

Knowledge, awareness, and practice of the use of peak flow meters by physicians in the management of asthma in children

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Abstract

The peak flow meter (PFM) is a useful device in asthma monitoring and in determining the severity of symptoms. Against the background of reported underutilisation of PFMs in the management of asthma and prescription for home use, and the paucity of such data in developing countries, this study was carried out to assess the knowledge, awareness, and practice of physicians on the use of PFMs in the management of children with asthma.

The work was a prospective cross-sectional study involving 67 doctors working in the paediatric departments of two government hospitals in Lagos State, Nigeria. The number of doctors varied as not all responded to all the questions. The figures therefore correspond with the number of doctors that responded to the particular issue/question addressed. The survey was conducted with a self-administered structured questionnaire. Information obtained included the availability of PFMs in consulting rooms, knowledge of their use, benefits, frequency of prescription, and constraints in prescribing PFMs for the home management of asthma.

Only 13 (20.0%) of the doctors (n=65) used the peak expiratory flow rate (PEFR) regularly in the diagnosis of asthma. The designation of the respondents and the years of experience in the management of asthma were significantly related to the frequency of prescription of the PFM ($p=0.007$, $p=0.003$ respectively). Non-availability was the highest constraint to PFM use (75.0%), followed by the cost of the PFM (51.7%).

This study revealed that the physicians' knowledge about the PFM was suboptimal. The meters were rarely used in diagnosis nor prescribed for home management by physicians attending to asthmatic children at the two referral hospitals. The cost and availability of the PFM should be addressed by the hospital management.

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Introduction

Asthma affects an estimated 300 million individuals worldwide and 250 000 asthma-related deaths are reported each year.¹ Approximately 500 000 annual hospitalisations are due to asthma, with 34.6% being individuals age 18 years or younger.² The management of acute asthma symptoms in children begins at home with parents and other caregivers being at the forefront.³ The dynamic nature of asthma, with waxing and waning symptoms, requires continuous assessment and modification of the treatment plan as needed. It is therefore necessary for medical practitioners to work with families to help them develop asthma management skills by providing them with appropriate resources, teaching them to recognise asthma symptoms, and to follow an appropriate treatment plan.⁴ Inaccurate perception of a child's asthma symptom severity by caregivers may lead to the overuse or underuse of quick relief asthma medications.³

The peak flow meter (PFM) is a useful device in asthma monitoring and in determining the severity of symptoms.⁵ Attempts to assess lung function through physical examinations and patients' reports are often inaccurate. The PFM is used to determine the degree of obstruction along the airways, thus providing objective measures of lung function, which is important in making a diagnosis of asthma, assessing the severity, and in developing and using asthma control plans.⁶ The PFM is used in emergency department units and clinics to quickly and objectively assess the effectiveness of bronchodilators in the treatment of acute asthma attacks. It can also be used at home by patients with asthma to assess the efficacy of control therapy.⁷

There is a high degree of under-utilisation and inadequate knowledge of the use of PFMs. A study conducted in the urban areas of Johannesburg⁸ showed that only 29% of the practitioners prescribed a PFM for home-monitoring. Of the practitioners who reported that a PFM was available in their consulting rooms, 28% failed to show it to the researcher and were also unable to adequately demonstrate the correct use of the meter. Only 58% and 63% of practitioners in the public and private sectors respectively, actually used the PFM to assess the severity of asthma. The cost, insufficient time available to teach the correct use of the PFM, and availability of the meter were reported reasons for under-utilisation.

In Nigeria, among 68 tertiary hospitals only 38% have a PFM in the clinic,⁹ while in a study in South-East Nigeria, only 34% among 285 doctors (most of whom are from the tertiary health facilities) used signs, symptoms and peak flow readings to make a diagnosis of asthma and 46% actually used the PFM in the management of asthma.¹⁰ In Turkey, older and more experienced physicians were less likely to objectively measure lung function in making a diagnosis of asthma. They relied more on their experience.¹¹ Among newly qualified doctors (house officers) in South-West Nigeria, 92% had seen a PFM, 94% knew how to use it, and 67% considered it necessary, but only 49% had ever used it in managing asthma.¹² Against the background of reported under-utilisation of PFMs, especially in the management of asthma and particularly in the prescription for home use, this study was carried out to assess the knowledge, awareness, and practice of physicians on the use of PFMs in the management of children with asthma.

