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Respiratory Medicine

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# News and Notes

## First two doctors to complete fellowship training in pulmonary medicine are praised

The World Lung Foundation (WLF) hailed the graduation of the first two fellows, Dr. Fahmi Oumer and Dr. Tola Bayesa, who completed fellowship training in pulmony medicine at the Addis Ababa University in January of this year as part of the East African Training Initiative programme.

This new programme run by the WLF, in partnership with Addis Ababa University and Tikur Anbessa (Black Lion) Hospital, and with support of the Ministry of Health in Ethiopia, launched two years ago. The programme will help create a new generation of lung health specialists by providing specialist training in-country for graduates of accredited medical schools in Ethiopia.

Dr Neil Schluger, Chief Scientific Officer, World Lung Foundation, said: 'We have been impressed with the commitment and professionalism shown by Dr. Oumer and Dr. Bayesa and it has been an honor to work alongside them.

'We thank our colleagues at Addis Ababa University and the Black Lion Hospital, who shared our vision of developing and delivering the Initiative. Over the next few years, a further six doctors will join Dr. Oumer and Dr. Bayesa in becoming qualified pulmonary specialists. This is a life-saving achievement; the initiative shows that it is possible to develop medical specialists in their own country in a way that makes a real difference to the public, to the medical practitioners and facilities involved and to public health in the countries willing to commit to building capacity.'

For the past two years, Dr. Oumer and Dr. Bayesa have been instructed, mentored and supervised by a visiting faculty of lung health experts drawn primarily from the USA and Switzerland. In addition to their training in Ethiopia, both fellows presented original research about the nature and extent of lung cancer, as well as other common and chronic lung diseases in Ethiopia at the Union World Conference on Lung Health in Barcelona back in October last year.

Near the end of their two-year training programme, the doctors undertook a five-week rotation in the USA at Brown University in Rhode Island and Columbia University Medical Centre in New York. After graduating, Dr Oumer will remain at the Black Lion Hospital, the largest public hospital in Addis Ababa and Dr Bayesa will return to his home institution of St Paul's Hospital, also in Addis Ababa.

Dr. Ahmed Reja, Executive Director of the College of Health Sciences, Addis Ababa University, said: 'We extend our thanks to World Lung Foundation for partnering with us in this initiative and to the host of other partners and visiting Faculty who have helped to make it possible. We can assure our colleagues that the public of Ethiopia will benefit from our collective investment in these outstanding young doctors.'

## Critics challenge Ebola respiratory protection equipment

Health experts have raised concerns as to whether the Ebola virus might become airbourne in the future.



*Despite their protective gear, the Médecins Sans Frontières medical team tries to maintain human contact with patients by talking with them a great deal and getting close enough to be able to look into their eyes. Photo credit: © Sylvain Cherkaoui/Cosmos.*

Health organisations and authorities have said that Ebola is not an airborne disease and can only be spread through direct contact with bodily fluids of an infected person or animal.

Contagious disease expert, Dr. Mark Nicas says it is 'biologically possible' that the virus to spread through small droplets. He also states that when it comes to a disease as acute and deadly as Ebola it is best to follow the precautionary principal and ensure healthcare workers (HCWs) are provided with the best possible protection.

'If I can be hit in the face with one of those particles as a projectile, then it's coming close enough to me that I can also inhale it,' says Mark.

Debates about what the best protection is is being discussed across the continent, with many health agencies recommending HCWs wear a disposable respirator classified as 'N95'.

Bonnie Castillo works with the biggest nurses' union in the United States and is concerned that the N95 leaks and allows fluids to get through. She says: 'We know it leaks… We have experience in terms of having to constantly re-adjust. As you re-adjust you contaminate, and to contaminate with a deadly disease? You don't gamble like that. You're literally gambling with nurses lives.'

Castillo and her union demanded recommendations in California change. Now nurses are provided with another respirator known as a powered, air-purifying respirator (PAPR) during aerosol-generating procedures on confirmed Ebola patients. PAPRs can cover the entire face and use a powered fan to bring air in through a filter.

The Ebola virus, also named 'the nurse killer' in West Africa, has claimed more than 8000 lives in what has become the largest outbreak since it was first discovered in 1976.

A report from the World Health Organization (WHO) states that in January of this year 820 healthcare workers have been infected with the virus and 488 have died from it.
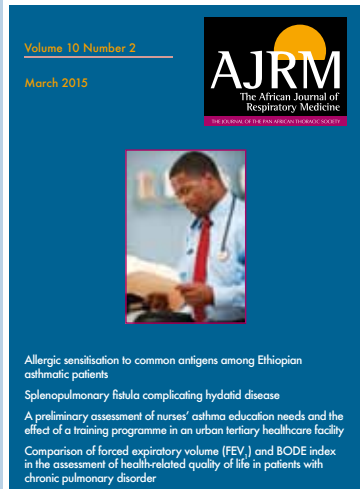
WHO agrees the risk of catching and controlling the spread of Ebola comes 'when infection control precautions are not strictly practiced'. These precautions often involve wearing layers of various equipment, training programmes and strict protocol on putting on and taking off personal protective equipment.

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# First word

Numerous studies worldwide have shown that exacerbation of asthma and chronic obstructive pulmonary disease (COPD) portend morbidity and mortality for patients. Recognising patients at risk of acute severe asthma and acute exacerbation of COPD is one great way of reducing morbidity from these diseases. Use of modern strategies for dealing with these conditions still remain the cornerstone in combating the diseases. However, one overlooked aspect in most centres is the importance of education.

Asthma education is essential, not only for patients but also for physicians, especially in low-income countries. The word 'doctor' was derived from 'doctore' which means teacher. The doctor should not just emphasise patient care, but also be involved in education of patients and care givers. The goal of asthma education is to empower doctors and health professionals to be educators and teach their patients on how to recognise acute episodes, use peak flow meter, record asthma diary charts and simple measures in the event of an acute severe episode. It also involves educating physicians on how to diagnose asthma, monitor progress of disease through the use of lung function tests, and how to recognise acute severe asthma thereby helping to minimise hospital and emergency visits, and mortality from asthma.

It has been shown that many health practitioners have inadequate knowledge about asthma. Dr. Adeyeye's article corroborates the fact that many nurses have sub-optimal knowledge about the use of peak flow meter in the management of asthma. In some instances, some were found not to recognise a peak flow meter.

This edition of *the African Journal of Respiratory Medicine* highlights some of these challenges and emphasises the need for efforts to be intensified at mitigating this gap in knowledge and practice.

Deliberate efforts must be geared towards educating the care givers. Regular continuing medical education should be organised for doctors and other health workers, particularly those directly involved in managing asthma patients. Adequate attention should also be dedicated to communicating with the patients about their asthma in the clinic.

All these will go a long way in helping to minimise the burden associated with the disease.

*Prof Gregory Erhabor, Co-Editor, AJRM*

# Contents

# Comparison of forced expiratory volume (FEV$_1$) and BODE index in the assessment of health-related quality of life in patients with chronic pulmonary disorder

## W Ketata, T Abid, W Feki, S Msaad, N Bahloul, and A Ayoub

## Abstract

Chronic obstructive pulmonary disease (COPD) can lead to major alterations in the patient's quality of life. Our objectives were to assess the quality of life in a population of COPD patients in stable condition and to analyse the correlations between quality of life expressed by the St George's respiratory questionnaire (SGRQ), forced expiratory volume in 1 second (FEV$_1$) and the BODE index. This study was a prospective study concerning 70 outpatients treated for COPD. Quality of life was assessed using the French version of the SGRQ. The study population was predominantly male (97%) with a mean age of 63 years. The average total SGRQ score was 2049 (SD 523). The difficulties expressed by our patients mainly concerned the domain of 'activity', followed by 'impact of the disease' and 'symptoms'. The correlation between FEV$_1$ (percentage of predicted value) and the total SGRQ score and its different domains revealed a significant relationship with all parameters, but this correlation was weak with a correlation coefficient (r) between -0.43 and -0.28. In contrast, the BODE index was more strongly correlated with the quality of life (r between 0.44 and 0.60). In conclusion, FEV$_1$ is correlated with health-related quality of life measured by the SGRQ, but the multidimensional BODE index is more reliable for assessing the impact of COPD on quality of life.

## Introduction

Chronic obstructive pulmonary disease (COPD) is considered a systemic disease that starts in the lungs. Dyspnoea, resulting from bronchial obstruction and hyperinflation, leads to inactivity which reduces exercise capacity through muscle deconditioning. These phenomena lead to a major alteration of the quality of life; preserving quality of life should be a key objective when managing patients with COPD.[1]

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Measures of health-related quality of life have undergone important developments in recent years. Their goal is to assess the health status of an individual in terms of physical, mental, and social parameters. This is a perceptual approach that takes into account the views of the patient and not only those of doctors or other health professionals. Assessing quality of life may be done by the use of either generic questionnaires that evaluate the overall state of the patient, regardless of their health status and regardless of the context, or by the use of specific questionnaires designed to assess for diseases such as COPD or asthma. The latter are more sensitive to clinical changes than generic questionnaires.[2]

The objectives of this work were to assess the quality of life in a population of COPD patients in a stable condition and to analyse the correlations between quality of life expressed by the St George's respiratory questionnaire (SGRQ), forced expiratory volume in 1 second (FEV$_1$), and the multi-dimensional BODE index.

## Methods

We performed a prospective study of outpatients with COPD in a stable condition, followed in the pulmonology department at the Hedi Chaker hospital of Sfax (Tunisia) over 16 months.

The patients included in the study were aged 40 years and over, had smoked for more than 10 pack-years, were being followed for COPD and were stable during the study, and had not had any exacerbation at least 1 month prior to enrolment. Patients with pulmonary diseases other than COPD or severe disabling comorbidities (cardiovascular, neurological, or rheumatic) were excluded.

An information sheet containing patient demographics, smoking status, medical history, duration of disease and disease course, assessment of dyspnoea using the Medical Research Council (MRC) scale, and the number of exacerbations in the previous year was filled out by the attending physician during a regular outpatient clinic for patients meeting the inclusion criteria. Spirometry was performed before and after bronchodilatation; reference values taken were those of the European Respiratory Society (ERS).[3]

The 6-minute walk test was performed by a doctor trained according to the American Thoracic Society (ATS) recommendations.[4]

The BODE index[5] was calculated for each patient based

on the following variables: $FEV_1$, walking distance in 6 minutes, dyspnoea score according to the MRC scale, and body mass index. Depending on the score, four quartiles were defined: quartile 1 (score between 0 and 2), quartile 2 (score between 3 and 4), quartile 3 (score between 5 and 6), and quartile 4 (score between 7 and 10).

To investigate the quality of life of our patients, we relied on the SGRQ (French version).[6] The questionnaire consists of three domains (symptoms, activity, and impacts). The questions were asked by a trained physician in order to avoid cases of non-response or multiple responses. The responses were weighted and a score is calculated by dividing the sum for the patient by the maximum points available and expressing the result as a percentage. The score ranges from 0 to 100%; a score of 100% indicates a state of good health.

Data were entered and analysed using SPSS version 17.0 software. Numerical values were expressed as mean±standard deviation (SD). The study of correlations was made in bivariate analysis based on Pearson's correlation coefficient. A p-value of <0.05 was considered statistically significant.

