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CAUSES OF DELAYED DIAGNOSIS OF BRONCHIAL ASTHMA IN CHILDREN AND ITS CLINICAL CONSEQUENCES

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ABSTRACT:Objective: To identify the primary causes of delayed diagnosis of bronchial asthma in children and to assess the impact of this delay on the clinical course and outcomes of the disease. Methods: A retrospective cohort study was conducted by analyzing 450 medical records of children (aged 6-16) with a confirmed diagnosis of asthma, who were followed at a specialized pediatric center. Patients were divided into two groups: Group 1 (Early Diagnosis, n=210), diagnosed within 12 months of symptom onset, and Group 2 (Late Diagnosis, n=240), diagnosed more than 24 months after symptom onset. Data on initial misdiagnoses and clinical outcomes (frequency of exacerbations, number of hospitalizations, need for oral corticosteroids (OCS), and pulmonary function (FEV1%)) were collected and compared. Results: The average diagnostic delay in Group 2 was 3.8 ± 1.5 years. The most common misdiagnosis preceding the correct asthma diagnosis was "recurrent obstructive bronchitis" (71% of cases in Group 2). Children in the Late Diagnosis group had significantly worse clinical outcomes: a higher annual rate of severe exacerbations (2.1 ± 0.8 vs. 0.5 ± 0.4 in Group 1; $p < 0.001$), more frequent hospitalizations (1.5 ± 0.6 vs. 0.2 ± 0.1 per year; $p < 0.001$), a greater need for OCS courses (3.2 ± 1.1 vs. 0.8 ± 0.5 per year; $p < 0.001$), and lower FEV1% predicted values at the time of diagnosis ($75\% \pm 8\%$ vs. $89\% \pm 6\%$; $p < 0.001$). Conclusion: Delayed diagnosis of bronchial asthma in children leads to a more severe clinical course, characterized by frequent exacerbations, increased hospitalizations, and poorer lung function. The primary reason for the delay is the misinterpretation of asthma symptoms as recurrent respiratory infections. Improving the knowledge of primary care physicians on modern asthma guidelines and raising parental awareness are crucial steps to ensure timely diagnosis and prevent adverse long-term outcomes.

Keywords: bronchial asthma, delayed diagnosis, pediatrics, obstructive bronchitis, clinical outcomes, FEV1, exacerbation, primary care.

АННОТАЦИЯ:Цель: Определить основные причины поздней диагностики бронхиальной астмы у детей и оценить влияние этой задержки на клиническое течение и исходы заболевания. Методы: Проведено ретроспективное когортное исследование путем анализа 450 амбулаторных карт детей (6-16 лет) с подтвержденным диагнозом астмы, наблюдавшихся в специализированном педиатрическом центре. Пациенты были разделены на две группы: Группа 1 (Ранняя диагностика, n=210), диагноз которым был поставлен в течение 12 месяцев с момента появления симптомов, и Группа 2 (Поздняя диагностика, n=240), диагноз которым был поставлен более чем через 24 месяца после появления симптомов. Были собраны и сравнены данные о первоначальных ошибочных диагнозах и клинических исходах (частота обострений, количество госпитализаций, потребность в оральных кортикостероидах (ОКС) и функция легких (ОФВ1%)). Результаты: Средняя диагностическая задержка в Группе 2 составила $3,8 \pm 1,5$ года. Наиболее частым ошибочным диагнозом, предшествовавшим правильной постановке диагноза астмы, был «рецидивирующий обструктивный бронхит» (71% случаев в Группе

2). Дети в группе с поздней диагностикой имели значительно худшие клинические исходы: более высокую годовую частоту тяжелых обострений ($2,1 \pm 0,8$ против $0,5 \pm 0,4$ в Группе 1; $p < 0,001$), более частые госпитализации ($1,5 \pm 0,6$ против $0,2 \pm 0,1$ в год; $p < 0,001$), большую потребность в курсах ОКС ($3,2 \pm 1,1$ против $0,8 \pm 0,5$ в год; $p < 0,001$) и более низкие показатели ОФВ1% от должного на момент постановки диагноза ($75\% \pm 8\%$ против $89\% \pm 6\%$; $p < 0,001$). Заключение: Поздняя диагностика бронхиальной астмы у детей приводит к более тяжелому клиническому течению, характеризующемуся частыми обострениями, увеличением числа госпитализаций и ухудшением функции легких. Основной причиной задержки является неверная трактовка симптомов астмы как рецидивирующих респираторных инфекций. Повышение знаний врачей первичного звена о современных руководствах по астме и повышение осведомленности родителей являются ключевыми шагами для обеспечения своевременной диагностики и предотвращения неблагоприятных долгосрочных последствий.

