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Nutrition Extension and Home Garden Intervention in Posyandu: Impact on Nutrition Knowledge, Vegetable Consumption and Intake of Vitamin A

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Abstract: This study aimed to determine whether the household vegetable consumption and vitamin A intake at household level improve with a home gardening utilization and nutritional extension program. Quasi experimental nonequivalent groups design. The study was conducted in Sukajadi village as a control group and Sukajaya village as the intervention group, Tamansari Subdistrict, Bogor Regency, West Java, Indonesia with demographic characteristics of rural areas on December 2011-June 2013. Mothers toddlers in control group 31 mothers and intervention group 30 mothers. Vegetable consumption and dietary intake of vitamin A was measured by food recall method 2×24 h. Nutrition knowledge of the intervention group was increased 12.3 point after the nutrition extension were given ($p<0.001$). Vegetable consumption and vitamin A intake in both groups was still below the WHO recommendation. The increased of vegetable consumption in control and intervention group was 12.5 and 18 g/cap/day, respectively. The increased of vitamin A intake in control and intervention group was 18.1 and 4 RE, respectively. Although the consumption of vegetable and intake of vitamin A slightly increased compared to baseline data, however the difference was not significant. There was a positive impact of nutritional extension program on nutrition knowledge, but the home gardening utilization and nutritional extension program not significantly improved vegetable consumption and vitamin A intake at household level in Tamansari Subdistrict, Bogor Regency, West Java, Indonesia.

Key words: Vegetable consumption, vitamin A intake, home gardening, nutrition extension, household

INTRODUCTION

Vitamin A deficiency (VAD) remains a major health problem, especially in developing countries. The highest prevalence of night blindness in pre-school children and pregnant women was in South-East Asia (WHO, 2009). WHO has implemented several strategies to reduce VAD, such as supplementation, fortification and dietary intake, especially in vulnerable groups such as children, pregnant and lactating mothers. In children and adults, the occurrence of VAD can be due to inadequate consumption of food rich in vitamin A such as animal food, colorful vegetables and fruits. In Indonesia, dietary sources of vitamin A such as animal foods are rarely consumed because its relatively expensive price. Meanwhile, the consumption of vegetables is still very low (Health Department, 2008). Therefore adequate vitamin A intake cannot be attained. WHO recommends a minimum of fruit and vegetable consumption of 400 g per day to reduce the risk of some non-communicable diseases such as coronary heart disease (Hung, 2004), diabetes (Heidemann *et al*., 2005), hypertension (Appel *et al*., 1997) and cancer (World Cancer Research Fund/American Institute of Cancer Research, 2007).

One of the strategies undertaken to increase the consumption of vegetables is the utilization of home garden. This strategy has been promoted by the Indonesian government since 2011 (Indonesian Ministry of Agriculture, 2012). Previous study showed that home gardening could increase fruit and vegetable consumption (HKI, 2010; Masset *et al*., 2012), increasing intake of vitamin A and serum retinol concentrations (Bloem *et al*., 1996; Faber *et al*., 2001) and also improving dietary diversity (Cabalda *et al*., 2011). Meanwhile, the utilization of the school garden with nutrition education also increased the consumption of fruit and vegetable (MacAleese *et al*., 2007; Ratcliffe *et al*., 2011). Therefore the home gardening utilization and nutritional extension program could increase vegetable consumption.

Many studies showed an increase in fruit and vegetable consumption through the use of school gardens and nutrition extension program. There are only a few studies that have been conducted in Indonesia, to observe and analyze the effects of home gardening utilization and nutritional extension program on vegetable consumption and vitamin A intake of households. Therefore, this study aimed to determine whether the household vegetable consumption and vitamin A intake can be improved through a home gardening utilization and nutritional extension program.

MATERIALS AND METHODS

Simple random sampling was performed to select village into the control or intervention group in this

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quasi-experimental study for 18 months, from December 2011 until June 2013. Purposive sampling was performed to select participants of 61 mothers in two villages, Sukajadi as a control group (31 mothers) and Sukajaya as the intervention group (30 mothers). There were 2 inclusion criteria: (1) mothers and toddlers were participants of integrated service center post (Posyandu) and, (2) willing to participated in this study until finished, The study was conducted in Tamansari Subdistrict, Bogor regency, West Java, Indonesia. The subdistrict had a demographic characteristics of rural areas. The control participants did not receive home gardening and nutritional extension program between pre and post-testing. There was one participant from the control group who dropped out due to moving house.

Intervention: There were two forms in this intervention study, the provision of a package home garden vegetable plants and the nutritional extension program. The nutritional extension program was conducted in three months with the frequency of twice a month. Each of which lasted about 60 minutes. Meanwhile, the home gardening program conducted in one year, which consists of socialization, observation, determination the type of plant and implementation. Agricultural extension workers involved to guide the cultivation of vegetable.