## Results

Our study involved 70 patients, predominantly male (97% male), with an average age of 63±10 years. All patients were current or past smokers; the average cumulative tobacco consumption was 46 pack-years. Nearly half of patients (52.8%) had been hospitalised one or more times for exacerbation of COPD. In the year before inclusion, 47 patients (67%) had at least one acute exacerbation of their disease.

The post bronchodilator $FEV_1$ was 1394±538 ml, or 46.4±15.7 (% predicted). The $FEV_1$/forced vital capacity (FVC) was less than 70% in all patients; the average value was 54.6±8.5% with a range from 36 to 64%. Referring to the GOLD (Global Initiative for Chronic Obstructive Lung Disease) classification, the majority (81.4%) of our patients had moderate to severe COPD. Only 2 patients had stage I COPD and 11 patients had reached a severe stage (Figure 1). The mean walking distance in 6 minutes was 430 m, with desaturation during exercise in 15 patients, and a fall of 6% on average.
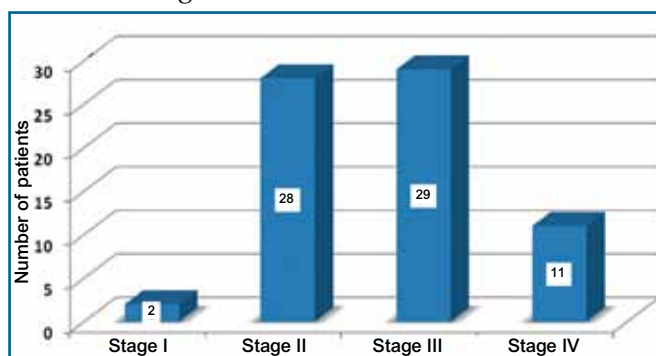


Figure 1: Distribution of patients according to the GOLD classification

Table 1 summarises the distribution of patients according to the limits of the various components of the BODE index. Based on the calculation of the BODE index and the division

| Factor | Classification | Number of patients |
|---|---|---|
| Body mass index (kg/m²) | >21 | 41 |
| | ≤21 | 29 |
| MRC scale | 0-1 | 8 |
| | 2 | 31 |
| | 3 | 18 |
| | 4 | 13 |
| 6 minutes walk test (m) | ≤149 | 2 |
| | 150-249 | 2 |
| | 250-349 | 16 |
| | ≥350 | 50 |
| $FEV_1$ (%) | ≤35 | 18 |
| | 36-49 | 22 |
| | 50-64 | 22 |
| | ≥65 | 8 |

Table 1: Distribution of patients according to the BODE index components

into four quartiles, the majority of our patients belonged to the second and third quartile (Figure 2). Assessing quality of life by the SGRQ total score gave an average value of 2048.9±523.3. The difficulties expressed by our patients mainly concerned the domain of 'activity', followed by 'impact of the disease' and 'symptoms' (Table 2).

The correlations of $FEV_1$ (% predicted) and the total score of SGRQ and its different domains (symptoms, activity, and impacts) were studied by bivariate analysis and showed significant relationships with all parameters, but correlations were weak with correlation coefficients (r) between -0.43 and -0.28 (Table 3). The BODE index correlated much better with the SGRQ total score and all its areas, with correlation coefficients between 0.44 and 0.60 (Table 3).
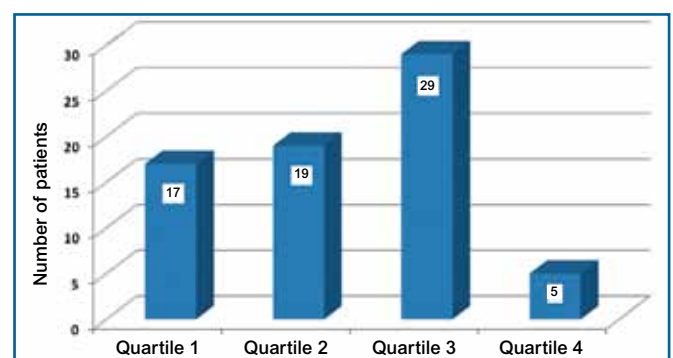


Figure 2: Distribution of patients according to quartiles of the BODE index

## Discussion

The first concerns regarding the quality of life of COPD patients emerged in the 1970s. Stewart et al.[7] studied the role of long-term oxygen therapy in improving the daily activities of patients; the patients kept a diary which to indicated improvements in daily tasks. Since then, clinical

| | Values | Percentage |
|---|---|---|
| **Symptoms** | 177.1±90.1 | 26.7±13.6% |
| **Activities** | 833.3±195.6 | 68.8±16.2% |
| **Impacts** | 1038.5±303.3 | 49.0±14.4% |
| **Total score** | 2048.9±523.3 | 50.8±14.0% |

*Table 2: Summary of the total SGRQ score and its domains*

studies have followed and the results showed negative changes in mood and social behaviour of patients with COPD, similar to those found in studies of hypoxaemia.

Some generic scales of quality of life were assessed for COPD patients to study their validity for this type of pathology. The SGRQ was first developed in 1983 by Jones et al. and the final version contains 76 items divided into three domains: 'symptoms' (respiratory symptoms, their frequency and severity), 'activity' (activities that cause or are limited by breathlessness), and 'impacts' (these cover a wide range of aspects involved in the disruption of social functioning and psychological damage resulting from the respiratory tract disease).[8] However, specific questions designed to measure anxiety and depression were excluded. This questionnaire is designed specifically for patients with respiratory disease and all its items relate more or less directly to the symptoms of these disorders (shortness of breath, wheezing)[6] or their impact on daily life. For the evaluation of the effectiveness of a therapeutic action on the quality of life, a variation of 4 points in the total score or domain score is considered significant.

The health-related quality of life in COPD seems to vary according to the severity of deterioration in $FEV_1$. Stage I has little effect on the quality of life, whereas stages II and III are associated with a severe deterioration in quality of life.[9] Previous studies that have investigated the relationship between $FEV_1$ and health-related quality of life have had important limitations. Prigatano et al.[10], McSweeny et al.[11] and Alonso et al.[12] found no significant link between the quality of life and $FEV_1$ (% predicted). However, these authors used generic measures of quality of life that are less sensitive than specific questionnaires for the detection of certain changes in the quality of life.

Ketelaars et al.[13] studied the quality of life of 126 patients with COPD. Their study population had a post-bronchodilator $FEV_1$ of 39±18%. A significant relationship was found only with the 'activity' domain of the SGRQ (p<0.01 and r = -0.24). However, this study has some limitations including the inclusion of patients in advanced stages of their disease and the lack of staging based on the severity of their pathology.

The clinical significance of measuring quality of life in patients with stage I disease is difficult to assess, but it seems very important from a quantitative point of view, given the number of patients at this stage. On the other hand, the study of Ferrer et al.[14] found a difference in the quality of life score of 13% among patients with stage I disease and the reference group (those in a healthy condition), and this difference was clinically relevant. Similarly, the relationship between the stage of severity according to the ATS classification and the total score of the SGRQ and its different domains was significant with correlation coefficients ranging from 0.27 to 0.51.

Recent studies have demonstrated a significant relationship between disease severity and quality of life in COPD. The study of Ståhl et al.[15] involved 168 patients treated for COPD and showed a significant relationship between quality of life and $FEV_1$ (p<0.001) with a good correlation (r=-0.34); however, the correlation of $FEV_1$ with the different domains of the SGRQ has not been studied, and neither has the change in quality of life with the different stages of GOLD.

Antonelli-Incalzi et al.[16] studied 381 patients with COPD and found a significant relationship between the SGRQ score and $FEV_1$, with a correlation coefficient of r=-0.46. A dramatic worsening of health status was found with increasing GOLD stages (Wilk's $\lambda$ 0.85, p<0.001). However, with an $r^2$ value of 0.21, it appeared that the severity of airway obstruction only explains a fifth of the variance observed in health status as evidenced by the total score of the SGRQ.

In our study, the link between $FEV_1$ and SGRQ was significant with a relatively high correlation (r=-0.28 to -0.43) according to the SGRQ domains. Progression through the stages of GOLD is associated with degradation of the quality of life related to health (Wilk's $\lambda$ 0.81, p=0.004).

COPD is a complex disease with significant systemic manifestations that are not accounted for using only the measurement of lung function. Thus, several publications have concluded that $FEV_1$ is probably not the best marker of the severity and prognosis of COPD.[17-19] However, it is the basis for the classification in the different stages of severity mentioned by the majority of scientific societies.[20,21] The National Institute for Clinical Excellence (NICE)[21] was the first scientific society to insist that body mass index, dyspnea, and walking distance in 6 minutes were simple elements, which must be integrated in the evaluation of patients with

| | | Correlations coefficient (r) | Significance (p) |
|---|---|---|---|
| **Total score** | BODE | 0.56 | <0.001 |
| | $FEV_1$ | -0.37 | 0.001 |
| **Symptoms** | BODE | 0.44 | <0.001 |
| | $FEV_1$ | -0.33 | 0.004 |
| **Activities** | BODE | 0.60 | <0.001 |
| | $FEV_1$ | -0.43 | <0.001 |
| **Impacts** | BODE | 0.47 | <0.001 |
| | $FEV_1$ | -0.28 | 0.018 |

*Table 3: Significance and correlation coefficients between BODE index, $FEV_1$ and SGRQ score*

COPD and can provide a more reliable representation of the various extra-pulmonary manifestations. It is therefore no coincidence that all these factors have been combined since 2004 as a clinical score called the BODE index which has been evaluated as a prognostic factor in COPD.[5]

The attraction of the BODE index is that it provides additional information other than $FEV_1$, thus reflecting the systemic impact of COPD.[18,22,23] Studies have confirmed that the BODE index is highly correlated with the degree of systemic inflammation, especially oxidative stress.[23,24] In the current study, the multidimensional BODE index was more strongly correlated with the quality of life than lung function alone.

Ong et al.[24] observed an important evolutionary turning point in health status between patients with GOLD stages III and IV without significant changes in SGRQ total score marking the progression of COPD from stage I to stage III. This study also found, in agreement with the GOLD classification, significant differences in the quality of life related to health between higher quartiles (quartiles 3 and 4) of the BODE classification system. This difference was not found between quartiles of consecutive lower grades. This suggests that the health status of COPD patients may be relatively preserved until later stages. Therefore, efforts must be taken to prevent disease progression even in severe COPD to avoid a dramatic decline in health status.

## Conclusion

$FEV_1$ is correlated with health-related quality of life measured by the SGRQ, but the multidimensional BODE index is more reliable for measuring the impact of COPD on quality of life. Thus, although the $FEV_1$ is a simple way of assessing the severity of COPD, it should not be used alone to appreciate the impact of COPD.

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# Original Article

# A descriptive study of patients admitted with acute exacerbation of chronic obstructive pulmonary disease in three hospitals in Cape Town, South Africa

### L Pienaar, M Unger, and S Hanekom

## Abstract

The aim of this study was to determine the profiles and outcomes of patients hospitalised with acute exacerbation in the northern suburbs of the Cape metropolitan area, South Africa. Although published reports concerning the prevalence and risk factors of chronic obstructive pulmonary disease (COPD) are available in South Africa, very little is known about the profile and admission frequency of patients hospitalised with acute exacerbation of COPD. This study reviewed the medical records of patients hospitalised in two state hospitals (tertiary and secondary) and one private hospital from 1 June 2004 to 1 June 2005. The information obtained retrospectively included demographics, co-morbidities, re-admission frequency, and length of stay.

