

Improving Mothers' Knowledge and Child Calorie Intake through Modified Growth Chart in Deli Serdang Distric, Indonesia

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ABSTRACT: The improper knowledge of mothers is the most causes of the onset of malnutrition in young children. Growth chart is an essential tool in growth monitoring program for malnutrition prevention among children. This study is to investigate the impact of the modified growth chart that is called "Bubble Score Growth Chart" on mothers' knowledge and child calorie intake. Mothers in intervention group used bubble score growth chart while mothers in control group used the normal growth chart. Sixteen written questions were designed and tested to measure mothers' knowledge. Results : Before intervention, there was no significant difference of mothers' knowledge, comprehension and application ($p>0.05$) and child calorie intake ($p>0.05$) between intervention and control group. After intervention, there was significantly different of high knowledge (86% vs 52%); high comprehension (86% vs 54%) and high application (78% vs 46%, $p<0.01$) and high calorie intake (74% vs 46%, $p<0.01$) respectively for intervention and control groups. Modified growth chart effectively improved mothers' knowledge and child calorie intake.

KEYWORDS: malnutrition, modified growth chart, bubble score chart, mothers' knowledge, child calorie Intake.

1 INTRODUCTION

The improper knowledge of mothers is the most causes of the onset of malnutrition in young children [1]. Growth chart is an essential tool in growth monitoring program for malnutrition prevention among children [2]. Clinical nutritionists have long recognized that nutritional status is determined by calorie intake [3]. Pediatric nutrition studies have demonstrated that children age 6-18 months is most critical periods of physical growth [3]. It is the reason the United Nations [4] states that the prevalence of malnutrition of under-five year children is one of the indicator for monitoring the Millennium Development Goals (MDGs). Therefore, the function of growth chart needs to be strengthened. 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 [5]. However, the interpretation of a child growth trajectory is highly dependent on the growth chart used [6].

Although growth charts are recommended for monitoring children, the recent reports from several countries indicate poor use by mothers and health workers [7], [8]. A study reported by Roberfroid *et al.* (2007) [9], the doctors had limited knowledge on the interpretation of the growth chart though they considered it is a good tool for diagnosis. Roberfroid 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 Philipines, Mexico, India, Lesotho, Nigeria and Indonesia [10].

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 [11], [8] [12], [13].

Recent evidence related to child mortality proved that 60% of all deaths among children under five years is directly or indirectly to malnutrition annually and over 2/3rd of these deaths are associated with inappropriate feeding practices and occur during the first year of life [14].

Indonesia had a successful experience in implementing growth monitoring program. Hendrata (1984) [15] 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 [16]. The Basic Health Research, 2007 revealed that only 23.3% mothers had growth charts and brought to home while 41.7% of mothers let their child cards kept by *Posyandu* cadres [16]. Whereas the function of chart is supposed to be an education tool for parents and caregivers and the end they can take action related child growth status [5]. It is therefore, the more simple, understandable and informative growth chart need to be created as the WHO suggested [17]

In this paper, the authors introduce a modified growth chart is called "Bubble Scored Chart" as a simple and informative growth chart. The chart is a modification of the new WHO-2005 growth chart. The lines along vertical axis replaced by bubbles in order to make it easier to do plotting and along the right side in between the color tapes presented scores/numbers 5, 6, 7, 8 and 10. These scores will guide the mothers to do interpretation based on children weight status. The explanation on how to interpret the child weight status and guidelines on the appropriate food is attached on the back side of bubble score chart. (see appendices)

In introducing the bubble score chart to mothers, an intensive nutritional education is conducted. Therefore, the results presented in this paper specifically addressed the comparison of the maternal knowledge and child calorie intake between mothers in intervention group who use bubble score chart and control group who use the normal growth chart.

2 MATERIAL AND METHODS

2.1 SUBJECTS

The study included 107 mothers/caregivers (54 mothers in intervention group and 53 mothers in control group) with their children aged 0-12 month recruited from eight *Posyandu* (weighing posts). The inclusive criteria were set to select the subjects; mothers aged 20-27 years, minimum nine years followed the formal education, babies' birth weight 2600-4000 grams and breastfed.

