OPEN ACCESS

Advanced Natural Sciences: Life and Health Sciences,
ISSN: 3107-636X, Vol-2, Issue-1, June-2025, PP-33-41
https://indjournals.com/index.php

Original Research

A Comparative analysis of impacts of trained Family engagement and asthma outcomes in elderly asthmatic patients aged over 60

[1]Rubina Rashid, [1]Nazmin Chowdhary and [2]*Nazia Rizvi

[1]Department of Physiology, Medical College For Women and Hospital, Uttara Model Town, Uttara, Dhaka, Bangladesh
[2]Dept. of Pharmacology, East West Medical College & Hospital, Dhour, Nishat Nagar, Uttara, Dhaka, Bangladesh

Article Info:
Correspondence:
[2]Dept. of Pharmacology, East West Medical College & Hospital, Dhour,
Nishat Nagar, Uttara, Dhaka, Bangladesh
*nrizvipharma99@gmail.com

[Received 29-04-2025,
Accepted 26-06-2025,
Published 30-06-2025]

Publisher's Note: Natural Science Association stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract:

The primary objective of this study was to assess the level of familial support received by individuals with asthma, to provide educational training to their families, and to compare asthma control before and after this intervention. A cross-sectional design was employed for the study, with data collected from seven randomly selected community health centers. From these centers, seventeen rural households were chosen at random, and one asthmatic patient from each was enrolled. Demographic information of the participants is presented in Table 1. The average age of the sample was 63.2 years. The majority were male (12 participants; 70.58%) and unmarried (16 participants; 94.11%). Regarding education, 70.58% had attained education up to the primary level. In terms of income, 58.82% reported earning less than 12,000 BDT monthly, while 41.17% earned more. Employment status revealed that 52.94% were employed in various sectors, whereas 47.08% were either unemployed or retired.

Before the training intervention, perceived levels of family support were categorized as "some support" in 41.17% of cases and "strong support" in 35.29%. Following the training of family members, asthma severity was reassessed using the Asthma Control Score (ACS). Post-training results indicated an improvement in asthma control, with an increase in the number of patients classified under the "well-controlled" category and a corresponding reduction in those with "partially controlled" or "poorly controlled" asthma. These findings suggest that family education and involvement can play a significant role in enhancing asthma management outcomes.

Keywords: Perceived family support, control of asthma, Family engagement, elderly patients, Asthma Clinical Severity Score (ACS).

Cite this article: Rubina Rashid, Nazmin Chowdhary and Nazia Rizvi, 2025. A Comparative analysis of impacts of trained Family engagement and asthma outcomes in elderly asthmatic patients aged over 60, Advanced Natural Sciences: Life and Health Sciences, ISSN: 3107-636X, Vol-2, Issue-1, June-2025, PP 33-41, https://indjournals.com/index.php

Introduction

Asthma remains a persistent global health concern, affecting approximately 6.5 million children and their families annually, significantly impairing quality of life. Effective asthma management is crucial to reducing the frequency and severity of symptoms; however, varying environmental and individual triggers often result in unpredictable and distressing exacerbations for patients and caregivers. Despite advances in therapeutic strategies, recent research highlights that asthma management continues to fall short of optimal standards [1].

Asthma is characterized by inflammation and narrowing of the bronchial airways, accompanied by excessive mucus production, leading to respiratory difficulties such as wheezing, coughing, and shortness of breath [2]. It affects an estimated 339 million individuals worldwide and is responsible for approximately 1,000 deaths per day [3]. While it is a global issue, the disease burden is disproportionately higher in low- and middle-income countries [4]. According to the Asthma Association of Bangladesh (AAB), nearly 7 million individuals are currently affected by asthma within the country. Notably, the prevalence of asthma varies significantly across different geographic regions [5].

The present study aimed to assess the role of family support, implement a training intervention for family members, and evaluate the change in asthma control among patients before and after the intervention.

Asthma in the Elderly Population

In clinical contexts, individuals aged 65 and above are classified as older adults, and within this demographic, asthma affects over 10% of the population [6,7]. Typical symptoms include wheezing, chronic cough, and shortness of breath, often accompanied by fluctuating airflow limitation. The pathophysiology of asthma in older adults involves airway inflammation and remodeling, including thickening of the basement membrane and smooth muscle hypertrophy. Studies using induced sputum analysis suggest that eosinophilic inflammation is predominant in most asthma cases; however, in older adults, neutrophilic inflammation is more frequently observed [8].

