to food or nutrient intake provided by a nutritionist. In general, daily food intake is divided into three main meals: breakfast (20%), lunch (30%), and dinner (25%), along with 2–3 snacks (10–15%) consumed between meals. For individuals with DM who have comorbidities, dietary patterns should be adjusted according to the accompanying conditions [1]. Dietary modifications for patients with DM and atherosclerotic cardiovascular disease (ASCVD) complications include carbohydrate management, consideration of the Glycemic Index (GI), increased dietary fiber intake, and reduced intake of saturated and trans fats [3].

One approach to support the implementation of a DM-ASCVD diet is to modify the diet using locally available food ingredients with a low glycemic index, adequate nutritional content, and high fiber content. A dietary snack modification for patients with DM and ASCVD is pudding made from guava, starfruit, and pumpkin, referred to as BUBELLA pudding. Guava flesh contains high amounts of pectin, a type of dietary fiber that delays glucose absorption in the intestine, thereby preventing a sudden increase in blood glucose levels [4]. One of the major benefits of guava is its potential to reduce cholesterol levels in the body, which plays an important role in reducing the risk of cardiovascular diseases, such as heart disease and stroke [5]. Starfruit (*Averrhoa carambola*) has a low glycemic index (GI), approximately 28, and contains a high amount of insoluble dietary fiber. This fiber is considered capable of slowing glucose absorption, thereby helping to reduce and prevent spikes in blood glucose levels [6]. Pumpkin (*Cucurbita moschata* Durum) is a food ingredient rich in dietary fiber, containing approximately

2,7 g of fiber per 100 g. Its high dietary fiber content, particularly in the form of pectin, may help control blood glucose levels and provide protection against various degenerative diseases, including diabetes mellitus [7]. In addition, boiled pumpkin has a relatively low glycemic index of 13,05 [8].

2. Materials and Methods

This study was a diet modification product development study using a descriptive quantitative approach. The modified dietary product was BUBELLA pudding, which was intended as a snack for outpatients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD). The pudding was provided in two servings per day for two days. The study was conducted from June to July 2026 at Dr. Soedomo Regional General Hospital, Trenggalek.

The study population consisted of outpatients with DM complicated by ASCVD and employees of the Nutrition Installation at Dr. Soedomo Regional General Hospital, Trenggalek. The study sample consisted of 5 outpatients with DM complicated by ASCVD who served as subjects for the nutritional intervention and monitoring and evaluation. The organoleptic test panel consisted of 15 employees of the Nutrition Installation at Dr. Soedomo Regional General Hospital, Trenggalek.

The sampling technique used was purposive sampling, which involved selecting subjects based on criteria predetermined by the researcher.

Inclusion criteria for panelists were outpatients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD) and employees of the Nutrition Installation at Dr. Soedomo Regional General Hospital, Trenggalek, who were willing to participate as panelists; were not experiencing flu, anosmia, or other conditions that could interfere with their sense of smell or taste; had no impairment of chewing or swallowing function; had no history of allergy to fruits or milk; were aged >18 years; and were able to communicate effectively. Exclusion criteria for panelists were individuals who declined to participate as panelists, had an allergy to fruits or milk, had impaired smell or taste function, had impaired chewing or swallowing function, or were aged <18 years.

The equipment used included a knife, cutting board, digital scale, cooking pot, bowl, blender, ladle, measuring cup, pudding cups, and NutriSurvey software for analyzing nutrient content.

The ingredients used to prepare the BUBELLA pudding formulation were guava, starfruit, pumpkin, low-fat diabetic milk, diabetic sugar, agar-agar, and water.

Table 1. Ingredients for the BUBELLA Pudding Formula

Ingredient	Unit	Treatment		
		Formula A	Formula B	Formula C
Guava	g	300	200	200
Starfruit	g	100	200	300
Pumpkin	g	200	200	100
Low-fat DM milk	g	20	20	20
DM sugar	g	5	5	5
Agar-agar	g	7	7	7
Water	ml	500	500	500

The modified dietary pudding product was formulated into three different formulas with varying proportions of guava, starfruit, and pumpkin. An organoleptic test was conducted with 15 semi-trained panelists using a 5-point hedonic scale. The selected formula was subsequently implemented as a snack intervention for the respondents.

The variables studied included nutritional content, acceptability, energy, protein, fat, carbohydrate, and fiber intake, also blood pressure and fasting blood glucose levels before and after consuming the pudding.

