

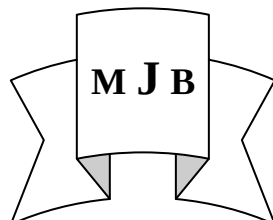
Bacterial Profile and Risk Factors Associated with Typical Pneumonia

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Abstract

The main aim of this study was to detect the bacterial profile associated with typical pneumonia. Some risk factors represented by age, sex, residence, smoking and comorbidity illness and their effect on incidence of pneumonia were considered. For this, a total of, 142 proofly pneumonic patients who referred to Marjan Teaching Hospital and consultant clinic for respiratory and chest diseases were studied during a six- month period from October 2012 to March 2013.

The bacterial causes were determined in 126 (88.7%) sputum samples out of 142 samples under study. Bacterial isolates represented by 49 isolates (34.5%) of *Streptococcus pneumoniae*, 26 isolates (18.4%) of *Klebsiella pneumoniae*, 21 isolates (14.8%) of *Neisseria meningitidis*, 4 isolates (2.8%) of *Staphylococcus aureus*, 4 isolates (2.8%) of *Haemophilus influenzae* and 2 isolates (1.4%) of *Streptococcus pyogenes*. Mix growth was found in 20 isolates (14.0%). Patients aged above 49 years were more susceptible for pneumonia. Males 89 cases (62.7%) were found to be more susceptible for infection compared with females 53 cases (37.3%). The urban residence individuals revealed a high frequency of pneumonia 78 cases (55%) versus 64 cases (45%) of rural residence individuals. Pneumonia was high incidence in smoker patients 92 (64.8%) compared with non-smoker patients 50 (35.2). Patients with comorbidity illness were more also susceptible to pneumonia.

الخلاصة

هدفت هذه الدراسة الى تحديد المحتوى البكتيري لذات الرئة النوعي. ثم ايضا الاخذ بنظر الاعتبار بعض عوامل الخطورة متمثلة بالعمر، الجنس، السكن، التدخين، الامراض المشتركة على الاصابة بذات الرئة. تم دراسة ١٤٢ نمودجا من المرضى المصابين بذات الرئة المشخصة سريريا والذين كانوا يراجعون مستشفى مرجان التعليمي والعيادة الاستشارية للامراض الصدرية والتنفسية خلال سنة اشهر من تشرين الاول ٢٠١٢ ولغاية اذار 2013.

حددت المسببات البكتيرية في ١٢٦ عينة قشع من اصل ١٤٢ عينة تحت الدراسة. تمثلت العزلات بالمسببات الرئوية *Streptococcus pneumoniae* ٤٩ عينة (٣٤,٥%) و ٢٦ عينة (١٨,٤%) من الكليبيلا الرئوية *Klebsiella pneumoniae* و ٢١ عينة (١٤,٨%) من *Neisseria meningitidis* و ٤ عينة (٢,٨%) من المكورات العنقودية *Staphylococcus aureus* و ٤ عينة (٢,٨%) من البكتيريا المحبة للدم *Haemophilus influenzae* و ٢ عينة (١,٤%) من المسببات القححية *Streptococcus pyogenes*. النمو المختلط وجد في ٢٠ عينة (١٤,٠%). كان المرضى الذين يتزايد اعمارهم عن ٥٨ سنة اكثر عرضة للاصابة بذات الرئة. وكان الرجال يشكلون ٨٩ حالة (٦٢,٧%) وهم اكثر عرضة للاصابة مقارنة بالنساء ٥٣ حالة (٣٧,٣%). كما واطهر الافراد من سكنى المدينة تردد عالي نسبيا للاصابة ٧٨ حالة (٥٥%) مقابل ٦٤ حالة (٤٥%) من سكنى الريف. كما وجد ان ذات الرئة عالي الانتشار عند الاشخاص المدخنين ٩٢ حالة (٦٤,٨%) مقارنة بالمرضى غير المدخنين ٥٠ حالة (٣٥,٢%). المرضى الذين لديهم امراض مزمنة مرافقة كانوا اكثر عرضة للاصابة.

Introduction

Pneumonia is a common potentially serious illness that is associated with morbidity and mortality worldwide [1,2]. Pneumonia is responsible for about 19% of all death cases in children aged less than 5 years [3]. It is the eighth leading cause of death in the United States and the most frequent cause of death due to infectious diseases [4]. Whereas in Asia, pneumonia is the sixth leading cause of death [5]. Pneumonia is at two main types according to the mode of infection either Community -acquired pneumonia (CAP) or Hospital – acquired pneumonia(HAP).

CAP accounts 5 % to 12 % of all cases of adult lower respiratory tract infections in the community. In Spain the annual incidence of CAP in adult varies between 1.6 and 1.8 per 1000 inhabitants [6]. The incidence of CAP is higher in winter, in older males and patients with risk factor. The percentage of adult patients required hospitalization is 22 -42%, other patients treated on an ambulatory basis, approximately 1.2 % and 10 % of these admitted to hospital managed on an intensive care unit (ICU) [6].