A key diagnostic challenge lies in distinguishing asthma from chronic obstructive pulmonary disease (COPD), especially in elderly patients with a history of smoking. COPD is defined by partially reversible airflow obstruction and neutrophilic inflammation, contributing to diagnostic ambiguity and confusion in therapeutic decisions [9,10].

Asthma in older adults is often classified based on the age of onset: **early-onset asthma** persists into old age, while **late-onset asthma** begins after the age of 65. The latter is typically more severe, with increased symptom persistence and greater reliance on corticosteroids [11]. Furthermore, elderly individuals often face challenges in accessing healthcare services due to limited financial resources, physical frailty, and psychological barriers, such as feeling undeserving of emergency care [12–14]. These factors cumulatively contribute to reduced healthcare utilization and suboptimal disease management.

Role of Family and Caregiver Support

Caregivers—most often family members—play a vital role in the daily care, medication adherence, and emotional support of asthma patients. These caregivers frequently experience psychological burdens such as guilt, stress, or perceived failure in providing timely care [17]. Family empowerment, defined as the process of enabling families to gain control and confidence in managing health conditions, has been recognized as a key element in chronic disease management, including asthma [18].

Empowerment strategies typically involve training family members in the use of inhalers, respiratory support devices, and management of nutrition and physical activity, especially in pediatric asthma cases. Research suggests that

while patient age and gender may not significantly influence caregiver burden, the educational level of caregivers can have an impact [19,20].

Caregiver burden is commonly understood in two dimensions:

- **Objective burden** refers to tangible challenges such as disruptions to daily routines, social life, and occupational commitments, as well as physical health consequences [21].
- **Subjective burden**, on the other hand, encompasses the emotional and psychological stress experienced by caregivers [22].

Though several interventions have successfully reduced caregiver burden, psychoeducational programs are still not routinely integrated into asthma treatment protocols [23–26].

The overall **quality of life** for caregivers is strongly influenced by their perceived well-being across physical, emotional, social, and economic dimensions [27]. Low quality of life among caregivers is associated with increased rates of anxiety, depression, social isolation, and even physical pain [28–32].

Study Hypothesis

This study hypothesizes that older patients' perceptions of trained family support would positively correlate with improved asthma outcomes, contributing to better symptom control and reduced disease burden.

Methods

Study Design

A cross-sectional study was conducted between March and April 2022 at the Medical College for Women and Hospital, located in Uttara Model Town, Dhaka, Bangladesh. The study adhered strictly to the ethical guidelines laid out by the national and institutional review boards concerning research involving human subjects. All procedures conformed to the ethical principles outlined in the Declaration of Helsinki (1975), including its subsequent amendments in 2008. Ethical clearance for the study was granted by the Institutional Ethics Committee, and informed written consent was obtained from all participating individuals.

For sampling, five villages located in the peri-urban areas surrounding Dhaka city were purposively selected. The **Primary Sampling Unit (PSU)** was defined as the village in rural regions and the municipality area in urban regions. Data collection was carried out in seven randomly selected community centers, from which 17 rural households were chosen through simple random sampling. One asthmatic patient was identified and recruited from each household based on the inclusion criteria. Eligible participants were those diagnosed with active asthma—defined as having experienced symptoms or received medication for asthma within the preceding year—and registered at a tertiary referral asthma clinic.

Each household was estimated to accommodate between two and six members. All asthmatic individuals from the selected homes were included in the study sample. However, individuals with diagnosed mental health disorders or chronic illnesses other than asthma were excluded from participation to avoid confounding variables.

Family members of the asthma patients underwent a structured training program focusing on enhancing caregiving practices. The training covered several key areas, including:

- Providing emotional and moral support
- Ensuring timely administration of medication
- Encouraging regular health checkups
- Spending quality time with the patient
- Avoiding blame or verbal abuse
- Supplying oxygen support when required
- Offering meals on time
- Involving patients in family functions and social activities

This intervention aimed to strengthen family-based care and improve asthma management outcomes through informed and empathetic support.

Data collection:

Data were collected through a structured questionnaire designed to gather personal and socio-demographic information, along with perceived levels of family support. A team of three pulmonologists visited each selected household and conducted face-to-face interviews with housewives or other available adult family members. Every household member's relevant information was systematically documented. Only individuals aged 60 years and above were included in the study; those under 60 were excluded to maintain consistency in the elderly population sample.

