Three Months of Positive Deviance Approach Integrated with Posyandu TKA Increased Development Performance and Decreased Morbidity of Underweight Children (6–59 Months)

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ABSTRACT

Positive Deviance Approach integrated with Posyandu TKA (Centre for Growth and Development) offered an excellent opportunity to alleviate the health and malnutrition problem. The study aimed to measure the effectiveness of 3-month Positive Deviance Approach (PDA) integrated with posyandu TKA on growth, development and morbidity of underweight children under five in Pandeglang Assessment of growth used anthropometrics measurement; KPSP test for development, feeding practice used 24-hour food recall, and morbidity record on diarrhea and ARI (Acute Respiratory Infection). Results showed that after 3 months of intervention there were no significant changes on growth of the children in term of WAZ, HAZ and WHZ, but prevalence of underweight among intervention children reduced up to 27.5%, whereas among control children 18.2%. No significant changes in energy and protein intake of the children. However feeding frequency, food diversity and good feeding practices of intervention children were significantly improved. The morbidity was significantly reduced in the intervention group by 10–25%. The development score of the intervention group was about 1.9 better than control group. The posyandu TKA was an alternative model in educating mothers for a better feeding practices, and stimulating the children for improving development and prevention from nutritional status deterioration. This should make an ideal model for posyandu in Indonesia.

Key words: *malnutrition, intervention, positive deviance approach (PDA), posyandu, growth, development*

INTRODUCTION

Childhood malnutrition is a major public health problem throughout the developing world and is one of the principal underlying causes of death for many of the world's children (Coufield *et al*., 1999; UNICEF, 2001). According to SUSENAS report (2000) In Indonesia, one fourth of children under five year of age, or some 6 million children were underweight. Malnutrition increases the risk of death, inhibits physical and mental development, and diminishes a child potential for becoming a healthy, productive adult (CGI, 2001 and Engle, 1995).

Previous studies have claimed that adequate nutrient intake and appropriate health care could be achieved by good care practices especially in household with poor economic conditions. The Positive Deviance Approach (PDA) focuses on changing or promoting good behavior which already exists in the community and PDA also work on stimulating interactions between parents and children to enhance the child's tendency to exercise and its developing organ systems and hence to utilize nutrients for growth and development (Mc Gregor *et al*., 1999). Furthermore, the successful program of community based Positive Deviance Approach (PDA) studies has shown promising result in rehabilitating and preventing childhood malnutrition. Save the Children Federation had proven that Positive Deviance conducted as part of two years Poverty Alleviation and Nutrition Program (PANP) in Vietnam, resulted in a 40% reduction in moderate malnutrition and 68% reduction in severe malnutrition (Lapping *et al.*, 2002).

Indonesia has an extensive network of posyandu for growth monitoring and health promotion activities which offered an excellent opportunity to alleviate the malnutrition problem. Eventhough most of Indonesia's posyandu were not functioning at present; it remains the best channel to reach children and women (CGI, 2001). PDA would be a good example integrated nutrition program to alleviate the malnutrition problem if it integrates posyandu activities and child stimulation and it called Posyandu *TKA* (*Tumbuh Kembang Anak*).

METHODS

Study Design

This study was a community trial study comparing groups of children participated in *Posyandu TKA* (intervention group) and control group (regular posyandu).

Area and Subject for the Study

The study area covered 6 villages in 2 sub-districts of Pandeglang district, Banten Province, Indonesia. Pandeglang district was a poor area with majority of population was small subsistence farmers and had limited access to basic sanitation. The prevalence of underweight was > 30%. The subjects of the study were underweight children aged 6–59 months. The inclusion criteria of the subjects were (1) moderate underweight (–2.00 WAZ score to –3.00 WAZ score), (2) apparently healthy children (not having chronic disease, such as tuberculosis and malaria), (3) children with no apparently congenital defects, and (4) children whose parents willing to participate. By the end of intervention, those who had attendance to *posyandu TKA* activities < 50% were excluded.

Sample Size and Sampling Procedure

Sample size calculation was based on expected mean difference of WAZ of 0.5 SD Z-score and standard deviance of 0.81 SD Z-score (Dewey, et al., 2003). With the statistical confidence level of 95% (an error risk of 5%) and 20% drop out, 70 children were needed for each group. Sample size for child development was calculated based on difference between two proportions of children's development. The proportion of underweight children who fell in the "delay" category for development was 41% (PCI, 2005). With the expected reduction of proportion of children in "delay" category of 25% by the end of intervention (personal communication), confidence level of 95% and 5% drop out, a sample size of 53 children were required.