The etiology of pneumonia has been studied world wide during the past decade and special emphasis has been given to the changes in the etiology of pneumonia. This infectious disease commonly caused by bacteria and viruses but may be caused by fungi and parasites [7]. The bacteriological profile of community- acquired pneumonia is different in different countries and changing with time within the same country, probably due to frequent use of antibiotics, changes in environmental pollution, increased awareness of the disease and changes in life expectancy [8]. For instances *S. pneumoniae* remainse

leading cause of community– aquired pneumonia in most parts of Europe [9], United states [10], UK [11], Iraq [12] and Delhi [13]. *K. pneumoniae* is most common pathogen leading to admission to medical intensive care unit in Singapore [14]. Its distribution as a CAP pathogen is uneven across world incidence in developing countries and Asia [15,16].

Pneumonia is increasingly common among older patients and those with co-morbidity like diabetes mellitus renal failure, congestive heart failure, chronic lung disease and other conditions [8]. Smoking is other important and serious risk factor for pneumonia and other lower respiratory tract infection, it has substantial local and systemic effects on immune systeme, for this, motality of pneumonia increased between smoker patients [17].

Materials and Methods

From October 2012 to March 2013, a total of 142 consecutive patients with proof pneumonia (according to clinical diagnostic feature observed by physicians) who were referred to MarjanTeaching Hospital and consultant clinic for respiratory and chest diseases were investigated. Age of patients ranged between 18-93 years .The following data were recorded for each patient: age, sex, residence, current cigarette smoking , comorbidity illnesses. The patients were suffering from presumptive pneumonia with clinical symptoms represented by fever, chest pain cough with purulent sputum, chills, headache , with new infiltrate chest radiography. Aquestionary sheet was prepared for each patient to record the following risk factors (if any) : (chronic bronchitis , asthema , heart failure, diabetes mellitus, hypertensive,

allergic bronchitis, renal failure and TB). After collection of sputum, Gram stain was done for each sample. Sputum containing more than 25 polymorph nuclear cells and less than 10 epithelial cells per low power field were appropriated to culturing on traditional media [8]. Sputum was inoculated on blood, chocolate, nutrient and MacConkey media, as well as Thayer martin medium was used as selective media for *Neisseria meningitidis* in current study. All essential physiological and biochemical tests were used to diagnosis of bacterial causes.

Results

According to bacterial types isolated from pneumonic patients, the bacterial causes were indicated in 126 cases (88.7%) out of 142 cases under study whereas, 16 cases (11.3%) revealed negative results as shown in table -1, the most frequent pathogen was *S. pneumoniae* 45 cases (40.9 %), followed by 26 cases of *K. pneumoniae* (21.7%), 21 cases of *N. meningitidis* (14.8%), 4 cases (2.8%) for each one of *St. aureus* and *H. influenzae* and 2 cases of *S. pyogenes* (1.4%). Mixed bacteria were indicated in 20 cases (14%). These bacterial isolates accounted 126 cases (88.7%).

Table 1 Bacterial isolates from sputum of patients suspected with pneumonia:

Bacterial species	Number (%)
<i>Streptococcus pneumoniae</i>	49(34.5)
<i>Klebsiella pneumoniae</i>	26(18.4)
<i>Neisseria meningitidis</i>	21(14.8)
<i>Staphylococcus aureus</i>	4(2.8)
<i>Haemophilus influenzae</i>	4(2.8)
<i>Streptococcus pyogenes</i>	2(1.4)
Mixed bacteria	20(14.0)
Negative	16(11.2)
Total	142

According to risk factors as mention in table -2. Patients aged more than 49 years were high incidence for pneumonia. Male individuals 89 cases (62.7%) were more incidence for pneumonia comparison with female individuals 53 cases (37.3%). Regarding to residence urban individuals revealed

78 cases (55%) while rural individuals revealed 64 cases (45%). Smoking habit appeared in 92 individuals (64.8%) whereas, 50 cases (35.2%) of patients were non-smokers in present time. Also the number of pneumonic patients with comorbid illness 78 cases (55%) versus 64 cases (45%) without.

Table 2 Description of 142 patients according to risk factors

Risk factor	Number (%)
Age	
18-33	21(14.8)
34-48	27(19.0)
49-63	55(38.7)
Age > 63	39 (27.5)
Sex	
Male	89(62.7)
Female	53(37.3)
Residence	
Rural	64(45)
Urban	78 (55)
Current cigarette smoking	
Smoker	92(64.8)
Non-Smoker	50(35.2)
Comorbidity illnesses	
Comorbid illness	78(55.0)
Non-comorbid illness	64(45.0)

Discussion

The frequency of patients with negative result were low compared with some study. In local study, Al-muhanna, [18] reported the negative sample obtained from pneumonic patient accounted for (38.9 %). The explanation for this result may be related with two factors, the first factor is that the current study included pneumonic patients with productive cough only and rejected any patients without productive cough, therefore, the study focused in the diagnosis on sputum Gram stain and sputum culture only, whereas other study depended on blood culture as well as sputum Gram stain and sputum culture. The second factor that the patients with non productive cough mostly have atypical pneumonia [19,20] and atypical pneumonia is rare in developing countries, Mitike *et al*, [21], pointed out that the pneumonia cases with typical bacteria are common in developing

countries, while viruses are major causes in developed countries.

