Indonesian Journal of Global Health Research
Volume 7 Number 2, April 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

ACCEPTABILITY TEST OF RAINBOW MEATBALL AS AN ALTERNATIVE SNACK TO PREVENT ANEMIA IN ADOLESCENTS

Kusmini Suprihatin*, Ani Intiyati, Siti Maemunah
Politekkes Kemenkes Surabaya, Jl. Pucang Jajar Tengah No.56, Kertajaya, Gubeng, Surabaya, East Java 60282, Indonesia
*berkas.kusmini@gmail.com

ABSTRACT

Anemia is a health problem that can occur in all age groups ranging from toddlers to the elderly. Adolescent girls are prone to anemia due to the monthly menstrual cycle. Anemia in adolescents is defined as a state of hemoglobin (Hb) levels in the blood less and normal numbers according to sex and age groups. The incidence of anemia in East Java in 2021 showed a percentage of 57.1%. Meanwhile, the incidence of anemia in Sidoarjo district is 46.7%. In setting a diet with balanced nutrition in adolescent girls, iron intake is so important, so snack innovations with high iron content are needed.Objectives: To determine the acceptability of rainbow meatballs as an alternative iron-rich snack to prevent anemia in adolescent girlsMethods: This research design is a Pre Experiment research design with organoleptic tests on 30 adolescents aged 10-19 years as panelists with random sampling technique. The population was taken from a class of 42 students of the Diploma in Nutrition Program who had been trained. The sample was determined based on the slovin formula and 30 panelists were obtained with an alpha of 0.01. The data that has been collected will then be processed, tabulated, and interpreted, and analyzed. the data analysis technique used is the Kruskal Wallis statistical test and continued with Mann Whitney.Results: The most preferred formula and has the highest iron content is formula 3 with an average value of 4.01 and iron content of 0.41 mg each 100 g of product. The results of statistical tests using Kruskal Wallis showed significant differences in taste and appearance indicators, which then after further testing using Mann Whitney found significant differences between the 3 rainbow meatball formulas on taste and appearance indicators.Conclusions: The most preferred rainbow meatball formulation by panelists is formula 3 with an average score of 4.01. In the Kruskal Wallis statistical test, differences were found in the taste and appearance indicators. After further testing using Mann Whitney on the taste indicator, there was a significant difference between three formulation of rainbow meatballs. The formulation with the highest iron content is formula 3 with the addition of carrot extract.

Keywords: anemia; alternative snack; iron; meatball

How to cite (in APA style)
Suprihatin, K., Intiyati, A., & Maemonah, S. (2025). Acceptability Test of Rainbow Meatball as an Alternative Snack to Prevent Anemia in Adolescents. Indonesian Journal of Global Health Research, 7(2), 833-840. https://doi.org/10.37287/ijghr.v7i2.5913.

INTRODUCTION

Anemia is a health problem that can occur in all age groups ranging from toddlers to the elderly. Adolescent girls are prone to anemia due to the monthly menstrual cycle. Anemia in adolescents is defined as a state of hemoglobin (Hb) levels in the blood less and normal numbers according to sex and age groups. The threshold value of anemia based on WHO provisions for adolescent females is 12 g/dL while for males it is 13 g/dL(Hasyim et al., 2018). World Health Organization noted the prevalence of anemia in women aged 15-49 years worldwide was 29.9% in 2019. Based on Basic Health Research 2018, the prevalence of anemia in adolescents is 32%, meaning that 3-4 out of 10 adolescents suffer from anemia. This is influenced by the habit of non-optimal nutritional intake and lack of physical activity(Estiasih et al., 2014; Kementerian Kesehatan RI, 2018). The incidence of anemia in East Java in 2021 showed a percentage of 57.1%. Meanwhile, the incidence of anemia in Sidoarjo district is 46.7%(Lilyanti et al., 2023).