2.2 CALCULATION OF SAMPLE SIZE

It was assumed that there would be a 30% difference of proportion of high nutrition knowledge for the intervention group after receiving intensive nutrition education. Using the formula $n = \frac{\{Z_{1-\alpha}/2\sqrt{2PQ} + Z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}\}^2}{(P_1-P_2)^2}$, $n = 50$. Then 10% is added for drop-out possibility in each group; so, the total sample size was 55 persons. Based on this calculation, 10-15 mothers in each *Posyandu* were recruited.

2.3 DATA COLLECTION

There were two phases implemented in data collection of this study. Phase I was collecting the base data on knowledge. Sixteen written questionnaires was designed by researchers based on the nutritional related information that available in the bubble score chart. The first six questions were intended to measure *knowledge*, question no. 7 to 11 to measure *comprehension* and question no. 12-16 were intended to measure *application*. Type of questionnaires were closed ended question.

Data on calorie intake for two-non consecutive days was collected by 24-hour dietary recall. The types of foods included the process and portion were asked to mothers and recorded in a form. Phase II was the final data collection using similar questionnaires. This was done a month after the interventions ended.

2.4 INTERVENTION

There were nine lessons delivered during the four months interventions. The ten topics are; 1) function of the growth charts, 2) function of curves, 3) function of color tapes, 4) monthly minimum weight gain, 5) function of bubbles, 6) function

of scores, 7) plotting and graphing , 8) interpreting the weight status and 9) appropriate food for child. All information are taken from the bubble score chart. While in control group - mothers used normal growth charts.

3 RESEARCH IMPLEMENTATION

The study was conducted on May-October 2013. Four researchers assisted by four enumerators from Academy of Nutrition to collect the data from 107 mothers in eight *Posyandus*. The schedule of *Posyandu* was taken from Public Health Center (*Puskesmas*). Two researchers with two enumerators were responsible for one *Posyandu*. If the selected mothers could not be met or not present in *Posyandu*, the team visit them to their house.

4 DATA ANALYSIS

To analyse mothers' knowledge, sixteen questions were used in which each question has two possible answer and scored, if the answer is wrong the score is 1, and if the answer is right the score is 2. The level of knowledge was divided into two categories; high knowledge and low knowledge. If the total score \geq mean score=high knowledge ; $<$ mean score = low knowledge.

To analyze the calorie intake from foods the *Food Processor* program was used and to calculate the calorie content from mother's milk, a spesific formula was used. This based on the information on duration (in hour) of breastfeeding in a day with the assumption that in 24 hours mother produces around 700 ml milk in the first six month. In each 100 ml mother's milk contains 62 calorie [18] . The required daily allowance (RDA) for child aged 0-6 month is 550 calorie/day and 7-12 month is 650 calorie/day [21].

The level of calorie intake was divided into two categories; high calorie intake and low calorie intake. If the calorie intake \geq RDA = high calorie intake and if calorie intake $<$ RDA = low calorie intake.

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 and chi-squares test for categoric variables.

5 RESULTS

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
Mother's Education			15(28.3)		0.69
Grade 7-9	17(31.5)		37(69.8)		
Grade 10-12	32(59.2)		1(1.9)		
Above grade 12	5(9.3)				
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)		
Fathers Education					0.37
Primary(Grade1-6)	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)		
Fathers Occupation					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

