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Effect of asthma on the English-speaking and reading comprehension ability of dusty allergy affected school children: A pediatric research

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***Abstract*---**Background: This study examines the effect of Asthma on the English-speaking time of school children. The study was investigated systematically in 34 patients with a history of asthma from the Cholistan desert of Punjab province in Pakistan, who attended an emergency department of a hospital in Bahawalpur city having dust allergy with asthma for an acute aggravation. Each patient listened to an educational audiotape on the appropriate counting technique before inhaling maximally and counting until a second breath was mandatory. This indicated the "speech time" of the patient in seconds. The researcher collected a total of 250 pairs of pretreatment and posttreatment PEFR and speaking time measurements. The results of speaking time discovered that the PEFR may be statistically anticipated by speaking time [P .0001]. Conclusions of the study also showed that aggravation of acute asthma badly affects the students' English-speaking ability.

***Keywords*---**Asthma, educational, audiotape, technique, easurements, speaking

1. Introduction

Asthma is a long-term inflammatory condition of the airways in which several cells and cellular components are involved. Wheezing, dyspnea, chest tightness, and coughing reoccur often, especially at night or in the early morning, because of the chronic inflammation's accompanying rise in airway hyper reactivity. These episodes are typically accompanied by a widespread but varied airflow blockage that may frequently be resolved either naturally or with the help of medications. When these conditions manifest in youngsters, speaking ability is hampered (Dharmage, Perret, & Custovic, 2019).

A serious health issue is an asthma and its price tag is in excess of $1 billion USD. Asthma is the most common chronic illness in childhood, and Pijnenburg et al. (2015) state that wheezing in asthma is the most common reason why school-aged children visit their physicians because it retains their speaking and reading abilities in school.

The process of breathing is necessary for life. Although all body parts are affected by breathing, which is thought to be the most fundamental of all bodily activities, speaking is more significant for schoolchildren. According to O'connell (2004), asthma is a lung condition that results in recurrent episodes of wheezing, shortness of breath, chest tightness, and late-night or early-morning coughing during school assemblies, making the student reluctant to participate in any way in the morning school assembly and early classes. Although it affects kids of all age groups, it often starts in infancy. Less speaking ability is one of several side effects that asthma sufferers in children endure (Bush & Saglani, 2010). Approximately 300 million individuals worldwide suffer from asthma, and another 100 million people are predicted to do so by 2025. Asthma is a frequent medical condition, especially in children from low-income households, that affects schoolchildren in Pakistani desert communities like Cholistan and Thur (A. A. Khan et al., 2014). Asthma is very likely to go undiagnosed and untreated in these communities of such a remote control desert areas of Pakistan. In Pakistan, bronchial asthma affects 13.9% of the population. Asthma may be treated pharmacologically with both reliever and controller medications. Reliever medications are those that provide short-term symptom relief during an asthma attack or other exacerbation. Controller meds are used to treat asthma on a long-term basis. measures relating to medicine and public health Nowadays, therapeutic methods and complementary and alternative medicine (CAM) for asthma are of interest to the general population all over the big cities of Pakistan but children of desert areas when get suffered from dust allergy do not have much facilities even a small dispensary in the remote control areas of two deserts such as, Cholistan and Thur desert areas (Sabar et al., 2018).

Hasnain, Khan, Saleem, and Waqar (2009) write that according to current estimates, there are 650 million obese people, 463 million people with diabetes, and 339 million asthmatics globally. About 125 million (45%) Americans had one or more chronic diseases in 2000, and 61 million (21%) of these individuals also had several chronic conditions. According to studies, a person's degree of education has an impact on their capacity to manage a chronic ailment like asthma. Adults with less education than a high school diploma are more likely

than those with greater levels of education to pass away from a chronic illness. Education and health in general do indeed have proven correlations (M. A. Khan & Hazir, 1995). Literacy, a crucial element of education, has lately received attention as a potential explanatory pathway following the publishing of results from tests of children literacy abilities conducted by the educational community of Pakistan where they estimate that only two deserts of Pakistan have almost five thousand asthma child patients and these have speaking and reading problems to their illness.

