THE INCREASE IN NUTRITIONAL STATUS BY FERMENTED MILK SUPPLEMENT ON ELEMENTARY SCHOOL CHILDREN FROM FISHERMAN'S VILLAGE IN BANTUL, YOGYAKARTA PROVINCE OF INDONESIA

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Abstract: Probiotics drinks, containing *Lactobacillus,* were rapidly developed because of its benefit to the health. The bacteria reduced the pathogenic microorganism growth such as virus, fungi, and protozoa. The nutritional status is influenced by food intake, immunity and infection. The children of fisherman's village are included in the insecure nutrition group because of the low social economic status and healthy living behavior. The aim of this research was to know the influence of daily consumption of probiotics in fermented milk to the nutrition status in elementary school children. This research is quasi-experimental with *pretest-posttest control group* design. Subjects of 95 elementary school children were divided into 2 groups: 62 children as treatment group and 33 children as control group. Determination of nutritional status is based on anthropometry according to CDC 2000 (BMI-age) growth-chart; and the biochemistry parameter consist of the level of serum total protein, albumin, blood urea nitrogen (BUN), urine creatinine and hemoglobin. Determination of serum total protein and BUN were carried out by *Microkjeldahl* method, hemoglobine by *cyanmet hemoglobin* method, albumin by *dye-binding* method, and creatinine level by *Jaffe* reaction method. The infection status was determined by anamnesis and laboratory examination of feces which was conducted to find the parasite in the stool. Of sixty five ml fermented milk, that contains of 6.5 x 10^9 *Lactobacillus shirota* strain, was consumed every day in 37 days. The data was analyzed by *Wilcoxon test* for nonparametric data and *paired T-test* for parametric data. The result shows that after the treatment, it increased the nutritional status athropometrically from underweight to normal (12.9%) and *overweight* to normal (3.23%). In biochemically, it increased the total protein level from 6,111 to 6,705 mg/dL (p=0,001) and decreased the BUN from 42,709 to 41,127 mg/dL (p=0,004) significantly eventhough it was in normal range. The conclusion is that consuming fermented milk for 37 days in children is proven to enhance the nutritional status both by anthropometric and biochemistry parameter.

Keywords: probiotic, nutritional status, *Lactobacillus,* fermented milk supplement

INTRODUCTION

Determination of community health degree is based on mortality rate, nutritional status, and morbidity rate. Mortality rate per 1000 children were fluctuating from year to year with the highest rate occurred in 2002 with 165 (13.7%) in Indonesia. Malnutrition cases occurred in 2001 (1.7 %), and under five years old deficiency of energy and protein cases were 15,89 % in 2002 at Bantul district, Yogyakarta, Indonesia.[1] A condition of susceptible Nutrition is an important issue because of its relation with the future of human resources. Malnutrition cases will bring loss 200 million of IQ potency rate per year (30 % of productivity opportunity) in Indonesia.[1] This issue is related with poverty, household food security, low level of knowledge and unhealthy lifestyle. Therefore, it could not be solved only by medical approach and health services.

Probiotic is fermented milk containing lactic acid bacteria from *bifidobacteria* group. Some of lactobacilli species have been known as an important role of human physiologic function.[2] Probiotic in the body is proved to prevent cancer through elimination of pro carcinogenic material from the body and increasing the immune system activity to produces antitumor active material, some vitamins like thiamine (B1), riboflavine (B2), pyridoxine (B6), folic acid and cyanocobalamine (B12). The probiotic ability to produce lactic acid and acetic acid in the gut can pressure *E. coli* and *Clostridium perfringens* bacteria growth and other pathogenic, also reduce ammonia. Niacin product by bifidobacteria can reduce cholesterol level.[3]

This research aim is to prove the benefit of fermented milk supplementation consumption in elementary students in farms area at Bantul district of Yogyakarta Special Region. The result is expected to be consideration in plan and implementation policy especially in food and nutrition field of children.

