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Role Of X-Ray In Detection Of Complication Of Renal Failure (Pulmonary Edema And Pleural Effusion).

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ABSTRACT

The prospect include 30 patients attending to Baghdad teaching hospital and Al gaze Al Hariri hospital in Baghdad city during the period from July 2016 to May 2017 , the sample comprises 11 female and 19 males aged 12—60 years. All prospective patients who were suspected to have pulmonary edema and pleural effusion due to renal diseases (acute or chronic) have been examined by X- ray procedure and routinely Investigation were done on all patients that complaining from pulmonary edema and pleural effusion performing X-ray machines (type seaman's)and each patient provides history was recorded associated with clinical features. Second step we make for each patient pulmonary function test (PFT) for checking the function of lung who have renal failure, the study explained as follow, the first part of this study to find the relationship between age and sex, second step of this study is relationship between lesion (pulmonary edema, pleural effusion) according to the age, third part of study is evaluation of chest X-ray (CXR) in these cases. In exam the results of diseases and the (CXR). Features for both sex according to the age. The fourth outcome is to fiend (PFT), and in adult population the distribution of the sex to age male to female patients is approximately 2:1.

Keywords: Pulmonary edema, Pleural effusion, X-Ray, Pulmonary function test, Physical examination

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INTRODUCTION

As homeostatic organs that control the acid-base & cellular electrolyte status, the kidneys and lungs are related to each other. Pulmonary disorders may arise as a direct result of a renal disease (primary consequence) or through a generalized systemic process. [1] Pulmonary edema that is associated with renal disease may occur due to different pathogenic mechanisms. Renal pulmonary edema may be associated with excessive accumulation of extracellular fluid following an impaired water and solute excretion or to an increased pulmonary capillary permeability [2] Plural effusion can be caused by fluid overload, renal cardiac disease, and pulmonary embolism [3] Physiologically, kidneys and lungs are intricately related as homeostatic organs that control the cellular acid-base & electrolyte status to guarantee the best cellular function of microenvironment. Perceptually, pulmonary diseases may develop as a direct result of a renal disease (primary consequences) or through a generalized systemic process that specifically involve both organ systems. The previous group is the topics of this article. [41], [5], [6] and these consequences may be classified on a pathophysiological basis depending upon the resultant functional derangement in renal homeostatic mechanism.

Basic anatomy of pleura, it is a serious membrane which covers the surface of the lung (the vesral pleura) and lines the inner surface of the chest wall (the parietal pleura), the two pleura are closely applied to each other and separated by a thin layer of lubrication pleural flied, which is normally not more than a few milliliters in volume. Both parietal and vesiral pleura cover the periphery of the lung are not normally visible radio logically but the two layers of pleura outlined by aerated lung[4]In health the two pleura are in contact when the lung collapsed, however when air or liquid collect between the two membranes the pleural cavity or sac becomes apparent[7].

Pulmonary edema

Pulmonary edema is defined as an abnormal accumulate lotion of transudate fluid in the extravascular space of the lung, accumulation of fluid in the alveoli of the lungs and moves from blood vessels across capillary and alveoli membranes in to alveoli causing symptoms like shortness of breath, early pulmonary edema as a result of heart failure affect the base of lungs and adult respiratory distress syndrome develop [8]. We can say on pulmonary edema that extravascular accumulation of fluid in the pulmonary taint air spaces [9] and it is one of the of the most frequent causes of respiratory distress [4,5] Different pathophysiologic mechanisms are responsible for PE, including increased vascular hydrostatic pressure, decreased plasma oncotic pressure, increased vascular permeability, and impaired lymphatic drainage.[4] Cardiogenic PE is caused by an increase in pulmonary venous hydrostatic pressure mainly resulting from an increased left atrial pressure, with more interstitial fluid being produced than the lymphatic vessels can accommodate.[5] Mitral regurgitation is the most common and clinically important valvular disorder in domestic carnivores, leading to increased left atrial pressure and, eventually, PE. [4,6]. Predisposing factors of pulmonary edema include increase pressure in pulmonary veins, increase capillary permeability and reduce level of protein in blood (**8)** pulmonary function test (PFT) and physical examination [10]