A total of 178 patient records were reviewed, significantly less than the 730 records identified as suitable. The mean age of patients hospitalised with acute exacerbation of COPD was 63 years (SD=12); patients were predominantly males, 66% (117) were ex-smokers while 34% (61) continued to smoke during the study period. The majority (78%) of patients had at least one co-morbidity. Patients with two or more co-morbidities had an increased risk for readmission (p=0.02). In the 12 months, between 1 and 8 admissions were recorded per patient, resulting in 338 hospitalisations; 56% of the patients were hospitalised once in the study period, 25% twice, and 19% three times. Most of the readmissions occurred at the secondary level hospital. Patients admitted to the tertiary hospital were more likely to be re-admitted: mean 2.3 admissions compared with <2 admissions at the secondary hospital. There were no significant differences in hospitalisation frequency, length of stay, and presence of co-morbid diseases for patients hospitalised at the three hospitals, which provide healthcare to a range of socio-economic groups. The study concluded that re-admission with acute exacerbation was common among a substantial proportion of COPD patients. Patients with co-morbid disease were more at risk of re-admission.

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## Introduction

Acute exacerbation usually refers to deterioration in the patient's clinical status, with worsening of respiratory symptoms beyond the normal day-to-day variation experienced by the patient, requiring medical intervention.[1] These episodes may contribute significantly to the burden of lung disease.[2] At the healthcare level, there is escalation in medical resource utilisation and cost; at the individual level there is loss of income, increased physical disability, and social isolation, as well as increased risk of mortality.[3] Significantly, the presence of co-morbidities such as cardiovascular disease can influence the course of chronic obstructive pulmonary disease (COPD) and can result in more hospitalisations.[4]

Research encompassing pertinent data (such as demographic profile, admission frequency, and length of hospital stay) for patients hospitalised with acute exacerbation has been conducted in developed countries in an attempt to determine the impact of acute exacerbation.[5] In a retrospective, multicentre study, Bahadori and Fitzgerald et al. found a high re-admission frequency with variability of re-admission rate among the hospitals in the study.[6] In a prospective study, Kessler et al. established that co-morbidities such as pulmonary hypertension and hypercapnia affected hospital admission.[7] In 2001–2002, COPD accounted for more than 500 000 hospitalisations in the United States alone and $20.9 billion in direct healthcare costs, hence the disease represents a significant economic burden.[8,9] Currently there is very little published data concerning COPD and the frequency of admissions due to acute exacerbation for COPD patients in sub-Saharan Africa.[9,10] In Africa, and South Africa in particular, limited evidence is available on hospitalisations although evidence of the increasing prevalence of the disease has been published.[11]

The South Africa Demographic and Health Survey 2003 provided evidence of the developing lung disease amongst men and women in the Western Cape. In the survey, males in the Western Cape had the second highest percentage of self-reported chronic bronchitis and asthma at 3.4% and 5.7% respectively and females had the third highest percentages at 5.7% and 8.9%.[12,13] The BOLD study in 2007 further revealed a high prevalence of moderate to severe COPD (stage II and higher) in Cape Town at 19.1%. Cape Town was one of four cities (the others being Krakow in Poland, Lexington in USA, and Manila in the Philippines) that have the highest proportion of patients with moderate to severe COPD out

of a total of 12 cities worldwide in the study.[14]

In addition, South African mortality data provide evidence of the burden of disease on the population: COPD featured in the top 20 causes of death in South Africa in 2000 with 113 499 deaths from the total of 11 967 822, and a resultant 0.9% years of life not lived due to premature mortality for male and females.[15] In the Western Cape in particular, COPD accounted for 3.8% of deaths from a total of 41 547, and 2.1% of the years of life lost.[16]

This study, therefore, is an attempt to learn more about healthcare utilisation and the characteristics of patients hospitalised with acute exacerbation within the setting of a developing country. This study aimed to profile COPD patients in the Cape metropolitan area who had been hospitalised with acute exacerbation in state and private institutions. South Africa has a divided economy, which is evident through the utilisation of two different types of healthcare systems, i.e. private medical facilities and Government-funded facilities. Private healthcare caters for a small percentage of patients who are able to pay for these services. However, the majority of South Africans, who have lower incomes, use state-funded medical facilities. The institutions included in the study are representative of the healthcare accessed by the different socio-economic groups in South Africa.

The Health Research Ethics Committee of Stellenbosch University (N05/07/118) approved this project and all the relevant authorities granted permission. No patients were contacted.

## Methods

All hospitalisations at the three hospitals between 1 June 2004 and 1 July 2005 were included in the study. The variables that were investigated retrospectively included age, gender, smoking habits, and the presence of co-morbidities; this made it possible to create a profile of patients who were hospitalised with acute exacerbation in the northern suburbs of the Western Cape. Patient outcomes were assessed based on re-admission frequency and length of stay for the different hospitals. We elected to investigate the above characteristics as opposed to mortality (in hospital or after hospitalisation) to learn more about the factors that may influence re-admission.[17]

We used a sample of convenience for this study comprising one tertiary, one secondary, and one private hospital in the northern suburbs of Cape Town. The state hospitals comprised one (270-bed) secondary and one (1300-bed) tertiary hospital and serve communities surrounding the hospitals in the northern suburbs of Cape Town. The secondary hospital provides services such as trauma and emergency care, in-patient care, outpatient visits, and paediatric and obstetric care services. Critical patients are usually referred to the tertiary hospitals as these hospitals have the specialised equipment and staff to deal with complex medical cases.

The tertiary hospital serves a dual function, being a teaching hospital for health sciences students while also providing healthcare to communities from the surrounding areas. In contrast, although the private healthcare facility provides services to patients from areas surrounding the hospital, it is not limited to those areas.

Patients were included in the study following a diagnosis of COPD, emphysema, or chronic bronchitis as recorded in their medical folders. However, patients who were discharged from the emergency department within 24 hours of treatment and those who had died within 24 hours of admission were excluded from the study.

At the time of data collection, the International Classification of Disease ICD-10 with the relevant code assigned to acute exacerbation was not uniformly used to record patient diagnosis in the hospitals.[18] In order to overcome this lack of uniformity we used a two-step process to identify eligible patients as follows:

- Firstly, the principal investigator reviewed the admissions list for each of the hospitals for the period 1 June 2004 to 1 June 2005 and recorded all admissions of patients presenting with symptoms of acute exacerbation of COPD. Identifiable symptoms included complaints of dyspnoea, increase in sputum, bronchospasm, infection, pneumonia, cough, new arrhythmia, and deterioration in mobility.[19]
- Secondly, we sourced the medical folder from the records department and if the admission diagnosis by the attending doctor concurred with the existing diagnosis of COPD, the patient was included as a study participant and we extracted all relevant data from the medical folder.

The principal investigator was responsible for the extraction of all the data, using a self-designed data extraction form. All pertinent information concerning the admission was extracted from the patient's medical records. These included the nurses' notes reflecting vital signs and blood gas results, and the doctor's notes documenting the clinical status of the patient and the prescription chart.

Analysis of the data was conducted in consultation with a statistician, using Statistica Version 9 (Statsoft, Tulsa, Oklahoma, USA). We report central tendencies as means and data variability as standard deviations, when distributed normally. When not distributed normally we report medians and inter-quartile ranges. Histograms and pie charts are used to present descriptive data. Student's t-test was utilised to compare the groups for continuous variables while the Chi-squared test or Fisher's exact test were used for categorical variables (when appropriate). The analysis showed significant differences between groups or across groups at the alpha level of 0.05 with all reported p-values being two-sided. Analysis included variables (age, gender, smoking, co-morbid conditions) with less than 10% missing data.

## Results

In all, 730 medical folders were requested from the three hospitals reviewed in this study (tertiary 221, secondary 423, private 86). From this, we managed to review

the medical records of 178 patients (24%) who fulfilled the inclusion criteria, which is considerably less than we anticipated (tertiary 28, secondary 119, private 31). The remaining 552 subjects were excluded because their records were unobtainable from the medical records departments, or they did not meet the inclusion criteria, or, in the case of state hospitals, the medical records were illegible. The latter problem arose because some records had been converted to poor-quality microfilms, rendering the records unreadable and unusable for this study.

The demographic profiles of the 178 patients are depicted in Table 1. Patients admitted with acute exacerbation were predominantly male, and all had a history of smoking cigarettes. The age range varied from 30 to 95 years, but 29% of patients were between the ages of 65 and 75, and 56% were younger than 65 years of age. Patients in the private hospital were slightly older (mean, 65 years) than patients at the public hospital (means, 63 and 62 years respectively).

| Demographic | Classification |
|---|---|
| Number of patients | 178 |
| Mean age (years) (±SD) | 63 (±12) |
| Gender (male:female) | 103:75 |
| History of smoking | 178 (100%) |
| Current smokers (yes:no) | 117:61 |

Table 1: Demographics of all patients on entry into study

The admission frequency ranged from 1 to 8, during which time 338 re-admissions were recorded for the 178 patients, with those patients admitted twice or more (n=78) contributing to the majority of re-admissions. Neither age nor gender were associated with risk for re-admission. Table 2 describes the age, gender, days in hospital (length of stay (LOS)), and co-morbid conditions for the COPD patients admitted with acute exacerbation in relation to the admission frequencies.

Most of the re-admissions occurred at the secondary hospital (n=221); 56 re-admissions occurred at the private hospital; 61 readmissions occurred at the tertiary hospital. Patients admitted to the tertiary hospital were more likely to be re-admitted, mean of 2.3 re-admissions compared with <2 re-admissions at the secondary hospital; however, this was not significant (p=0.49). Although the mean age of the patients at the private hospital was slightly higher (65 years) than individuals at the secondary and tertiary hospitals (means, 63 and 62 years, respectively) this was not associated with higher re-admission rates (p=0.28). There was no significant difference in LOS between the hospitals.

There were a total of 78% of patients with reported co-morbidities. Figure 1 depicts the co-morbidities recorded at the beginning of the study, with hypertension occurring most often amongst the patients. Patients with two or more co-morbidities were more likely to be re-admitted to hospital three or more times (p=0.02). Specifically, patients with congestive cardiac failure were more likely (p=0.01) to be admitted three or more times. No other co-morbid conditions were associated with a higher risk for readmission.

## Discussion

Limited data exist on the profile of patients hospitalised in South Africa with acute exacerbation of COPD. This study thus provides data on the profile and outcomes of patients admitted with acute exacerbation of COPD in public and private health institutions in Cape Town. We recorded data for all patients admitted to hospital for more than 24 hours. It should be noted that the argument by Weiss et al. (2003) that a hospital stay of less than 24 hours suggests that the exacerbation was not severe enough for admission does not hold for South Africa's public healthcare system, where limited bed space could hinder hospitalisation.[20] For this reason, comparisons between admissions of less than and greater than 24 hours were not conducted in this study, which focused more pertinently on patient demographics, co-morbidities, and smoking history. This study also focuses on and records the number of re-admissions of patients within the 1-year study period as well as the LOS for each admission.

