Pediatric Asthma

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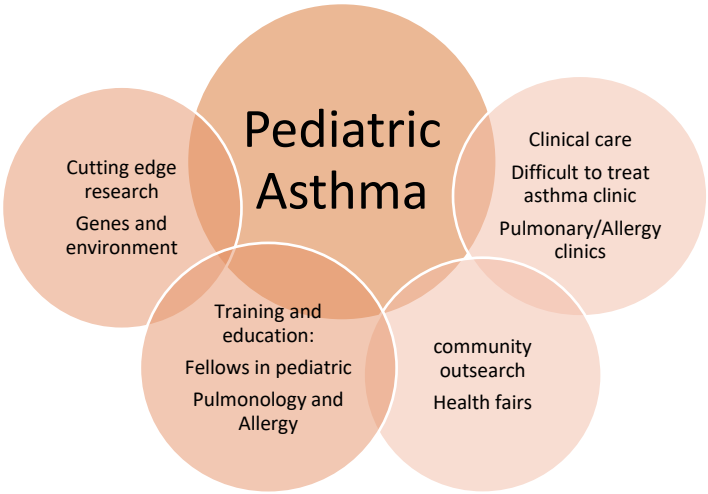
Abstract:

Asthma has a persistent health care obligation and has been the most prevalent chronic illness in adolescents. In recent decades, the incidence of asthma symptoms in both children and teens has risen worldwide. The pattern was expected to be influenced by the host (genetic factors, atopy) and environmental conditions (microbial exposures, smoking cannabis emission and environmental pollution). A growing incidence in rural yet, overwhelmingly, urban regions of metropolitan areas stressed the role of air pollution throughout the initiation of asthma. The total global estimation for disability-adjusted lifetimes (DALYs) is around 1.1% for certain conditions. The total estimate for all factors that cause is 100,000. In several nations around the world, childhood asthma is widespread and has been growing. Huge surveys suggest that almost 1/3 of the asthma adolescents in the preceding 12 months already endured five or maybe more hissing incidents. The family has a huge responsibility, in comparison to the broad human strain of asthma. Further homework might well be needed in order to limit the sensitivity of the child to possible external stimuli. Duration to take care of the patient infant might well be expected for "off task." Children wake frequently at night because they have extreme asthma, although 50 percent of parents demonstrate that their lives are limited. Spouse reports suggest that adolescents with no asthma are often overlooked and parents do not have enough time to give themselves to them. Pediatric asthma prevalence is poor but also has declined considerably in recent decades. Throughout spite of the lack of future years of life, the economic and social strain is significant. Further study has revealed whether family asthma treatment verbal reports are correlated to results regarding asthma. Asthma treatment is categorized as responsive, alignment of care practices and family relationships by parent surveys. These trends were related to parallel and potential patient compliance and usage markers. Such results underline the significance of the familial asthma scheme in the successful treatment of childhood asthma.

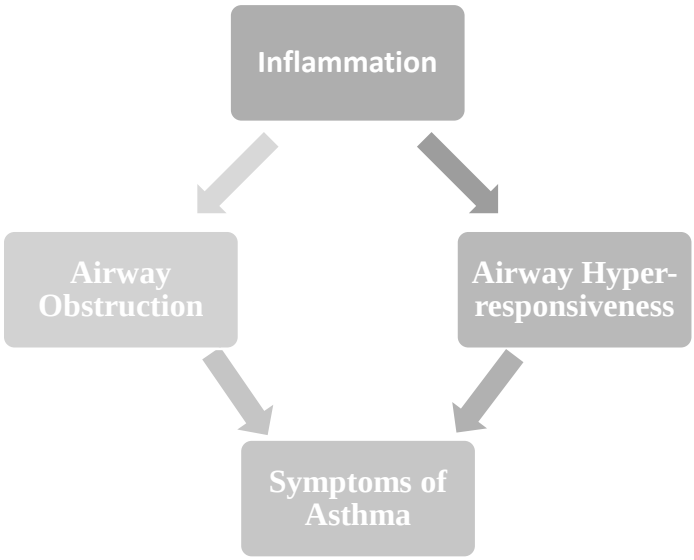
Keywords: Asthma, chronic illness, adolescents, environmental conditions, pediatric asthma



