*J Med Sci*
*Volume 44, No.2, June 2012: 1 - 9*

# The effect of food supplementation on nutritional status of severe malnourishment children aged 12-59 months in Sleman District, Yogyakarta Special Region

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## ABSTRACT

Malnutrition and malnourishment are still big problems among children in Indonesia. Age between 12 to 59 months is the most important and critical time periods for the physical and intelligence development of children. Therefore, the children should obtain a good health care and nutrition according to their needs. The purpose of this study was to evaluate the influence of food supplementation on the nutritional status of children in Sleman District, Yogyakarta Special Region. This was a quasi experimental study involving 60 severe malnourishment children between the age of 12-59 months from Sayegan Sub Districts. Body weight and height of the children were measured before and after food supplementation. Food supplements were given for 100 days. The outcome of this study was the change of nutritional status based on Z-score according to the Ministry of Health classification adopted from WHO-NCHS (World Health Organization-US National Center for Health Statistics) recommendations. According to Z score for weight-for-age (WAZ), the food supplementation did not improve the nutritional status of children. Although the nutritional status of 25.87% children increased and the mean of WAZ significantly increased 1.04 to be -3.29 after supplementation ($p<0.05$), the mean of nutritional status of the children was still the worst (WAZ <-3SD). According to Z score height-for-age (HAZ), food supplementation did not improve nutritional status of the children either. The mean of HAZ before food supplementation (-2.53) was not signifantly different compared to after food supplementation (-2.45). Moreover, mean of nutritional status of the children after food supplementation was still short (HAZ <-2SD). According to Z score weight-for-height (WHZ), food supplementation improved the nutritional status in 86.21% children. The mean of WHZ significantly increased 1.13 from -3.35 to be -2.22 after food supplementation ($p<0.05$) indicating the change of nutritional status from wasted (WHZ <-3SD) to thin (WHZ <-2SD to ≥ -3SD). In conclusion, food supplementation on children aged 12-59 months succeeds to improve their nutritional status according to WHZ.

## ABSTRAK

Gizi kurang dan gizi buruk masih menjadi masalah diantara anak Indonesia. Usia antara 12-59 bulan merupakan masa yang penting dan kritis bagi perkembangan fisik dan intelegensia anak. Oleh karena itu, anak harus mendapat perawatan kesehatan dan nutrisi yang baik sesuai dengan kebutuhannya. Tujuan penelitian ini adalah mengkaji pengaruh pemberian makanan tambahan pada status gizi anak umur 12-59 bulan in Kabupaten Sleman, Daerah Istimewa Yogyakarta. Penelitian ini merupakan penelitian semu yang melibatkan 60 anak dengan gizi buruk berumur antara 12-59 bulan dari Kecamatan Sayegan. Berat badan dan tinggi badan anak diukur sebelum dan sesudah pemberian makanan tambahan yang diberikan selama 100 hari. Keluaran dari penelitian

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ini adalah perubahan status gizi anak berdasarkan nilai Z dari Kementrian Kesehatan yang diadopsi dari WHO/NCHS. Berdasarkan berat badan menurut umur (BB/U) pemberian makanan tambahan tidak meningkatkan status gizi anak. Meskipun status gizi 25,87% anak naik dan rerata indeks BB/U naik 1.04 menjadi -3.29 setelah pemberian makanan tambahan ($p<0.05$), namun rerata status gizi anak masih dalam kategori gizi buruk (BB/U<-3SD). Menurut indeks tinggi badan menurut umur (TB/U), pemberian makanan tambahan juga tidak menaikkan status gizi anak. Rerata indeks TB/U sebelum (-2.53) dan sesudah (-2.45) pemberian makanan tambahan tidak berbeda nyata. Selain itu, status gizi anak setelah pemberian makanan tambahan masih dalam kategori pendek (TB/U<-2SD). Menurut indeks berat badan menurut tinggi badan (BB/TB), pemberian makanan tambahan memperbaiki status gizi 86,21% anak. Rerata indeks BB/TB meningkat nyata 1.13 dari -3.35 sebelum menjadi 2.22 sesudah pemberian makanan tambahan ($p<0.05$). Hal ini menunjukkan status gizi anak meningkat dari kurus sekali (BB/TB<-3SD) menjadi kurus (BB/TB<-2SD -≥-SD). Dari hasil penelitian ini dapat disimpulkan bahwa pemberian makanan tambahan pada anak berumur 12-59 bulan dapat meningkatkan status gizi berdasarkan indeks BB/TB.

