

Evaluating the effectiveness of a family empowerment program on family function and pulmonary function of children with asthma: A randomized control trial



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ABSTRACT

Background: Empowerment can be an effective strategy for changing an individual's health behaviours. However, how to empower whole families to manage their children's asthma is a challenge that requires innovative nursing intervention based on family-centred care. **Aims:** To evaluate the effectiveness of a family empowerment program on family function and pulmonary function of children with asthma compared to those receiving traditional self-management only.

Design: A randomized control trial.

Methods: Sixty-five families were recruited from one asthma clinic in a medical centre in Taiwan. After random assignment, 34 families in the experimental group received the family empowerment program consisting of four counselling dialogues with the child and its family. We empowered the family caregiver's ability to manage their child's asthma problems through finding the problems in the family, discovery and discussion about the way to solve problems, and enabling the family's cooperation and asthma management. The other 31 families received the traditional care in asthma clinics. The Parental Stress Index and Family Environment Scale of family caregivers, and pulmonary function, and asthma signs of children with asthma were collected at pre-test, 3-month post-test, and one-year follow-up. We utilized the linear mixed model in SPSS (18.0) to analyze the effects between groups, across time, and the interaction between group and time.

Results: The family empowerment program decreased parental stress ($F=13.993$, $p<.0001$) and increased family function (cohesion, expression, conflict solving, and independence) ($F=19.848$, $p<.0001$). Children in the experimental group had better pulmonary expiratory flow (PEF) ($F=26.483$, $p<.0001$) and forced expiratory volume in first second (FEV1) ($F=7.381$, $p=.001$) than children in the comparison group; however, no significant change in forced expiratory volume in first second (FEV1)/forced vital

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capacity (FVC) was found between the two groups. Sleep problems did not show significant changes but cough, wheezing, and dyspnoea were significantly reduced by family caregiver's observations.

Conclusion: We empowered families by listening, dialogues, reflection, and taking action based on Freire's empowerment theory. Nurses could initiate the families' life changes and assist children to solve the problems by themselves, which could yield positive health outcomes.

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What is already known about the topic?

- Systematic reviews reveal that self-management programs and personal care plans could lead to better conditions for patients with asthma.
- Parental stress and family dysfunction are associated with the onset and severity of children's asthma symptoms.
- Family-based intervention for children with asthma could increase families' caring skills, medical adherence, medical care utilization, and quality of life of children, as well as parents' well-being.
- Empowerment programs have shown positive effects for parents, children, and adolescents, for example, by improving parents' self-reliance, encouraging breastfeeding, preventing suicide of adolescents, and increasing the health of children with chronic conditions.

What this paper adds

- This result provides evidence that the asthma family empowerment program and combined self-management intervention decreased parental stress compared to self-management only.
- The asthma family empowerment program combined with self-management intervention improved various aspects of family function – cohesion, expression, conflict solving, and independence dimensions – compared to families receiving self-management only.
- The asthma family empowerment program combined with self-management intervention increased children's pulmonary function such as FEV₁ and PEF, and improved asthma symptoms such as cough, wheezing, and dyspnoea compared to families receiving self-management only.

1. Introduction

Childhood asthma is a highly prevalent chronic illness (Chang et al., 2013; Yeh et al., 2011) and affects many families' lives (Svavarsdottir and Rayens, 2005). Complicated asthma management and recurrent asthma exacerbations could disturb family relationships and threaten daily family life (Santer et al., 2014), as well as cause parent–child discord for children with moderate asthma (Chiang, 2005). Parents suffer from high stress as they take on the responsibilities of self-managing asthma care for their children within the context of family life (Brown et al., 2010). Families with higher levels of family dysfunction and chronic family stress have shown that

the children suffer from increased inflammatory production and asthma symptoms (Marin et al., 2009). Family function has also been shown to be a protector and benefit in coping with a childhood chronic illness (Rosland et al., 2010). However, previous interventions for improving the self-management for children with asthma were focused on asthma knowledge and disease management with educational and behavioural interventions (Clark et al., 2010; Guevara et al., 2003). The self-management plan predominantly emphasized a personal action asthma plan (Ring et al., 2007). Most self-management programs (Ahmad and Grimes, 2011; Welsh et al., 2011) emphasize only a caregiver's responsibility of monitoring adherence to treatment and not a comprehensive family care approach to address relieving parental stress or increasing family function (Horner, 1995).

For successful management, a case manager should consistently and patiently meet with the family to build a trusting relationship (Schulte et al., 2004). The major responsibility of paediatric nurses is providing holistic family-centred nursing care to improve family function (Kuhlthau et al., 2011) and to maintain a well-controlled asthma regimen for children to have normal growth and development. Until now, there has been no study implementing family empowerment methods and examining the effects on parental stress, family function, and the asthma conditions of children with asthma.

We developed the Asthma Family Empowerment Program (AFEP) based on Freire's empowerment theory to recruit the whole family with asthmatic children into the nursing intervention.

