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Home Gardening Is Associated with Filipino Preschool Children's Dietary Diversity

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ABSTRACT

Dietary diversification through home gardening is a sustainable strategy that can address multiple micronutrient deficiencies. This cross-sectional study aimed to determine the association between home gardening and the dietary diversity of preschool-aged children. Households with children aged 2 to 5 years (n=200) were surveyed from Baras and Angono in the province of Rizal, Philippines in January 2008. Food security was determined based on the US Department of Agriculture Food Security Questionnaire. Dietary diversity score was based on the number of unique food groups consumed during the past 24 hours. The Student *t* test was performed to compare means between groups (households with gardens vs households without gardens) whereas proportions between groups were compared using Pearson's χ^2 analyses. Multiple linear regression was performed to model the adjusted regression coefficients for the quantitative outcome variables by exposure variable. Around 52.5% of children were from households with a fruit and/or vegetable garden. Children from households with gardens had higher dietary diversity scores whether using the all-inclusive dietary diversity score (6.12 vs 5.62; $P=0.040$) or applying a 10-g minimum intake for each food group (5.89 vs 5.37; $P=0.044$) compared with children who lived in homes without a garden. Children from households with gardens were significantly more likely to eat vegetables more frequently ($\chi^2=9.06$; $P=0.029$). The presence or absence of a garden was not significantly associated with food security. Having a home garden was positively associated with the child's diet diversity and with frequency of vegetable consumption. Households without gardens may benefit from interventions promoting gardens as a means to improve diet quality.

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Undernutrition, which encompasses stunting, wasting, and micronutrient deficiencies, continues to be a prevalent condition in low-income and middle-income countries (1). Although malnutrition is multifactorial, inadequate food intake is usually its primary cause. The number of people with chronic hunger worldwide was put at about 923 million by the Food and Agriculture Organization of the United Nations in 2007 (2). In the Philippines, protein-energy malnutrition and micronutrient deficiencies continue to be public health problems (3).

With undernutrition a persistent problem in most countries, the rise in food prices stirred global concern over its influence on the prevalence of hunger and ultimately on the population's nutritional status. Being food secure means that at a minimum, nutritionally adequate and safe foods are readily available and the ability to acquire acceptable foods in socially acceptable ways is assured (4). Households faced with the crisis of increasing food prices may opt to change the quantity, quality, and/or diversity of their daily food consumption.

Dietary diversification, central to all food-based strategies, is sustainable even without external support (5-7). This strategy includes expanding and diversifying food production (5). Home gardening is among the approaches recognized to increase production and consumption of vitamin A–rich foods and also has the potential to provide multiple nutrients (8).

Home gardens have been associated with improved consumption of fruits, vegetables, and/or nutrient intake; improved child health and nutritional status; improved household food security and income; and women's empowerment (9-16). There have been, however, few studies linking home gardening with dietary diversity (17). Dietary diversification through home gardening provides households with the option of free and easily accessible fruits and vegetables that may help mitigate the problem of limited resource and access to staple and micronutrient-rich foods. This study aimed to determine the association between home gardening and the dietary diversity of preschool-aged children in an urban and semiurban area in the Philippines.

METHODS

Survey Design and Participants

This cross-sectional study was conducted from January 3 to 28, 2008, in the municipalities of Baras and Angono in the province of Rizal, Philippines. The province of Rizal

has a high prevalence of underweight children younger than age 5 years (35%) and vitamin A deficiency (30%) and anemia (36%) among children aged 6 months to 5 years (18). Baras is a rural, predominantly agricultural community, whereas Angono is an urban municipality whose primary source of income is trading, farming, fishing, and manufacturing. The village of Mahabang Parang was selected because it is one of the largest villages in Angono.

Households with children aged 2 to 5 years were eligible for inclusion in the study. The households were grouped by Village Health Worker household cluster assignment. There were 28 clusters in Baras and 10 clusters in Mahabang Parang. The clusters were ranked randomly by drawing of lots separately for Baras and for Mahabang Parang. The households were surveyed consecutively down the ranked list of clusters until 100 households were surveyed for each of the municipalities.