Sajid and Fraidan (2019) have demonstrated that the forced expiratory volume in 1 second (FEV1) is the best spirometric test for assessing airway blockage and treatment response in acute asthma during reading and speaking time (Wispriyono, Yulaeva, Hartono, & Pratama, 2019). Wargocki, Wyon, Lynge-Jensen, and Bornehag (2008) have written that 1-3 FEV1 is the volume of air exhaled in one second from maximal inspiration. However, Trollvik, Ringsberg, and Silén (2013) have claimed that doing FEV1 measurements in the emergency room (El) is typically neither practicable nor convenient. In the past 10 years, it has been demonstrated that the peak expiratory flow rate (PEFR) correlates strongly with the forced expiratory volume in one second (FEV1) (Torres, Souza, Coelho, de Mello, & Souza-Machado, 2021). Due to this and the simplicity with which PEFR may be collected, it has become a standard tool for assessing asthma patients. The American Thoracic Society and the National Institutes of Health National Asthma Education Program have incorporated PEFR into the evaluation of acute asthma exacerbations. Sanchis, Gich, Pedersen, and Team (2016) have discovered PEFR as an objective measure of airway obstruction in asthma patients has become the standard of care in the emergency department, where it is used not only as an initial objective measurement of severity, but also throughout the course of treatment to gauge response to therapy and as a predictor of the need for admission of children with this illness. Sajid and Kassim (2019) have found that it is typical for physicians and nurses to determine the severity of an asthma attack based on the patient's ability to talk and read coherently and in whole phrases especially for reading comprehension abilities with very less speaking health issue. They come to the conclusion that it hampers a student’s reading comprehension as well as speaking ability.

As the severity of an asthma attack increases, it has been hypothesized that the patient's speech deteriorates to one- or two-word phrases due to respiratory difficulties (Rosenfeld et al., 2011). Various respiratory disorders, including asthma, have been investigated for their effects on speech-related respiration. However, these studies did not explicitly examine the use of speech as an objective indicator of asthma exacerbation severity (Rak et al., 2016). Peacock et al. (2003) have compared single-breath counting timed by a metronome to PEFR in individuals referred for pulmonary function testing. They discovered that single breath counting correlated well with PEFR and might be a viable alternative. Patients completed single-breath counting by filling their lungs to capacity and counting normally for as long as possible without taking another breath (Nguyen-Thi-Bich et al., 2016). A metronome was used to pace the patients at a rate of two counts per second. This study might be expanded to examine speaking duration and PEFR in patients with asthma coming to the ED with an acute exacerbation (Koury, Counselman, Huff, Peebles, & Kolm, 1998). If speaking time was proven

to correspond reliably with PEFR data, it may be utilized as a universally accessible objective technique for children with asthma illness and to resolve their speaking and reading problems (Jáuregui et al., 2009). This might be beneficial in situations when a peak flow meter is unavailable, such as in a prehospital setting, urgent care facility, or doctor's office in such a remote control desert area of Pakistan (Hoesterey et al., 2019). The goal of this study was to evaluate if there was an association between PEFR measures and the amount of time a patient may talk between breaths (speaking time) in ED children patients with an acute asthma exacerbation with their reading comprehension abilities (Hassan, Abusaad, & Mohammed, 2022)

2. Methods

This research data was collected from a hospital of Punjab Province which is situated near Cholistan desert. A verbal perrmission was taken by the researchers when one of the researcher went back to Pakistan on annual leave for collection of data.

The research was conducted from May 2022 through August 2022. School children patients who complained of having an acute asthma attack, had a history of asthma. These patients were selected due to dust allergy effects that created asthma in them. They were confirmed to be experiencing one by the emergency medicine doctor under the observation of the researchers assessing them were eligible to participate in the research. Patients who were too unstable to provide informed permission, and who refused to participate in the study were all eliminated from it.

Each patient gave their informed permission verbally with the hospital staff and doctors as per research ethics. Every patient listened to a taped voice count from "one thousand," "two thousand," etc., to "twenty one thousand." Each phrase on the tape, such "one-one-thousand," was generated to correspond to one second. The patient was then instructed to inhale fully and count along with the tape (e.g., "one-one-thousand," "two-one-thousand," etc.) until a second breath was required. The end-point was established as the moment the patient started breathing again. The tallied figure, such as "5,000," reflected the speaking duration in seconds (eg, "five-one-thousand" would translate to 5 seconds). Then, a tiny peak flow meter was used to measure the peak flow. Each subject was instructed to inhale fully before being forced to forcefully exhale via the portable flow meter. The recorded PEFR was then determined to be the best of the three attempts. Speaking time and PEFR measures were taken both before and after each albuterol hand-held nebulization therapy.

