

Original Research Article

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Trends of Laboratory Cultured *Streptococcus pneumoniae* Cases in the Federal Medical Center Bida Niger State

D. Adama^{1*}, J. M. Usman¹, I. Yakubu¹, S. Adama² and V. Saba³

¹Department of Medical Laboratory Science, School of Health Technology,
Minna, Niger State, Nigeria

²Federal Medical Centre, Bida Niger State, Nigeria

³Primary health care Maikunkele, Minna Niger State, Nigeria

*Corresponding author

ABSTRACT

This study determined the prevalence of *Streptococcus pneumoniae* among patients attending federal medical center Bida. The data of 1719 patients aged 1-100 was obtained from the record books of bacteriology department from 2014-2018. A total sample number of 119 was diagnosed positive for both males. 63(54.10%) and females 56(45.90%) patients respectively. Based on the age groups and gender positivity prevalence was 0.06%, 0.12% (1-10 years), 0.41%, 0.58% (11-20 years), 0.52%, 0.41% (21-30 years), 0.70%, 0.58% (31-40 years), 0.70%, 0.76% (41-50 years), 0.70%, 0.58% (51-60 years), 0.47%, 0.06% (61-70 years). 71-80 years, 81-90 years, and 90-100 years recorded 0.06%, 0.12%; 0.00%, 0.06%; 0.06%, 0.00% respectively. 3.66% and 3.26% is the total positivity prevalence for both males and females respectively. Furthermore, the prevalence revealed that streptococcus pneumoniae affect certain age groups than the others. This suggested that some individuals are more prone to this infection perhaps due to their immune response. This has remain one of the major cause of morbidity and mortality even though there is an advancement in the treatment regime, diagnosis and preventive measures put in place.

Keywords

Niger state;
Streptococcus pneumoniae, Bida

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Introduction

Streptococcus pneumoniae for a period of one hundred years was considered to be one of the leading cause of pneumonia. Around 1930 in the USA this condition was the 3rd major cause of mortality (Centre for Disease Control, 1999). Also in the 1950s before the emergence of the antibiotics, pneumonia and other respiratory infections remains the 4th

frequent cause of death globally (Naghavi *et al.*, 2015). Intervention by the Government and the Non-Governmental Organizations (NGO) have reduced drastically the incidence of pneumonia especially in the highest risk population (Musher and Thorner, 2014; Bonten *et al.*, 2015). It is still even today a major burden in terms of morbidity and mortality and health cost, as well as days of work cost (Welte, Torres and Nathwani, 2012;

File and Marrie,2010; Song, Thamlikitkul and Hsueh, 2011; Ewig and Torres, 2011). When this organism lives in the presence of oxygen they are Gram positive alpha hemolytic while in the absence of oxygen they are Gram positive beta hemolytic. They are spore forming bacteria often present itself in pairs. They lack the ability to move (Ryan *et al.*, 2004).

Immuno competent individuals are asymptomatic while immune compromised persons for example the aged or children, the bacterium might assume the state of been pathogenic and thereby causing infection in other part of the body system, though they resides majorly in the respiratory tract, sinuses and nasal cavity (Torres *et al.*, 2018).Transmission of this infection is usually through direct contact i.e person to person, via the respiratory droplets and also by itself inoculating in persons harboring the bacterium in the respiratory tract. It often leads to neonatal infections (Baucells *et al.*, 2015).

Other microorganisms such as viruses and fungi have also been discovered to be one of the cause of pneumonia. The lungs and the lungs alveoli can become infected by these microbes. Pneumonia is the most prevalence with symptoms of fever, chills, cough difficulty in breathing and chest pain and also confusion, low alertness with the older individuals (Mc Luckie, 2009).

