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Effect of Red rice *Oryza Nivara* Feeding and Tbc Preventive Therapy on Controlling Latent Tuberculosis Infection in Children in the Working Area of the Banggai District Health Office

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Abstract

Based on WHO survey data, Indonesia is second only to India for tuberculosis with 969,000 cases and 93,000 deaths per year. The increase in pediatric tuberculosis cases in the working area of the Banggai district health office is a major problem for controlling latent tuberculosis infection. This study aims to determine the effect of TB Preventive Therapy (TPT) and Red rice on the control of Latent Tuberculosis Infection (ILTB) in children. This study used the Quasi Experiment Method with a pre-post test design with the control group with a sample of 48 children divided into 24 intervention groups and 24 control groups. which were selected by the Accidental Sampling method and data analysis using the SPSS statistical package for the social sciences program. Based on the intervention group, the pre-test showed an average body mass index of 15.50 while the post-test average body mass index was 18.63 with a p-value of 0.000, in the control group, the pre-test showed an average body mass index of 18.79, while the post-test average body mass index was 19.00 with a p value of 0.233, this shows a mean difference in the intervention group of 3.13 with a p-value of 0.006 and a control group of 0.21 with a p value of 0.823. There is a significant effect of giving red rice as a supporting food in improving the nutrition of children with latent tuberculosis infection who are undergoing preventive therapy for pulmonary tuberculosis.

Keywords: Latent TB infection, Red Rice, TB Preventive Therapy

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1. Introduction

Pulmonary tuberculosis (TB) is an infectious disease that is one of the leading causes of death worldwide from a single infectious agent, ranking above HIV/AIDS. TB is caused by Mycobacterium tuberculosis [1]. This disease usually affects the lungs. Transmission of pulmonary TB occurs when people with BTA positive pulmonary TB talk, sneeze or cough and indirectly the patient releases sputum splashes in the air and there are ±3000 sputum splashes containing germs. Pulmonary TB can cause death if you do not take medicine regularly for up to 6 months [2]. In toddlers, active TB is still undeveloped, called Latent Tuberculosis Infection (ILTB). ILTB is a condition where a person is infected with Mycobacterium tuberculosis without any signs and symptoms of TB disease. In other words, the person is not sick with TB (Ministry of Health, 2020b). Latent Tuberculosis Infection (ILTB) is a condition in which the immune system of the infected person is unable to eliminate the Mycobacterium tuberculosis bacteria from the body completely but is able to control the bacteria so that no symptoms of TB disease (Active Tuberculosis) arise. Children are the most vulnerable age group to infection and progression to active TB compared to adults after close contact with active TB patients. Typical symptoms of active TB in children are prolonged (≥ 2 weeks) and/or recurrent fever without apparent cause, prolonged cough (≥ 2 weeks) and lethargy or malaise, and weight loss or no weight gain in the previous 2 months despite efforts to improve good nutrition for 1-2 months [3]. People with ILTB when the Tuberculin Skin Test (TST) or Interferon Gamma-Release Assay (IGRA) examination is positive, but the results of the thorax X-ray examination are normal and the sputum examination and Xpert MTB / Rif® are negative [4].