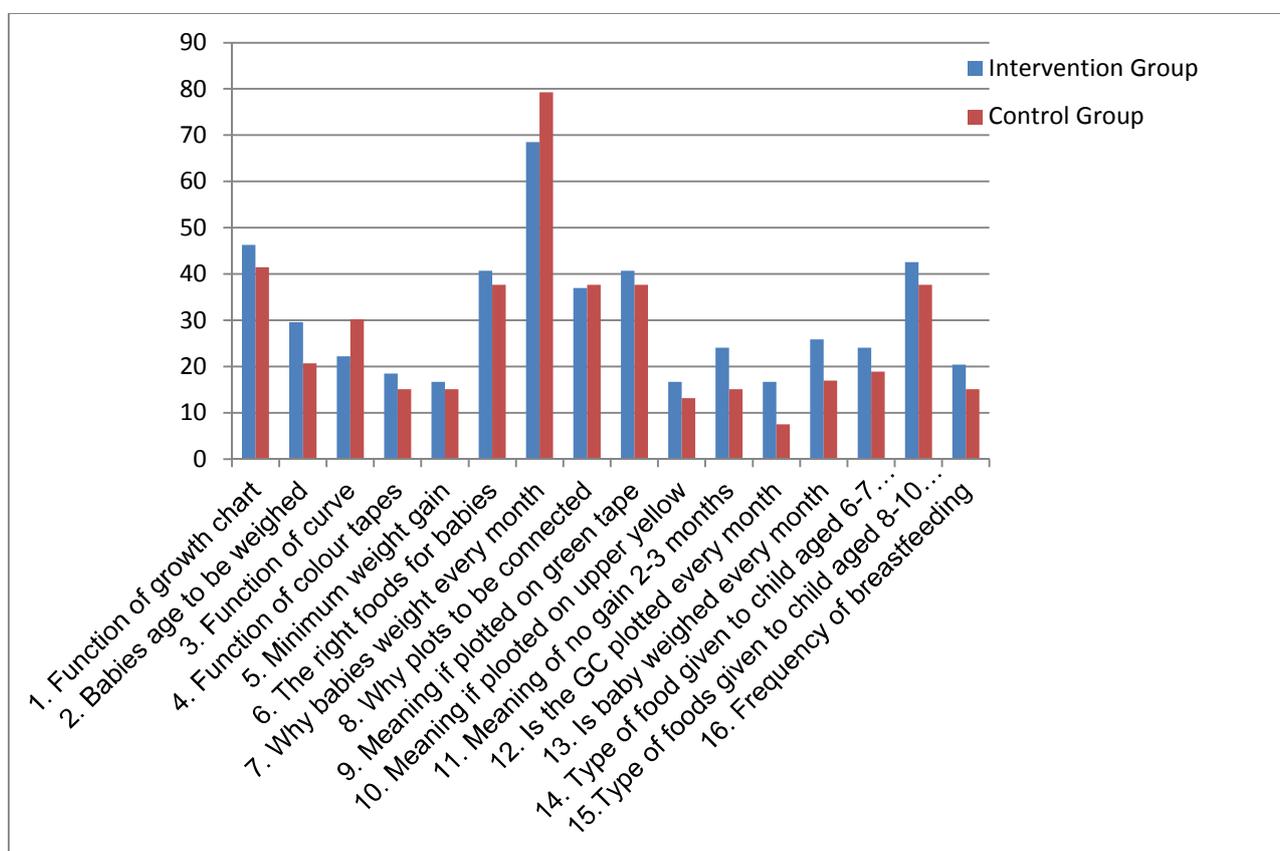
As seen in **Table 1**, the average of child birth weight between two groups of study was quite similar (3240 ± 0.38 and 3213 ± 0.45 for intervention and control group respectively). The base line weight, there was 300 grams different of children weight between the two groups but it was not statistically different ($p > 0.05$). Based on statistics calculation all characteristics variables were comparable (p -values > 0.05). Most parents in the two groups of study had high education level, since more than half of them had completed grade 9-12 (59.2% and 68.5% ; 69.8% and 69.8%). Household worker was the main job of mothers (85.2% and 92.4% for intervention and control group respectively), while fathers mostly worked in private sectors and only around 5% was government workers. Through this kind of occupation the family earned Rp. 1.5-2.0 million rupiahs/month (1USD=11.600 IDR). This amount was similar to the regional minimum salary determined by the local government. The p values of all characteristics were > 0.05 , means that the characteristics of respondents between the two groups of study was comparable.

5.1 CHANGES OF NUTRITION KNOWLEDGE

To present the changes of mothers' knowledge between intervention and control groups, the proportion of correct answer of sixteen questions and level of knowledge before and after intervention was presented.

