Development of a Model of Family Management for Overweight Prevention in Urban Thai Preschoolers

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Abstract : The aim of this investigation was to develop, using Ecological Systems Theory (EST) as a contextual framework to determine influencing factors and desired outcomes, a family management model to prevent preschoolers from becoming overweight. A three-phase participatory action research (PAR) design was implemented with stakeholders in a public primary school in Thailand. In the first phase, 327 families with preschoolers were assessed, by way of a self-administered questionnaire, about factors that influence weight gain. The second phase consisted of two workshops, involving 59 stakeholders, and home visits to 27 families conducted for the purpose of developing the model. The final phase evaluated the effects of the model. Both quantitative and qualitative methods were used. A repeated measure ANOVA was performed to analyze the quantitative data, while content analysis was utilized to evaluate the qualitative data.

A three component model (family, school and public health) for family management of overweight prevention in urban preschoolers emerged. The family component consisted of: a) family management processes: preparing a family's readiness, acting or managing behaviors, and observing and modifying behaviors; and, b) family essential elements: perceptions and concerns about their preschooler's body shape, nutritional knowledge and skills, participation and consensus. The school component consisted of networking among school organizations, while the public health component involved public health nurses, from the district, who provided school health services and served as co-investigators. Overall, based upon the spiral characteristics of the PAR process, the following procedural steps evolved: 1) preparing the participants; 2) organizing the family management; 3) sharing and promoting knowledge and experiences; and, 4) forming the network.

The model may enhance parents' knowledge and skills of feeding practices, as well as improve preschoolers' health behaviors. Fifteen families, through application of the model, were able to maintain their preschoolers' healthy weight. Use of the model reduced the prevalence of overweight from 16.5% to 13.8 %.

The keys to success were derived from strong family participation in the PAR process and collaborating with school officials to enhance sustainability of the model. Therefore, networking of families, schools and public health nurses are important.

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Background

The prevalence rate of overweight children has increased worldwide. In 2005, the World Health Organization (WHO)[1] estimated 17.6 million preschoolers, globally, were classified as overweight.[2,3] The most important consequence of childhood overweight is it's persistence into

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adulthood, where it is an associated risk factor for chronic diseases, such as hypertension, type 2 diabetes and cardiovascular disease. All of which are significantly associated with premature mortality and morbidity.[4-6] Therefore, the WHO[1] has recommended that preventing overweight children from becoming overweight adults is a target of prevention, and that strategies should be aimed at high-risk groups, such as overweight children, and those at risk of becoming overweight.

In Thailand, a 2001 cross sectional survey, found the prevalence rate of childhood overweight, among 1,157 preschoolers in a moderately industrialized province, to be 22.7%.[7] Furthermore, in 2003, the Ministry of Public Health (MOPH)[8] reported the prevalence rate of overweight children, across Thailand, to be 13.4 %. Recently, Mo-suwan[9] noted the prevalence rate of overweight preschoolers has risen rapidly, and if no definitive actions are taken, one out of every five preschoolers will be overweight within the next decade. This situation has gained the attention of the MOPH, which has set a goal for the prevalence level of obesity at 10.0 %, or less, for school age children.[10]

The development of overweight children results from the comprehensive interactions of individual, family and environmental factors. However, family context, for children, is a strong influencing factor, and provides an avenue for interventions for weight management.[11] Families perform functions and shape the environment that contribute, directly and indirectly, to their children's health and behavior, which include dietary patterns, food exposure, and both physical and sedentary activities. One of the WHO's[1] recommendations, for overweight child management, has been a family-based program where parents are able to exert a higher degree of external control over their child's eating and activity patterns. Such intervention is thought to increase social support and reduce a child's feelings of isolation, which may develop when treated separately from the rest of the family.

To adequately address this public health problem, there needs to be collaboration among public health professionals to devise strategies for preventing overweight in children. It is a challenge for public health nurses to conduct further research on strategies for overweight prevention, particularly among young children. Adiposity rebound tends to occur in children four to eight years of age, which is a critical time for instituting overweight interventions.[6, 12-13]

Recently, the United States of America (USA) Committee on Prevention of Obesity in Children and Youth[13] proposed an Ecological System Theory (EST) for understanding obesity in children and youth. This framework reveals four layers of ecological factors which influence a child/youth's energy imbalance. The two innermost layers describe genetic and psycho-social factors affecting the child/youth, and the setting that affects the child/youth's daily behaviors (home, school and community). The outermost layer addresses the significance of social norms and values that both determine and respond to the child/youth's behaviors within the context of the larger culture. The framework emphasizes the need for obesity prevention efforts to leverage the interests and actions of a number of stakeholders working within and across multiple settings and sectors, and to guide and develop recommendations to promote children/youth's healthy eating and active living. Individual prevention goals, for each child/youth, are focused on energy balance and a desire for a healthy weight trajectory.