Globally, the estimated number of deaths from TB increased between 2019 and 2021, reversing years of decline between 2005 and 2019. In 2021, there are an estimated 1.4 million deaths among HIV-negative people (95% uncertainty interval [UI]: 1.3-1.5 million) and 187,000 deaths (95% UI: 158,000-218,000) among HIV-positive people, for a combined total of 1.6 million. This is up from best estimates of 1.5 million in 2020 and 1.4 million in 2019, and back to 2017 levels. The net reduction from 2015 to 2021 is 5.9%, about one-sixth of the WHO End TB Strategy's first milestone. An estimated 10.6 million people (95% UI: 9.9-11 million) fell ill with TB in 2021, a 4.5% increase from 10.1 million (95% UI: 9.5-10.7 million) in 2020. The TB incidence rate (new cases per 100,000 population per year) rose by 3.6% between 2020 and 2021, reversing a decline of about 2% per year over the previous nearly 2 decades. The net reduction from 2015 to 2021 is 10%, only half of the first milestone of the End TB Strategy. 11 studies in Southeast Asia show 24.4% to 69.2% of children under 15 years of age come into contact with adults with active TB and 3.3%-5.5% of them will develop TB disease. Therefore, contact investigation and preventive treatment are important in children to reduce the risk of active TB. Indonesia ranks second only to India for tuberculosis (TB), with 969,000 cases and 93,000 deaths per year, equivalent to 11 deaths per hour [5]. Where the Ministry of Health explained that the burden of ILTB in the world in 2014 was estimated at 1,700,000,000 people, of which 35% came from the Southeast Asian region including Indonesia [6]. Currently there is no exact data on the magnitude of the ILTB rate at the national level, but the ILTB estimate is around 2,700,000 people with contacts with active TB cases, ILTB cases in Indonesia since 2016 have been given Tuberculosis Preventive Therapy (TPT). Government policy is stated in Presidential Regulation of the Republic of Indonesia Number 67 of 2021. The provision of preventive drugs as referred to in Article 9 letter e is intended for contacts with TB patients, people with Human Immunodeficiencg Vints (HIVI I Acquired Immuno Deficiency Sgndrome (AIDS) who are proven not to have TB, and people who have decreased immune function [7]. In 2022 Banggai district has implemented a program to provide TPT to close contacts and 90 home contacts, where the number of index cases that have been investigated in the period January to October 2022 is 402, with the number of home contacts 982 people and close contacts 1,226, a total of 2,208 people contacted [8]. Indonesia has implemented the provision of Isoniazid Preventive Treatment (INH) to the two most high-risk populations, namely PLHIV and children <5 years of age who have household contact with active TB patients, who are not proven to be sick with TB. However, implementation is still far from the expected target of 40% by 2018 [9]. In contrast to adult TB patients, pediatric TB patients are mostly transmitted by close people who have direct contact. The source of infection in children is mostly adults who transmit in the immediate environment [10]. In addition to the Indonesian government program, handling and controlling the problem of latent tuberculosis infection in children under five is by optimizing nutrition in children under five can be done through diversification of additional food formula development by considering aspects of nutrition, health benefits, acceptability, durability and superiority of local food resources. Local food resources include red rice *Oryza nivara*. Red rice contains antioxidants derived from anthocyanin pigments as a preventive for coronary heart disease, cancer, diabetes and hypertension, as well as curing night blindness and beriberi, producing lovastatin as a blood cholesterol lowering agent, and atherosclerosis plaque lowering agent [11]. Some pigmented rice are red, black, and purple rice which have pigments or dyes in the form of anthocyanins and proanthocyanidins in the aleurone layer. Anthocyanins and proanthocyanidins are color pigments that belong to the class of phenolic compounds that have potential as antioxidants. The content of phenolic compounds, flavonoids, and antioxidant activity in pigmented rice is known to be more than in unpigmented rice. Pigmented rice in addition to having a fairly high phenolic content, also has nutritional content in the form of Fe, Zn, Ca, Cu and Mg. The content of proanthocyanidin has antioxidative and anti-inflammatory activities. anticancer, gastroprotective, anti-ulcerogenic, cholesterol-lowering and various other health benefits [12]. The antioxidant properties can function to capture free radicals in the body, and can prevent inflammation and even inflammation that causes Active TB. Red rice is rich in bioactive compounds such as polyphenols and vitamins including vitamin E that function as antioxidants. The content in red rice makes red rice popular as a functional food. Antioxidant activity in red rice *Oryza nivara L*. has the highest activity, namely 95.05% (Azis et al., 2015) in [12]. For this reason, pigmented rice or in this case red rice is able to increase the immunity and nutritional status of children to be able to prevent active TB infection in children. The need for adequate carbon atom compounds that have anti-microbial activity contained in red rice and fulfillment of the need for balanced nutrition to and able to make improvements to toddlers with latent TB and can prevent active TB and be able to control the occurrence of TB transmission to children who are very vulnerable to diseases in the environment. Based on the above background, researchers are interested in further examining the effect of providing TB Prevention Therapy (TPT) by providing nutritional improvement interventions using red rice *Oryza Nivara* in an effort to prevent and control Latent Tuberculosis Infection (ILTB) that occurs in toddlers. For this reason, the title raised in this study is "The Effect of Providing Red rice *Oryza Nivara* and TB Preventive Therapy (TPT) on Controlling Latent Tuberculosis Infection (ILTB) in Toddlers in the Banggai Regency Area". The purpose of this study was to determine the effect of giving tuberculosis prevention therapy (TPT) and red rice on controlling latent tuberculosis infection (ILTB) in children.