2. Literature review

2.1. Family function and parental stress

Reviews of parental stress indicated that parental stress increases the risk of childhood wheezing among children with no parental history of asthma (Milam et al., 2008; Yamamoto and Nagano, 2015). Interactively, the family function and parent–child relationships, and management ability also influence the health of children with asthma (Preechawong et al., 2007). Two previous studies that have examined the effects of parental stress on the incidence of childhood asthma and wheezing, indicated that stress preceded the onset of symptoms (Mrazek et al., 1999; Wright et al., 2002). Greater levels of parental stress were associated with a significant increased risk of subsequent wheezing. There is accumulating clinical evidence showing that family dysfunction, stress, and emotional reactions to

stress influence airway reactivity and increase asthma symptom severity. The autonomic nervous system (ANS) response to negative psychological states (e.g., emotional reactions and stress related to family and other factors) may affect airway function (Miller and Beatrice, 2003; Panton and Barley, 2000). Therefore, it will be important to perform intervention studies that target stress to prove that the mitigation of stress can lead to the improvement of a child's asthma or reduce the risk of asthma (Yamamoto and Nagano, 2015).

2.2. Family empowerment

Nurses are natural educators and advocates for helping families rear children with asthma. Both of these roles are instrumental in empowering families to ensure the health of their asthmatic children. The previous family-related intervention for children with asthma was conducted to evaluate families' skills (Kelcher and Brownoff, 1994), medical adherence and health care utilization (Fiese and Wamboldt, 2003), and quality of life (Fiese et al., 2005; Ng et al., 2008; Payroove et al., 2014). A systematic review also indicated that parent- and family-based psychological therapies can improve parent outcomes (Law et al., 2014). All of these family-based intervention studies measured the cognitive, behavioural and physiological outcomes, and lacked an understanding of the effects of family function and parental stress.

Empowerment is defined as "the interpersonal process of providing the proper tools, resources and environment to build, develop, and increase the ability and effectiveness of others to set and reach goals for individual and social ends" (Hawks, 1992). Freire is one of the most important theorists and philosophers of "critical pedagogy." He believed the principles of social justice (liberation, equal access, and empowerment) were necessary to help individuals and communities address the larger socioeconomic causes of oppression and poor health. Freire advocated a problem-posing method of education, in which teacher-student contradictions were resolved through dialogue. Education is not merely the transferal of information but also consists of acts of cognition (Freire, 1994). Some studies have utilized Freire's empowerment theory to help people in poor health conditions. Rindner (2004) incorporated Freire's empowerment into a three level of psychiatric settings to support adolescent autonomy and facilitate an adolescent self and develop critical thinking skills. Empowerment programs can improve parents' self-reliance while taking care of children that are mentally handicapped (Cameron and Cadell, 1999; Eo, 2005), for family of the juvenile offenders (Cervenka et al., 1996), for children with diabetes (Adolfsson et al., 2004), to reduce youth suicide risk factors (Toumbourou and Gregg, 2002), for children living with HIV (Kmita et al., 2002), for children and families affected by Fetal Alcohol Spectrum Disorders (Wilton and Plane, 2006), as well as promoting breast feeding (Kang et al., 2008).

The family empowerment was based on a family system approach that treats the family as a system (Cervenka et al., 1996). All family systems are constantly changing and evolving. Strong functioning families could

maintain their equilibrium by identifying and trying several solutions by themselves. Therefore, we applied family empowerment programs for parents and children with asthma to reduce parental stress, increase family functioning, and thus improve children's pulmonary function and asthma symptoms.

3. Aims

The aim of this study was to examine the effectiveness of the asthma family empowerment program (AFEP) for parents on parental stress, family function, and children's pulmonary function and asthma symptoms; in addition, we compared these families to families who only had self-management.

4. Methods

4.1. Study design

The study design was a randomized control trial to repeatedly measure the parental stress, family function, and children's pulmonary function and asthma symptoms. We measured three time points, including baseline and three-month and one-year follow-ups. A family empowerment program was implemented for 1.5 years and included four sessions over sixteen weeks.

4.2. Participants

Families with asthmatic children were recruited from a medical centre in middle Taiwan. Selection criteria included the following: (a) a diagnosis of moderate-to-severe asthma by a physician at least six months prior to the study period; (b) children aged 6–12 (years) in the 1st to 6th grade in elementary schools; (c) low function families, as defined by an APGAR score less than 6 (Smilkstein, 1978); (d) regular treatment with asthma medication in a paediatric clinic, and (e) the ability to speak and read. The exclusion criteria included the following: (a) having any other chronic disease, e.g., epilepsy, congenital heart disease, diabetes or other major organ disease; (b) having a family move from their living area during the study period.

4.3. Study groups and intervention

A total of 76 children with asthma between the ages of 6 and 12, and their families were recruited for this study. This study was conducted from August 2009 to May 2012. Once the parents and children were selected to participate based on their APGAR score <6, informed consents were obtained before the randomization. The eligible families were randomly assigned to one of two groups using sealed opaque envelopes, following computer-generated random serial numbers by the correspondent author (principal investigator). Because of shortage of time or unwillingness of family members to participate in the study, three families in each group did not receive allocated intervention. Additionally, 1 family in the experimental group (male child aged 7 y/o) and four families in the comparison

group (two male children aged 7 y/o, one girl child aged 8 y/o, and one male child aged 10 y/o) were lost to follow-up since the mothers in the family felt too tired to continue in the study. The age, gender, and asthma severity of children in the families lost to follow-up did not influence the homogeneity of baseline demographic characteristics between the two groups. Finally, 34 children were completed in the experimental group and 31 children were completed in the comparison group (Fig. 1). Some of the children and families did not complete part of the third questionnaire in one-year follow ups. The completed data were different based on the different variables.

