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Radiological And Clinical Pattern Of Pleural Effusion In Ilorin.

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ABSTRACT
Background: Pleural effusion (PE) is the commonest manifestation of pleural disease and may herald pathologies from other parts of the body. Etiology varies with age and geographical location. Chest radiography is an essential component of early assessment though there are suggestions to apply chest ultrasonography also early in patient evaluation. This study aims to determine the radiological and clinical pattern of pleural effusions based on clinical and radiological diagnosis of pleural effusion and to correlate this with etiology.
Method: A retrospective analysis of 276 plain Chest X-rays (CXR) of patients diagnosed clinically to have PE over a period of 6½ years in the University of Teaching Hospital was conducted.
Result: A bimodal age distribution involving the first and second decades was demonstrated. Etiological factors were identified in 95.6% of cases. Chronic inflammation and pyogenic effusion accounted for 47.6%. Amongst children, adolescents and young adults, the percentage rose to 62.0%. Heart failure was responsible for PE in 18.1% of all the cases and 63.3% of patients =50years. More than half of PE occurred in the right hemithorax (53.1%). Pyogenic and malignant effusion showed predilection for the right side (75.6% and 58.3% respectively). Heart failure accounted for 57.1% of all patients with bilateral effusions.
Conclusion: We found that chronic inflammation and pyogenic effusion accounted for a greater proportion of etiological factors. Conventional CXR is still valuable as a first line investigative modality.
Key words: Pleural effusion, Chest X-ray

INTRODUCTION

PE which refers to the accumulation of serous fluid within the pleural space is the most common manifestation of pleural disorders[1]. While it affects up to 800,000 persons per year in United States[2], Garrido and Sancho quoted incidence of 400/100,000 of population in Spain[3]. PE requires early recognition, estimation of its severity (volume of collection) and identification of the etiology in order to institute an effective treatment. A complete history and careful physical examination can raise the suspicion of an effusion and may provide clues to the etiology[4,5]. Since PE occurs in a wide variety of clinical conditions and because it may evade clinical detection, other diagnostic measures are often necessary[4,5]. These includes imaging modalities, pleural fluid analysis, pleural biopsy and thoracoscpy[2,3,4,5]. Of the imaging techniques, plain CXR has become a universally accepted modality being cheap, easily accessible and non-sophisticated. Other modalities include thoracic ultrasound (ThUSS), chest CT scan, and Magnetic Resonance Imaging (MRI)[2,3,5].

The aim of this study is to determine the clinical characters of patients with pleural effusion evaluated by plain chest radiograph at the radiology department of University of Ilorin Teaching Hospital, Nigeria and to correlate this to the etiology. It is expected that this will reflect the pattern which exists in a developing society.

MATERIALS AND METHOD

This retrospective study was conducted at the radiology department of University of Ilorin Teaching Hospital (UITH). The requests and reports of plain chest radiographs taken between January 2000 and June 2006 of patients who had radiological diagnosis of pleural effusion were retrieved. Age, sex, and occupation of patient, side of effusion (right, left or bilateral) as well as clinical diagnosis if

known were recorded and analyzed using the computer software SPSS version 11.5 package.

RESULTS

Two hundred and seventy six plain chest radiographs of patients with pleural effusion were reviewed. Five patients, accounting for 1.8% had incomplete data record and were excluded from the study. One hundred and fifty four patients out of the 271 CXR analyzed were males (56.8%) with M: F ratio of 1.3:1. The age range of patients was 1 82 years with a mean of 34.7 years (S.D. 22.31). As demonstrated in figure 1, PE occurred most frequently amongst age groups 0-9 with 48 patients (17.7%) and 20-29 with 49 patients (18.1%). Patients who were 70 years and above were least affected (23, 8.5%). A relatively even distribution was observed in the other age groups.