Introduction:

Asthma seems to be the world's most common chronic respiratory disease that affects over 300 million people throughout all races. That is the most prevalent chronic condition in infants, and the healthcare system becomes steadily burdened. Despite the numerous asthma-related phenotypes identified by infants, the conditions of shortness of breath, chest pressure and/or coughing, combined with an expiratory airflow restriction, which can correct itself naturally or as a consequence of drugs, is generally known as a persistent inflammatory disorder of the respiratory tract. Due to international and domestic surveys of general populace, awareness of the worldwide prevalence of childhood asthma improved throughout the last 2 centuries. Throughout the concept of prevalence of asthma, epidemiological trials concentrated on self-reported manifestations instead of on doctoral diagnoses, using structured questionnaires. The far more significant indication of asthma identification was in fact wheezing. Genetically predisposed adolescents may have been a subcategory of vulnerable children for having extreme asthma for conduct asthma and disorder. Since pediatrics asthma is more widespread and debilitating particularly with small children, and particularly with non-Hispanic indigenous students. Extensive asthma response strategies have concentrated on vulnerable local areas with significant vulnerability for incidence and death from asthma. Besides that, recent report is primarily directed at discovering the causes of asthma, and secondly at further understanding the evolutionary history of asthma. More and more multiple disciplines procedures are needed in order to truly comprehend asthma that synthesis biochemical, social and economic, physiological and familial contexts. View of the increasing series of studies investigating asthma-related facets of psychosocial functioning, psychological disorders in children with intermediate to medium asthma do not seem to be increasing. That being said, the elevated risk of serious and badly controlled asthma has also been linked with psychopathology, family breakdown, and drug non-compliance. Therefore, it is essential for researchers that carefully investigate the associations across psychosocial processes

and extreme asthma, as this can enable them to understand that impact or outcomes of different asthma psychological and familial parameters



Childhood Asthma Risk Factors

Epigenetics and Genetics:

Asthma incidence variations occurring in different ethnic groups all over the world can indeed be associated with genetic vulnerability variations. While the basic model is adapted by asthma genetics has not really been entirely explained, several genetic factors have also been consistently investigated in recent years in relation to asthma and chronic inflammation. Through specific, asthma was associated with numerous polymorphisms throughout the 17q21 locus. The asthma, even though mechanism wasn't yet understood, is called the toughest loci. Increasing numbers of CD4+ cells and perhaps even the amount of asthma eosinophil's present throughout respiratory system barrier biopsies is correlated with threat alleles of certain single nucleotide polymorphisms (SNPs), indicating the presence of certain genes throughout the Th2 mechanism. About direction 16q12, a new locus linked to the time asthma happened. A finding supports the hypothesis additional genetic factors that could theoretically explain sex-specific childhood asthma symptoms. In comparison, the earliest lung activity declined due to an SNP around 8 chromosomes. And yet no particular prototypes have also been established for genetic transmission. A multi-factorial framework was therefore suggested that characterizes dynamic interactions between genes and the environment in many more recent decades the impact of asthma congestion induced air emissions has been correlated with DNA De-methylation of its Gene locus, the potential transcription factor of childhood asthma, throughout the promoter region of a Ten-Eleven trans-locational 1 gene.