The initial recognition of *Streptococcus pneumoniae* in the late 1800 has continue to remain an important human pathogen compare to that of immune-deficiency virus (HIV), tuberculosis and malaria (World Health Organization, 2014)The greatest burden of this infection account for 66% in Asia and Africa respectively (O'Brien *et al.*, 2009). The total burden of Nigeria which is at the 3rd place account for 5% after China and India(WHO, 2014).The community-acquired

pneumonia (CAP) is commonly caused by *Streptococcus pneumoniae*. It could also result to sporadic meningitis bacterium in both Children and Adults (Maston *et al.*, 1997; Torres *et al.*, 2018; Mook-kanomori *et al.*, 2011; Vander poll and Opal, 2009). In addition, *S. pneumoniae* is a leading cause of otitis, sinuses and bronchitis, particularly in children (O'Brien *et al.*, 2009).30-70% of those infected with CAP all over the globe are usually hospitalized. Some researchers have shown that pneumonia in part of Nigeria e.g. Zaria, Enugu and Kano accounts for 50,54.5 and 60% of CAP respectively.

In this article, we assess the trends of laboratory cultured *Streptococcus pneumoniae* cases in order to detect the rate of respiratory pathogens. The inclusion of this review is that of pathogen that cause pneumonia. The use of this method will enhance the clinicians to employ a better antibiotic regime.

Materials and Methods

Study area

The study was conducted at the department of bacteriology Federal Medical Centre Bida. Niger state. Bida area is located at 9.08 latitude and 6.01 longitude.92.8 km away from the state capital .The *district* had a total population of 188,181, of whom 93.741 were men and 91.812 women; 49.50 or 50.50% are urban inhabitants.

Administratively, the district is situated at elevation 118 metre above sea level (The world Gazetteer, 2007). The district is characterized by having a bimodal type of rainfall pattern with light rains during the February to April period and heavy rains between July and September. The mean annual rainfall is about 724 mm with mean daily average temperatures of 26.5°C. About 481 mm of precipitation falls annually.

Data Source

There are two sources of data which are primary and secondary sources. But the present study is based on secondary data from Federal medical centre, Niger state. The data were available for the interval of 5 years (2014-2018). A total of one thousand seven hundred and nineteen (1,719). Data was collected in a period of three consecutive months. The data of each participant was collected based on names, sex, and age and *Streptococcus pneumoniae* results. In order to carry out this research consents was seek from the appropriate authorities who are involved in the management of data in this Health facilities. All information collected were treated with high level of confidentiality. Other data were gathered from other sources such as related journal

Study design

This study is a retrospective cohort study of patients suffering from *Streptococcus pneumoniae*. A retrospective review of all patients with *Streptococcus pneumoniae* among patients' records enrolled at Federal Medical Centre, Bida, Niger State from year 2014 – 2018 was conducted.

Data analysis

The raw data from the respondents were tabulated using Microsoft office excel software and transferred to Minitab software for final analysis. It was used to present the graphs.

Study population

Targeted population or the criteria for inclusion in this study were registered Nurse, License medical laboratory scientist working in school of health technology, Federal medical Centre and records in the hospitals Laboratory.

Ethical consideration

This four year data was collected after ethical clearance obtained from the appropriate authorities of the hospitals involved, after discussing the purpose and method of the study, written permission was sought from the Head of these health facilities before the data collection.

Results and Discussion

The purpose of this trend analysis was to investigate the laboratory cultured *Streptococcus pneumoniae* cases in the Federal Medical Centre Bida between 2014 to 2018 in order to highlight priorities for the rate of infection. A total of 1719 patients were examined 119 were positive to *Streptococcus pneumoniae* perhaps due to immune deficiency as a result of some underline factors HIV, tuberculosis, hepatitis and other related illness. These individuals are more vulnerable

The present study has shown that *S. pneumoniae* can affect people of all age groups (1-100) i.e children and adults. This is in line with part of (Marston *et al.*, 1997) work. it was found that majority of the respondents were in age between 21-30, 31-40 and 41-50 years.