Radiologic Diagnosis Of Pulmonary Edema

The most useful investigation in the diagnosis of pulmonary edema [11], Radio graphically, PE manifests initially as a hazy unstructured interstitial pulmonary pattern that may progress to an alveolar pattern, characterized by tiny nodular or acinar areas of increased opacity that tend to coalesce.[12,13] In humans, distribution of radiographic findings indicative of cardiogenic PE is usually diffuse and random, although a so called bat-wing appearance of increased pulmonary opacity is sometimes found in subjects with rapidly developing severe cardiac failure.7 However, asymmetric distribution of increased pulmonary opacity, mainly localized to the right upper lobe, has also been reported with MRI[3,11] An eccentric direction of the MRJ is considered responsible for this radiographic feature in humans.[7,11]. Chest radiograph characteristically show the enlargement of peribronchovascular spaces, prominent sepal lines as well as asincar areas of increased opacity that coalesce in to frank consolidations, which was explained by Ware and Mattly, (2005),

Pleural Effusion

Fluid accumulation in the pleural space may be exudates, transudate, blood, pus or chley[3] On chest X-ray, the radiological signs indicating that the shadowing is effusion View [4]

The position and morphology of this shadow will depend upon the amount of fluid, the state of underling lung and the position of the patient, small effusions will thus bend posteriorly and in most patients(1-2)ml of fluid are required to fill in this recess before the fluid will be seen above the dome of diaphragm on the frontal view and thus may be seen earlier on lateral films than on the frontal ,but it is possible to identify effusion of only few milliliters using lateral decubitus position with horizontal beam and more fluid accumulates in the cost phrenic angle on the frontal .

*****Transudate (may call hydrothorax) contain less than 3g/dl of protein which are usually clear or faintly yellow, watery fluid they are often bilateral. The common causes of this are cardiac right, hpoproteinemia nephritic syndrome constrictive pericarditis and myxedema [(4)]
*****Exudates contain more than 3g/dl of protein, purulent pleural effusion is termed empyema, and the causes of pleural exudate are bacterial, malignant, connective tissue disorders and so.
*****Haemothorax, it is bleeding into the pleural space is almost always secondary to open or closed trauma to the chest and rarely it is due to hemophilia.
*****Chylotrhorax, chyle is a milky fluid high in neutral fat and fatty acid. Chylotrhorax may develop secondary to damage or obstruction of the thoracic lymphatic vessels caused by chest trauma

These are commonly seen in chronic renal failure (CRF) patients, and may occur as secondary features to renal cardiac disease, fluid overload, pulmonary embolism or tuberculosis. However, a pleural effusion that is primarily related to uremia can also be detected.[(15)] These effusions may be unilateral or bilateral and range from small to massive in size. [(16)]

Radiologic Diagnosis Of Pleural Effusion

Pleural effusions appear white on chest X-rays, while air space looks black. If a pleural effusion is likely, get more X-ray a film lying on which side is affected. These can show if the fluid flows freely within the pleural space. [(17)]

During 10 months period, the data have been collected from July 2016 to May 2017at Baghdad Teaching Hospital and Al gaze Al Hariri hospital in Baghdad city. Studies were done on 30 patients (19 males and 11 females) with the age was ranged from 12 to above 60 years and all with acute or chronic renal disease to evaluate the pulmonary edema and pleural effusion.

METHODOLOGY

Patient and method

The prospect study have been done Baghdad teaching hospital and Al gaze Al Hariri hospital in Baghdad city during the period from July 2016 to May 201 , which include 30 patients, the comprises 11 female and 19 males aged 12—60 years. All prospective patients who were suspected to have pulmonary edema and pleural effusion due to renal diseases (acute or chronic) have been examined by chest X- ray procedure and routinely Investigation were done on all patients that complaining from pulmonary edema and pleural effusion performing X-ray machines (type seaman's) and each patient provides history was recorded associated with clinical features cough, dyspnea, hemoptysis and chest pain [(18).]