A pertinent finding is that no difference was recorded in the outcomes or profiles of patients admitted with acute exacerbation in state and private institutions in the northern metropolitan area. This suggests that patients across these different sectors in the study are exposed to a range of risk factors associated with the development of COPD, most commonly tobacco smoking, and most likely of variable intensity. However, some variations among the risk factors in affluent and non-affluent communities

| Admission frequency | No. of patients (n=178) (male:female) | Age, median (25-75% IQR) | Days in hospital, median (25-75% IQR) | Co-morbidities, median (25-75% IQR) |
|---|---|---|---|---|
| 1 | 100 (57:43) | 61 (52:71) | 4 (3–7) | 1 (1–2) |
| 2 | 44 (30:14) | 66 (59-71) | 4 (3–6) | 1 (0–2) |
| ≥3 | 34 (16:18) | 65 (56-73) | 5 (3–7.5) | 1 (1–2) |
| IQR: interquartile range | | | | |

Table 2: Days in hospital, age, gender, and co-morbidities in relation to the number of admission frequencies
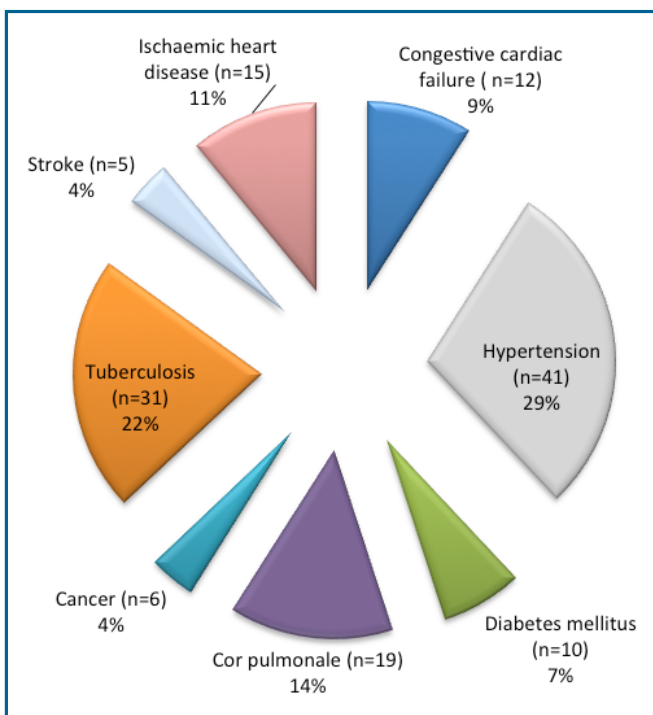
*Figure 1: Percentage of patients with co-morbid conditions at entry into the study*

do exist, contributing to differences in the risk profiles of these groups. The identification of patients as young as 30 years with acute exacerbation is surprising because COPD generally occurs well above this age. The possibility exists that the similarity in symptoms to other respiratory disease such as asthma could have contributed towards a misdiagnosis.[19,20] As the information was obtained retrospectively, we relied on the clinical information within the medical folder to verify the diagnosis of acute exacerbation of COPD.

As expected, all patients had a history of smoking. However, it was disconcerting to find that almost a third of patients admitted with an acute exacerbation of COPD elected to continue smoking. This in itself may not increase the risk for hospital admission, but it certainly increases the severity of the disease process, which affects risk of re-admission. Both the growing use of tobacco smoke among younger people in South Africa and the effects of industrialisation in developing economies are of great concern.[21–23]

A study by Fletcher et al. of patients aged between 45 and 67 years found that the financial loss due to lost working hours was substantial. Significant too is the fact that a large percentage of the patients in the study retired before their actual retirement age due to poor health.[24] In our small study, we found that a large proportion of patients younger than 65 years, which is generally considered the retirement age for males in South Africa (60 years for females), were admitted with an acute exacerbation at least once during the study period. This may be indicative of an emerging burden of disease affecting the working age population.

Of significance, patients with two or more co-morbid

diseases, particularly congestive cardiac failure, had an increased risk of admission compared with patients with one or no co-morbidities. These results are similar to the study by Miravitlles et al. who found that diabetes mellitus and cardiac disease increased the risk of hospital admission.[25] These findings also surface in a prospective longitudinal study by Terzano et al. who found evidence of increased hospital admission relating to cardiovascular disease in their study cohort.[26]

Given the multi-cultural and diverse socio-economic society that exists in South Africa, with all its accompanying lifestyle and dietary differences, the expectation was that the results yielded would mirror these differences. However, surprisingly, the co-morbid diseases observed in this study of patients hospitalised with acute exacerbation in both the private and state hospitals, correlate with findings from studies conducted in developed countries.[26,27] These findings may well be attributed to lifestyle influences transmitted from developed countries to developing countries and suggests that the far-reaching effects should not be under-estimated.

Of the 338 hospital admissions recorded over the 1-year study period, individual admissions varied between 1 and 8 admissions per patient. It should be noted that a substantial percentage (44%) of patients demonstrated significant health care usage, as they were re-admitted twice or more during the 1-year period. This is similar to the findings reported by Cao et al., which showed 46% of patients were readmitted twice or more in 1 year.[28] These frequent exacerbators exact a huge financial burden on the healthcare system, as hospitalisation may be necessary to manage episodes of acute exacerbation in patients with moderate to severe lung disease. The findings by Oostenbrink and Rutten-van Mölken, a Belgium and Netherlands study, confirm the economic consequences. They found the majority (90%) of the total healthcare costs aimed at managing mild, moderate or severe exacerbations were due to hospitalisation for such an episode.[29] The potential economic impact of these hospitalisations could be substantial both for the patients themselves and for developing countries, in terms of loss of income and loss of productivity. Further studies should be carried out to determine the socio-economic implications of frequent hospitalisations in resource-constrained healthcare settings.

Notwithstanding a huge effort on our part to conduct as exhaustive a study of COPD patients hospitalised with acute exacerbation as possible, this study has certain limitations. In addition to problems with identifying COPD patients due to poor use of a diagnosis or the ICD-10 code, we had to exclude many patients when two requests to the medical record department produced no results or when the records were illegible. Since we could not conclusively verify the diagnosis of acute exacerbation without the medical records, these aforementioned factors led to the small sample of records reviewed in the study. Hence, we cannot assume that our sample of patients is fully representative of all patients hospitalised with acute exacerbation in the Western Cape, although

we also have no reason to believe that our sample was seriously biased.

## Conclusions

This study has sought to determine the profile and outcomes of patients hospitalised with acute exacerbation within different healthcare settings of the northern suburbs of the Cape metropolitan area. From the study, we conclude that there are no significant differences in outcome for patients admitted to the three hospitals under review that provide different levels of healthcare for a range of different socio-economic groups.

Furthermore, because hospitalisations may vary across hospitals in the same city, it is vital that hospitals document, monitor, and respond to disease patterns within the communities they service, in an attempt to reduce the impact of chronic diseases.

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# A preliminary assessment of nurses' asthma education needs and the effect of a training programme in an urban tertiary healthcare facility

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## Abstract

Nurses are important partners in the provision of quality healthcare to asthma sufferers worldwide. However adequate attention has not been given to asthma education among various health professionals, and in particular nurses, in our environment where most patients do not have access to qualified medical practitioners. The aim of the current study was to assess the knowledge of nurses, evaluate their skills and competency on asthma treatment and also to assess the impact of a training programme. Seventy-eight nurses were recruited from relevant departments that were involved in asthma care in a tertiary health institution in Lagos, Nigeria. A one-day training programme was carried out with a pre- and post-test evaluation. The training included didactic lectures on the pathogenesis, presentation , and management of asthma and hands-on training sessions on various drug delivery devices used in asthma care and the use of a peak flow meter.

The mean age of the nurses was 46.59±8.30 years and the mean duration of practice was 21.69± 9.86 years. At pre- test, nurses' knowledge and use of the peak flow meter was fair with 48 (61.5%) reporting its usefulness in asthma monitoring while only 17 (21.8%) had used a peak flow meter prior to the training. The use of spacers was very low with only 3 (3.8%) having used one previously. The training resulted in all the nurses 75 (100%) being able to effectively handle and use the peak flow meter. At the end of the training, there was a statistically significant increase in their knowledge.

The pre-test knowledge of the nurses about drug delivery devices and peak flow meters was poor and inadequate, but with the training these metrics were significantly improved. We recommend that a structured course on asthma management, to include hands-on training with various devices and the peak flow meter, should be put in place and made accessible to all nurses who attend to patients with asthma.

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## Introduction

Asthma is one of the most common chronic diseases; it is estimated to affect about 300 million people worldwide.[1] In Nigeria it is estimated to affect about 10.7% of the population.[2] Nurses are an important part of the team providing care to affected individuals. Nurses are often more widespread, and are available in all tiers of health facilities and also in the communities; as such they are the first line of contact for sufferers, particularly during acute crises at home or in healthcare facilities. It is therefore expected that nurses themselves have adequate knowledge about this condition.

Asthma is a frequent cause of hospital visits and absenteeism from school and work; poor control therefore has a negative impact on the patient's quality of life. It is known that the symptoms of asthma can be effectively managed by using appropriate medications properly delivered with adequate attention to trigger factors in the environment, including avoidance of allergens and adherence to treatment for maintenance. In a study conducted among asthma patients, poor inhaler technique was identified as a major hinderance to achieving optimal control,[3] thus adequate training of nurses on inhaler techniques and use of other devices may help improve outcomes in these patients.

The nurses' knowledge will obviously influence the quality of care and the standard of the health education provided to these patients, particularly in our environment where there is a shortage of health educators.[3] This study was therefore conducted to assess the knowledge of nurses about asthma, to evaluate their skills and competency in the treatment of asthma, and to assess the effect of a training programme in an urban tertiary healthcare facility.

## Method

This study was a cross-sectional quasi-intervention study carried out in a tertiary hospital located in Lagos, south-west, Nigeria. The centre is a 600-bed hospital located in a densely populated area of Lagos and receives substantial numbers of asthma cases both in the outpatient department and as in-patients. It has about 500 nurses distributed unevenly throughout its various departments. The participants of the study were nurses from all the departments where asthma patients were likely to be treated.

The teaching materials used in the education programme were developed from the Global Initiative

# Original Article

for Asthma (GINA) guidelines for the management of asthma.[2,3] Two respiratory physicians, a community physician, a pharmacist, and a nurse educator designed and conducted the training. The facilitators gave lectures on asthma aetiology, clinical features and management of chronic asthma, acute severe asthma management, drug delivery devices in asthma care, as well as nursing care plans for patients with asthma. Each session lasted about 30 minutes. There were demonstrations of the use of peak flow meters, meter dose inhalers, turbohalers, and diskus, and the use of volumatics as well as nebulisers. The participants were also split into groups for hands-on training in the use of the devices. Nurses were also given take-home instructional materials. The training lasted 5 hours, i.e. 3 hours of lectures and 2 hours of practice.

The effectiveness of the asthma education programme was evaluated by the use of a questionnaire which was administered before and after the course. The questionnaire consisted of 33 questions which were divided into four sections. Section one described the demography of the respondents while section two focused on asthma aetiology and pathophysiology; section three evaluated asthma treatment and section four evaluated confidence, training, and health education knowledge.

The data collected were analysed with SPSS software version 19. Descriptive statistics were used to describe the demographic characteristics of the nurses. Continuous variables were expressed as means±standard deviation while categorical variables were expressed in proportions. Comparison of unpaired categorical variables was carried out using the chi-square test. Paired dichotomous data were compared using Student's t-test. A p-value of <0.05 was taken as significant.