It seems that using EST,[11,13-14] as the conceptual framework with a participatory action research (PAR) design , may prove helpful in the development of a model for family management of

overweight prevention for Thai preschoolers. The goal for any intervention should be the selection of effective methodologies to link theory, research and practice to support family management goals that: establish a healthy environment; balance an individual child's food intake and energy expenditure; and, maintain weight while promoting normal linear growth.[5, 12, 15]

Objectives

The research objectives were:

1. To develop a model of family management for overweight prevention in urban Thai preschoolers.

2. To evaluate the effectiveness of the model of family management for overweight prevention that influences family health promoting behaviors and maintains child weight, while achieving normal linear growth.

Conceptual Framework

This study used EST, as a contextual framework, for assessing predictors[11, 13-14] of overweight in children. PAR was applied as a method to guide the desired outcome of family management of overweight prevention in preschoolers. The PAR process involved five spiral steps,[16] including: assessing; planning a change; acting and observing; reflecting; and, re-planning. The advantage of using the PAR process is that it assists public health nurses, families and other stakeholders to understand the actual problems and processes requiring their collaboration in: assessing and identifying childhood overweight risk factors; designing action plans; implementing actions; and, evaluating outcomes. Moreover, to achieve normal linear growth, the PAR process may enhance family empowerment, and help members of the community establish and maintain a systematic long-term weight management action plan for their children. Finally, this study assists in filling the gaps between theory, research and practice, and links the full triangle of knowledge: theory-action-evaluation.[16-18]

Method

Design: Using a method of PAR, the study involved three phases, over a period of 40 weeks. These phases consisted of: 1) eight weeks for situational analysis; 2) 24 weeks for model development; and, 3) eight weeks for evaluation.

Phase I: Situational Analysis. The first phase involved examining risk factors for preschooler overweight. This was done via distribution, to parents of preschoolers, of a series of researcher developed self-administered questionnaires. The questionnaires addressed: 1) child activity and eating behaviors; 2) parental knowledge of nutrition and overweight prevention, and feeding practices; and, 3) the school food environment.

Data regarding each child's physical activity and sedentary behaviors (measured before model development, during model development and two months after model development) were gathered via questionnaires, completed by the respective parents, which sought the average amount of time their child spent in physical activities, such as playing, cycling and outdoor play. The children's eating behaviors were assessed by having each family complete a weekly 35 item food frequency survey and a ten item child eating habits questionnaire. The 35 item of food frequency survey consisted of 6 groups of high caloric foods, including: fast foods (8 items); rice and noodles (9 items); sweetened beverages (6 items); sweet fruits (4 items); desserts (4 items); and, snacks (4 items). These kinds of food are representative of the high caloric foods found in the Thai diet. Examples of questions in the food frequency survey included: "How often does your

child consume pizza?"; "How often does your child consume chicken with oily rice?"; "How often does your child eat Rambutan (Thai fruit)?"; "How often does your child drink carbonated beverages?"; "How often does your child eat Thai desserts?"; and, "How often does your child consume candy?"

The ten "yes/no" item child eating habits questionnaire measured the parents' perception of the average frequency of their preschoolers' consumption of high caloric foods in the last seven days. The questions, such as: "Does your child eat food in big bites?" and "Does your child like deep fried foods?", sought to examine and confirm the association between the preschooler's eating behaviors and their overweight status using univariate logistic regression analysis. The parents were asked to respond to each question on a 0 to 7 point Likert-like scale (never practice =0 score; 1-2 time/wk=1 score; 3-4 time/wk=3 score; 5-6 time/wk=5 score; practice every day = 7 score).

The questionnaire was administered three times during the study: before model development, after model development and at a 2 month follow-up. The fast food scores ranged from 0-56; rice and noodle intake ranged from 0-63; consumption of sweetened ranged from 0-42; sweet fruit intake scores ranged from 0-28; dessert eating ranged from 0-28; and, snack consumption ranged from 0-28. Eating behaviors were included as a variable because they have been identified as a significant factor in prior Thai research on obesity.[19,20] The results found in phase I, regarding eating behaviors, were useful in creating the intervention used in the development of the model in phase II.

Parental knowledge of nutrition and overweight protection was measured via a researcher developed 15 item questionnaire, which sought information from the parents regarding their knowledge of nutrition practices that may decrease overweight. For example, one of the questions asked: "Does overweight result from a child having unlimited access to sweetened milk? Each item required a yes/no response, with a score of one given for each correct answer. Possible scores ranged from 0 to 15, with higher scores indicating knowledge of childhood overweight. The instrument was administered 3 times over the course of the study; before, during and after model development.

