

## CLINICAL EVALUATION OF CARDIAC INVOLVEMENT IN PNEUMONIA

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**ABSTRACT:** Pneumonia is a major cause of morbidity and mortality throughout the world in the earlier decades before the advent of antimicrobials. After the advent of antibiotics, a spectacular improvement in the control of infection was expected, but it still exists and quite prevalent. In India, because of low socioeconomic status, overcrowding and increasing HIV infection pneumonia is still an important cause of morbidity and mortality. As pneumonia has predilection to elderly individual, they are more prone for developing secondary cardiac complications, such as pericarditis which carry high mortality rate if left untreated. **AIMS:** To know the frequency of cardiac involvement and the type of cardiac involvement in pneumonias. **MATERIAL AND METHODS:** This is a Non Randomized Descriptive Study. Patients both female and males above 12 years with history of fever, cough, with or without pleuritic chest pain with radiological appearance suggesting pneumonic consolidation are included in the study. Patients who fulfill the inclusion criteria are included in the study. Detailed history regarding complaints, antibiotic treatment received prior to admission to our hospital followed by detail general physical examination, respiratory system examination, cardiovascular system examination and gastrointestinal system examination. Then patients were investigated with routine blood examinations; renal parameters; sputum examination by Gram's stain, culture and sensitivity, KOH preparation, ZN staining; chest x-ray ; Blood C/S; ECG; 2D echocardiogram. Clinical and laboratory criteria are used for making the diagnosis of pericarditis, myocarditis and endocarditis in the absence of evidence of an acute myocardial infarction or history of previous cardiac disease. **RESULTS:** Out of 40 Patients, 25 were males and 15 were females. In 40 patients only 2 developed cardiac complication which accounts for 5%. Of the 2 cardiac complications, both were pericarditis. Of the 2 cardiac complication which we encountered in our study, both of the patients had not received antibiotic treatment prior to admission. **CONCLUSION:** Cardiac involvement secondary to pneumonia are still present, but the incidence compared to the pre antibiotic era it is very less. It's the Untreated pneumonias which secondarily involve cardia. Of the cardiac complications, pericarditis is common whereas myocarditis and endocarditis are uncommon.

**KEYWORDS:** Pneumonia, Cardiac Complications, Pericarditis, Myocarditis, Endocarditis

**INTRODUCTION:** Pneumonia is a disease known to mankind from antiquity. It was a major cause of morbidity and mortality throughout the world in the earlier decades before the advent of antimicrobials. After the advent of antibiotics, a spectacular improvement in the control of infection was expected, but it still exists and quite prevalent. Even today, it is an important cause of morbidity and mortality<sup>16,17</sup>.

In India, because of low socioeconomic status, overcrowding and increasing HIV infection pneumonia is still an important cause of morbidity and mortality. In India, respiratory tract infections occur at the rate of 374 cases per 1000 population<sup>28</sup>, of these pneumonias constitute the third major cause of mortality.

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At around 1950, and coinciding with the beginning of antibiotic era, the mortality rate leveled off and remained fairly constant. This mortality rate is heavily weighed against elderly, so that the death rates were 35 and 21 per 10000 for man and woman respectively in age group 55-64 years, and death rate were 775 and 572 per 10000 for the age group 75-84 years<sup>1</sup>. This predilection of pneumonia for the elderly is not new and led William Osler in 1998 to describe the condition as "The friend of the aged", whereas pneumonia in elderly is frequently a terminal event in a patient disabled or dying as a result of some other incurable disease, this is clearly not usually the case in younger ones<sup>4</sup>. As pneumonia has predilection to elderly individual, they are also more prone for developing secondary complications, such as cardiac ones pericarditis which carry high mortality rate if left untreated<sup>20</sup>.

The annual incidence of community acquired pneumonia in those aged over 63 years has been estimated to be between 25 and 44 cases per 1000, with a rate varying from 2 to 8 times greater than this in subjects of similar age but living in institutions such as residential or nursing homes<sup>5,6</sup>.

Elderly patients are also much more likely to acquire pneumonia in hospital than the younger age groups. Subject of pneumonia in the elderly has been well reviewed<sup>7</sup>. Pneumonia is the most common hospital-acquired infection accounting for death, occurring with an estimated frequency of 0.5-5% of admissions<sup>8</sup>.

