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## Using Modified Growth Chart in Posyandu Effectively Improved Child Weight Gain in Deli Serdang District, Indonesia

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**Abstract:** Growth chart is an essential tool in growth monitoring program for malnutrition prevention among children. However, reports from several countries indicate poor use of growth chart by mothers and health workers. A simple and informative growth chart is currently needed to be used as educational tool for mothers to easily comprehend their children's growth. The objective of study was to investigate the impact of modified growth chart on child weight gain. The study was a quasi experimental with the non equivalent control group design approach. Children in intervention group used modified chart while children in control group used normal growth chart. Child's weight was collected for ten months using hanging scale. Data was analyzed two times; at the first five month and at the second five month. T-test independent was used for statistical analysis. At the baseline there was no significant difference of child weight between intervention and control group ( $p>0.05$ ). However at the first month there was significantly difference in child weight of age group 14-17 months ( $p<0.05$ ) and for age group 16-18 months at the second five month ( $p<0.05$ ). Modified growth chart effectively improved child weight gain and highly suggested to be used in Posyandu.

**Key words:** Growth chart, modified growth chart, child weight gain

### INTRODUCTION

Growth chart is an essential tool in growth monitoring program for malnutrition prevention among children. The graph of children growth is shown every month and the trend of growth can be used to encourage mothers to do positive practices, motivating the changes, giving rewards and to do innovative health behavior (Griffiths, *et al.*, 1996). Although growth charts are recommended for monitoring children, the recent reports from several countries indicate poor use by mothers and health workers. Roberfroid *et al.* (2007) also reviewed 20 studies on growth chart from Asia, Africa and Latin America concluded that 30-75% mothers had low understanding in interpreting the children growth chart. Thus, several countries have been modifying their own growth charts. It has been estimated that 200-300 kinds of growth chart currently are used by more than 80 countries in the world, some are quite similar to the original while others are considerably modified. Several countries that have ever published their modified chart are Philippines, Mexico, India, Lesotho, Nigeria and Indonesia (Brownlee, 1990). Experiences from several countries proved that introducing revised growth charts together with education might have enhanced mothers' knowledge, understanding, interpretation and comprehension on growth chart (Martinez *et al.*, 1996; Senanayake *et al.*, 1997; Sohal *et al.*, 1998; Ruel, 1990). In the year 1980-90's, Indonesia had successful experiences in implementing growth monitoring

program through integrated health post (Posyandu). Posyandu is a place to run monthly growth monitoring for under five year children conducted by community health cadres and village midwives, in which the growth chart is used as the growth monitoring tool (Sulistyorini *et al.*, 2010; Kemenkes, 2006). Indonesia had a successful experience in implementing growth monitoring program. Hendrata (1984) recorded that Indonesia can cover 30,000 villages in expanding the growth monitoring program in Posyandu in less than five years.

However, in the year 2000's Indonesia was not so successful in applying the growth chart as the growth monitoring nutritional educational tool. The Basic Health Research, 2007 (Kemenkes, 2008) revealed that only 23.3% mothers possessed growth chart and kept the chart at home, while 41.7% of mothers let their child's cards kept by Posyandu cadres and the rests, 35% did not have growth charts.

Whereas the function of chart is supposed to be an education tool for parents and care givers and the end they can take action related child growth status (Griffiths *et al.*, 1996). It is therefore, the more simple, understand able and informative growth chart need to be created as the WHO suggested (Joseph *et al.*, 2009). In this paper, the authors introduce a modified growth chart so called Bubble Score Growth Chart (Sinaga, 2012 unpublished paper), to motivate mothers improve their child weight gain through monthly weighing in Posyandu.