The parent's feeding practices were measured daily by way of a 15 item questionnaire, using a 0 to 7 point Likert-like scale (never practice = 0; 1-2 time/wk = 1; 3-4 time/wk = 3; 5-6 time/wk = 5; practice every day = 7), that measured how the parents controlled food intake, encouraged healthy food choices, prepared healthy foods and rewarded their child's food consumption. Examples of items in the questionnaire included: "How often do you provide unsweetened and low fat milk for your child?"; "How often do you prepare low sweetened fruit instead of a snack?"; "How often do you control your child's eating times?"; "How often do you encourage your child to overeat?"; and, "How often do you reward your child with food?" In order to assess parental frequency of engaging in good feeding practices, items that demonstrated negative behaviors, such as encouraging, preparing and rewarding unhealthy food, were reverse scored. Parents reported their feeding practices for the past seven days. This instrument was administered on three occasions: before, during and after model development. The total score represented the summed score of items 1-15 (negative items were reversed scored). Possible scores ranged from 0 - 105. The higher the score, the more frequently the parents offered healthier foods, indicating greater parental involvement in providing healthier foods to their children. Scores of: 0-53 indicated low frequency of offering healthy foods; 54-60 were designated as fair offering of healthy foods; and, 60-105 indicated the parents were good at offering

healthy foods.

The school food environment was assessed regarding the appropriateness of the school lunches and school shop food products, by way of content analysis. This questionnaire consisted of 5 "yes/no" response items and 5 open-ended questions, asking the parents' opinion, in regards to each of the 5 "yes/no" items. Examples of the "yes/no" and related open-ended questions were: (a) "Do you believe that the menu of the school lunch is appropriate for preschoolers (yes/no)? If the menu is not appropriate, please provide information on the type of school lunch menu that you would provide;" and, (b) "Do you believe that the products (snacks and drinks) provided by the school shop are appropriate for preschoolers (yes/no)? If the snacks and drinks are not appropriate, what type of foods do you want the school shop to provide?" The questionnaire was administered once prior to model development.

The content validity of all questionnaires was assessed by five specialists, including: a pediatric physician; a nurse from the Nutrition Division of the Thai Ministry of Public Health; and, three doctorally prepared dieticians. The questionnaires were modified in accord with the comments of the specialists. The reliability and consistency of each component of the questionnaire was determined, via a pilot study, using 30 preschooler families at a school similar to the study setting in Chonburi Province. Cronbach's alpha for the child's eating behaviors and parental feeding practices were determined to be 0.79 and 0.86, respectively. The Kuber-Richardson-20 value of the parents' nutritional and overweight prevention knowledge was 0.73

Phase II: Model Development. The PAR process was selected, in the second phase, due to its encouragement of involvement of stakeholders throughout the process, to formulate interventions and develop a model of family management for overweight prevention in urban Thai preschoolers. Development of the interventions and the related model were based upon information obtained from the questionnaires used in Phase I.

Phase III: Evaluation. This phase was aimed at evaluating: (a) outputs and outcomes of family management in the prevention of overweight; (b) parent and preschooler behavior; and, (c) preschoolers' progression towards normal weight for height growth.

Setting: The setting was a public elementary school in Chonburi Province, a recognized center of industrial development in the Eastern Region of Thailand. The school's enrollment included 845 school age children and 392 preschoolers (3 to 5 years of age). Nearly all (n =384; 90.3%) of the children lived in the urban areas surrounding the school. A measure of weight for height screening, done by the school's administration, in January 2007, found a 16.5% prevalence rate of overweight among the preschoolers.[21] The school administrator expressed grave concern at this finding, since it was higher than the 10% goal established by Version 9 of the National Health Plan of Thailand.[9,10]

Participants: In phase I, 384 preschoolers and their parents, were enrolled in the study, after parents gave consent for their children to be in the study, and the children met the eligibility criteria. Eligibility criteria included: preschoolers who were 3-5 years of age and without any known co-morbidities (chronic diseases or delayed growth and development). In phases II and III, 2 public health nurses, who provided school health services, and 5 school teachers, who were accountable for childhood overweight problems in the school, were added, upon their consent, as study participants.

Ethical Considerations: Approval to conduct the study was granted by both the Institutional Review Board of the primary researcher's university, and the administrator of the school used

in the study. During Phase I, the primary investigator approached the 384 potential parental subjects during a family meeting day at the school. They were informed: about the purpose and process of the study; of their right to discontinue involvement in the study, at any time, without any negative consequences; and, that they could stop participation, in the study, and re-enter at a later date. Two weeks after the family meeting day, parents of all the school's preschoolers were sent a letter inviting them to participate, in the study, and, if they agreed to participate, to sign and return an enclosed consent form via their respective preschooler.

In addition, a letter providing information, about the purpose of the study and the two workshops involved in Phase II, was sent to 120 parents, 15 school teachers, and 3 school's public health nurses inviting them to take part in the second phase of the study. Fifty-two parents (43%), 5 teachers (33%) and 2 public health nurses (67%) verbally consented. Verbal consent to take part in Phase III of the study was obtained from 27 parents, who had taken part in Phase II. However, two of the parents moved from the area, during the last part of Phase III, making the final number of participants to be 25. These 25 parents were involved throughout the entire study.