Measurements: Participants were interviewed by trained enumerator to collect baseline and endline data. The socioeconomic data was obtained via a questionnaire. Data of vegetable consumption and intake of vitamin A were collected by 2×24 h food recall. The questionnaire was developed through discussions and pre-tested at Tamansari Subdistrict. In depth interview was done for home gardening utilization.

Statistical analysis: All statistical analyses were conducted using SPSS (Statistical Product and Service Solution) for windows 16 edition. The data was analyzed using univariate and bivariate analysis. Data analysis was done by comparing two groups: control and intervention. Means and standard deviations was computed for nutrition knowledge and paired t-test was performed to compare means within the groups (pre-post data). Socioeconomic data, vegetable consumption and intake of vitamin A were summarized by the medians and interquartile range (IQR). Difference between the two groups was tested by Mann Whitney U test and within the groups by Wilcoxon Rank Test. Correlation between two variable was analylize using Spearman Rank Test.

RESULTS

Participants were divided into control group (n = 31) and intervention group (n = 30). More than half of the participants belonged to small household (<4 people). Intervention participants were more likely to have a medium than big household size compared to the control group. Most of the participants and their husband belonged to the productive age (21-40 years). However, there were still many participants under 20 years old in both groups. There were no differences in baseline measures of household size, mothers and fathers age between the intervention and control groups.

Fathers and mothers in control group had a better education than intervention group ($p<0.05$). However, they all had relatively low education level (<9 years) and only a slight (<10%) who had high levels of education (high school, diploma or undergraduate). Therefore, most of the occupation of the fathers were non-farm workers (laborers of shoes manufacture), farmers, traders, agricultural laborers, civil servants and other services. Meanwhile, almost every mothers in both groups were housewives.

Household income was estimated from total household expenditure. Participants in control group had a higher income than the intervention group, but the difference was not significant. The intervention group spent more money on buying food and less money on non-food compared to the control group, nevertheless the difference was also insignificant.

Home garden utilization: Home garden utilization hadn't been developed optimally. More than half of participants in intervention group did not utilize their home garden due to various reason, such as inavailability seedling plants, time for gardening and basic knowledge about gardening.

Table 2 showed that median of home gardens size in control group was 10.0 m^2, wider than the intervention group which only reached 5.5 m^2. Nevertheless there was no difference between the two groups. Most of the home gardens size in both groups were very narrow which is less than 10 m^2. Only two participants in the intervention group who had considerably spacious home gardens size which is more than 30 m^2.

During the intervening years, the home gardens, had highest production in August 2012 (114.8 kg) with production accounts for most vegetables are tomatoes (63.9 kg), eggplant (15.2 kg) and bitter melon (10.5 kg). Most of the crops were consumed alone and the rest was distributed to neighbors and relatives.

In depth interviews revealed that factors affecting the production of home garden were internal factors (motivation, family support and time allocation) and external factors (home garden size, weather, fertilizer, pest and maintenance). Yield of Narrow home garden was less than the wide ones. Polybag and verticulture were tried to participants with very narrow home garden but still, it hadn't produce enough vegetables. The weather which was to dry or to wet could also reduced the vegetable production. Less fertilizer and

Table 1: Median (IQR) household socioeconomics and demographic characteristic

Household characteristics	Control	Intervention	P-value
Household size (people)	4 (3.0)	4 (2.3)	0.716
Fathers age (years)	29 (6.0)	30 (8.0)	0.195
Mothers age (years)	23 (7.0)	25 (7.5)	0.519
Fathers education (years)	6 (0.0)	6 (2.0)	0.019
Mothers education (years)	6 (3.0)	5 (2.0)	0.000
Expenditure (IDR/cap/month)			
Food	187 040 (122 964)	196 071 (87 026)	0.817
Non food	184 967 (267 585)	126 917 (110 186)	0.817
Total	456 170 (343 284)	340 048 (178 621)	0.162

Table 2: Households distributions by home garden size (m^2)

Home garden size (m^2)	Control n (%)		Intervention n (%)	
	Pre	Post	Pre	Post
<10	16 (51.6)	17 (56.7)	21 (70.0)	22 (73.3)
11-30	7 (26.6)	7 (23.3)	9 (30.0)	6 (20.0)
>30	8 (25.8)	6 (20.0)	0 (0.0)	2 (6.7)
Median (IQR)	10.0 (35.0)	4.5 (25.2)	5.5 (12.0)	4.6 (9.6)
P-value	0.304		0.871	

Table 3: Mother distributions by nutrition knowledge category

Nutrition knowledge category	Control		Intervention	
	Pre	Post	Pre	Post
Nutrition knowledge score				
Poor (<60)	9 (29.0)	7 (22.6)	10 (33.3)	3 (10.0)
Moderate (60 - 80)	18 (58.1)	21 (67.7)	19 (63.3)	16 (53.3)
Good (>80)	4 (12.9)	3 (9.7)	1 (3.3)	11 (36.7)
Mean ± Std	64.7±16.8	66.5±15.9	62.4±9.8	75.6±11.2
Paired t-test	0.266		0.000	