2. Materials and Methods

This research will be conducted in July - November 2023, the research location is in the work area of the Banggai District Health Office. This type of research used is Quasi Expriment with a pre-post test with control group design approach used to see the effect of treatment between the intervention group and the control group, aiming to measure the effect of giving red rice and TB prevention therapy (TPT) in children as an intervention group and control group in pediatric patients with the provision of pulmonary tuberculosis prevention therapy. This study compared two groups between an intervention group and a control group. Experimental Group: Pediatric patients with latent infection of pulmonary tuberculosis (ILTB) who were given

Pulmonary Tuberculosis Preventive Therapy (TPT) and Red rice and Control Group: Pediatric patients with latent infection of pulmonary tuberculosis (ILTB) who were given Pulmonary Tuberculosis Preventive Therapy (TPT).

2.1. Population and Sample

The population in this study were all children with a doctor's diagnosis of Latent Tuberculosis Infection aged 0-15 years and recorded at the health center in the working area of the Banggai District Health Office in 2023. The sample in this study based on the criteria there were 48 respondents who participated in the study until the end of this study.

2.2. Materials

The material used in this study was red rice (Oryza nivara) obtained from the local market of Luwuk City, Banggai Regency.

2.2.1. How to Process Red Rice

Processing red rice porridge for babies while maintaining its nutritional content requires special attention and hygiene. Here are the complete steps for preparing baby red rice porridge while maintaining its nutritional content [11] in Modification.

Required Ingredients: Red rice porridge, Clean water, A pinch of salt (optional, but best avoided for babies under 1 year old), Vegetables or fruits for added flavor (optional).

Processing Steps: Red rice Porridge Washing: Wash the baby red rice in running water to remove dirt and potential contaminants, Rinse the red rice several times until the water runs clear.

Soaking (Optional): Soak red rice in water for 6-8 hours or overnight. This can help soften the red rice kernels, however, for younger babies, you can skip the soaking stage and go straight to cooking the brown rice.

Cooking: Pour the red rice into a pot and add clean water in a 1:4 ratio (1 part brown rice, 4 parts water), Heat the pot over medium heat.

Cooking for Baby: Let the red rice boil. Once boiling, lower the heat to low and cook the red rice slowly, Cover the pot and cook for about 30-40 minutes, or until the red rice is completely soft and cooked, For younger babies, you can cook the red rice until it is completely soft to facilitate digestion.

Final Processing: Once the red rice is cooked, turn off the heat and allow the porridge to cool slightly before further processing, you can use a blender or other food processing tool to puree the porridge into a consistency suitable for babies.

Additional Flavors (Optional): If you want to add extra flavor or nutrition, you can incorporate blanched vegetables or soft fruits into the smooth porridge.

Serving: When serving baby red rice porridge, make sure the temperature is warm enough and safe for baby, do not add salt or sugar, especially for babies under 1 year old.

Storage: If there is any leftover porridge, cool it first before storing it in an airtight container and Store in the refrigerator and consume within a short period of time to ensure that the nutritional content is maintained. Always ensure to pay attention to hygiene when preparing baby food and consult a doctor or nutritionist about introducing solid food to the baby, especially if you have any doubts.

2.3. Procedure for Feeding red rice (Ministry of Health)

The pattern of giving red rice porridge to children is to pay attention to age and food given such as children aged 6-9 months given red rice porridge with the quality of crushed food or in this case eating filtered with a fine concentration with the amount of giving each meal 2-3 spoons, children at the age of 1-5 years consume 50-100 grams of red rice per day, at the age of 6-10 years 100-150 grams per day and at the age of 11-15 years 150-200 grams per day.

2.4. Data Collection

The sample in this study were pediatric patients with Latent TB Infection who resided in the Banggai Regency area and the respondents in the study were parents who would be asked for consent by filling out the Infomened concent sheet. Respondents were given an explanation of the benefits of the study, as well as a guarantee of confidentiality of the information provided during the study. Pediatric patients with Latent TB Infection who were selected as samples in the study were given the intervention of providing nutritional improvement therapy using red rice which was then observed with Body Mass Index observation sheets.

2.5. Data Analysis

Data were processed using the SPSS statistical package for the social sciences program. To see the mean value of children's body mass index in the intervention group and control group. The parametric analysis used was Two Mean Dependent t-test and Two Mean Independent t-test.