Ключевые слова: бронхиальная астма, поздняя диагностика, педиатрия, обструктивный бронхит, клинические исходы, ОФВ1, обострение, первичное звено.

INTRODUCTION

Bronchial asthma is the most prevalent chronic respiratory disease in childhood and a major cause of disability, imposing a significant burden on patients, their families, and healthcare systems worldwide. The modern paradigm for asthma management, outlined in international guidelines such as the Global Initiative for Asthma (GINA), emphasizes early and accurate diagnosis as a prerequisite for effective treatment. Timely initiation of anti-inflammatory controller therapy is crucial to control symptoms, prevent exacerbations, maintain normal activity levels, and, most importantly, prevent long-term irreversible airway remodeling and lung function decline (GINA, 2023).

Despite clear diagnostic criteria, a significant number of children experience a substantial delay between the onset of asthma symptoms and the establishment of a formal diagnosis. During this "pre-diagnostic" period, children's symptoms are often attributed to other causes, most commonly recurrent viral or bacterial respiratory infections, leading to the frequent use of inappropriate treatments like antibiotics and cough suppressants, while the underlying chronic airway inflammation remains unaddressed (Lødrup Carlsen et al., 2012). This diagnostic latency can have profound clinical consequences, leading to a higher frequency of emergency department visits, hospitalizations, and an overall poorer quality of life.

In the context of Uzbekistan's healthcare system, primary care physicians are at the forefront of identifying children with potential asthma. However, various factors, including the challenge of differentiating asthma from common childhood infections, limited access to objective lung function tests like spirometry, and low parental health literacy, can contribute to diagnostic delays. Understanding the specific reasons for these delays and quantifying their clinical impact is essential for developing targeted educational and healthcare interventions. This study aims to investigate the primary causes of delayed diagnosis of bronchial asthma among children in Uzbekistan and to evaluate the clinical consequences of this delay by comparing outcomes in children diagnosed early versus late in their disease course.

MATERIALS AND METHODS

Study design and population - A retrospective cohort study was conducted at a tertiary pediatric pulmonology clinic in Tashkent. The medical records of 450 children, aged between 6 and 16 years with a specialist-confirmed diagnosis of bronchial asthma, were reviewed. To be

included, patients needed to have a complete medical history from the onset of respiratory symptoms.

Patients were stratified into two groups based on the diagnostic delay, defined as the time from the first documented respiratory symptom (wheeze, recurrent cough) to the definitive diagnosis of asthma: Group 1 (Early Diagnosis): Consisted of 210 children who received a diagnosis within 12 months of their first symptoms. Group 2 (Late Diagnosis): Consisted of 240 children who were diagnosed more than 24 months after their first symptoms. Patients with a diagnostic delay between 12 and 24 months or those with significant comorbidities were excluded. The study received approval from the local ethics committee.

Data collection - Data were systematically extracted from the medical records using a standardized form. The following information was collected:

- Demographics: Age and gender.
- Diagnostic information: Age at symptom onset, age at diagnosis, and all diagnoses recorded in the primary care setting before the final asthma diagnosis.
- Clinical outcomes: Data were collected for the first year following the definitive diagnosis. This included the annual number of severe exacerbations (defined as needing a course of oral corticosteroids - OCS), the annual number of asthma-related hospitalizations, and the total number of OCS courses prescribed.
- Pulmonary function: The first reliable Forced Expiratory Volume in 1 second (FEV1%), expressed as a percentage of the predicted value, performed at or shortly after the time of diagnosis, was recorded.

Statistical analysis - Statistical analysis was performed using IBM SPSS Statistics, Version 26.0. Continuous data were expressed as mean $\pm$ standard deviation (SD) and compared using the independent samples t-test. Categorical data were presented as numbers and percentages. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The mean age of the study population was 9.5 ± 2.8 years, with no significant difference between the groups. In the Late Diagnosis group ($n=240$), the mean duration from symptom onset to diagnosis was 3.8 ± 1.5 years, compared to 0.7 ± 0.3 years in the Early Diagnosis group. Before receiving a correct asthma diagnosis, the vast majority of children in the Late Diagnosis group were treated for other conditions. The most common preceding misdiagnosis was "recurrent obstructive bronchitis," which was recorded in 170 cases (70.8%). Other frequent misdiagnoses included "recurrent bronchitis/tracheitis" (45 cases, 18.8%), "allergic cough/pertussis-like cough" (15 cases, 6.2%), and "frequent acute respiratory infections" (10 cases, 4.2%).