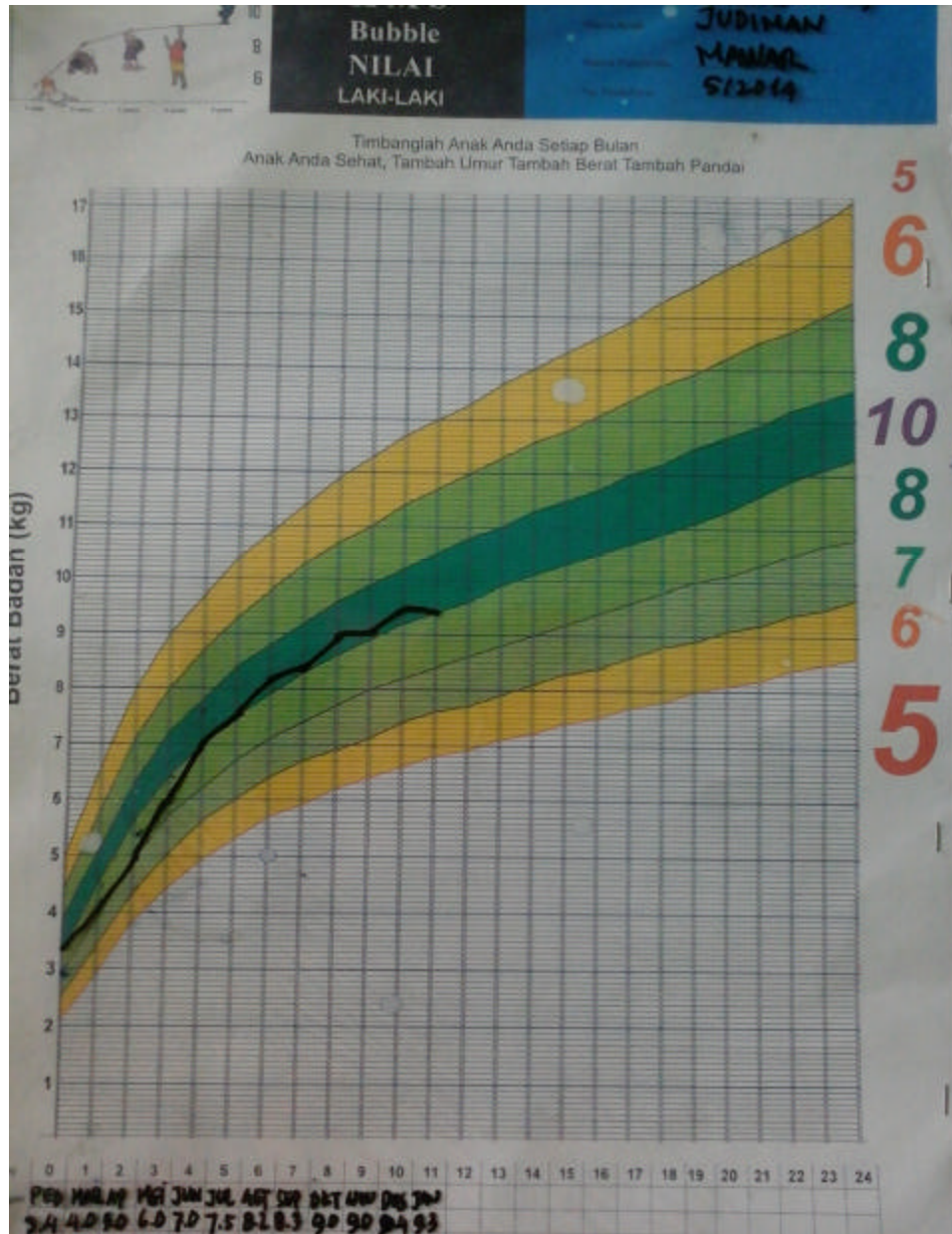


Fig. 1: Modified growth chart (bubble score growth chart)

To measure the effectiveness of modified growth chart in improving child weight an intensive nutritional education is conducted. Therefore, the results presented in this paper specifically addressed the comparison of child weight gain between children who used modified growth chart (Fig. 1) and children in control group used the normal growth chart (Fig. 2).

