



# Downstreaming Research Results on Food Products as Enhancers of Immunity During the Covid-19 Pandemic through Nutrition Education

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Received: December 30, 2022

Revised: February 22, 2023

Accepted: February 25, 2023

Published: February 28, 2023

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DOI: [10.29303/jppipa.v9i2.3021](https://doi.org/10.29303/jppipa.v9i2.3021)

**Abstract:** The World Health Organization (WHO) and the Indonesian government were recommend increasing consumption of food that is safe, diverse and nutritionally balanced, as well as having functional components to increase people's immune system, especially during the Covid-19 pandemic. One of the food that has the potential to increase immunity is yogurt. Previously, research on the development of instant yoghurt flour products from local nuts and Manonjaya zalacca fruit had been carried out. The products of this research need to be downstreamed to Micro, Small and Medium Enterprises (MSMEs), so that it is expected to expand the use of these products to the public. The aim of the study was to determine changes in public knowledge about food consumption to increase the immune system of MSMEs through nutrition education interventions. This research type was a quasi-experimental research with a one group pre-post test design. Sampling was carried out purposively consisting of 15 MSME actors. The intervention provided was nutritional education using lecture and discussion methods as well as dissemination and downstreaming of one of the products resulting from research on yogurt flour from local nuts and Manonjaya salak using a demonstration method. Nutritional education media was a book about preventing Covid-19 infection which has obtained a Copyright from the Ministry of Law and Human Rights with registration number 000389023. The results of measuring knowledge before counseling (pre-test) were 57.3+16.1. After counseling (post-test) the results were 73.8+17.9. Five of the 15 questions significantly increased the percentage answered correctly, namely regarding the types of research products from green and red beans containing probiotics, agents in the mechanism of spreading Covid-19, composition of food in a balanced nutritional cone, definition of probiotics, and examples of types of food as prebiotics. In addition, it is necessary to continue to provide assistance to MSME actors in the production of immunity-boosting food.

**Keywords:** Immunity; Nutritional education; Probiotics-prebiotics; SMEs; Yogurt

## Introduction

The Covid-19 pandemic is still being experienced by all countries, including Indonesia. Handling in controlling the pandemic has been carried out by many parties and various countries. One of the recommendations by both the World Health Organization (WHO) and the government is to increase the body's resistance for all people to control the Covid-

19 pandemic (World Health Organization, 2022). One way to increase immunity is to consume food that is safe, diverse and nutritionally balanced (Yuniarti & Trisnadi, 2022) and has functional components (Lange, 2022). The results of the study prove that to prevent getting infected with Covid-19, people need to get used to a healthy diet and an active life, prevent obesity and lack of intake of nutrients that cause malnutrition (Mentella et al., 2021).

### How to Cite:

Sumarto, S., Radiati, A. ., & Seftiatullaeli, N. . (2023). Downstreaming Research Results on Food Products as Enhancers of Immunity During the Covid-19 Pandemic through Nutrition Education. *Jurnal Penelitian Pendidikan IPA*, 9(2), 762-769. <https://doi.org/10.29303/jppipa.v9i2.3021>

On the other hand, not many people get proper information about a balanced nutritious diet to boost immunity. As a reaction and an effort to deal with the Covid-19 pandemic, several Indonesian government ministries and agencies have issued various kinds of outreach related to increasing food consumption which can increase body immunity. The Ministry of Agriculture of the Republic of Indonesia, for example, has issued guidelines and information related to the choice of Potential Food Ingredients for Anti-Virus and Immun Booster (Mentella et al., 2021).

One food that has the potential to increase endurance is yogurt. Yogurt is one of the most popular fermented milk products worldwide which has great consumer acceptance due to its health benefits apart from its basic nutrition. Yogurt is considered as a probiotic carrier food that can deliver a large number of probiotic bacteria into the body which can claim health, especially related to digestion. Additionally, yogurt reportedly claims to improve lactose tolerance, boost immunity and prevent digestive disorders (Weerathilake et al., 2014).

The author previously conducted research on product development for instant yogurt flour from local nuts and Manonjaya salak in 2020 and 2021. The product already has product characteristics that comply with the Indonesian National Standard (SNI). For example, the characteristics of the number of Lactic Acid Bacteria (LAB) are more than 109 colonies/gram. This finding is being submitted for a patent to the Indonesian Ministry of Law and Human Rights with number S00202105690. One food ingredient that has high fiber has the potential to be added to synbiotic food, namely Manonjaya salak. Based on the results of the study, it showed that the fiber and carbohydrate content in Manonjaya salak flour was quite high (Bachtiar et al., 2018; Aprianty et al., 2018). Fiber acts as a prebiotic that supports the growth of probiotics in the gut (Kusharto, 2006). It is hoped that Manonjaya salak flour can be added to instant yogurt powder products for nuts as a synbiotic food. In addition, Manonjaya salak flour is food that comes from local raw materials typical of the Tasikmalaya district. Thus, instant synbiotic yogurt powder products, nuts and Manonjaya salak flour can increase the added value of local food.