Patients and methods

This work was a prospective cross-sectional study involving 67 doctors working in two government hospitals in Lagos State, Nigeria. Of the 67 doctors, 43 worked at the paediatric department of the Lagos University Teaching Hospital (LUTH), which is a tertiary institution, while 24 worked in Massey-Street children's hospital (MASSEY), which is a secondary institution with specific focus on the management of childhood diseases. The number of doctors varied as not all responded to all the questions. The figures therefore correspond with the number of doctors that responded to the particular issue/question addressed.

The study was carried out between July and September, 2012. A convenience sampling technique was used as all voluntary participants were recruited in the study.

A self-administered, structured questionnaire was used to collect the data on demographic information and years of experience in the management of asthma in children. Other information sought was the presence/absence of a PFM in their consulting rooms, frequency of prescription of PFMs for children, and their constraints in prescribing PFM for the home management of asthma in children. Their knowledge on the use and benefits of PFM in managing children with asthma was also evaluated.

The data were processed and analysed using Statistical Package for Social Sciences (SPSS) version 17.0. Categorical variables were compared and the Chi-squared test was used to test for significant associations with significance at $p < 0.05$.

To analyse the doctor's knowledge on the use of PFMs, a scoring system similar to that of a previous research was used.⁸ Knowledge was classified as good, fair, or poor. To have a good knowledge score, doctors needed to know at least three out of four points about each device. Knowledge of only two points was scored as 'fair' while less than two was scored as 'poor'.

Ethical approval for the study was obtained from the

Health Research and Ethics Committee at LUTH and the Lagos State Health Service Commission (for Massey children's hospital). Informed consent was obtained from the doctors and information treated with confidentiality.

Results

All 67 doctors returned the completed questionnaire; 64.2% of the doctors were from LUTH while 35.8% were from MASSEY. There were 20 males and 47 females (M: F= 1:2.4) with 20.9% house officers, 23.9% medical officers, 31.3% registrars, 19.4% senior registrars, and only 4.5% consultants. Thirty (45.5%) of the doctors had been qualified for 1 to 5 years, 23 (34.8%) for 6 to 10 years, 7 (10.6%) for 11 to 15 years, 2 (3.2%) for 16 to 20 years, 1 (1.5%) for 21 to 25 years,⁸ and 3 (4.5%) for more than 25 years. Of the doctors, 47 (71.2%) had 1 to 5 years of experience in paediatric asthma, 11 (16.2%) had 6–10 years of experience, 5 (7.6%) had 11 to 15 years of experience and 3 (4.5%) had more than 15 years of experience. On a monthly basis, 47 (72.3%) of the study participants (88.1% of doctors in LUTH and 43.5% of doctors in MASSEY) saw between one and ten children with asthma; 11 (16.9%) (4.8% of doctors in LUTH and 39.1% of doctors in MASSEY) saw between 11 and 20 cases while only 2 (3.1%) (3.1% of doctors in MASSEY) saw more than 20 cases. Doctors in MASSEY saw more children with asthma than doctors in LUTH.

Knowledge and awareness of the role of PFMs

Table 1 shows the PFM knowledge grades among the study participants and their designations and number of years after qualification.

Out of 64 respondents, 37 (57.8%) had a good score on questions about the PFM and the interpretation of its readings, 18 (28.1%) had a fair score while 9 (14.1%) had a poor score. There is however no statistically significant relationship between the designation of respondents and the knowledge of PFM. However, all the consultants and 69.2% of the senior registrars had a good knowledge of the PFM. There is also no statistical significant relationship between the years of qualification and knowledge of the PFM. However, all doctors with 16 to 25 years qualification had a good knowledge of PFM. Of doctors who graduated more than 25 years ago and 6 to 10 years ago only 66.7% and 61.9% respectively had a good knowledge of PFM.

Role of PFMs

Responses were obtained from 64 participants on the role of the PFMs: 45 (70.3%) of these reported that the PFM was useful in making a diagnosis of asthma while 50 (78.1%) reported that it was useful in assessing the severity of an asthma episode. The majority of the doctors, 56 (87.5%), stated that peak flow measurement was useful in objectively assessing the effectiveness of an asthma medication. Of the doctors, 51 (79.7%) stated that the PFM was useful in getting patients and their caregivers actively involved in managing the asthma