The questionnaire captured variables such as age, marital status, educational background, occupation, and economic status. Family support was assessed using the objective support subscale of the **Social Support Rating Scale (Chinese version)** [33]. This instrument evaluates the extent of support received from key family members, including spouses, parents, in-laws, siblings, children, and other relatives. Responses were recorded on a 4-point Likert scale, where 1 indicated "no support," and 4 indicated "strong support/care" [34].

Family Training and Follow-up

The patients' families received structured training conducted by pulmonologists, focusing on asthma management strategies, the importance of medication adherence, use of assistive devices, and emotional support. The intervention aimed to enhance the family's capacity to support the asthma patient effectively. Families were followed up weekly over a four-week period to monitor changes and ensure adherence to the training protocol.

Asthma control was evaluated using the **Asthma Clinical Severity (ACS) Score**, as proposed by Juniper et al. This tool was utilized to assess the severity of asthma both before and after the family support intervention. A comparative analysis of ACS scores was presented in Table 3, highlighting changes following the training.

Statistical Analysis

Prevalence estimates for asthma and levels of perceived family support were calculated with exact binomial 95% confidence intervals. Data analysis was performed using **SPSS software, version 17.0** (SPSS Inc., Chicago, IL, USA). All statistical tests were conducted using a two-tailed approach, with **p-values < 0.05** considered statistically significant.

Results

The socio-demographic profile of the study participants is presented in **Table 1**. The respondents had an average age of **63.2 years**. A majority of the participants were male (**n = 12; 70.58%**) and **unmarried (n = 16; 94.11%)**. In terms of educational background, **70.58%** had received education up to the primary level. Regarding monthly income, **58.82%** (n = 10) earned less than **12,000 BDT**, while **41.17%** (n = 7) reported earning more than **12,000 BDT** per month.

In terms of employment status, **52.94%** (n = 9) of participants were engaged in various occupations, whereas **47.08%** (n = 8) were either unemployed or retired. The level of perceived family support was assessed prior to the training intervention: **41.17%** (n = 7) reported receiving moderate support, while **35.29%** (n = 6) reported receiving strong support from their families.

Table1: The socio-demographic characteristics of the participants.

Variables	n =17	(%)	P Value
Age (mean ± SD, yr)	63.2		0.031
Gender			0.001
Male	12	70.58	
Female	5	29.41	
Marital status			0.07
married	16	94.11	
Single, separated, divorced or widowed	1	5.88	

Educational level			0.001
Primary	12	70.58	
Secondary	4	23.52	
Graduation	1	5.88	
Monthly household income (BDT)			0.017
<12000	10	58.82	
≥12000	7	41.17	
Occupation status			0.003
Employed	9	52.94	
Non-employed	8	47.08	
Perceived family support level			0.001
Rare	2	11.76	
Some	7	41.17	
Strong	6	35.29	
none	1	5.88	

Table2: Questionnaire response from asthma patient regarding the family support before training to family members.

Questions/Response n=17	Rare (%)	Some (%)	Strong (%)	None (%)
Family support Morally	3 (17.64%)	4 (23.52%)	9 (52.94%)	1 (5.88%)
Timely medicine	4 (23.52%)	5 (29.41%)	6 (35.29%)	2 (11.76%)
Health Checkups	12 (70.58%)	1 (5.88%)	1 (5.88%)	3 (17.64%)
Time spending	6 (35.29%)	5 (29.41%)	2 (11.76%)	4 (23.52%)
Motivate	5 (29.41%)	6 (35.29%)	4 (23.52%)	2 (11.16%)
Blaming	2 (11.76%)	4 (23.52%)	2 (11.76%)	9 (52.94%)
Harassment	3 (17.64%)	5 (29.41%)	1 (5.88%)	8 (47.05%)
Provide Oxygen Support timely	3 (17.64%)	3 (17.64%)	8 (47.05%)	3 (17.64%)
Timely offer meal	4 (23.52%)	8 (47.05%)	5 (29.41%)	0 (%)
Involve in family function	8 (47.05%)	2 (11.76%)	2 (11.76%)	5 (29.41%)
Total	50	43	40	37

Table3: Questionnaire response from asthma patient regarding the family support before training to family members.