Moreover, the treating physician printed out a questionnaire to collect the information. The information comprised patient age, sex, the number of treatments received prior to study enrolment, peak flow measurements taken before and after treatment, and speaking periods corresponding to those measures. The amount of albuterol treatments, oxygen, steroids, antibiotics, or nebulized ipratropium administered, as well as their frequency in the trial, were not under control. The patient might be treated as normal by the treating doctor under the assessment of the researhers. The sole exception from the typical,

routine treatment of an acute asthma exacerbation in the ED was the determination of speaking times. A regression analysis of the PEFR values and speaking time in seconds was used for the statistical study. For each speaking time, 95% confidence intervals (CIs) were calculated. The mean speaking time for pretreatment, posttreatment, and across treatments (i.e., treatment 1 through treatment 3) were compared using an analysis of covariance (ANCOVA) by using the SPSS software. The cutoff for statistical significance was P .05 which was a satisfactory level.

3. Findings

The research included 34 patients in total. 17 males and 17 female children were present. Participants in the research ranged in age from 14 to 14, with an average age of 12.7. The 34 patients provided 158 sets of pretreatment and posttreatment peak flow measurements and speaking times. Any given patient might have between one and four measurement pairs taken. However, the regression predicting PEFR from the speaking time in seconds was statistically significant at P.0001 when taking into consideration the repeated observations for each patient. Speaking time and PEFR had a 0.65 association coefficient (r). PEFR (L/min) = 114.8 + (17.6 speaking time) was the regression equation. The PEFR rose by around 17.6 L/rain per second of speech.

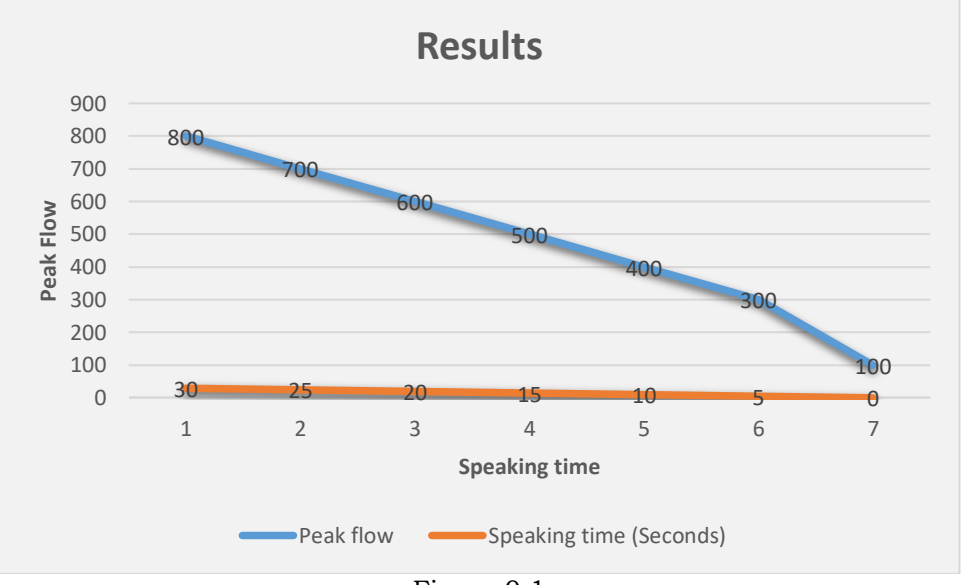

Figure 0.1

Plots the regression line from the preceding equation together with the individual PEFR-speaking time (dotted lines). For every patient, multiply the speaking time in seconds by 17.6 and then add 114.8 to get an estimate of the PEFR. The 95% CIs for each speaking time are listed in Figure 1. A speaking duration of 10 seconds, for instance, results in an estimated PEFR of 291 L/rain (95% CI, 195 to 386 L/rain). The mean speaking time for pretreatment, posttreatment, and across treatments (i.e., treatment 1 through treatment 3) were compared using analysis of covariance (ANCOVA). Speaking time was modified in this research to account

for PEFR. Speaking time increased statistically significantly (P =.0019) from 1 to 3 sessions. When anticipated, patients' PEFRs and corresponding speaking times increased as they received nebulized albuterol treatments (Figure 2). Using the discovered regression equation, Table 3 shows the anticipated PEFR for speech durations ranging from 3 seconds to 20 seconds.

