# The Effect of Giving Barusa Kacang Gude on the Body Weight, the Upper Arm Circumference, and the Total Protein Concentration of Elementary School Students With Malnutrition in Bonto Ramba Sub District, Jeneponto Regency

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## ABSTRACT

The aim of study to observe influence of the baruasa kacang gude (gude bean) consumption on the body weight, upper arm circumferences and serum protein level in the elementary school student with malnutrition. The study was conducted by using quasi experimental research with non-randomized pre-post design for 2 months period. The sampling method was purposive sampling technique. The study involved 56 students is divided to 2 groups: intervention and control group. The intervention group is consisted samples who had gude bean and deworming agent only. Meanwhile, control group is included samples who had deworming agent. The intervention group had given 10 ml of deworming agent (pryantel pamoate) and gude bean (78 g/day) for 60 days. In additions, 10 ml of deworming agent (pryantel pamoate) was given to control group. The measurement of the body weight, upper arm circumference, and serum protein was taken before and after the intervention. The result showed changed of mean value of body weight, upper arm circumference and total serum protein in the intervention group was higher than control group. Statistically, there was significant difference in increment of upper arm circumference in the intervention group compared to control group. The gude beans had increased body weight, upper arm circumference and serum protein level in the elementary school students with malnutrition.

## CCS Concepts

•**Social and professional topics → User characteristics**


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## Keywords

baruasa kacang gude; body weight; upper arm circumference; serum protein level; elementary school student

## 1. INTRODUCTION

The malnutrition is a health problem occurs for children in development and in transition countries. Malnutrition is condition resulted from lack of nutrient. The malnutrition in children lead to physical and cognitive development damage during first two years of a children's life. Malnutrition was contributed one third of all child death worldwide [1,2]. In worldwide, an estimated 101 million children aged below five years were underweight [3]. Based on Indonesian National Survey (Riskesdas), there were 19.6% of children aged under 5 years were underweight, wasting as 37.2% and combined overweight and obesity as 11.9% [4].

There are two forms of malnutrition such as over nutrition and under nutrition. The over nutrition is defined as over consumption of food and nutrient lead to obesity and overweight. Meanwhile, under nutrition is nutrient deficiency resulted from lack of food consumption. In Mongolia, prevalence of malnutrition in children under 5 years were stunting as 15.6%, wasting, 1.7% and underweight for 4.7% in 2012 [5]. Meanwhile,51% of children under five experienced stunting in West Bengal, India for 2016 [6].

The malnutrition is due to several causes such as poor diet, disease, socioeconomic, accessibility to health services and healthy environment [7-15]. The children with lack of physical growth is due to lower socioeconomic and infrastructural facilities [16]. The nutritional status in children had influenced by maternal health. A study found children had poor nutritional status also had mother which their body mass index (BMI) lower than normal level [6].

Introduction of supplementary food program in school was among way helped in children nutritional status improvement. A study had suggested supplementary food program with routine health care increased nutritional status children in rural communities in Dominican Republic [17]. In contrast, mid-day meal (MDM) scheme provided by NGO had no impact on growth of the primary

school children. However, this scheme had significantly improved vitamin deficiency among children [18].

Indonesia had launched school feeding program for elementary school such as *Pemberian Makanan Tambahan pada Anak Sekolah* (PMT-AS) aimed to improve school attendance, physical stability and community participation [19]. This program had deliver food to primary school children in form of snack instead of meal, use local foodstuff and commonly consumed by community. The snack had between 300 and 400 calories and contains at least 5 to 9 grams of protein. Besides, this program also provided deworming tablets twice a year. The health screening had performed in primary school to examine the children health and growth. The objective for this study was influence of gude bean consumption on body weight, upper arm circumferences and serum protein level in elementary school student with malnutrition.

## 2. METHODOLOGY

The study was conducted by using quasi experimental research with non-randomized pre-post design for 2 months period. The sampling method in this study was purposive sampling technique. The study involved 56 students is divided to 2 groups: intervention and control group. The intervention group is consisted samples who had gude beans and deworming agent only. Meanwhile, control group was included samples who had deworming agent. The intervention group was given 10 ml of deworming agent (pryantel pamoate) and gude beans (78 g/day) for 60 days. In additions, 10 ml of deworming agent (pryantel pamoate) was given to control group. Before intervention period, all samples were given recall of food consumption sample for 24 hours and anthropometric measurement. The measurement of body weight, upper arm circumference, and serum protein was taken before and after intervention period. The intervention group was given gude beans contained 300 calories and 5 grams of protein daily. After intervention period, measurement would be taken for all samples. The body weight was measured by using digital body weight scale, while measuring instrument of upper arm circumference was used to measure upper arm circumference. The serum protein was measured using bluret test in standardized laboratory. The paired T-test, independence T-test, Mann-whitney test, repeated Annova, and Friedman test were used for the data analysis.