#### MATERIALS AND METHODS

**Subjects:** The study included 107 mothers/care givers (54 mothers in intervention group and 53 mothers in

control group) with their children aged 0-12 month recruited from 8 integrated health posts (Posyandu) selected from two sub-districts. Mothers were identified from the posyandu register book. The inclusive criterias were set to select the subjects; mothers aged 20-27 years, minimum nine years followed the formal education, babies' birth weight 2600-4000 g and breastfed.

**Calculation of sample size:** It was assumed that there would be a 30% difference of proportion of high nutrition

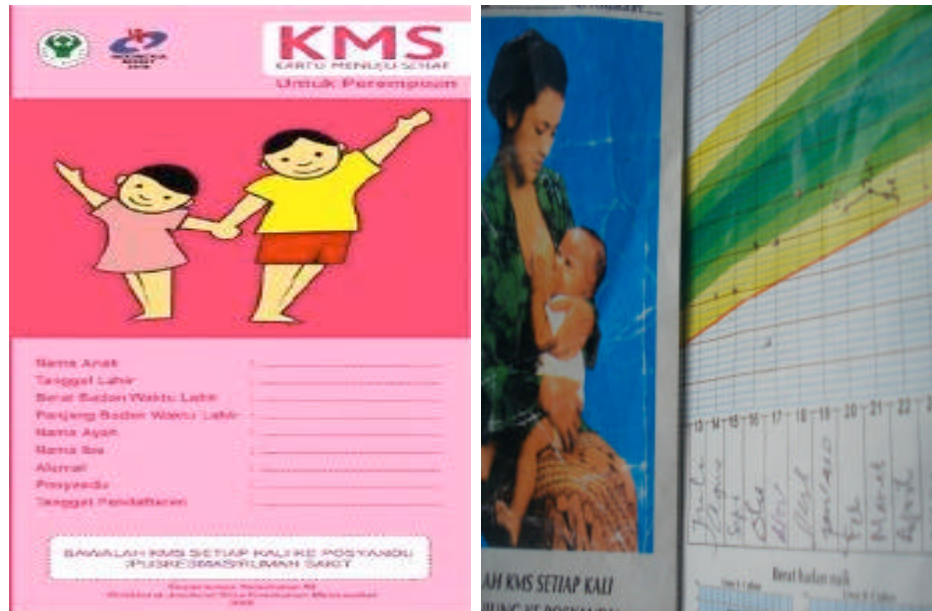


Fig. 2: Normal growth charts

knowledge for the intervention group after receiving intensive nutrition education. Using the formula:

$$n = \{Z_{1-\alpha/2} \sqrt{2PQ} + Z_{1-\beta} \sqrt{[P_1(1-P_1) + P_2(1-P_2)]} \}^2 / (P_1 - P_2)^2, n = 50$$

Then 10% is added for drop-out possibility in each group; so, the total sample size was 55 persons. Based on this calculation, in each posyandu 10-15 mothers were recruited.

**Data collection:** There base data on mother's and family characteristics collected by the written questionnaires and monthly child weight during ten months were taken by weighing month in Posyandu.

**Intervention:** Mothers in intervention group received modified growth chart based nutritional education. Five lessons delivered during the four months interventions. The five topics are; (1) function of the growth charts (2) function of curves and colour tapes (3) monthly minimum weight gain (4) function of bubbles and scores and (5) plotting and graphing. While mothers in control group used the normal growth chart and treated by Posyandu cadets.

**Research implementation:** The study was conducted for ten months started on May 2013 till March 2014. Three researchers assisted by four enumerators collected the data from 107 children in eight Posyandus.

**Data analysis:** Child weight was recorded every month and grouped based on the child age group. The average

of child weight then calculated. Statistical analyses were conducted using the SPSS for Mc, version 17 used to test statistical significance of differences between two groups used t-independent test for numeric variable.

## RESULTS

Of ten characteristics seven variables belong to parents and three for child; birth weight, age and current weight. The birth weight of child was quiet similar between two groups but for baseline weight children in intervention group was heavier around 400 gr compared to child weight in control group but not significantly different ( $p > 0.05$ ).