The first cause of anemia is nutrient deficiency, namely low intake of nutrients both animal and vegetable, which are food sources of iron, and chronic infectious diseases such as tuberculosis, HIV/AIDS, and malignancies. Anemia in adolescents has a negative impact on reducing immunity, concentration, learning achievement, adolescent fitness and productivity(Ashar et al., 2023). Anemia in adolescent girls is at risk of increasing stunting. Adolescent girls are prone to anemia because they lose a lot of blood during menstruation. Adolescent girls have a higher risk of anemia due to increased demand, low intake of hematopoietic nutrients and low intake of nutrients that increase their absorption of hematopoietic nutrients(Engidaw et al., 2018). Adolescent girls who suffer from anemia are at risk of anemia during pregnancy. This will have a negative impact on the growth and development of the fetus in the womb and has the potential to cause complications of pregnancy and childbirth, even causing maternal and child death(Yusnita et al., 2024). Rainbow meatballs is a snack that presents pentol with attractive and bright colors to add visual appeal. The pentol is made with a beef base with a mixture of iron-rich vegetable extracts as natural coloring while increasing the iron content in the snack. The rainbow colors are extracted from the vegetable ingredients pokcoy, broccoli, beetroot, carrot using a slow juicer to produce natural colors to be mixed in the process of making rainbow meatballs. The purpose of this study is to analyze the acceptability test and Fe content of rainbow meatballs as an alternative snack to prevent anemia in adolescents in Sidoarjo regency

METHOD

This research design is a pre experiment research design with organoleptic tests on 30 adolescents aged 10-19 years as panelists. The sampling technique used is random sampling. The population was taken from a class of 42 students of the Diploma in Nutrition Program who had been trained. The sample was determined based on the slovin formula and 30 panelists were obtained with an alpha of 0.01. Organoleptic test is a sensory evaluation method used to measure human response to the organoleptic (sensory) characteristics of a food or beverage product. It involves the use of the five human senses, such as sight, smell, taste, and touch, to evaluate various aspects of the product, such as taste, aroma, texture, and appearance. Meanwhile, iron content testing was conducted at PT Saraswanti Indo Genetech Surabaya, AMG Tower, Lt 12, Jalan. Dukuh Menanggal No. 1-A, Gayungan, Surabaya, East Java, Postal Code 60234. The data that has been collected will then be processed, tabulated, and interpreted, and analyzed. the data analysis technique used is the Kruskal Wallis statistical test and continued with Mann Whitney.

RESULT

Table 1.
Characteristic of Rainbow Meatball

Indicator	Formulation		
	Formula 1 (meatball + beetroot extract)	Formula 2 (meatball + pokcoy + broccoli extract)	Formula 3 (meatball + carrot extract)
Taste	The distinctive taste of savory beef meatballs with a slight bitter sensation after eating	Savory beef meatballs with a hint of vegetable bitterness and languor.	Savory beef meatballs with a hint of carrot sweetness
Texture	Chewy and soft	Chewy and soft	Chewy and soft
Aroma	Savory aroma of beef meatballs	Savory aroma of beef meatballs	Savory aroma of beef meatballs
Appearance	Round in shape with a slight rough texture on the surface with a color according to the characteristics of beet fruit extract.	Round in shape with a slight rough texture on the surface with a color characteristic of pakcoy and broccoli extracts	Round in shape with a slight rough texture on the surface with a color characteristic of carrot extracts
Color	Slightly pale purplish red	Light green	Orange

Table 2.
Organoleptic Test Results

Indicator	Formulation		
	Formula 1 (meatball + beetroot extract)	Formula 2 (meatball + pokcoy + broccoli extract)	Formula 3 (meatball + carrot extract)
Taste	3	3,8	4,43
Texture	4,1	4,1	4,06
Aroma	3,6	3,9	3,8
Appearance	3,36	3,3	4,1
Color	3,6	3,2	3,7
Average	3,53	3,66	4,01

Based on the table above the rainbow meatball formulation, the output of the level of liking is obtained using the organoleptic test assessment (hedonic scale). Overall, based on 5 indicators, namely taste, texture, aroma, appearance, and color in rainbow meatballs with 3 formulations, the most popular meatball formulation is formula 3 with an average score of 4.01.

Table 3.

Kruskal Wallis Test Results

Indicator	*Kruskal Wallis* Results
Taste	0,001
Texture	0,812
Aroma	0,414
Appearance	0,021
Color	0,463

Based on the table, the results of the Kruskal Wallis test on the taste indicator have a p value = 0.001 and on the appearance indicator has a p value = 0.021 where the p value <0.05, indicating a difference in taste and appearance indicators in the 3 rainbow meatball formulations. Meanwhile, the results of the Kruskal Wallis test on texture, aroma, and color indicators have a p value> 0.05 which indicates there is no difference in these indicators for the 3 rainbow meatball formulations.