Nutritional values of the pudding formulas and dietary intake of the study participants were analyzed using NutriSurvey software. Data were analyzed descriptively, and data processing was performed using Microsoft Excel. Nutritional data of the pudding formulas and nutrient intake data of the respondents were analyzed using NutriSurvey.

This study obtained Ethical Clearance from the Health Research Ethics Committee (KEPK) of RSUD dr. Soedomo Trenggalek, with Ethical Clearance Number 000.9/395/406.010.001/18.00/2026, valid from June 24, 2026 to December 24, 2026.

3. Results

Characteristics of the Subjects

The subjects were five outpatients at RSUD dr. Soedomo Trenggalek diagnosed Diabetes mellitus (DM) complicated by atherosclerotic cardiovascular disease (ASCVD). Three subjects were classified as overweight,

while two had normal nutritional status. Based on HbA1c and fasting blood glucose examinations, all subjects had hyperglycemic diabetes mellitus. Blood pressure measurements showed that all subjects had hypertension. In general, the patients' dietary patterns did not yet comply with the recommended 3J principles of diabetes mellitus dietary management, namely the right amount, type, and schedule. Their meal schedules were irregular, and they continued to consume simple carbohydrate sources daily. Their consumption of vegetables and fruits was inadequate in both quantity and variety. In terms of food preparation methods, the patients generally used coconut milk and cooking oil to prepare side dishes and vegetables.

Nutritional Content of BUBELLA Pudding

Table 2. Nutritional Content of the BUBELLA Pudding Formula

Nutrients	Unit	Formula A		Formula B		Formula C	
		/4 serving	/serving	/4 serving	/serving	/4 serving	/serving
Energy	kcal	372,60	93,15	353,80	88,45	346,90	86,73
Protein	g	13,80	3,45	13,60	3,40	13,30	3,33
Fat	g	4,40	1,10	4,20	1,05	4,00	1,00
Carbohydrate	g	80,50	20,13	76,10	19,03	74,20	18,55
Fiber	g	27,30	6,83	22,40	5,60	20,10	5,03

BUBELLA pudding contains adequate amounts of energy, protein, fat, and carbohydrates, as well as a high fiber content.

Organoleptic Test Results of BUBELLA Pudding

Table 3. Mean Hedonic Scores of the Panelists Organoleptic Test for the BUBELLA Pudding Formulations

Attribute	Formula A	Formula B	Formula C
Color	3,33	3,87	3,47
Taste	3,33	3,93	3,27
Aroma	3,53	4,20	3,53
Texture	3,07	4,13	3,33
Mean	3,32	4,03	3,40

The selected formula was Formula B, which had the highest hedonic score of 4,03. It contained 88,45 kcal of energy, 3,4 g of protein, 1,05 g of fat, 19,03 g of carbohydrates, and 5,6 g of dietary fiber.

Formula B was implemented as a snack for outpatients DM with ASCVD, provided at 2 servings per day for 2 days. Providing 2 servings of BUBELLA pudding per day can fulfill approximately 10%–15% of the total daily nutritional requirements.

Respondents Acceptability of BUBELLA Pudding

Table 4. Hedonic Scores of Patients with DM complicated by ASCVD

Attribute	Hedonic Score
Color	4,40
Taste	4,60
Aroma	4,80
Texture	4,80
Mean	4,65

The mean hedonic score of 4,65 obtained from patients with DM complicated by ASCVD for BUBELLA pudding indicates that the BUBELLA pudding was well-liked by the patients.

Table 5. Monitoring of BUBELLA Pudding Acceptability

Patient	Day 1		Day 2	
	Pudding Intake	Remakrs	Pudding Intake	Remakrs
1	100%	Consumed according to schedule. No digestive complaints.	100%	Consumed according to schedule. No digestive complaints.

Patient	Day 1		Day 2	
	Pudding Intake	Remakrs	Pudding Intake	Remakrs
2	75%	Consumed according to schedule. Still felt full after breakfast and consumed fried foods. No digestive complaints.	100%	Consumed according to schedule. No digestive complaints.
3	100%	Consumed according to schedule. No digestive complaints.	100%	Consumed according to schedule. No digestive complaints.
4	100%	Consumed according to schedule. No digestive complaints.	100%	Consumed according to schedule. No digestive complaints.
5	100%	Consumed according to schedule. No digestive complaints.	100%	Consumed according to schedule. No digestive complaints.