Questions/Response n=17	Rare (%)	Some (%)	Strong (%)	None (%)
Family support Morally	0	1 (5.88%)	16 (94.11%)	0
Timely medicine	2 (11.76%)	3 (17.64%)	12 (70.58%)	0
Health Checkups	5 (29.41%)	2 (11.76%)	10 (58.82%)	0
Time spending	1 (5.88%)	6 (35.29%)	10 (58.82%)	0
Motivate	1 (5.88%)	3 (17.64%)	13 (76.47%)	0
Blaming	0	0	1 (5.88%)	15 (88.23%)
Harassment	1 (5.88%)	0	0	14 (82.35%)
Provide Oxygen Support timely	0	0	17 (100%)	0
Timely offer meal	0	1 (5.88%)	15 (88.23%)	1 (5.88%)
Involve in family function	2 (11.76%)	3 (17.64%)	11 (64.70%)	1 (5.88%)

A structured questionnaire was employed to evaluate the perceived family support among asthma patients prior to and following the training provided to family members. The findings revealed a substantial improvement in various aspects of familial involvement in patient care.

Prior to the training, only **9 patients (52.94%)** reported receiving strong emotional and caregiving support from their families, which significantly increased to **16 patients (94.11%)** after training. In terms of medication adherence, **6 participants (35.29%)** reported receiving timely medicines before

training, which rose to **12 (70.58%)** following the intervention. The frequency of health check-ups arranged by family members improved markedly from **1 patient (5.88%)** to **10 patients (58.82%)** after training. Similarly, the amount of time family members spent with patients increased from **2 (11.76%)** before training to **10 (58.82%)** afterward.

Notably, the incidence of **blaming behavior** significantly decreased, with **15 patients (88.23%)** reporting no such experiences after training compared to **9 (52.94%)** beforehand. Likewise, **harassment by family members** reduced substantially—from **8 cases (47.05%)** before training to just **3 cases (17.65%)** post-training, with **14 patients (82.35%)** reporting no harassment after the intervention.

At each follow-up visit, the patients' asthma status was classified into three categories—**well controlled**, **partially controlled**, or **poorly controlled**—based on the **Asthma Clinical Severity Score (ACS)**. The training intervention was correlated with notable improvements in clinical outcomes, as evidenced by a shift toward the "well controlled" category post-intervention.

Table 4: Asthma Control as per Asthma Clinical Severity Score (ACS).

Status	Pre-Training N (%)	Post-Training N (%)	P Value
Well-controlled	7 (41.17%)	10 (58.82%)	0.001
Partially-controlled	4 (23.52%)	7 (41.17%)	
Poorly-controlled	6 (35.29%)	0 (0%)	

The current study aimed to evaluate the role of family support in the management of asthma among older adults, particularly before and after targeted family training. The results demonstrated a noticeable improvement in asthma control, as measured by the Asthma Clinical Severity (ACS) score, following the intervention. Specifically, the proportion of patients classified under the "well-controlled" category increased, while those in "partially controlled" and "poorly controlled" categories decreased post-training. These findings highlight the pivotal role of family engagement in the management of chronic respiratory conditions in the elderly.

In Bangladesh, and in many other low- and middle-income countries, structured family education programs for chronic disease management, such as asthma, are not routinely implemented. The outcomes of this study underscore the necessity of such programs. Family involvement significantly influences the quality of care, with improved medication adherence, timely healthcare-seeking behavior, and enhanced psychological support contributing to better disease outcomes.

Our findings align with those of Espinoza-Palma et al. [35], who reported that asthma education, even without a formal self-management plan, can reduce exacerbations, emergency department visits, and hospital admissions. Moreover, the benefits of family-centered interventions are well-documented across other chronic diseases such as diabetes [36], cystic fibrosis [37], and HIV [38], where familial participation has led to improved treatment adherence and health outcomes. In the context of elderly asthma patients, who often underreport symptoms or delay care due to social or physical limitations, family empowerment emerges as a critical component of effective disease management.

Conclusion

Asthma in the elderly poses a considerable public health burden due to its association with increased morbidity and mortality. This study contributes to the growing body of evidence emphasizing the importance of family support

in the management of asthma among individuals aged 60 years and above. Our findings suggest that training family members can substantially enhance asthma control by fostering a more supportive and proactive home environment.

However, the limited sample size restricts the generalizability of these findings. Larger, population-based studies are warranted to validate and expand upon these results. Additionally, future research should explore specific risk factors and protective mechanisms associated with asthma development and progression in Bangladesh's aging population.