	Knowledge of PFMs			Test $\chi^2 = 6.911$ $p = 0.546$
	Good n (%)	Fair n (%)	Poor n (%)	
Designation^a				
House officer	6 (42.9)	6 (42.9)	2 (14.3)	
Medical officer	7 (46.7)	4 (26.7)	4 (26.7)	
Registrar	12 (63.2)	5 (26.3)	2 (10.5)	
Senior registrar	9 (69.2)	3 (23.1)	1 (7.7)	
Consultant	3 (100.0)	0 (0)	0 (0)	
Years of qualification^b				$\chi^2 = 3.931$ $p = 0.950$
1–5	14 (48.3)	10 (34.5)	5 (17.2)	
6–10	13 (61.9)	5 (23.8)	3 (14.3)	
11–15	4 (57.1)	2 (28.6)	1 (14.3)	
16–20	2 (100.0)	0 (0)	0 (0)	
21–25	1 (100.0)	0 (0)	0 (0)	
>25	2 (66.7)	1 (33.3)	0 (0)	

Notes: All percentages are row percentages;
PFM = PFM; ^an=64; ^bn=63

Table 1 Respondents' characteristics and their knowledge of the PFM

and 44 (68.8%) of the doctors reported that the PFM was useful in detecting worsening of the asthma in a child long before symptoms occur. Fewer doctors, 18 (28.1%), reported that peak flow measurement was useful in predicting an impending attack.

Practice of the use of PFMs

Out of 64 respondents, 28.1% (43.9% of doctors in LUTH) reported that a PFM was available in their consulting rooms. None of the doctors in MASSEY had a PFM meter in their consulting rooms. Only 11 (16.7%) of the doctors used PFM regularly in making a diagnosis of asthma while all the doctors still relied on signs and symptoms in making a diagnosis. Only 15 (22.7%) of the doctors used PFM occasionally while 40 (60.6%) used it rarely or did not use it at all.

Nearly half (49.2%) the doctors had never prescribed a PFM or only prescribed it occasionally. Study centre had a causal effect on prescription rate of PFM. All doctors who always prescribed a PFM were from LUTH. There is a statistically significant relationship between the designation of respondents and the frequency of prescription of the PFM ($p=0.007$). Those who always prescribed the PFM were 15.4% of the house officers, 9.5% of the registrars, and 7.7% of the senior registrars. A large majority (93.3%) of the medical officers had never prescribed a PFM; all the consultants and 69.2% of senior registrars prescribed it occasionally (see Table 4).

There is no statistically significant relationship between the number of years of qualification of the doctors and the prescription rate of PFM ($p=0.578$). However, the PFM was prescribed always, only by doctors that graduated no more than 10 years ago.

There is a statistically significant relationship between the years of experience of the doctor in attending to children with asthma and the frequency of prescription of the PFM ($p=0.003$). Only doctors with ≤ 5 years experience reported that they always prescribed the PFM; 90.9% of doctors with 6 to 10 years' experience and all doctors with more than 15 years' experience only prescribed the PFM occasionally.

Constraints to the prescription of PFM for home-management of asthma in children

Non-availability (75.0%) and cost of PFM (51.7%) were the two main constraints. Other reported constraints are: poor compliance by caregivers, (31.7%); insufficient time available to teach patients/caregivers the use of the PFM, (11.7%); difficulty in reading numbers on the PFM, (5.0%); not a necessary device (1.7%).

Discussion

The knowledge of PFMs was relatively poor among the surveyed doctors in Lagos State. The relatively inexperienced doctors (house officers) do not have a good knowledge-score of the use of PFM with 42.9% of the house officers from the two paediatric clinics displaying a good knowledge-score on the use of the PFM and the interpretation of its readings, while 53.8% had never used it. By contrast, 94% of house-officers in the Obafemi Awolowo University, Ile-Ife and the University College Hospital, Ibadan in the South-West of Nigeria had a good knowledge of the use of the peak-flow meter but only 49% had ever used it in managing asthma.¹² This variation in knowledge may be due to differences in the degree of incorporation of the knowledge of the PFM into undergraduate curriculum. At an asthma-workshop in Australia, it was found that medical students had poor knowledge about several important features of asthma care.¹³ The workshop was effective in increasing knowledge and confidence in management of asthma in the short term, and could be potentially useful later in training of junior medical officers. There is however no statistically significant relationship between the designation of respondents in this study and the knowledge of PFM. But all the consultants and 69.2% of the senior registrars had a good knowledge of the PFM.