5.1.1 PROPORTION OF CORRECT ANSWER BEFORE INTERVENTION

Table 2. The Proportion of Correct Answer of Sixteen Questions on Knowledge, Comprehension and Application Between Intervention and Control Group Before Interventions



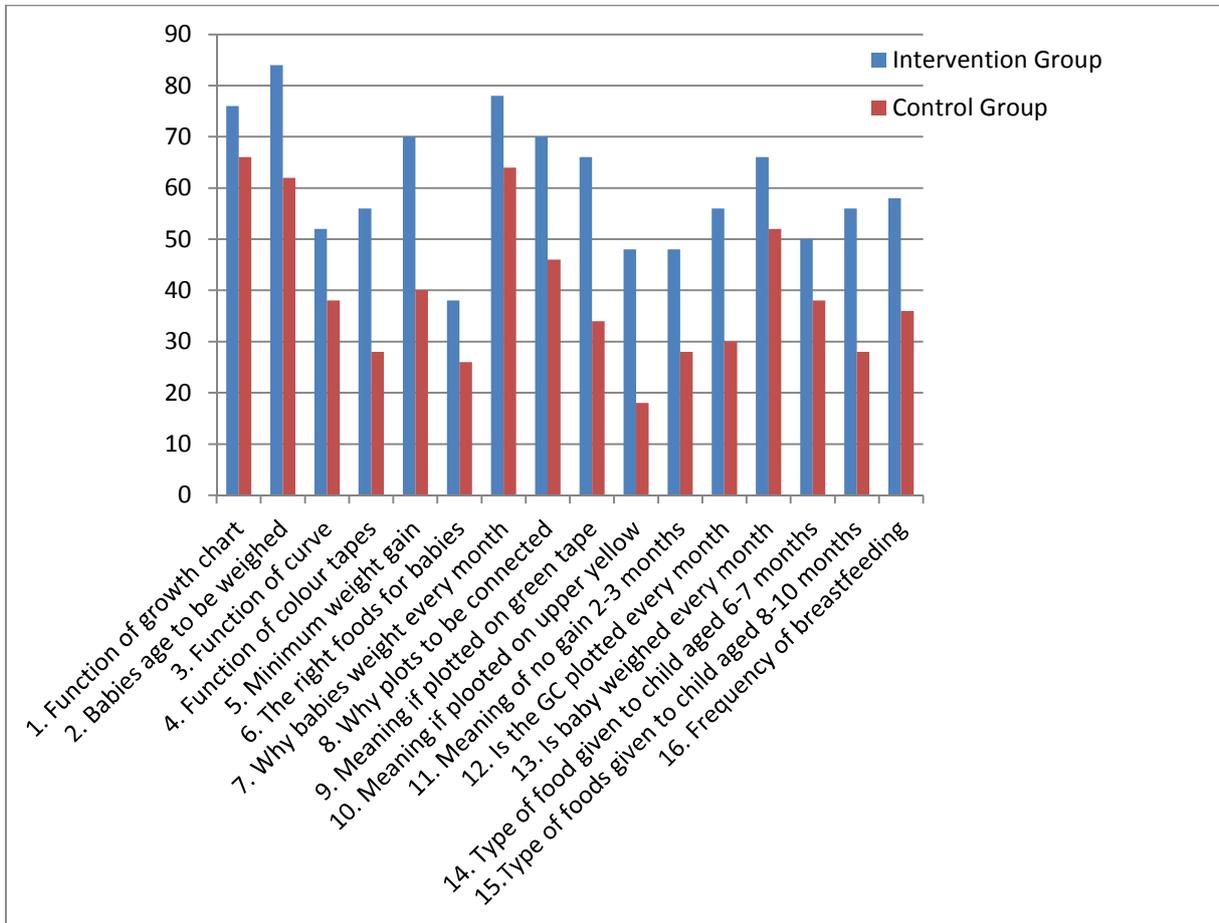
P-value of each answer, significant at $p < 0.05$

No.	<i>p-value</i>	No.	<i>p-value</i>	No.	<i>p-value</i>
1.	0.69	7.	0.22	12.	0.08
2.	0.57	8.	0.99	13.	0.17
3.	0.40	9.	0.94	14.	0.31
4.	0.54	10.	0.17	15.	0.10
5.	0.30	11.	0.44	16.	0.70
6.	0.96				

As it is present in Table 2 above, of 54 and 53 respondents in intervention and control group respectively, around three fourth (68.5% vs 79.3%) of them can answer correctly question no. 7 (*why babies should be weighed every month?*) and the remaining fifteen items the percentage of correct answer was only around 40% in each group of study. This findings revealed that before intervention mothers' knowledge on child growth chart and food in both groups of study was in the middle level and comparable.