Ethical clearance was obtained from the institutional review board as well as from the nursing directorate. Verbal informed consent was obtained from the participants prior to the training.

## Results

### Demography of participants

A total of 78 nurses participated in the training and took the pre-test, while only 76 participated in the post-test. The mean age of the nurses was 46.59±8.3 years. The mean duration of practice as a nurse was 21.69±9.86. years. About one-quarter of the participating nurses were from the Department of Medicine (21(26.9%)), 13

| Statements | Pre-test frequency (%) (n=78) | Post-test frequency (%) (n=75) |
|---|---|---|
| **Asthma is a chronic inflammatory disorder of the airways** Yes No Don't know | 62 (79.5) 10 (12.8) 06 (7.7) | 75 (100) |
| **Asthma is a disease characterised by airway hyper-responsiveness** Yes No Don't know | 74 (94.9) 02 (2.6) 02 (2.6) | 75 (100) |
| **Asthma is a non-communicable disease** Yes No Don't know | 70 (89.7) 06 (7.7) 02 (2.6) | 69 (92.0) 06 (8.0) |
| **Asthma is a disease with widespread airway narrowing** Yes No Don't know | 74 (94.9) 01 (1.3) 03 (3.8) | 75 (100) |
| **Patients could have chronic cough** Yes No Don't know | 60 (76.9) 13 (6.7) 05 (6.4) | 74 (98.7) 01 (1.3) |
| **Patients present with chest tightness** Yes No Don't know | 77 (98.7) 01 (1.3) | 75 (100) |
| **Wheezing occurs in asthma** Yes No Don't know | 77 (98.7) 01 (1.3) | 75 (100) |
| **Patients have episodic breathlessness** Yes No Don't know | 77 (98.7) 01 (1.3) | 75 (100) |

*Table 1: Nurses' knowledge of asthma definition and symptoms*

(16.7%) were from Surgery, while 11 (14.1%) were from the Paediatric Department; 8 (10.3%), 7 (9.0%), and 6 (7.7%) were from the Obstetrics, Critical Care, and emergency units, respectively.

## Asthma definition and presentation

The pre-test and post-test knowledge of the nurses about asthma definition and clinical presentation are shown in Table 1. The majority of the nurses 62 (79.5%) agreed that asthma is a chronic inflammatory disorder while a good number had adequate knowledge about the definition of asthma with 62 (79.5%) agreeing that it is a chronic inflammatory disorder of the airway. Seventy-four (94.9%) nurses knew that asthma is a disease characterised by airway hyper-responsiveness. However, following the training there was a stastistically significant improvement in the knowledge of nurses regarding the definition of asthma definition (p<0.001).

Regarding the symptoms of asthma, the majority of the nurses 77 (98.7%) knew that chest tightness, episodic breathlessness, and wheezing were modes of presentation; a much lower number (60 (76.9%)) knew that chronic cough could also be a symptom of asthma. This knowledge improved to almost 100% following the training.

Evaluating the knowledge of the nurses about trigger factors showed that all the nurses knew that exposure to allergens may be a trigger factor; exercise was mentioned by 74 (94.9%), while respiratory infections, cold air exposure, and certain drugs were regarded as trigger factors by 68 (87.2%), 71 (91%), and 66 (84.6%) respectively. These percentages increased with training.

The majority of the nurses were aware of the association between asthma and allergic rhinitis and sinusitis, this was noted by 66 (84.6%) and 66 (84.6%) nurses respectively. About half, 41 (52.6%) and 33 42.3%), knew that asthma could be associated with allergic conjunctivitis and atopic dermatitis respectively. At the end of the training 66 (88%) knew that asthma could be associated with atopic dermatitis (Table 2).

The knowledge of the nurses about good asthma control was also evaluated (Table 3). There was a significant improvement in the knowledge of the nurses about good asthma control after the training.

## Use of peak flow meter

Knowledge about the use of peak flow meter was noted to be very low among the nurses. The majority of the nurses 45 (57.7%) had never seen a peak flow meter before while only 16 (20.5%) had used a peak flow meter previously. Seventeen (21.8%) had seen a peak flow meter, but never used one; 48 (61.5%) nurses knew that peak flow meter was useful in monitoring asthma.

## Medications in asthma

Table 4 shows the nurses' knowledge about medications

*Table 2: Nurses' knowledge of the trigger factors and associated conditions*

| | Pre-test frequency (%) (n=78) | Post-test frequency (%) (n=75) |
|---|---|---|
| **Trigger factors** | | |
| **Respiratory infections** | | |
| Yes | 68 (87.2) | 75 (100) |
| No | 07 (9.0) | |
| Don't know | 03 (3.8) | |
| **Exposure to allegens** | | |
| Yes | 78 (100) | 75 (100) |
| No | | |
| Don't know | | |
| **Exercise** | | |
| Yes | 49 (62.8) | 68 (90.67) |
| No | 19 (24.4) | 07 (9.33) |
| Don't know | 09 (11.5) | |
| **Exposure to cold air** | | |
| Yes | 71 (91.0) | 75 (100) |
| No | 04 (5.1) | |
| Don't know | 03 (3.8) | |
| **Drugs** | | |
| Yes | 66 (84.6) | 74 (98.7) |
| No | 03 (3.8) | 01 (1.3) |
| Don't know | 09 (11.5) | |
| **Pollutants** | | |
| Yes | 74 (94.8) | 75 (100) |
| No | 02 (2.6) | |
| Don't know | 02 (2.6) | |
| **Associated conditions** | | |
| **Allergic conjunctivitis** | | |
| Yes | 41 (52.6) | 70 (93.3) |
| No | 24 (30.8) | 03 (4.0) |
| Don't know | 13 (15.7) | 02 (2.6) |
| **Allergic rhinitis** | | |
| Yes | 66 (84.6) | 72 (96.0) |
| No | 05 (6.4) | 03 (4.0) |
| Don't know | 07 (9.0) | |
| **Atopic dermatitis** | | |
| Yes | 33 (42.3) | 66 (88.0) |
| No | 25 (32.1) | 04 (5.3) |
| Don't know | 20 (25.6) | 05 (6.7) |
| **Allergic sinusitis** | | |
| Yes | 66 (84.6) | 72 (96.0) |
| No | 08 (10.3) | 02 (2.7) |
| Don't know | 04 (5.1) | 01 (1.3) |

used in asthma patients. A large percentage (70 (89.7%)) knew that asthma medications included relievers and controller medications and this improved with training. Also, 61(78.2%) knew that inhaled corticosteroids are controller medications in asthma while 62 (79.5%) agreed that inhaled steroids are anti-inflammatory. About half (44 (56.4%)) of the nurses knew that β-agonists were short- and long-acting while about one-third (26 (34.3%)) of the nurses did not know that short-acting β-agonists were reliever medications and are useful in acute episodes (29 (37.2%)). Less than half, 33 (42.3%), knew that oral steroids could be given during acute exacerbations. The majority of the respondents (66 (84.6%)) knew that asthma medications were best given by the inhaled route. The knowledge of medications increased after the training.

## Use of drug delivery devices
Nebulisers were the most frequently used device by the nurses, 64 (82.1%). One-third, 24 (30.8%), of the respondents had used a meter dose inhaler device for their patients. Seven (9%) and 11 (14.1%) had used turbohalers and accuhalersfor their patients respectively, while only 3 (3.8%) had used a spacer previously.

## Self-rating of confidence of nurses at managing asthma
Prior to the training, less than half of the nurses (36 (46.2%)) reported that they had enough knowledge to manage asthma effectively, with 23 (29.5%) of them confident of being able to demonstrate the use of an inhaler; this increased to 73 (97.3%) following training. Twenty-eight (35.9%) of the nurses claimed that they demonstrate the use of inhalers to their patients. The majority of the nurses (59 (75.6%)) had received no training on asthma care since leaving school. The majority of the nurses (74 (94.9 %)) also agreed to participate in future continuing medical education (CME) on asthma care.

## Provision of health education
Many of the nurses (58 (74.4%)) provided health education to their patients about asthma. All the nurses agreed that asthma health education should include advice on avoidance of smoking. Seventy-six (97.4%) of the respondents would tell their patients to avoid known allergens, including exposure to fumes and dust; 61 (78.2%) would tell their patients to keep the house free from cockroaches.

## Emergency asthma care
Sixty-eight (87.2%) nurses agreed that oxygen should be given in acute asthma, while 66 (84.6%) knew that

| Variables | Pre-test frequency (%) (n=78) | Post-test frequency (%) (n=75) |
|---|---|---|
| **No limitation of activities** | | |
| Yes | 51 (65.4) | 66 (88) |
| No | 23 (29.5) | 07 (9.3) |
| Don't know | 04 (5.1) | 02 (2.6) |
| **No emergency visit** | | |
| Yes | 49 (62.8) | 68 (90.6) |
| No | 22 (28.2) | 07 (9.3) |
| Don't know | 07 (9.0) | |
| **No night time awakening** | | |
| Yes | 58 (74.4) | 68 (90.6) |
| No | 14 (17.9) | 07 (9.3) |
| Don't know | 06 (7.7) | |
| **No absenteeism** | | |
| Yes | 59 (75.6) | 68 (90.6) |
| No | 14 (17.9) | 07 (9.3) |
| Don't know | 05 (6.4) | 0 |
| **No need for frequent rescue medications** | | |
| Yes | 51 (65.4) | 60 (80) |
| No | 23 (29.5) | 13 (17.3) |
| Don't know | 04 (5.1) | 02 (2.6) |

Table 3: Nurses' knowledge of good asthma control

intravenous hydrocortisone is indicated in emergency asthma care. Over 90% knew that salbutamol is nebulised in emergency care and a similar number agreed to the use of intravenous aminophylline. This increased to 75 (100%) after the training. However, only 36 (46.2%) knew that ipratropium bromide could be used in acute care. This increased to 59 (78.7%) at the end of the training.

## Discussion
Nurses are an important component of healthcare provision to asthma patients worldwide. In Nigeria, nurses are found in most healthcare facilities and they are the personnel most frequently consulted for medical attention outside the hospital settings in our communities. This study highlighted the significance of CME and training for nurses as an integral part of achieving optimal asthma care. This training would update their knowledge about current trends and recent advances in asthma which will ultimately lead to improved patient care. This study demonstrated that significant improvements in knowledge of asthma definitions, symptomatology, triggers, and environmental factors occurred in nurses following a 5-hour training session. This is similar to the findings among Taiwanese public health nurses.[4] It was also noted that many of the nurses did not have adequate knowledge

about other atopic conditions which may have negative implications on the treatment outcomes of asthma patients who may also suffers from such conditions. Such patients may have several years of skin, nasal, or eye troubles without adequate attention being given to them.

The finding of poor knowledge and utilisation of the peak flow meter in this study is similar to the reports of the studies conducted elsewhere.[4-6] It is therefore very important that continuing asthma education for nurses and other healthcare professionals is given priority. There is also a need to make peak flow meters available in practices where asthma patients are managed.

Regarding medications in asthma, the nurses' knowledge increased significantly after the training. In this study we did not assess nurses' inhaler techniques by direct observation; however, the self-rated confidence on the use of inhalers was low. The nurses notably did not use many of the other devices. This may be due to the relative rarity of these devices compared with the metered dose inhaler. This finding is quite surprising as in the last few years there has been a relative increase in the availability of turbohalers and accuhaler-based medications for asthma in our environment. Adequate training of the nurses would have raised awareness of their availability. This further illustrates the need for greater education among nurses about medications and devices available for administration.