Certain sections of the community, such as drug abusers are susceptible to pneumonia, this may be due to seeding of the lung by Staphylococci or other organisms from right sided infectious endocarditis<sup>10</sup>, or as a result of aspiration of oropharyngeal contents while in a stuporous state, which may result in a predominantly anaerobic or Gram negative pneumonia.

Death rates from pneumonia may be influenced by seasonal factors, being greater in the cold winters than in the summer. This differences is more evident in lower socioeconomic groups and is unaccounted for by influenza epidemics above<sup>11</sup>. It is possible that greater overcrowding and poor ventilation in cold weather may be the factors enabling the spread of infection.

As known pneumonia can go for complications, both pulmonary and extrapulmonary. Extrapulmonary complications are rare in this antibiotic era. But in developing country like India these complications are still persisting due to delay in institution of antibiotic therapy<sup>12</sup> because of low socioeconomic status and lack of availability of medical facilities, and. increasing HIV infection.

Of extrapulmonary complications, cardiac complications such as pericarditis, myocarditis and endocarditis carry high mortality, their early diagnosis and prompt treatment can reduce the mortality rate and morbidity rates.

So we conducted this study to know the percentage of cardiac involvement secondary to pneumonia in this antibiotic era and to decide whether cardiac evaluation is required to all the patients with pneumonias.

**MATERIAL AND METHODS:** This study was done at Kempegowda Institute of Medical Sciences, Bangalore . This is a Non Randomized Descriptive Study which had a sample size of 40 cases.

**Study Population:** Patients both female and males above 12 years with history of fever, cough, with or without pleuritic chest pain admitted with radiological appearance suggesting pneumonic consolidation are included in the study..

**Inclusion criteria's:**

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1. Patients age above 12 years after taking consent.
2. Patients with clinical symptoms, signs, as well as radiological appearance suggesting pneumonic consolidation.

## **Exclusion criteria's:**

1. Patients below 12 years of age.
2. Patients with symptoms and signs but without radiological features suggesting pneumonic consolidation.
3. Patients with past history of ischaemic heart diseases or any cardiac diseases.

## **Objectives of study:**

1. To know the frequency of cardiac involvement in case of pneumonias.
2. To know the type of cardiac involvement in case of pneumonias.

Patients who fulfill the inclusion criteria are included in the study. Detailed history regarding complaints, antibiotic treatment received prior to admission to our hospital followed by detailed general physical examination, respiratory system examination, cardiovascular system examination and gastrointestinal system examination. Then the patients were investigated which included routine blood examinations; renal function test; sputum examination by Gram's stain, C/S, KOH preparation, ZN staining; chest x-ray PA view; Blood C/S; electrocardiogram; 2D echocardiogram. Clinical and laboratory criteria are used for making the diagnosis of pericarditis, myocarditis and endocarditis in the absence of evidence of an acute myocardial infarction or history of previous cardiac disease<sup>21</sup>.

Clinical diagnosis of Pericardial involvement was accepted if 2 or more of the following clinical and laboratory criteria is present in the absence of evidence of an acute myocardial infarction or history of previous cardiac disease.

1. Characteristic precordial chest pain influenced by position but not respiration, and not typically anginal in nature
2. Pericardial friction rub.
3. Specific ECG abnormalities.
4. Pericardial effusion found by echo or by aspiration.

Following ECG changes are used in diagnosing pericarditis, In acute phase - elevated concave upward ST segment with upright tall and peaked T wave in most of the leads associated with sinus tachycardia, In pericardial effusion - low to inverted T waves in most leads, diminished amplitude of all the electrocardiographic deflections, potential electrical alternans. Following echocardiographic findings are taken for diagnosing pericardial effusion - fluid in pericardial space,

Clinical diagnosis of Myocardial Involvement is accepted if 2 or more of the following clinical and lab criteria is satisfied in the absence of evidence of an acute myocardial infarction or history of previous cardiac disease<sup>22</sup>.

1. Development of left ventricular failure as demonstrated by clinical and radiographic appearance of pulmonary oedema or radiographic evidence of progressive cardiomegaly.
2. Appearance of electrocardiographic abnormalities.
3. Echocardiographic findings.

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Following ECG changes are used in diagnosing myocarditis - prolonged QRS duration, bundle branch blocks, frequent ectopic beats, ST segment may be either elevated or depressed, T wave flattening or inversion in left precordial leads, prolonged QTc interval, sinus tachycardia. Following echocardiographic findings are taken for diagnosing myocarditis - left ventricular dysfunction, segmental wall motion abnormalities, wall thickness may be increased if the inflammation is fulminant.