Second step we make for each patient pulmonary function test (PFT) for checking the function of lung who have complaining from the symptoms mentioned and physical examination, the study explained as follow, the first part of this study to find the relationship between age and sex, second step of this study is relationship between lesion (pulmonary edema, pleural effusion) according to the age, third part of study is evaluation of chest X-ray (CXR) in these cases. In exam the results of diseases and the (CXR) features for both sex according to the age.

The fourth outcome is to fiend (PFT) according to the age and consideration the sex. The fourth outcome is to fiend (PFT), according to the age and consideration the sex. According to age distribution was relatively similar among males and females.Dr. Jeffery cheng and Dr. Yuranga Wearakkedy et al.

All patients were subjected to the following steps to exclude pulmonary edema or pleural effusion

Chest X-ray for all the patients Anterio posterior (AP) Lateral and lateral decubitus to found a less abnormal amount of fluid.

Pulmonary function test (PFT).

Features and history from the patient complaining.

Physical examination to exclude any abnormality in the chest or heart

Clinical Patient Preparation

No special preparation requires to a chest x-ray. We should protect the patients from X-ray radiation. Patients should remove jewelry, any glasses, dental appliances, any metal objects and some or all clothes that might interfere with the x-ray images. They may be asked to wear a gown during the examination. Women should always tell the physician and the X-ray technologist if there is any possibility that they are pregnant, because many imaging exams are not carried out during pregnancy so as to avoid the fetus exposure to radiation. If an X-ray test is necessary to be performed, then precautions must be taken to minimize baby's exposure to radiation. When it is difficult to the patient to stand, he may be positioned lying down on a table for chest x-ray exam. The patient may be asked to keep away from breathing for a few seconds at the time of taking the X-ray picture to reduce the blurred image possibility. The technologist should go behind a wall or into the next room for the activation of the X-ray machine so as to protect himself from radiation.

When the examination is complete, the patient is asked to wait until the radiologist determines the obtaining of all the necessary images.

The entire chest X-ray examination time is usually completed within 15 minutes, from positioning the patient to obtaining and verifying the images.

RESULTS AND DISCUSSION

Previous Studies

(Dr.Jeffrey and Yuranya Weer akkody et al, in adult population, the ratio of male to female patient is approximately 2:1. And the ratio 0f pediatric to adult population approximately more than the ratio of adult male to female, **this study in agreement with our study as shown in table (1) and figure (1).**

Mansor, et al (,2001) ,reported the diagnosis of pulmonary edema is made using acomplex of clinical finding initial evaluation should include a chest X-ray **also this study in agreement with our study as mentioned.**

Ware and Mattly (2005), chest radiograph characteristically demonstrate enlargement of peri bronchovascular spaces, prominent sepals lines as well as asincar areas of increased opacity that coalesce in to frank consolidations.

Galen, M.A, et al., (1975) reported hemorrhagic pleural effusion in patients undergoing recurrent hemodialysis. In this study, three patients who were maintained on recurrent hemodialysis developed hemorrhagic pleural effusions. The effusions imitated to be merely related to the uremic state, while other causes were excluded. Pulmonary restriction requiring decortications happened in only one patient. They concluded that hemorrhagic pleural effusion can be a complication of uremia in the chronically dialyzed patients, and that fibrous pleurisies causing pulmonary fetters may also result.

Traill, Z.C., et al.,(2001), worked on thoracic computed tomography(CT) in patients with doubtful malignant pleural effusion. They found in this study Contrast-enhanced CT is of value in patients with suspicious malignant pleural effusions.

Cohen, Mark, and Steven A., (2001) studied decision of pleural effusion. Other medical specialists such as pulmonologists, internal medicine and surgeons usually encounter the pleural effusion patients. Most

of the articles were written on the pleural fluid characteristics and pathophysiology, which help the doctors to establish a therapeutic plan & diagnosis for pleural diseases that are associated with effusions. In contrast, information is little on the ward time of pleural effusions. This review aimed to provide available published information on the nonmalignant pleural effusion time course of decision in empyema, which is the most commonly encountered pleural disease and is a (collection of pus in the pleural space).