PAR Procedure: In **Phase I**, each preschooler's height and weight were measured to determine whether he/she was overweight, under weight or of normal weight. Each child then was given the questionnaires, to take home, for his/her parents to complete. Of the 384 questionnaires distributed, 346 were returned, for an 85.2 % response rate. Parents who provided incomplete responses, or had a child with health exclusions, were dropped from the study, leaving 327 usable questionnaires. The 327 questionnaires were subjected to univariate logistic regression analysis to determine the influencing factors for the preschoolers' overweight.

A standard Thai chart, addressing weight, height, and gender that were specific for the age span of birth to nineteen years of age, was used to define whether each child was overweight.[22] Therefore, childhood overweight was defined as a child weighing more than + 2 standard deviations (SD), from the child's preferred weight, based on the child's height, age and gender. On the other hand, childhood underweight was defined as a child weighing more than - 2 SDs, from the child's preferred weight, based on the child's height, age and gender. Normal weight was defined as a child weighing between + 2 SDs and − 2 SDs, of the child's preferred weight, based on the child's height, age and gender.

Phase II included two workshops, in addition to two home visits. The first workshop involved 59 stakeholders (33 parents of overweight children, 19 parents of normal weight children, 5 teachers and 2 public health nurses, who provided school health services). The workshop was developed for the purposes of: (a) increasing the stakeholders' awareness and knowledge about childhood overweight, related risk factors and problems, and issues related to overweight management; and, (b) initiating an overweight prevention management plan that involved all stakeholders.

The workshop used appreciation influence control (AIC) techniques and 5 focus groups. The groups consisted of: 2 with parents of overweight children; 2 with parents of normal weight children; and, 1with parents of both overweight and normal weight children. One teacher was in each focus group, while the primary researcher and a public health nurse moved among the five groups. Information obtained from the questionnaires, during Phase I, was shared with each of the groups.

During the workshop, parents established a family management plan, for preventing childhood overweight, which included family needs and suitable

health goals. Strategies to reduce overweight involved new approaches to: cooking healthy food; increasing physical activity; barriers to reducing overweight; counting calories; and, locating educational programs and resources on nutrition. School activities also were organized, during the workshop, to support the model. These activities included: a teachers' campaign for serving healthy food to students; increased availability of healthy food during school lunches; and, addition of play activities to the school curriculum.

The second workshop, organized by the primary researcher and another public health nurse, utilized participatory learning principles, and sought to improve parent's nutritional knowledge and skills, related to dietary assessment and preparation of healthy foods for a balanced diet. The major objectives centered on concepts regarding healthy eating, increased physical activity and limited sedentary time. The workshop incorporated educational sessions, demonstrations and discussions. Using the nutritional pyramid, the primary researcher discussed how to prepare healthy foods, demonstrated how to evaluate and record a preschooler's caloric intake, and identified occasions where physical activities, for preschoolers, could be encouraged.

Upon completion of the workshop, the parents (n = 27) who volunteered to continue to participate in the last phase of the study provided additional information for development of a family management model for overweight prevention for preschoolers. The parents were interviewed twice, over four months, by the primary investigator and research assistants, in their respective homes, for the purpose of developing more confidence regarding family management of childhood overweight. They identified risk factors related to being overweight, worked on informing and persuading members of their families to cooperate with dietary changes, and set goals and manage all components of dietary changes within their respective families.

The parents' management focused on improving their families' feeding practices and food selections, as well as improving their children's food selections and physical activities. They observed the results, and modified their management strategies, based upon their goals. After the completion of two home visits, the types of family management were categorized, based on performance identification, as either: successful (15 families); ongoing progressive (6 families); or, unsuccessful (6 families). Those identified as having successfully managed their family reported changes that involved: altered family food choices; improved family feeding practices; avoidance of purchasing unhealthy foods; better role models; promotion of children's intake of healthy foods; and, encouragement and participation with their children in physical activities. As a result, they reported their greatest satisfaction in terms of family improvement. Families, assessed as having experienced ongoing progressive management, were uncertain about the outcomes of their management, while those identified as having unsuccessful family management were not satisfied with their management. As a result, the families suggested a group discussion take place to evaluate family management outcomes and provided a venue where participants and the primary researcher could share their knowledge and experiences. Therefore, a one day group discussion with families, lead by the primary researcher, teachers and public health nurses, was organized and held at the school hall.