4. Discussion

PEFR is the greatest flow rate that may be produced during a forceful expiration using the entire lung capacity. The patient must put forth their best effort in order for the PEFR to be accurate. In the examination of a patient who presents to the ED with an acute asthma exacerbation, the use of PEFR measures has become commonplace. Peak flow meters are now necessary equipment in the ED due to their usage as a tool to objectively quantify the severity of an attack, as a way to determine how responsive to therapy, and as a way to forecast whether admission is necessary. According to Nowak et al. 117, 92% of asthmatics with an initial PEFR of less than 100 L/min and a post-treatment value of less than 300 L/min either needed hospitalization or relapsed. Our observations show that despite their obvious advantages, peak flow meters are frequently unavailable at primary care physician offices, urgent care facilities, and prehospital care providers. This makes it challenging for these medical professionals to evaluate the severity of an asthma attack and the response to medication objectively.

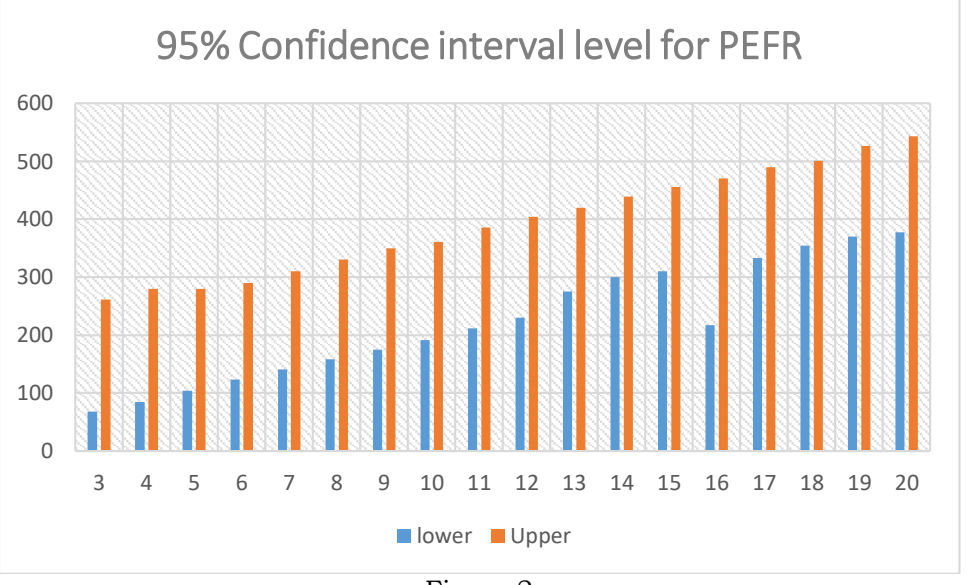

Figure 2

Other approaches to evaluating asthma patients have included examining their speech patterns and contrasting them with those of healthy people. According to Sahito et al. (2015), asthma patients had speech segment lengths that were comparable to those of healthy children and could fulfill the sound level requirements for "loud counting." However, they "produced fewer syllables each breath" and "increased pause duration between speech parts." Nevertheless, because the criteria evaluated were too complicated to be used in the ED, these

investigations were not carried out on patients while they were experiencing an acute exacerbation. Single-breath counting with a metronome was evaluated and compared to PEFR in a research in Pakistan (Jamalvi, Raza, Naz, Shamim, & Jamalvi, 2006). Single-breath counting was found to strongly correspond with PEFR in a research including 22 individuals, including those who did not have asthma. In contrast, the present study only looked at those who had an acute asthma exacerbation when they visited the emergency room. However, here the researchers measured speaking time in a different way than other studies did (Hazir, Das, Piracha, Waheed, & Azam, 2002; Jabeen, Zeeshan, Bano, Bari, & Rathore, 2018).

For this reason, a term "speaking time" was used in the current research paper instead of single-breath counting to describe the technique we utilized in our study. It's noteworthy that Bartfield et al discovered a correlation between single-breath counting and PEFR with a r value of 0.68. This closely resembles the association between speaking duration and PEFR that was discovered here, which had a r value of 0.65.

