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Original Research Article

Management of asthma in children under 36 months by physicians in university hospitals of Antananarivo, Madagascar

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ABSTRACT

Background: Asthma is one of the most common chronic conditions in paediatrics. The main objective of this study was to describe the management of asthma in children under 36 months of age by doctors working in paediatric wards in Antananarivo hospitals.
Methods: This was a descriptive survey carried out in the form of a questionnaire among doctors practicing in the paediatric wards of Antananarivo Hospital Centers from February 2022 to February 2023.
Results: Fifty-two doctors were surveyed, giving a participation rate of 86.7%. Chest X-rays (88.5%) and allergy tests (32.6%) were the most frequently prescribed complementary examinations. For the treatment of an asthma attack, doctors prescribed salbutamol spray or nebulizer combined with corticosteroid. Inhaled corticosteroids were the most widely prescribed background treatment (75%), and all doctors practiced therapeutic education. The causes of under-diagnosis reported were confusion between bronchiolitis and asthma in infants, and the atypical presentation of the attack. The most common difficulties encountered were related to financial problems, parents' low level of education (94.9%) and inadequate technical facilities (66.7%).
Conclusions: To improve the management of asthma in children, it is necessary to provide continuing medical education, draw up a standardized management protocol for all paediatric departments, improve technical facilities and set up an asthma school for parents.

Keywords: Asthma, Children, Hospital management, Pediatrics

INTRODUCTION

Asthma is a chronic inflammatory airway disease affecting all age groups and remains a major public health concern worldwide. According to the World Health Organization, approximately 262 million people were living with asthma globally, accounting for about 455,000 deaths.[1] The Global Initiative for Asthma (GINA) reports that asthma is the most common chronic respiratory disease, affecting 1%-29% of the population depending on the country.[2]

In Madagascar, the point prevalence of asthma among adolescents aged 13-14 years in Antananarivo was estimated at 4% in 2012, with a cumulative prevalence of 16%.[3] Another study conducted in Mahajanga in 2013 reported a prevalence of 5.6% among children aged 3-15 years.[4] However, epidemiological data on asthma in infants remain limited. The diagnosis of asthma in children under 36 months remains challenging because of the lack of a consensual definition and the heterogeneity of clinical presentations. Terms such as “asthmatic bronchitis,”

"asthma-like cough," and "recurrent bronchiolitis" are frequently used, leading to a substantial risk of underdiagnosis.[5,6] Asthma equivalents, including nocturnal cough or exercise-induced cough with or without dyspnea, are often underestimated, delaying diagnosis and appropriate management. The underdiagnosis rate of asthma in infants has been estimated at 25%.[7] Asthma is also one of the leading causes of pediatric emergency visits, hospitalizations, and school or work absenteeism among children and parents, respectively.[8] Despite its frequency, few studies have evaluated childhood asthma management in Madagascar. Therefore, this study aimed to describe the management of asthma in children under 36 months by physicians working in pediatric departments of university hospitals in Antananarivo and to identify the causes of underdiagnosis and the difficulties encountered in asthma management.

METHODS

This descriptive cross-sectional study was conducted in the pediatric departments of seven hospitals in Antananarivo, Madagascar: the University Hospital Center for Mother and Child of Tsaralalana (CHUMET) , University Hospital Center for Mother and Child of Ambohimiandra (CHUMEA), Joseph Raseta Befelatanana University Hospital Center, Anosiala University Hospital Center(CHUJRB), Soavinandriana Hospital Center (CENHOSOA) Anosy Avaratra District Referral Hospital Center, Itaosy District Referral Hospital Center. The study was carried out over a 12-months period from February 2022 to February 2023.

The study population included pediatricians and general practitioners working in these pediatric departments and involved in the management of children under 36 months of age. Physicians who declined participation were excluded. A census sampling method was used, including all eligible physicians practicing in the seven hospitals. Data were collected using a pre-structured questionnaire administered through semi-structured interviews to ensure consistent understanding among participants. The variables studied included physicians' demographic characteristics, daily consultations of children under 36 months, diagnostic approaches, severity assessment, management during and outside asthma exacerbations, therapeutic education, parental counseling, and difficulties encountered in diagnosis and management. Data entry and statistical analysis were performed using Microsoft Excel 2010. Results were expressed as percentages. Ethical approval was obtained from the directors of each participating hospital before data collection. Participation was voluntary, and physicians' anonymity and informed consent were respected.