During the one day group discussion, the parents were divided into 3 discussion groups (8 – 10 per group) and asked to: evaluate their family management outcomes, and share their knowledge and experiences. Those who had successfully managed their child's weight were recognized for how they: promoted adjustment of foods offered to their children; encouraged their family members' participation in the dietary change process; and,

promoted positive eating behaviors, such as offering healthy food and adjusting the family food lifestyle. Those who had been unable to meet their management goals acknowledged what the others had done that was successful, and indicated their intent to implement a new plan. As a result of the one day group discussion, participants formed a "family self-help group" aimed at helping other parents to promote and manage healthy dietary intake and exercise activities for their families. In addition, school administration agreed that overweight prevention could be addressed via networking among families and school employees (teachers and public health nurses), all of whom are important stakeholders. The school stated plans to establish a policy to: prevent childhood overweight, ban the presence of carbonated beverages and have the public health nurses implement activities to assist the children in controlling their weight (i.e. better lunch program, and educational programs on healthy eating and exercise).

Data were gathered, during all phase II interviews, focus groups and the one day discussion group, via tape recording. The data then were transcribed and simultaneously analyzed. Field notes and participant observation was used to obtain data regarding the activities undertaken throughout model development. Details of the observed events (i.e. participants' behavior, family environment, process and participant interactions) were recorded by the primary researcher.

Upon completion of data gathering in phase II, the primary researcher collaborated with the other members of the research team, who had prior experience in qualitative/quantitative research and PAR, for the purpose of analyzing both the qualitative and quantitative data. Based on analysis of the data, the model was developed by the research team. Following model development, the primary researcher confirmed the accuracy of the model with the 27 parents who consented to be in Phase III of the study, the school administrator, 15 kindergarten teachers and the public health nurse, who had served as the research assistant. A description of the model follows.

Family Management for Overweight Prevention Model (FMOPM): The Family Management for Overweight Prevention Model (FMOPM) was developed, using EST as the conceptual framework, based on analysis of the quantitative and qualitative data, and synthesis of the activities, that had occurred within the PAR process (see **Figure 1**). The FMOPM consists of two management levels: family and school atmosphere. The inner circle refers to management at the *family level* (micro-system), while the outer circle refers to management of *the child's environment at the community level* (meso-system), which was facilitated by the activities of the family self-help group and the public health nurse in her capacity as a school health nurse. The dotted lines indicate a semi-open system in which selected energy could be transferred between the family management level and the child's environment at the community level. As a result of family management, the model's output is the health behavior of the family and the preschooler, while the outcome of the model is the achievement of the preschooler's normal weight and linear growth.

The family level, depicted by the dotted inner circle, refers to the semi-open system of the family, through which selected energy can be transferred to the environment. The circle reflects the movement, within the PAR process, which is enhanced by management within the family. The triangle shape represents the family management processes and essential elements.

The family management process began by preparing the family for readiness. The parents informed and persuaded their family members to

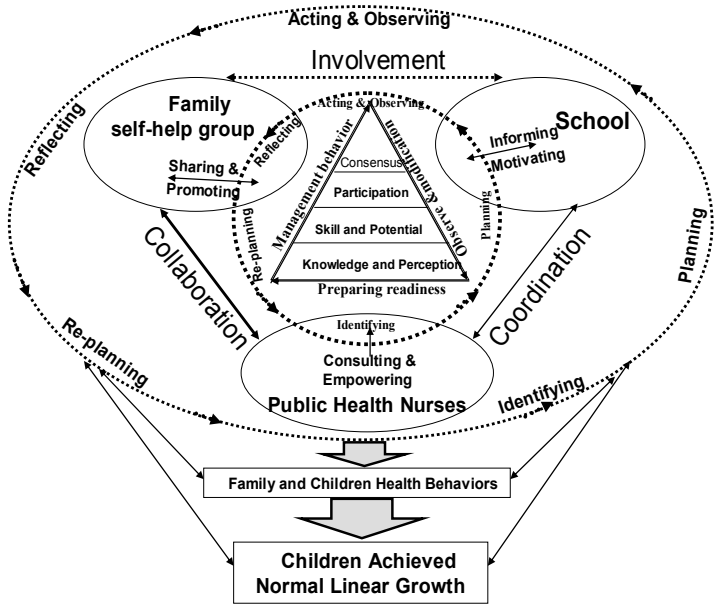

Figure 1 Model of Family Management for Overweight Prevention in Urban Thai Preschoolers

participate. Thereafter, each family managed all components of the process, with respect to their own context. The most significant elements identified were food and activities management. Throughout the process, parents observed and evaluated their preschooler's behavior and, accordingly, modified their management.

The family essential elements supported the success of the family management component. These elements included the parent's and family's perceptions regarding their preschooler's: body shape, nutritional knowledge, skills, potential, family participation and family consensus. They were arranged in order, from perception and knowledge, to family participation and consensus.