The prevalence of positive patients for males and females was 54.4% and 45.8% respectively which is in accordance with the work done in Zaria 50%, Enugu 54.5% and Kano 60% of community-acquired pneumonia cases respectively (Kalin *et al.*, 2000) it also account for 66% of CAP in Asia and Africa respectively. During this study, the positive prevalence of *S. pneumoniae* observed for 2014-2018 was 6.92% which was similar to the previous study conducted on the total burden of Nigeria which accounted for 5% after China and India (World Health Organization, 2014)

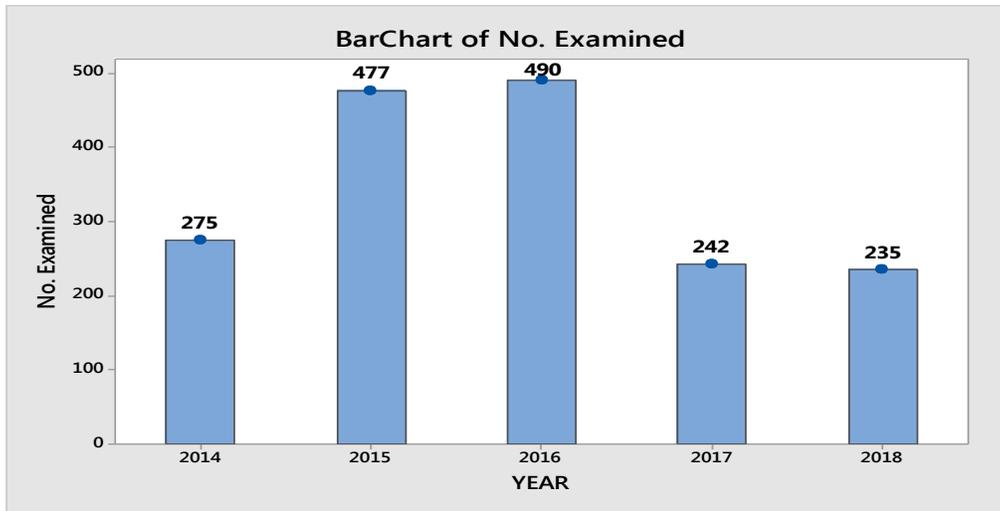


Fig.1 A bar chart showing the number examined with respect to the year

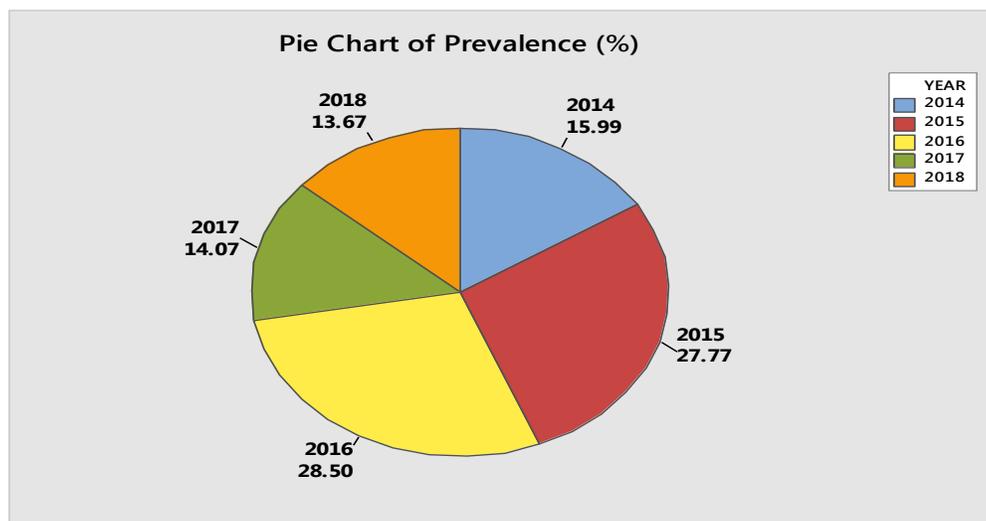


Fig.2 A pie chart showing the prevalence cases from 2014 to 2018

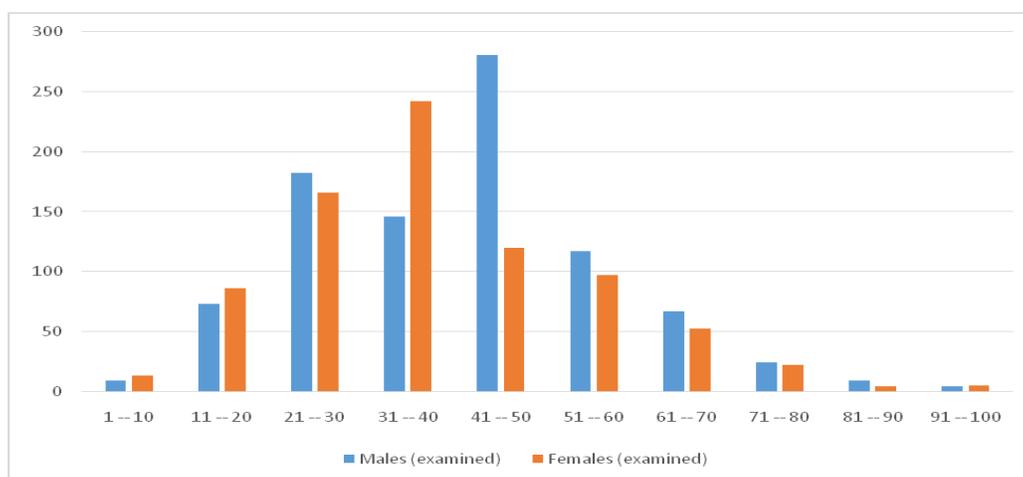


Fig.3 Males and females examined for *Streptococcus pneumoniae*.