Light, Richard W., (2002), reported pleural effusion. Pleural effusions may produce similar radiologic findings, alternative imaging studies are frequently necessary to verify that a pleural effusion is present. Ultrasonography studies or lateral decubitus radiographs are used most commonly, but computed tomographic (CT) scans of the chest allow imaging of the underlying lung parenchyma or mediastinum.Evalution of unknown causes of pleural effusion and differentiation of exudates from transudates was described.

Porcel, J.M.,&Light, R.W.,(2006), studied diagnosis approach to pleural effusion in adults. The first stride in pleural effusion patient detection was to find whether the effusion is an exudate or a transudate. If the patients meet Light's criteria, then exudative effusions are diagnosed. The serum to albumin gradients or to pleural fluid protein can be helpful to superior assortation of the incidental transudates that are misidentified as exudates by these gauges. Management must be directed towards the implied heart failure or cirrhosis, if the patients have transudate effusions, while attempts must be made to define the etiology, if the patients have exudate. Most effusions are related to cancer, tuberculosis, pneumonia, and pulmonary embolism. To diagnose exudative effusions differentially, several pleural effusions are useful. The helical computed tomography & thoracoscopy may also help in the diagnosis.

Balik, M., et al., (2006), reported ultrasound determination of volume of pleural fluid in mechanically ventilated patients. They found in this study easy quantification of pleural fluid may help to resolve about performing thoracenthesis in high-risk patients, although thoracentesis under ultrasound guidance appears to be a safe procedure. The aim of this study was develop a practical method for assessment of the volume of pleural effusion using ultrasonography in mechanically ventilated patients.

In his study, Pierson D.J., (2006) worked on the respiratory considerations in renal failure patients and found that the relationship between the kidneys & lungs is clinically important in both health and disease conditions. This article is the first that reviews the interactions between renal & respiratory function tests under normal conditions. It then makes a brief overview on the large group of diseases that affect both the kidneys & lungs, and then summarizes three of these diseases in somewhat more details. It shows how the chronic renal failure can affect the respiratory function and the intrathoracic structures along with a brief review of the corresponding features of acute renal failure and how the respiratory care is affected by them.

Lombardi, Giuseppe, et al.,(2010) studied the diagnosis & treatment of malignant pleural effusion, which is a usual complication in many tumors, and its turnout indicates short prospective survival. This survey updates the current available knowledge regarding the diagnosis and management of malignant pleural effusions. Recently, progress has been made in their diagnosis by using new radiological & pathological methods, such as the introduction of positron emission tomography or (PET) scanning.

Hooper, c.; Lee, Y.G., &Maskell, N., (2011), works on investigation of unilateral pleural effusion in adults. Pleural effusions are a most common medical problem with more than 50 famous causes including disease local to the pleura or underlying lung, systemic conditions, organ dysfunction and drugs. Causes of pleural effusion was described according to case was reviewed.

In the current study, a total 60 patients included 31 males (51.7%) and 29 females (48.3%), their age was ranged from (22 to +70) years. All patients with chronic renal disease and all investigated by x-ray to diagnosis the pleural effusion **this study with agreement to the study which is down by Hooper, c.; Lee, Y.G., &Maskell, N., (2011).** .

Bakirci, T., et al.,(2007), reported pleural effusion in long term hemodialysis patient. A uremic patient was oversensitive to many causes of pleural effusions. Moreover, uremia directly makes a kind of exudative pleural effusion. Uremic pleuritis has been introduced as a clinic pathologic source for the past four

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decades. In this study they found that Infectious disease including Para pneumonic effusion and tuberculosis can be the most common causes of pleural effusion in recurrent hemodialysis patient.

Table (1): Age & Sex distribution of the study Population

Sex / Age	Male	Female	Total	%
10 -- 19	---	2	2	6.7
20 -- 29	2	1	3	10
30 --- 39	6	4	10	33.3
40 --- 49	5	3	8	26.7
50 --- 60	6	1	7	23.7
Total	19	11	30	100