The outer circle of the model depicts the activities and behaviors that occur *within the child's environment at the community level,* which similarly supports the success of the family management level. One of the most important factors within the child's environment was found to be the school system. The school system plays a role in informing and motivating children and families. That is, teachers provide children with physical activities that may reduce overweight and present basic nutritional principles in their classes. Additionally, school lunches serve as a major source of the food children consume during the school day. The family self-help group served to provide nutritional and health education to parents, allowing them to collaborate on ways to improve their children's nutrition, and provide a support network for these families. The public health nurse, in her role as a school nurse, monitored the children's linear growth and weight, to determine those at risk for overweight. In addition, she served as an expert on nutrition and health during the workshops, and parents were able to use her expertise to develop better nutritional plans for their children. The PAR process was dynamic in the outer circle, which enhanced the development

of the model. Three main parts represented in the model, which interact via coordination, collaboration and involvement are: family self – help group, school and public health nurses.

During **Phase III,** the self-administered questionnaires, originally distributed during Phase I, again was distributed to the 27 parents who originally consented to be in Phase III of the study. The first administration of the questionnaire was immediately after development of the model (end of the second workshop). The second administration of the questionnaire was two months after the end of the second workshop. The questionnaires were sent home with the children of the 27 parents, completed by their parents and returned to the researcher by the children. There was a 100% (n = 27) return rate of the questionnaires, from its first administration, during Phase III, and a 92.6% (n = 25) return rate from its second administration. Two families moved from the area between the first and second administration of the questionnaires, during Phase III. Both times questionnaires were distributed to parents, the heights and weights of their respective children were measured.

Data Analysis: Quantitative data were analyzed via descriptive statistics and repeated measures ANOVA. Content analysis was used to assess the qualitative data.[23,24]

Results

Results, based on analysis of the quantitative data, indicate that each the family's food environment, feeding practices and perceptions, as well as the child's dietary habits, were considered to be the strongest predictors for preschooler overweight. In addition, the parents indicated family management was the most significant strategy for preventing childhood overweight. Therefore, development of family management strategies, in the second phase, were expected to improve these factors, by assisting the children to engage in more health promoting behaviors, and control their weight, while maintaining normal linear growth.

Evaluation of the Model: The evaluation process was aimed at examining the effectiveness of the FMOPM, in terms of output and outcomes, at both the family and school levels. The primary researcher, as a public health nurse at a local educational institution, coordinated and collaborated with the public health nurses, who serve as school health nurses. In their role as school health nurses, the public health nurses act as facilitators, health educators and advocates for families. More specifically, they work in schools and monitor preschooler's weight and height status every month, as well as provide nutrition and health education to students, schools and families in order to prevent childhood overweight.

The repeated measures ANOVA was employed to ascertain, at three points in time, the parents' nutritional and overweight prevention knowledge, and their feeding practices (see **Table 1**). The repeated measures ANOVA also was used to evaluate, at three points in time, the children's eating behaviors and physical activities. The children were found to have significantly improved behavior regarding their sweetened beverage consumption (see **Table 2**).

With respect to physical activity, the children, before model development, engaged in activities, such as cycling, walking and group play. Although the time they spent engaged in these activities increased, it was found not to increase significantly over the three points in time (**see Table 2**). Likewise, the time the children spent, watching TV decreased, over three points in time, but was not significantly different (see **Table 2**).

Table 1 Mean scores, at three periods of time, of parents' nutritional and overweight prevention knowledge, and feeding practices (n = 25).

Time	Parents' knowledge	Parents' feeding practice
	Mean ± S.D	Mean ± S.D
Before model development (Time 1)	8.50 ± 0 .47	56.88± 3.56
Immediately after model development (Time 2)	10.54 ± 0.35	64.79 ± 2.86
Two months follow up (Time 3)	10.33 ± 0.31	61.58 ± 2.91
	F= 22.973, df =2,46, *p*= 0.001	F=3.512,df =2,46, *p*= 0.038

Table 2 Mean scores, at three periods of time, of children's beverage consumption, physical activities and hours of TV watching (n = 25).

Time	Beverage consumption	Physical activity	TV watching
	Mean ± S.D	Mean ± S.D	Mean ± S.D
Before model development (Time 1)	13.000 ± 1.468	2.375 ± 0.317	3.083 ± 0.408
Immediately after model development (Time 2)	9.292 ± 1.064	2.542 ± 0.262	2.542 ± 0.233
Two months follow-up (Time 3)	8.875 ± 0.975	2.958 ± 0.185	2.542 ± 0.233
	F = 5.767	F = 1.599	F = 0.893
	df = 2,46, *p* = 0.006	df = 2,46, *p* = 0.213	df = 2,46, *p* = 0.416

An outcome evaluation was performed, during the last phase of the study, to examine the preschoolers' nutritional status. The children's weight and height were measured, in order to compare the measures with their nutritional status. The prevalence rate of overweight preschoolers decreased from 16.5 %, at the beginning of the study, to 13.2 %, immediately after model development, and to 13.8 %, two months after model development. After model development, the number of overweight preschoolers (> +2 SD), had decreased 72 %, from 25 to 18; while 9 (33.3%) preschoolers, who had been overweight, had returned to a normal weight. Before model development, the average weight of the 27 children (whose parents were involved in the last stage of Phase II, and in part or all of Phase III) was 23.6 kg. However, two months after model development their average weight was 24.4kg, which reflected a weight gain of 0.8kg. The children's average height, prior to model development, was 106.1cm, while two months after model development it was 107.7cm, revealing a 3.6 cm. height increase.