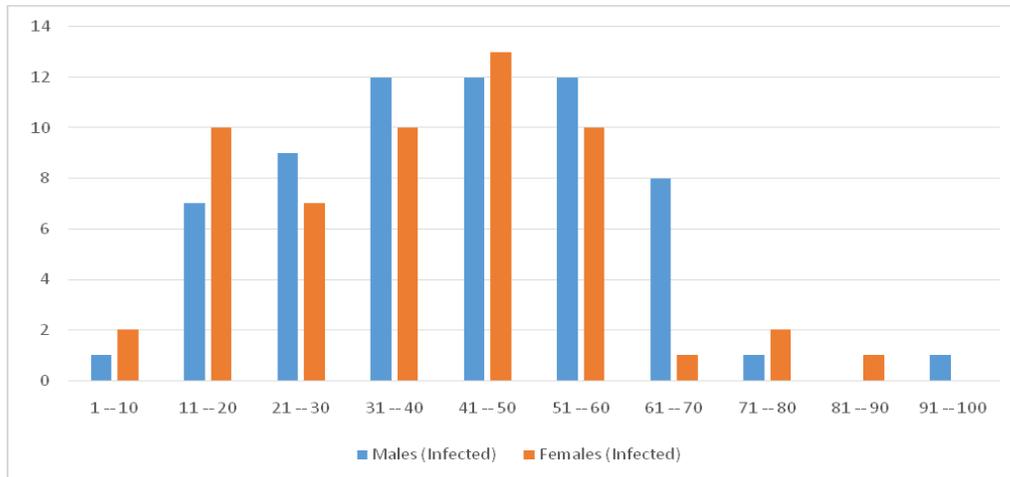


Fig.4 Males and females infected with *Streptococcus pneumoniae*

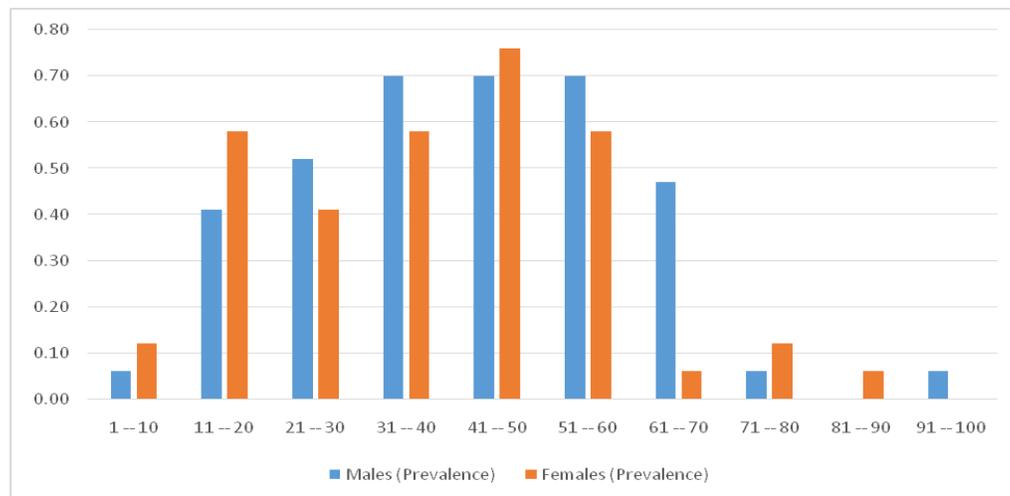


Fig.5 Prevalence value of gender and age range infected with *Streptococcus pneumoniae*

The highest positive prevalence of *S. pneumoniae* was found between the ages of 41-50 years. This is in contrast with the study that says *S. pneumoniae* is the common pathogen in school aged children adolescents i.e 5-18 years of age (British Thoracic Society Standard of Care Committee, 2002). It is also in contrast with the study that revealed higher pneumonia cases among patients older than 65 years, and accounts for 80% to 95% of the total cost for pneumonia care in this age group (File *et al.*, 2010; Niederman *et al.*, 1998). In another study which involves over 25,000 people in the US, the danger possessed on CAP patients above 65 years was 4.17 times higher than in patients below 45 years

of age (Baik *et al.*, 2000). The present study shows the prevalence of positive cases of males 54.10% and female 45.8%. This was similar to the previous work done which says that the studies on comparison of effectiveness of antibodies in Community acquired pneumonia in adults reviewed by the Cochrane Database of systematic make clear that *S. pneumoniae* was major causative organism, showing 56% of positive culture (Bjerre *et al.*, 2009). This present work done also reveals the highest prevalence among age group 41-50 is in contrast with (Marston *et al.*, 1997) which says that pneumonia death rate at high level among children below five and those advanced in years precisely 75 with