## 3. RESULT AND DISCUSSION

### 3.1 Univariate Analysis

The study was conducted on 59 students during pretest of serum protein. The samples were divided on 2 groups: intervention group (30 children) and control group (29 children). During study was conducted, there were 3 samples did not take posttest of serum protein due to their personal reason. Based on Table 1, mean of body weight for intervention group was 22.12 kg and 20.65 kg in control group. The mean body height for intervention group was 128.05 kg and 125.16 kg for control group. The upper arm circumference in the intervention group was 16.05 cm and 15.99 for control group. In Table 2, percentage of student who consumed gude beans was divided into 2 groups: good when consuming ≥80% and less when consuming < 80% for 2 months. In this study, 21 students who consumed good gude beans

### 3.2 Bivariate Analysis

There was a significant difference between body weight during pre and post study for intervention and control groups. The body weight had observed increased from 22.12 kg to 23.37 kg after intervention period for intervention group. Meanwhile, control group had observed increment from 20.65 kg to 21.83 kg after intervention period. The mean weight was observed increase through 2 months, which was statistically significant ($p<0.05$) for intervention and control group. Table 5 had showed a significant increment after the introduction of gude beans in the intervention group ($p<0.05$). The upper arm circumference was observed increased in intervention group from 16.05 cm to 16.57 cm after intervention period. Even though, control group had observed increment in upper arm circumference but no significant difference in upper arm circumference after intervention period as shown in Table 4. The mean in serum protein level for both group was observed increased significantly ($p<0.05$). For the intervention group, increment from 7.32 g/dL to 7.55 g/dL. Meanwhile, control group was experienced increment from 7.55 g/dL to 7.73 g/dL.

**Table 1. Student's anthropometric data by the body weight, height and upper circumference.**

| Anthropometric Characteristic | Intervention group (n=28) | Control Group (n=28) |
|---|---|---|
| | Mean ± SD | Mean ± SD |
| Body Weight | 22.12 ± 2.47 | 20.65 ± 2.19 |
| Body height | 128.05 ± 6.09 | 125.16 ± 5.56 |
| Upper Arm circumference | 16.05 ± 0.83 | 15.99 ± 1.07 |

Source: Primary data,2016

**Table 2. Student compliance distribution in beans consumption.**

| Consumption compliance | Sample number (n) | Percentage (%) |
|---|---|---|
| <80% (Less) | 9 | 30% |
| ≥80% (Good) | 21 | 70% |
| Total | 30 | 100.0 |

Source: Primary data, 2016

**Table 3. The comparison of the mean weight rates between the intervention and control group.**

| Group | Body Weight (Kg) | | | p value |
|---|---|---|---|---|
| | Initial (Mean ± SD) (kg) | First Month (Mean ± SD) (kg) | Second Month (Mean ± SD) (kg) | |
| Intervention | 22.12 ± 2.47 | 23.23 ± 2.66 | 23.37 ± 2.73 | 0.00** |
| Control | 20.65 ± 2.19 | 21.67 ± 2.46 | 21.83 ± 2.54 | 0.00** |
| p value | 0.022* | 0.028* | 0.033* | |

* T Independence Test

** Repeated Anova Test

Source: Primary data, 2016

**Table 4. Comparison of upper arm circumferences between intervention and control group.**

| Group | Upper Arm Circumference (cm) | | | p value |
|---|---|---|---|---|
| | Initial (Mean ± SD) (kg) | First Month (Mean ± SD) (kg) | Second Month (Mean ± SD) (kg) | |
| Intervention | 16.05 ± 0.83 | 16.47 ± 0.84 | 16.57 ± 0.94 | 0.00** |
| Control | 15.99 ± 1.07 | 16.04 ± 0.91 | 16.07 ± 0.83 | 0.82** |
| P value | 0.81* | 0.72* | 0.39* | |