After the families were allocated into the experimental or comparison groups with the permission of the researcher (the first author), each family could receive the regular asthma self-management with the asthma diary, the asthma education booklet, a CD about asthma, and a peak flow metre. The booklet, "Totally Care for the Children with Asthma," provided the majority of information on caring for asthmatic children in a simple and clear

way to teach strategies and list resources for social support groups. This asthma educational booklet that was edited by asthma physicians and nurses from the research team was based on previous studies findings (Chiang et al., 2004; Chiang, 2005) and the GINA guideline (2010). The content was designed to help improve parents' self-management for caring for their children with asthma by increasing the recognition of asthma, self-confidence and competency of asthma management, and benefits of environmental control devices, as well as increasing the number of regular asthma clinic visits and the peak flow metre monitoring and recording. The families in the comparison group only received the regular asthma self-management in the asthma clinic. All of the families could get a small incentive for their participation.

Table 1 presents the content and process of the Asthma Family Empowerment Program (AFEP) for the families in the experimental group, which includes generated themes, problems posed, and act-reflect-act in four stages based on Freire's empowerment theory. Family empowerment was

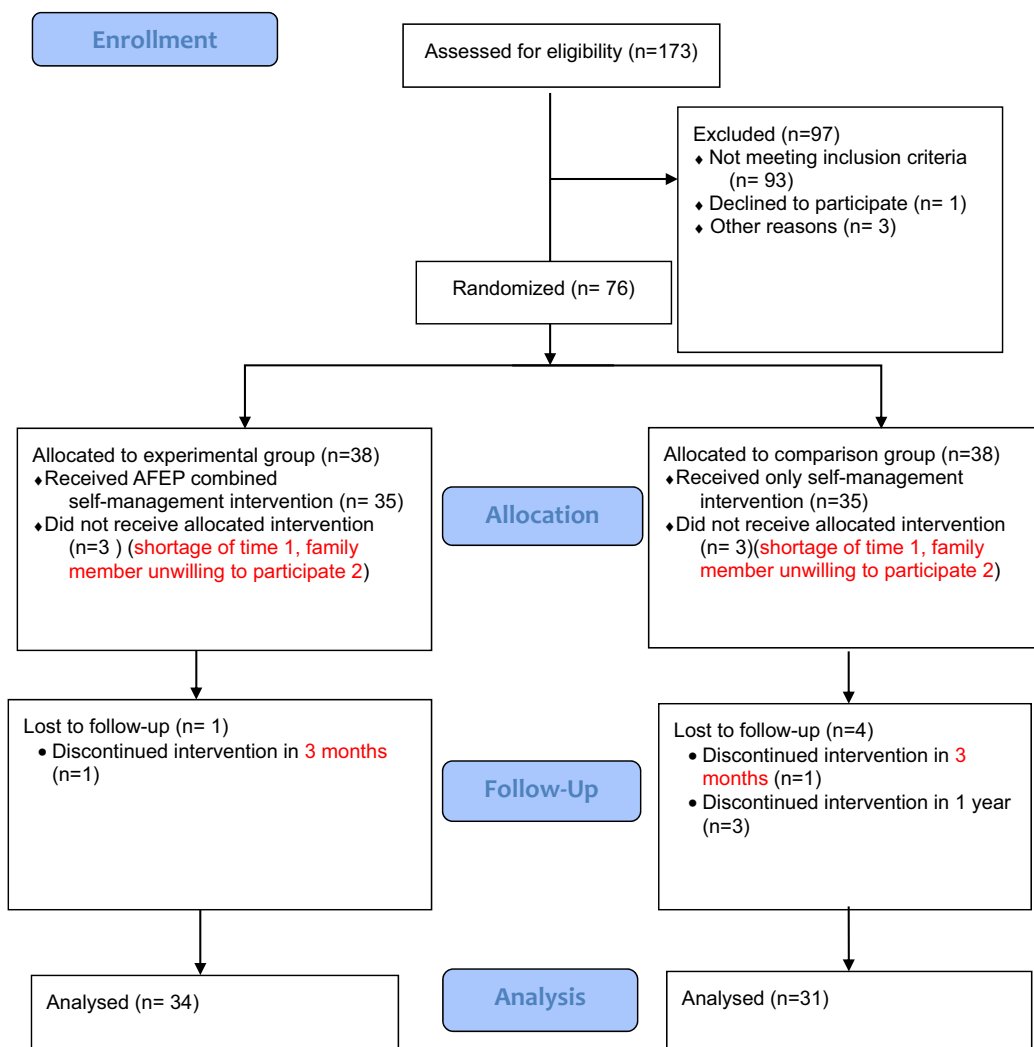


Fig. 1. The flow chart of recruiting participants.

Table 1
Asthma Family Empowerment Program (AFEP).