RESEARCH METHODS

This study was quasi-experimental with pretest-posttest control group design. Research participants are elementary students in fisherman's village in south part of Bantul district, i.e. Subdistrict Kretek of Bantul, Yogyakarta, Indonesia. The variables in this research were fermented milk consumption as independent variable, while nutritional and infection status as dependent variable. Nutritional status measurement was conducted by anthropometric parameter according to CDC, 2000 (BMI-age) growth-chart and biochemistry parameter i.e. total protein serum level, BUN, Hemoglobin and urine creatinine.

There were 96 students of local elementary school (age of 9-12 years old), which 62 students as treatment group and 33 students as control group. Sampling is done consecutively, on all of IV and V class elementary students who meet the inclusion criteria and are willing to follow the research. Willingness to follow or not determined by the parents of each student after being given explanation and discussion about this research by signing the informed consent sheet. Students of elementary school of Bungkus as participants of the treatment group, and students of elementary school of Tegalsari as participants of the control group. All of participants in treatment group consumed fermented milk every day for 37 days. The dosage of fermentation milk consumption was 65 ml containing 6,5 x 10^9 *Lactobacillus casein shirota* *). Participants in the control group received no treatment, only the nutritional status was measured. The measurement of nutritional status was done before and after treatment. Blood

examination was conducted to know the serum total protein level and BUN by *Micro-kjeldahl* method, haemoglobin level by *cyanmet Hb* method and urine creatininee by *Jaffe* method.

As additional data, there were parents education level, occupation and monthly income in average as the picture of social status. Monthly income were divided into three categories i.e. low (L) < IDR. 400.000,- per month; moderate (M) IDR. 400.000,- up to IDR. 700.000,- and high (H) > IDR. 700.000,- in year 2010. Parents education level were divided into three categories i.e. low (L) Elementary-Junior High School; moderate (M) High School and high (H) college. Types of occupations were divided into three categories i.e. labour, farmer, fisherman (1); trader, private employee (2); government's employee, teacher (3).

Research validity was done by observing the subject diets with full menu checklist everyday. Data analysis with *Wilcoxon* for non parametric data and *paired T-test* for parametric data by SPSS version 20.0.

After agreed to the informed consent, the body weight and height of all participants in both treatment and control group were measured to determine the anthropometric nutritional status. Blood serum was collected to determine the biochemically nutritional status. These data called pretest data (before treatment). In the next day, the participants of treatment group were had to drink fermented milk every once a day for 37 days, while the control group did not have any treatment. One day after last day of treatment, we collected the samples in the same way as before (pre-test) to obtain the post test data.

RESULTS AND DISCUSSIONS

Bantul district located in the southern part of Yogyakarta Special Region of Indonesia, with 506.85 km² or 50 685 ha area which is geographically located between 07º44'04 "- 08º00'27" latitude and 110º12'34 "-110º31'08" longitude. There are 3,228 ha (6.37%) of low-altitude region (< 7 meters) area in Sub-District of Kretek, Sanden, and Srandakan, generally by the Indonesian Ocean. The Natural state is suitable for farming, so the majority of people in Bantul are farmers (45%), including fishermen.[4]

There were 62 elementary students as treatment group participants and 33 students as control groups. The social economic status of them is shown in Table 1.

Table 1. Social economic status of treatment group based on monthly income in average, education level, and occupation of their parents

Group	Monthly income (IDR)				Education level				Occupation			
	L	M	H	NA	L	M	H	NA	L	M	H	NA
Treatment	27	17	11	7	35	19	3	5	46	8	7	1
%	43,55	27,42	17,74	11,29	56,45	30,65	4,84	8,06	74,19	12,90	11,29	1,61
Control	11	5	6	8	15	10	5	0	15	9	6	0
%	36,67	16,67	20	26,67	50	33,33	16,67	0	50	30	20	0

Note: L=low; M=moderate; H=high; NA=not available

Table 1 shows that socio-economic level of participants are mostly low according to the monthly income, education level and occupation. According to Ginting (2004),[5] the majority of poverty population in Indonesia are villagers and generally is a group of fishermen,[6] farmers, [5] and small craftsmen.[7]

Nutritional status determination in this research was based on both of anthropometric and biochemistry parameter. The result showed in Table 2,3 and 4.