More than half of parents in the two groups of study completed grade 9-12 of formal study; fathers: 59.2 vs 68.5% and mothers: 69.8 vs 69.8%, respectively for intervention and control group. In terms of occupation, the most main job of mothers was household workers; 85.2 and 92.4% for intervention and control group, respectively, while fathers mostly worked in private sectors and only around 5% was worked as the government workers. Through those occupations the monthly family income was around Rp. 1.5-2.0 million rupiahs (1USD = 11.600 IDR). This amount was similar to the regional minimum salary determined by the local government. Statistical analysis showed that the p-values of all characteristics were  $> 0.05$ , means that the characteristics of respondents between the groups of study were comparable.

Table 2 shows that before intervention, the mean weight of the three age groups were not significantly different ( $p > 0.05$ ). However, after five months the mean weight of

Table 1: Demographic characteristics of subjects and families

Characteristics	-- Intervention group (N = 54) --		---- Control group(N = 53) ----		p-value
	Mean±SD	n (%)	Mean±SD	n (%)	
Birth weight (kg)	3.2±0.38		3.2±0.45		0.78
Baseline weight(kg)	6.5±1.90		6.1±1.67		0.21
Age (months)	5.19±3.54		4.6±3.83		0.40
0-5 month		27(50.0)		30(56.6)	
6-8 month		13(24.1)		12(22.6)	
9-12 month		14(25.9)		11(20.8)	
Mother's Age (year)	27.8±4.44		27.9±4.59		0.93
<b>Mother's education</b>					0.69
Grade 7-9		17(31.5)		15(28.3)	
Grade 10-12		32(59.2)		37(69.8)	
Above grade 12		5(9.3)		1(1.9)	
Mother's Occupation					0.20
Household workers		46(85.2)		49(92.4)	
Agricultural/skill labour		2(3.7)		2(3.8)	
Private sector		6(11.1)		2(3.8)	
<b>Fathers' education</b>					0.37
Primary (Grade 1-6)		4(7.4)		3(5.7)	
Grade 7-9		7(6.4)		11(20.7)	
Grade 10-12		37(68.5)		37(69.8)	
Above grade 12		6(11.1)		2(3.8)	
<b>Fathers' occupation</b>					0.28
Government workers		2(3.7)		3(5.7)	
Agricultural/skill labour		8(14.8)		3(5.7)	
Private sector		42(77.7)		45(84.8)	
Others		2(3.7)		2(3.8)	
Household member (person)		4.02(±0.94)		4.04(±0.99)	0.91

child in intervention group (age group 14-17 months) was significantly higher compared to children in control group (9.55±0.69 and 8.69±1.01, p<0.04).

Table 3 shows that at the second five month there was a changing of weight in the two groups of study. In intervention group at the first five month age group 14-17 months gained more weight significantly, however at the second five month age group 16-18 months significantly gained more weight (p = 0.02) compared to other two age groups (p = 0.33 and p = 0.09).

## DISCUSSION

This study investigated the impact of modified growth chart on children weight gain. This study proved that after ten months intervention, child weight in intervention group (in certain age group; 14-17 months at the first five month and 16-18 months at the second five month) was significantly heavier compared to children who did not use modified growth chart. This might due to breastfeeding practices. The changes of feeding practices could happen when the child aged 9-12 months. As this study also documented that 58% mothers in the test group breastfed child more than eight times per day, in contrast only 36% did the same in control group. Riviera and Ruel (1997) also found in their study in Guatemala that 40-80% child aged 9-12 month experienced growth failure. In Indonesia the prevalence of malnutrition of child age 11-12 months was 10% (Kemenkes, 2008). Therefore

children aged 9-12 months should be put into high consideration in community nutrition program.