5.1.2 PROPORTION OF CORRECT ANSWER AFTER INTERVENTION

Table 3. The Proportion of Correct Answer of Sixteen Questions on Knowledge, Comprehension and Application Between Intervention and Control Group After Interventions



P-value of each answer, significant at $p < 0.05$					
No.	p-value	No.	p-value	No.	p-value
1.	0.17	7.	0.30	12.	0.01
2.	0.02	8.	0.03	13.	0.28
3.	0.02	9.	0.00	14.	0.00
4.	0.00	10.	0.02	15.	0.00
5.	0.01	11.	0.06	16.	0.01
6.	0.01				

As shown in Table 3, of 54 respondents in intervention group, 50-84% of them had the correct answer, while in control group only 18-66%. Among sixteen questions delivered, there four questions (no. 1, 7, 11 and 13) that was not significantly different ($p > 0.05$), the remainings were significantly different ($p < 0.01$). This findings revealed that the usage bubble score growth chart in nutritional education program can enhance mothers' knowledge, comprehension and application significantly.

5.2 CHANGES OF KNOWLEDGE LEVEL

Table 4. Changes of Knowledge Level Before and After Intervention

Variabel	BEFORE INTERVENTION					AFTER INTERVENTION					Relative Risk(RR) (Lower-Upper)
	Intervention Group, N=54		Control Group N=53		p-value	Intervention Group, N=50		Control Group N=50		p-value	
	High n (%)	Low n (%)	High n (%)	Low n (%)		High n (%)	Low n (%)	High n (%)	Low n (%)		
Knowledge	30(55.6)	24 (44.4)	24(45.3)	29(54.7)	0.29	44(88.0)	6(12.0)	26(52.0)	24(48.0)	0.00	3.1(1.5-6.5)
Comprehension	31(57.4)	23(42.6)	29(54.7)	24(45.3)	0.78	43(86.0)	7(14.0)	27(54.0)	23(46.0)	0.00	2.6(1.3-5.2)
Application	27(50.0)	27(50.0)	20(37.7)	33(62.3)	0.09	39(78.0)	16(32.0)	23(46.0)	27(54.0)	0.00	2.2(1.3-3.7)

As seen in Tabel 4, before intervention, around half of respondents (50-57%) in intervention group had high knowledge, comprehension and application, while in control group the percentage was a bit lower (37-54%), but the *p* values showed that level of knowledge between the two groups of study was not significantly different (*p* >0.05). In other words when both groups used the normal growth charts, their knowledge, comprehension and application level on growth chart and child food was in middle level and comparable. However, after intervention or when mothers in intervention group had been using the modified chart (bubble score growth chart), mothers' knowledge (knowledge 88%, comprehension 86% and application 78%) improved significantly.

The statistical analysis proved that there was significantly difference of mothers' knowledge, comprehension and application between intervention and control group (*p*<0.01). The relative risk showed that the effect of using bubble score chart was three times stronger to make mothers to be have the high knowledge. The repeated presentation on the bubble score chart lessons mixed with practising and tests during four months intervention and followed by observing mothers activities in *Posyandu* by educators might strongly affected mother's memory and ability in undersanding the function of growth chart and feeding the child with appropriate food.

Table 5. Calorie Intake Before and After Intervention

Age Group	BEFORE INTERVENTION			Age Group	AFTER INTERVENTION		
	Intervention Group	Control Group	p-value		Intervention Group	Control Group	p-value
	Mean ±SD(kcal)	Mean±SD(kcal)			Mean ±SD(kcal)	Mean ±SD(kcal)	
0-6 month	375.9±64.8	352.8±85.1	0.21	6-11 month	565.6±48.2	501.8±62.6	0.00
7-12 month	482.4±39.3	510±94.6	0.21	12-17 month	598.5.2±48.5	485.8±72.7	0.00

As it can be seen in Table 5, before intervention the mean calorie intake of children in two age groups (0-6 month and 7-12 month) between intervention and control group was not significantly different (*p*>0.05). But if it is compared to recommended daily allowance (RDA), the mean calories intake in both groups of study was lower than RDA, hence the RDA for age group 0-6 month is 550 calories per day and age group 7-12 month is 650 calories per day.