Monitoring of Energy, Protein, Fat, Carbohydrate, and Fiber Intake

Table 6. Monitoring of Energy, Protein, Fat, Carbohydrate, and Fiber Intake

Patient	Period	Description	Energy	Protein	Fat	Carbohidrate	Fiber
1	Before	Intake (%)	81,97	85,06	118,86	70,89	44,38
		Category	Mild deficit	Mild deficit	Adequate	Moderate deficit	Severe deficit
	After	Intake (%)	84,93	94,63	92,65	84,31	111,18
2	Before	Intake (%)	124,21	93,97	142,65	124,00	25,00
		Category	Excessive	Adequate	Excessive	Excessive	Severe deficit
	After	Intake (%)	94,60	96,18	115,49	92,88	118,86
3	Before	Intake (%)	120,54	79,54	150,25	120,99	56,29
		Category	Excessive	Moderate deficit	Excessive	Excessive	Severe deficit
	After	Intake (%)	92,48	92,06	99,85	92,19	87,36
4	Before	Intake (%)	123,87	100,87	149,17	122,01	43,57
		Category	Excessive	Adequate	Excessive	Excessive	Severe deficit
	After	Intake (%)	93,64	91,86	97,27	93,78	86,76
5	Before	Intake (%)	85,96	84,83	130,82	72,14	39,08
		Category	Mild deficit	Mild deficit	Excessive	Moderate deficit	Severe deficit
	After	Intake (%)	93,72	96,77	94,13	95,74	98,41

The results of the energy intake recall before the intervention with BUBELLA pudding showed that 3 patients (60%) were classified as having excessive energy intake, while 2 patients (40%) had a mild energy deficit. After the BUBELLA pudding intervention, 4 patients (80%) had adequate energy intake, while 1 patient (20%) had a mild energy deficit.

The results of the protein intake recall before the intervention with BUBELLA pudding showed that 2 patients (40%) were classified as having adequate protein intake, 2 patients (40%) had a mild protein deficit, and 1 patient (20%) had a moderate protein deficit. After the BUBELLA pudding intervention, all 5 patients (100%) were classified as having adequate protein intake.

The results of the fat intake recall before the intervention with BUBELLA pudding showed that 4 patients (80%) were classified as having excessive fat intake, while 1 patient (20%) had adequate fat intake. After the BUBELLA pudding intervention, all 5 patients (100%) showed a reduction in fat intake and were classified as having adequate intake. These findings indicate that the provision of BUBELLA pudding was associated with a reduction in fat intake among patients with diabetes mellitus complicated by ASCVD, resulting in an adequate intake category.

The results of the carbohydrate intake recall before the intervention with BUBELLA pudding showed that 3 patients (60%) were classified as having excessive carbohydrate intake, while 2 patients (40%) were

classified as having a moderate carbohydrate deficit. After the BUBELLA pudding intervention, 4 patients (80%) were classified as having adequate carbohydrate intake, while 1 patient (20%) had a mild carbohydrate deficit.

The results of the fiber intake recall before the intervention with BUBELLA pudding showed that all 5 patients (100%) were classified as having a severe fiber intake deficit. After the BUBELLA pudding intervention, all respondents experienced an increase in fiber intake, with 3 patients (60%) classified as having adequate fiber intake and 2 patients (40%) classified as having a mild fiber intake deficit.

This indicates that the provision of BUBELLA pudding accompanied by nutrition education contributed to optimizing energy, protein, fat, carbohydrate, and fiber intake among patients with DM complicated by ASCVD, resulting in an adequate intake category.

Blood Pressure Monitoring of Patients

Table 7. Blood Pressure Before and After Consuming the Pudding

Patients	Blood Pressure (mmHg)		Description
	Before	After	
1	185/98	155/90	decreased
2	167/95	148/82	decreased
3	181/92	142/85	decreased
4	175/89	148/81	decreased
5	165/94	145/83	decreased

The results of blood pressure monitoring in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD) after consuming two servings of BUBELLA pudding daily for two days showed that all five patients (100%) experienced a decrease in blood pressure, although their blood pressure levels remained above the normal range. The administration of two servings of BUBELLA pudding daily for two days had an effect on reducing blood pressure in patients with DM complicated by ASCVD.