Session	Objectives	Strategies	Contents
First	Identify the family	• Nurse as facilitator • Be a participant observer • Active listening • Facilitate sharing • Prioritize family needs	• Share the life story of asthma disease of the family • Listening the communication of families • Generate the themes of each family • Identifying learning needs
Second	Pose problem and conflict in the family	• Asking questions without obvious answers • Engage conversation	• Appraise problems • Improving the relationship between parents and child
Third	Engage in dialogue and critical thinking	• Discussion on the alternatives/problems solving • Confirming the successful family asthma management • Encourage support from each other's in family	• Helping decision making to selecting solution • Appraise the benefits and barriers of solutions • Reinforcing the family asthma management
Fourth	Apply knowledge and acting out	• Share information/resources • Help family member to test and acting out the solutions • Raise awareness	• Recognize the family as a whole • Sharing the experiences of acting out • Writing down the perception of new family's story • Celebration and summary

designed to tailor family interventions for each individual family based on the family-centred nursing care philosophy. Because each family has unique problems in caring for their asthmatic children in the context of their family life, the intervention followed the principles of family-centred care. We assessed family perceptions and coping abilities regarding asthma management, encouraged the expression of feelings and concerns, educated the child and family about asthma and condition management, supported positive coping behaviours, and secured resources to help families manage their child's condition. In the 16 weeks, AFEP was conducted four times for a primary family caregiver by the researcher (first author) who has more than ten years of paediatric clinical experience and is well-trained in one asthma education center. The families' members in the experimental group were invited into each session discussion. The researcher established a respectful and trusting relationship with the families, and initiated each individual family to address problems themselves after the dialogues. The decision making for actionable changes were done through their reflections into action. Next, the families were encouraged to choose alternatives or problem solving ideas after family discussions. Finally, the nurse reinforced their decision making, confirming successful family asthma management, and helped the family member to test and act out their solutions. All of the families in the experimental group had four treatment sessions, and each session took 50 min. After the one year following up, the research assistant interviewed each individual family to briefly report their process and outcomes.

4.4. Power calculation

Based on the variations of pulmonary expiratory flow (PEF) in previous studies (Tzeng et al., 2010), and balancing between the size of the effect that we can detect, and the resources available for the study, a conventional medium effect size of 0.5 was selected (Cohen, 1988). We calculated with the sample size for two groups and repeated measures over three times with 0.8 power, and two-tail

$\alpha = 0.05$ by the G*Power (3.1.9.2). This calculation resulted in a total of 42 participants, with 21 participants per group. These results assume two sequential tests using the O'Brien and Fleming (1979) spending function to determine test boundaries.

4.5. Instruments

The measurements included basic demographic data of children with asthma and the primary family caregivers. The demographic data of children included gender, age, severity of asthma; the family demographic data included family role, age, and marital status of the primary family caregivers.

4.5.1. Parental Stress Index (PSI)

A Chinese version of the Parental Stress Index (PSI) was used to assess the perceived stress of parents caring for their children with asthma. This Chinese-version PSI was developed by Wong (2011), and the permission to administer the measure was obtained from Psychological Publishing Co., Ltd. (Taiwan). The PSI included 113 items to measure a mother's unhappiness, parenthood involvement, social isolation, marital relationship, health status, and children's emotional responses and adaptation. The 1–94 items were measured with a 5-point Likert's scale, and the 95–113 items were measured with yes/no responses. The total score ranged from 94 to 489. A higher score reflects higher perceived stress. The validity and reliability have been validated by a survey of 1362 parents of kindergarten and elementary school children in middle Taiwan with acceptable internal consistency ranging from 0.492 to 0.913, and good construct validity (Wong, 2011).

4.5.2. Family function

The real form (Form R) of the Family Environment Scale (FES) included a 90-item self-report measurement that assesses the social-environmental characteristics of the family system (Moos, 1990). The FES is comprised of ten subscales in three dimensions measuring people's perceptions of their actual family environment. The "Relationship"

dimension involves assessments of cohesion, expressiveness, and conflict. The “Personal Growth” dimension involves assessments of independence, achievement orientation, intellectual–cultural orientation, active–recreational orientation, and moral–religious emphasis. The “System Maintenance” dimension includes organization and control measures. It was administered with a four-point Likert scale response that could be answered in 15–20 min. It had been used in paediatric nurses in Taiwan with good reliability and validity (Chen and Clark, 2007; Juang et al., 2004). Homogeneity, including internal consistency for the 10 subscales ranged from 0.64 to 0.79. The internal consistency for the tool was not reported. The average subscale inter-correlations are 0.20. Stability was established by the 8-week test–retest, which ranged from 0.68 to 0.86 (Moos and Moos, 1986). These authors examined the translatability of family concepts into the Taiwanese culture. Forward- and back-translation processes and cross-cultural assessment of reliability and validity were examined. This Chinese version of the FES has a good content validity index (0.89–1.0); consistency between English and Chinese versions of the FES by bilingual children was also good (ICC 0.72–0.83). Test–retest reliability of the FES was good (0.30–0.68) after two weeks, and construct validity was determined as well-fit by confirmatory factor analysis. The total internal consistency of the FES was 0.52. Internal reliability estimates for the FES subscales ranged from 0.61 to 0.78, and inter-correlations among these 10 subscales range from –0.53 to 0.45 in 60 parents. This is a reasonably stable scale over long time and has been used by international researchers and published in more than 2000 articles.