RESULTS

Out of 60 eligible physicians, 52 participated in the study, yielding a participation rate of 86.7%. The study population consisted of 51.9% general practitioners and 48.1% pediatricians (Figure 1). The mean age of participants was 39.2±9.9 years (range: 24-58 years), and the majority were female (78.8%). In terms of clinical background, general practitioners accounted for 51.9% of respondents, while pediatricians represented 48.1%.

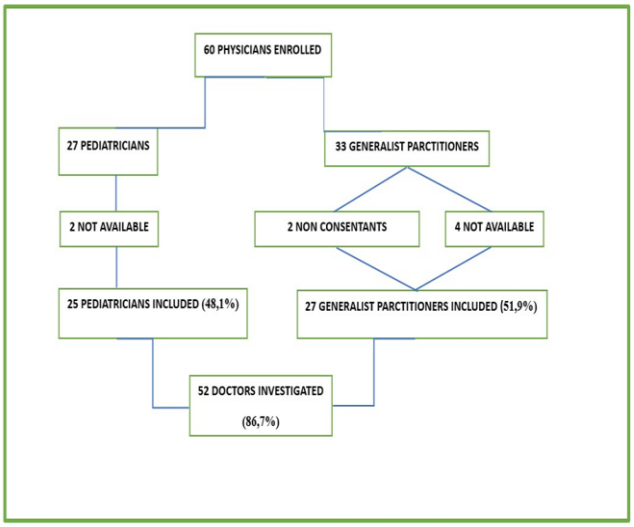

Figure 1: Physicians participation rate.

Most physicians were practicing in university hospitals, mainly CHUMET (30.8%) and CHUJRB (25%). In addition, more than 80% of general practitioners had over 10 years of clinical experience, whereas 68% of pediatricians had less than 10 years of practice. All physicians reported managing fewer than 10 infants under 36 months per day.

Table 1: Distribution of physicians by gender.

	Number (N)	Percentage (%)
General practicioners	27	51.9
Pediatricians	25	48.1
Total	52	100

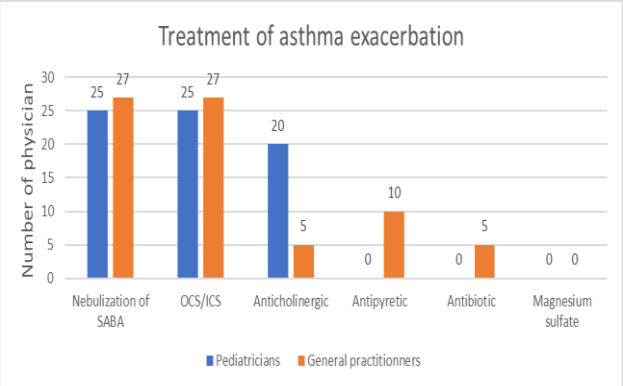

Figure 2 : Treatment of asthma exacerbation.

Regarding training, two-thirds of general practitioners (66.7%) had received additional pediatric training beyond

the mandatory curriculum. With respect to knowledge and perceptions of infant asthma, the condition was most commonly defined as a third episode of wheezing before 24 months of age by 55.6% of general practitioners, with responses influenced by years of professional experience. Furthermore, asthma was considered hereditary by nearly all physicians (98.1%). When asked about the differentiation between asthma and bronchiolitis, most physicians relied primarily on the child's age (<or>24 months) and the recurrence of wheezing episodes. The most frequently reported clinical manifestations of infant asthma included expiratory wheezing, nocturnal cough, and signs of respiratory distress. In terms of disease severity, the most commonly cited indicators were cyanosis, signs of respiratory distress, a history of intensive care admission, associated comorbidities, and silent chest on auscultation. Complementary investigations were widely used, with chest radiography prescribed by 88.5% of physicians, and systematically requested in 32.7% of cases.

Table 2: Distribution of physicians by age.