Table 2. Nutritional status of all participants based on BMI-age in both of treatment and control group before treatment with 37 days consumption of fermented milk containing *Lactobacillus shirota*

Research Group	Nutritional Status										Total	
	Short Stature		Underweight		Normal		OW		OB			
	M	F	M	F	M	F	M	F	M	F	M	F
Treatment (N)	2	7	15	18	8	7	0	3	2	0	27	35
%	3,23	11,29	24,19	29,03	6,45	11,29	0	4,84	3,23	0	43,55	56,45
Control (N)	6	5	7	4	3	4	3	0	1	0	20	13
%	18,18	15,15	21,21	12,12	9,09	12,12	9,09	0	3,03	0	60,61	39,39

M= male; F=female; OW=overweight; OB=obesity

Table 2 shows that 67.75% was underweight-short stature, 24.19% normal, 4.8% overweight and 3.23% obesity in treatment group, while the nutritional status of control group was almost similar with the treatment group. All participants of treatment group consumed fermented milk everyday for 37 days and the measurements were done before and after treatment. The nutritional status after treatment is shown in Table 3.

Table 3. Nutritional status of all participants based on BMI-age in both of treatment and control group after treatment with 37 days consumption of fermented milk containing *Lactobacillus shirota*

GROUP	Nutritional Status										Total	
	Short Stature		Underweight		Normal		OW		OB			
	M	F	M	F	M	F	M	F	M	F	M	F
Treatment	2	7	13	15	10	12	0	1	2	0	27	35
%	3,23	11,29	20,97	29,03	12,90	11,29	0	1,61	3,23	0	43,55	56,45
Control	6	5	7	4	3	4	3	0	1	0	20	13
%	18,18	15,15	21,21	12,12	9,09	12,12	9,09	0	3,03	0	60,61	39,39

M: male; F: female

Table 3 shows that fermented milk consumption in 37 days can decrease the number of underweight and overweight become to the normal status. There is no impact on the status of short stature and obesity as well.

Table 4. Nutritional status of participants based on biochemistry parameter before and after treatment with 37 days consumption of fermented milk containing *Lactobacillus shirota*

Groups	Hb (g/dL)		Albumin (mg/dL)		Creatinine (mg/dL)		BUN (mg/dL)		Total Protein (mg/dL)	
	before	after	before	after	before	after	before	after	before	after
Treatment	13,050 (±0,443)	13,209 (±0,546)	4,0324 (±0,271)	4,0760 (±0,273)	0,8409 (±0,123)	0,852 (±0,139)	42,709 ±0,37	41,127 ±3,119	6,111 (±0,379)	6,705 (±0,405)
Control	13,20 ± 0,124	13,24 ±0,008	4,24 ± 0,321	4,25 ± 0,293	0,66 ± 0,41	0,68 ± 0,512	41,26 ± 0,471	41,22 ± 0,299	6,35 ± 0,054	6,37 ± 0,081

Table 4. shows that fermented milk consumption in 37 days can increase hemoglobin and total protein levels dari 6,111 mg/dL menjadi 6,705 mg/dL (p = 0,001).

The result shows that fermented milk containing *Lactobacillus* consumption in 37 days can decrease underweight and overweight rate. It also enhanced the normal status rate but there was no impact to short stature and obesity rate.

Fermented milk is a source of protein, phosphorus, calcium, magnesium, and calories, but does not contains vitamin C and iron in sufficient quantities and has lower fat content. Zemel (2004) [8] proved that calcium, especially in dairy products, can slow down the formation of body fat, aside from fermented milk in the daily menu which has helped to lose fat and keep the muscle weight two times more effective than before. The content of nutrients and calories in fermented milk able to increase the number of normal status from underweight and overweight.