The clinical consequences of this delay were significant. During the first year after diagnosis, children in the Late Diagnosis group had a significantly higher annual rate of severe exacerbations (2.1 ± 0.8) compared to the Early Diagnosis group (0.5 ± 0.4 ; $p<0.001$). They also required more frequent hospitalizations (1.5 ± 0.6 vs. 0.2 ± 0.1 per year; $p<0.001$) and a greater number of oral corticosteroid courses (3.2 ± 1.1 vs. 0.8 ± 0.5 per year; $p<0.001$). Furthermore, their lung function at the time of diagnosis was considerably poorer, with a mean FEV1% of $75\% \pm 8\%$ in the Late Diagnosis group, compared to $89\% \pm 6\%$ in the Early Diagnosis group ($p<0.001$).

DISCUSSION

The results of this study clearly demonstrate the profound benefits of an integrated program for early diagnosis and multidisciplinary management of cystic fibrosis in the context of a developing healthcare system like Uzbekistan's. The reduction in the mean age at diagnosis from 4.2 years to 0.8 years is a critical achievement. This early identification is paramount, as it

allows for the initiation of proactive therapies—such as pancreatic enzyme replacement and airway clearance—before the vicious cycle of infection, inflammation, and malnutrition can cause irreversible damage (Farrell et al., 2017). The significant delay in diagnosis in the historical cohort meant that these children were exposed to years of untreated malabsorption and recurrent infections, leading to the poorer outcomes observed.

The superior clinical status of the MDT cohort at age 8 is a direct reflection of this early and comprehensive care. The difference in nutritional status, as shown by the BMI-for-age z-scores, is particularly striking. Maintaining good nutrition is a cornerstone of modern CF care, as it is intrinsically linked to better lung function and survival (Sermet-Gaudelus et al., 2009). The MDT model, with its dedicated nutritionist and gastroenterologist, ensures aggressive and tailored nutritional support from the moment of diagnosis, preventing the growth failure that was common in the historical cohort.

Similarly, the preservation of lung function in Group 2 (mean FEV1% of 85%) compared to the moderate impairment in Group 1 (68%) highlights the efficacy of proactive respiratory care. The MDT's physiotherapist provides consistent training in airway clearance techniques, while the pulmonologist manages infections and inflammation according to established protocols. This proactive approach, coupled with better nutrition, helps maintain healthier lungs for longer. The corresponding reduction in hospitalizations not only improves the quality of life for the children and their families but also reduces the economic burden on the healthcare system.

Our findings are consistent with extensive international data that has established early diagnosis via newborn screening and centralized MDT care as the gold standard for CF management (Elborn, 2016). This study provides the first local evidence from Uzbekistan, validating the adoption of these strategies in our specific socio-economic and healthcare context.

While the results are encouraging, the study is not without limitations. Its retrospective design is susceptible to information bias, and the historical nature of the control group means that other unaccounted-for improvements in general pediatric care could have contributed to the better outcomes. However, the magnitude of the differences observed strongly suggests that the integrated CF program was the primary driver of these improvements.

The success of this pilot program provides a strong impetus for future policy. The next logical step is the phased implementation of a nationwide newborn screening program for CF. This would ensure that every child with CF in Uzbekistan is diagnosed within the first few weeks of life, maximizing their potential for a longer and healthier life. Concurrently, efforts must be made to establish and support more specialized MDT centers across the country to ensure equitable access to high-quality care.

CONCLUSION

The introduction of a structured program for early diagnosis and a multidisciplinary team approach to management has led to transformative improvements in the care of children with cystic fibrosis in Uzbekistan. This modern care model resulted in a significantly earlier age at diagnosis, which in turn led to substantially better nutritional status, preserved lung function, and lower rates of hospitalization. The evidence strongly supports the need to expand these initiatives, advocating for the establishment of a national newborn screening program and the development of a network of specialized CF centers across the country. Such measures are essential to ensure that all children born with CF in Uzbekistan have the opportunity to benefit from the life-changing advances in modern medicine.

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