Blood Glucose Monitoring

Table 8. Fasting Blood Glucose Levels Before and After Consuming the Pudding

Patients	Fasting Blood Glucose (mg/dl)	
	Before	After
1	276	205
2	440	153
3	182	142
4	191	113
5	307	166

The results of fasting blood glucose monitoring after the administration of BUBELLA pudding showed that all five patients (100%) experienced a decrease in fasting blood glucose levels toward the normal range. This indicates that consuming two servings of BUBELLA pudding over two days, accompanied by nutritional education on a diabetes mellitus diet, had an effect on reducing fasting blood glucose levels in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD)

4. Discussion

BUBELLA pudding contains adequate nutrients, with each serving providing 88,45 kcal of energy, 3,4 g of protein, 1,05 g of fat, 19,03 g of carbohydrates, and 5,6 g of dietary fiber. Providing two servings of BUBELLA pudding per day can fulfill approximately 10–15% of the nutritional requirements of patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD). The cost analysis showed that BUBELLA pudding is highly affordable because it is made from guava, starfruit, and pumpkin, which are abundantly available at low prices in local markets in Trenggalek. In addition, the pudding preparation process is relatively simple, making BUBELLA pudding feasible for sustainable daily consumption by patients.

The results of the patient acceptability assessment through an organoleptic test showed a relatively high mean hedonic score of 4,65, indicating that BUBELLA pudding was well-liked and accepted by the respondents in terms of taste, color, aroma, and texture.

The results of energy intake monitoring after consuming BUBELLA pudding showed that 4 respondents (80%) were categorized as having adequate energy intake, while 1 respondent (20%) had a mild deficit. This indicates that the provision of BUBELLA pudding accompanied by nutritional education was able to optimize energy intake in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with

ASCVD). According to the Indonesian Ministry of Health [9], the energy content per 100 g of food ingredients is 39 kcal for pumpkin, 50.9 kcal for guava, and 32 kcal for starfruit. Providing two servings of BUBELLA pudding per day, containing 176.9 kcal of energy, can fulfill approximately 10–15% of the energy requirements of patients with DM complicated by ASCVD.

The results of protein intake monitoring after the BUBELLA pudding consumption intervention showed that all respondents were categorized as having adequate protein intake. This indicates that providing BUBELLA pudding accompanied by nutritional education can optimize protein intake in patients with DM complicated by ASCVD. The addition of diabetes-specific milk to BUBELLA pudding serves as a source of low-fat protein. Providing two servings of BUBELLA pudding per day, containing 6.8 g of protein, can fulfill approximately 10–15% of the protein requirements of patients with DM complicated by ASCVD.

According to PERSAGI and ASDI [10], the protein requirement for patients with diabetes mellitus is 10–20% of total energy intake. According to Hardinsyah and Supriasa [11], protein is one of the essential macronutrients for human life, in addition to carbohydrates and fats. The primary function of protein is to support growth and replace damaged cells. Protein is used as an energy source when energy availability from other sources, namely carbohydrates and fats, is insufficient, through the process of gluconeogenesis [12]. In addition to its role in building and repairing damaged cells, protein consumption can also reduce or delay hunger, thereby helping prevent people with diabetes from excessive eating habits that may contribute to obesity [13].

The results of fat intake monitoring after the BUBELLA pudding consumption intervention showed that all respondents experienced a decrease in fat intake to the adequate intake category. This indicates that the provision of BUBELLA pudding had an effect on reducing fat intake in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD), bringing their intake into the adequate category. The quality of dietary fat consumed affects metabolic targets and cardiovascular risk. The recommended fats include monounsaturated fatty acids, polyunsaturated fatty acids, and long-chain fatty acids, such as those found in fish, nuts, and seeds. Fish consumption, particularly fatty fish, at least twice a week is recommended for people with diabetes mellitus [1]. Dietary fat is useful for meeting energy requirements, facilitating the absorption of vitamins A, D, E, and K, and enhancing the palatability of food. Excessive fat intake is one of the factors contributing to insulin resistance and overweight [13].