well over 300 mortality per 100,000 in relative age categories for all central, Eastern, and western Europe. According to Jokinen *et al.*, 1993 that the incidence of *S. pneumonia* is highest at the extreme of age. This is in contrast with the present work done which confirms that the highest incidence is between the middle age i.e 41-50 years

The present research reveals that all age can become infected with this *S. pneumonia*. But according to Ruiz *et al.*, 1999 investigate consequence on the cause of pneumonia and resolved that an age of ≥ 60 years was not related with any discernible outcome on microbial etiology; nevertheless; patients aged >60 years significantly more frequently had CAP caused by a typical pathogen, especially *M. pneumonia*

The present research reveals that all ages can become infected with this *S. pneumonia*. This is in accordance with this statement which says that Primary health care centers regularly refer critically ill patients to one of these health care facilities for hospitalization. Patients of all age are been enrolled after presenting with clinically suspected meningitis or *S. pneumonia* (WHO, 1999)

In this study, *Streptococcus pneumoniae* infection remains a serious problem of public health. The most affected were the middle age groups, with the high infection rate in the Males. Culture of this Microorganism still remains one of the cheapest and easy methods of diagnosis worldwide .The helps to enhance the prescription of the appropriate drug regime by the clinicians.

References

Bonten MJ, Huijts SM, Bolkenbaas M, *et al.*, (2015) Polysaccharide conjugate vaccine against pneumococcal pneumonia in adults. *N Engl J Med*; 372: 1114–1125.