To increase the utilization of the research results above, it is necessary to do downstreaming. The products of this research need to be downstreamed to Micro, Small and Medium Enterprises (MSMEs), so that it is expected to expand the use of these products to the public. The MSME group is the type of business that is mostly carried out by Indonesian people, namely more than 99% (Badan Pusat Statistik, 2022). The goal is to downstream research results and increase knowledge about the potential of local food as an increase in

community immunity, especially during the Covid-19 pandemic.

The aim of this research is to change public knowledge about food consumption to increase endurance as well as to disseminate and downstream one of the research products with this function to MSME actors through nutrition education interventions. Nutrition education is carried out in a comprehensive manner by taking into account the characteristics of the yoghurt flour product produced and its potential as an immunity-boosting food as well as adequate literature review.

## Method

The research method used was a quasi-experimental design with one group pre-post test. The research was conducted at the Tasikmalaya Health Polytechnic of Health Nutrition Department campus from March to October 2022.

The sampling method used is purposive sampling. The samples included in this study were 15 food processing MSME actors. Based on the inclusion criteria set, namely respondents must take the pre-test and post-test, 10 MSME actors respondents came from Manonjaya District and 5 (candidate) MSME actors from Sukajadi Village, Cisayong District, Tasikmalaya Regency. The selection of one of the target MSME actors is in accordance with the previous evaluation results in 2017 and 2020. The MSME group is a group that has been given previous interventions in 2017 and 2020 activities and has the potential to develop and is committed to participating in this research. Including new MSME actors from the Foster Village, namely Sukajaya Village, Cisayong District, Tasikmalaya Regency.

The tools and materials used in this study are nutrition education facilities, nutrition education media, and evaluation instruments. The tools and materials needed in nutrition education are LCD projectors, laptops, speakers, and office stationery. The nutrition education media used is in the form of a pocket book that has obtained a copyright from the Ministry of Law and Human Rights of the Republic of Indonesia. The required evaluation instrument is printed materials for the pre-test and post-test questionnaires.

Nutrition education intervention methods are lectures and discussions. The nutritional education media used is in the form of a pocket book on "Balanced Nutrition and Functional Foods of Probiotics - Prebiotics with Local Basic Ingredients to Increase Immunity. This book has obtained a Copyright with Registration Number 000389023 Kemenkumham RI (Sumarto et al., 2022). Nutrition education materials are divided into 7 sections, namely: 1. Introduction to the

spread of infectious diseases (Covid-19) and the immune system, 2. Control of infectious diseases (Covid-19), 3. Guidelines for balanced nutrition for controlling infectious diseases (Covid-19). Instruments for measuring changes in the knowledge of research subjects were also developed based on these 7 major materials.

Apart from that, the nutrition education intervention also demonstrated how to make yoghurt flour products from local beans and Manonjaya zalacca to the research subjects. The demonstration of making this product is a form of downstreaming and is expected to be practiced by participants, SMEs as research subjects. The products that are downstreamed are instant yogurt flour from local nuts and Manonjaya salak as a result of previous studies in 2020 and 2021 which are in the process of filing a patent with application number S00202105690.

The variables measured consisted of the characteristics of the respondents and changes in knowledge before and after the nutrition education intervention. Respondent characteristic variables were analyzed descriptively, while knowledge variables were analyzed analytically using paired t-test. Before the knowledge variable was analyzed by paired t test, the data was tested for normality by the Kolmogorov Smirnov test through computer statistics software (Sabri & Hastono, 2018).

## Result and Discussion

### Characteristics of Respondents

Respondents who participated in this study amounted to 15 people. Most of the respondents were women, namely 86.7%. The age of the respondents varied from 22 to 63 years. Most of the respondents' last education was high school, namely 46.7%. Meanwhile, the respondent's sub-district domicile is 66.7% from Manonjaya District and 33.3% from Cisayong District, Tasikmalaya Regency. The complete characteristics of the respondents who participated in this study can be seen in Table 1.

Respondents in this study were MSME actors, which is the business scale that most businessmen in Indonesia do. Respondents are engaged in the food processing business, which based on a business survey in Indonesia, this field is one of the types of businesses that are widely cultivated, namely 16.28% in 2021 (Badan Pusat Statistik, 2022).