After intervention there was a sharp increasing of calorie intake in children in intervention group; both age groups can reach 89% of RDA. While calori intake in control group children only reach 70% of RDA. Table 4 also presented that in control group children there was negatif trend of calorie intake for age group 12-17 month (before intervention: 510±94.6 kcal and after intervention: 485.8±72.7 kcal). This findings proved that child age 12-17 months was vulnerable group to meet their RDA.

5.3 CHANGES OF CALORIE INTAKE

Table 6. The Level of Calorie Intake Before and After Intervention

BEFORE INTERVENTION				P- value	AFTER INTERVENTION				p- value
Level of Calorie Intake					Level of Calorie Intake				
Intervention Group N=54		Control Group N=53			Intervention Group N=50		Control Group N = 50		
High n (%)	Low n (%)	High n (%)	Low n (%)	High n (%)	Low n (%)	High n (%)	Low n (%)		
3 (5.5)	53(94.5)	3(5.7)	50(94.3)	0.29	21(42)	29(58)	13(26)	37(74)	0.09

Table 6 shows that before intervention of 54 and 53 children in intervention and control group, only 5.5% and 5.7% were categorized into high calorie intake. However, after intervention more children in intervention met the RDA compared to children in control group (42% vs 26%). But the statistical analysis proved that there was not a significantly different of calorie intake between children in the test group and control group ($p>0.05$). This findings revealed that it is not easy to meet the RDA, therefore it needs extra activities for health workers to educate mothers how to feed children in order to meet the RDA

6 DISCUSSION

This study investigated the impact of modified growth chart on mothers' knowledge and child calorie intake. The background of this study was the reality that most developing countries including Indonesia did not use properly the existing growth charts in improving mothers' nutritional knowledge. This study proved that modified growth chart effectively enhanced mothers' knowledge and comprehension of components that available in a growth chart. In this study, replacing along vertical lines by the bubbles and the application of scores 5, 6, 7, 8 and 10 in interpreting child weight status might have motivated mothers to comprehend the meaning curves line, colour tapes and the minimum weight gain (MWG) and to apply their knowledge in daily child care activities.

In modifying the chart the authors followed WHO and Treversky and Morison suggestions saying that a growth chart should be simple and more informative in order to be easier to understand by parents [17]. The reasons applying the scores or numbers 5 to 10 in the growth chart was because most Indonesian mothers had been familiar these scores. Numbers was frequently used in measuring health status. Fargelin *et al* [20] had experiences in changing health behavior and Schapira, *et al* [21] also used numbers in giving advices for Mexican-American population improving caring to their health status. The potentially reasons to apply bubbles and scores in this new bubble score growth chart because that simpler and more informative growth chart will be practical and powerful tool in teaching mothers. While in introducing the normal growth chart was lack of information and promotion activities in addition mothers have never been involved in filling and plotting the child weight in the chart. The results of this study was in line with the experiences of Martinez *et al* [11], Senanayake *et al.*, [8], Sohal *et al.*[12], Ruel *et al.*, [13]. The revised growth charts that they used enhanced mothers' knowledge, understanding, interpretation and comprehension on growth chart.

In term of energy intake, this study proved that after using modified growth chart child calorie intake significantly improved but not reach the RDA (child intake of 6-11 month and 12-17 month was 87% and 92 of RDA). This result was in line with children in Lusaka, Zambia, although mothers had wide knowledge of optimal infant feeding but child energy intake of 6-8 month was 88% of RDA and age 12-18 month 94% of RDA [22].

Among the two age groups, age group 7-12 months (12 -17 months) experienced more constraints in reaching the RDA and it is assumed that during 9-12 month was a critical time in feeding the child. It might be because of the improper of breastfeeding practices since in this study found that only 58% of mothers breastfed seven times per day and the remaining was lower than seven times. This result was quiet similar to a study in Goba district, South East Ehtiopia, in which the mean frequency of breastfeeding was six times [23]. We predict with this breastfeeding practices, the infant will often be inadequate to meet infant energy requirement and affect the RDA. The child aged 9-12 months could suffer from malnutrition. Some proofs for this assumption, Riviera *et al*, (1997)[24] 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% [16]. Therefore, one implication of these findings, Indonesia government should put children aged 9-12 months into high consideration in every nutrition promotion program particularly in growth monitoring and feeding program.