***Keywords***: poor family - nutritional status - children - severe malnourishment - Z-score

## INTRODUCTION

Malnutrition and malnourishment are still big problems among children in Indonesia, especially children under five years old or toddlers.[1] Actually, Indonesian goverment has made a lot of progress in reducing malnutrition and malnourishment in toddlers, to 37.5% in 1989, 35.5% in 1992, 31.6% in 1995, 29.5% in 1998, 26.4% in 1999, and 24.7% in 2000. However, since 2000 the number of malnutrition and malnourishment increased again to 26.1% in 2001, 27.3% in 2002, 27.5% in 2003, and 29% in 2005.[2,3]

Indonesian economic crisis in 1997 that expanded to a political and social crisis led to declining food availability and accesibility due to disappearance of rice and other fundamental food, escalating food prices, weakened purchasing power, mass lay-offs and un-employment.[4] The crisis resulted in the increasing number of poor people in Indonesia.[5] As the result, a decline in the purchasing power of food and the access to medical care had been identified. Finally, the crisis triggered the emergence of the malnutrition and malnourish-ment, especially in toddlers.

The 12-59 months of age is an important and critical period in the growth process for both the physical and intelligence of the children. On the other hand, children at this age are known to be at a vulnerable age for nutritio-nal inadequacies. For this reason, they must obtain adequate health care and nutrition according to their needs.[6] One of the cause of malnutrition or malnourishment is poverty which makes children unable to obtain adequate food.[7] The escalating number of the poverty has been a great concern of goverment. A supplementary food program has been launched through the Social Safety Net in Health Sector Program (Program Jaring Pengaman Sosial-Bidang Kesehatan or PJPS-BK), which distributed supplementary food to children aged 12-59 months for poor families across Indonesia.[8,9]

Food supplements are food or beverages that contain nutrients given to children to meet their nutritional needs.[1] Food supplements should be given at the right time and amount to increase nutritional status and to decrease malnutrition or malnourishment in toddlers. The supplementary food program is necessary because as the age of the children increases, their needs of the nutrients will increase along with their growth. Meanwhile, the milk produced by their mothers could not meet the nutritional needs.[3]

This study was conducted to evaluate the effect of food supplement to nutritional status changes of severe malnourishment children aged 12-59 months in Sleman District, Yogyakarta Special Region.

## MATERIALS AND METHODS

### Subjects

This was a quasi experimental study with uncontrolled before and after studies design conducted in Sayegan Sub District, Sleman District for 100 days from February to May 2005. The population of study was children aged 12-59 months from poor families in Sayegan Sub District, Sleman District, while the subjects of study was children aged 12-59 months from poor families in Sayegan Sub District, Sleman District who met the inclusion and exclusion criteria. The inclusion criteria referred to children aged 12-59 months of both sexes from poor families whose parents agreed to follow this research, whereas the exclusion criteria referred to children who suffered from chronic diseases such as tuberculosis and malaria, as well as congenital abnormalities such as labio-schisis, labio-palatoschisis, and labiognato-palatoschisis, esophageal artesian, Hirsch sprung disease, congenital heart disease and down syndrome.

The sample size required to test the effect of additional food supplementation on the

$$N = 2\,x\left[\frac{(Z_\alpha + Z_\beta)x\,S}{X_1 - X_2}\right]^2$$

where N was sample size each group, $Z_{á}$ was 95% confidence level (1.96), $Z_{â}$ was power test (0.846), S was standard deviation of the nutritional status (0.75), and $X_1$-$X_2$ was expected clinical differences (0:43). Based on this formula the minimum sample size needed in this study was 55 subjects.

### Data collection

Data collection of the nutritional status of children was conducted twice before and after food supplementation. Prior to data collection, a questionnaire was designed and pretested. Recruitment and training of research assistants were also conducted. The data collection was conducted after ethical clearance obtained from the Medical and Health Research Ethics Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta.

Before food supplementation, a face-to-face interviews with the child's mother on behalf of the child was conducted in order to answer the questionnaire and to obtain the inform consent. The nutritional status of children were evaluated based on body height and body weight of children. The body height was measured using a microtoise with a precision of 0.1cm while the body weight was taken using a weighing scale with a precision of 0.1 kg.

Food supplementation in the form of food additives manufactured from dairy slurry packed in 200 g sachets was administered 100 g per day during 100 days. A monitoring was conducted during the food supplementation. At the end of the food supplementation, the nutritional status of children were evaluated again as conducted as before supplementation.

### Data analysis

The children were grouped into two chronological age categories (12-23 and 24-59 months) and gender categories (male an female). Mean z scores for weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) were calculated to describe the nutritional status of children according to a standard developed by Indonesian Ministry of Health[10] as shown in TABLE 1.