The characteristics of the respondents in this study are different from the results of the 2021 business survey which shows that businesses in Indonesia are dominated by men, namely 78.75% (Badan Pusat Statistik, 2022). Meanwhile, in this study, respondents were dominated by women, namely 86.7% (Table 1).

**Table 1.** Characteristics of respondents to nutrition education interventions about food products to increase body immunity

Indicator	Number of people	Percentages (%)
Gender		
Male	2	13.3
Female	13	86.7
Age	Years	
Maximum	63	
Minimum	22	
Last education	Amount of people	Percentages
Elementary School	4	26.7
Junior High School	2	13.3
Senior High School	7	46.7
Diploma- 3	2	13.3
Amount	15	100
District domicile		
Manonjaya	10	66.7
Cisayong	5	33.3
Amount	15	100

### Changes in Respondents' Knowledge of Immunity Enhancing Foods

Evaluation of the nutrition education intervention is by looking at changes in the knowledge of research subjects before and after the intervention. The results of the nutrition education intervention showed that there was a change in the level of knowledge of the research subjects before (pre-test) and after (post-test) the nutrition education intervention. The level of change in knowledge can be seen in Table 2.

**Table 2.** Changes in respondents' knowledge before and after the nutrition education intervention about food products that increase body immunity

Pre-test (Mean + Standard Deviation)	Post-test (Mean + Standard Deviation)	p value
57.3+16.1	73.8+17.9	0.000

The nutrition education intervention significantly increased the respondents' knowledge (Table 2). The effectiveness of counseling in increasing public knowledge has been carried out a lot. Although with different goals from respondents in this community service activity, research on 1,600 grade 5 elementary school students in 18 districts/cities in Indonesia has increased knowledge about children's snacks after being given education using flipcharts, posters, and audio-kinetic media (Briawan, 2016). The education also uses audio-visual media as is done in this community service activity.

One of the counseling media used in this community service is using tempe product demos made from non-soybeans and yogurt from local nuts and Manonjaya salak. Even though the target groups are

different, the media used is almost the same as the research conducted on 90 SD/MI students through counseling with a simulation of selecting food sources of nutrients with pictures in Depok City (Sartika, 2011) and Manonjaya salak processed products for junior high school students in the District Manonjaya, Tasikmalaya Regency (Bachtiar et al., 2018). In addition, this method is also carried out in increasing the capacity of disaster emergency food organizers (Sumarto, et al., 2019). The results can also increase the knowledge of respondents.

The main media used in nutrition education is the pocket book "Balanced Nutrition and Probiotic Functional Food - Prebiotic Local Ingredients to Increase Immunity". This book has obtained a Copyright with Registration Number 000389023 Ministry of Law and Human Rights (Kemenkumham) RI. This media is the same as what is done in nutrition education for elementary school students who experience anemia in Kartasura District, Sukoharjo Regency (Zulaekah, 2012). The result is that students' knowledge increases significantly after obtaining nutrition education. The counseling method used in nutrition education is the same as that practiced by (Hartono, et al. 2015) who provided nutrition education to elementary school students in Tumpakrejo with comic media and regular lectures. The results of this study indicated that there was an increase in the knowledge of choosing healthy snacks for 41 elementary school students in grade 5 through nutrition education. This method produces changes in knowledge that are not significantly different from the comic media. Counseling in increasing the capacity of disaster emergency food organizers with booklet media has also succeeded in increasing the knowledge of participants (Sumarto, et al., 2019) as in this study.

Increased knowledge as a result of this nutrition education intervention can be an asset in downstream food products to increase immunity during the Covid-19 pandemic, especially Micro, Small and Medium Enterprises (MSMEs) in the food sector. As one of the efforts to accelerate the improvement of the community's body immunity in dealing with infectious diseases, including Covid-19. This is in accordance with the advice given from the results of research (Martianto et al., 2009) that the role and partnership of stakeholders is a strategic priority in efforts to accelerate the diversification of local food-based food consumption.

The role of counseling in increasing the knowledge, attitudes and behavior of respondents has been widely proven from several research results. For example, the results of the study (Putri, et al. 2013) show that the knowledge of female students at the Asy-Syarifah Demak Islamic Boarding School, who are still teenagers (aged 13-18 years), significantly influences their protein consumption. Although, this does not guarantee

compatibility between knowledge and attitudes with practice. Such as research conducted (Laenggeng & Lumalang, 2015) on 70 Class VIII students of SMP Negeri 1 Palu which showed that there was no significant relationship between knowledge and attitudes with the behavior of choosing snack foods.

