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Innovation In *Dioscorea Hispida* Functional Food Products To Improve Nutrition For The Elderly In Preventing Osteoporosis In Old Age

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ABSTRACT

Dioscorea Hispida is a tuberous plant that grows wild in forests and is distributed throughout Indonesia, including in Bima City, West Nusa Tenggara. Dioscorea Hispida is the main source of carbohydrates and a source of calcium that functions to maintain health and bone formation. This study aims to determine the effect of Dioscorea Hispida sponge cake on the nutritional status of the elderly. The type of research used is experimental research with a correlation study research design. The research population was all elderly people in Saleko Village, Bima City, NTB. The research sample consisted of 30 elderly respondents aged 60-65 years. Data analysis was carried out with univariate, bivariate, and chi square pearson tests. Based on the results of univariate analysis, the frequency distribution of respondent characteristics consisted of 23.3% aged 63 years. while the results of the frequency analysis of respondents who experienced body pain ranged from 40% and those who did not experience body pain ranged from 60%. The distribution of respondents with hunched posture ranged from 56.7% and non-hunched posture ranged from 43.3%. the results of bivariate analysis showed that the relationship between the provision of innovative food products from Dioscorea Hispida on elderly health had a significant effect Asymp.Sig. (2-Sailed) around 0.023%. It can be concluded that the provision of sponge cake innovation products made from Diascorea hispida has a positive influence on the nutritional health of elderly people with osteoporosis.

Keywords: *Dioscorea, Food, Osteoporosis*

INTRODUCTION

Osteoporosis is a systemic skeletal disorder that is often encountered (Holroyd et al., 2021; Schwesig et al., 2006). Osteoporosis is characterized by a combination of reduced osteoblastic matrix formation and increased osteoclastic bone resorption, with the final result being a decrease in bone mineral density (BMD). Indonesian women are four times more at risk of osteoporosis than men. In a 2006 study, the prevalence of osteoporosis in Indonesian women aged 50-80 years was 23%, and in the age range of 70-80 years it increased to 53% (Figure 1). 2.3 In addition to age and gender, other influential risk factors are family history of osteoporosis, post-menopause (natural or artificially induced), low calcium diet, smoking, excessive consumption of alcohol and caffeine, long-term steroid use, and inadequate physical exercise. In addition, long-term immobilization and inflammation also increase the risk of regional osteoporosis (Chang et al., 2016; Jakobsen et al., 2012; Luettje, 2015; Strukov et al., 2022).

Osteoporosis increases mortality and morbidity, mainly due to its complications, namely vertebral and hip fractures.7 There are various osteoporosis therapies, such as estrogen (for women only), anabolic hormones, bisphosphonates, calcitonin, vitamin D, calcium, sodium fluoride. Adequate intake of calcium and vitamin D during bisphosphonate therapy plays an important role in the success of treatment, especially in elderly patients who tend to have less sun exposure, poor dietary intake, and decreased kidney function. Adequate intake of calcium and vitamin D supports bone formation and maintenance of bone density, which in the long run may reduce the incidence of falls in high-risk elderly (Boykinov et al., 2001; Kasumova et al., 2004; Luettje, 2015).

Bone contains 99% of the body's calcium, which will be mobilized if serum calcium levels are low Vitamin D deficiency can reduce dietary calcium absorption, leading to secondary hyperparathyroidism with decreased skeletal calcium to maintain normocalcemia levels. Given the range of vitamin and mineral content deficiencies that lead to bone loss (osteoporosis), it is necessary to provide nutrients that contain high levels of calcium and iron. one of the functional foods that have high calcium and iron levels is the diascorea hispida plant (Valera et al., 2019).

The *Dioscorea Hispida* plant, also known as Ubi Gadung in eastern Indonesia, is a poisonous tuberous root crop that contains the alkaloid dioscorin. Alkaloid compounds from tubers can cause vomiting, drowsiness, dizziness, and nausea in humans. *Dioscorea Hispida* tubers can be eaten after the dioscorin compounds are removed. There are several ways to remove dioscorin alkaloid compounds in *Dioscorea Hispida* plants, such as using curing methods. As for some of the processes of removing toxins in Dioscorea hispida, namely through boiling, steamed grilling, peeling and frying to facilitate the reduction of cyanide levels (Lutz et al., 2019; Saleha, Saidi, ., et al., 2018).

Previous research on *Dioscorea Hispida* starch showed that hydrogels made from starch function as antibacterial agents to prevent microorganism activity. In addition, starch is known as an environmentally friendly alternative material and offers the most favorable prospects for sustainable use. This is due to its availability from renewable sources, low cost, and wide application possibilities in non-food and food products. Generally, carbohydrates, the main substance stored in starch, exist naturally in the form of granules. These granules are generally obtained in stems, tubers, seeds, and leaves with diameters ranging from 1 µm to more than 100 µm with various shapes, e.g. polygonal, polyhedral, irregular, round, oval, and angular (Saleha, Saidi, ., et al., 2018; Valera et al., 2019).