The school provided space for student activities, and organized one educational campaign related to healthy food for preschoolers. Unfortunately, the school could not implement some suggested activities, such as prohibition of carbonated drinks, because the school had a contract with a carbonated beverage company and a portion of the profits from the sale of the drinks was applied to staff salaries.

Weight and height measurements of children who participated in the study were assessed in order to compare these with changes in the children's nutritional status. The prevalence rate of overweight preschoolers was 16.5 % at the beginning of the study, but decreased to 13.2 %, immediately after model development, and to 13.8 %, two months after model development.

Discussion

Process of the model development: The advantage of using PAR was it: (a) fostered full participant involvement, in the research process; (b) progressively helped the participants solve their problems; and, (c) created activities to prevent childhood overweight, at both the family and the school atmosphere levels. This methodology is consistent with the PAR used in development of a family-school partnership program in the USA.[25] Several researchers, in Thailand, also have reported the effectiveness of the PAR process in building, developing and implementing a health program among specific groups. These studies have included: an urban community in Bangkok;[26] community leaders in Songkhla;[27] and, a multidisciplinary team, in a medical unit of a tertiary care hospital, in the north-central region of Thailand.[28] Outcomes, of the studies, indicated the PAR process resulted in design and implementation of programs that were: culturally specific; acceptable to the participants; and, had potential for sustainability.

Efficacy of model development: The findings suggested that implementation of the model could lead to changes at both the family level and the child's environment at the community level. Utilization of the PAR process raised the awareness of the public health nurses who functioned as school nurses. Due to this research, the school nurses increased monitoring of children for overweight and began providing health education to children and families within the school, as well as at the local primary health care center.

Changes at the family level may have been attributable to almost all of the activities in both workshops which involved health education, using AIC and PL techniques, and which were aimed at raising awareness, increasing knowledge and promoting parents' feeding skills. Additionally, the home visits aimed to increase the families' confidence in improving health promoting behaviors. Therefore, parents may have paid more attention to improving family food choices, avoiding the purchase of unhealthy foods, serving as better role models and controlling their children's food intake, especially their intake of sweetened and/or carbonated beverages. These improvements seemed to have made a difference, given that the parents' knowledge and feeding practice scores significantly increased (see **Table 1**), and their preschooler's beverage consumption significantly decreased, when compared over three time periods (see **Table 2**).

With respect to the children's growth, results imply implementation of the model could improve preschooler nutritional status, and be used to prevent

overweight in preschool children. The preschoolers, who had an average weight after model development, had an average weight gain of 0.8 kg/10 months and an average height increase of 3.6 cm/10 months. These findings support the USA's Healthy Start Preschool Study Goals,[5] and suggest a reasonable goal, for preschool overweight prevention, of a weight gain of 2.5 lb/in (1 kg/2cm) of linear growth.

In the child's environment at the community level, findings reveal similar concerns regarding the preschoolers' nutritional status. Although the school officials spearheaded a health education campaign and improved school lunches, they could not implement some of the activities, due to not being allowed to prohibit carbonated beverages. Thus, the model, regarding the child's environment at the community level, was limited.

Implications and Recommendations

The level of application of the model applies to both family level and the child's environment at the community level. The family level is well suited for a narrow purpose of achieving the desirable outcomes of promoting family and child health behavior, and preventing rapid weight gain in children. Whereas, the child's environment at the community level is appropriate for a project that is broader in scope, and aimed at promoting children's health behaviors and reducing the prevalence rate of childhood overweight. The success of the family management model can be derived from strong family participation, in collaboration with school officials, utilizing the PAR process. Further, the model has broad applicability to public health nurses who work in schools and in the community. At the school level, the model supports the role of the nurse in monitoring children's height and weight status, providing nutrition and health care education to children and their families, and educating teachers on ways to promote appropriate growth in children. Public health nurses also play a significant role in the community. This model provides a roadmap for public health nursing interventions. For instance, children regularly are seen at well-baby clinics, where public health nurses provide health education. In addition, public health nurses perform community health home visits. During home visits, this model can be used to educate families regarding ways to promote healthy eating and activities.

Public health nurses, who may be interested in using or applying this model, should start by assessing the family's perception of their child's body shape, overweight prevention knowledge and risk factors. If a family's perception of barriers is high, and/or their nutritional knowledge is low, health education sessions should be provided. Most importantly, nurses should empower families to encourage their members to be involved in drafting a suitable family consensus plan, for childhood overweight prevention, within the context of the given family.