Table 4: Median (IQR) Vegetable consumption and intake of vitamin A from vegetable

	Control		Intervention	
Outcome	Pre	Post	Pre	Post
Vegetable consumption (g/cap/day)	53.8 (53.7)	66.3 (83.0)	61.0 (52.7)	79.0 (63.5)
P value	0.165		0.318	
Vitamin A intake from vegetable (RE)	30.0 (99.3)	48.1 (93.5)	49.3 (101.6)	53.3(126.2)
P-value	0.478		0.254	

maintenance also determined the vegetables production. Vegetables high productivity could reduced food expenditure ($p<0.01$). The participants stated that they could save food expenditure especially for vegetables purchases for an average of 9700 IDR per week. Nevertheless participants still hope that home gardens production will more reduce vegetables expenditure in the future.

Nutrition knowledge: The nutrition knowledge measurement was done by pre and post-testing questions. Ten questions were given in every topic extension. Pre-test showed that more than half participants in both groups had moderate nutrition knowledge. At post-test the participants in intervention group had a better nutrition knowledge score (increased 12.3) compared to pre-test. There was positive impact of nutritional extension program on nutrition knowledge ($p<0.001$).

Vegetable consumption and intake of vitamin A: Vegetable consumption before the intervention was very low in both groups, which was 53.8 g/cap/day (control) and 61 g/cap/day (intervention) respectively. After the home garden utilization and nutritional extension program was given, the consumption of vegetable was slightly increased by 18 g/cap/day. However, the vegetable consumption in both groups was still below the average vegetable consumption of Indonesian population (150 g/cap/day) and far below the WHO recommendation (400 g/day).

Intake of vitamin A from vegetable in the intervention group was higher than the control group. Post-data showed that intake of vitamin A from vegetables in both groups were slightly increased compared to pre-data. However the difference was not significant.

DISCUSSION

Nutrition knowledge, availability and access to food are important factors for predicting vegetable consumption

(Wardle *et al*., 2000; Jago *et al*., 2007; Dave *et al*., 2010). Increased nutrition knowledge, availability and access to vegetables through home gardening and nutritional extension program had not been able to increased vegetable consumption and intake of vitamin A from vegetable significantly. This result was not in line with previous study (Wardle, 2000; Faber *et al*., 2001; McAleese *et al*., 2007; HKI, 2010; Cabalda *et al*., 2011). This could be occurre because most of the participants in intervention group had a very narrow home garden which impact to a low vegetable productivity (600 g/month). Unsustainable harvest time also influence the vegetable productivity. AVRDC (1993) stated that a specially designed home garden planned to spread the harvest over time with 16 m^2 can potentially meet the 40% iron and calcium, 80% vitamin A and 100% vitamin C daily requirements of a five-member family.

The type of vegetable which accounted for the highest production was the fruit vegetables such as tomatoes, egg plant, etc. It could be harvested several times and didn't require intensive care from the owner so the plant was suitable to be planted around the house. Intensive vegetable garden (36 m^2) can grow approximately 250-500 kg of vegetables throughout the year (AVRDC, 2011).

Many people would make intentions to adopt healthful eating, but acting on their intentions was very difficult (Contento, 2008). In depth interview about mothers self efficacy on vegetable consumption revealed that most mothers feel confident could make their family consume vegetables in a sufficient quantities (2-3 serving per day), but the confidence decreases when they asked for its ability to encourage family to eat 3-5 serving of vegetables a day. As they felt the amount was too much to be consumed. Difference perception regarding the sufficient amount of vegetable to be consumed could lead to low vegetable consumption. Overestimation of vegetable intake, child preferences, attitudes of the mother, childhood experiences toward vegetable consumption and also limited exposure to the fruit or vegetable can lead to negatively experience of vegetables and fruit consumption. Perception about the adequacy of the intake, child preferences, mother attitudes, childhood experiences, including limited exposure to the fruit or vegetable and can negatively affect memory consumption of vegetables and fruit (Maclellan *et al*., 2004).

Self reported dietary intake through food recall is the limitation of this study as this method lead to a bias perceptions and conceptualizations about food portion sizes. Adults tend to underestimate their intake by 10% compared to that observed intake or through observation (ACAORN, 2010).

Conclusions: Nutrition extension has a positive effect for nutrition knowledge ($p<0.001$), but the home gardening utilization and nutritional extension program hadn't been able to improved vegetable consumption and vitamin A intake of household significantly in Tamansari Subdistrict, Bogor Regency, West Java, Indonesia. Further research was needed on the utilization of home garden in a wider area (>200 m^2) and the impact on long-term nutritional extension to increase the consumption of vegetables at household level.

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