Table 4.
Mann Whitney Test Results

Indicator	*Mann Whitney* Results		
	Formula 1 : Formula 2	Formula 1 : Formula 3	Formula 2 : Formula 3
Taste	0,001	0,001	0,729
Appearance	0,413	0,008	0,050

Based on the table above, the Mann Whitney test on the taste and appearance indicators of the 3 formulations of rainbow meatballs formula 1: formula 2; formula 1: formula 3; formula 2: formula 3 has a p value <0.005. This indicates that H0 research is rejected while for H1 research can be accepted, which means that there are differences in the taste and appearance indicators of the 3 rainbow meatball formulations.

Table 5.
Iron Level Test

Formulation	Iron Level (mg/100 g)
Formula 1 (meatball + beetroot extract)	0
Formula 2 (meatball + pokcoy and broccoli extract)	0.22
Formula 3 (meatball + carrot extract)	0.41

Based on the results of the iron content test on the 3 rainbow meatball formulations, it was found that formula 1 did not contain iron, while formula 2 contained 0.22 milligrams of iron in every 100 grams of product, and formula 3 had the highest iron content of 0.41 milligrams in every 100 grams of product.

DISCUSSION

Characteristic of Rainbow Meatball Formulation

The organoleptic test used is the hedonic test or what is often called the liking test. This test was carried out using 30 trained panelists and was conducted at the Taste Test Laboratory, Department of Nutrition, Poltekkes Kemenkes Surabaya. Panelists were asked to give a personal assessment of the rainbow meatball product. Each level of assessment belongs to each formulation, so panelists were asked to provide personal scores and not compare one sample with another. Assessment indicators include taste, texture, aroma, appearance, and color of rainbow meatballs.

Taste

Taste is a sensory response to nerve stimuli that produces sweet, salty, sour, and bitter tastes. Taste in food products is an important attribute that can determine a person's acceptance of a food product. Formula 1 has a distinctive taste of savory beef meatballs with a slight bitter sensation after eating, this is due to the addition of beetroot extract in the processing process, this is in line with research of Maimunah in 2021 which states that beetroot has taste characteristics that tend to be bitter when used in large quantities can affect the taste of a product(Maimunah et al., 2021). Formula 2 has a distinctive taste of savory beef meatballs with a slight bitter and languorous taste, this taste is due to the addition of pakcoy and broccoli extracts, this is in line with research of Fathurrahman in 2023 that the languorous taste and after taste of broccoli can affect the taste of a food product where the languorous sensation is caused by the presence of isothiocyanate compounds and non-volatile glucosinolate precursors(Fathurrahman et al., 2023). While in formula 3 the resulting taste is the typical taste of savory beef meatballs with a little sweetness of carrots.

Texture

Texture is one of the important components in food products that can affect consumer acceptance. Food texture is the result of the tactile sense response to the form of physical stimuli when there is contact between the parts in the oral cavity and food(Sari & Yohana, 2015). In the formulation of rainbow meatballs, the main ingredient used is beef which is then processed with other additional ingredients such as eggs, tapioca flour, and complementary spices which in the manufacturing process also pay attention to appropriate temperature settings, resulting in 3 formulations of rainbow meatballs with the same texture, namely chewy and soft.

Aroma

Aroma is the smell of a product, where odor itself is a response when volatile compounds from a food product enter and are smelled by the nasal cavity. The aroma of the 3 rainbow meatball formulations has no difference, all three have the same aroma, namely a savory aroma with a fairly strong characteristic of beef aroma.

Appearance

Appearance is the way an object reflects and emits light to form a visual that can be described and is usually related to color and shape. Bakso is a processed food product made from round-shaped beef.In this study, meatballs were chosen as one type of food that is widely favored by the public with the addition of vegetable extracts as a natural colorant that can increase a person's interest in the product. Formula 1, formula 2, and formula 3 have the same product shape which is round with a little rough texture on the surface with color variations according to the vegetable extracts added during the processing process. Formula 1 with a slightly pale purplish red color due to the addition of beetroot extract, formula 2 with an easy green color from the addition of pakcoy and broccoli, and formula 3 with orange comes from the addition

of carrot extract. This is in line with research of Diana, Triastuti, and Rizki in 2022 which states that the beta-carotene content in carrots is able to provide a bright orange color so that it can enhance the appearance of the product(Diana et al., 2022).