But the researchers of this study were able to develop an equation to predict the PEFR in patients with an acute asthma exacerbation based on their speaking times using regression analysis as seems in the data. In this pediatric research study, these children were only instructed to take a deep breath and count to 1,000, 2,000, etc., till

Table 1 Predicted Mean Speaking time (second, standard error from ANCOVA Model between Nebulized Albuterol Treatments

Treatment	Pretreatment (sec)	Posttreatment (sec)
1	8.0 and 0.61	9.0 and 0.60
2	8.8 and 0.56	9.5 and 0.59
3	10.0 and 0.61	10.1 and 0.65

Table 2: Correlation of speaking time with PEFR

Speaking time (sec)	Peak flow (L/min)
1	167
2	183
3	201
4	210
5	230
6	250
7	270
8	290
9	305
10	321
11	340
12	360
13	370
14	390
15	410

16	420
17	440
18	460
19	490
20	444

They had to exhale once more. Each phrase roughly corresponds to one second. The activity was terminated and the final phrase said was recorded as soon as the patient took a second breath. When the patient reached "five-one thousand," the number 5 was added to the equation below: PEFR(L/min) = 114.8 plus 17.6 seconds of speaking time. A PEFR of 203 L/rain (95% CI, 105.9 to 299.9 L/rain) would result from this. The relationship between speaking time and PEFR values is seen in Table 2. This table could be shown at clinics, urgent care facilities, and ambulances. The table might be used to forecast the PEFR once the patient completes the workout. Alternately, one might memorize a few crucial values from this table. One may make approximations for other metrics, for instance, by recalling that a speaking time of 5 correlates to a PEFR of 200 L/rain, a speaking time of 10 to 290 L/rain, and a speaking time of 15 to 390 L/rain. Experienced emergency care doctors and nurses have long understood the value of patient speech patterns in determining the severity of an acute asthma attack. Although this finding is commonly made in reviews of acute asthma, no research that formally support it have ever been cited (Qureshi, 2006).

This study, to our knowledge, is the first to formally show a relationship between patient speech patterns and the severity of an acute asthma attack in the emergency department. We do not want to suggest speaking time in place of the peak flow meter. Patients who report to the ED with an acute asthma exacerbation should be treated with a peak flow meter if one is available. Our 95% confidence intervals indicate that the speaking time approach is not as accurate at forecasting PEFR as a real peak flow meter. Speaking time can be utilized to provide an objective assessment of the severity of an acute asthma exacerbation, independent of conventional physical examination results, in instances when a peak flow meter is not available. The speaking time approach also has the advantage of requiring no equipment other than the examiner's watch. The patient or the caregiver incur no costs as a result of the usage of speaking time. Patients with extremely mild or very severe exacerbations are one area where the current study has limitations. The formula has not been confirmed at either end of the speaking time range, i.e., -2 or >20. None of our patients had a count below 3 or higher than 20. Therefore, the researchers are unable to suggest using the formula at its extremes. A patient who is feeling such acute shortness of breath due to dust allergy while living in a Pakistani desert area that they are unable to utter "one-one-thousand" is most likely having a very severe asthma attack and will not be able to adequately blow into a peak flow meter. These child patient base was a second restriction. This research study purposefully excluded patients under the age of 6 from our research. This study would need to be replicated in the pediatric population in order to assess whether the speaking time strategy is effective for kids.

Moroverr, pediatric child patients who report to the ED with an acute asthma exacerbation seem to have a limited capacity to forecast the requirement for

hospitalization using PEFR measures. 15 Patients who were 11 years old or older were also not included. This was done largely to prevent enrolling children who had asthma rather than chronic obstructive pulmonary disease. 2° FEV1 was shown to be preferred to PEFR in a recent study (Aslam et al., 2021) while evaluating patients who were presenting to the emergency department (ED) with an acute exacerbation of chronic obstructive pulmonary disease.