2.6. Ethical Approval

The Health Research Ethics Committee of Hasanuddin University approved this study with ethical approval recommendation number 5043/UN4.14.1/TP.01.02/2023. Informed consent was obtained from all research respondents, data confidentiality was maintained and privacy was guaranteed.

3. Results and discussion

Table 1 The mean distribution of the respondents' parents' data showed that the intervention group had a relatively uniform number in each age category (37.5%) for 15-20 years, (37.5%) for 21-35 years, and there was (25.0%) for 36-45 years, while the control group showed a slight

difference, with the lowest number in the 36-45 years category (33.3%). In the parental sex distribution, this distribution also showed a significant difference between the two groups. The intervention group had a lower proportion of males (12.5%) than the control group (33.3%), while females were higher in the intervention group (87.5%) than the control group (66.7%). Religion also differed between the two groups. The majority of intervention group respondents were Muslim (75.0%), while the majority of control group respondents were Christian (87.5%). There was also a difference in parental education level between the intervention and control groups. The intervention group had a more even distribution in each education category, while the control group showed differences in each category. The intervention group was dominated by junior high school graduates (Intervention = 33.3% and Control = 37.5%) while the parents' employment status was also very different between the two groups. The intervention group had the majority of respondents working as self-employed (62.5%), while the control group had the majority of respondents working as laborers (45.8%). Table 2 This table summarizes the characteristics of the respondents as well as the distribution of the number of individuals in the two main groups: intervention and control. In the intervention group of 24 respondents, the age of respondents was divided into three categories, with the majority of respondents aged 6-10 years (41.7%) followed by the age groups 1-5 years (37.5%) and 11-15 years (20.8%). While in the control group, which also consisted of 24 respondents, the majority of respondents were aged 1-5 years (45.8%), followed by the age group of 6-10 years (33.3%) and 11-15 years (20.8%). There was a difference in age distribution between the two groups. In addition, in terms of gender, in the intervention group, there were 16 male respondents (66.7%) and 8 female respondents (33.3%). While in the control group, there were 13 male respondents (54.2%) and 11 female respondents (45.8%). The total number of respondents from both intervention and control groups was 48. This data formed the main basis for the comparative analysis between the two groups in order to evaluate the effect of the intervention on the respondents. Table 3 Based on the Paired Samples T-Test analysis, the intervention group obtained a value of p = 0.000, while in the control group p = 0.223, it can be interpreted that there is a significant effect of nutritional improvement in toddlers with latent tuberculosis infection (ILTB) using the intervention of giving red rice and tuberculosis prevention therapy (TPT). Table 4 The mean body mass index of children under five with ILTB in the pre-test of the intervention group of red rice and tuberculosis prevention therapy (TPT) was 15.50 and the post-test of the intervention group of red rice and pulmonary tuberculosis prevention therapy showed that the mean body mass index of children under five with ILTB was 18.63 with a difference of 3.13. In the control group administering tuberculosis prevention therapy (TPT), the mean value of body mass index of children under five with ILTB pre test was 18.79 and post test of the control group administering tuberculosis prevention therapy (TPT) was 19.00 with a difference of 0.21. The p value in the intervention group obtained in table 4.6 with two-way (sig 2-tailed) = 0.006. with the hypothesis in this study is one-way, so the p value obtained must be divided by two to = 0.003. The p value in the Control group obtained in table 4.6 with two directions (sig 2-tailed) = 0.824. with the hypothesis in this study is one-way, so the p value obtained must be divided by two to = 0.412. because the p value obtained = 0.412> 0.05. The conclusion in this case is because the p value obtained in the intervention group giving red rice and tuberculosis prevention therapy (TPT) = 0.003 < 0.05, then H0 is rejected. Which means there is an effect of giving red rice and TB prevention therapy (TPT) on controlling latent tuberculosis infection (ILTB) in children.