The nutrition education intervention activity was similar but with a different target, namely to the youth group which was carried out in Wonogiri, Central Java in the socialization of increasing immunity in the face of the Covid-19 pandemic (Mustofa & Suhartatik, 2020). In addition, similar interventions have also been carried out in education on how to process food to prevent Covid-19 from being carried out to the community, although no quantitative evaluation was carried out on changes in the respondent's knowledge (Murdiana et al., 2021). Similar interventions given to groups of micro, small and medium enterprises have also been provided with nutritional education methods in increasing knowledge and practices of food safety in the city of Tasikmalaya (Sumarto et al., 2018). Nutrition education as an intervention in this activity does not face more severe challenges such as genomics education which is a relatively new science (Whitley et al., 2020).

#### *Types of Questions Answered Correctly by Respondents*

If you look at each of the questions given to the research subjects, there were a number of questions that increased significantly and there were also questions where there was no change in the percentage of correct answers before and after the nutrition education intervention. The types of questions that were answered correctly can be seen in Table 3.

The pre-test and post-test questions given to respondents before and after the nutrition education intervention were prepared based on the educational media used, namely a pocket book that had obtained a copyright from the Indonesian Ministry of Law and Human Rights (Masrikhiyah, 2020). Five of the 15 questions that significantly increased the percentage of correct answers by respondents were about 1. Types of research products from green and red beans containing probiotics, 2. Agents in the mechanism of spreading Covid-19, 3. Food composition in a balanced nutritional cone, 4 5. Definition of probiotics, and 5. Examples of types of food as prebiotics (Table 3).

The balanced nutrition material provided in this nutrition education intervention was developed from the Balanced Nutrition Guidelines issued based on Minister of Health Regulation Number 41 of 2014 (Kemenkes, 2014). The material on nutrition education interventions is divided into 7 sections, namely: Introduction to the spread of infectious diseases (Covid-19) and the immune system; Control of infectious diseases (Covid-19); Guidelines for balanced nutrition

for controlling infectious diseases (Covid-19) 19); The role of nutrients in increasing immunity; Sample menus to fulfill balanced nutrition in increasing immunity; The role of probiotics and prebiotics as functional food to

increase immunity; and Development of probiotic and prebiotic functional food based on local raw materials (Masrikhiyah, 2020).

**Table 3.** Types of questions answered correctly by research subjects before and after the nutrition education intervention

Questions	Percentage of Correct Answers (%)		
	Pre-test	Post-test	Enhancement
Covid-19 category as an infectious disease	93.3	93.3	0.0
Definition of the immune system	86.7	100.0	13.3
Agent on the mechanism of the spread of Covid-19	0.0	33.3	33.3
Examples of Clean and Healthy Behavior in preventing infectious diseases	86.7	93.3	6.7
5M protocol activities in preventing the spread of Covid-19	73.3	86.7	13.3
Control of Covid-19 disease by implementing 5 keys to food safety	80.0	93.3	13.3
The four pillars of balanced nutrition	53.3	73.3	20.0
The composition of the food on the tumpang is nutritionally balanced	46.7	73.3	26.7
Ten messages of balanced nutrition	100.0	100.0	0.0
Nutrients that can increase the body's immunity	46.7	60.0	13.3
The existence of the microbiome as good bacteria in increasing the immunity of the human body	80.0	86.7	6.7
Definition of probiotics	40.0	66.7	26.7
Examples of types of food as prebiotics	26.7	53.3	26.7
Types of research products from green and red beans containing probiotics	40.0	86.7	46.7
examples of research food/beverages containing probiotics	100.0	100.0	0.0

The nutrition education intervention material provided regarding the consumption of balanced nutrition to increase immunity, especially during the Covid-19 pandemic, is a development from the results of a literature review and downstream from the results of previous research. Some literature, for example, states that balanced nutrition is mainly contributed from foods that contain several vitamins, minerals, amino acids, and fatty acids, which play a role in improving the gut microbiota which also influences the body's immune system. The vitamins needed are mainly A, B6, B12, folate, C, D, and E. While the minerals needed are zinc (Zn), copper (Cu), Selenium (Se), and Iron (Fe). The required fatty acid is omega-3 (Calder, 2020). Reviews from other researchers added types of fatty acids with medium and long chains (Clemente-Suárez et al., 2021). Commonly recommended forms of food are fruit, vegetables, and whole grains (de Faria et al., 2021). For this reason, the dissemination and downstreaming of research results embodied in this nutrition education intervention was also carried out to optimize the use of local fruits and vegetables, especially yoghurt flour from local nuts and Manonjaya salak fruit.

