

# Successful Management of a Boy with Mild Persistent Asthma (A Longitudinal Case)

Lubis A., Setiawati L., Setyoningrum A. R., Suryawan A., Irwanto

**Abstract**—Asthma is a condition that causing chronic health problems in children. In addition to basic therapy against disease, we must try to reduce the impact of chronic health problems and also optimize their medical aspect of growth and development. A boy with mild asthma attack frequent episode did not showed any improvement with medical treatment and his asthma control test was 11. From radiologic examination he got hyperaerated lung and billateral sinusitis maxillaris; skin test results were house dust, food and pet allergy; an overweight body; bad school grades; psychological and environmental problem. We followed and evaluated this boy in 6 months, treated holistically. Even we could not do much on environmental but no more psychological and school problems, his on a good bodyweight and his asthma control test was 22. A case of a child with mild asthma attack frequent episode was reported. Asthma clinical course show no significant improvement when other predisposing factor is not well-controlled and a child's growth and development may be affected. Improving condition of the patient can be created with the help of loving and caring way of nurturing from the parents and supportive peer group. Therefore, continuous and consistent monitoring is required because prognosis of asthma is generally good when regularly and properly controlled.

**Keywords**—Asthma, chronic health problems, growth and development.

## I. INTRODUCTION

**A**STHMA is a chronic respiratory disease that is most often found. The prevalence of asthma in the world is estimated to 7.2% (10% of children and 6% of adults) [1] and these prevalence variate between countries [2], in India from 15 epidemiological studies showed that the mean prevalence of asthma among children was 7.24% [3]. These diseases have a negative impact, especially on children, making frequently absent from school and limit various activities as well as activities the whole family [1], [4], [5].

Asthma in children gives a lot of problems in the quality of life, due to the limitations of activity. So quality of life assessments consisting of essential elements such as physical, psychological, and social functioning is needed [4]-[6].

The goal of asthma management is to ensure the achievement of optimal development of the child, so they can perform various activities. Symptomatic treatment often fails to decrease morbidity and mortality significantly. So apart from the basic therapies against the disease, it is important to reduce the impact of chronic health conditions and optimize

the development of children in physical development, cognitive, and psychosocial [1], [4], [5], [7].

## II. CASE REPORT

A 12 years old boy came with difficulty of breathing, wheezing especially at night time recently for 2 years and worsened in the past 3 months. The assessment was mild asthma attack with frequent episode and his asthma control test was 11. Cough was usually triggered when the weather was cold, worsened by activity and when he was exposed in a dusty environment. Psychological issue might play a role in the worsening cough (e.g. Taking exams at school, having dispute with parents) and recently reported that his grades in school was failing because he almost always was missing his classes. When he reached 8 years old there was recurrent and persistent cough at least once in every three months and improving with over-the-counter medication. At 9 years old the cough got heavier accompanied by wheezing, and improving with nebulization. All complaints were getting much worse that he required salbutamol inhalation therapy. He was overweight with % (ideal body weight) IBW was 125%. Chest x-ray showed hyperaerated lung.

TABLE I  
FIRST ASTHMA CONTROL TEST IN THIS PATIENT (SCORE: 20-25  
(CONTROLLED); 15-19 (UNCONTROLLED); <14 (POORLY UNCONTROLLED))  
[10]

Asthma Control Test		
Question 1	In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or at home?	Score
	All of time; Most of time; Some of time; A little of time; Not at all	2
Question 2	During the past 4 weeks, how often have you had shortness of breath?	3
	>1x/day; 1x/day; 3-6x/weeks; 1-2x/weeks; Not at all	
Question 3	During the past 4 weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?	2
	≥4x/weeks; 2-3x/weeks; 1x/weeks; 1-2x/month; Not at all	
Question 4	During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?	3
	≥3x/day; 1-2x/day; 2-3x/weeks; ≤1x/weeks; Not at all	
Question 5	How would you rate your asthma control during the past 4 weeks?	1
	Not controlled at all; Poorly controlled; Somewhat controlled; Well controlled; Completely controlled	
Total		11

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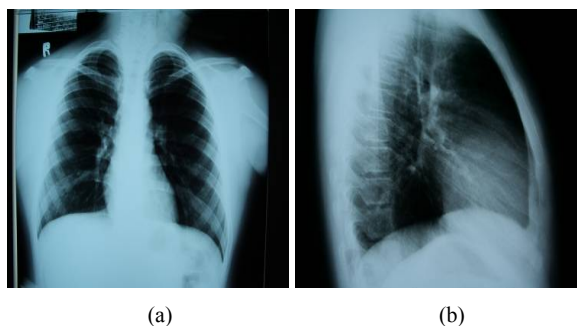