Following diagnostic criteria are used for diagnosing Endocarditis<sup>29</sup>.

- (A) Two major criteria or
- (B) One major and three minor criteria or
- (C) Five minor criteria using specific definitions for these criterias as listed below.

Major criterias are as follows:

1. Positive blood culture for infective endocarditis.
2. Evidence of endocardial involvement
  - A. Positive echocardiogram findings for infective endocarditis are
    - a) Oscillating intracardiac mass on valve or supporting structures, or in the path of regurgitant jet.
    - b) Abscess
  - B. New valvular regurgitation.

Minor criteria are as follows:

1. Predisposition: Predisposing heart conditions or intravenous drug use.
2. Fever: > 38.0°C (100.4°F)
3. Vascular phenomena: Major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial haemorrhage, conjunctival haemorrhage, Janeway lesions.
4. Immunologic phenomena: Glomerulonephritis, Osler nodes, Roth spots, rheumatoid factor.
5. Microbiologic evidence: Blood culture but not meeting major criterion above or serologic evidence of active infection with organism consistent with infective endocarditis.
6. Echocardiogram Consistent with infective endocarditis but not meeting major criterion above. Patients are followed up every day till they are in the hospital and if they develop new findings and if they are not responding then necessary investigations are repeated again to know the problem.

**ETHICAL CLEARANCE:** This study was approved by ethical committee of KIMS Bangalore.

**RESULTS:** Out of 40 patients, 25 were male patients and 15 were females. In this present study Pneumonia was distributed among all age group, but maximum being in age group of 61 to 70 yr accounting to 22%, next being 41 to 50 yr age group accounts 20%, next being 21 to 30 & 31 to 40 yr age group between accounting 15% each.

In this present study out of 40 cases 29 patients had received Antibiotics prior to admission, which accounts for 72.5%. In these 16 Male patients had received antibiotics which accounted for 64% and 13 female patients had received antibiotic which accounted for 86.67%.

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In this study of 40 patients only 2 of the patient developed cardiac complication which accounts for 5%. Of the 2 cardiac complications, both were pericarditis. Of the 2 cardiac complication which we encountered in our study, both of these patients had not received antibiotic treatment prior to admission. Both the patient's with cardiac complication are males. Of the 2 cardiac complication, one was observed in the age group of 31 to 40 yrs, and one in age group of 61 to 70 yrs.

**DISCUSSION:** Not much studies has been done on cardiac complications secondary to pneumonias. In most of studies which has been done they have taken one particular pneumonia eg. pneumococcal pneumonia and they have shown the incidences of cardiac involvement in them. In this present study we have taken pneumonia in general whatever the causative agent is and studied the cardiac involvement in them and also the type of cardiac involvement in this antibiotic era.

In this present study we studied 40 patients of various pneumonias, out of 40 patients, 25 were males and 15 were females and 2 had cardiac complications. Usually pneumonia is more common in extremes of age groups <sup>13</sup>, but in this study pneumonia is distributed among all age groups, but maximum being in age group of 61-70 yr accounting to 22%, next being 41-50 yr age group accounting 20%, next being 21-30 yr and 31-40 yr age groups accounting 15% each. Of the 2 cardiac complications in this present study, one is in the age group of 31-40 yrs and one in 61-70 yr age group. In Steve L Berk et al<sup>24</sup> study of 6 patients of pericarditis, age ranged from 1 - 65 yrs. In Carol A Kauffman et al<sup>9</sup> study of 5 patients of pericarditis, age ranged from 7 months to 52 yrs. In Kenneth Gould et al<sup>20</sup> study, average age was 49 yrs with a range from 16 to 80 yrs. In Lt David Finkelstein et al<sup>25</sup> study, age ranged from 19 to 27 yrs.