3.1. Red rice and TPT for Children with ILTB (Intervention Group).

An intervention involving red rice and tuberculosis preventive therapy (TPT) provided significant improvements in the nutritional status of children with latent tuberculosis infection. The significant increase in body mass index suggests that this intervention has the potential to improve the nutritional health of children with ILTB. Red rice is rich in nutrients, including fiber, vitamins, minerals, and antioxidants. Its high fiber content helps maintain a child's digestive health, preventing constipation and keeping gut bacteria in balance. In addition, its complex carbohydrates provide long-lasting energy, maintain blood sugar levels, and support the immune system to fight infection. With balanced nutrition, red rice can support children's overall growth and development. However, it is important to balance red rice consumption with other healthy foods, such as protein, good fats, vegetables and fruits, and consult a doctor or nutritionist to ensure that the child's diet matches his or her nutritional needs. This is related to the control of latent tuberculosis infection in preventing the development of active tuberculosis in children. This research is in line with Nisa, (2018) explains that people with poor nutritional status are highly influential in exposure to active tuberculosis disease, or suffering from tuberculosis disease, Lulu et al., (2018) explained that children suffering from tuberculosis will eventually cause nutritional disorders characterized by weight loss (undernutrition or malnutrition). Conversely, children who are malnourished are one of the risk factors for being easily infected or suffering from tuberculosis, Dhanny & Sefriantina, (2022) also explains the same thing where patients with poor nutrition have a higher risk of developing tuberculosis compared to those with normal nutrition. Poor nutrition can lower a person's immune system, making them more susceptible to infection. Many patients with pulmonary tuberculosis have decreased nutritional status, leading to malnutrition. Some of the factors associated with nutritional status in pulmonary tuberculosis patients include nutrient intake, especially energy and protein, the patient's diet, and the duration of the person's pulmonary tuberculosis experience.

3.2. TB Preventive Therapy (Control Group)

The results of the study in this case showed that there was no significant change in the nutritional status of children who were only given tuberculosis prevention therapy (TPT) without being given additional supplements as in the intervention group that received red rice as well as treatment with the pulmonary tuberculosis prevention therapy program. A person with latent tuberculosis infection (ILTB) is an individual who has been infected by Mycobacterium tuberculosis bacteria without showing any clinical symptoms.

Chest X-rays are normal, but immunologic tests such as the Tuberculin Skin Test (TST) or Interferon Gamma Release Assay (IGRA) are positive. The term latent TB is used to describe children who do not show symptoms of TB but show a positive response to the tuberculin test. The incidence of latent TB is uneven across all age groups. The chance of developing latent TB is higher in younger age groups because the immune system is not yet fully developed, resulting in a lower ability to fight infection [16]. Immunity is important to the cure of latent tuberculosis infection where supplementation that supports good nutritional status of the child can help the health recovery of the child, this is in line with research Kusumaningroh et al., (2018) explained that in BBKPM Surakarta, many pulmonary tuberculosis patients have normal nutritional status. This is due to the Supplementary Feeding Program (PMT) and nutritional counseling that is mandatory for patients during the treatment period. This program includes 3 nutrition counseling sessions in the early stage (2 times) and advanced stage (1 time in the 5th month), as well as the provision of PMT 10 times during the treatment period, both in the early and advanced stages, indicating that the role of supplementary feeding, in this case brown rice, which supports the role of nutrition of children diagnosed with latent tuberculosis infection, is important to apply this right can support the healing of children with latent pulmonary tuberculosis infection in children themselves. The importance of supplementary feeding in addressing low body mass index is also explained in Lihi et al., (2021) Low body mass index and lack of weight gain are associated with an increased risk of mortality, TB recurrence, and are indicative of the severity of TB, as well as signaling poor treatment response or the presence of other disease conditions. Supplementary feeding is an important aspect of care, helping to meet patients' nutritional needs, which can be monitored by changes in their weight. Adherence to TB treatment is crucial for recovery, and good knowledge of the treatment process can improve patient compliance. The key to recovery for TB patients is adhering to treatment instructions, taking the correct dose of medication, undergoing regular treatment, and adhering to the prescribed sputum examination schedule.

3.3. Effect of Red rice (Oryza Nivara) and TB Preventive Therapy (TPT) on Controlling Latent Tuberculosis Infection (ILTB) in Children