The evidence presented advocates for the restructuring of chronic disease care models to include systematic family education and involvement. Developing and integrating family support programs into routine asthma management protocols may serve as a cost-effective and impactful strategy for improving outcomes in elderly asthma patients. Further longitudinal studies are recommended to assess the long-term benefits of such interventions.

Acknowledge: Authors acknowledge the participants of this study.

Ethical statement

The authors affirm that all procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki Declaration, as revised in 2008. Ethical approval for the study was granted by the Ethics Committee of the Medical College for Women and Hospital, Uttara, Dhaka, Bangladesh. Informed written consent was obtained from all participants prior to data collection, ensuring their voluntary participation and confidentiality throughout the research process.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding: Authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

References

1. FitzGerald JM, Boulet LP, McIvor RA, Zimmerman S, Chapman KR. Asthma control in Canada remains suboptimal: the Reality of Asthma Control (TRAC) study. Can Respir J 2006;13(5):253-9.
2. Rodrigo, G.J., Rodrigo, C. and Hall, J.G. 2009. Acute asthma in adults: a review. Chest. 125, 1081-1102.
3. The Global Asthma Report. 2018. The article was retrieved from http://www.globalasthmareport.org/
4. Cruz, Á.A., Stelmach, R. and Ponte, E.V. 2017. Asthma prevalence and severity in low-resource communities. Curr. Opin. Immunol. 17, 188-193.
5. Zaman, K., Takeuch H., Yunus M., Arifeen S.E., Chowdhury H.R., Baqui A.H. and Iwata S.W.T. 2007. Asthma in rural Bangladeshi children. Indian J. Pediatr. 74, 539-43.
6. Australian Centre for Asthma Monitoring (ACAM) Available from: www.asthmamonitoring.org.
7. Akinbami LJ, Moorman JE, Liu X. Asthma prevalence, health care use, and mortality United States, 2005-2009. Hyattsville: National Center for Health Statistics; 2011. National Health Statistics Reports, No 32.
8. Thomas RA, Green RH, Brightling CE, Birring SS, Parker D, Wardlaw AJ, Pavord ID. The influence of age on induced sputum differential cell counts in normal subjects. Chest. 2004;126:1811–1814.
9. Gibson PG, McDonald VM, Marks GB. Asthma in older adults. Lancet. 2010;376:803–813.

10. Enright P. The diagnosis of asthma in older patients. Exp Lung Res. 2005;31(Suppl 1):15–21.
11. Quadrelli SA, Roncoroni AJ. Is asthma in the elderly really different? Respiration. 1998;65:347–353.
12. Goeman DP, O'Hehir RE, Jenkins C, Scharf SL, Douglass JA. 'You have to learn to live with it': a qualitative and quantitative study of older people with asthma. Clin Respir J. 2007;1:99–105.
13. Goeman DP, Douglass JA. Understanding asthma in older Australians: a qualitative approach. Med J Aust. 2005;183:S26–S27.
14. Aroni R, Goeman D, Stewart K, Thien F, Sawyer S, Abramson M, Douglass J. Enhancing validity: what counts as an asthma attack? J Asthma. 2004;41:729–737.
15. Dean BB, Calimlim BM, Kindermann SL, Khandker RK, Tinkelman D. The impact of uncontrolled asthma on absenteeism and health-related quality of life. J Asthma 2009;46(9):861-6.
16. Mola E, De Bonis JA, Giancane R. Integrating patient empowerment as an essential characteristic of the discipline of general practice/family medicine. Eur J Gen Pract 2008;14(2):89-94
17. McCann TV, Luban DI, Clark E. First time primary caregivers' experience from young adults with first episode psychosis. Schizophr Bull. 2011;37(2):381–388.
18. Payrovee Z, Kashaninia Z, Alireza Mahdaviani S, Rezasoltani P. Effect of Family Empowerment on the Quality of life of School-Aged Children with Asthma. Tanaffos 2014;13(1):35-42.
19. Mueser KT, Webb C, Pfeiffer M. Family burden of schizophrenia and bipolar disorders: perceptions of relatives and professionals. *Psychiatr Serv*. 1996;47:507–511.
20. Wolthaus JE, Dingemans PM, Schene AH, et al. Caregiver burden in recent-onset schizophrenia and spectrum disorders: the influence of symptoms and personality traits. *J Nerv Ment Dis*. 2002;190:241–247.
21. Colina A. Los cuidados no formales en el contexto de la salud mental comunitaria. En: Estigma, necesidades y cuidados no formales en personas con trastornos picóticos de larga evolución. Ponencia en el II Congreso Virtual de Psiquiatría, 2001.
22. Leal M, Sales R, Ibáñez E, Giner J, Leal C. Valoración de la sobrecarga en cuidadores informales de pacientes con esquizofrenia antes y después de un programa psicoeducativo. *Actas Esp Psiquiatr*. 2008;36(2):63–69.
23. Berglund N, Vahlne J, Edman A. Family intervention in schizophrenia. Impact on family burden and attitude. *Soc Psychiatry Psychiatr Epidemiol*. 2003;38:116–121.
24. Riley G, Gregory N, Bellinger J, Davies N, Mabbott G, Sabourin R. Carer's education groups for relatives with a first episode of psychosis: an evaluation of an eight-week education group. *Early Interv Psychiatry*. 2011;5(1):57–63.
25. Chan SW, Yip B, Tso S, Cheng BS, Tam W. Evaluation of a psychoeducation program for Chinese clients with schizophrenia and their family caregivers. *Patient Educ Couns*. 2009;75(1):67–76.
26. Koolaee AK, Etemadi A. The outcome of family interventions for the mothers of schizophrenia patients in Iran. *Int J Soc Psychiatry*. 2010;56(6):634–646.
27. Caqueo A, Urzúa A. Calidad de vida: una revisión teórica del concepto. *Revista Terapia Psicológica*. 2002;30(1):61–71.
28. Harvey K, Burns T. Relatives of patients with severe mental disorders: unique traits and experiences of primary, nonprimary, and lone caregivers. *Am J Orthopsychiatry*. 2003;73(3):324–333.
29. Argimon JM, Limon E, Vila J, Cabezas C. Health-related quality of life in carers of patients with dementia. *Fam Pract*. 2004;21(4):454–457.
30. Caqueo-Urizar A, Gutierrez-Maldonado J, Miranda-Castillo C. Quality of life in