The process of introducing the modified growth chart through intensive nutrition education including action framework, teaching methods, medias and duraion might have a significant role in achieving the objectives. Similar activities in nutrition education for child mothers were also found by Rahmawati *et al* [25] and Nikmawati *et al* [26] in Indonesia and Roy *et al* [27] in Bangladesh and Salehi *et al* [28] in Iranian children.

7 CONCLUSION

This study was designed to investigate the effect of modified growth chart on mothers' knowledge and child calories intake. Our findings suggest that modified growth chart is effective in improving mothers' knowledge and child food intake. Nutrition workers who work at community level should have innovation and creativity in applying the existing nutritional medias in order to be easier understood by parents and caregivers. The recommended dietary allowance (RDA) for children needs to be explained clearly to mothers. Children aged 9-12 month should be put into a high concern in feeding program. In teaching mothers on the growth chart and Feeding child, need more instructions and followed by demonstration. The weakness of study was the number of subjects participated too small. Further studies need to recruit bigger participants.

8 CONFLICT OF INTEREST

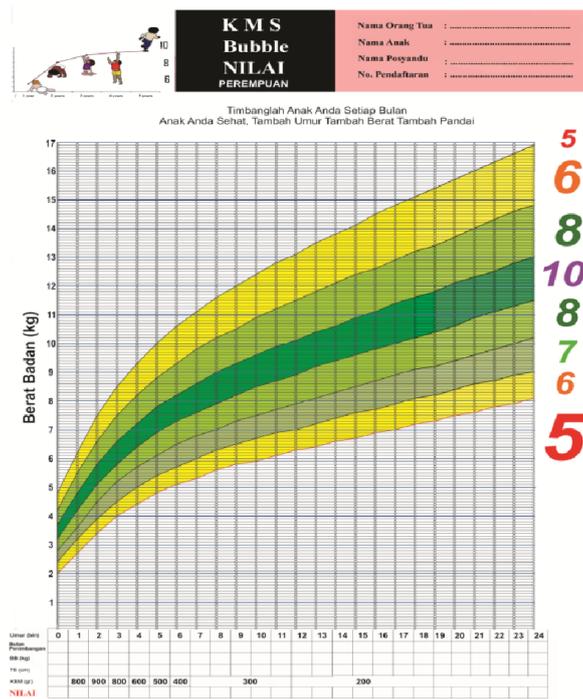
The authors declared that there is no conflict of interest with regard to the content of this paper.

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APPENDIX 1. BUBBLE SCORE CHART (FRONT SIDE)



APPENDIX 2. STEPS ON APPROPRIATE FEEDING FOR CHILD AGED 0-24 MONTHS (BACK SIDE OF BUBBLE CHART)

Age (Month)	Textures	Portion and Frequency
 0-6 month	<p>Feed baby only with breast milk- no other milk, food, drinks not even water. In case mother has to give formula milk, consult with nutritionist or doctor the appropriate formula milk to be fed for your baby.</p>	<p>Breastfeed baby frequently at least 10 times in a day. Prepare formula milk as instructed. Use clean bottle and boil the bottled after using.</p>
 6-7 month	<p>Keep breastfeeding and start introducing semi solid complementary foods such as mashed cereal rice, pumpkin, alvocado, banana, green leafy vegetables mixed with breast milk or formula milk. Introduce one stuff for 2-3 days untill the baby get the taste then change to another stuff. Then introduce milk porridge, start with thinner porridge and gradually to thicker porridge. Avoid giving eggs, fish and meat.</p>	<p>Breastfeed baby frequently at least 8 times per day. Give complementary foods 2-3 times per day. Start with 2-3 tablespoons and gradually improve to 6-7 tablespoons per day.</p>
 8-9 month	<p>Keep breastfeeding and start introducing the solid complementary foods such as : cereal rice porridge, pure carrot mixed with eggs, tempeh, tofu, fish, meat. Introduce 2-3 kinds of stuff for 2-3 days until the baby get the taste then change to anothers stuffs. Let the baby taste the original taste and do not give sour taste foods and sugar</p>	<p>Serve 2-3 meals plus frequent breastfeeding. Start with 4-5 tablespoons and gradually improve to be 8-10 tablespoons. Offer nutritious snack between meal such as sweet orange juice, papaya, banana two times per day.</p>
 10-12 month	<p>Keep breastfeeding and more variation of solid complementary foods such as soft rice mixed with 2 kinds of vegetables and 1 protein source such as egg, tempeh, tofu, fish, meat, peanuts. Introduce 3-4 kinds of stuff for 4-5 days until the baby get the taste then change to another stuffs. To enhance the energy content and taste, add coconut milk, a teaspoonful of fried oil. Sugar, honey can be added to child's food.</p>	<p>3-4 meals per day plus frequent breastfeeding. Start with 6-7 tablespoons and gradually enhance to be 10-12 tablespoons. Offer nutritious snacks in between meal such as fruits soup, green peanut porridge, biscuits, breads two times per day.</p>
 12-24 month	<p>Keep breastfeeding baby until aged 2 years. Family foods have been able given to child. Plain rice with 2 kinds of vegetables and 2 protein source such as egg, tempeh, tofu, fish, meat, peanuts. Don't give child the strong spicy food.</p>	<p>Serve 3-4 meals per day plus breastfeeding. Offer nutritious snacks in between meal such as fruits soup, formula milk. cheese, biscuits, breads two times per day.</p>