Fig. 1 Chest x-ray (a) and (b) showed hyperaerated lung

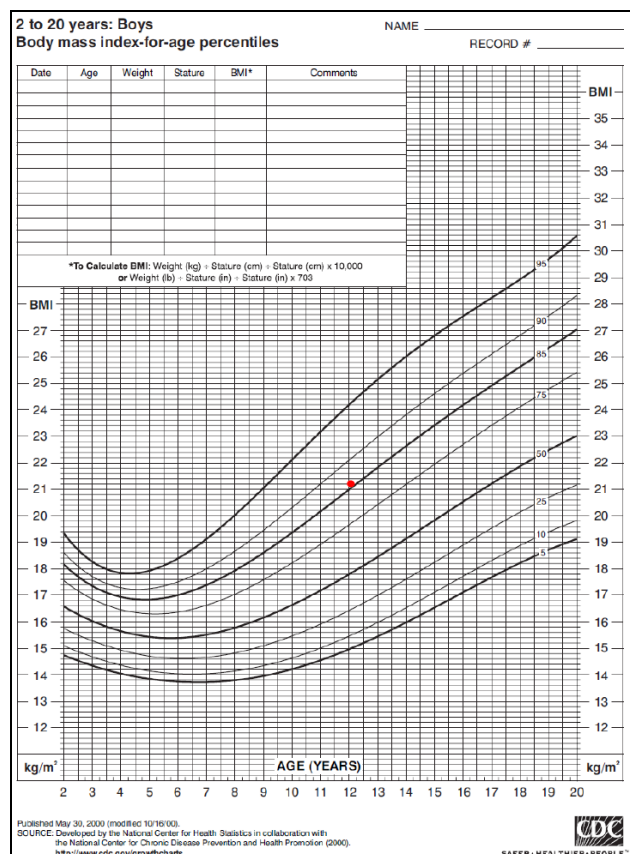


Fig. 2 Body Mass Index of the patient for the first time

So we consulted him to physiologic division and gave inhalation therapy (fluticasone and salmeterol). For his overweight we advised to commence life style and diet alteration and adjusted physical exercise that do not exert his asthma. We observed him for 6 month routinely and also did the home care.

The patient was taken care by his mother and she could accept his son condition with a chronic condition requiring long life treatment, regular hospital visit was controlled closely by her and she make every effort cleaning curtains, carpets, floor of the house dust, and replace the patient's bed with a foam mattress. Although this patient had difficulties when advised to work on strict elimination diet but he takes

medications regularly and feel anxious when the drug wears off. Even his father often work outside the town and was rarely spend time with him but he feels that he have received considerable attention, because his father always bought him a gift.

#### A. First Month Observations

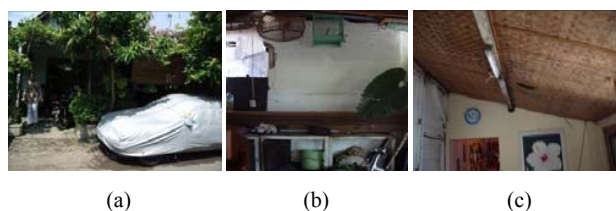
Based on psychology test, his IQ was 104 (average), with well developed subjective logical ability, well understanding on complicated matter and well ability to complete tasks. Emotionally, he had tendency on being anxious which led to low self esteem. Family and social peer support were essential. The psychologist advised him and the parents to make daily schedule activity, a commitment to be obeyed unless disregard for certain excuses with punishment when being disobeyed.

TABLE II  
PATIENT DAILY SCHEDULE ACTIVITY BETWEEN PATIENT AND PARENTS

Time	Monday – Saturday	Sunday
05.00-06.00	Subuh (morning prayer), cleaning his bedroom, take a shower, preparing for school, breakfast	Depend on family events
06.10	Go to school	
06.30-12.00	At school	
12.00-15.00	Go home, dhuhur (day prayer), lunch, take an afternoon nap.	
15.00-16.30	Take a shower, Ashar (afternoon prayer), play	
16.30-18.00	Doing homework, Maghrib (evening prayer)	
18.00-19.00	Play/relax, Isya (night prayer), dinner	
19.00-20.30	Study, preparing school for tomorrow	
20.30-21.00	Break time	
21.00	Bed time	

From home visit observation, we found a few data that his mother was 45-year-old, javanese, moslem, a housewife with last education was senior high school. His father was 48 years old, javanese, moslem, a contractor with last education was senior high school. Family average income is about 5 million rupiah/month. All health care payment for their children was solely provided by the father. His younger brother aged 7 years old was a first-grader in elementary school. He lived in a house with 4 people located near the river bank in Surabaya.