	General practicioner		Pediatrician		Total	
	Number (N)	Percentage (%)	Number (N)	Percentage (%)	Number (N)	Percentage (%)
Age (years)						
<25	0	0	05	20	05	9.6
25-35	04	14.8	09	36	13	25
36-45	10	37	07	28	17	32.7
46-55	11	40.7	03	12	14	26.9
>55	02	7.4	01	04	03	5.8
Total	27	100	25	100	52	100

Regarding acute management, all physicians reported initiating immediate supportive care, including oxygen therapy and airway clearance measures. Pharmacological treatment was mainly based on inhaled short-acting bronchodilators combined with corticosteroids, while anticholinergics were added in more severe cases. Notably, magnesium sulfate was not used by any participant.

Monitoring of acute episodes was most commonly guided by the PRAM score (73.1%). For long-term management, maintenance therapy was prescribed by 86.5% of physicians, with inhaled corticosteroids being the most frequently used treatment (75%). Follow-up was generally organized on a quarterly basis (53.8%). In contrast, respiratory physiotherapy and influenza vaccination were not routinely recommended (Table 1).

Regarding referral patterns, approximately one-quarter of general practitioners referred patients to specialists, mainly in cases of unstable asthma or associated comorbidities. In addition to clinical management, all physicians reported providing therapeutic education to parents, focusing on disease understanding, management of acute attacks, inhaler technique, and treatment adherence.

Finally, several challenges were identified in clinical practice. Diagnostic difficulties were reported by 30.8% of physicians, mainly due to atypical presentations and the young age of patients. Moreover, management difficulties were reported by 75% of respondents, primarily related to financial constraints, low parental educational level, and limited technical resources. Despite these challenges, all physicians expressed a strong need for additional training and updated information on infant asthma.

DISCUSSION

The participation rate in this study was high at 86.7% (52/60 physicians), comparable to the Compli'Asthme study in metropolitan France (88%).[9] Lower rates have been reported in Togo (78%), Burkina Faso (63.4%), Bourgogne-Franche-Comté (6.6%), and Sfax (53.75%).[10-13] This relatively high participation may be explained by the fact that the study was conducted in pediatric departments, where physicians are routinely exposed to infant respiratory diseases.

Regarding the sociodemographic profile of participants, the study included a balanced proportion of general practitioners (51.9%) and pediatricians (48.1%), with a predominance of physicians with more than 10 years of experience among general practitioners. The mean age of 39.2±9.9 years is consistent with findings from Burkina Faso and Niger, confirming that pediatric care providers are generally young.[11,14] A marked female predominance (78.8%) was also observed, in line with data from Niger, but contrasting with findings from European settings, which may reflect the strong involvement of female physicians in pediatric practice.[14,15] Most physicians worked in major referral hospitals (CHUMET and CHUJRB), which are the busiest and most accessible centers in Antananarivo. All participants reported seeing fewer than 10 infants per day, although this workload may increase during respiratory outbreaks.

In terms of training, two-thirds of general practitioners had received additional pediatric education, a proportion

higher than that reported in other studies, and similar to Breant's findings.[15,16] This highlights the importance of continuing medical education, particularly in hospital-based pediatric care.

When exploring knowledge of infant asthma, marked variability was observed in its definition. While some physicians considered it as a third episode of wheezing before 24 months, others used broader criteria including recurrent wheezing after 12 months and atopic background. This heterogeneity was influenced by professional experience and has been previously described.[15] However, according to international recommendations, diagnosis of asthma in children under 36 months remains primarily clinical and should not be delayed.[2] Current guidelines emphasize that a first episode of wheezing before 12 months is more suggestive of bronchiolitis, whereas recurrent episodes associated with atopy or bronchodilator response are more indicative of asthma.[17,18] Misinterpretation of these criteria may therefore lead to underdiagnosis or inappropriate management.