APPENDIX 3. GUIDELINES IN INTERPRETING CHILD WEIGHT STATUS AND ADVICES FOR PARENTS (BACK SIDE OF BUBBLE CHART)

Score	Weihging status	Interpretations of weight status	Advices for Parents
3	Three months NOT Increase	Child's growth is in "dangerous" because body weight not increase during three months.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things given to child clean and safe.
4	Two months NOT Increase	Child's growth is failure because body weight not increase during two months.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things given to child clean and safe.
5 Upper	Increase	Child's growth is extremely fast and suffer from Obese. The child might be having hormonal disorder	Check your child's health to hospital to ensure the cause of obesity. Limited the fatty foods and improve child activities and follow foods guidelines.
	Decrease	Child's growth is extremely fast and suffering from Obese, but tends to be overweight.	Check your child's health to hospital to ensure the cause of obesity. Limit the fatty foods and improve child activities.
6 Upper	Increase	Child's weight is Overweight and tend to be obese.	Check your child's health to hospital to ensure the cause of obesity. Limit the fatty foods and improve child activities.
	Decrease	Child's weight is Overweight but to be normal.	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child weight decreasing slowly
8 Upper	Increase	Child's weight is Normal but tend to be overweight	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child health in order to gain or decrease weight slowly
	Decrease	Child's weight is normal and tend to be quite normal.	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child in order to gain or decrease weight slowly.
5 Lower	Increase	Child's weight is extremely Less but tend to be normal.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things given to child clean and safe. Improve mothers' caring and feeding .
	Decrease	Child's growth is in Dangerous and Abnormal tend to be severe malnutrition.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things given to child clean and safe. Improve mothers' caring and feeding .
6 Lower	Increase	Child's weight is Less Normal and tend to be normal.	Your child needs more nutritious foods. Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep every things given to child clean and safe. Improve mothers' caring and feeding .
	Decrease	Child's growth is in Dangerous and tend to suffer from severe malnutrition.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things given to child clean and safe. Improve mothers' caring and feeding .
7	Increase	Child's weight is Less Normal but tend to be Normal	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child health in order to gain weight rapidly.
	Decrease	Child's weight is Less Normal and tend be failure and suffering from malnutrition.	Your child could be suffering from chronic and infectious disease. Bring the child immediately to hospital/public health center to get doctor's diagnose. Keep every things

			given to child clean and safe. Improve mothers' caring and feeding.
8 Lower	Increase	Child's weight is NORMAL and tend to be Quite Normal.	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child health in order to gain more weight.
	Decrease	Child's weight is NORMAL and tend to be Less Normal.	Keep feeding your child with appropriate foods and follow the steps as in the guidelines. Keep the child health in order to gain more weight.
10	Increase	Child's growth and the weight is quite Normal. The child is in optimum nutrition	Your baby is in optimum nutrition. Keep what you have done in caring and feeding your baby.
10	Decrease	Child's growth and the weight is quite Normal but tend to decrease	Your baby is in optimum nutrition. Keep what you have done in caring and feeding your baby. Avoid of losing weight

APPENDIX 4. NORMAL GROWTH CHART