- Bjerre LM, Verheij TJM, Kochen MM. (2009) Antibiotics for CAP in adult outpatients. *Cochrane Database of syst Rev*, issue 4 Art. No.; CD002109. DOI: 10.1002/14651858 CD0022109.pub3
- British Thoracic Society Standards of care Committee (2002) British thoracic society guidelines for the management of CAP in childhood. *Thorax*. ;57 suppl.1:11-24
- Baucells B J, Mercadal Hally M, Alvarez Sanchez A. T, Figueras Aloy J. (2015). “Asociaciones de Probioticos Para la Prevencion de la Enterocolitis Necrosante y la Reduccion de la Mortalidad Neonatal en Recienacidos Prevencion de Menos de 1.500g”
- Baik I, Curhan GC, Rimm EB, *et al.*, (2000) A prospective study of age and lifestyle factors in relation to community-acquired pneumonia in US men and women. *Arch Intern Med*;160(20):3082–8.
- Centers for Disease Control and Prevention (CDC). Control of Infectious Diseases. *MMWR Morb Mortal Wkly Rep* 1999; 48: 621–629.
- Ewig S, Torres A. Community-acquired pneumonia as an emergency: time for an aggressive intervention to lower mortality. *Eur Respir J* 2011; 38: 253–260.
- File TM Jr, Marrie TJ. Burden of community-acquired pneumonia in North American adults. *Postgrad Med* 2010; 122: 130–141.
- Jokinen C, Heiskanen L, Juvonen H, *et al.*, (1993) incidence of CAP in population of four municipalities in eastern finland. *Am J epidemiol*;137:977-88
- Kalin M, Ortqvist A, Almela M. (2000) Prospective study of prognostic factors in community-acquired bacteremic pneumococcal disease in 5 countries. *J Infect Dis*;182:840-7.
- Mook-Kanamori B.B., Geldhoff M., Van der

- poll., Van de Beek D.(2011) pathogenesis and pathophysiology of pneumococcal meningitis. *Clin. Microbiol. Rev*; 24:557-591. Doi: 10.1128/CMR.00008-11.
- Musher DM, Thorner AR. Community-acquired pneumonia. *N Engl J Med* 2014; 371: 1619–1628.
- Marston B J, Ploffe J F, File TM Jr, Hackman B A, Salstrom S J, Lipmah HB, *et al.*, (1997). Incidence of Community Acquired Pneumonia Requiring Hospitalization.
- McLuckie, A. (2009). Respiratory Disease and its Management New York: Springer and Nadel. Chapter 31.
- Naghavi M, Wang H, Lozano, R, *et al.*, Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013.*Lancet* 2015; 385: 117–171
- Niederman MS, McCombs JS, Unger AN, *et al.*, (1998) The cost of treating community acquired pneumonia. *Clin Ther*;20(4):820–37.
- O'Brien KL, Wolfson LJ, Watt JP, Henkle E, Deloria-Knoll M, McCallN, Lee E., Mulholland K., Levine O.S., CherianT., *et al.*, (2009). “Burden Caused by *Streptococcus pneumoniae* in Children Younger than 5 Years Global Estimates. *Lancet*.;374:893-902. DOI:10.1016/S01406736(09)61204-6.
- Ryan KJ, Ray CG, eds.(2004) Sherri's Medical Microbiology McGraw Hill.
- Ruiz M, Ewig S, Marcos MA,*et al.*, (1999) etiology of CAP. Impact of age, comorbidity, and severity. *Am J Respir crit care med* ;160:397-405
- Song JH, Thamlikitkul V, Hsueh PR. Clinical and economic burden of community-acquired pneumonia amongst adults in the Asia-Pacific region. *Int J Antimicrob Agents* 2011; 38: 108–117.
- Torres A., Cilloniz C., Blasi F., Chalmers J.D.,GaillatJ., Dartois N.,Schmitt H. J., Welte T. (2018) Burden of pneumococcal community-acquired pneumonia in adults across Europe: Aliterature review. *RespairMed*..02.007.
- Van der Poll T., Opal S.M. (2009) Pathogenesis, treatment, and prevention of pneumococcal pneumonia. *Lancet*; 374:1543-1556.doi:10.1016/S0140-6736(09)61114-4.
- World Health Organisation. (2014). The Burden of disease. <http://www.who.int/healthinfo/globalburdendiSea/GBDreport>
- Welte T, Torres A, Nathwani D. Clinical and economic burden of community-acquired pneumonia among adults in Europe. *Thorax* 2012; 67: 71–79.
- WHO(1999) Laboratory methods for the diagnosis of meningitis caused by *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*. WHO Communicable disease surveillance and response.

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