4.5.3. Pulmonary function

FEV₁ was measured using a portable Spirometer for PC (SPIROMETRICS medical equipment company) that meets the standards of the American Thoracic Society. Our well-trained paediatric nurse (the first author) taught children the manoeuvres, according to the American Thoracic Society procedures, to perform a forced expiratory manoeuvre after maximal inhalation to measure FEV₁, functional vital capacity, and FEV₁/FVC. For analysis, we analyzed the percent-predicted of normal based on height, sex, and ethnic variations. Peak expiratory flow (PEF) was recorded by children or parents based on standard protocols. The peak flow monitoring was conducted by children themselves after they were trained on the proper techniques. A total of three manoeuvres with <5% variability were recorded according to American Thoracic Society standard. Participants were also asked to record the best performance of three PEFs in the morning and evening.

4.5.4. Asthma symptoms

Participants and their family caregivers were taught to record their asthma symptoms in an asthma diary at baseline and three-month and one-year follow-ups, which included their difficulty to sleep at night, and episodes of coughing, wheezing, and dyspnoea. A score of 0 was defined as no asthma symptoms. Asthma symptoms were defined as follows: a score of 1 as mild symptoms not interfering with favourite daily activities; a score of 2 as

moderate asthma symptoms that interfered with the child's activities, and a score of 3 as serious asthma symptoms that prevented the child from participating in activities (Sharek et al., 2002). The Cronbach's alpha for internal consistency was 0.73 in this study.

4.6. Data analysis

The data were analyzed according the purposes of study by using SPSS for Windows (version 18.0). The chi-square test was performed to analyze demographic differences between experimental and comparison groups. A linear mixed model was used to examine the effect within time, between groups, and the interaction of times and groups on outcome indicators between the two different interventions. Chan (2004) noted the mixed model technique is better than the General Linear Model in overcoming missing data in some variables at follow-up and limiting the availability of variance–covariance structures. The mixture of one between-group factor and one within-group factor on the interaction effect could examine the changes of each outcome variables in three time point measurements. Statistical significance was set as $\alpha < 0.05$.

4.7. Ethical considerations

Permissions were acquired from the Institute Board Review in the hospital that the participants were recruited from. Parents were given a letter explaining all of the details regarding the study and informing patients they have the right to withdraw from the study at any time, and for any reason, in accordance with the Declaration of Helsinki. Signed parental and children permissions were obtained prior to randomization. The principle investigator should, however, endeavour to keep the participants in the study after enrolment.

5. Results

5.1. Demographic data of children and family

Table 2 showed the demographic data of children and their primary family caregivers in two groups. There were no significant differences between the groups in terms of gender, age, asthma severity, or marital status of family caregivers.

5.2. Parental stress and family function

Table 3 showed the average score of the Parental Stress Index (PSI) was significantly reduced from baseline (229.88) to three months (202.12), to one year (195.32) in the experimental group compared with the comparison group at baseline, and three months and one-year follow-up (220.13, 222.03, 228.68), respectively ($F_{in} = 13.993$, $p < 0.0001$) (Fig. 2).

The average mean of the total score of the Family Environment Scale (FES) was significantly increased from 48.56 to 49.44 at the three-month post-test and to 56.38 at the one-year follow-up in the experimental group compared with the comparison group at baseline (45.39),

Table 2
Demographic characteristics of children with asthma and family caregivers by groups.

	Experimental group (n = 34)		Comparison group (n = 31)		χ^2	<i>p</i>
	<i>n</i>	%	<i>n</i>	%		
Children with asthma						
Gender						
Male	20	58.8	19	61.3	0.041	0.839
Female	14	41.2	12	38.7		
Age (y/o)						
6	13	38.2	10	32.3	5.795	0.447
7	6	17.6	2	6.5		
8	4	11.8	5	16.1		
9	3	8.8	7	22.6		
10	5	14.7	2	6.5		
11	2	5.9	3	9.7		
12	1	2.9	2	6.5		
Severity of asthma						
Mild	12	35.3	11	35.5	0.037	0.981
Moderate	19	55.9	18	58.1		
Severe	3	8.8	2	6.4		
Family caregivers						
Fathers	7	20.6	2	6.5	5.670	0.129
Mothers	26	76.5	27	87.1		
Other ^a	1	2.9	2	6.5		
Age (y/o)						
25–35	11	32.4	12	37.8	1.351	0.509
36–45	20	58.8	18	58.0		
≥46	3	8.8	1	3.2		
Marital status						
Married	30	88.2	34	89.5	1.174	0.556
Single ^b	4	11.8	4	12.9		

^a Grandparents or other family relatives.

^b Father died or divorced.

three-month posttest (44.68), and at one-year follow-up (43.32) ($F_{in} = 19.848$, $p < 0.0001$) (Fig. 3).