The pie chart in figure 2 displays the various etiological factors identified on clinical and CXR assessment. Chronic inflammatory conditions constituted the majority (88, 32.5%). Effusion secondary to heart failure and pyogenic causes occurred in 49 (18.1%) and 41 (15.1%) patients respectively. Twenty four patients representing 8.9% had malignant effusion while trauma as a cause of PE was seen in only 4 (1.5%) of cases in this study. Other causes such as type II diabetes, malnutrition, chronic liver disease, renal disease (nephrotic syndrome and acute glomerulonephritis), post laparotomy, typhoid septicaemia, and endocarditis occurred in 54 patients (19.9%). In 11 patients (4.1%), an etiological factor could not be established. Tuberculosis (Tb) accounted for 83 (94.3%) of the 88 patients with chronic inflammation.

More than half of the effusions occured in the right hemithorax (144, 53.1%), 92 (33.9%) occurred in the left, while 35 (12.9%) were bilateral.

Table 1 shows the distribution of causes of pleural effusion according to age. Pyogenic effusion occurred mostly in the under 10 age group (18, 44%) and the incidence decreased progressively with advancing age. In contrast, heart failure occurred predominantly in the older age groups with 31 (63.3%) being 50 years and above. One hundred percent of traumatic etiology occurred within the economically active age group of 20-49 years. Though the highest occurrence of malignant effusion was found in age groups 20-29 and 30-39 with 6 patients (25%) each and the highest occurrence of chronic inflammation in 20-29 age group (20, 22.7%), no distinct pattern of distribution was identified for these two etiological factors. A prospective study will be required for further explanation on this observation. However, malignancy would seem to be a rare cause of effusion at < 20 years and > 70 years of age.

When the side of effusion was analyzed according to the etiology (Table 2) it was found that pyogenic and malignant effusions occurred more frequently on the right side (75.6% and 58.3% respectively). Chronic inflammation showed a more even side distribution (44.3% - right, 51.1% - left) but was rarely bilateral (4.5%). Though heart failure caused unilateral effusion in 29 patients (59.2%), the occurrence of bilateral effusion in 20 patients (40.8%) accounted for greater than half (57.1%) of bilateral effusions recorded from the various etiological factors.

DISCUSSION

Other forms of liquid which may collect in the pleural space include blood (haemothorax), chyle (chylothorax) and pus (pyothorax or empyema thoracis)[2]. CXR may not distinguish between the various types. Further studies such as CT, MR, US, microbial, cytological and biochemical tests, may be needed in some of these cases. In normal subjects, the pleural space have been quoted to contain 5-20mls of fluid which serves as lubricant between the two apposing surfaces of parietal and visceral pleura[2,6,7]. It probably varies with individual's body weight hence Quadri and Thomson expressed the normal volume as 0.3mls/Kg body weight[8]. This volume of fluid is maintained by a balance between intravascular or extravascular colloid oncotic and intravascular hydrostatic pressures (Sterling's equilibrium), an optimal capillary and mesothelial permeability and also a patent lymphatic drainage system[2,3,4]. Perturbation in any of these fluid transport mechanisms will therefore result in PE[4,5]. Often more than one mechanism is involved in the evolution of the effusion[4,5]. Broadly, the effusion may be transudative or exudative, a distinction obtained on biochemical analysis though

suspicion may exist from the predisposing clinical condition[2,4].

Radiology plays a prominent role in the management of PE. Radiology will assist in confirming the effusion, estimate its severity (volume of collection) and also identify possible etiological factor. Radiologically, PE may be classified as free flowing or loculated and as typical or atypical (subpulmonic, fissural, mediastinal)[2,3]. Chest radiograph is the most easily available and cheap modality though with poor specificity for the cause or causes of some of the effusions[1]. The minimum volume of fluid detectable on plain CXR varies. Garrido et al documents that it must be above 75mls[3]. Others identify variability with views of exposure hence 25-50mls on a lateral view and 150mls on posteroanterior exposure[2,4]. Attempt to improve the sensitivity of CXR in detecting PE leads to the adoption of lateral decubitus view first used by Rigler in 1931[7]. Kocijanic et al have modified Rigler's technique to include expiratory exposure to further improve on sensitivity[7]. Generally, a fluid thickness of 10mm from the inside of the chest wall to the lung on a lateral decubitus film is accessible to thoracentesis[1,4].