Atopy:

There was a clear correlation regarding asthma and atopy throughout the evidence from epidemiological data. Through fact, atopy medical history is amongst the most significant asthma adverse outcomes. That was a well link amongst allergic sensitize and asthma. That explanatory

associations between proximity to particular allergens and condition production have not yet been well demarcated, perhaps because of the complexities of correlations involving exposure period and dosage and genetic predisposes. Approximately 60% of asthma-like pupils are susceptible to lifelong irritants, including mites, droppings, molds and other household allergens. Such indoors allergens are significant in the formation of asthma, increase inflammation of the airways and bronchospasm hyperactivity. These were reportedly been shown that threat of asthma and prevalence in puberty was substantially higher prior five years of age.

Exposure of microbes:

Reduced microbial contamination across better hygiene and enhanced immunization rates has been associated with a higher prevalence of childhood asthma. That influence the composition including its immune response, adjustments throughout the environment and/or lifestyles have also been recommended to raise the chances of asthma in genetically predisposed participants, based on the so-called hygiene hypothesis. Throughout consideration of the under-stimulation of that same immune response, children who are raised throughout developed environments with a low natural microbial pressure could perhaps be vulnerable to developing allergic diseases. Admittedly, latest evidence has shown that certain microbes can indeed be shielded from atopy contact, while others tend to encourage allergic diseases. In accordance to either the genetic predisposition of its organism, the duration of exposures and perhaps even the characteristics of its infected individual can determine the potential production of asthma. There has been confirmation that respiratory viruses play a central role in the growth of asthma during formative years. Respiratory syncytial viruses (RSV) and human rhinovirus (HRV) were mostly normally associated during instances of respiratory symptoms in pre-school infants although with the development of asthma in the upcoming months. Many studies have demonstrated, in response to virus infections, whether diseases with atypical bacteria, including such Mycoplasma pneumoniae as well as Chlamydia pneumonia, increasing play a role in reducing and intensifying asthma.

Exposure in environment:

The highest prevalence of asthma across urban areas has emphasizes the importance of environmental pollution throughout the initiation of asthma in rural communities and, particularly, in developed economies. Elevated asthma exacerbations, hospital admission occurrences and impaired lung function have been correlated with proximity both for outdoor or indoor contaminants. While there was no correlation regarding pollution exposure and asthma susceptibility in some kind of a cross-sectional sample, a Systemic review of even more over 14,000 children found whether elevated susceptibility to nitric dioxide (NO2) including particulates with either a diameter of 2.5 μm (PM2.5) at conception were correlated with a higher occurrence of asthma at 14-16 years and older. A meta-analysis of birth cohort research suggesting whether increased childhood susceptibility to PM2.5 including dark carbon are correlated with greater asthma threat either at age of 12 years provides additional evidence. Environmental Tobacco Smoke (ETS), which would be widely accepted as an important risk factor for asthma, is perhaps the most harmful response to either the climate in adolescents. Prenatal through even postnatal inactive smoke consumption might have had a detrimental impact mostly on the immune response including lung functional and structural growth, which might also understand the