This study substantially confirms that red rice and TB preventive therapy (TPT) have a significant effect on controlling latent tuberculosis infection in children. These results provide a strong basis for further consideration of the effectiveness of these interventions on a broader scale as well as their practical implications in the fight against childhood tuberculosis. This study is in line with research from Irennius, (2023) explaining the significant relationship between nutritional status and the incidence of pulmonary TB in children. The findings showed that toddlers who experienced limited nutritional status had an odds ratio (ORadjusted) of 2.92 (95% CI: 1.44-5.91; p=0.003). This indicates that the likelihood of under-fives with nutritional deficiencies is 2.92 times higher to develop pulmonary TB compared to under-fives with normal nutritional status. Research results [20] also showed a p-value of 0.960. Such a high p-value indicates that there is insufficient statistical evidence to support the rejection of the null hypothesis (H0), which in this case states that there is no significant relationship between treatment phase and nutritional status. Research results Mirania & Louis, (2021) The results of the Chi-square statistical test supplemented with Fisher's alternative test showed a p value of 0.000, which is lower than the set significance level (α = 0.05). The nutritional status of children should be the main focus in efforts to cure children with latent tuberculosis infection. Nutrition and Immunity to TB Tuberculosis (TB) has attracted attention as a crucial factor in the influence on the immune system and the response to this infectious disease. Good health is largely dependent on adequate nutritional intake. Nutritional deficiencies, such as lack of protein, vitamins (A, D, E, C), and minerals (iron, zinc), are often factors that make people susceptible to TB infection. TB infection, which is caused by the bacterium Mycobacterium tuberculosis, gains greater traction in malnourished individuals due to their weakened immune systems [22]. The importance of nutrition in supporting the immune system is central to the relationship between nutrition and TB. Adequate nutrition plays a major role in the production of immune cells, white blood cell function, and the optimal working of the various components of the immune system. Certain vitamins and minerals, such as vitamin D and iron, play an important role in maintaining a strong immune system, which helps fight TB infection and supports the healing process[15]. Furthermore, Dhanny & Sefriantina, (2022) explain that when someone is infected with TB, their nutritional status also affects the response to treatment. TB patients with poor nutrition tend to experience more serious complications and a slower healing process. Adequate nutrition is essential to improve treatment effectiveness and recovery. A balanced diet is also an important factor in lung health. A diet rich in antioxidants, such as vitamins A, C, and E, as well as minerals such as zinc, helps protect the lungs from damage caused by TB infection. Consumption of healthy foods can also speed up the recovery process and strengthen immunity.

Nutritional interventions have become an important part of the TB management strategy. Nutritional supplementation, especially in individuals at risk of malnutrition, has been a focus in improving health and the body's response to the disease. However, challenges related to access to nutritious food, awareness of the importance of nutrition, and limited resources, remain barriers to the implementation of effective nutrition interventions [7]. Awareness of the strong link between nutrition and TB is not only important for individual treatment, but also for global efforts to address the TB problem as a whole. Appropriate and well-planned nutrition interventions can be an integral part of a more holistic TB control strategy.

Table 1. Distribution of Respondents by Characteristics (*n=48*)

Respondent Characteristics family data	Intervenes		Control		Total	*P Value	**P Value
	n	%	n	%			
Age							
15-20 Year	9	(37.5)	9	(37.5)	18	0.327	0.426
21-35 Year	9	(37.5)	7	(29.2)	16		
36-45 Year	6	(25.0)	8	(33.3)	14		
Gender							
Male	3	(12.5)	8	(33.3)	11	0.355	0.604
Female	21	(87.5)	16	(66.7)	37		
Religion							
Islam	18	(75.0)	21	(87.5)	39	0.616	0.206
Kristen	6	(25.0)	3	(12.5)	9		
Education							
Elementary School	6	(25.0)	1	(4.2)	7	0.278	0.480
Junior High School	8	(33.3)	9	(37.5)	17		
High School	6	(25.0)	7	(29.2)	13		
Higher Education	4	(16.7)	7	(29.2)	11		
Jobs							
Civil Servants	1	(4.2)	5	(20.8)	6	0.257	0.597
Self-Employed	15	(62.5)	6	(25.0)	21		
Labor	2	(8.3)	2	(8.3)	4		
Farmers	2	(8.3)	0	(0.0)	2		
Housewife	4	(16.7)	11	(45.8)	15		
Total	24	100	24	100	48		

Source: Primary Data

Description:
*P Value = Pearson Chi-Square Age Intervention Group
*P Value = Pearson Chi-Square Gender of Intervention Group
*P Value = Pearson Chi-Square Intervention Group Religion
*P Value = Pearson Chi-Square Education of Intervention Group
*P Value = Pearson Chi-Square Occupation Intervention Group
**P Value = Pearson Chi-Square Age Control Group
**P Value = Pearson Chi-Square Gender Control Group
**P Value = Pearson Chi-Square Religion Control Group
**P Value = Pearson Chi-Square Control Group Education
**P Value = Pearson Chi-Square Control Group Occupation