Though the years of qualification did not statistically affect knowledge of the PFM, 66.7% and 61.9% respectively of doctors who graduated more than 25 years ago and 6 to 10 years ago only had a good knowledge of PFM. Overall, 57.8% of the doctors in this study had a good score (75–100%) on the knowledge of the PFM while had reported that only 33% of the doctors attained maximum or close to maximum scores in a South African study.⁸ This large difference in scores reported in the two studies may be due to the fact that there were differences in the criteria scored. In the South African study, the ability of the doctor to correctly demonstrate the use of the PFM was scored but actual demonstration of use was not evaluated in this study.

A serious underutilisation of the PFM in the diagnosis and management of asthma among the doctors surveyed was demonstrated in this study. Some 70.3% of the doctors considered the PFM useful in making a diagnosis while 78% would use it in assessing the severity of asthma, but only 16.7% and 20.7% respectively reported regular use of PFMs for the diagnosis and severity assessment of an asthma episode (see Table 2). Thus it appears that there lies a gap between the knowledge of PFMs and their actual use in the clinical setting. These findings are similar to reports among health maintenance organisations where physicians exhibited clear deficiencies in assessing asthma severity based on measurement of pulmonary function.¹⁴ In South-Eastern Nigeria, 34% of the doctors used a PFM in making a diagnosis of asthma.¹⁰ This is comparable with the findings in Spain where 33% of the paediatricians studied used the PFM for diagnosis and treatment of asthma.¹⁵ However in Johannesburg, South Africa, 58% of the practitioners in the public sector used the PFM to assess the severity of asthma.⁸ The reasons for the findings in this study are not clear but plausible

Methods of asthma diagnosis	Frequency		
	Use regularly	Use occasionally	Use rarely/not at all
Signs and symptoms	66 (100%)	0.0	0.0
Response to medication	47(73.4%)	16(25.0%)	1(1.6%)
Peak expiratory flow rate	11(16.7%)	15(22.7%)	40(60.6%)
X-ray	110 (15.2%)	21(31.8%)	35(53.0%)

Table 2 Methods of asthma diagnosis

reasons may be due to unavailability of the meters in the consulting rooms or the patient load in these paediatric centres. Thus the doctors may not have sufficient time to use the PFMs routinely in the clinical setting. Effective patient treatment and management depends upon accurate classification of asthma severity.

In this study a low prescription rate for home use of the PFMs was also observed. Only 7.7% of the participants always prescribed the use of PFM in the home management of asthma. Nearly half (49.2%) of the doctors had never prescribed a PFM while the others only prescribed it occasionally. In Johannesburg,⁸ 29% of the doctors prescribed the PFM for home use. The relatively higher prescription rate and use of the PFM among doctors in Johannesburg may be a function of the presence of PFMs in consulting rooms as

80% of the doctors had a PFM in their consulting rooms while only 28.1% of doctors in this study had the instrument in their consulting rooms. Since most of the doctors in this study did not have a PFM in their consulting rooms nor used it for diagnosis, demonstrating the use of the meter to patients/caregivers would be minimal if not impossible, hence, the low prescription rate. The doctors in MASSEY focus exclusively on paediatric ailments and treated more asthma cases than their counterparts in LUTH but none had ever used a PFM for diagnosis since the instrument was not available in the clinics. This unfortunately, seems to be the situation in many hospitals in Nigeria, as even among 68 surveyed tertiary hospitals in Nigeria⁹ only 38% had a PFM in the clinics. This result was further confirmed through a review of asthma management in Nigeria, where lack of availability of standard diagnostic equipment (e.g. a PFM) was reported as one of the problems encountered in asthma management.¹⁶ The experience of the doctors influenced the use of the PFMs significantly (see Table 3). The few doctors – mainly house officers, registrars and senior registrars – who always prescribed the PFM were those with 5 years' experience or less in management of paediatric asthma. Doctors with more than 5 years' experience with asthma management in paediatrics and those who had qualified for over 10 years were less likely to prescribe the PFM, although most of them had a good knowledge score on the use of the meter and the interpretation of its readings. Consultants only prescribed the PFM occasionally though they also had a good knowledge score on the use of the meter. Thus it appears that doctors relied more on their clinical experience of sign and symptoms rather than the objective measure of the lung function. In India, the years of experience similarly did not have a significant effect on awareness of newer trends in childhood asthma management and nebulisers/inhalers remained under-used.¹⁷