5. Conclusion

Finally, in the present research, the researchers taught and timed our patients' counting using a tape recorder. The vocal clock on the tape was all that was present. The speaking time approach should be accurate as long as the patient counts at a pace of one word per second. Alternately, a healthcare professional may just use a watch to gauge the appropriate moment to talk. Another study examining a larger number of child patients and evaluating prehospital care providers using the speaking time method during evaluation of patients with an acute exacerbation of asthma could be designed in order to further validate the utility of speaking time as an accurate, objective estimate of PEFR (Aslam et al., 2021). Using a peak flow meter, as in our investigation, the PEFR would be calculated after the speaking time was obtained. After then, the two readings would be compared. This would attest to the speaking time method's precision in calculating PEFR in the prehospital environment. Even though PEFR measurements are now a crucial part of diagnosing and treating patients with acute asthma attacks due to desert area dust allergy patients, not all medical professionals have access to or know how to use peak flow meters. However, this research study demonstrated that speaking time and PEFR during an acute asthma exacerbation are statistically correlated. Based on the child patient's speaking duration, the PEFR reading may be predicted using the regression equation.

References

Aslam, R., Shahid, M., Bano, I., Ayoub, M., Sabar, M. F., Altaf, S., . . . Shahid, A. A. (2021). Major histocompatibility complex class II polymorphic variants are associated with asthma predisposition in the Punjabi population of Lahore, Pakistan. *The Clinical Respiratory Journal, 15*(4), 374-381.

Bush, A., & Saglani, S. (2010). Management of severe asthma in children. *The Lancet, 376*(9743), 814-825. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3471126/pdf/ukmss-50059.pdf

Dharmage, S. C., Perret, J. L., & Custovic, A. (2019). Epidemiology of asthma in children and adults. *Frontiers in Pediatrics, 7*, 246. Retrieved from https://spiral.imperial.ac.uk/bitstream/10044/1/71483/2/Epidemiology%20of%20Asthma%20in%20Children%20and%20Adults.pdf

Hasnain, S. M., Khan, M., Saleem, A., & Waqar, M. A. (2009). Prevalence of asthma and allergic rhinitis among school children of Karachi, Pakistan, 2007. *Journal of Asthma, 46*(1), 86-90.

Hassan, E. E. M., Abusaad, F. E., & Mohammed, B. A. (2022). Effect of the Buteyko breathing technique on asthma severity control among school age children. *The Egyptian Journal of Bronchology, 16*(1), 1-12.

Hazir, T., Das, C., Piracha, F., Waheed, B., & Azam, M. (2002). Carers' perception of childhood asthma and its management in a selected Pakistani community. *Archives of disease in childhood, 87*(4), 287-290. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763057/pdf/v087p00287.pdf

Hoesterey, D., Das, N., Janssens, W., Buhr, R. G., Martinez, F. J., Cooper, C. B., . . . Barjaktarevic, I. (2019). Spirometric indices of early airflow impairment in individuals at risk of developing COPD: spirometry beyond FEV1/FVC. *Respiratory medicine, 156*, 58-68. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6768077/pdf/nihms-1049786.pdf

Jabeen, U., Zeeshan, F., Bano, I., Bari, A., & Rathore, A. W. (2018). Adherence to asthma treatment and their association with asthma control in children. *J Pak Med Assoc, 68*(5), 725-728.

Jamalvi, S. W., Raza, S. J., Naz, F., Shamim, S., & Jamalvi, S. (2006). Management of Acute Asthma in children using metered dose in inhaler and small volume nebulizer. *JOURNAL-PAKISTAN MEDICAL ASSOCIATION, 56*(12), 595.

Jáuregui, I., Mullol, J., Dávila, I., Ferrer, M., Bartra, J., Del Cuvillo, A., . . . Valero, A. (2009). Allergic rhinitis and school performance. *J Investig Allergol Clin Immunol, 19*(Suppl 1), 32-39.

Khan, A. A., Tanzil, S., Jamali, T., Shahid, A., Naeem, S., Sahito, A., . . . Fatmi, Z. (2014). Burden of asthma among children in a developing megacity: childhood asthma study, Pakistan. *Journal of Asthma, 51*(9), 891-899.

Khan, M. A., & Hazir, T. (1995). Management of bronchial asthma in children. *JOURNAL-PAKISTAN MEDICAL ASSOCIATION, 45*, 46-46.

Koury, T. G., Counselman, F. L., Huff, J. S., Peebles, J. S., & Kolm, P. (1998). Comparison of peak expiratory flow rate with speaking time in ED patients presenting with acute exacerbation of asthma. *The American journal of emergency medicine, 16*(6), 572-575.