TABLE 1. Nutritional status according to Indonesian Ministry of Health standard

| Index | Nutritional status | Cut-off point |
|---|---|---|
| WAZ | • Worst | ? -3SD |
| | • Poor | ? -2SD to = -3SD |
| | • Good | = -2SD to +2SD |
| | • Over | ? +2SD |
| HAZ | • Short | ? -2SD |
| | • Normal | = -2SD |
| WHZ | • Wasted | ? -3SD |
| | • Thin | ? -2SD to = -3SD |
| | • Normal | = -2SD to +2SD |
| | • Obese | ? +2SD |

*WAZ: weight-for-age; HAZ: height-for-age; WHZ: weight-for-height; SD: standard deviation*

Descriptive analysis was carried out to show the characteristics of data subjects, the nutritional status of children before and after the food supplementation, either by sex or age group (12-23 months, 24-59 months). Then, statistical analysis was performed using the Mann Whitney U test to determine the relationship among the provision of food supplement and changes in nutritional status. The software used for data entry and data analysis in this study was SPSS. Statistical significance expressed confidence interval 95% (95% confidence interval) and $p < 0.05$.

## RESULTS

A total of 58 children aged 12-59 months from poor families in Sayedan Sub District, Sleman District were enrolled in this study (TABLE 2). Thirty six children (62.07%) were male and the other 22 children (37.93%) were female. Most of the children (45 children or 77.59%) were 24-59 months and only 13 children were (22.41%) 12-23 months. The majority of father's education was senior secondary school, while the majority of father's occupation was farmer.

TABLE 2. Characteristics of children enrolled in this study

| Variables | n | Percentage (%) |
|---|---|---|
| Gender | | |
| • Male | 36 | 62.07 |
| • Female | 22 | 37.93 |
| Age | | |
| • 12-23 months | 13 | 22.41 |
| • 24-59 months | 45 | 77.59 |
| Father's education | | |
| • No education | 2 | 3.45 |
| • Primary School | 15 | 25.86 |
| • Junior Secondary School | 9 | 15.52 |
| • Senior Secondary School | 32 | 55.17 |
| Father's occupation | | |
| • Private Employee | 13 | 22.42 |
| • Laborer | 15 | 25.86 |
| • Farmer | 29 | 50.00 |
| • Unemployed | 1 | 1.72 |

The nutritional status of children before and after food supplementation according to WAZ, HAZ and WHZ is shown in TABLE 3. According to WAZ, food supplementation did not change nutritional status of children. Before food supplementation, the mean of nutritional status of children according to WAZ was the worst with mean WAZ of -4.33. Although the mean of WAZ significantly increased 1.04 to be -3.29 after supplementation ($p<0.05$), mean of nutritional status of the children was still the worst (WAZ <-3SD). According to HAZ, food supplementation did not change nutritional status of the children. Although the mean of HAZ increased 0.08 from -2.53 before food supplementation to be -2.45 after food supplementation, despite being insignificant. Moreover, the mean of nutritional status of the children was still short (HAZ <-2SD). According to Z score weight-for-height (WHZ), food supplementation improved the nutritional status of 86.21% children. The mean of WHZ significantly increased 1.13 from -3.35 before to be -2.22 after food supplementation ($p<0.05$) indicating the change of nutritional status from

wasted (WHZ <-3SD) to be thin (WHZ <-2SD to ≥ -3SD).

TABLE 3. Nutritional status of children before and after intervention

| Nutritional status | Before n (%) | *After* n (%) |
|---|---|---|
| WAZ | | |
| • Worst | 58 (100.00) | 43 (74.44) |
| • Poor | 0 (0.00) | 11 (6.90) |
| • Good | 0 (0.00) | 4 (6.90) |
| HAZ | | |
| • Short | 34 (58.62) | 38 (65.52) |
| • Normal | 24 (41.38) | 20 (34.48) |
| WHZ | | |
| • Thin | 45 (77.59) | 8 (13.79) |
| • Wasted | 13 (22.41) | 33 (56.90) |
| • Normal | 0 (0.00) | 17 (29.31) |