While metered-dose inhalers were very frequent in our practice, there were also a considerable number of patients who were unable to use the devices appropriately,[3] thus needing spacer devices; it was however of concern that the majority of our nurses were unaware of spacer devices and their use. This study highlighted the knowledge gaps that exist among the nurses regarding asthma care. The findings will form a basis for designing a more comprehensive asthma care education programme for nurses in Lagos, with the goal of improving their knowledge and providing better treatments with improved health outcomes for the numerous asthma patients whose treatments are handled by this group of healthcare practitioners.

While this study was conducted among nurses, it important to note that other healthcare professionals, particularly the pharmacist, may play a key role in delivering qualitative care to asthma sufferers. The effect of pharmacist education on asthma treatment plans has been found to be associated with better use of medications and improvement in patient outcomes.[7] In a study by Mehuys and colleagues in Belgium, pharmacist intervention – including education about asthma management, inhaler techniques, medication adherence, and smoking cessation – was effective in improving asthma control and related quality of life.[8]

This present study is limited to immediate recall and self-report. However, it has demonsrated the importance of a training programme for healthcare providers on asthma treatment and control. Further study should elicit long-term recall.

## Conclusion

This study showed that the nurses in the tertiary hospital studied had good knowledge about asthma definition, symptoms, and precipitating factors, and these improved with health education. The study also identified gaps in the knowledge of the nurses regarding asthma medications, drug delivery devices, and use of peak flow meters. The findings will form the basis for planning an appropriate health education intervention programme to improve the skills and competence of nurses in managing asthma appropriately.

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# Allergic sensitisation to common antigens among Ethiopian asthmatic patients

## K Gidey, A Adem, M Guizaw, K-H Franz , and A Potthoff

## Abstract

This review was conducted with the aim of identifying the allergic sensitisation patterns to common antigens among asthmatic patients and to assess for possible sociodemographic correlates. Records were reviewed retrospectively for patients who had undergone skin prick testing as part of a routine care for asthma between June 2012 and June 2013 at the Pulmonology clinic of Ayder Referral Hospital, Mekelle, Ethiopia. The records of 47 patients were eligible for the study and were hence reviewed. The mean age of these patients was 41.3 years. Skin prick testing was positive for one or more antigens in 53.2% of patients. The three most common positive antigen tests were for *Dermatophagoides farinae* (27.7% patients), *Dermatophagoides pteronyssinus* (25.5%), and dog hair (12.8%). The conclusions from the study are that allergic sensitisation among Ethiopian asthmatic patients was common and that house dust mites were the most commonest sensitisers. Further studies are recommended to investigate sensitisation for additional allergens and to better assess correlations with risk factors.

## Introduction

Asthma is one of the most common chronic diseases globally and currently affects approximately 10–12% of adults and 15% of children worldwide. The prevalence in developing countries has increased in recent decades due to increased urbanisation.[1,2]

Although there is lack of population-based prevalence reports in Ethiopia, a report in 1997 from Jimma (southwest Ethiopia) showed that 3.6% of the urban population in the area had asthma. Additionally, the overall prevalence of wheezes in rural areas was lower than in urban groups.[3] Another report in 2003 among school children from Gondar Town, Ethiopia showed a prevalence of 16.2%.[4] A more recent cohort of 1006 newborns who were followed for 5 years in the Butajira cohort study showed a prevalence of wheeze among 1 year olds (as reported by their mothers) of 11.5%.[5]

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With changes in lifestyle, the prevalence of asthma also changes, as seen from a 1999 report among Ethiopian immigrants in Israel. According to the report, 2.5% of the immigrants had asthma at the time of immigration and this figure increased to 17% after 8–17 years spent living in Israel.[6]

Asthma is a heterogeneous disease with interplay between genetic and environmental factors. Several risk factors and triggers are involved in the pathogenesis of asthma. Endogenous factors such as genetic predisposition, atopy, and airway hyper-responsiveness, and environmental factors such as indoor allergens, outdoor allergens, and occupational sensitisers etc. are all known to contribute. Many triggers have been identified – for example, allergens, upper respiratory tract infection, cold air, stress, irritants (household spray, paint fumes), etc.[1,7] In the Butajira birth cohort study, the incidence of wheeze and eczema was increased with early-in-life use of paracetamol,[8] but in a similar group of patients the incidence was lower among children with *Helicobacter pylori* infection.[9]

Most patients with asthma are atopic, with sensitisation to various allergens. Many allergens have been tested and identified worldwide, for example *Dermatophagoides farinae* and *Dermatophagoides pteronyssinus* (house dust mites), cat hair, dog fur, *Alternaria alternata* (*A. tenuis*), cockroach (*Blatella germanica*), olive (*Olea europaea*), and many others. The pattern of allergic sensitisation to different allergens is believed to differ from country to country.[10] To our knowledge there are no published data about patterns of sensitisation in northern Ethiopia.

Asthma is usually diagnosed clinically with history of cough, shortness of breath and with findings of diffuse wheezes on chest examination. Further investigations may include lung function tests to show any reversible obstructive features.[11] Skin prick testing is an essential test procedure to confirm sensitisation in immunoglobulin E (IgE)-mediated allergic disease in subjects with rhinoconjunctivitis, asthma, urticaria, anaphylaxis, atopic eczema, and food and drug allergies.[10]

The aim of this study was to assess common sensitising allergens among asthmatic patients who presented to the emergency department of Ayder Referral Hospital, Mekelle, Ethiopia.

## Methods

The study was conducted in the Ayder Referral Hospital of Mekelle University, which is located in Mekelle city 783 km north of the Ethiopian capital Addis Ababa. The hospital is the biggest referral hospital in the region with

a catchment area of 8 million including inhabitants from neighbouring regions of Amhara and Afar.

A retrospective record review was carried out of the skin prick test recording book in the Pulmonology Unit; data were analysed over a 1-year period. The skin prick test was carried out for patients who came to the emergency clinic over the study period (June 2012 to June 2013) with a diagnosis of an acute asthmatic attack with subsequent improvement after therapy. The documents of all patients who appeared during the stated period were reviewed for the purposes of the current study. Information on the registry includes patients' identification, age, sex, place of residence, diagnosis and response to allergic prick tests.

Adult patients (aged ≥20 years) who visited the medical emergency clinic of the hospital in the study period and who were given a diagnosis of acute exacerbation of asthma were included in the current study. The diagnosis of asthma was made by the treating physician and was retrieved from patients' records. All patients having a chronic disease characterised by recurrent attacks of breathlessness and wheezing, fulfilled the World Health Organization clinical definition of asthma. The presence of wheezing was confirmed by physical examination, and was apparent in all patients as they appeared during an acute attack and subsequent improvement/resolution with therapy.

The skin prick test was carried out as a part of comprehensive asthma care. One trained medical resident performed and analysed all the tests. The test was performed once the patients were stabilised and had been treated for the acute exacerbation in the hospital. The necessary precautions for the management of complications were taken. No cases of anaphylaxis were encountered.

Skin prick testing was performed using 14 common allergens selected based on data from prior publications and on availability. There were positive (histamine, 1 mg/ml; Allergopharma, Germany) and negative (saline) controls. The allergens used were as follows: (1) *Dermatophagoides pteronyssinus*; (2) *D. farina*; (3) *Tyrophagus putrescentiae*; (4) cows' milk; (5) chicken egg; (6) chicken feathers; (7) dog hair; (8) cow hair; (9) grass pollen; (10) wheat pollen; (11) mould-1 (*Alternaria tenuis, Botrytis cinerea, Cladosporium herbarum, Curvularia lunata, Helminthosporium, Fusarium moniliforme*); (12) mould-2 (*Aspergillus fumigatus, Mucor mucedo, Penicillium notatum, Pullularia pullulans, Rhizopus nigricans, Serpula lacrymans*); (13) *Candida albicans*; (14) *Alternaria alternata*. Allergens 7 and 8 were obtained from ALK-Abello (Denmark) and the remaining allergens were from Allergopharma (Germany).

Drops of each allergen were placed over the volar aspect of the forearm, nearly two fingers away from the wrist joint and ante-cubital fossa. The allergens were spaced 2 cm from each other. A prick of about 1 mm was made through the allergens over the skin using sterile lancets. The results were read 15 minutes after the test and positivity was defined as maximal wheal diameter of 3 mm or more in the case of absent reaction to negative control or 3 mm or more reaction compared with the negative control in those with reaction to saline.

Patients were excluded if they showed severe dermatographism, as assessed by a positive reaction of 3 mm or more for the negative control, or had less than 3 mm reaction to histamine as documented on the patients' card.[10,12] There was only one patient with a 3 mm reaction to saline; despite this the patient was enrolled in the analysis because he had a 7 mm reaction to *D. pteronyssinus* and a <3 mm reaction to all other antigens. There were no patients with <3 mm reactions to histamine.

Patients were subsequently monitored for 30 minutes for complications. Emergency medications (adrenaline and hydrocortisone) were made available for management of complications.

The data collected were cleared and entered in to the statistical software SPSS (version 21). We prepared descriptive statistics of the sociodemographic parameters, proportions of skin test positivity to any of the antigens and possible sociodemographic correlates were assessed using the same statistical software. Ethical clearance was obtained from the institutional review board of the College of Health Sciences, Mekelle University.

## Results

A total of 47 patients were included. All were known asthmatic patients who had been having follow-up appointments. The mean duration of asthma was recorded for 40 (85.1%) patients, and was 10.2 ± 11.8 years. There was no record of asthma duration for 7 patients. Twenty-four patients (51.1%) were female; the age of the participants ranged from 20 to 73 years with a mean age of 41.3±14.32 years; 39 patients (83.0%) were from urban areas of the region (Table 1).

The mean age of onset of asthma was recorded in 40 (85.1%) patients and was 31.1±14.5 years (8–62 years); association with all the tested allergens was sought, but was found to be statistically non-significant (p 0.08–0.9).

Among the patients, 25 (53.2%) were positive to one or more allergens and 22 (46.8%) were negative. There was skin-prick-testing positivity to all tested allergens except for *Alternaria alternata* (Figure 1).

Among patients who tested positive for the allergens, 10 patients (40%)

| Variables | |
|---|---|
| **Sex (n=47)** | |
| Male, n (%) | 23 (48.9%) |
| Female, n (%) | 24 (51.1%) |
| **Age in years (mean ± SD)** | |
| Total (n=47) | 41.3 ± 14.3 |
| Male (n=23) | 42.9 ± 14.3 |
| Female (n=24) | 40.7 ± 14.6 |
| **Place of residence** | |
| Urban, n (%) | 39 (83%) |
| Male, n (%) | 19 (82.6%) |
| Female n (%) | 20 (83.3%) |
| **Rural, n (%)** | 8 (17%) |
| Male, n (%) | 4 (17.4%) |
| Female, n (%) | 4 (16.7%) |

Table 1: Sociodemographic characteristics of patients

reacted to a single allergen. There were 10, 4 (16%), and 1 (4%) patients who had positive tests for 2, 3, and 4 allergens respectively. Four (16%) of the patients reacted to food allergens, all of whom showed additional aeroallergen sensitivity. There were no clinically relevant symptoms after ingestion of food in the above patients. None of the positive tests for the allergens showed significant correlation with patients' places of residence.