Table 2. Distribution based on age and gender characteristics of the sample

Characteristics of the Research Sample	Intervenes		Control		Total (n=48)	*P Value	**P Value
	n	%	n	%			
Age							
1-5 Year	9	(37.5)	11	(45.8)	20	0.412	0.346
6-10 Year	10	(41.7)	8	(33.3)	18		
11-15 Year	5	(20.8)	5	(20.8)	10		
Gender						0.145	0.510
Islam	16	(66.7)	13	(54.2)	29		
Female	8	(33.3)	11	(45.8)	19		
Total	24	100	24	100	48		

Source: Primary Data

Description:

*P Value = Pearson Chi-Square Age of Intervention Group
**P Value = Pearson Chi-Square Age of Control Group
*P Value = Pearson Chi-Square Gender of Intervention Group
**P Value = Pearson Chi-Square Gender of Control Group

Table 3. Differences before and after red rice intervention + tuberculosis preventive therapy in the intervention group and in the control group before and after the provision of Tuberculosis preventive therapy

Measurement Group Body mass index	Treatment	*Mean*	*Std*	P* Value
Red rice + TPT	Pretest	15.50	3.624	0.000
	Posttest	18.63	3.809	
TPT	Pretest	18.79	3.297	0.233
	Posttest	19.00	3.107	

Table 4. Mean scores between intervention and control groups

Variable	**Pre Test** ***Mean ± SD***	***Pre Test Mean ± SD***	***Difference Mean*** Δ	***P value***
Red rice + TPT	15.50±3.624	18.63±3.809	3.13	0.006
TPT	18.79±3.297	19.00±3.107	0.21	0.823

Description: P* = Independent Sample T Test

In addition to nutritional aspects, it is also important to consider social, economic, and infrastructural challenges that may affect access to nutritious food. Collaborative efforts between the government, health agencies, non-governmental organizations, and the wider community are needed to develop and implement effective nutrition programs for TB management [23]. With better awareness of the link between nutrition and TB, it is expected that greater steps will be taken to provide the necessary resources to improve access to adequate nutrition for TB-infected individuals. In addition, a holistic approach to TB management, which includes nutrition, will provide a strong foundation to fight the disease globally[23]. The role of nutrition in TB cannot be overlooked. The importance of adequate and balanced nutrition not only impacts individual treatment, but is also an important part of the global TB control strategy. Appropriate nutrition interventions, accompanied by nutrition education and awareness, can be a milestone in the management of the disease and help reduce its impact to a large extent [24]. Red rice Specialty Foods as Supplements. The importance of nutrition in the context of Tuberculosis (TB) has paved the way for research into specialty foods as supplements in an effort to improve health and the body's response to infections such as TB. Several scientific journals have highlighted the benefits of specialty foods, one of which is brown rice, which is known to be rich in certain nutrients that have the potential to improve nutritional status and influence the body's response to TB or other infections. Red rice contains a number of important nutrients, including fiber, B-complex vitamins, iron, magnesium, and antioxidants. The presence of these nutrients in red rice makes it an attractive option in meeting the nutritional needs of individuals infected with TB [15]. Research highlights the link between nutrition and the body's response to TB. Adequate and balanced nutrition is believed to strengthen the immune system, which in turn can improve the body's ability to fight infection. Brown rice, as one type of specialty food, has been the subject of attention due to its nutrient-rich content. The B-complex vitamins found in brown rice, such as thiamine, riboflavin and niacin, have a role in promoting energy metabolism and maintaining optimal nerve function. Meanwhile, iron and magnesium help maintain mineral balance in the body, support the formation of red blood cells, and optimize muscle and nerve function [25]. Red rice is also known to contain antioxidants such as vitamin E and other phytochemical compounds. These antioxidants play an important role in protecting the body's cells from free radical damage, which can result from TB infection. In the context of TB, where the infection can cause inflammation and oxidative stress, the presence of antioxidants in red rice can help mitigate these negative effects, as well as support the body's healing and recovery process [26]. Although research on the direct link between red rice consumption and TB is still under development, the potential of this specialty food as a supplement in improving the body's response to infection has been highlighted in nutrition research. The implications of brown rice's rich nutrient content, especially in the context of boosting immunity, provide confidence that specialty foods such as this can be a valuable addition in efforts to improve the health of TB patients. The importance of specialty foods as supplements is also reflected in efforts to diversify diets and enrich nutrient intake in populations at risk of TB infection. In communities with limited access to nutritious foods, the provision of specialty foods such as red rice can be a viable alternative in improving nutritional status and enhancing overall health [27]. The role of specialty foods as supplements, it is important to note that they should not be considered as a substitute for recommended medical treatment. Nutritional supplements, including brown rice, should be used as a supportive adjunct to, not a substitute for, established medical treatment for Tuberculosis patients. Regular medical monitoring and treatment in accordance with protocols prescribed by health professionals remains the top priority in the management of control and cure of patients with latent tuberculosis infection, especially in children. Tuberculosis Preventive Therapy (TPT) and Nutrition Research on Tuberculosis Preventive Therapy (TPT) has been a major focus of efforts to address the spread of TB in vulnerable populations, particularly children under 15 years of age. However, in addition to focusing on its effectiveness