The results revealed that out of 129 samples 126 (88.7%) samples were positive and the most common pathogen was *S. pneumoniae* (34.5%). This result was in agreement with most studies. Gupta *et al*, [22] reported that *S. pneumoniae* is the most common etiological agent of pneumonia. Isturiz *et al*, [23] stated that the *S. pneumoniae* was identified as the most common pathogen, accounting for up to 35% of (CAP). Capelastegui *et al*, [24] pointed out that the most frequently isolated organism from pneumonic patients was *S. pneumoniae* which account for (43.6%). The second pathogen being isolated by this study was *K. pneumoniae* which account for 26 sample (18.4%). This result nearly is in accordance with the results being reported by other studies. *K. pneumoniae* constituted (8%) and (10.4%) of isolated bacterial

pathogens for patients with pneumonia [25,26].

Other Gram negative bacteria were also isolated *N. meningitidis*, which is regarded as uncommon pathogen among pneumonia. This organism constituted (14.8 %). pusch *et al*, [27] isolated *N. meningitides* in a frequency of (30%). Dulovic *et al* (28) stated that *N. meningitidis* was responsible for (4.3%) from pneumonia cases. Richter, [29] asserted that *N. meningitidis* causing pneumonia is commonly caused by serotype 135, but may be caused by other serotypes represented by serotype B, C, X, Z and Y. *H. influenzae* and *St. aureus* were constituted 4 isolates(2.8%) for each, this results relatively in agreement with finding Al-muhanna, [18] who found that *H. influenzae* and *St.aureus* were constituted 5 isolates (4.6%) and 2 isolates (1.8%) respectively.

According to risk factors, the incidence of pneumonia increased in patients aged more than 49 years. Sethi, [30] described pneumonia as a closely associated illness with increase of age. Mortality from pneumonia in Americans age > or = 65 has been increasing since 1980, vaccination of older patients living in the community has been shown to decrease hospitalizations due to pneumonia. Proportional of pneumonia with the age is due to physiological changes that lead to the decrease in the pulmonary function take place as the aging process advances [31]. After a person turns 55 years, the respiratory muscles start to weaken and the thoracic wall becomes less elastic. Other effects aging causes the defense mechanisms of the airways to decrease; it also reduces the efficacy of the mucocilliary clearance. More importantly, there is a decrease in the efficacy of the cough reflex [31].

According to the gender of patients being investigated in this study, this result is consistent with Kolsuz *et al*, [32] who pointed out that the incidence of pneumonia in males and in females were (60.4 %) and (39.6%) respectively.

One explanation for dominance of infection in males than females is probably that cigarette smoking was more common among male [33].

Regarding the residence of patients included in this study, it was found that 78 cases (55%) of urban individuals while 64 cases (45%) of rural patients, because in current study the collection of samples from medical centers in urban region (Hilla city). This results in disagreement with finding of Almuhanha, [18], in Najaf city who found from 180 cases; 115 (63.9%) rural individuals and 65 (36.1%) urban individuals. According to current cigarette smoking, this result is in agreement with Shah *et al*, [8] who found smoking was most common predisposing factor identified (65%) in pneumonic patients. The increase incidence of pneumonia in smoker individuals because the smoking habit has serious effects on respiratory tract as well as substantial local and systemic adverse effects on the immune system [17]. Generally, the effects on respiratory tract includes smoking – related comorbidities (COPD etc.), decreased respiratory capacity, peribronchiolar inflammation, disruption of respiratory epithelium, impaired mucociliary clearance, decreased phagocytic capacity of alveolar macrophages and increased carriage of pathogenic bacteria [17]. On the other hand, the effects of smoking habit on immune system includes impaired function of leucocytes, alterations in lymphocyte subpopulations in CD4

and CD8 cells, depressed cytotoxic activity of natural killer cell, decreased levels of immunoglobulins, levels of inflammatory mediators and enhanced oxidative stress [17]. According to comorbidity illnesses this result in agreement with Kolsuz *et al*, [33] that found 53% of pneumonia patients with chronic diseases.

Conclusions of present study: the incidences of pneumonia increase during the cold seasons, individuals aged more than 49 years were more susceptible for pneumonia, sex, smoking and comorbidity illness all were risk factors and *S. pneumoniae* was leading cause for pneumonia.

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