In this present study of 40 patients, 33 patients (82%) had fever, 28 patients (70%) had cough, 21 patients (52%) had dyspnoea, 12 patients (30%) had pleuritic chest pain. Some patients had associated atypical symptoms. In the 2 cardiac complication patients, none of them had signs such as raised JVP, pulsus paradox, distended neck veins, signs of endocarditis, hepatomegaly, muffled heart sounds or pericardial rub which are suggestive of cardiac involvement. In Steve L Berk et al<sup>24</sup> study, only 1 patient had friction rub out of 6 pericarditis patients, in these patients physical examination gave no specific evidence of pericarditis. Carol Kauffmann et al<sup>19</sup> noticed 3 out of 5 patients having pericarditis clinically. Boyle et al<sup>34</sup> recognised 3 out of 11 cases of pericarditis clinically. Trevas Dale<sup>9</sup> stated in 1933 that the diagnosis was suspected clinically in only 17% of the patients in whom pericarditis was established at necropsy. Lt David Finkelstein et al<sup>25</sup> in his study of 3 patients with pericarditis, he noticed paucity of symptoms and signs and diagnosis depends on changes in ECG and echocardiography. M Raid El Khatib et al<sup>27</sup> in his study of 1 patient with myocarditis noticed pericardial rub

In this present study, out of 40 patients, only 2 developed cardiac complications which accounts for 5%. 2 cardiac complications which we encountered were pericarditis. Steve L Berk et al<sup>24</sup> has done a retrospective study and has reviewed 6 patients with pericarditis caused by *Streptococcus pneumoniae*. Carol H Kauffman et al<sup>19</sup> studied 5 patients with purulent pericarditis, here the predisposing factors were untreated pneumococcal pneumonia. Milton J Sands et al<sup>21</sup> in his study has showed 13 cases of pericarditis / perimyocarditis associated with *Mycoplasma pneumoniae* pneumonia infection. Kenneth Gould et al<sup>20</sup> studied 20 patients with purulent pericarditis, in these, 5 were due to pneumococcal pneumonia, 5 were due to aerobic Gram negative

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bacilli pneumonia, 4 were due to coagulase positive Staph aureus and 3 were due to anerobic organisms. Lt David Finkelstein et al<sup>25</sup> studied 3 cases of pericarditis associated with primary atypical pneumonia.

In this present study of 40 patients, 2 patients developed cardiac complication. Both the patients developed purulent pericarditis, there wasn't any myocarditis or endocarditis in this study. In Steve L Berk et al<sup>24</sup> study, 6 patients developed pericarditis secondary to pneumococcal pneumoniae pneumonia infection. In Carol A Kauffmann et al<sup>19</sup> study they encountered 20 patients with purulent pericarditis. In Milton J Sands et al<sup>21</sup> study, 8 cases had pericarditis, 5 had peri myocarditis. In Kenneth Gould et al<sup>20</sup> study they encountered 20 patients with purulent pericarditis secondary to various pneumonias. Lt David Finkelstein et al<sup>25</sup> presented 3 cases of pericarditis associated with primary atypical pneumonia. Feizo o et al<sup>35</sup> showed 5 cases of myocarditis associated with primary atypical pneumonia. M Raid El Khatib et al<sup>27</sup> reported a case of Mycoplasma pneumonia. Kenneth Gould et al<sup>20</sup> in his study of 20 cases found 2 cases of bacterial endocarditis associated with pneumonia. D A Levison et al<sup>36</sup> in his study of 2 cases of Chlamydiae pneumonia, there was associated infective endocarditis.

In this present study of 40 patients, 29 patients (72.5%) had received antibiotic prior to admission and 11 didn't (27.5%), 2 patients with pericarditis in this study didn't receive antibiotic prior to admission. Steve L Berk et al<sup>24</sup> reviewed the clinical dates of 26 cases of pneumococcal pericarditis reported in publications since 1915. Although pericarditis was more often encountered as a complication of untreated pneumococcal disease in pre-antibiotic era <sup>31,32,33</sup>, the use of effective antimicrobial therapy against Streptococcal pneumonia has decreased the incidence of pericarditis. In Carol A Kauffman et al<sup>19</sup> study of 5 patients with purulent pericarditis the predisposing factor was untreated pneumococcal pneumonia in all cases. They reviewed 113 cases of purulent pneumococcal pericarditis since 1900, Of these 113 cases, 98 occurred prior to the use of penicillin in 1945. Overall mortality was 63.7%. Prior to 1945, 69.4% patients died, after 1945 26.7% died.