The unavailability of the PFM was the highest (75.0%) reported constraint to its prescription for the home-management of asthma in children. Other workers have also reported unavailability of equipment as a major constraint for failure to perform lung function tests in 65% of their study participants.^{16,18} The purchase of this equipment may not receive priority attention since patients are not charged for its use compared with other routine laboratory investigations. However, in Spain, 65% availability

PFM for asthma diagnosis	Designation of respondent				
	House officer n (%)	Medical officer n (%)	Registrar n (%)	Senior registrar n (%)	Consultant n (%)
Use regularly	2 (14.3)	1 (6.3)	5 (25.0)	2 (15.4)	1 (33.3)
Use occasionally	2 (14.3)	1 (6.3)	7 (35.0)	5 (38.5)	0 (0)
Rarely/not at all	10 (71.4)	14 (87.5)	8 (40.0)	6 (46.2)	2 (66.7)
Total	14 (100.0)	16 (100.0)	20 (100.0)	13 (100.0)	3 (100.0)

Notes: $\chi^2 = 12.257$; $p = 0.140$; PFM = PFM

Table 3 Designation of physician and frequency of use of PFM for asthma diagnosis

	Frequency of prescription of PFM			
	Never	Occasionally	Always	Test
	n (%)	n (%)	n (%)	
Study centre				
LUTH	13 (31.0)	24 (57.1)	5 (11.9)	$\chi^2 = 16.245$, $p = 0.000$
MASSEY	19 (82.6)	4 (17.4)	0 (0)	
Designation^a				
House officer	6 (46.2)	5 (38.5)	2 (15.4)	$\chi^2 = 20.986$, $p = 0.007$
Medical officer	14 (93.3)	1 (6.7)	0 (0)	
Registrar	9 (42.9)	10 (47.6)	2 (9.5)	
Senior registrar	3 (23.1)	9 (69.2)	1 (7.7)	
Consultant	0 (0)	3 (100.0)	0 (0)	
Years of qualification^a				
1–5	15 (51.7)	10 (34.5)	4 (13.8)	$\chi^2 = 8.522$, $p = 0.578$
6–10	13 (59.1)	8 (36.4)	1 (4.5)	
11–15	3 (42.9)	4 (57.1)	0 (0)	
16–20	0 (0)	2 (100.0)	0 (0)	
21–25	0 (0)	1 (100.0)	0 (0)	
>25	1 (33.3)	2 (66.7)	0 (0)	
Years of experience^b with paediatric asthma				
1–5	28 (62.2)	12 (26.7)	5 (11.1)	$\chi^2 = 19.879$, $p = 0.003$
6–10	1 (9.1)	10 (90.9)	0 (0)	
11–15	3 (60.0)	2 (40.0)	0 (0)	
>15	0 (0)	3 (100.0)	0 (0)	

Notes: All percentages are row percentages; LUTH = Lagos University Teaching Hospital; MASSEY = Massey Children's Hospital; ^a n=65, ^b n=64

Table 4 Respondents' characteristics and the prescription of PFM for home-monitoring of asthma in children

of PFM in doctors' offices has been reported.¹⁵ The cost of the meter was another important constraint (51.7%) in this study. The cost of the PFM was the highest reported cause of its under-utilisation by public sector practitioners (68%) in the South African study. Other constraints identified by caregivers in the Lagos survey were: poor compliance by caregivers (31.7%); insufficient time available to teach patients/caregivers the use of the meter (11.7%); and difficulty in reading numbers on the PFM (5.0%). Teaching of patients can be enhanced by the use of pictures.¹⁹ The South African survey also identified similar reasons though to varying degrees.⁸ The variation in the degrees of importance of the reasons may be due to differences in the study environments.

Though all categories of doctors seem to be aware of the usefulness of the PFM, there lies a gap between the knowledge and actual use of this valuable instrument. Failure to use this tool has been attributed to the constraints outlined earlier and the need for re-orientation of physicians on the need to use this tool cannot be overemphasised.

Conclusion

This study revealed that PFM were rarely used in diagnosis and also not prescribed by physicians attending to asthmatic children at the LUTH and Massey Street Children's Hospital, Lagos. The physicians' knowledge about the

PFM was suboptimal. The cost of the PFM and its availability are the major constraints to the use and prescription for the home-management of asthma in children.

Emphasis should be laid on the use of the PFM in the training and retraining of doctors. To reduce asthma morbidity and mortality, educational efforts should aim at improving physicians' severity assessment through increased use of objective measures of lung function. Hospitals, community pharmacies as well as doctors' consulting rooms should be equipped with PFM.

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