Five-year audit of spirometry at the LASUTH, Ikeja, south-west Nigeria

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Abstract

Spirometry is a non-invasive tool of importance in respiratory medicine. There is an enormous burden of pulmonary disease worldwide, including in Nigeria. This retrospective study was done to determine the utilisation of spirometry services in the Lagos State University Teaching Hospital (LASUTH). It determined the sources of referral, indications, and pattern of pulmonary abnormalities.

This is a retrospective study. An audit was done on the data collected at the Pulmonary Function Laboratory of the LASUTH between September 2006 and October 2011. Spirometry was done using the Gold Standard Vitalograph spirometer. The demographic characteristics of the patients who had spirometry as well as FEV1, (forced expiratory volume in 1 second) FVC (forced vital capacity), and their predicted values were noted.

A total of 849 patients had spirometry done over the 5-year period. Slightly more than half were male patients. The mean age of the patient was 50±19 years. There was a steady increase in the number of spirometry tests performed from 2006 reaching a peak in 2009. Thereafter, a sharp decline was seen in 2010 with a steady rise in the first 10 months of 2011.

The most common indication for spirometry was in the evaluation and assessment of asthma in 487 patients (57%). Most of the referrals for spirometry were from the medical department of the hospital representing 532 (63%) patients; 202 (24%) of the request were from the general out-patient department by family physicians, while 115 (13%) came from the surgical department. The outcome of the ventilatory abnormalities showed that 372 (44%) had normal ventilatory indices, 206 (24%) had obstructive patterns, 169 (20%) had mixed type, while restrictive patterns were seen in 102 (12%).

We concluded that although spirometry is frequently used in our clinical practice, this can be improved upon.

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Introduction

Spirometry is a non-invasive investigative tool of importance in respiratory medicine and a vital tool in the assessment of several diseases of the respiratory system. It measures the dynamic lung volume during forced expiration and inspiration to quantify how effectively and quickly the lung can be emptied and filled.[1] it is widely used as an assessment tool in people presenting with breathlessness, wheeze, cough, and stridor, as well as in diagnosing obstructive and restrictive ventilatory disease. It is an important screening tool in patients at risk of occupational lung disease and it constitutes an important investigation in the pre-employment and follow-up of some categories of workers. Its use in anaesthesia and as part of pre-operative assessment of surgical patients for thoracic and abdominal surgery cannot be over emphasised.

Respiratory disease is an important cause of morbidity and mortality world-wide and the World Health Organisation (WHO) has predicted that COPD (chronic obstructive pulmonary disease) will be the fourth leading cause of death by the year 2030.[2] In developing countries like Nigeria, where there is inadequate provision of investigative tools, it is of great importance to maximise the effective use of the available, simple non-invasive tools such as the spirometer. This will go a long way in improving our diagnosis and providing appropriate interventions which should ultimately improve the quality of care the health personnel are providing.

The enormous burden of pulmonary disease has also made it necessary to evaluate the importance of this device in our pulmonary function assessment since it was installed in our laboratory in September 2006. We therefore designed this study to determine the sources of referral for spirometry among the patients seen in our pulmonary function laboratory, indications for the referrals, and the pattern of pulmonary abnormalities seen.

Subjects and methods

The Pulmonary Function Laboratory service at the Lagos State University Teaching Hospital (LASUTH) is central to the assessment of patients with respiratory diseases. It is located within a tertiary centre in the city of Lagos. The centre receives referrals from the city peripherals and in conjunction with two other tertiary centres provides tertiary healthcare services to the estimated 18 million people

in the State. This retrospective study was conducted by an audit of the records of the pulmonary function tests carried out at the LASUTH Pulmonary Function Laboratory between September 2006 and October 2011.

Information was extracted from the spirometry register in the Pulmonary Function Laboratory, as well as the referral forms and in some cases the case notes of the patients. The socio-demographic characteristics of the patients were noted (age, sex) as well as the anthropometric indices such as weight, height, and body mass index. The source of referral and indications were also noted where possible.