In this present study of 40 patients, only in 8 patients organisms were isolated from sputum, in them 6 showed Klebsiella species, 1 showed E.coli species, 1 showed both Klebsiella and Pseudomonas. Of the 2 pericarditis patients organisms was not isolated from the sputum. We did not do pericardiocentesis and culture of pericardial fluid as the patients were not willing. In these 2 patients even blood culture did not show any growth of organisms. In present study, in 20% of patients organisms were isolated and in 80% we did not isolate organisms, this may be due to antibiotic treatment received by the patients prior, to admission. In present study Gram negative bacilli are isolated due to injudicious use of antibiotics, so that Pneumococcus which was once a common pathogen is coming down. Kenneth Gould M D et al<sup>20</sup> study of 20 patients with purulent pericarditis, 5 patients had Diplococcus pneumoniae in blood culture and pericardial fluid, 5 patients had aerobic Gram negative bacilli in blood culture, coagulase positive Staph aureus was isolated from 4 patients in blood and pericardial fluid, anerobic organisms were isolated from 3 of the patients, in 1 patient polymicrobial bacteraemia with Haemophilus species and Peptococcus organisms were isolated, in 3 patients no organisms were isolated.

Pneumococci and Staphylococci remains frequent causes of purulent pericarditis, while in all of the post antibiotic series Streptococci are less common than previously noted. Aerobic Gram negative bacilli and anerobic organisms were isolated more frequently than noted in earlier reports. In Carol A Kauffmann M D et al<sup>19</sup> study of 5 patients, Diplococcus pneumonia was isolated from 4

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patients and 1 patient didn't show any organisms and he had previously received penicillin. In Steven L Berk et al<sup>24</sup> study of 6 patients *Streptococcus pneumoniae* was isolated. In Lt David Finkelstein et al<sup>25</sup> study of 3 patients of pericarditis associated with primary atypical pneumonia, organisms were not isolated.

In this present study of 40 patients of pneumonia, 2 patients had concomitant pericarditis secondary to pneumonia. They were put on appropriate antibiotics without pericardiocentesis, they recovered fully and at the time of discharge check echocardiography showed complete resolution of pericardial effusion. So there was no mortality in our study.

Most studies quoted above have done retrospective analysis of cardiac complications in specific pneumonias. In our study we have taken pneumonia in general whatever the causative agent and studied incidence of cardiac involvement. In this study, out of 40 pneumonia cases, 2 had cardiac involvement which accounts to 5%.

## CONCLUSION:

1. Cardiac involvement secondary to pneumonia are still present, but the incidence compared to the pre antibiotic era it is very less.
2. Untreated pneumonias may secondarily involve cardia.
3. Of the cardiac complications, pericarditis is common whereas myocarditis and endocarditis are uncommon.

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**LIST OF ABBREVIATIONS USED:**

- C/S - Culture & sensitivity
- ZN Stain - Ziehl - Neelsen stain
- KOH - Fungal Stain
- CXR - Chest X-Ray
- ECG - Electrocardiogram
- 2D Echo - Echocardiography
- KIMS - Kempegowda Institute of Medical Sciences

**TABLES:**

Age in yrs	Males	%	Female	%	Total	%
12-20	2	8	0	0	2	5
21-30	1	4	5	33.33	5	15
31-40	6	24	0	0	6	15
41-50	4	15	4	26.67	8	20
51-60	4	16	1	6.67	5	12.5
61-70	5	20	4	26.67	9	22.5
71-80	3	12	1	6.67	4	10
<b>Total</b>	<b>25</b>	<b>100</b>	<b>15</b>	<b>100</b>	<b>40</b>	<b>100</b>

**TABLE-1: Age group distribution of 40 cases in one study**

History of Antibiotic treatment received prior to admission	Males	%	Female	%	Total	%
Present	16	64	1	86.67	29	72.5
Absent	9	36	2	13.33	11	27.5
Total	25	100	15	100	40	100

**TABLE-2: Antibiotic History**

Total No. of Patients	No. of cardiac complications	%
40	2	5

**TABLE-3: Cardiac Complications**

Total no. of Cardiac complication	Type of Cardiac complications		
	Pericarditis	Myocarditis	Endocarditis
	2	0	0

**TABLE-4: Type of Cardiac Complications**

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No. of cardiac complication	History of antibiotic treatment received prior to admission			
	Present	%	Absent	%
2	0	0	2	100

**TABLE-5: Cardiac complication & its relation to Antibiotic treatment received prior to admission.**

No. of patients with cardiac complication	Males	Females
2	2	0

**TABLE-6: Cardiac Complication & its relation to sex.**

Age group	Males	Females	Cardiac complications
12-20	2	0	0
21-30	1	5	0
31-40	6	0	1
41-50	4	4	0
51-60	4	1	0
61-70	5	4	1
71-80	3	1	0

**TABLE-7: Cardiac complication and its age group distribution**

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