The nutritional status of children before and after food supplementation according to gender is shown in TABLE 4. According to WAZ, nutritional status before food supplementation of both female (35 children or 100%) and male (23 children or 100%) children were the worst. After food supplemenation, the nutritional status of 33 female children (94.29%) remained the worst and 2 female children (5.71%) became good, while 12 male children (52.17%) remained the worst, 10 male children (43.58%) became poor and 1 male children (4.35%) became good. According to HAZ, nutritional status before supplementation of 26 female children (74.29%) were short and 9 female children (25.71%) were normal, while 9 male chlidren (39.13%) were short and 14 male children (60.87%) were normal. After food supplementation, the nutritional status of female children decreased as indicated with the increase of short nutritional status to be 29 female children (82.86%) and the decrease of normal nutritional status to be 6 female children (17.14%). Meanwhile, the nutritional status of male children did not change after food supplementation. According to WHZ, nutritional status before supplementation of 26 femlae children (74.29%) were thin and 9 female children (25.71%) were wasted, while 18 male chlidren (78.26%) were thin and 3 male children (13.04%) were wasted and 1 male children (4.35%) was normal. After food supplemenation, the nutritional status of 5 female children (14.29%) remained thin and 18 female children (51.43%) became wasted and 12 female children became normal, while 2 male children (8.67%) remained thin, 13 male children (56.52%) became wasted and 7 male children (30.43%) became normal.

TABLE 4. Nutritional status of children according to gender before and after intervention

| Nutritional status | Female | | Male | |
|---|---|---|---|---|
| | Before n (%) | After n (%) | Before n (%) | After n (%) |
| WAZ | | | | |
| • Worst | 35 (100.00) | 33 (94.29) | 23 (100.00) | 12 (52.17) |
| • Poor | 0 (0.00) | 0 (0.00) | 0 (0.00) | 10 (43.58) |
| • Good | 0 (0.00) | 2 (5.71) | 0 (0.00) | 1 (4.35) |
| HAZ | | | | |
| • Short | 26 (74.29) | 29 (82.86) | 9 (39.13) | 9 (39.13) |
| • Normal | 9 (25.71) | 6 (17.14) | 14 (60.87) | 14 (60.87) |
| WHZ | | | | |
| • Thin | 26 (74.29) | 5 (14.29) | 18 (78.26) | 2 (8.67) |
| • Wasted | 9 (25.71) | 18 (51.43) | 3 (13.04) | 13 (56.52) |
| • Normal | 0 (0.00) | 12 (34.28) | 1 (4.35) | 7 (30.43) |

The nutritional status of children before and after food supplementation according to age is shown in TABLE 5. According to WAZ, nutritional status before food supplementation at the age of 12-23 months of 13 children (100%) were the worst, and so were the age of 24-59 months of 45 children (100%). After food supplementation, the nutritional status at the age of 12-23 months of 8 childen (61.54%) remained worst, 4 children (30.77%) became poor and 1 children (7.69%) became good, while at the age of 24-59 months of 35 children (77.78%) remained worst, 7 children (15.56%) became poor and 3 children (6.66%) became good. According to HAZ, nutritional status before food supplementation at the age of 12-23 months of 2 children (15.38%) were short and 11 children (84.61%) were normal, while at the age of 24-59 months of 33 children (73.33%) were short and 12 children (26.67%) were normal. After food supplementation, the nutritional status of children at the 12-23 and 24-59 months decreased. It was indicated with the increase of short nutritional status to be 4 children (30.77%) at 12-23 months and 34 children (75.56%) at 24-59 months. Moreover, the normal nutritional status decreased to be 9 children (69.23%) at 12-23 months and 11 children (24.44%) at 24-59 months. According to WHZ, nutritional status before food supplementation at the age of 12-23 months of 11 children (100%) were thin and 2 children (15.38%) wasted, while at the age of 24-59 months of 35 children (77.78%) were thin, 10 children (22.22%) were wasted. After food supplementation, the nutritional status at the age of 12-23 months of 3 childen (23.08%) remained thin, 8 children (61.54%) became wasted and 3 children (23.08%) became normal, while at the age of 24-59 months, there were only 5 children (11.11%) remained thin, 30 children (66.67%) became wasted and 10 children (22.22%) became normal.

TABLE 5. Nutritional status of children according to age group before and after intervention

| Nutritional status | 12-23 months | | 24-59 months | |
|---|---|---|---|---|
| | Before n (%) | After n (%) | Before n (%) | After n (%) |
| WAZ | | | | |
| • Worst | 13 (100.00) | 8 (61.54) | 45 (100.00) | 35 (77.78) |
| • Poor | 0 (0.00) | 4 (30.77) | 0 (0.00) | 7 (15.56) |
| • Good | 0 (0.00) | 1 (7.69) | 0 (0.00) | 3 (6.66) |
| HAZ | | | | |
| • Short | 2 (15.38) | 4 (30.77) | 33 (73.33) | 34 (75.56) |
| • Normal | 11 (84.61) | 9 (69.23) | 12 (26.67) | 11 (24.44) |
| WHZ | | | | |
| • Thin | 11 (84.61) | 3 (23.08) | 35 (77.78) | 5 (11.11) |
| • Wasted | 2 (15.38) | 8 (61.54) | 10 (22.22) | 30 (66.67) |
| • Normal | 0 (0.00) | 3 (23.08) | 0 (0.00) | 10 (22.22) |