Though CXR is non-specific, its value in suggesting etiological factor when combined with clinical evaluation and bacteriology of aspirate is of great significance. A probable etiological factor was identified in about 95.6% of patients in our review. Chronic inflammation, heart failure and pyogenic effusion accounted for the top three causes of PE in this study. In contrast, in most European communities and United States heart failure, non-tuberculous infections, malignancy and pulmonary embolism are the leading causes of PE[2,3,5].

Tb remains an important etiological factor in PE particularly in developing countries where it is assuming greater significance with the advent of human immunodeficiency virus (HIV)[5]. Tuberculous pleural effusion (TPE) is the second most frequent form of extrapulmonary presentation of Tb[9]. In Spain, the pleura is affected in 23% of patients with Tb[3,5,9]. As indicated by this review, Tb constituted the highest etiological factor accounting for about 94% of chronic inflammatory conditions and 30.6% of the 271 radiographs reviewed. Valdes et al also recorded TPE as the highest cause of PE from their centre in Spain accounting for 25% and quoted Chretien et al with 30% incidence from France[9]. They also quoted low incidence from Czech Republic (with no case of TPE) to very high incidence in Rwanda with about 87% incidence[9]. They conclude that the variability in incidence is determined by the prevalence of Tb in the general population which is influenced by the prevalence of HIV infection[9]. Saton and Ingram reported that TPE is more common in young adults[2]. This is similar to the findings in this study, with the finding of 22.7% of chronic inflammatory effusion (majority of which are from tuberculosis infection), occurring among age group of 20-29 years, and the occurrence in other age groups is also of significant frequency.

Reports from developed countries indicate that heart failure is the leading cause of PE[2,3,5]. With 18.1% incidence, heart failure competes for second place with pyogenic effusion in our review. In reckoning with previous observations[2,3], most cases (40.8%) were bilateral and of the unilateral effusions, the right side was more common (ratio 1.4:1). Saton and Ingram further stated that the right side is more affected even in bilateral effusion[2]. As expected, PE secondary to heart failure was more common with advancing age (63.3% 50 years and above). The lower life expectancy of the general population in our environment probably accounts for lower incidence of PE secondary to heart failure when compared with the developed nations.

Pyogenic effusion representing the parapneumonic effusions (PPE) occurred in 15.1% of cases mostly in children and adolescents (27, 65.8%).The frequency of occurrence on the right, left, bilateral, were, 75%, 19.5% and 4.9% respectively. When combined with chronic inflammatory causes, they account for 69% of PE in the under-10 age group. Forty to fifty-seven percent of patients with pneumonia develop an effusion in the course of their illness[1,3,4,5,8]. Quintero and Fan identified emergence of antibiotic-resistant organisms as the culprit for about 3 fold increase in PPE between 1992 and 2000 amongst children in a U.S. centre[10]. Morcelin and Fischer from Brazil reported 95% incidence in children below 12 years[1]. In a developing country like ours, malnutrition and lack of prompt antibiotic treatment may account for high incidence of PPE in addition to antibiotic-resistant organisms. In a report of 68 cases of PPE by Caksen and colleagues, the age range was

2.5 months to 16 years. About 84% were <10years and there was equal side predilection (right 48.5%, left 48.5%, bilateral 2.9%)[11].

Reports from America indicate that 30-65% of PE are secondary to malignancy and are mostly due to lung and breast cancers[4]. In our review, malignancy accounted for a distant fourth with 8.9%. This may be due to the lower incidence of lung cancer in our environment.