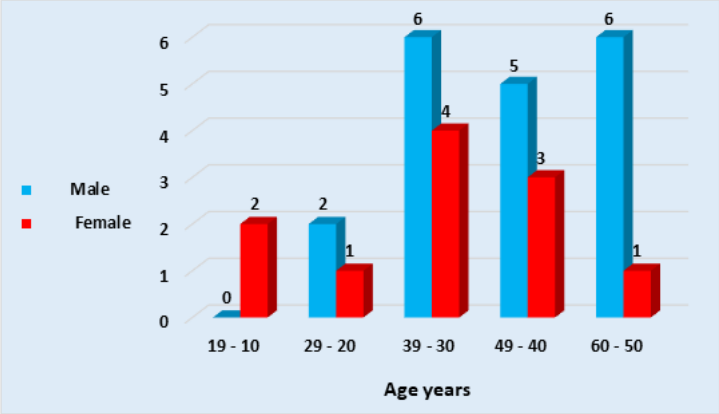

Figure (1): Age & Sex distribution of the study Population

Table (2): Distribution of the lesion according to age

esion Age	Pleural Effusion	Pulmonary Edema	Total	%
10 - 19	1	1	2	6.7
20 - 29	1	2	3	10
30 - 39	2	8	10	33.3
40 - 49	3	5	8	26.7
50 - 60	3	4	7	23.3
Total	10	20	30	100

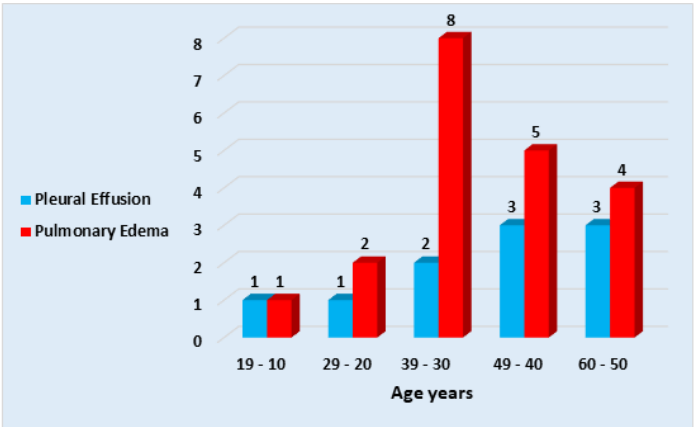

Figure (2): Distribution of the lesion according to age

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Table (3): Distribution of Chest X-Ray finding according to age & Sex

Chest X – Ray Finding / Age	Male		Female		Total	%
	Pulmonary edema	Pleural effusion	Pulmonary edema	Pleural effusion		
10 - 19	-	-	1	1	2	6.7
20 -29	1	1	1	-	3	10
30 -39	5	1	3	1	10	3.3
40 -49	4	1	1	2	8	26.7
50 -60	3	3	1	-	7	33.3
Total	13	6	7	4	30	100
%	43.3	20	23.3	13.2	100	

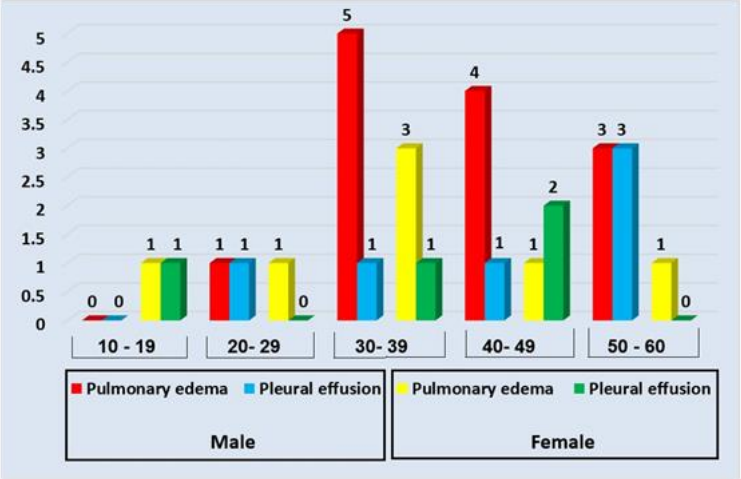

Figure (3):): Distribution of Chest X-Ray finding according to age & Sex

Table (4): Distribution of (Pulmonary Function Test) according to age & Sex

P. F. T. / Age	Female			Male			Total	%
	Obstric	Restriction	Normal	Obstric	Restriction	Normal		
10 -19	-	1	1	-	-	-	2	6.7
20 -29	-	1	-	-	2	-	3	10
30 -39	3	1	-		4	2	10	33.3
40 -49	-	1	2	2	2	1	8	26.7
50 -60	1	-	-	1	2	3	7	23.7
Total	4	4	3	3	10	6	30	100
%	13.3	13.3	10	10	33.4	20	100	