caregivers of patients with schizophrenia: a literature review. *Health Qual Life Outcomes*. 2009;7:84.
31. Foldemo A, Gullberg M, Ek AC, Bogren L. Quality of life and burden in parents of outpatients with schizophrenia. *Soc Psychiatry Psychiatr Epidemiol*. 2005;40(2):133–138.
32. Osman CB, Alipah B, Tutiiryani MD, Ainsah O. Depressive disorders and family functioning among the caregivers of patients with schizophrenia. *East Asian Arch Psychiatry*. 2010;20(3):101–108.
33. Wang XD, MaH. Social Support Rating Scale. Beijing: Chinese Mental Health Publishing House, 1999
34. Xie RH, Yang J, Liao S, Xie H, Walker M, Wen SW. Prenatal family support, postnatal family support and postpartum depression. Aust N Z J Obstet Gynaecol 2010; 50: 340-345 [PMID: 20716261 DOI: 10.1111/j.1479-828X.2010.01185.x]
35. Espinoza-Palma T, Zamorano A, Arancibia F, Bustos MF, Silva MJ, Cardenas C, et al. Effectiveness of asthma education with and without a self-management plan in hospitalized children. J Asthma 2009;46(9):906-10.
36. Wysocki T, Harris MA, Buckloh LM, et al. Effects of behavioral family systems therapy for diabetes on adolescents' family relationships, treatment adherence, and metabolic control. J Pediatr Psychol 2006;31:928–938. [PubMed: 16401678]
37. Stark LJ, Quittner AL, Powers SW, et al. Randomized clinical trial of behavioral intervention and nutrition education to improve caloric intake and weight in children with cystic fibrosis. Arch Pediatr Adolesc Med 2009;163:915–921. [PubMed: 19805710]
38. Ellis DA, Naar-King S, Cunningham PB, Secord E. Use of multisystemic therapy to improve antiretroviral adherence and health outcomes in HIV-infected pediatric patients: Evaluation of a pilot program. AIDS Patient Care STDS 2006;20:112–121. [PubMed: 16475892]
39. Yeh HY, Ma WF, Huang JL, et al. Evaluating the effectiveness of a family empowerment program on family function and pulmonary function of children with asthma: A randomized control trial. International Journal of Nursing Studies. 2016;60:133-144
40. Dardouri M, Sahli J, Ajmi T, et al. Effect of family empowerment education on pulmonary function and quality of life of children with asthma and their parents in Tunisia: A randomized controlled trial. Journal of Pediatric Nursing. 2020;54:e9-e16