## Discussion

Asthma is classified as allergic and non-allergic; the former is mediated by immunologic mechanisms. The allergic type plays an important role in around 80% of childhood asthma and in 40–50% of adult



Figure 1: Pattern of skin-prick-test positivity for common allergens

onset asthma cases; the allergic type is differentiated from the non-allergic type by the presence of a positive skin prick test to usual aeroallergens.[13]

Skin prick testing is an essential test procedure to confirm sensitisation in IgE-mediated allergic disease in subjects with rhinoconjunctivitis, asthma, urticaria, anaphylaxis, atopic eczema, and food and drug allergy.[10] Our patients' ages ranged from 20 to 73 years with a mean age of 41.32±14.32 years. Most studies have shown that the prevalence of skin-prick-test positivity peaks in young adults and diminishes with age regardless of the type of allergen.[14] Despite this, the skin-prick-test positivity in our patients was significant. Of our patients, 53.2% had reactivity for one or more allergens. All of these patients had aeroallergen sensitivity, while four patients (16%) were additionally sensitised to food allergens. An older report from Addis Ababa in the year 1989, reported 54 positive skin prick tests for house dust mite among 77 asthmatic patients; this figure is higher than in our report. Additionally, a publication from Saudi Arabia in 2006 reported skin-prick-test positivity to one or more allergens in 113 of 151 (74.8%) asthmatic patients. These difference could partly be attributed to variation in age among the patient groups, in the Saudi Arabian study, the mean age of the patients was 30±13 years and females constituted 65.5%.[15,16]

House dust mites were the commonest sensitisers in our report with *D. farinae* accounting for 27.7% and *D. pteronyssinus* for 25.5%, which, despite being magnitude large proportion is less than the report from Saudi Arabia, which showed sensitisation to *D. pteronyssinus* in 87%, *D. farinae* in 84%, cat in 44%, and cockroach in 33%.[16]

A retrospective study from Iraq recruited 130 asthmatic patients from September 2008 to May 2010 and 61% of the patients having skin-prick-test positivity were sensitive to pollens and 17% were sensitive to moulds. Of these patients 52% were male.[17] This demonstrates the fact that allergic sensitisation varies significantly between geographical areas.

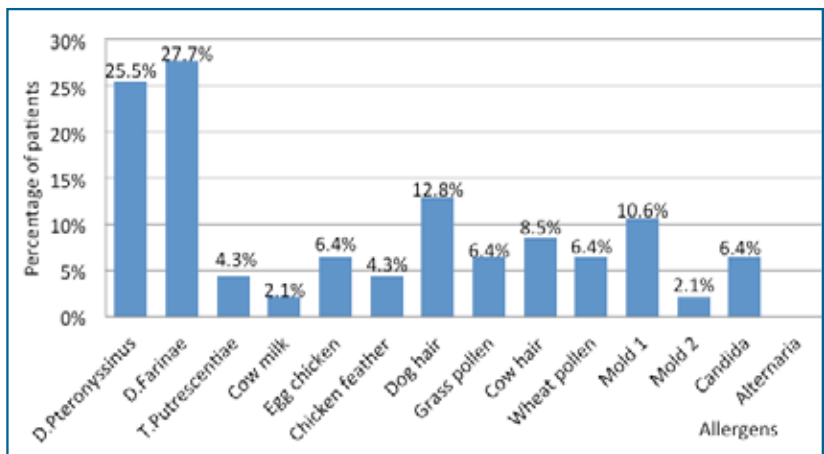In a report of skin-prick-test reactivity to common allergens among women aged 14 years or older in Entebbe, Uganda, skin-prick-test positivity was significantly associated with a history of asthma (70% to any allergen), among which 60% were positive for *Dermatophagoides* mixtures and 20% positive for dogs.[18]

In contrast to an older report from Switzerland stating that there are very few house dust mites in high mountainous areas, our findings suggest their frequent occurrence in the northern Ethiopian highlands. In comparison with Ethiopia, the weather in Switzerland was cold and had lower humidity.[19] Another report from the highlands of Venezuela showed, if the humidity is high, that dust mites are common despite the high altitude.[20]

The limitations of this study include the fact that it is a retrospective record review. The strength of the evidence is weak due to the lack of a control group and the low number of patients. There were incomplete recordings of treatment history (use of medications), although none of the patients were reported to be on antihistamines/antidepressants during the time of testing. The use of systemic corticosteroids was also not consistently recorded. The type, severity, family history of asthma and presence of other atopic diseases were not consistently reported.

## Conclusion

Aeroallergen sensitivity among asthmatics from the northern Ethiopian highlands is high. House dust mites were the commonest sensitisers identified. Large-scale prospective trials are recommended to investigate sensitisation to additional allergens and to better assess correlations with risk factors.

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# Splenopulmonary fistula complicating hydatid disease

**Y Ouadnouni, J Ghalimi, R Sani, M Lakranbi, and M Smahi**

## Abstract

Splenic echinococcosis is rare even in endemic regions and the intrathoracic rupture is extremely rare. We present the case of a patient with a primary splenic hydatid disease complicated with pulmonary extension through a splenothoracic fistula.

## Introduction

In patients with hydatid disease or echinococcosis, the most commonly affected organ is the liver, followed by the lung and the spleen.[1] Splenic echinococcosis is rare even in endemic regions. Splenic hydatid cysts may rupture intra-abdominally, but intrathoracic rupture is extremely rare.[2] We present the case of a patient with primary splenic hydatid disease complicated with pulmonary extension through a splenothoracic fistula.

## Observation

A 45-year-old man was admitted to the hospital because of pain in the left side of his chest with haemoptysis of 1 month's duration. At admission, physical examination was normal except for signs of left pleural effusion. A chest radiograph disclosed a left lower lobe opacity (Figure. 1). A computed tomographic scan of the thorax and abdomen showed a multilocular cystic structure of the spleen with trans-diaphragmatic lung involvement (Figure 2). No other cysts were apparent.

A left seventh interspace posterolateral thoracotomy was made. The left hemidiaphragm was elevated, and adhesions between the left lower lobe and the diaphragm were noted. The diaphragm and lower lobe were separated and the cystic lesion of the left lower lobe was opened and found to contain a hydatid cyst with splenopulmonary fistula. A segmentectomy of the left lower lobe was performed. The splenopulmonary fistula was cannulated and splenic cysts were aspirated transdiaphragmatically, removing 750 cc of fluid without any additional resection. External marsupialisation over two left-sided trans-abdominal tubes was performed, and two left-sided chest drainage tubes were inserted.
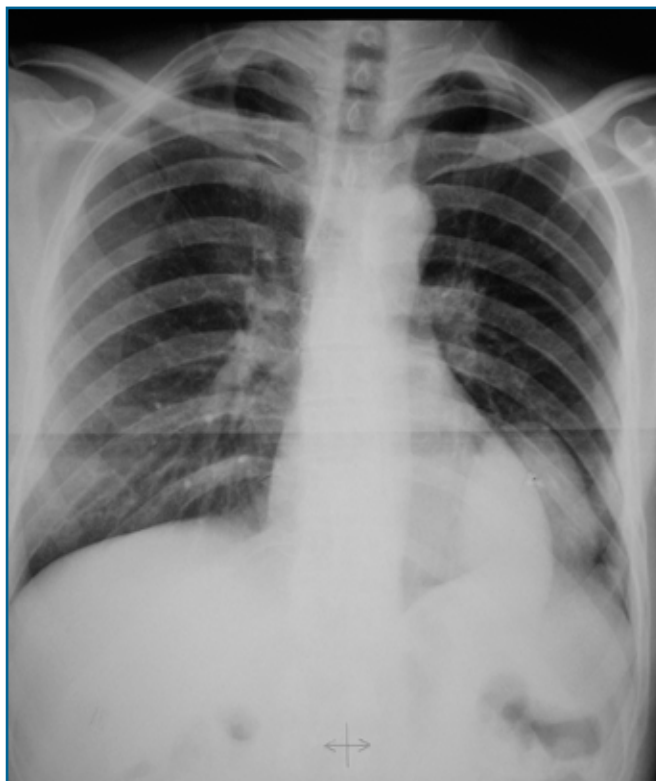
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*Figure 1: Chest radiograph showing an opacity in the left lower lobe*

The patient had an uneventful recovery, was discharged on post-operative day 8 and was asymptomatic at a 10-month follow-up consultation.

## Discussion

Hydatid disease is a parasitic disease caused by the development of the larval form of *Echinococcus granulosus*. The parasite can infest every organ. The liver and lung are the most frequently affected organ, but the spleen ranks third, with an estimated frequency of less than 4% of all cases.[1] Hydatid cysts of the spleen can be either primary or secondary to dissemination into the abdominal cavity.[1]

Our patient had solitary splenic hydatidosis without any other localisation of hydatid disease. Intra-abdominal rupture is a well-known complication of splenic hydatidosis, whereas intrathoracic rupture (either in the pleural cavity or in the lung parenchyma) is extremely rare, with only a few cases reported in the medical literature.[2–5] In our patient, the cyst ruptured into the lung parenchyma after having eroded the diaphragm.

The treatment of hydatid disease is surgical, with thoraco-abdominal access if necessary. When a splenic

*Figure 2. CT scan showing a multilocular cystic structure of the spleen with trans-diaphragmatic lung involvement: (a) mediastinal window; (b) parenchymal window; (c) sagittal reconstruction.*



*Figure 2 (a)*



*Figure 2 (b)*



*Figure 2 (c)*

cyst extends through the diaphragm, a low posterolateral thoracotomy allows access to and treatment of the parenchymal lesions and then, through a phrenotomy, of the splenic lesions.[4,5] This procedure was followed in our patient in whom we successfully performed a thoracotomy allowing us to carry out an atypical parenchymal resection and then a splenic cystectomy.

## Conclusion

Splenothoracic hydatidosis is a rare complication of splenic hydatid cysts. A low thoracotomy allows treatment of the chest and splenic cysts in a single procedure.

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# Catamenial right haemothorax due to endometriosis: two case reports

A Ahmed, I Garba, B A Denue, M B Alkali, B Bakki, and H Rawizza

## Introduction

The presence of ectopic functional endometrial tissue may occur in 5–15% of females, especially those within the reproductive age group. Pelvic and rarely extrapelvic structures, including in the thoracic region, are the site of involvement in most reported cases.[1–3] Thoracic endometriosis may involve either or both the pleura and the lung parenchyma. Pleural endometriosis manifests as catamenial pneumothorax or haemothorax ('catamenial' means simultaneous with menstruation). Thoracic endometriosis, especially cases involving the pleura, typically occurs in women in their mid-30s,[3,4] patients usually present with chest pain and dyspnoea over the first 1–2 days of menstruation due to right-sided haemothorax or pneumothorax.[2–4]

Endometriosis involving the pelvic and thoracic region poses a diagnostic challenge especially in settings with few facilities and expertise for imaging and histological evaluation. Treatment options include medical therapies, ultrasound-guided chemical pleurodesis, surgery, or a combination of approaches.[5–8] There is a dearth of reports in the literature on extrapelvic endometriosis with thoracic involvement, especially from sub-Saharan Africa. Here, therefore, we report two cases of catamenial right-sided hydrothorax due to endometriosis in female patients of reproductive age who presented for care in a tertiary health institution in north-eastern Nigeria.