Features of Intervention

The intervention group consisted of children who participated in program using a 'modified' Positive Deviance Approach called *Posyandu TKA*. The posyandu TKA consisted of twice weekly meetings for three consecutive months. Each meeting lasted for approximately 2 hours. In each meeting, mothers with their underweight children had activities as follow: (1) supplementary feeding to the children (2) health and nutrition education to the mothers (3) stimulation to the children and (4) hygiene and sanitation practices for both children and mothers. The menu of supplementary feeding was expected to provide energy of 600–800 kcal and 25–27 gram of protein (Sternin, 1999).

Methods and Instruments Used

Interview was carried out by trained enumerators using structured questionnaires to describe the socioeconomic and demography condition of the children, breastfeeding and complementary feeding practice, hygiene and sanitation practice. *Observation* was also employed to record housing condition and environment sanitation.

Anthropometric measurement of weight and height of children were assessed every month during the intervention program. Body weight of children was measured to the nearest of 0.1 kg on a standardized and calibrated electronic weighing scale (SECA, A & D). Body height of children who already could stand was measured to the nearest 0.1 cm using a microtoice (UNICEF), whereas, the length of the children who could not stand was measured on a length board (SECA 210). The anthropometrics indices were expressed in term of Z score (standard deviance score) following cut-offs based on WHO-NCHS reference (Gibson, 1990).

Dietary intake assessment was ascertained via the caregiver's 24-hour recall of what the child consumed in the previous day. Dietary intake assessment was conducted twice, at the beginning of intervention and at the end of intervention for both groups. Frequency of feeding and food diversity score of the children were assessed from 24 hours recall to determined the good feeding practices of young children (6–24 months) according to FANTA indicators (Arimond *et al*., 2003).

Infectious Diseases/Morbidity Measurement. Diarrhea and acute respiratory infection were defined as indicators of infectious diseases occurrence. Children diarrhea and acute respiratory infection were defined as mothers/ caregivers report of at least one day of diarrhea episode or respiratory illness in the 14 days preceding the interview during the intervention conducted.

Child Development Measurement using development test for screening namely KPSP (*Kuesioner Pra Screening Perkembangan*) was assessed to determine whether the children in the normal development, doubt or delay development according to the Ministry of Health category (MOH, 2003).

Data Analysis and Statistical Method

A statistical feature of SPSS for windows software (version 11.5) was used for data analysis. Z Score for anthropometrics measurements was computed using the Nutri-survey for Smart version 2005 program, while dietary intake was analyzed using the Nutri-survey for windows version 2004 version.

Ethical Consideration

The study received ethical clearance from the Ethical Committee, Faculty of Medicine, University of Indonesia

RESULTS

Background Information of all the Children

One hundred and forty nine children were recruited from 6 villages in 2 sub-districts of Pandeglang. Of the 79 recruited children in the intervention group, 69 children completed the intervention and of the 70-recruited children in control group, 66 children completed the assessment until the end of study.

Age, sex and nutritional status of the underweight children were relatively similar and comparable between the 2 groups (Table 1). The exception was the WHZ; the intervention group had significantly higher WHZ than the control group. Almost 60% of both group were already stunted (HAZ score <–2.00 SD) at baseline. Infectious diseases among children were also common in the study area. During baseline, children reported having diarrhea was 14.5% in intervention group and 16.7% in control group**.** Proportion of children with Acute Respiratory Infection (ARI) was four times higher than with diarrhea. Children reported to have any ARI was 58% in the intervention group and 62.1% in the control group. Almost all ARI symptoms were upper respiratory infection as typically characterized by cough (33%) and/or runny nose (50%).