Only four subscales of the FES significantly improved. The AFEP could increase the “Cohesion” ($F_{in} = 7.180$, $p < 0.0001$) and “Expressiveness” ($F_{in} = 27.075$, $p < 0.0001$), decrease “Conflict” ($F_{in} = 16.092$, $p < 0.0001$), and improve the “Independent” ($F_{in} = 29.344$, $p < 0.0001$) subscales. The other subscales, “Achievement orientation,” “Intelligence-Cultural Orientation,” “Active-Recreational Orientation,” “Moral-Religious Emphasis,” “Organization,” and “Control” were not significantly improved.

5.3. Pulmonary function and asthma signs/symptoms

Table 4 indicated that the children in the experimental group have better FEV₁ and PEF than children in the comparison group after a four month intervention ($p < 0.05$); however, no significant change was observed in FEV₁/FVC between the two groups after the intervention (Fig. 4). Except for the sleeping problems, the other outcomes, including coughing, wheezing, and dyspnoea, significantly differed after the intervention between the groups.

6. Discussion

The results of this study indicate that the Asthma Family Empowerment Program (AFEP) based on Freire's empowerment theory can reduce parental stress and improve family function (subscales of Cohesion, Expressiveness, Conflict,

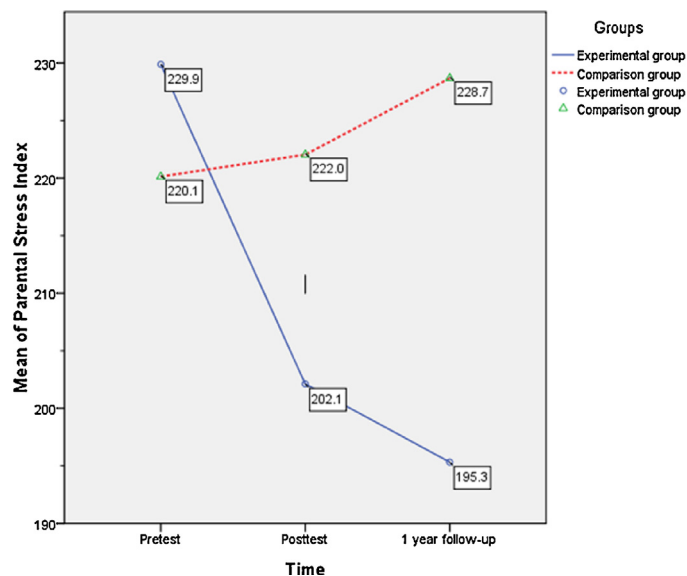
and Independent) from parents' perceptions, as well as improve children's pulmonary function (FEV₁, PEF) and reduce daily asthma symptoms compared with only asthma self-management interventions after one year of follow-up.

This study selected dysfunctional families whose APGAR < 6, and provided the families with empowerment by incorporating self-management to reduce parental stress and improve the family function, as well as significantly improve children's asthma conditions. Parental stress is associated with the health of asthmatic children (Milam et al., 2008; Wolf et al., 2008; Yamamoto and Nagano, 2015); families who have higher levels of family dysfunction and chronic family stress have children with increased inflammatory production and asthma symptoms (Marin et al., 2009). Yamamoto and Nagano (2015) suggested further interventional studies be conducted to address parental stress and improve children's health. Health care providers cannot ignore the effects of parental stress and family function on children's asthma conditions. The results added evidence that family-based self-management interventions could have better outcomes than previous studies that reported the effects of individual self-management on improving children's asthma conditions (Guevara et al., 2003; Ring et al., 2007; Smith et al., 2005, 2007). Consistent with a previous systematic review we indicated that parent- and family-based psychological therapies can improve parent outcomes (Law et al., 2014), and family-related interventions for children with asthma could increase the children's quality of life (Fiese et al., 2005; Ng et al., 2008; Payroovee

Table 3

The effects of family empowerment program on family function by linear mixed model.

Outcome measure	Group ^a	Pretest ^b	Posttest ^c	1 year follow-up	Between-groups	Within-times	Interaction
		Mean (SD)	Mean (SD)	Mean (SD)	$F_b(p)^d$	$F_w(p)^e$	$F_{in}(p)^f$
PSI ^g	E	229.88 (46.018)	202.12 (25.93)	195.32 (25.68)	5.198 (0.026)	7.725 (0.001)	13.993 (<0.0001)
	C	220.13 (25.98)	222.03 (25.57)	228.68 (25.17)			
FES total ^h	E	48.56 (7.62)	49.44 (3.14)	56.38 (3.28)	33.783 (<0.0001)	8.126 (<0.0001)	19.848 (<0.0001)
	C	45.39 (7.50)	44.68 (6.79)	43.32 (5.99)			
Cohesion	E	6.68 (1.75)	7.41 (1.33)	7.71 (1.27)	39.649 (<0.0001)	0.643 (0.528)	7.180 (0.001)
	C	5.71 (1.88)	4.97 (1.70)	5.13 (1.82)			
Expressiveness	E	5.29 (1.27)	6.71 (1.12)	7.26 (0.75)	96.497 (<0.0001)	4.633 (0.011)	27.075 (<0.0001)
	C	4.77 (1.45)	4.10 (1.40)	4.00 (1.21)			
Conflict	E	2.09 (1.48)	1.24 (1.07)	0.85 (0.70)	34.936 (<0.0001)	0.354 (0.702)	16.092 (<0.0001)
	C	2.16 (1.13)	2.84 (1.49)	3.06 (1.26)			
Independent	E	5.97 (1.43)	3.97 (1.38)	6.79 (1.25)	28.869 (<0.0001)	33.916 (<0.0001)	29.344 (<0.0001)
	C	4.65 (2.07)	3.87 (1.65)	3.61 (1.28)			