in preventing TB infection, research has also begun to look at the impact of TPT on the nutritional status of individuals undergoing this therapy. Preventive therapies such as isoniazid (INH) or combination therapy have become an integral part of TB prevention strategies, especially in populations at high risk of TB exposure. However, there is growing concern related to how these therapies may affect the dietary intake and nutritional status of individuals undergoing TPT. The use of isoniazid, which is a commonly used preventive therapy, has the potential to affect the body's digestive system and metabolism. While isoniazid has been shown to be effective in the prevention of TB, its use has also been associated with possible effects on dietary intake and nutrient absorption in the body. Some individuals undergoing TPT, especially those who experience side effects such as indigestion or discomfort, experience a decrease in appetite or changes in their diet. This could potentially affect nutrient intake and nutritional balance in the body if there is no follow-up intervention related to adding additional dietary supplements to children undergoing TB preventive therapy. Combination therapy, which combines multiple TB drugs in one treatment, has also been the focus of attention for its impact on child nutrition. The use of combination therapy can not only affect an individual's physical condition but also has the potential to affect nutritional aspects of the body. Changes in metabolism and organ function, which occur as a result of these therapies, have implications for nutrient absorption, energy use, and overall nutritional balance, Medications can improve the body's defense mechanisms by reducing the number of bacteria in the body. As the body's defense mechanism improves, nutrients to replace the destruction of body tissues for the formation of proteins or enzymes can be suppressed, resulting in improved nutritional status [28]. Regular monitoring of nutritional status, including evaluation of dietary intake, nutritional assessment, and weight monitoring, can help identify possible changes and take necessary preventive measures. While TPT is an important part of the TB prevention strategy, it should also be noted that side effects or changes in dietary intake and nutritional status cannot be ignored. Influences on dietary intake and nutritional status can affect the body's response to therapy and can also affect the overall prognosis of individuals on TPT, especially children on therapy. Therefore, it is important to consider strategies that can assist individuals in maintaining optimal nutritional status while on TB preventive therapy.

4. Conclusions

This study showed that the provision of red rice as a food supplement, along with tuberculosis preventive therapy (TPT), led to significant improvements in the nutritional status of children with Infectious Latent Tuberculosis (ILTB). The intervention improved the children's body mass index, suggesting that the nutrients obtained from red rice had a positive impact on the nutritional health of children with ILTB. Meanwhile, in the control group that only received tuberculosis prevention therapy without the addition of brown rice, there was no significant change in the nutritional status of children with ILTB. This suggests that supplementary feeding such as red rice has an important role in improving the nutritional health of children with latent tuberculosis infection. This study is consistent with previous findings confirming the association between poor nutritional status and the incidence of pulmonary tuberculosis in children. Latent tuberculosis infection tends to be more common in individuals with poor nutritional status, and conversely, nutritional disorders are risk factors for becoming infected or suffering from tuberculosis disease. Red rice contains important nutrients such as fiber, vitamins, minerals, and antioxidants that play a role in maintaining digestive health, providing long-lasting energy, supporting the immune system, and improving nutritional status. However, it is important to note that consumption of red rice should be balanced with other healthy foods to meet overall nutritional needs. Preventive therapy for tuberculosis plays a crucial role in controlling latent tuberculosis infection, but attention to the nutritional status of individuals undergoing this therapy is also important. Side effects or changes in dietary intake that may occur during TB preventive therapy need to be monitored and managed properly to maintain optimal nutritional status.

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