The patient house was 5 x 12 meter, tile-floored and some of the walls were built in bamboo. There were 2 bedrooms with 1 single bath room consisted of toilet. The kitchen was located in the back of the house near the river. Clean water was taken from the regional water source from the government. There were a lot of abandoned utensils in the backyard. Lighting was adequate however ventilation was merely well-built, and feel musty. There were piled up dusty book. Electronics were located in their small room consisting of television, radio, digital camera, refrigerator. They had one car, one bicycle and one motor cycle.

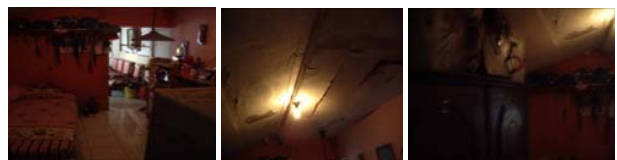




(d)

(e)

(f)



(g)

(h)

(i)

Fig. 4 (a) Front view of patient's house (b) Terrace house (c) The roof of the living room (d) Living room (e) Bathroom (f) Garden side of the house (g) Patient bedroom (h) The roof of patient bedroom (i) Stacks of goods at patient bedroom

The surrounding community was slightly dense and most of them were used for business. On the right of the house is a piece of glass workshop, on the front and left of the house is using for chicken abattoir, and behind the house is a river. Children who live in the area often play on the street as a means of playing is very limited in this area. This patient usually play with his friends from his neighborhood but his mother often minimizing his playing activity because she is afraid of his illness. They had a good relationship in the neighbourhood. The health care facility was primary health centre located 200 meter from their house.



(a)

(b)

(c)

(d)

Fig. 5 Home environment: (a) Chicken abattoir (b) Place for glass cutting and printing paper (c) The left of the house is also a live chicken abattoir (d) Back of the house directly adjacent with public water drainage

#### B. Third Month Observations

Based on Water's photo, he was assessed with bilateral maxillary sinusitis and given antibiotic (macrolide) for 2 weeks and physiotherapy commenced on (short wave diathermia) SWD for 2 weeks.



Fig. 6 Waters X-Ray: maxillary bilateral sinusitis

Allergic skin test revealed house dust mite, pet and food allergy. Symptomatic treatment, focused diet and environment education, and planned for immunotherapy. All was given in order to control and to improve his allergy-related symptoms. The patient had improvement on his condition, he had a good night sleep, cough and cold only twice in a month, but the result of asthma control test was 19 (uncontrolled).

#### C. Fifth Month Observations

Repeated water's photo still showed bilateral maxillary sinusitis, so we start the immunotherapy and repeated the SWD and give amoxicillin clavulanic acid as antibiotic.



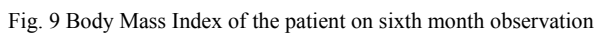
Fig. 7 Waters X-Ray: Bilateral maxillary sinusitis still persist

When we visited the patient at his house, the cough and cold decreased, about 1 or 2 times in a month, and he also had a good night sleep. Asthma score was 21 (controlled).

#### D. Sixth Month Observations

From home visit the patient felt much better; cough and cold only once in a month, no difficulty in breathing. His sinusitis was improved.

He had a good antropomethry with IBW 120%. Asthma scored 22 (controlled) and his allergic complaints improved significantly.



### III. DISCUSSION

Fig. 10 Normal height and weight curve CDC 2000

365



TABLE III  
ASTHMA TRIGGER FACTORS [7]

Common viral infections of the respiratory tract
Aeroallergens in sensitized asthmatics
Animal dander
Indoor allergens:
Dust mite
Chochroaches
Molds
Seasonal allergens:
Pollen (trees, grasses, weeds)
Seasonal molds
Environmental tobacco smokes
Air pollutants
Ozone
Sulfurdioxide
Particulate matter
Wood or coal burning smoke
Endotoxin, mycotoxin
Dust
Strong or noxious odor or fumes
Perfumes, hairsprays
Cleaning agents
Occupational exposures
Farm and barn exposures
Formaldehydes, cecar, paint fumes
Cold air, dry air
Crying, laughter, hyperventilation
Exercise
Co morbid conditions
Rhinitis
Sinusitis
Gastroesophageal reflux