## DISCUSSION

The Indonesian economic crisis in 1997 led to the increasing number of poor people and triggered the emergence of the malnutrition and malnourishment, especially in toddlers.[4,5] To prevent a worsening situation, the Indonesian government has taken prompt action by launching the Social Safety Net in Health Sector Program (PJPS-BK).[8,9] One of the activities of the PJPS-BK is providing food supplementation for

toddlers. This activity has been implemented in all Indonesian districts, including Sleman District. In this study, evaluation of food supplement effect to nutritional status changes of severe malnourishment children aged 12-59 months in Sayegan Sub District of Sleman District has been conducted. The evaluation of nutritional status changes was based on Z-score according to Ministry of Health.

The results showed that the food supplementaion did not improve the nutritional status of children according to WAZ. Although the nutritional status of 25.87% children increased and the mean of WAZ significantly increased 1.04 to be -3.29 after supplementation ($p<0.05$), the mean of nutritional status of the children was still the worst (WAZ <-3SD). Moreover, the food supplementation did not improve the nutritional status of the children according to HAZ either. The mean of HAZ before food supplementation (-2.53) was not significantly different compared to after food supplementation (-2.45). Therefore, mean of nutritional status of the children after food supplementation was still short (HAZ <-2SD). However, the food supplementation improved the nutritional status of 86.21% children. The mean of WHZ significantly increased 1.13 from -3.35 to be -2.22 after food supplementation ($p<0.05$). In addition, the nutritional status of the children changed from wasted (WHZ <-3SD) to thin (WHZ <-2SD to ≥-3SD).

Food supplementation program has been implemented especially in some developing countries in the world with different schemes and results. A food supplementation program integrated with routine health care through mobile clinics in migrant communities in the Dominician Republic showed that the food supplementation can decrease acute undernutrition rates from 40% to 23%, while chronic undernutrition rates decrease from 33% to 18%.[11] Isanaka et al.[12] evaluated the effect of a 3-month distribution of ready-to-use therapeutic food on the nutritional status of children aged 6 to 60 months in 12 villages in Maradi, Niger. The intervention could reduce the incidence of wasting about 36% (95% CI: 17-50%) and severe wasting about 58% (95% CI: 43-68%). Nielsen et al.[13] reported that the degree of malnutrition after supplementary feeding did not increase during the war emergency in Guinea-Bissau in 1998-19991. The prevalence of malnutrition increased with the beginning of the war but then decreased. Moreover, the mortality of malnourished children did not increase during the war.

The issue of malnutrition is very complex and influenced by mutlidimensional factors. Several determinants that affect children malnutrition are intrauterine growth retardation, lack of exclusive breastfeeding, inappropriate complementary feeding, repeated attacks of infectious illnesses, food scarcity, and micronutrient deficiencies.[14] The socioeconomic and demographic factors are, importantly, associated with severe and moderate malnutrition.[15]

In this study, the effect of food supplemenation on nutritional status of female children was more significant than male children according to WAZ and WHZ. However, according to HAZ, the effect of food supplementation on nutritional status of female and male children was similar. Furthermore, according to the age groups, the effect of food supplementation on nutritional status of children aged 12-23 months was higher than on children aged 24-59 months.

The determinants of gender and age in association with the nutritional status of toddlers have been reported. Olack et al.[16] reported that children aged 36-47 months had the highest prevalence of stunting while the highest prevalence of wasting was in children aged 6-11 months in an informal urban settlement in Nairobi, Kenya. In addition, boys were more stunted than girls, and older children were

significantly stunted compared to younger children. In the third year of life, girls were more likely to be wasted than boys. A meta analysis conducted by Wamani et al.[17] also reported that boys were more stunted than girls in sub Saharan Africa. Although the influence of gender and age on nutritional status of children has been reported, however, their mechanism as determinants related to the nutritional status is complex and poorly understood.

## CONCLUSION

In conclusion, food supplementation on children aged 12-59 months improves their nutritional status according to WHZ. Moreover, the effect of food supplementation is more significant on nutritional status in female than male children and is higher in children aged 12-23 months than 24-59 months.

## ACKNOWLEDGEMENTS

The authors would like to thank Mr. Jumarko and Mr. Widhiharto for their valuable assistance during conducting this research.

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