It could be assumed that the revised chart was significantly improved mothers' knowledge on the function of growth chart. Our findings documented that mothers could plotted the chart, connected the plots and fed baby with appropriate foods due to mothers participation in monthly growth monitoring program in Posyandu. The findings are consistent with the results of several studies on the application of modification and revised growth charts that introduced with creative teaching aid and training to mothers in Mexico, Colombo, Srilanka and Kwa Zulu and Lesotho, Africa (Martinez *et al.*, 1996; Senanayake *et al.*, 1997; Sohal *et al.*, 1998). This can be explained that modification chart might have enhanced mothers eagerness and willingness to study and understand more about growth chart components. In this study, replacing along vertical lines by the bubbles and the application of scores 5, 6, 7, 8 and 10 as frequently used by teachers in school to evaluate students might have motivated mothers to understand the growth chart. The bigger size of bubble score chart made it easier for mothers to plot and connecting the dots. In fact using numbers, percent and ratio was frequently applied in changing health behavior (Fargelin *et al.*, 2007). A study in Mexican-American population proved that inserted numbers in health advices improved caring to their health (Schapira *et al.*, 2011).

Table 2: Mean weight (kg) of child before intervention and five months after intervention

----- Before intervention -----				----- 5 months after intervention -----			
	Intervention group N = 54	Control group N = 53	p-value		Intervention group N = 50	Control group N = 50	p-value
Age group	Mean (kg)±SD	Mean (kg)±SD		Age group	Mean (kg)±SD	Mean (kg)±SD	
0-5 months	5.10±1.31	5.14±1.55	0.91	5-10 months	7.42±0.69	7.32±0.93	0.66
6-8 months	7.50±1.08	6.95±1.04	0.17	11-13 months	8.80±0.81	8.35±0.62	0.14
9-12 months	8.34±1.33	8.14±1.36	0.72	14-17 months	9.55±0.69	8.69±1.01	0.04

Table 3: Mean weight (kg) of child at the first and second five months

----- First 5 months after intervention -----				----- Second 5 months after intervention -----			
	Intervention group N = 54	Control group N = 53	p-value		Intervention group N = 50	Control group N = 50	p-value
Age groups	Mean (kg)±SD	Mean (kg)±SD		Age group	Mean (kg)±SD	Mean (kg)±SD	
5-10 months	7.42±0.69	7.32±0.93	0.66	10-15 months	8.17±0.87	7.97±0.55	0.33
11-13 months	8.80±0.81	8.35±0.62	0.14	16-18 months	9.69±0.82	9.04±0.67	0.02
14-17 months	9.55±0.69	8.69±1.01	0.04	19-22 months	10.26±0.75	9.25±1.17	0.09

Difficulties in comprehending and applying the normal chart was because there was no intensive nutrition education to promote the new world health organization (WHO)-2005 chart. In the recent growth chart can not be found information on how to interpret child weight, appropriate feeding guidelines and in application at Posyandu mothers have never been involved in filling and plotting the growth chart. In contrary, the appearance of modified growth chart is referring to WHO, Treversky and Morirson suggestions that parents should be involved in plotting and the appearance of growth chart should be simple and presenting the explanations and advices what parents should do at home (Joseph *et al.*, 2009).

**Conclusion:** The present study was designed to investigate the effect of modified growth chart that used as the main media in nutrition education on child weight gain. Our findings that modified growth chart that is called Bubble Score Growth Chart is more effective media in improving child weigh gain. Creativity and innovation of health workers need to be enhanced particularly in using the existing health promotion medias such as growth chart.

The implication to the present growth monitoring program that currently running in Posyandu in Indonesia is mothers should be taught how to use growth chart with new and interested methods and media. Children aged 9-12 month should be put into high concern. The supervision of health workers to Posyandu should be focus on improving mothers' knowledge on the function of growth chart and appropriate foods for child. The weakness of study was the number of subjects participated too small. Further studies need to recruit bigger participants and started from birth and followed up until 12 months.

**Conflict of interest:** The authors declared that there is no conflict of interest for any of the authors with regard to the content of this study.

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