Color

Color is a major aspect of food both before processing and after processing. Color in food ingredients is a factor that determines the quality of food ingredients and factors that influence the perception of flavor. Based on the findings of the research that has been carried out, it is found that the color of rainbow meatballs has a varied color with differences in formula 1 has a slightly pale purplish red color as a result of the addition of beetroot extract, for formula 2 has a light green color produced by a fairly dominant green pigment derived from pakcoy and broccoli, this is in line with research of Permata, Ismed, and Putri in 2019 which states that the green color in chlorophyll has dominant pigmentation so that it can cover other colors, while formula 3 has an orange color obtained from the addition of carrot extract in the processing process(Permata et al., 2019).

Kruskal Wallis Test

The formulation of rainbow meatballs with the addition of iron-rich vegetable extracts, in addition to being subjectively tested using the organoleptic test, was also statistically tested. This aims to decide whether the research hypothesis is accepted or rejected. The statistical test used is the Kruskal Wallis Test. In its use, data is required to be classified as ordinal data and homogeneous. In addition, if there is a significant difference in each indicator in the hedonic test, the next step can be tested with the Mann Whitney Test to determine which formulation has a significant difference. The results of the Kruskal Wallis test on meatball formulations found significant differences in taste and appearance indicators so that these indicators were continued with the Mann Whitney Test.

Mann Whitney Test

Indicators of taste and appearance of rainbow meatball formulations have significant differences in the results of the Kruskal Wallis test so that further tests are carried out using Mann Whitney. From the test results, it was found that in the taste indicator there was a significant difference between formula 1 with formula 2 and formula 1 with formula 3, while for formulation 2 with formulation 3 there was no significant difference. While in the appearance indicator there is a significant difference between formula 1 with formula 3 and formula 2 with formula 3, while in formula 1 with formula 2 there is no significant difference.

Iron Level Test

Rainbow meatballs are processed food products which in the processing process add iron-rich vegetable extracts, this aims to be an alternative snack for adolescent girls where iron consumption is so important. According to nutritional adequacy rate 2019, the daily iron intake needs of adolescent girls aged 10-19 years are 8-15 milligrams each day(Ummah, 2019). Iron is a mineral micronutrient that plays a role in the process of blood formation, especially hemoglobin, in addition to its function as a cofactor for several enzymes(Muchtar & Effendy, 2023; Purnamasari et al., 2020). Iron (Fe) levels in every 100 grams of rainbow meatball products are 0 mg, 0.22 mg, and 0.41 mg. The highest iron content is in formula 3 so that the recommended serving weight for each serving is 185 grams with an iron content of 0.75 mg, in order to meet the daily iron requirement it is recommended to consume 2 servings of formula 3 rainbow meatballs in one sitting, therefore the amount of iron consumed is 1.5 mg which has reached 10% of the daily requirement. This is in line with Nurul Amalina's research in 2020 which states that carrots have a high iron content so that they can affect a person's hemoglobin levels(Amalina & Sari, 2020). Meanwhile, for formula 2 with the same

portion weight, the iron content is 0.39 mg, so it takes 4 servings in one sitting to meet 10% of daily iron needs.

CONCLUSIONS

Rainbow meatballs are processed food products in which the processing process adds iron-rich vegetable extracts, this aims to be an alternative snack for teenage girls where iron consumption is so important. The most preferred rainbow meatball formulation by panelists is formula 3 with an average score of 4.01. In the Kruskal Wallis statistical test, differences were found in the taste and appearance indicators because the p value was <0.05. After further testing using mann whitney on the taste indicator, there was a significant difference between formula 1 with formula 2 and formula 1 with formula 3. While on the appearance indicator, the significant difference was in formula 1 with formula 3 and formula 2 with formula 3. The results of the crude iron test on the rainbow meatball formula showed that formula 3, namely the addition of carrot extract in the processing process, produced the highest iron content among the other two formulations. In every 100 grams of formula 3 product contained 0.41 milligrams of iron, so the portion weight of each serving of rainbow meatballs forlua 3 is 185 grams with the suggestion of consumption of 2 servings per meal will get the amount of iron intake as much as 1.5 milligrams or 10% of the total daily requirement.

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