The spirometery was done with the Vitalograph Gold Standard spirometer which measures volume displacement. Spirometry was carried out previously by two trained technologists with the supervision of the Consultant Pulmonologist and Senior Registrar, according to American Thoracic Society guidelines.[3] The variously obtained FEV1 and FVC values were noted and compared with those predicted for the relevant age and sex. These values were entered into the pulmonary function test register. The predicted values used were those previously standardised among Nigerians by Femi-Pearse et al.[4]

The outcomes of the test were classified as follows:

- normal if FEV1/FVC was greater than 70%;
- obstructive ventilatory defect if FEV1/FVC less than 70%;
- restrictive ventilatory defect if the ratio of FEVI/FVC greater than 70% and the ratio of obtained FVC/predicted FVC less than 80%;
- mixed ventilatory defect if FEV1/FVC was less than 70% and the ratio of obtained FVC to predicted FVC was less than 80%.

The data analysis was done using the SPSS version 17. All quantitative data were expressed as mean±SD. Qualitative data were expressed in percentages and ratio. Means were compared using the t test while comparison of quantitative data was with chi square. The level of significance was taken as $p<0.05$.

Results

A total of 849 patients had spirometry done during the period under review. There were 428 males and 421 females. The male:female ratio was 1:1.02. The mean age of the patients was 50.5±18.7 years. Most of the patients who had the test belonged to the age group 41–50 years. Table 1 shows the age and sex distribution of the patients who had spirometry during the period under review. There is no significant association between the age and gender of the patients compared using the chi square. χ^2=17.82, p=0.007 (see Table 1).

There is a steady increase in the number of spirometry tests performed from 2006 to a peak in the year 2009; thereafter a sharp decline was seen in 2010, with a steady rise in 2011 (see Figure 1). The most common indication for spirometry was in the evaluation and assessment of asthma (487 patients (57.4%). Other indications included suspected COPD, interstitial lung disease, thoracic cage deformities, connective tissue disease, large airway obstruction, neuromuscular disease, pre-operative assessment, routine medical evaluation, unexplained chest pain, and breathlessness. In 42 (5%) patients, however, the indications were not documented (see Table 2).

In evaluating sources of referrals, it was noted that most of the referrals for spirometry were from the medical department of the hospital representing 532 (63%) tests; 202 (24%) of the requests were from the general out-patients by family physicians; while 115 (13%) werefrom the surgical department (see Table 3). In this study, 372 (44%) patients had normal ventilatory indices, 206 (24%) had obstructive pattern, 169 (20%) had mixed type, while restrictive pattern were seen in 102 (12%) patients. (see Figure 2).

Age range (years)	Male n (%)	Female n (%)	Total n (%)
<20 years	46 (5)	44 (5)	90 (11)
21–30	55 (6)	84 (10)	139 (16)
31–40	42 (5)	77 (9)	119 (14)
41–50	72 (8)	82 (10)	154 (18)
51–60	59 (7)	63 (7)	122 (14)
61–70	67 (8)	60 (47)	127 (15)
>71	58 (7)	40 (5)	98 (12)
χ^2 = 17.82, p =.007.			

Table 1 Age and sex distribution of patients who had spirometry at LASUTH, Ikeja

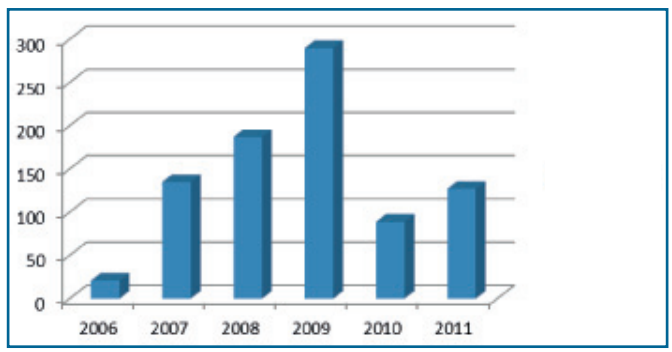

Figure 1 Trends of frequency spirometry at LASUTH, Ikeja

Indications	n (%)
Asthma evaluation	487 (57)
Interstitial lung disease	45 (5)
Suspected COPD	148 (17)
Thoracic cage deformity	12 (1)
Connective tissue disease	10 (1)
Compressive goitre	5 (1)
Neuro-muscular disease	5 (1)
Pre-operative assessment	48 (6)
Routine medical	25 (3)
Unexplained chest pain/dyspnoea	22 (3)
Not indicated	42 (5)