^a E: experimental group; C: comparison group.^b Measured at the first time recruiting on the asthma clinic.^c Measured after 3 months of the family empowerment intervention.^d F_b : the F value of between groups comparisons.^e F_w : the F value of within pretest, posttest, and 1 year follow-up.^f F_{in} : the F value of the interaction of between groups and within pretest, posttest, and 1 year follow-up.^g PSI: Parent Stress Index.^h FES: Family Environment Score, we only report the significant subscales in Table 3.**Fig. 2.** The comparison of the changes of Parental Stress Index between groups.

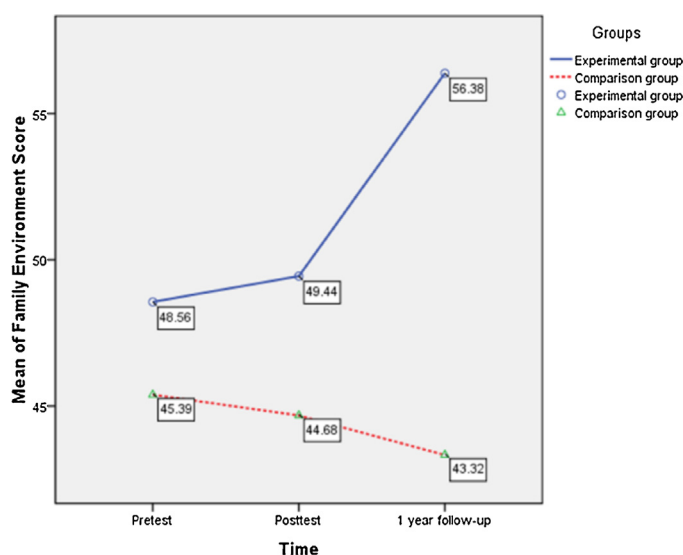


Fig. 3. The comparison of the changes of Family Environment Score between groups.

Table 4

The effects of family empowerment program on pulmonary function and asthma symptoms by linear mixed model.

		Group ^a	Pretest ^b	Posttest ^c	1 year follow-up	Between-groups	Within-times	Interaction
			Mean (SD)	Mean (SD)	Mean (SD)	F _b (p) ^d	F _w (p) ^e	F _{in} (p) ^f
Pulmonary function								
PEF ^g	E		149.41 (59.29)	202.65 (58.33)	211.18 (55.96)	4.945 (0.030)	127.071 (<0.0001)	26.483 (<0.0001)
	C		145.81 (45.22)	165.48 (42.99)	169.68 (40.29)			
FEV ₁ ^h	E		1.15 (0.35)	1.47 (0.46)	1.49 (0.43)	7.622 (0.007)	17.714 (<0.0001)	7.381 (0.001)
	C		1.11 (0.34)	1.17 (0.30)	1.19 (0.28)			
FEV ₁ /FVC ⁱ	E		95.09 (7.53)	97.12 (4.09)	97.17 (3.70)	0.220 (0.882)	1.594 (0.208)	0.960 (0.386)
	C		96.43 (5.18)	96.79 (2.79)	96.52 (2.66)			
Asthma symptoms								
Sleep problem	E		0.85 (0.66)	0.09 (0.29)	0.12 (0.33)	24.443 (<0.0001)	48.923 (<0.000)	1.142 (0.322)
	C		1.10 (0.40)	0.52 (0.51)	0.58 (0.50)			
Cough	E		1.65 (0.65)	0.62 (0.55)	0.35 (0.49)	34.518 (<0.0001)	56.529 (<0.0001)	5.555 (0.005)
	C		1.94 (0.57)	1.35 (0.82)	1.29 (0.64)			
Wheeze	E		0.65 (0.59)	0.12 (0.33)	0.09 (0.29)	0.180 (0.673)	15.241 (<0.0001)	5.902 (0.004)
	C		0.42 (0.50)	0.32 (0.60)	0.23 (0.50)			
Activity	E		1.35 (1.04)	0.500 (0.66)	0.35 (0.49)	3.465 (0.067)	22.861 (<0.0001)	4.141 (0.018)
	C		1.29 (0.82)	1.00 (0.86)	0.77 (0.76)			

^a E: Experimental group; C: Comparison group.^b Measured at the first time recruiting on the asthma clinic.^c Measured after three-month of the family empowerment intervention.^d F_b : the F value of between groups comparisons.^e F_w : the F value of within pretest, posttest, and 1 year follow-up.^f F_{in} : the F value of the interaction of between groups and within pretest, posttest, and 1 year follow-up.^g PEF: children's maximum speed of expiration, as measured with a peak flow metre.^h FEV₁: forced expiratory volume in first second.ⁱ FEV₁/FVC: the ratio represents the proportion of a person's vital capacity that they are able to expire in the first second of forced expiration.