Determination of the biochemical parameters of nutritional status aims to support the nutritional status data. Hemoglobin is widely used as parameter to define the prevalence of anemia. Low contents of hemoglobin indicate anemia. [8] Normal hemoglobin value which measured by *cyanmet haemoglobin* method was ranged from 12.3 to 15.3 g%. The result shows that hemoglobin level was in the normal range in both before and after treatment in all groups. It was 13.050 (± 0.443) g% before and 13.209 (± 0.546) g% after treatment. There was increasing rates in hemoglobin level, but it was not significant (p = 0.067). The increased levels of haemoglobin is not significant and this was also occured in research conducted by Muwakhidah (2009), [9] but it is proved to reduce the commonness of anemia in women workers in Sukoharjo, Central Java Province of Indonesia, thereby it could be said that consuming fermented milk can play a role in reducing anemia in the community. Fermented milk contains a lot of Zink for the growth of probiotic bacteria, [10] might enhanced the mineral absorption.[11] Zinc is an important substance in the formation of hemoglobin, cell replication and metabolism of nucleic acids and amino acids. [12] This possibility is related to the function of fermented milk in increasing hemoglobin levels in the blood.

The serum protein level can be used to measure protein status. The measurement of protein status based on the assumption that the reduction of it is due to a decrease in serum protein production in the liver. The average of total protein was 6.111 (± 0.379) g% before and 6.705 (± 0.405) g% after treatment. It was significant (p = 0.001) statistically. Albumin is a major component of total serum protein in human body. The albumin level of treatment group was 4.0324 (± 0.271) g% before and 4.0760 (± 0.273) g% after treatment. This value is in the normal range (3.5-5 g%) and the escalation is not significant (p = 0.334). According to Mature and Eraslan (2012), [13] there is an advantageous interaction between probiotic bacteria and intestinal cells that could lead to the multidimensional effect on digestion, absorption and barrier function, secretory function and postnatal maturation. It is likely to be able to optimize digestion and absorption in order increase the blood proteins and survive within normal levels. In relation to the nutritional status, blood proteins had an important physiological role for the body, such as a reserve body protein, an important transport for certain nutrients, the antibodies of various diseases, especially gamma globulin and regulate the blood flow thus helping the heart works. [14] It is needed to prove the effectiveness of fermented milk consuming to help the heart works further.

Levels of creatinine blood and BUN (Blood Urea Nitrogen) could describe the reserve protein in the body. Creatinine is

removed from muscle tissue at a quite constant speed. Sceletal muscle tissue is the largest component of lean body mass, which means the highest reserve body protein. [15] The assessment of creatinine and BUN usually used to measure the kidney function. In this study, two types parameters of renal function were still in normal range (creatinine 0.6 to 1.1 mg/dL; BUN 10 to 50 mg/dL). Creatinine levels were unsignificantly increase (p = 0.554) and still in normal range. It might did not indicate the occurrence of kidney damage, but perhaps because of the optimal absorption of protein in the digestive tract. Blood Urea Nitrogen was significantly decrease (p = 0.004) and eventhough it was still in normal range, that may also does not indicate the occurrence of kidney damage. According to Smeltzer and Bare (2002), [16] reducing of BUN is not only influenced by renal disease, but also by protein intake of diet, tissue catabolisme or steroids drug used. McCain *et al* (2011) [17] stated that the oral administration of probiotics, in the future, could reduced clinical symptoms due to renal failure azotemia in the Felidae and it proved significantly to reduce the levels of creatinine after oral administration of 6 months but not significantly for 2 months.

CONCLUSIONS

Consuming fermented milk for 37 days in children is proven to enhance the nutritional status both by anthropometric and biochemistry parameter. In anthropometric parameter, it improved the nutritional status from underweight become normal and the overweight become normal too so that the normal nutritional status is increased overall. In biochemistry parameter, it improved the nutritional status of serum total protein level.

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