Diagnosis constitutes of history taking, physical examination, rhinoscopy, translumination and radiological examination. Antibiotics given in minimum of 2 weeks time to eradicate infection along with other symptomatic medication. Diathermy is recommended to be commenced for 10 days while sinus irrigation should help to improved drainage and sinus cleansing when needed. Should conservative treatment fail then may consider proceeding with surgical intervention [11]-[14]. Proper sinusitis management may improve the severity of asthma. Asthma management should concern upper respiratory tract condition to bring good asthma control [10], [13]-[16]. In this case, patient had bilateral maxillary sinusitis and was given antibiotic amoxicillin clavulanic acid for 2 weeks and 2-weeks course of SWD. Condition improved after adding another course of antibiotic and another 2 weeks of SWD physiotherapy.

Bronchial asthma occurred due to hyperreactivity of the bronchus and allergen is one of the triggering factors [5]. Allergen may come from food ingestion or inhalant. Inhalant allergen divided in outdoor or indoor allergen [17], [18]. Main management is allergen avoidance and as for food allergy is advised to restrict diet (free from milk, egg, fish and nuts), replaced with hypoallergenic food [17], [19]. Immunotherapy gives best result for inhalant allergen and also for house dust mite, pollen, dermatophagoids allergy. While for fungi and animal fur the results remain controversial. Medication is given symptom-based [17], [18]. This patient diagnosed as house dust mite, pet, and food allergy. We gave restricted allergic diet and environment control, symptomatic based medication and planned for immunotherapy.

Obesity is one the risk factor to develop asthma due to decreasing ventilation function [20]-[22]. Increasing pro-inflammatory adipokines or decreasing anti-inflammatory adiponectine mechanism may contribute as the comorbid factors [22]-[24]. Obesity is also related to change in drug distribution, duration and interaction [23]. Fat tissue is one of the pro-inflammatory source for cytokine (interleukin-6, leptin, interleukin-18 and tumor necrotizing factor), and may be potential to develop lung inflammation [20], [24], [25]. Obesity causes abnormality in lung volume function and elasticity, causing increasing reactivity and persistent obstruction. Decreasing of fat tissue automatically will lower the risk for asthma [21], [25], [26]. In this patient with %IBW of 125% and BMI (body mass index) in the 85<sup>th</sup> percentile considered to be overweight. So we suggest him to change his lifestyle, consume more vegetables, and do some sport activity like swimming. When we visit the patient at his house he no longer overweighted with %IBW 120% and BMI between 75-85<sup>th</sup> percentile.

The development of child with chronic health condition more focused on affected organ then the others [4]. Physiologic response towards stress including corticotropin releasing factor (CRF) from the hypothalamus into the hypophyseal-pituitary portal system causing the releasing of glucocorticoid that will inhibit growth and reproduction [27]. Some researchers stated that pubertal disorder depends on asthma severity and it is a common belief that psychological problem, especially that occurs in pre-school time will cause delayed puberty [28], [29].

TABLE IV  
CORRELATION BETWEEN GROWTH AND PUBERTY STAGE IN MALE [31]

Stage	Pubic hair	Testis vol. (ml)	Growth velocity	Bone age (year)
1	None	<2	Pre puberty (5cm/year)	< 11
2	A few pigmen	<4	Pre puberty	12
3	Pigmen, spreading to mons pubic	4-10	Pre Puberty	13
4	Adult type and distribution, but not spreading to thigh	10-12	Maximal growth phase	14
5	Adult type, spreading to thigh	12-25	Growth phase decreasing	15-16
6	Adult type spreading to abdomen	12-25	Minimal growth phase	>17 = 99% maturity

When children reach puberty, they experience sex differentiation, reproductive organ change and the development of secondary sex character, body size and shape, muscular proportion, fat and bone and several physiological functions. Previous literature showed that puberty is characterized by the development of pubic hair, however recently it is showed by the testicular enlargement, prostate, and seminal vesicles or uterus and vagina. In males, it begins with the testicular enlargement [30]. Testicles in volume are measured using Prader orchidometer and then plotted in the testicular curves. Volume of 4 ml showed definitive enlargement in puberty and 12 ml of volume is the mature size for people in general [30], [31]. In this patient, the size of the

testicles was slightly under the 50th percentile which was considerably normal as it is consistent with the beginning size in male puberty.