* T Independence Test

** Repeated Anova Test

Source: Primary data, 2016

**Table 5. Comparison of serum protein level between intervention and control group.**

| Group | Protein Serum) g/dL) | | p value |
|---|---|---|---|
| | Pretest | Post test | |
| | Mean ± SD | Mean ± SD | |
| Intervention | 7.32 ±0.4 | 7.55 ±0.41 | 0.000* |
| Control | 7.55 ±0.35 | 7.73 ±0.31 | 0.009* |
| p value | 0.026** | 0.075** | |

* T Independence Test

** Repeated Anova Test

Source: Primary data, 2016

## 3.3 Overall Discussion

Based on result found consumption of gude beans in 2 months had changed statistically significant in body weight in both groups. The intervention group had achieved at 1.24 kg. Meanwhile, control group had showed no increased statistically significant ($p>0.05$). This result was correlated with a study suggested given nutrient potato-based biscuit had increased children's weight in Tamil Nadu region, India [20]. Besides, supplementary of soybean in Rwanda for three months significantly increased children's weight [21].

The reason was due to similarities of food intake and diet in both group. Although, an inconsistent of gude beans intake during intervention period, test statistical result for three measurements (Initial, first month and second month) were not significantly different during the study. The respondents' ability in biscuit consumption for two consecutive months caused initial variables was normal distributed and changed to not normally distributed at the end of study. The samples in intervention group initially was transferred to control group due to unable to consume biscuit for two consecutive months.

Local food was available in Jeneponto was gude beans. This gude bean became alternative food source for Jeneponto resident. The gude bean was one type of bean provided high protein and iron and served in cereal or biscuit form. The gude beans were good sources for fiber, sulfur, calcium, potassium (K), manganese and water-soluble vitamins especially thiamine, riboflavin and niacin [22] This gude bean was one of solution for malnutrition in developing and in transition countries and recommended in school food program. The gude beans are highly processed food with high nutritional value, especially content calories and protein. Every 100 grams of gude beans contained 387.11 calories and 7.75 grams of protein. Based on nutrition adequacy rate of children aged 10-12 years, 100 grams gude beans were contributed energy or calories about 18.43% and 13.83% of the protein.

The deworming tablet among control group increased body weight. In India, increment in body weight was observed in pre-school children with given deworming tablet [23]. The worms is correlated with malnutrition, growth disorders and poor performance. Although, no significant difference in body weight changes between intervention and control group. The body weight was observed increased in intervention group about 1.24kg. There was an increment in upper arm circumferences of the children during 2 consecutive months. The intervention group was observed statistically significant increase in the upper arm circumferences between initial and after 2 consecutive months. The upper arm circumferences had increased from 16.04 cm to 16.56 cm at end of the study. In mean difference between intervention and control group for before and after 2 consecutive months showed statistically significant different ($p<0.05$). There was significant difference in mean difference between intervention and control group for pre and post study. The upper arm circumference in the intervention group had increased 0.51 cm.

A study also found significantly increased in upper arm circumference in Kenya school children with give local vegetable-based food combined with meat or milk [24]. In addition, a study in Malawi found statistically significant increment in upper arm circumference in children received additional food at school [25]. In this study, serum protein level had significant increase in both groups. In intervention group, serum protein was 7.32 g/dl in pre study and increased to 7.55 g/dl in post study. The statistical test result showed significant change in serum protein level ($p<0.05$). Besides, increment occurs in serum protein level for control group. There was no significant different increment in serum protein level between both group ($p>0.05$). Nevertheless, highest increment occurs in intervention group, 0.22 g/dl. The serum protein also observed increased in control group was due to the deworming agent itself. The increment in serum protein between intervention and control because serum protein was at normal level for all samples at pre study. Overall, no significant difference between intervention and control group during intervention period in term of biscuit consumption and diet. The gude beans influenced increment in body weight, upper arm circumference and serum protein level in students in the intervention group.

# 4. CONCLUSION

Total increment in body weight for intervention group was 1.24 kg and control group were observed increased 1.18kg during

intervention period. There was no significant different in mean between intervention and control group ($p>0.05$). The upper arm circumferences had observed in both group. The intervention group was observed increased 0.51cm and control group also observed increased in upper arm circumferences for 0.075cm. From statistical test results had showed a significant difference between increment in both group ($p<0.05$). The protein serum level was observed increased 0.22 g/dL on intervention group. Meanwhile, control group was observed increased 0.17 g/dL in protein serum level after intervention period. There was no statistically significant different between intervention and control group ($p>0.05$). The parent should give attention to their children dietary especially consuming multi nutrient food. The government should promote and encourage their residents for their nutritional status in order promote local food which is beneficial to general health and improves their nutritional status.

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