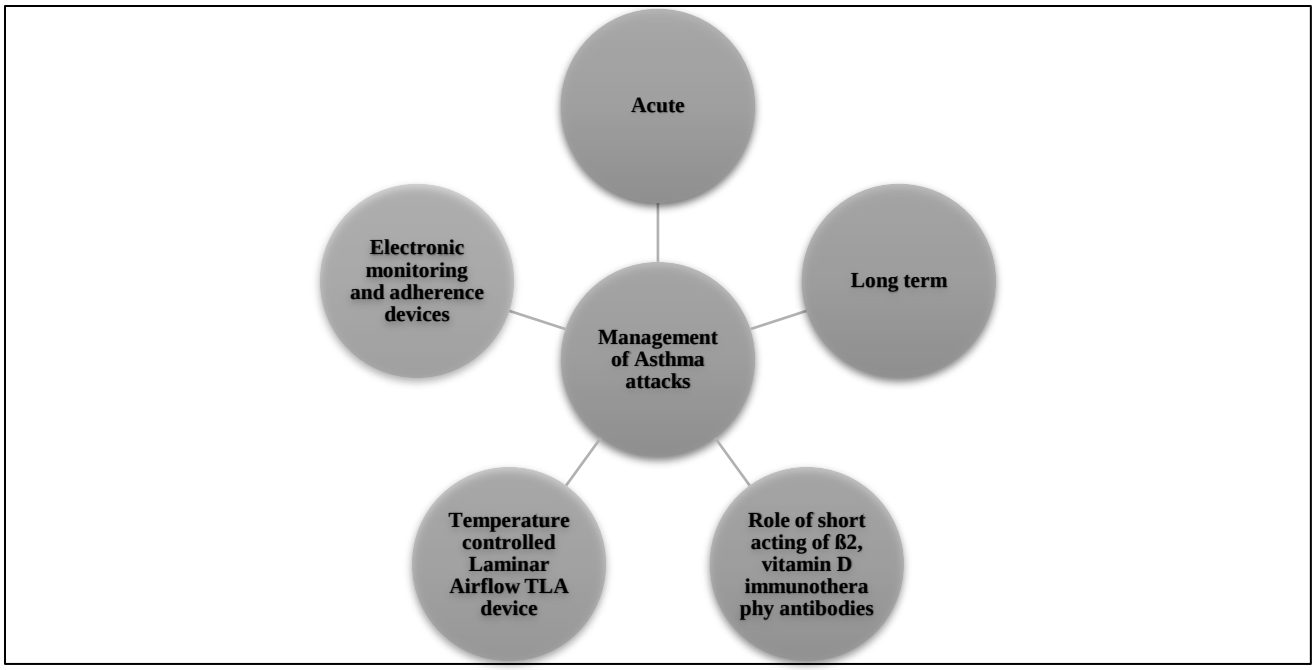
resulting higher risk of asthma incidence. School-age sensitivity towards ETS is linked with an increased incidence of frequency and irregular heartbeats and can be deemed a later-life health hazard for asthma retention. That radical concept about Third-Hand Smoking (THS), that mixture of tobacco smoke toxins that linger in an interior environment although tobacco has indeed been consumed, has increased growing attention in recent years. Although infants and children were vulnerable to the associated risks with THS exposures, studies should be undertaken to research the health impacts of THS pertaining to multiple mechanisms of exposed and patterns that also appear in pre-natal existence. Finally, with the proliferation of electronic cigarettes, another very widely utilized tobacco substance by teenagers, a perceived conflict to the respiratory development of children and adolescents has indeed been created.

Characteristics of family and outcomes of Asthma:

There has been emerging literature demonstrating the association between the features of the household and infant and the effects of pediatric asthma. Two moderated mediation frameworks for interpreting these interactions are backed by theoretical and empirical evidence. Initially, family structures may influence the actions of asthma treatment and lifestyle variables that impact asthma consequences in exchange. Second, physiological mechanisms that could really connect adolescent and parents' emotional responses as well as asthma consequences have been studied in literature focusing.

Family functioning impacts consequences of asthma across management of Asthma:

The successful treatment of a children's asthma requires the cooperation of health care professionals about the whole family structure and substitute caregivers. Asthma treatment requires a diverse collection of activities, with compliance to recommended medical treatments becoming one of the obligations of the household. Diagnosis prevention, symptoms avoidance, use of educational and medical services, care provider contact, and cognitive development and family relations represent 5 main domains of parental rights. Asthma managers often well enough and unique component is compliance. It has been well known that children and young people adherence-related habits are connected to asthma outcomes. Lower interest rates of compliance to ingested systemic corticosteroids were correlated with disease exacerbation in either a report tracking ingested corticosteroid use for ninety days, thus demonstrating the possible danger and effect of medication non-adherence. Infants for whom the caregivers identified increasingly regular noncompliance with a doctor's prescription for asthma treatment demonstrated substantially worsening mortality on eight of nine indicators, independent of disease severity. Although analysis has attempted to classify variables which might eventually influence limited efficacy, it's not really clear which variables may encourage elevated amounts of compliance; additionally, the factors that promote compliance may vary from those that discourage compliance. Four components which does not influence compliance includes health coverage or healthcare insurance condition.