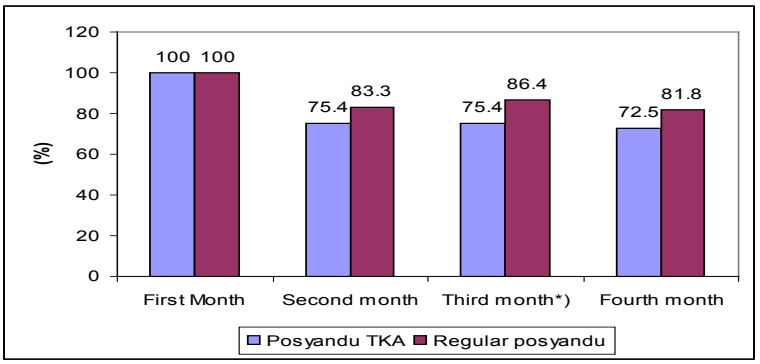
The Effects of the Intervention on Growth of the Children

The intervention group had lower prevalence of underweight than the control group by months of follow up. The difference of this prevalence was showed in figure 1**,** among intervention group decreased to 72.5% and in control group to 81.9% after 3 months of intervention, but this changes were not statistical significant**.** There were no significant changes in prevalence of stunting and wasting.

Table 1. General Characteristic of Underweight Children at Baseline[1]

Characteristics	Posyandu TKA n = 69	Regular posyandu n = 66
Age (months)	31.2 ± 13.5	30.3 ± 12.9
Sex		
– Male	34 (49.3)	29 (43.9)
– Female	35 (50.7)	37 (56.1)
Weight (kg)	10.0 ± 1.7	9.7 ± 1.7
Height (cm)	82.5 ± 8.3	82.2 ± 7.4
Weight for age (WAZ)	-2.40 ± 0.29	-2.47 ± 0.31
Height for age (HAZ)	-2.29 ± 0.84	-2.19 ± 1.04
Weight for height (WHZ)	-1.37 ± 0.56*	-1.49 ± 0.78
Stunting	47 (68.1)	41 (62.1)
Wasting[b]	9 (13.0)	15 (22.7)
Proportion of diarrhea	10 (14.5)	11 (16.7)
Proportion of ARI	40 (57.9)	41 (62.1)

[1] Values are Mean ± SD and n (%)
* Significant different (Independent sample t-test, p < 0.05)



[a] No significant changes of prevalence of underweight in both groups (McNemar Test)

Figure 1. Prevalence of Underweight by Study Group and Month of Follow up[a]

The Effects of Intervention on Feeding Practice of the Children

By the end of intervention almost 50% of children in both groups met the daily calorie requirements. Vitamin A adequacy of intervention group was significantly higher than baseline and showed statistically different than control children. Both the iron and zinc adequacy of the children was still below 20% of requirements at end line (Figure 2).

After 3 months of intervention, feeding frequency, food diversity score and good feeding practices of intervention group were significantly better than the control children (Table 2). Also, feeding practices and food diversity score in the intervention group was significantly better than baseline.

The Effect of Intervention on Morbidity of the Children

The proportion of children reported having diarrhea remained low across all study groups by months of follow up. However, intervention group had statistically lower proportion of diarrhea than control group at end line (Figure 3).

The proportion of respiratory illness was lower in the intervention group than the control group during the intervention period, and reached statistical significant difference at third month and fourth month (Figure 4).

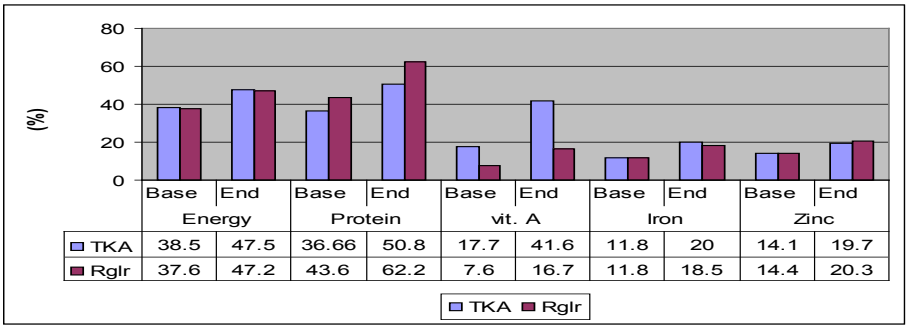
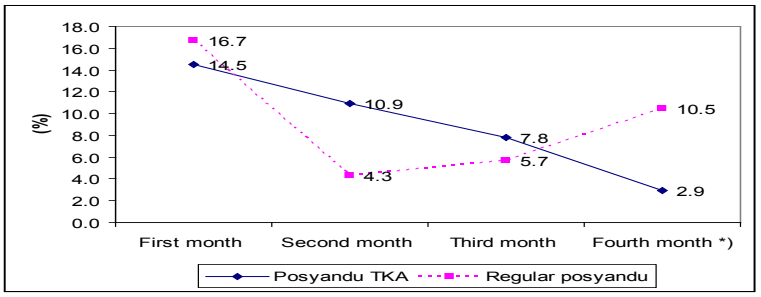