The results of carbohydrate intake monitoring after the BUBELLA pudding consumption intervention showed that 4 respondents (80%) were categorized as having adequate carbohydrate intake, while 1 respondent (20%) had a mild deficit. This indicates that the provision of BUBELLA pudding accompanied by nutritional education contributed to optimizing carbohydrate intake among outpatients with DM and ASCVD, bringing their intake into the adequate category. According to PERKENI [1], monitoring carbohydrate intake based on carbohydrate counting or other methods is still necessary because carbohydrate intake determines postprandial blood glucose levels and the need for insulin adjustment. Recommended carbohydrate sources are those rich in nutrients and fiber (≥ 14 g of fiber per 1,000 kcal), including fruits, vegetables, whole grains, and legumes. Carbohydrate sources that are high in protein should be avoided in patients with diabetes because protein can increase the insulin response and thereby increase the risk of hypoglycemia.

The results of fiber intake monitoring after the BUBELLA pudding consumption intervention showed that all respondents experienced an increase in fiber intake. Three respondents (60%) experienced an increase in fiber intake to the adequate category, while 2 respondents (40%) remained in the mild-deficit category. This indicates that the provision of BUBELLA pudding contributed to optimizing fiber intake in patients with DM complicated by ASCVD. BUBELLA pudding is made from ingredients with relatively high fiber content. According to the Indonesian Ministry of Health [9], the fiber content per 100 g of food ingredients is 5.4 g for guava, 0.5 g for starfruit, and 2.8 g for pumpkin. Providing two servings of BUBELLA pudding per day, containing 11.2 g of fiber, can fulfill approximately 40–50% of the fiber requirements of patients with DM complicated by ASCVD.

The results of blood pressure monitoring in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD) after consuming BUBELLA pudding showed that all respondents experienced a decrease in blood pressure, although their blood pressure levels remained above the normal range. The administration of two servings of BUBELLA pudding over two days, accompanied by nutritional education on a diabetes mellitus diet and sodium restriction, had an effect on reducing blood pressure in patients with DM complicated by ASCVD. These findings are consistent with a study conducted by Safinatunnajah et al. [14], which reported that consuming starfruit juice for three days could reduce blood pressure in patients with hypertension because starfruit is rich in potassium, an essential mineral for the body. Potassium plays an important role in maintaining normal muscle function. It also has a vasodilatory effect by relaxing the walls of blood vessels, causing them to widen. As a result, blood flow through the vessels becomes smoother, which can contribute to a reduction in blood pressure.

The results of fasting blood glucose monitoring after the administration of BUBELLA pudding showed that all respondents experienced a decrease in fasting blood glucose levels toward the normal range. This indicates that consuming two servings of BUBELLA pudding over two days, accompanied by nutritional education on a diabetes

mellitus diet, had an effect on reducing fasting blood glucose levels in patients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD).

Red guava (*Psidium guajava* L.) is classified as a low-glycemic-index food, with a glycemic index of 19, making it suitable for consumption by people with diabetes mellitus [15]. Guava pulp contains a high amount of pectin, a type of dietary fiber that delays glucose absorption in the intestine, thereby preventing sudden increases in blood glucose levels [4].

Starfruit (*Averrhoa carambola*) contains a high amount of insoluble dietary fiber, which is considered capable of inhibiting glucose absorption, thereby helping to lower and prevent spikes in blood glucose levels [6]. Pumpkin is a food ingredient rich in dietary fiber, particularly pectin. Its high dietary fiber content in the form of pectin can help regulate serum insulin levels, lower blood glucose levels, improve glucose tolerance, and provide protection against various diseases, including diabetes, cardiovascular disease, constipation, and colorectal cancer [16]. Pumpkin (*Cucurbita moschata* Duch.) is also a food ingredient rich in dietary fiber, particularly pectin, which can help regulate blood glucose levels [7].

5. Conclusions and Recommendations

Conclusion

The administration of BUBELLA pudding accompanied by nutritional education on a diabetes mellitus diet was able to optimize energy, protein, fat, carbohydrate, and fiber intake, as indicated by the post-intervention intake monitoring results, in which most respondents were categorized as having adequate intake. BUBELLA pudding was also able to reduce the respondents' blood pressure, although it remained above the normal range, and reduce fasting blood glucose levels toward the normal range.

Recommendation

Further research is needed with a sufficiently long study period and a larger number of respondents to obtain a more comprehensive understanding of the benefits of BUBELLA pudding. Future studies should also assess its effects on nutritional status and lipid profiles in outpatients with diabetes mellitus complicated by atherosclerotic cardiovascular disease (DM with ASCVD).

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