Nguyen-Thi-Bich, H., Duong-Thi-Ly, H., Thom, V. T., Pham-Thi-Hong, N., Dinh, L. D., Le-Thi-Minh, H., . . . Duong-Quy, S. (2016). Study of the correlations between fractional exhaled nitric oxide in exhaled breath and atopic status, blood eosinophils, FCER2 mutation, and asthma control in Vietnamese children. *Journal of Asthma and Allergy, 9*, 163. Retrieved from https://www.dovepress.com/getfile.php?fileID=32446

O'connell, E. (2004). The burden of atopy and asthma in children. *Allergy, 59*, 7-11.

Peacock, J., Symonds, P., Jackson, P., Bremner, S., Scarlett, J., Strachan, D., & Anderson, H. (2003). Acute effects of winter air pollution on respiratory function in schoolchildren in southern England. *Occupational and Environmental Medicine, 60*(2), 82-89. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1740463/pdf/v060p00082.pdf

Pijnenburg, M. W., Baraldi, E., Brand, P. L., Carlsen, K.-H., Eber, E., Frischer, T., . . . Mäkelä, M. J. (2015). Monitoring asthma in children. *European Respiratory Journal, 45*(4), 906-925. Retrieved from https://erj.ersjournals.com/content/erj/45/4/906.full.pdf

Qureshi, A. (2006). *Caregivers' knowledge regarding childhood asthma and its association with stage of asthma severity among their children in Pakistan*: Southern Connecticut State University.

Rak, E. C., Hooper, S. R., Belsante, M. J., Burnett, O., Layton, B., Tauer, D., . . . Ferris, M. E. (2016). Caregiver word reading literacy and health outcomes among children treated in a pediatric nephrology practice. *Clinical kidney journal, 9*(3), 510-515. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4886911/pdf/sfw015.pdf

Rosenfeld, L., Rudd, R., Emmons, K. M., Acevedo-García, D., Martin, L., & Buka, S. (2011). Beyond reading alone: the relationship between aural literacy and asthma management. *Patient education and counseling, 82*(1), 110-116. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2944911/pdf/nihms198502.pdf

Sabar, M. F., Akram, M., Awan, F. I., Ghani, M. U., Shahid, M., Iqbal, Z., . . . Idrees, M. (2018). Awareness of Asthma Genetics in Pakistan: A review with some recommendations. *Advancements in Life Sciences, 6*(1), 1-10.

Sahito, A., Khan, A. A., Tanzil, S., Jamali, T., Shahid, A., Naeem, S., . . . Fatmi, Z. (2015). Burden of asthma among children in a developing megacity: Childhood asthma study, Pakistan. In: Eur Respiratory Soc.

Sajid, M. K. M., & Fraidan, A. A. (2019). Effectiveness of reading aloud strategies for inferential reading comprehension skills and text difficulties of saudi students at university level. *International Journal of Innovative Technology and Exploring Engineering, 9*(1), 2983-2989.

Sajid, M. K. M., & Kassim, H. (2019). The Effects of Reading Aloud Strategies on text Level Difficulties, Reading Proficiency and Reading Comprehension Skill. *International Journal of Language Education and Applied Linguistics*, 85-97.

Sanchis, J., Gich, I., Pedersen, S., & Team, A. D. M. I. (2016). Systematic review of errors in inhaler use: has patient technique improved over time? *Chest, 150*(2), 394-406.

Torres, R. M., Souza, M. D. S., Coelho, A. C. C., de Mello, L. M., & Souza-Machado, C. (2021). Association between asthma and Type 2 diabetes mellitus: Mechanisms and impact on asthma control—A Literature Review. *Canadian respiratory journal, 2021*.

Trollvik, A., Ringsberg, K. C., & Silén, C. (2013). Children's experiences of a participation approach to asthma education. *Journal of Clinical Nursing, 22*(7-8), 996-1004.

Wargocki, P., Wyon, D. P., Lynge-Jensen, K., & Bornehag, C.-G. (2008). The effects of electrostatic particle filtration and supply-air filter condition in classrooms on the performance of schoolwork by children (RP-1257). *Hvac&R Research, 14*(3), 327-344.

Wispriyono, B., Yulaeva, E., Hartono, B., & Pratama, S. (2019). Indoor air pollution (carbon dioxide and total volatile organic compound) and pulmonary disorders in junior high school students in Depok, West Java. *Glob J Health Sci, 11*, 45-54.