Fig. 11 Testicular volume measurement curve in this patient.[30]

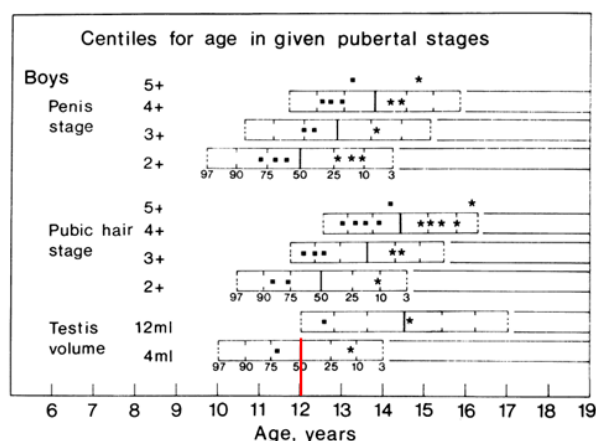


Fig. 12 Standard puberty for male. Normal in this patient [30]

Several studies showed that long term use of steroids in asthmatic patients may lower the growth and pubertal rate [32]-[35]. Steroid inhalation effect constituted into local effect (oral thrush) due to local immunosuppression and dysphonia (hoarseness) due to vocal cord myopathy [7], and the second would be the systemic effect that is generally caused by high dose steroid [7], [36]. The use of steroid inhaler may decrease physical growth should it reach systemic effect, by lung or gastrointestinal absorption. The amount of drug deposited in the lung and oropharynx will affect this condition. Drug absorption through lung is very minimal hence very rare to reach systemic effect, especially in asthmatic patient when the lung function is not at its best. However, the use of inhaler for asthmatic patient may cause decreasing in physical growth other than the disease itself. Steroid cessation should consider

the risk, benefit and the outcome [32], [34], [35]. Further studies are required to acknowledge the unknown and uncertain of steroid use [32], [33], [35].

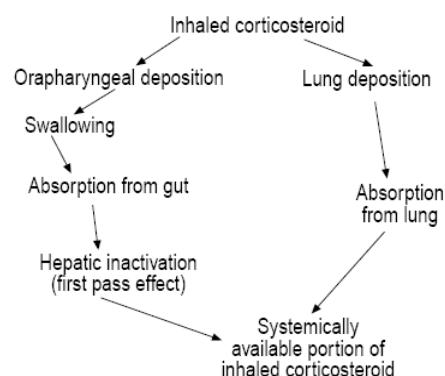


Fig. 13 Inhaled steroid pathway to systemic through gastrointestinal tract and lungs [32]

This patient received controller medication that has appropriate range of dose therefore minimizing the side effect of steroid. He became more confident and performed better in his daily activity. Mother had concerns regarding the long term use of steroid inhaler. They were all advised that every treatment has its own loss and benefit and that this treatment and medication were needed in order to reach the goal therapy.

TABLE V  
SYSTEMIC STEROID DRUG SIDE EFFECTS [1]

	Acute and chronic use	Chronic use
Metabolic	Hypopotasemia Diabetes mellitus Suppression of HPA axis	Hyperlipidemia Cushing syndrome Secondary amenorrhea Impotent
Cardiovascular	Hypertension Edema Exacerbation of heart failure	
Gastrointestinal	Peptic ulcer Esophagitis Pancreatitis	
Infection complication	Intestine perforation Susceptible to infection Reactivation of infection Dissemination of live vaccine	
Skin		Hirsutism Thinning of the skin and skin fragility
Central nervous system	Change of psychologic behaviour Seizure	
Musculoskeletal	Myopathy Aseptic necrosis	Osteoporotic Loss of muscle mass
Ocular	Glaucoma	Cataract

Emotional stress maybe one of the asthma trigger [7]. In chronic condition with its correlation to psychological and physical condition with the disease severity [37]. About 56% of asthmatic patient showed severe anxiety and 19% are depressive [38]-[40]. Stress activates immunity through several pathways, including cytokine release [27], [39], [40].