Family Asthma management System Scale (FAMSS):

In order to recognize family weaknesses and strengths of pediatric asthma management among a range of domains, the FAMSS interviewing was created. The FAMSS also adapted from either the philosophy of self-management, but adds a focus mostly on infant as rooted in the family structure and in the wider sense of healthcare services. Appropriate therapy of asthma is assessed at different levels, including all the child's cognitive development acceptable self-care habits, clear parental responses to trigger diagnosis and trigger regulation, and productive relationships with both the healthcare sector and existing caregivers beyond the household.

Reviews from family and friends aren't usually taken too seriously. For instance, in order to make a decision about what's really happening in the household, the respondent must incorporate inconsistent details (e.g., a children and parents can present separate reports on prescription usages). The preliminary investigation explaining the FAMSS suggested that convergent validity was strong among all the 11 predictor variables (Cornbrash's alpha = 91), as well as the analysis rating could've been obtained with outstanding inter-rater accuracy. A significant percentage of the variation in estimating the operational levels of patients with asthma was collectively compensated for by the FAMSS overview ranking, along with an asthma severity. The FAMSS has indeed been widely applied in various screening tests in current history that has become more streamlined.

FAMSS Subscale		**Specifications**
The knowledge of asthma		Awareness of essential asthma anatomy, particularly bronchoconstriction and inflammatory principles, chronicity;

		comprehension of operation and usage of asthma prescribed medication by children
The assessment of symptoms		Knowledge of the fundamental symptoms of asthma exacerbation, comprehension and acknowledgement of signs and symptoms, seasonal and daily trends, and severity gradient
Answering exacerbations and symptoms		Reasonableness of measures taken to treat early symptoms of severe exacerbations; proof of surveillance of indications and execution of the implementation plan
Control on environment		Confirmation and degree of ambient tobacco smoke-exposed, susceptibility to rodents and pets, exposures to bed bugs (if globally pertinent), associated environmental susceptibility
Adherence of medication		Accessibility and suitable usage medicines for rapid recovery; compliance to medicines for long-term regulation
Health care provider coordination		Defined patient advocate partnership, involving communicating effectively, therapy strategy contract; contractor meets existing management protocols, offers implementation plan
Controlled asthma integration and home life		Maintain of commitment to the treatment of asthma as well as other problems with growth and parents (e.g., participation in family activities and extracurricular, school attendance)

Table 1: Constructs and Subscales Measured of FAMSS

Family activity impacts physiological influences on asthma outcomes:

Numerous physiological factors have been suggested to fully understand whether psychological variables may well be linked to pediatric asthma consequences in the sense of family relationships. In particular, the relationships among psychological and physiological mechanisms can reflect three phases: first, the functionality of the axis of the hypothalamic-pituitary-adrenal (HPA) as well as the immune response; second, the functionality of the autonomous nervous system; and third, the interpretation of symptoms. Evidence which supports these suggested frameworks is the product of multidiscipline viewpoints being incorporated.

Nervous Autonomic System:

Vagal stimulation of the sympathetic nervous system is indeed a further pathway which has already been investigated as a potential correlation among emotional symptoms and asthma. The findings claimed a parasympathetic mediation analysis in a study of the research literature mostly on