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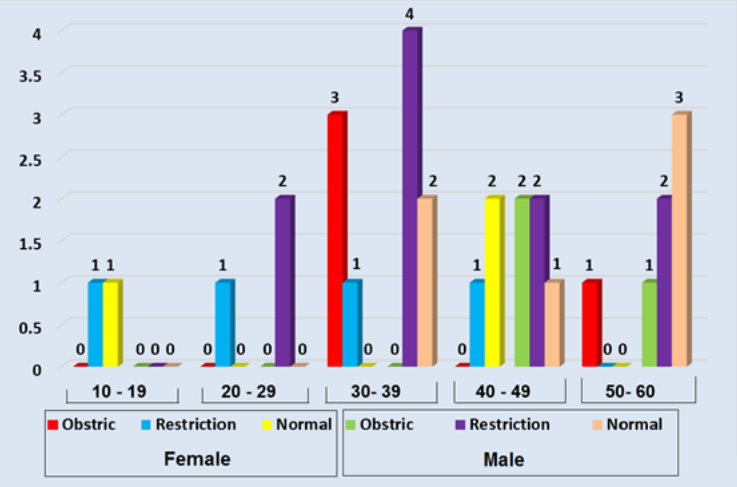

Figure (4): Distribution of (Pulmonary Function Test) according to age & Sex

DISCUSSION

***X-ray was used and pulmonary function test (PFT) associated with clinical history to diagnosis these patients. Dyspnea, cough, and chest pain were noted in most of these patients' the results from this study table (1) show the percentage of the pleural effusion and pulmonary edema ,was higher among the age (30—39) years old in percent 33.3% while it was found that the least percentage among the age group (10—19) in percent 6.7% . (Dr.Jeffrey and Dr.Yuranya Weerakkody et al, in adult population, the ratio of male to female patient is approximately 2:1. And the ratio 0f pediatric to adult population approximately 1:5.

In table (2) the percentage of pleural effusion 33% for (10) patient of all age group, and the percentage of pulmonary edema 67% for (20) patients of all age group. Table (3) shows the percentage of lesions (pulmonary edema and pleural effusion) according to sex were (43.3% f0r (13) patients male and (23.3% for (7) patients female develop pulmonary edema for all age group. (20%) for (6) patients male and (13.3%) for (4) patients female were developed pleural effusion of all age group. Table (4) show the percentage of PFT) according to age and sex were (13.3%)for (4) patient female with obstructive type and (13.3%) for (4) patients female restrictive type and (10%) for (3) patient normal, also in the same table the sum of male patients affected by obstructive and restrictive are (13) with percentage (43.4%) with (6) patients male (20%) are normal, while (8) female patients of (26.6%) are abnormal of PFT, this mean that abnormal (PFT) of all patients in this study are (21) patients (7o%) male and female while abnormal (PFT) for female (8) patients (26.6%) again in the same table (4) the normal patients in both male and female are (9) patients of (30%) this mean that we have (21) patients of (70%) in both male and female abnormal (PFT} while (9) patients of (30%) normal with (PFT).