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the National Ethics Committee of the Philippine Council for Health Research and Development. Written informed consent was obtained from parents or guardians.

Household Visits

Household visits were done to interview a child's mother using structured questionnaire.

Socioeconomic and Demographic Characteristics. Parents' age and educational attainment and child's age and sex were collected by interviewing the mother. Socioeconomic status was described by income category, household size, number of appliances owned, and the percentage of income spent on food derived from information on the family's food spending habits and household income for the past 4 weeks (19-22).

Household Food Security. Household food security was determined through a series of questions about behaviors and experiences associated with difficulty in meeting food needs based on the US Department of Agriculture Food Security Questionnaire (23). This instrument has been translated, validated, and was used in the last National Nutrition Survey of the Philippines Food and Nutrition Research Institute (3). Raw scores from 0 to 1 were classified as having high or marginal food security, 2 to 4 had low food security, and 5 to 6 had very low food security. Households with high or marginal food security were described as food secure and those with low or very low food security were food insecure.

Diet Diversity. Mothers were asked if their child consumed food items from a set of 10 food groups during the past 24 hours: cereals, roots, and tubers; meat, poultry, and fish; dairy; eggs; legumes and nuts; vitamin A–rich fruits and vegetables; other fruits; other vegetables; oils and fats; and other food items such as sugar, sweets, nonjuice or nondairy beverages, condiments, and spices (24,25). The data included the amount consumed in teaspoons and tablespoons estimated by mothers. A child can have a dietary diversity score from 0 to 10 depending on the number of unique food groups consumed (24). This method of counting food groups has been shown to predict adequate micronutrient intake among young nonbreastfeeding Filipino children and applying a 10-g minimum intake for all food groups except for fats and oils enhanced the performance of the dietary diversity score indicator (24).

Frequency of Vegetable Consumption. Using the household survey form, the frequency of a child's vegetable consumption was determined by asking the mother to estimate the number of times a child eats vegetables within a week.

Morbidity History. A child's morbidity history was determined by asking the mother whether her child had fever or diarrhea during the past 2 weeks. Fever and diarrhea are among the illnesses examined in morbidity surveys among children (11,26-28). Diarrhea is defined as the passage of at least three loose or watery stools or one bloody stool in a 24-hour period.

Home Gardening. A home garden is an area around the home where vegetables, annual and perennial plants, spices, herbs, shrubs, and fruits are grown seasonally or throughout the year to meet family consumption requirements. Home gardens were classified as: simple, those that produce one to two varieties of vegetables and are scattered and seasonal; improved, those that have three to four varieties but are not productive throughout the year; and developed, those that produce at least three varieties of vegetables throughout the year (29).

Anthropometric Status. Children's weight was measured to the nearest tenth of a kilogram using a digital body weight scale (Seca 803, Seca Deutschland, Hamburg, Germany), and height to the nearest tenth of a centimeter using a portable stadiometer (Seca 214, Seca Deutschland). Weight-for-age, height-for-age, and weight-for-height z scores were determined using Stata statistical software package (version 9.2, 2007, StataCorp, College Station, TX) and based on the 2000 Centers for Disease Control and Prevention growth reference data (30). Observed weight-for age, height-for-age, and weight-for-height less than negative 2 standard deviations were categorized as underweight, stunted, and wasted, respectively.

Statistical Analysis

Data were entered into Microsoft Access 2000 (version 9, 1999, Microsoft Corp, Redmond, WA). Statistical analyses were performed using Stata statistical software package (version 9.2, 2007, StataCorp, College Station, TX).

The primary outcome variables were a child's dietary diversity score, household food security, and the frequency of vegetable intake among children. Data analyses were done comparing two groups: households with garden; and households without garden. Means and standard deviations were computed for food security, dietary diversity score, and the dietary diversity score with a 10-g minimum cutoff for each food group; and Student t tests were performed to compare means between groups (Table 1). Frequency distribution tables were generated for food security category and child's frequency of eating vegetables and proportions between groups were compared using Pearson's χ^2 analyses. Multiple linear regression was performed to model the adjusted regression coefficients for the quantitative outcome variables by exposure variable. The model was constructed using forward stepwise analysis. Significance level was determined using the