**Case 1.** A 31-year-old housewife reported a long history of cough, shortness of breath, shoulder pain, abdominal and right-sided pleuritic chest pain that was often severe during her monthly menstruation and occasionally necessitated hospitalisation. She had no other constitutional symptoms. On examination she was dyspnoeic with a respiratory rate of 18 breaths per minute, stony dull sounds on percussion, and decreased breath sounds over the entire right hemithorax consistent with pleural effusion. The remainder of the physical examination was normal. Haematological and biochemical investigations were within normal limits. Chest radiograph (Figure 1 a)

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revealed complete opacification of the right hemithorax with shift of the mediastinum to the contralateral side. The left lung and the thoracic cage appeared normal. Ultrasound-guided thoracentesis drained haemorrhagic fluid and cytology revealed red blood cells and inflammatory cells. Microbiologic examination, including stains for acid-fast bacilli and routine bacterial cultures, was negative. The patient was diagnosed with a massive right haemothorax and a therapeutic thoracentesis was performed, which drained 2.3 litres of blood. Repeat chest radiograph (Figure 1 b) after the procedure revealed normal lung fields. There was repetitive catamenial accumulation of pleural fluid during four menstrual cycles, confirmed by serial chest radiographs, which were also drained accordingly. Computed tomography (CT) scans of the chest on the third day of menstruation during the second cycle after the onset of the investigation showed extensive right pleural effusion without mass lesion in the thorax (Figure 2). Abdominal ultrasound scan and CT scan of the pelvis showed a bulky irregular uterus (13 × 7 × 6 cm), with an irregular, mixed-echogenicity mass measuring about 4 × 4 × 3 cm in the posterior wall, without calcifications. The endometrial plate measured about 1 cm in thickness and bowed anteriorly due to the mass. The adnexae and the pouch of Douglas were normal. Initial assessment of uterine fibroid was made, but laparotomy revealed a frozen pelvis with extensive endometriosis and adenomyosis in the posterior wall of the uterus. Histology confirmed pelvic endometriosis. After detailed counselling, the patient was placed on danazol 400 mg twice daily, which resulted in remarkable improvement. She was discharged a month later,



Figure 1 (a)  Figure 1 (b)

*Figure 1. (a) Chest radiograph of the patient showing complete opacification of the right hemithorax with shift of the mediastinum to the contralateral side; the left lungs and thoracic cage are normal. (b) Repeat chest radiograph after thoracentesis and drainage showing normal lung fields, heart, and rib cage.*
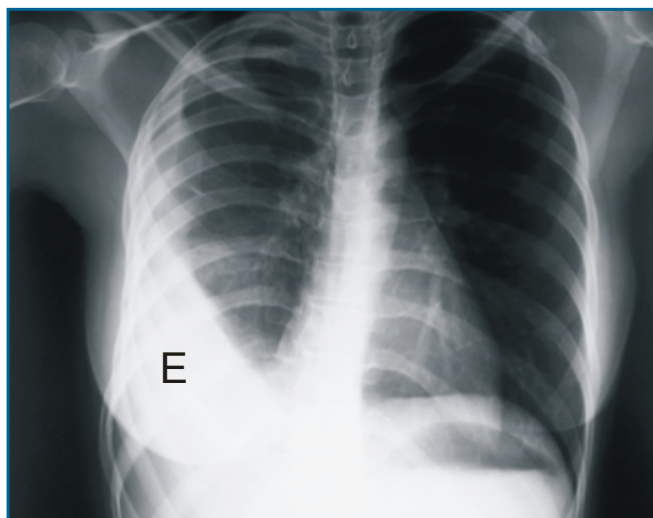
Figure 2. Non-contrast enhanced chest CT scan at second menstrual period showing right haemothorax with marked compression of the lung.

at which time the chest radiograph revealed no pleural effusion. Subsequently, she remained asymptomatic. Hence, a retrospective clinical diagnosis of thoracic endometriosis was made.

**Case 2.** A 27-year-old woman presented with an 8-year history of recurrent lower abdominal pain and pleuritic chest pain without other constitutional symptoms. The symptoms were typically severe at the onset of menstruation and subsided afterwards. She was evaluated at a secondary health facility, where she was given anti-tuberculous medications for 9 months for possible pulmonary tuberculosis complicated by pleural effusion, without significant improvement in her symptoms. She had been married for 10 years and did not have any children.

On examination, she had dullness to percussion and reduced breath sounds over the right middle and lower lung zones. The left lung field was normal. The rest of the physical examination was unremarkable. Chest radiograph (Figure 3) showed a homogeneous opacity involving the right middle and lower zones with obliteration of the adjacent cardiac and diaphragmatic borders, tracking along the lateral chest wall, with a shift of the heart and the mediastinum to the contralateral side. Further investigation using high-resolution computed tomography (HRCT) of the lungs showed an isodense pleural fluid collection with a wedge-shaped hyperdense mass in contact with the visceral pleural surface on the right. Pelvic ultrasound showed a slightly bulky uterus with a well-defined mass of mixed echogenicity measuring 4.4 × 2.5 cm in its posterior wall with a fluid collection in the pelvic cavity. A diagnosis of catamenial right haemothorax in a woman with pelvic endometriosis was made. Under ultrasound guidance, approximately 10 ml



Figure 3. Posterioranterior (PA) chest radiograph showing a homogenous opacity (E) in the right lower and mid zone with obliteration of the adjacent diaphragmatic lower cardiac outline and tracking along the lateral chest wall.

of haemorrhagic, chocolate-coloured fluid was aspirated from both the pleural and pelvic cavities. Acid-fast bacilli smear and routine bacterial cultures were both negative. Cytology revealed endometrial cells without evidence of malignancy. Biopsy for histology confirmed endometriosis in both the pelvic and the pleural cavities. The patient was counselled and placed on twice-daily danazol 400 mg for 2 weeks. She had an ultrasound-guided pleural fluid drainage in which 650 ml of fluid were drained from the pleural cavity and the cavity was ablated with 99% ethanol. This was followed by another session of ultrasound-guided pelvic fluid drainage. About 1.5 litres of a similar chocolate-coloured fluid were drained from the pelvic cavity and ablation was performed with 99% ethanol as a sclerosant. The patient showed a remarkable improvement in her condition as evidenced by the disappearance of the pelvic mass and pleural fluid, and improvement in her clinical condition.

## Discussion

Endometriosis is most commonly confined to the pelvis (pelvic endometriosis), involving structures of the peritoneal cavity, ovaries, and uterosacral ligaments. However, it may rarely occur in extrapelvic locations such as the umbilicus, abdominal scars, breasts, extremities, pleural cavity, and the lungs.[1–3,6] Extrapelvic endometriosis poses a diagnostic and therapeutic challenge, especially in settings where facilities and expertise for imaging and histological evaluation are limited. Thoracic endometriosis may involve either the pleura or lung parenchyma or both. Pleural endometriosis manifests with chest pain and dyspnoea as catamenial pneumothorax or haemothorax. Parenchymal endometriosis, on the other hand, usually presents with chest pain, dyspnoea and haemoptysis. Women of reproductive age, especially those in their mid-30s, are most commonly affected.[8–10] Exacerbation of symptoms coincides with onset of menstruation,

often regresses afterwards, and typically recurs with each menstrual cycle.[3,10,11] Most documented cases of thoracic endometriosis present with either catamenial pneumothorax or hydropneumothorax; however, our first case presented with pelvic endometriosis and isolated haemothorax without a thoracic lesion which is rather unusual.[8–10] Our second patient had both pelvic and pleural endometriosis lesions. However, consistent with the majority of cases reported in the literature, right-sided lesions were observed in both patients.

Although the pathogenesis of pulmonary endometriosis is not well understood, three main theories have been hypothesised.

1. Sampson theorised that menstrual blood with endometrial fragments could regurgitate from the Fallopian tube into the peritoneal cavity. This blood could find its way into the subphrenic space and pass through the diaphragmatic fenestrations into the pleural cavity.[3,8–11]
2. Ivanoff theorised that irritant blood with endometrial fragments could pass through pleural fenestrations and produce metaplasia of the pleural surface, which is histologically similar to that of the peritoneum.[3,8–11]
3. Others theorised that obstetrical and gynaecological procedures that disrupt endometrial blood vessels and lymphatics allow lymphovascular entry of endometrial tissue causing parenchymal disease. This theory is supported by studies that find an association between pulmonary endometriosis and certain forms of endometrial trauma.[3,8–11]

Initial imaging evaluation involves ultrasonography scan (USS) and chest radiography. Further investigations include HRCT scan and magnetic resonance imaging (MRI).[3] Reported HRCT and chest radiographic findings of pulmonary endometriosis include ill-defined opacities of varying sizes, nodules, and areas of consolidation surrounding the nodules, thin-walled cavities, and bullae. These lesions may vary in size during the menstrual cycle and may disappear after the cessation of menstruation. Our patients had massive right-sided effusions, without evidence of consolidation or cavitation. In pleural endometriosis, both HRCT and chest radiographs are usually normal except during menstruation, at which time pleural effusion, pneumothorax, or hydropneumothorax may be present. In rare instances it may present with diaphragmatic surface irregularity or opacities.[2–4,9,11] Both pleural and parenchymal endometriosis are usually unilateral and right-sided lesions are present in 90% of reported cases, which is in keeping with findings in our patients.[1–3,6] Studies indicate that parenchymal endometriosis is more commonly associated with prior uterine surgery than pleural disease.[1,4,6]

Histologic evidence of functioning endometrial tissue confirms the diagnosis of endometriosis; however, this is not always possible due to difficulty in isolating the endometrial tissue. Instead, the diagnosis is usually made on clinical grounds with exclusion of other pulmonary diseases. Thus, a constellation of recurrent symptoms concurrent with the menses, pathologic visualisation of pulmonary haemorrhage, compatible radiologic features, and exclusion of other diseases makes the diagnosis of endometriosis likely, as in our case series.[3–6,9]

Pelvic ultrasound scan is essential in all patients with thoracic endometriosis as it may coexist with pelvic endometriosis.[3] In our cases, uterine masses were noted that were validated histologically as endometriosis. Treatment options include medical therapy, ultrasound-guided chemical pleurodesis, surgery, or combination therapies.[4–7] However, the treatment strategy remains controversial due to a paucity of therapeutic trials. Medical approaches focus on the suppression of endometrial tissue by blocking the action of oestrogens, but recurrence rates are very high.[10] Also, virilisation, weight gain, and climacteric symptoms make hormonal therapy a less attractive option. Other treatment options include hysterectomy with salpingo-oophorectomy, chemical pleurodesis, lung-sparing segmentectomy and video-assisted thoracoscopic surgery.[3,11,12] In our patients, catamenial haemothorax coexisting with pelvic endometriosis responded favourably to ultrasound-guided sclerosant therapy and anti-oestrogen (danazol). However, our observation is anecdotal, being restricted to two cases. Thus larger prospective studies are needed to validate or refute our treatment modality.

## Conclusions

Endometriosis should be considered as a differential diagnosis of pleural effusion in females of reproductive age, especially when the symptoms are exacerbated by menses. Catamenial haemothorax coexisting with pelvic endometriosis responded favourably to ultrasound-guided sclerosant therapy and danazol in our patients.

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