potential effects of encouragement as well as emotional engagement on pulmonary function. Through specific, changes in the function of the brainstem can instigate psychological influences that contribute to upper respiratory tract becoming constricted. Those study findings referred to a distinct subcategory of people with asthma responding to unique highly emotional stimulation with enhanced bronchial interference. The framework that indicates enhanced cholinergic stimulation in desperate, stressed, and helpless conditions and cholinergically controlled respiratory excitability in asthma is psychophysiological sensitive to asthma, resulting in a psychophysiological vulnerable attitudinal condition (i.e., autonomic dysregulation as well as cholinergic bias), that might, in turn, can contribute to higher morbidity and mortality. Sorrow was observed to elicit trends of autonomic control that really are compatible with a cholinergically conditioned respiratory blockage in pursuit of such a concept. Conversely, satisfaction phases can be followed by autonomic changes, which would have been associated with improved lung capacity. This study adds to research exploring whether asthma results are influenced by emotional factors throughout households. In order to truly comprehend the particular processes regarding the development identified, further study is recommended. Including special attention to evaluation and a comprehensive evaluation of both the subcategory of adolescents with whom psychological factors lead to a specific form of asthma susceptibility, confirmation and expansion of the existing observations are necessary.

The Axis and Immune Response of HPA

The connection between emotional symptoms as well as asthma can be mediated by the HPA axis in the following reasons. First, throughout the control of activation, which would be a major element of asthma, that HPA axis can be concerned. Second, the influence of emotional influences mostly on working including its HPA axis has mainly been analyzed in the field of good perspective the contributions of individual people to anxiety. Research and practical evidence now suggest indicating that perhaps the HPA axis controls the transmission of allergic diseases and allergy inflammatory processes. Predisposition and tolerance to inflammatory diseases might influence the communication between both the nervous and immune processes. Through general, immune and inflammatory behavior and disorder neuroendocrine control can arise via the production of glucocorticoids by modulation including its HPA axis, this same existence of glucocorticoids in defensive systems, as well as the activation at inflammation sites of neurohormones & neuropeptide. Although glucocorticoids typically have an immunosuppressive and anti-inflammatory impact, increased sensitivity to disease is correlated with excessive stress hormone response, although insufficient stress hormone respondents are correlated with greater vulnerability to infectious, autoimmune, and allergy disorders. The interaction in between the development of spontaneous cortisol and allergic reaction can be noticeable in a number of different ways: lung function differs with either the plasma levels cortisol; the amount of inflammatory various diseases correlates mostly with plasma levels cortisol; although decreased amounts of prenatal cortisol can be correlated with asthma danger.

Results:

For parameters unwilling to adhere to the assumption of constant and constant variance, appropriate information modifications were implemented. In particular, the average minimum compliance and parental asthma awareness ratings were subjected to probit modifications that

standardize representations of conditional parameters, many of which were disproportionate information. To examine the psychometric properties but reliability of the FAMSS, 3 types of tests were performed. Second, associations were investigated between some of the FAMSS predictor variables and demographic correlations. Second, studies were carried out to determine the internal consistency of the indicator by examining the connection amongst FAMSS predictor variables, self-report tests, as well as the MDILog calculated measure of prescribed medications use. After that, the convergent ability of a FAMSS relative to certain other asthma management interventions in simultaneous asthma morbidity was tested in a sequence of regression analysis. To test the strength of agreement across different FAMSS subscales, Pearson correlation comparisons were being used. The FAMSS overview performance was insensitive to aging ($r = 0.01$, ns), infant sexuality ($t = .71$, ns), toddler ethnicity, [$F(3, 111) = 0.57$, ns], or ethnic background [$F(1, 111) = 0.08$, ns] as either an international asthma management measure. SES ($r = 0.31$, $p < .001$) were linked to the FAMSS description ranking, suggesting generally weaker management in lower family SES. The FAMSS overview ranking, [$F (3, 111) = 2.19$, ns], wasn't really connected to symptom severity. That longitudinal behavioral morbidity variable appeared negatively correlated to just the FAMSS description ranking, $r = -0.32$, $p < .001$.