Asthmatic patients tend to be frustrated about themselves and there is a correlation between anxiety and children [39], [40]. Children with asthma have restricted activity depending on the disease severity such as limited sport and playing activity with pets and friends. In older children, the stress may come from the limitation of school and learning activity while younger children may deliver it through anger [39]-[41]. Psychological factor causes decreasing ability in problem solving, several activities, memory and attention. All cognitive function affects our ability in decision making and personal management affectivity. Focusing on phsycologic factor dan personal management for patient is necessary to increase their daily activity [38]-[40]. There are several factors that are related to and will affect growth and development in children with chronic medical condition consisting of natural condition cause by the course of the disease, individual characteristic, family and environmental role and also nutrition [31], [37]. Psychological issue may also play roles in asthma management, both children and family should receive correct information and education in regards to asthma so their behaviour towards the disease will support the goals plan [31], [39], [40], [42]. Parents' role in asthma management is essential [1], [39], [40], [42]. Clinician is responsible in the management and intervention of asthmatic patient along with the psychological problem and always be aware of any potential issue that may affect asthmatic children physically [38]-[41]. Based on emotional aspect, the child will present a tendency towards anxiety and leads to low self esteem. One of the solution is to schedule daily activity based on agreement between mother and the child to overcome activity limitation and to obey this commitment unless for reasonable excuse.

Child's growth and development is affected by the frequency and intensity of child's relation to their surroundings. The closest environment will be their family. Parents who are willing to accept the child's condition will ultimately support the child and will create conducive surroundings to optimize a child's growth and development. On a contrary, parents who fail to overcome stress and frustration, guilt feelings or rejection will definitely interfere negatively towards their children growth and development [4], [31], [39], [40], [42]. Love from parents and family is really needed to support a child fighting a chronic medical condition. Mental and psychological disorder happens when love and patience from the family are unable to maintain. Love should also be accompanied with good nurture and care from both responsible parents. This attachment will bring security to the child and in the end will optimize their growth and development [27], [31], [39], [40], [42]. Communication, information and education about asthma are important to be received by parents and child's supporting group like teachers and friends to reach asthma management goals and will lower its morbidity and mortality rate [1], [39], [40], [42]. In this patient, the mother had difficult time to accept her child condition needing careful attention and complex management to deal with his asthma situation. However she was advised and convince and also supported that all kinds of support is really essential for a successful management in asthma and the

goal therapy is also possible to be achieved should parents and medical assistant are willing to co-operate comprehensively.

Education requires special attention and concern in every child who is dealing with chronic medical condition. Any form of education should be adjusted accordingly to each child's ability to receive such activity [4]. Education is one of psycho-social component that brings the quality of a child's growth and development [31], [39], [40], [42]. The mother had a great interest in her child's education and was worried should the child be unable to have proper and normal education just like any other child. She was then advised that good therapeutical maintenance will bring good result in her child's physical condition related to asthma, and good physical condition will certainly help the child to adapt with his surrounding and also to help out his educational activity.

Disease severity in asthma patient is also determined by controlling value. Asthma control value evaluation can change with every visit, repetition of severity classification is to be determined when stable level is reached and maintained for several periods of control to lower the therapeutic outcome [5], [10], [43]. Asthma control is the management goal of the asthmatic disease leading to disease manifestation [5], [10], [43], [44]. Good asthma control in this patient reflects good asthma management in dealing with asthma severity in each patient.

Asthma can be lethal. Several factors may contribute for bad prognosis on acute exacerbation including delay in medication, medication compliance, underestimating each emergency by the patient itself, parents or medical staff, psychological issue in the family [45], [46], [48]. To prevent is to educate and to deliver correct and in depth information and explanation regarding asthma [1], [11], [45], [46]. Long term prognosis in mild persistent asthmatic children with optimal management is good [45]-[48]. Many asthmatic children reach their adulthood without any significant problem. However many child with chronic asthma will exacerbate in adulthood. Steroid side effect should receive a careful attention as well [11], [45]-[47]. Growth and development prognosis in this case is good when asthma control can be achieved. Allergen avoidance, proper management, family and nutritional support will help the child to achieve optimal growth and development.

#### IV. SUMMARY

A case of a child with asthma in regards to medical aspect and growth-development point of view was reported. Asthma clinical course show no significant improvement when other predisposing factor is not well-controlled.

A child's growth and development may be affected by the asthma severity and frequency of attacks despite therapy given. Improving condition of the patient can be created with the help of loving and caring way of nurturing from the parents and supportive peer group. Therefore, continuous and consistent monitoring is required to achieve optimal growth and development.

Prognosis of asthma is generally good when regularly and properly controlled. Allergen avoidance, medication and

proper nutrition regimen will help to maintain and to reach goals of growth and development.

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