Figure 2. Nutrient Adequacy of Children by Study Group at Baseline and End line



*) Significant different between group (Fisher's Exact Test, p = 0.004)

[1] Significant changes of proportion of diarrhea in intervention group by months of intervention (p < 0.05; McNemar Test)

Figure 3. Proportion of Children Reported Having Diarrhea in the Past 14 Days by Study Group and Month of Follow up[1]

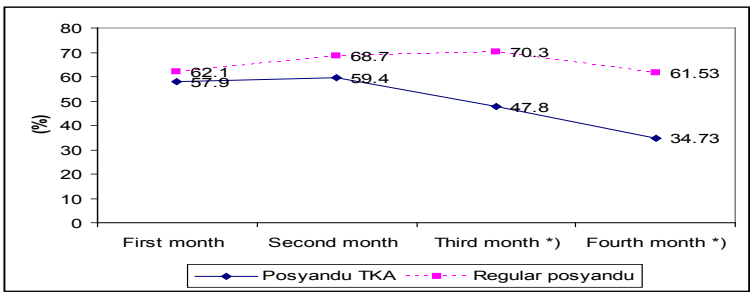
Table 2. Feeding frequency, Food Diversity Score, and Good Feeding Practices of Children by Study Group at Baseline and End line[1]

Variable	Baseline		Endline	
	Posyandu TKA	Regular posyandu	Posyandu TKA	Regular posyandu
Feeding frequency	2.68 ± 0.71^	2.53 ± 0.61	3.93 ± 0.71^**	3.19 ± 0.82**
Food diversity score	2.54 ± 0.99^	2.73 ± 1.24	3.93 ± 1.1^**	3.32 ± 1.39**
Good feeding practice (for children 6–24 mo)	3.3 ± 1.32	3.2 ± 1.14	4.43 ± 1.0**	3.43 ± 0.74**

[1] Value are Mean ± SD

**Significant different between group (p < 0.001, Independent Sample T-Test)

^ Significant different within group (p < 0.01, Paired T-Test).



*) Significant different between group (Fisher's Exact test, $p < 0.05$).

[1] Significant changes of proportion of ARI in intervention group by months of intervention ($p < 0.01$; Mc Nemar Test)

Figure 4. Proportion of Children Reported Having ARI in the Past 14 Days by Study Group and Month of Follow up[1]

The Effect of Intervention on Development of the Children

In the intervention group, the development score increased significantly compared to baseline and the proportion of children in the 'delay' category was reduced from 41% to 4%. By the end of intervention, the development scores of the intervention children was 1.5 point higher than baseline and 1.9 point higher than control children. In control group, the proportion of children in the 'delay' category was 40.4%, significantly higher than the intervention group (Table 3, 4).

DISCUSSION

Overall, the prevalence of underweight in intervention children was lower than the control group after 3 months of intervention, but not statistically significant. However the intervention had prevented and or reverses the malnutrition from getting worse. The short period of intervention (3 months) might be one of the reasons why the result was not much as expected. Lack of overall impact on growth may also due to the frequency of supplementary feeding which was conducted twice a week. Supplemental feeding here was more considered as nutrition education to the mothers than for nutrition rehabilitation to the children. Among 10 feeding program trials conducted in different developing countries with different duration of the intervention (from 3 to 12 months), the positive effect on linear growth was observed only in 3 countries (Sudan, Senegal and Ghana). The possible reason for the lack of effect on growth in the other sites were some study did not include enough infants under 12 months of age when faltering is most dramatic, small sample size, lack of control group that received no intervention at all and short duration of intervention (Dewey, 2000).