Symptoms of Asthma					
	symptoms		**< 5 years of age**	**5 years of age**	
	Daytime	**Night time**	**Exercise tolerance**	**PEF or FEV1**	**PEF variability**
Mild intermittent	≤2 per week	≤ per month	Excellent tolerance	≥80%	<20
Mild persistent	>2 per week but<1 per day	>2 per month	Exercise Symptoms	≥80%	20%-30%
Moderate Persistent	Daily symptoms	>1 per week	Frequent Exercise symptoms	60%-80%	>30%
Severe Persistent	Continual day symptoms	Frequent night symptoms	Exercise severely limited	≤60%	>30%

Table 2: Ratio of symptoms of Asthma

Conclusion:

Asthma is a dynamic disease, with large presentation variations not only due to the allergies or bronchial reactivity and even to environmental causes including changes in the intake to nicotine as well as other irritants. Asthma is indeed an issue of great variety of manifestations. Some rather condition occurrence resulted in substantial periods of learning deprivation, physical fitness disability and school failure due to disrupted sleep. If asthma is more serious, school absenteeism may affect the schooling of the child and, potentially, future career. That asthma variance can indeed correspond to either the psychosocial features of that same infant, family and spouse. Hereditary and familial elements influence and therefore can relate actively and profoundly to

mental, social and biological issues that could really proceed to impair growth across the course of life. . Throughout this background, a growing emphasis was put on epigenetics in recent decades, discovering that atmospheric sensitivity would attenuate expression of genes in a complicated relationship which can also be passed forward from mother to baby. Wheezing HRV-induced during adolescence was the best indicator of asthma detected by physicians either at age of 6 in adolescents at higher risk for developing asthma. Throughout the first 12 months, nearly 50 percent of adolescents with lower respiratory tract infections induced by RSV experienced respiratory problems during school level. The correlation with asthma symptoms in individuals has been seen in published findings. More study is recommended mostly on medical health risks associated cigarettes. A persistent issue is compliance to recommended care treatments for patients with asthma, despite adherence rates sometimes below 50 percent. People with much more loosely managed asthma may have relatives being unable to perform certain health care activities needed for pediatric asthma. The FAMSS embraces the semi-structured framework that enables parents and siblings to describe asthma management habits, values, and perceptions and communicate the degree about which individuals feel overwhelmed by the disease. Commentators are qualified to test before adequate information is collected to render a ranking in a particular domain regarding modification. . Sorrow was observed to elicit trends of autonomic control that really are compatible with a cholinergically conditioned respiratory blockage in pursuit of such a concept. Conversely, satisfaction phases can be followed by autonomic changes, which would have been associated with improved lung capacity. . And although information is entirely theoretical at that same point, nevertheless, in consideration of those same processes, we checked the preliminary findings.

References

1. A MIELCK, P. R. (April 1996). Severity of Childhood Asthma by Socioeconomic Status. Retrieved January 31, 2021, from https://academic.oup.com/ije/article/25/2/388/688352?login=true
2. Arpi bekmezian, M. C. (19 May 2015). Clinical pathway improves pediatrics asthma management in the emergency department and reduces admissions. Retrieved January 31, 2021, from https://www.tandfonline.com/doi/full/10.3109/02770903.2015.1019086?scroll=top&needAccess=true
3. Asher MI, M. S. (August 26, 2006). Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. Retrieved January 31, 2021, from https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)69283-0/fulltext
4. Asher, I., & Pearce, N. (1 November 2014). Global burden of asthma among children. Retrieved January 31, 2021, from https://www.ingentaconnect.com/content/iuatld/ijtld/2014/00000018/00000011/art00004;jsessionid=ogjs7epsgmp8.x-ic-live-03
5. Astrida Seja Kaugars, P. M. (October 2004). Family Influences on Pediatric Asthma. Retrieved January 31, 2021, from https://academic.oup.com/jpepsy/article/29/7/475/968155?login=true
6. Aydemir, H. C. (21 December 2014). The relationship between allergy and asthma control, quality of life, and emotional status in patients with asthma: a cross-sectional study. Retrieved