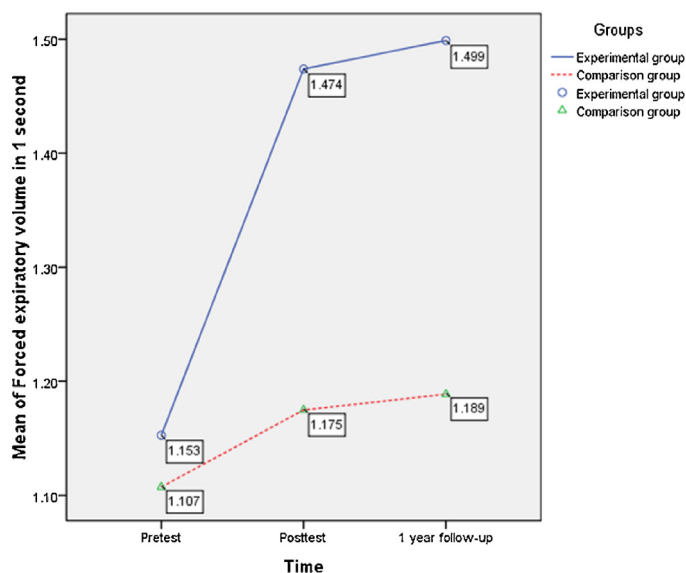


Fig. 4. The comparison of the changes of forced expiratory volume in 1 s between groups.

et al., 2014). The AFEP could empower parents to address problems while they take care for their asthmatic children and let themselves reflect and take action to improve their children's health. However, the AFEP only increased the cohesion and expression, and reduced the conflict in the "Relationship" dimension of family function and increased independence in the "Personal Growth" dimension, but not in the "System Maintenance" dimension. Although the family empowerment in this study was based on a family system approach that treated the family as a system (Cervenka et al., 1996), we assessed family perceptions and coping abilities related to asthma management, encouraging the expression of feelings and concerns, and educating the child and family about the asthma and condition management; furthermore, we supported positive coping behaviours and secured resources to help families manage their child's condition (Kurnat and Moore, 1999). The intervention of AFEP emphasized the potential problems of asthma management in the context of family life, and some of the other problems about family organization and control were not involved. Therefore, the results only increased the relationship in the family function dimension and empowered them to be more independent.

Freire emphasized the oppressed group's active participation and the need for them to take full control of their lives (Rudd and Comings, 1994). He believed personal freedom and development of the individual should occur through a supported interaction with others through the process of engaging in dialogue and in problem-posing education (Freire, 1994). The family members in the experimental group were encouraged by empowering them to actively engage in the dialogue process of the program through self-identity change, and reflecting and solving their problems. The results are consistent with the previous empowerment program on improving parents' self-reliance (Cameron and Cadell, 1999; Cervenka et al.,

1996; Eo, 2005), reducing youth suicide risk (Toumbourou and Gregg, 2002), and improving children's health (Adolfsson et al., 2004; Kmita et al., 2002; Wilton and Plane, 2006), as well as promoting breast feeding (Kang et al., 2008). In our study, we not only empowered the primary family caregivers but also involved the whole family. All of the problems and solutions were encouraged by dialogues, discussions, and reflections and take action with the decision of the whole family.

6.1. Limitation

The limitations of this study include the following: (1) The four time intervention program, which took more time and was difficult to prevent drop-outs at the one-year follow-up. (2) Building trust with the enrolled families for long-term evaluation was thought to be important for data collection. Hence, the nursing researcher collecting data and providing the intervention was not blinded. The questionnaires were self-reported by the primary family caregivers and we did not find any specific patterns influencing their answers. Despite these, we cannot completely rule out personal bias. (3) The parental stress and family function were only collected from primary family caregivers, and not the whole family.

6.2. Future research

It is important that further rigorous studies be performed and control for personal bias between the two groups by using blinding strategies. Family stress might accumulate, and therefore it is important to collect stress measures on all family members, and not just one parent. The other indicators of parents' health status and child–parent relationships could be considered in the further study designs.

7. Conclusion

Childhood asthma is a condition that affects families, as they must manage a child with a complicated illness, which may lead to increased parental stress and impaired family function. The Asthma Family Empowerment Program (AFEP) is needed to develop and implement empowering strategies for families to care a child with chronic asthma. Resolving the impact of asthma on parental stress and enabling family function could improve children's pulmonary function and decrease their asthmatic signs/symptoms after one-year of follow-up. The Asthma Family Empowerment Program (AFEP) was designed to initiate problem solving abilities for families while they have the conflicts or difficulties in caring for children with chronic asthma. With the extension of time, we believe the abilities of family to manage asthma and improve functioning will continually increase. The paediatric nurse could provide the self-management intervention through empowering discussion, reflection and take action inside families to accomplish the nursing contribution in chronic disease management through the family-centred nursing intervention.

8. Implication for practice and policy

A child with a chronic illness affects the whole family. The asthma self-management intervention for children with asthma is a regularly provided service in current asthma clinics. Paediatric nurses can provide the intervention series to families and empower them by having them listen, dialogue, reflect on, and act out their problem solving ideas while making regular clinic visits. Continuing education and service training programs for paediatric nurses to improve their competency on empowering families should be performed as needed.

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