Based on the results of the study (Table 3), respondents' understanding of the meaning of probiotics and products containing prebiotics also increased significantly. This means that respondents have understood the results of previous literature studies which state that prebiotics and several probiotic strains are associated with the incidence of obesity

(Cerdó et al., 2019). The balance of prebiotics and probiotics in the body plays a role in maintaining a healthy body weight and is associated with the incidence of obesity in children (Sanchez et al., 2015). Consumption of probiotics combined with prebiotics can improve the defense function of the intestine and markers of obesity (Hibberd et al., 2019).

Questions about the composition of the balanced nutritional tumpang related to increasing immunity to prevent the Covid-19 virus which were answered correctly by respondents also significantly increased (Table 3). This shows that the results of the literature related to this question or material are quite understood by the respondents. Such an understanding of dietary regulation can influence the profile of the gut microbiome which is associated with the incidence of obesity (Kim et al., 2019). Adequate intake of nutrients coupled with adequate physical activity can increase the body's immunity against viruses, including Covid-19 (Adijaya et al., 2021). Vitamins and minerals can function as antioxidants that can strengthen the human immune system (Siswanto & Ernawati, 2013; Lestari et al., 2018).

In addition, other literature that supports material in this nutrition education intervention states that probiotics through metabolic pathways in the gut play a role in regulating bone health (Abboud & Papandreu, 2019). Dietary adjustments play a role in increasing immunity and body health (Childs et al., 2019). Balancing the gut microbiome in the form of probiotics

supported by prebiotics can improve brain function (Mohajeri et al., 2018). Even a balance of gut microbiota that can be supplied from prebiotics and probiotics from food can prevent and treat cancer (Klement & Pazienza, 2019).

The results of the study also showed that questions about the agent of the spread of the Covid-19 virus that were answered correctly by respondents increased significantly (Table 3). Agents of spreading the Covid-19 virus which can be prevented by consuming balanced nutritious food and increasing immunity are also supported by several literatures. All forms of immunity are affected by a protein-energy nutrient deficiency (Calder, 2013). Macro and micro nutrients play a role in the formation and strengthening of the immune system in the body, including in fighting the Covid-19 virus immunity (Sumarmi, 2020). Stimulating the production of immunoglobins (IgM and IgG) in circulation, 3. Blocking the attachment of the Covid-19 virus to ACE-2 receptors, 4. Reducing the intensity of cytokine storms, and 5. Reducing the multiplication of the Covid-19 virus (Sumarmi, 2020).

It is very important to convey the product of the research results to the nutrition education intervention to the MSME group as respondents. These products include yogurt flour from local beans and Manonjaya salak and tempeh from local green beans and Garut red beans as potential food as probiotics and prebiotics at the same time, or called sinbiotics. Based on research data, questions about this type of product were answered correctly by respondents and increased significantly (Table 3). Diseases related to digestion, especially in the human stomach or intestines, are considered as a source of various diseases (Weerathilake et al., 2014). Probiotic supplementation can significantly restore gut microbiome diversity and enhance immunity (Vemuri, 2018). Intestinal microbiota is also an important factor in the incidence of type-2 diabetes mellitus and is important in the therapy of prebiotics and probiotics (Woldeamlak et al., 2019). The results of a review of several journals also show that there is a relationship between the administration of probiotics and prebiotics to reduce the risk of type-2 diabetes mellitus, cardiovascular disease, and obesity (Yoo & Kim, 2016).

## Conclusion

The results of the nutrition education intervention show that there has been a significant increase in the knowledge of MSME actors about preventing the Covid-19 infection and the dissemination of research results on products that increase body immunity significantly. The results of measuring knowledge before the nutrition education intervention (pre-test) was 57.3+16.1. After

the nutrition education intervention (post-test) the results were 73.8+17.9. Five of the 15 questions that significantly increased the percentage of correct answers by respondents were about the types of research products from green and red beans containing probiotics, agents in the mechanism of spreading Covid-19, food composition in a balanced nutritional cone, definition of probiotics, and examples of food types as a prebiotic. In addition, as a guarantee for the sustainability of this program, it continues to be carried out for MSMEs in Manonjaya District and Fostered Villages in Sukajadi Village, Cisayong District, Tasikmalaya Regency.

## Acknowledgments

The author would like to thank the Head of Manonjaya Sub-District, Head of Sukajadi Village, Cisayong District, Tasikmalaya Regency and all staff and the MSME group for the support of data, personnel and time in collecting data and conducting research. We also thank the Director of the Poltekkes Kemenkes Tasikmalaya, Head of the Center for Research and Community Service, Head of the Department of Nutrition and all academics who have provided financial and resource support for the implementation of research activities.

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