Table 2 Indications for spirometry in LASUTH, Ikeja

Source	n (%)
Medical department	532 (63%)
General out-patient	168 (20%)
Surgical department	115 (13%)
Not indicated	34 (4%)

Table 3 Sources of referral for spirometry at LASUTH, Ikeja

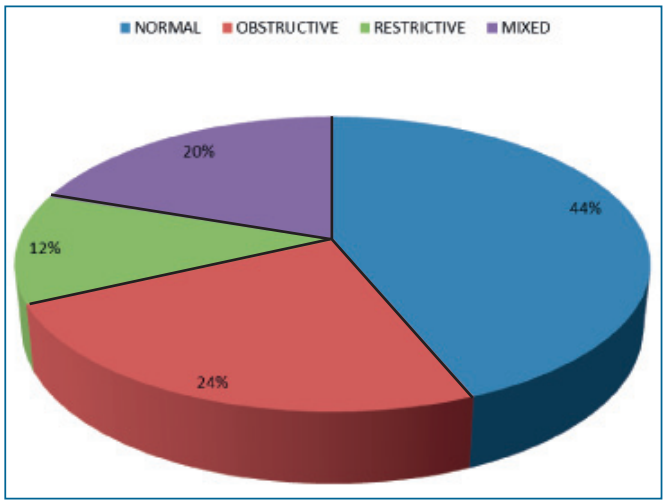

Figure 2 Pattern of ventilatory abnormalities in patients at LASUTH, Ikeja

Discussion

In our centre, 849 spirometry tests were carried out over a 5-year period. This is at variance with several other studies previously done in other centres in Nigeria which recorded less than 120 patients.[5,6] Although we had a steady increase at inception in 2006 to 2009, the interruption of clinical duties due to a labour dispute between healthcare personnel and the government for several months interrupted the service and is responsible for the decline noted in 2010.

Most of the patients who had spirometry carried out in our centre were below 50 years of age (59%). This is similar to the findings of similar studies in Ilorin and south-east Nigeria[5,6] where the majority of patients who had spirometry were below 50 years. The reason for this may be due to the fact that asthma, which is the most common indication for referral for spirometry in our study and theirs, is more common in young people. However, unlike these studies we had a larger number of patients who had spirometry.

There was no significant difference in the gender distribution of patients in our study. The ratio of males to females was 1:1.02, similar to the findings in the south-east Nigeria study.[6] However, this is at variance with an Icelandic study where spirometry was done more in females (44) compared with males (19) .[7]

In our study many of the referrals were from the medical department by internists, followed by the general out-patients department, who also referred mostly for assessment of bronchial asthma, COPD, and interstitial lung diseases. This is not unexpected as most of the indications will present to this group of doctors, it is however important that non-physician doctors are made aware of the indications and potential benefits of the tests to patients who might need the test. Only 14% of the referrals came from the surgical department, mostly for evaluation of cardiothoracic patients and pre-operative assessment of patients with pre-morbid respiratory conditions. This may be a reflection of an inadequate knowledge of spirometry. In our facility we did not receive referrals from outside the teaching hospital; patients were referred from the general out-patient department of the hospital after initial consultation with the family physician. It is, therefore, difficult to assess what percentage of the patients seen were actually referred for spirometry by doctors at the primary and secondary levels of healthcare services. This is different from the study in Ilorin where 21% of the patients came mostly from private hospitals.

In our study we found that 306 (44%) patients had normal spirometry with 206 (24%) having an obstructive pattern. In the Ilorin study, 40% of patients had normal spirometry, while 50% showed an obstructive pattern.[5] This may be because the most common indication was asthma diagnosis and evaluation. A normal spirometry for those patients on treatment may not preclude asthma diagnosis. At the same time, the predicted reference for Nigerians was established over 30 years ago and is much lower than that of Caucasians[4] – this may need a review. It is however unclear how much the lung functions of Nigerians may have changed in the past decades, thus the need for a study to determine new reference values for healthy Nigerians.

Conclusion

The importance of spirometry use in clinical medicine cannot be over-emphasised. It is vital that we increase the information available to practising doctors both within and outside the tertiary centres. It is also important to improve the services currently available in LASUTH to meet the growing demand by computerising the data management and increasing manpower and training.

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