In addition, the ash content of *Dioscorea Hispida* starch is relatively high due to the presence of phosphate groups. In terms of metals, the ash of native starch is mainly composed of potassium, calcium, sodium, and magnesium. The carbohydrate content of *Dioscorea Hispida* tuber composition is more than 80%, although it differs according to genetic, ecological, and agronomic factors. This can be seen in the starch obtained from chemical composition analysis, which has a carbohydrate content of 83% (Hazrati et al., 2021).

Minerals are part of the body that plays an important role in maintaining body functions at the level of cells, tissues, organs and overall body functions. Minerals also play a role in various stages of metabolism, especially as enzyme co-factors, maintenance of acid-base balance, helping the transfer of important bonds through cell membranes and maintaining the sensitivity of muscles and nerves to stimuli are some of the functions of minerals. Macro minerals are minerals that the body needs in amounts of more than 100 mg per day, while micro minerals are needed less than 100 mg per day. Not all elements absorbed by plants are nutrients. Plant composition is influenced by soil, environmental conditions, and genetic factors. This study uses the atomic absorption spectrophotometry method which is based on the accuracy of the instrument, speed of analysis, does not require preliminary separation and is very precise for determining the nutrient content of plants (Hazrati et al., 2021; Lutz et al., 2019; Putra et al., 2022; Saleha, Saidi, ., et al., 2018; Valera et al., 2019).

The results showed that the concentrations of iron (0.6445 + 0.0029 mg/100g), cadmium (0.0011 + 0.0083 mg/100g), potassium (265. 2780 + 0.4652 mg/100g), calcium (5.1015 + 0.0490 mg/100g), sodium (8.3011 + 0.0974 mg/100g), magnesium (29.0237 + 0.0706 mg/100g), copper (0.1110 + 0.0019 mg/100g), and zinc were (0.6113 + 0.0026 mg/100g). In addition, *Dioscorea Hispida* plants also contain major minerals, one of which is calcium which plays an important role in the formation and maintenance of bones (Hazrati et al., 2021; Valera et al., 2019).

Table 1. Nutrient Content of *Dioscorea Hispida* Dennst Tubers

Parameter	Amount
Calories (cal)	101
Protein (g)	2
Fat (g)	0.2
Carbohydrate (g)	23.23
Calcium (mg)	20
Phosphor (mg)	69
Iron (mg)	0.6
Vitamin B1 (mg/100g)	0.10
Water (g)	73.5
Vitamin C (mg/100g)	9.0
Consumable part (%)	85

Source: (Hazrati et al., 2021)

Based on the background above, therefore the purpose of this study is to determine the effect of giving innovative sponge cake products made from diascorea hispida on the nutritional status of elderly people with osteoporosis.

METHOD

This type of research is analytical observational with a cross sectional research design to determine the relationship between the provision of diascorea hispida innovation products on the nutritional status of the elderly in osteoporosis patients. This study was located in sarae village, bima city, west Nusa Tenggara. The study population included all osteoporosis patients in sarae village, bima city, NTB. The research sample consisted of 30 osteoporosis patients in sarae village, bima city, NTB with random sampling technique. Data collection techniques were carried out by observation, interviews, and giving treatment using innovative sponge cake products made from diascorea hispida for 7 days. data analysis techniques are carried out by univariate, bivariate tests with the determination of chi square values.

RESULTS AND DISCUSION

Univariate Analysis Results

Based on the results of bivariate analysis, the distribution of birth height and the distribution of wasting prevalence can be seen in tables 1 and 2.

Table 1. Age frequency distribution of osteoporosis respondents

BB/TB	N	%
60	5	16.7
61	2	6.7
62	4	13.3
63	7	23.3
64	6	20.0
65	6	20.0
Total	30	100

Based on table 1, the characteristics of respondents based on the results of univariate analysis consisted of 23.3% aged 63 years.

Table 2. Frequency distribution of body pain of respondents with osteoporosis

Body Pain	n	%
Body Pain	12	40
No body pain	18	60
Total	30	100

Based on Table 2, the results of the analysis show that those who experience body pain are around 40% while those who do not experience body pain are around 60%.

Table 3. Frequency distribution of posture of respondents with osteoporosis

Body Posture	n	%
Hunchback	17	56.7
No Hunchback	13	43.3
Total	30	100

Based on Table 3, the results of the analysis show that respondents with a hunched posture are around 56.7% while those with a non-hunched posture are around 43.3%.

Table 4. Frequency distribution of body balance of respondents with osteoporosis

Body Balance	n	%
Unbalanced	16	53
Balanced	14	46.7
Total	30	100

Based on Table 4, the results of the analysis showed that respondents with unbalanced bodies were 53.0%, while respondents with balanced bodies were 46.7%.