Feeding frequency of intervention group increased significantly from 2.6 times to 3.9 times a day, and it improved the nutrient intake of the children although it was not statistically different between before and after

Table 3. Development Test of the Children by Study Group (sub-sample)

Variable	Posyandu TKA			Regular posyandu	
	Baseline n = 38	End line n = 50	Change N = 38	Baseline	End line n = 52
Children development screening test [a]	7.16 ± 2.10*	8.66 ± 1.11^	1.50 ± **	–	6.78 ± 1.50^

[a] Mean ± SD

* Significant different ($p = 0.000$, Paired T-Test)

^ Significant different ($p = 0.000$, Independent Sample T-Test)

** Significant changes ($p = 0.000$, One Sample T-Test)

Table 4. Development Category by Study Group at End line

Development category**	Posyandu TKA (n = 50)	Regular Posyandu (n = 52)
Delay	2 (4.0)	21 (40.4)
Doubt	18 (36.0)	26 (50.0)
Normal	30 (60.0)	5 (9.6)

** Significant different between group (Chi Square Test).

intervention, except for vitamin A. Vitamin A intake in the intervention group was significantly higher than baseline. Children need more frequent meals, because the child's stomach is smaller than adults, whereas children's energy and body building needs are greater. So it is important that children eat frequently to fulfill all of their needed nutrients. From the age of six months to three or four years, children need to be fed four to five times a day (UNICEF, 2002).

Food diversity in the intervention group increased 1.4 point better then before, and the increment point was found in the vitamin A rich food source of the children (fruits and vegetables). Data derived from 24-hour food recall showed that intervention group consumed more fruits and vegetables. The intervention group had significantly higher vitamin A intake and adequacy than baseline.

The significant reduction in the proportion of children had diarrhea and ARI in the intervention group may be due to improved hygiene, such as increased hand washing with soap and or improved diet, including vitamin A intake and other micronutrient intake. As mentioned before, hand washing with soap was one of the must-do-activity in every meeting of PDA integrated with posyandu *TKA*, and this practice could counter or prevent the children from several bacteria and/or virus causing diarrhea and or respiratory illness. Study by Ahmed, et al., (1994) and it was reviewed by Curtisf and Caincross (2003) showed that the simple act of washing hand with soap can reduce diarrhea diseases among adults and young children by 42 to 47 percent. The large magnitude (10–25%) reduction and consistency of the results from month to month, however, indicate that these results were real. In Vietnam, children enrolled in the nutrition improvement project had significantly lower Acute Respiratory Infection (ARI) than the control communes (Sripaipan *et al.*, 2002).

The higher vitamin A intake among intervention group might also one of the explanations of the reduction of the morbidity (diarrhea and ARI) in addition to the vitamin A supplementation which given February 2005. Vitamin A is important for normal vision, and also for immunity and resistance to infections, including diarrhea and respiratory infections which account for more than half of infant and child deaths (UNICEF, 2000).

The development score in the intervention group increased and significantly higher than control children. And the proportion of children in the 'delay' category was statistically lower in intervention group than the control group. The development score was influenced by attendance to the posyandu TKA. It was true that the percentage of children attending the program may act as variable influencing the development of the children, because whenever the children came to the program that means that they got a set of development learning, such as ability to communicate with others, numerical understanding, social and emotional skills, singing, and also stimulation for sitting, walking, running, riding, eating by themselves, etc. The more frequent they came to the program, the more progress they had. Encouragement for independence, exploration, and learning by caregivers can stimulate and improve children's intellectual development and nutritional status. Young children are born with the ability to learn, but they need encouragement and stimulation to be able to develop that ability. In developing countries, malnourished children who have been given verbal and cognitive stimulation have higher growth rates than those who have not (Engle, 1995).

This study had similar findings with Satoto's study in Indonesia, which showed that education about development norms; complementary feeding and breastfeeding promotion will improve development and feeding behavior but not necessarily the nutritional status of the children (Engle and Lhotska, 1999).

CONCLUSSION

After 3 months of intervention with Positive Deviance Approach (PDA) integrated with Posyandu *TKA* there were no significant changes on growth of the children in term of WAZ, HAZ and WHZ. There were no significant changes in energy and protein intake of the children but there were significantly higher vitamin A intake, vitamin A adequacy, feeding frequency, food diversity and good feeding practices of children. Morbidity of the children (diarrhea and acute respiratory infection (ARI)) was reduced by 10–25% and the development scores of the children significantly increased about 1.5 point higher than baseline and 1.9 better than control children.

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