Additional research needs to be conducted, throughout Thailand, in order to refine the model and expand its generalizability. Further model development should address not only preschoolers, but all school age children. In addition, expanding

the network of stakeholders, to include local health administrator and shopkeepers near the schools, also is advisable.

Limitations

The present study was based on participatory action research. The knowledge gained from this study, by those who were involved, may not be generalizable to other types of families or school systems (i.e. families and schools in rural areas). However, it may be applicable to other families and schools in urban areas, who have similar contexts and situations.

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การพัฒนารูปแบบการจัดการโดยครอบครัวเพื่อป้องกันภาวะโภชนาการเกินในเด็กไทยก่อนวัยเรียนในเขตเมือง

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บทคัดย่อ: การศึกษาครั้งนี้เป็นการวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม(PAR) เพื่อศึกษาปัจจัยเสี่ยงที่มีอิทธิพล ต่อภาวะโภชนาการเกินและพัฒนารูปแบบการจัดการโดยครอบครัวเพื่อป้องกันภาวะโภชนาการเกินในเด็กก่อนวัยเรียน ในโรงเรียนประถมศึกษาแห่งหนึ่งในเขตเทศบาลเมืองแสนสุข จังหวัดชลบุรี ดำเนินการวิจัย โดยการเก็บข้อมูลด้วยแบบสอบ ถามจากผู้ปกครองเด็กก่อนวัยเรียน 327 คน เพื่อวิเคราะห์ปัญหาและปัจจัยเสี่ยง และการพัฒนารูปแบบ ผ่านการจัดเวทีระดมความคิดและการอบรมแก่ผู้มีส่วนเกี่ยวข้อง 59 คน และเยี่ยมบ้านผู้เข้าร่วมการพัฒนารูปแบบการจัดการในระดับครอบครัว 27 ครอบครัว การเก็บรวบรวมข้อมูลใช้ทั้งเชิงปริมาณและเชิงคุณภาพ การวิเคราะห์ข้อมูลเชิงปริมาณใช้การวิเคราะห์การวัดความแปรปรวนแบบวัดซ้ำ ข้อมูลเชิงคุณภาพใช้การวิเคราะห์เชิงเนื้อหา

ผลการศึกษาได้รูปแบบการจัดการเพื่อควบคุมป้องกันภาวะโภชนาการเกินในเด็กก่อนวัยเรียนที่ครอบคลุมทั้งระดับครอบครัวและชุมชน ในระดับครอบครัวประกอบด้วย 1) กระบวนการจัดการในครอบครัว ได้แก่ การเตรียมความพร้อม การปฏิบัติและการจัดการ การสังเกตและการปรับเปลี่ยน 2) องค์ประกอบสำคัญในการจัดการได้แก่ การรับรู้และตระหนักในรูปร่างของเด็ก ความรู้ทักษะและการมีส่วนร่วมของครอบครัว ส่วนรูปแบบการจัดการในระดับชุมชน มีการประสานงานการทำงานกันเป็นเครือข่ายของ โรงเรียน พยาบาลสาธารณสุขและกลุ่มช่วยเหลือตนเองของผู้ปกครอง กระบวนการที่ใช้ในการดำเนินงานของรูปแบบ ได้แก่ 1) การเตรียมความพร้อมแก่ผู้มีส่วนเกี่ยวข้อง 2) การสร้างระบบการจัดการในครอบครัว 3) การแลกเปลี่ยนประสบการณ์และกระตุ้นส่งเสริม 4) การสร้างกลุ่มช่วยเหลือตนเองและเครือข่าย

ผลของรูปแบบการจัดการสามารถเพิ่มความรู้และทักษะการส่งเสริมพฤติกรรมสุขภาพแก่ครอบครัว ในครั้งนี้ 15 ครอบครัวประสบความสำเร็จสามารถควบคุมน้ำหนักเด็กให้เป็นไปตามเกณฑ์ และในระดับโรงเรียนสามารถลดอัตราภาวะโภชนาการเกินเด็กก่อนวัยเรียนจากร้อยละ 16.5 เหลือร้อยละ 13.8 ปัจจัยความสำเร็จและความยั่งยืนของการ วิจัยครั้งนี้ ได้แก่ การมีส่วนร่วมอย่างแท้จริงของครอบครัวและความร่วมมือดำเนินการของโรงเรียนในการประสานงานจากทุกภาคส่วนที่เกี่ยวข้องสร้างเป็นเครือข่ายดำเนินการเพื่อผลลัพธ์คือการพัฒนาเด็กให้มีการเจริญเติบโตที่สมวัย

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คำสำคัญ : รูปแบบการจัดการโดยครอบครัว การป้องกันภาวะโภชนาการเกิน เด็กวัยก่อนเรียน การวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม

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