Bivariate Analysis Results

Based on the results of the analysis of the relationship between the provision of innovative food products from *Dioscorea Hispida* on the health of the body of osteoporosis sufferers in terms of 3 aspects consisting of body pain, posture, and body balance.

Table 5. Analysis of Birth Weight on Underweight Prevalence

Respondent Condition	***Dioscorea Hispida* administration in patients with Osteoporosis**						**Asymp. Sig. (2 Sailed)**
	Body Pain		**Body Posture**		**Body Balance**		
	n	%	n	%	n	%	
Stable	12	40.0	13	43.3	14	46.7	0.023
Unstable	18	60.0	17	56.7	16	53.3	

The results of the analysis show that the relationship between the provision of innovative food products from *Dioscorea Hispida* on elderly health has a significant influence. This can be seen from the value of Asymp.Sig. (2-Sailed) value around 0.023%. This is supported by the results showed that the concentration of iron (0.6445 + 0.0029 mg/100g), cadmium (0.0011 + 0.0083 mg/100g), potassium (265. 2780 + 0.4652 mg/100g), calcium (5.1015 + 0.0490 mg/100g), sodium (8.3011 + 0.0974 mg/100g), magnesium (29.0237 + 0.0706 mg/100g), copper (0.1110 + 0.0019 mg/100g), and zinc were (0.6113 + 0.0026 mg/100g) (Hazrati et al., 2021; Valera et al., 2019). In addition, *Dioscorea Hispida* plants also contain key minerals, one of which is calcium, which plays an important role in bone formation and maintenance. *Dioscorea Hispida* tubers also contain thick mucus consisting of water-soluble glycoproteins and polysaccharides which are bioactive ingredients that function as water-soluble dietary fiber and are hydrocolloids that are beneficial for lowering blood glucose levels and total cholesterol levels, especially LDL (Low Density Lipoprotein) cholesterol (Lutz et al., 2019; Saleha, Saidi, ., et al., 2018).

Osteoporosis is a disorder of bone metabolism due to decreased bone mass. The decrease in bone mass is caused by the speed of bone resorption which is greater than the speed of bone formation in continuous installments, the bones become brittle and break easily, even by light pressure 1) The incidence of osteoporosis in the elderly (elderly) will have a very bad impact on the sufferer. Osteoporosis in the elderly will lead to fractures in the bones which in turn can lead to high mortality. 3) Hip joint fractures cause many complications and even death. Patients with hip joint fractures have a six times greater risk of death than patients who do not have hip fractures (Kasumova et al., 2004; Kumoro et al., 2020; Sahoo et al., 2022; Saleha, Saidi, Rasnovi, et al., 2018).

In general, the mortality rate reaches 10-15% while the mortality rate a year after the fracture reaches 20% This fracture causes a large economic burden and is estimated to cost up to 300 trillion per year. 4) Bone density can be influenced by genetic factors, gender, nutritional status, nutrient intake and lifestyle such as smoking habits, caffeine consumption habits (coffee or tea drinks), excessive alcohol and physical activity. Lack of physical activity in youth will have an impact on bone density in old age. Physical activity is important in the process of osteoblast (bone formation) and bone mass density. the lower the physical activity, the greater the risk of osteoporosis (Aghaalikhani et al., 2012; Jakobsen et al., 2012; Luettje, 2015).

CONCLUSION

Based on the results of univariate analysis, the frequency distribution of respondent characteristics consisted of 23.3% aged 63 years. while the results of the frequency analysis of respondents who experienced body pain ranged from 40% and those who did not experience body pain ranged from 60%. the distribution of respondents with hunched posture ranged from 56.7% and non-hunched posture ranged from 43.3%. the results of bivariate analysis showed that the relationship between the provision of innovative food products from *Dioscorea Hispida* on elderly health had a significant effect Asymp.Sig. (2-Sailed) around 0.023%. It can be concluded that the provision of sponge cake innovation products made from Diascorea hispida has a positive influence on the nutritional health of elderly people with osteoporosis.

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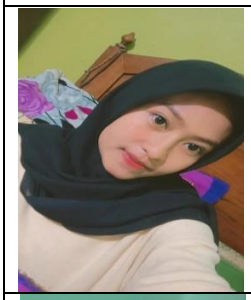	**Nabila Chairani Putri,** is an Students of nutrition study program, Faculty of Health, University of Muhammadiyah Bima. The author was born in Bima on August 30, 2005. The author is the second child of (Mr. Yudi Firmansyah and Mrs. S. Kartini). The author began attending elementary school at the age of 7 at SDN 21 Kota Bima. After completing elementary school, the author continued his junior high school education at MTsN 1 Kota Bima, then after that the author continued his senior high school education at MAN 2 Kota Bima, and after completing his senior high school education the author chose to continue his education at Muhammadiyah Bima University by taking the Nutrition Study Program. During the school period the author was active as a school volleyball athlete, and had participated in the inter-high school volleyball competition in the city of Bima in 2022.
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