Diagnosis of respiratory complications was considered if clinical features / pulmonary function tests

Were suggestive and High Resolution chest X-ray was consistent of pulmonary condition (Pulmonary Edema and Plural Effusion). The fourth outcome is to fiend (PFT), and in adult population the distribution of the sex to age male to female patients is approximately 2:1 (Dr.Jeffrey and Dr.Yuranya Weerakkody et al),

This study reported considerable proportions of respiratory complications among patients with ESRD with predominately Pulmonary Edema affecting 20% of the patients. Variable proportions of pulmonary edema have been reported in several studies. Pulmonary edema was previously reported in 36% of the cases with ESRD [19] which is very high from our findings. This variation may be due to the high cardiovascular risk profile of individuals with CKD, in that study, which was not similar to our study population, since cardiovascular disease was, an important cause of pulmonary edema [20] However, there are several factors associated with occurrence of pulmonary edema which were not assessed in the present study including high blood pressure (29%), rapid atrial fibrillation (29%) unstable angina pectoris (25%), infection (18%), and acute myocardial infarction (15%) [14]. Infection is one of the most common causes of morbidity and mortality in

patients with chronic kidney diseases (CKD) in many populations [21] The complicated associations between (CKD), infection, and cardiovascular diseases limit explanation of the direction of any causal association between (CKD) and infection [22] Pleural effusion was identified in 10% of the patients in .the present study, also it is encountered in patients with CKD may result from diverse causative factors that may differ from certain population to another. Therefore, there might be variable incidence rates in different countries. Incidence of 6.7% was previously reported in patients with chronic kidney diseases (CKD) [23] .The frequencies of all respiratory complications were found to increase with age. CKD is the most common in elderly individuals the mean age of all populations is continuously increasing; decreasing the risk of CKD in the elderly persons is one of the most important challenges of the future era. Therefore, elderly people were more susceptible for respiratory complications than the younger ones [24]. The strengths of the present study include the addition of more evidence to existing literature from Saudi Arabia by Mansor, et al (2001); In addition this study provides new insights for Local Health Care Provider regarding pulmonary comorbidities of ESRD, thus stimulating future research in this area. The study has some limitations, such as the nature of the collected data; information regarding end stage renal diseases (ESRD) was collected from patients' files, missing of detailed information regarding infections and subsequent patients' management. There is high rate of comorbid conditions, which represent major risk factors for the occurrence of CKD [25].

CONCLUSION

To conclude, pleural involvement is common in patients with chronic renal insufficiency most of those patients were on recurrent or chronic hemodialysis and with bilateral pleural effusion. Hence its detection is of fundamental importance because early revelation diminish the morbidity; patients predominantly ready with shortness of breath but cough and chest pain can be a feature.

Chest radiographs are the most common examination used to assess for the presence of a pleural effusion; however, it should be noted that on a routine erect chest x-ray as much as 250-600 ml of fluid is required before it becomes evident [26]. A lateral decubitus film is most sensitive, able to identify even a small amount of fluid; its projections enhance the sensitivity of conventional radiography. Effusions as small as 150 ml can be seen on a chest x-ray taken in special views (lateral decubitus view). At the other extreme, in supine films can mask large quantities of fluid [27].

Anterioposterior (AP) and lateral decubitus films are the first line to evaluation of pleural effusion in the patients with chronic renal failure. X-ray and pleural fluid analysis uses to diagnosis pleural effusion, the first establishment diagnosis is important for early treatment.

Approximately 200 ml of fluid are needed to detect an effusion in the frontal film vs. approximately 75ml for the lateral. Larger effusions, especially if unilateral, are more likely to be caused by malignancy than smaller ones.

A minimum of 300 ml of fluid accumulation is required for producing a significant radiological finding (blunting of cost phrenic angle) on a regular chest x-ray (Anerioposterior view).

Different imaging's modalities can be used to diagnose and manage pleural disease Findings on chest radiographs frequently confirm the presence of pleural effusion.

The presence of pleural effusions is often confirmed by lateral and posterio-anterior chest radiography, but when there is a doubt to confirm the result, then computed tomography scans or ultrasound images are considered definitive to detect small effusions and to differentiate pleural fluids from pleural thickenings**.** [28] .In the lateral decubitus, small amounts of pleural fluids that are not easily detected in the standard frontal view may be identified see (figures 1). On an Anterioposterior (AP) radiograph, free pleural fluid may blunt the cost phrenic angle; form a meniscus laterally; or hide in a sub pulmonic location, simulating an elevated hemi diaphragm.

So The most proper position to diagnose pleural effusion are lateral and lateral decubitus and the chest X –ray more favorite way for detection of pulmonary edema if doubt exits pleural. Ultrasound (US) or Tomography (CT)

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