January 31, 2021, from https://aacijournal.biomedcentral.com/articles/10.1186/s13223-014-0067-4
7. Claudia Galassi, M. D. (January 2006). Changes in Prevalence of Asthma and Allergies Among Children and Adolescents in Italy: 1994–2002. Retrieved January 31, 2021, from https://pediatrics.aappublications.org/content/117/1/34
8. Drotar, D. P., & Bonner, M. S. (December 2009). Influences on Adherence to Pediatric Asthma Treatment: A Review of Correlates and Predictors. Retrieved January 31, 2021, from https://journals.lww.com/jrnldbp/Abstract/2009/12000/Influences_on_Adherence_to_Pediatric_Asthma.14.aspx
9. E Duran-Tauleria, R. J. (1999). Geographical and socioeconomic variation in the prevalence of asthma symptoms in English and Scottish children. Retrieved January 31, 2021, from https://thorax.bmj.com/content/54/6/476
10. Eleonora P. Uphoff, P. K. (2017 march). Variations in the prevalence of childhood asthma and wheeze in MeDALL cohorts in Europe. Retrieved January 31, 2021, from https://openres.ersjournals.com/content/3/3/00150-2016
11. Elizabeth L. McQuaid, P. N. (03 March 2005). Pediatric Asthma Management in the Family Context: The Family Asthma Management System Scale. Retrieved January 31, 2021, from https://academic.oup.com/jpepsy/article/30/6/492/948840?login=true
12. Grutta, G. F. (22 June 2018). The Burden of Pediatric Asthma. Retrieved January 31, 2021, from https://www.frontiersin.org/articles/10.3389/fped.2018.00186/full
13. Khusdeep Malhotra, P. B. (27 Jun 2014). Geographic and racial variation in asthma prevalence and emergency department use among Medicaid-enrolled children in 14 southern states. Retrieved January 31, 2021, from https://www.tandfonline.com/doi/abs/10.3109/02770903.2014.930479
14. Lara J Akinbami, K. C. (2002 August). Trends in childhood asthma: prevalence, health care utilization, and mortality. Retrieved January 31, 2021, from https://pubmed.ncbi.nlm.nih.gov/12165584/
15. M. Banjari, Y. K.-H. (03 Jul 2018). The Relation between Asthma Control and Quality of Life in Children. Retrieved January 31, 2021, from https://www.hindawi.com/journals/ijpedi/2018/6517329/
16. Matthew Masoli, D. F. (06 April 2004). The global burden of asthma: executive summary of the GINA Dissemination Committee Report. Retrieved January 31, 2021, from https://onlinelibrary.wiley.com/doi/full/10.1111/j.1398-9995.2004.00526.x
17. MI Asher, U. K. (1995 september). International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. Retrieved January 31, 2021, from https://erj.ersjournals.com/content/8/3/483
18. Neil Pearce1, N. A.-K. (15 May 2007). Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). Retrieved January 31, 2021, from https://thorax.bmj.com/content/62/9/758.short
19. Newacheck, W. R. (November 1992). Impact of Childhood Asthma on Health. Retrieved january 31, 2021, from https://pediatrics.aappublications.org/content/90/5/657.short
20. Robert D. Annett, P. (MAY 01, 2001). Assessment of health status and quality of life outcomes for children with asthma. Retrieved January 31, 2021, from https://www.jacionline.org/article/S0091-6749(01)70144-3/abstract

21. SandlerMorrill, M. (March 2011). The effects of maternal employment on the health of school-age children. Retrieved January 31, 2021, from https://www.sciencedirect.com/science/article/abs/pii/S0167629611000075
22. Warren Lenney MD, F. D. (07 December 1998). The burden of pediatric asthma. Retrieved January 31, 2021, from https://onlinelibrary.wiley.com/doi/epdf/10.1002/%28SICI%291099-0496%28199709%2915%2B%3C13%3A%3AAID-PPUL4%3E3.0.CO%3B2-S