Almost all physicians recognized the hereditary nature of asthma, which is consistent with the established genetic predisposition reported in the literature.[19,20] Nevertheless, differentiation between asthma and bronchiolitis remained inconsistent, particularly among general practitioners, reflecting partial adherence to international guidelines.[17,18] This diagnostic uncertainty is further complicated by the fact that asthma may begin early in life, sometimes between one and two years of age.[19-23]

Although expiratory wheezing was universally identified, other important clinical signs such as nocturnal cough and respiratory distress were less consistently recognized. This is concerning, given that asthma diagnosis in this age group is fundamentally clinical.[2] Similar diagnostic challenges and underdiagnosis have been reported in previous studies, reinforcing the need for improved clinical awareness.[24,25]

Regarding severity assessment, physicians were generally able to identify major warning signs such as cyanosis and respiratory distress. However, poor response to bronchodilator therapy, a key marker of severity, was underreported. This omission is important, as misjudgment of severity is a major contributor to asthma-related mortality.[26]

Chest radiography was widely used (88.5%), despite being rarely indicated in typical cases of asthma according to international guidelines.[2] Similar patterns have been reported in Togo and Niger.[10,14] This overuse likely reflects diagnostic uncertainty and limited access to advanced diagnostic tools. Conversely, allergy testing was rarely performed, despite its relevance in identifying sensitization.[27] In terms of management, acute treatment practices were largely consistent with international recommendations. Short-acting β2-agonists, mainly salbutamol, were systematically used as first-line therapy.[2,10,12] Inhalation was preferred, although limitations in device availability sometimes affected optimal administration. Anticholinergics were used in severe cases, in line with guideline recommendations, and systemic corticosteroids were appropriately prescribed, with evidence supporting their role in reducing relapse and hospitalization duration.[2,28-30,31-34] However, occasional antibiotic use was reported despite the predominantly viral etiology of asthma exacerbations, highlighting the need for antibiotic stewardship.[22]

For maintenance therapy, inhaled corticosteroids were the most commonly prescribed controller medication (75%), consistent with international guidelines advocating early anti-inflammatory treatment.[35,36] Nevertheless, some physicians still avoided long-term therapy, often due to concerns about side effects or incomplete adherence to guidelines. In addition, influenza vaccination was not prescribed, despite clear recommendations for its use in asthmatic children.[2,7]

Follow-up practices were highly heterogeneous, ranging from no follow-up to regular quarterly monitoring. This variability contrasts with GINA recommendations, which emphasize structured and early reassessment after exacerbations.[2] Inadequate follow-up may compromise long-term asthma control.

Referral to specialists was relatively infrequent (25.9%), lower than in other studies.[11,12] This may be explained by the close collaboration between general practitioners and pediatricians within the same hospital settings, allowing informal consultations without formal referral. Importantly, all physicians reported providing therapeutic education to parents. This included disease understanding, management of acute attacks, inhaler technique, and treatment adherence. These findings are consistent with previous studies and are particularly relevant, as poor parental education has been strongly associated with increased emergency visits and exacerbations, whereas structured education significantly improves outcomes.[12,15,37]

Finally, several difficulties were identified in both diagnosis and management. Diagnostic challenges, reported by 30.8% of physicians, were mainly related to atypical presentations and young age. Management difficulties were more frequent (75%) and were largely driven by socioeconomic constraints, including low parental education and financial limitations. These findings are consistent with previous studies demonstrating the strong influence of socioeconomic status on asthma control.[38] Limited hospital resources and drug availability further exacerbated these challenges, as also reported by Koffi et al, highlighting the need for improved healthcare infrastructure and access to essential medications.[34] Despite these challenges, all physicians expressed a strong need for additional training and updated information on infant asthma. This underscores the

importance of continuous medical education, standardized protocols, and guideline dissemination to improve early diagnosis and optimize management of infant asthma.

This study has certain limitations. On the one hand, its self-reported nature exposes it to a risk of information bias related to participants' responses. On the other hand, since the study was based on a survey conducted over a given period, the results do not allow the establishment of a causal relationship."

CONCLUSION

Asthma is a common chronic condition in pediatrics, and its management in infants remains a daily clinical challenge. This study showed that, although most physicians in pediatric departments of Antananarivo generally follow international recommendations, important gaps persist in knowledge particularly in defining infant asthma and distinguishing it from bronchiolitis leading to a risk of underdiagnosis and suboptimal management.

To improve care, strengthening continuing medical education, updating clinical knowledge regularly, standardizing management protocols, improving hospital resources, and reinforcing parental education are essential. These measures would contribute to earlier diagnosis, better management, and improved outcomes in infants with asthma.

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