We conclude that plain chest radiograph remains an essential diagnostic tool in the management of PE despite availability of more sophisticated equipments. Infective (tuberculous and non-tuberculous) causes constitute predominant etiology of PE in our environment and should attract major public health focus particularly amongst children.The lung parenchymal features of TB such as the pattern of densities, cavitation, fibrosis and scarring with volume loss, shift of fissures, vessels and sometimes presence of calcifications, will indicate the cause of the pleural effusion.

Heart failure is an important etiolgical factor in the elderly while malignancy seems to be a less common factor in our environment. It will be of value to correlate these findings with the outcome of management of these patients.

TABLE 1: DISTRIBUTION 0F CAUSES OF PLEURAL EFFUSION Vs AGE (n=271)

Age range * causes of pleural effusion Cross-tabulation Count

Age range	Causes of pleural effusion							Total
	pyogenic	chronic inflammation	malignancy	trauma	heart failure	others	unknown	
0-9	18	15				12	3	48
10-19	9	10	1		4	2	1	27
20-29	5	20	6	2	4	10	2	49
30-39	4	10	6	1	4	7	2	34
40-49	2	9	3	1	6	8	1	30
50-59	1	11	4		9	6		31
60-69	1	6	3		12	6	1	29
70 and above	1	7	1		10	3	1	23
Total	41	88	24	4	49	54	11	271

TABLE 2: SIDE OF PLEURAL EFFUSION Vs AETIOLOGY (n=271)

Causes of pleural effusion * side Cross-tabulation Count

Causes of pleural effusion	*Side*			*Total*
	right	*left*	*bilateral*	
Pyogenic	31	8	2	41
Chronic inflammation	39	45	4	88
Malignancy	14	7	3	24
Trauma	2	2		4
Heart failure	17	12	20	49
Others	33	15	6	54
Unknown	8	3		11
Total	144	92	35	271

FIG 1: AGE DISTRIBUTION OF PATIENTS WITH PLEURAL EFFUSION (n=271)

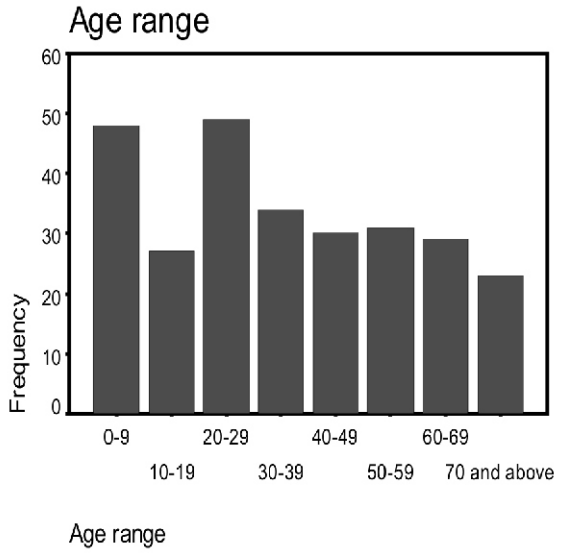
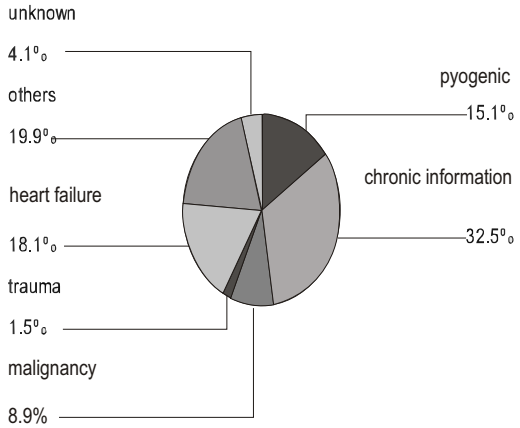


FIG 2: CAUSES OF PLEURAL EFFUSION (n=271)



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