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## Prevalence of pulmonary tuberculosis among active and passive smokers of cigarette in Benin City, Nigeria

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**ABSTRACT:** A survey aimed at ascertaining the prevalence of pulmonary tuberculosis among 100 men (involving active and passive smokers) was carried out at the Central Hospital Benin City, Nigeria. Sputum samples from the incoming patients of the Hospital were screened and diagnosed in the Chest Ward Laboratory of the Hospital and Ziehl-Neelsen's staining technique was used to identify *Mycobacterium tuberculosis*. The obtained results showed that, there was a prevalence of 48% pulmonary tuberculosis in active smokers and 16% in passive smokers. A high prevalence of 43% was obtained for 36-40years age group, 33% for 31-35 years age group while 25-30years of age recorded 20%. The result of this survey has serious health implication as passive smokers who may not be aware of this are mostly exposed to these dangerous smokes innocently and ignorantly. It therefore behooves on authorities of Nations to enforce all relevant laws on prohibition of smoking in public places and where such enabling laws are absent, they should be enacted in order that the health of the general public is protected from the health hazard emanating from cigarette smoking and cigarette smoke.

**Keywords:** Active smokers, *Mycobacterium tuberculosis*, Passive smokers, Pulmonary tuberculosis, Cigarette.

### Introduction

Tuberculosis is a chronic or acute bacterial infection that primarily attacks the lungs but which may also affect the kidney, bone, lymph nodes and brain (Raviglione and O'Brien, 2004). Pulmonary tuberculosis is a disease condition caused by a bacterium species called *Mycobacterim tuberculosis*. This bacterium pathogen (*M. tuberculosis*) was discovered and identified by Robert Koch in 1882 (Parish and Stoker, 1999). Cox (2004) described it as a small rod-like bacillus that can withstand weak disinfectants and survive in a dry state and can grow only within the cells of a host organism. These attributes of *Mycobacterium tuberculosis* made Robert Koch to describe and establish that pulmonary tuberculosis is an infectious disease. When viewed using the microscope, *M. tuberculosis* would appear red in colour presenting rod-like shape, usually bacilli in chains.

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Hubbard (1968) related tobacco smoking to tuberculosis because; the human body can be subjected to inhale toxic substances such as cigarette smoke and pathogens such as bacteria. He stated that because of the harmful nature of the smoke, a few years in a smoky environment, the lungs or any part of the body becomes lined with a black deposit and this makes their function more difficult, thus making the individual suffer from lack of energy and lowered resistance to disease.

WHO (2006), classified individuals that smoke tobacco (cigarette) into Active smokers, Passive smokers and Non smokers. Active or actual smokers are those that voluntarily inhale tobacco smoke product. This direct smoking affects the heart and the lungs. Passive smokers are also known as second-hand smokers and this is the involuntary inhalation of smoke from tobacco products. Scientific evidences have shown that exposure to second-hand tobacco smoke causes death, diseases and disability. It is on the bases of the risk that passive smokers are exposed to that led to the prohibition of tobacco smoking in public places by WHO (2006). Boyle *et al* (2003) posited that, second-hand (passive) smokers are exposed to the same problems as active smokers and these health problems include heart diseases, lung ailments such as pulmonary tuberculosis, asthma and others.

Lifelong non-smokers with partner who smoke in the home have 20-30% greater risk cancer and those exposed to cigarette smoke in the work place have an increased risk of 16-19% (Davies, 2006). Non-smokers are those who do not inhale tobacco smoke voluntarily or involuntarily which is according to Sharma (2004) are rare. WHO (2002) has reported that, nearly 2 billion people, that is a-third of the world's population have been exposed to pulmonary tuberculosis pathogen.

Annually, 8 million people become ill with pulmonary tuberculosis and 2 million people die from this disease worldwide (CDC, 2005). The World Health Organization's report of 2006 stated that, in 2004, around 14.6 million people had pulmonary tuberculosis that is active, with 9 million new cases. Accordingly, the annual incidence rate varies from 356 per 100,000 in Africa to 41 per 100,000 in America. Pulmonary tuberculosis is the world's greatest killer of women of reproductive age and the leading causes of death among people with HIV/AIDS (Newswire, 2002).

In 2005, the country with the highest estimated incidence of pulmonary tuberculosis is Swaziland with 1262 case per 100,000 people. The highest number of infection occurs in India with over 1.8 million cases (WHO, 2007). In developed countries, pulmonary tuberculosis is less common and mainly an urban disease. In the United Kingdom, pulmonary tuberculosis incidence ranges from 40 per 100,000 in London to less than 5 per 100,000 in the Rural South West of England with a National average of 13 per 100,000 (Nahid *et al*, 2006). The highest rates in Western Europe are in Portugal (42 per 100,000) and Spain (20 per 100,000), 113 per 100,000 in China and 64 per 100,000 in Brazil. In the United States, the overall pulmonary tuberculosis case rate was 4.9 per 100,000 persons in 2004 (CDC, 2005).

The age at which a person becomes infected with pulmonary tuberculosis is the main factor that determines the outcome. The incidence of pulmonary tuberculosis varies with age. In Africa, pulmonary tuberculosis primarily affects adolescents and young adults especially men (WHO, 2006). Among men of between the ages of 25 and 30 who are infected, fewer than 11% present symptoms of this disease, whereas those between the ages of 30 and 35 who are infected, has about 50% presenting symptoms of pulmonary tuberculosis. For those between the ages of 35 and 40 years who are infected, symptoms are presented in 80-90% of them (Zulma *et al*, 1999). However, in countries where pulmonary tuberculosis has gone from high to low incidence such as United States, pulmonary tuberculosis is mainly a disease of the older people (CDC, 2005).

WHO (2005) identified some presentable signs and symptoms of pulmonary tuberculosis to include persistent cough with a progressive increase in the production of mucus and last for more than 3 weeks, fever, sweating at night even when the weather is cold and chest pain. Others include loss of body weight and appetite, tiredness and shortness of breath and coughing of blood (not in all cases). Restropo (2007), has listed groups who are at risk to include cigarette smokers, intra-venous drug users, people with chest x-ray results showing previous infection of pulmonary tuberculosis, HIV/AIDS patients whose immune system are low and people living with already infected persons. Also identified as risk group include people who migrate from a country with a high number of cases, health care workers who have daily contact with pulmonary tuberculosis infected persons and children who are not immunized at birth. This present investigation was necessitated by the indiscriminate manner in which some members of the public carry out their smoking activities, and the general ignorance and innocence of the unsuspected members of the public.

## Materials and Methods

A total of 100 men were screened with each giving 3 samples of sputum collected early in the morning on 7 days routine exercise from May to July, 2008. Based on responses to questionnaire in the process of the survey, 50 active smoking men and 50 men who agreed to passive smoking were randomly selected from the incoming patients in Central hospital, Benin City, Edo state. All the samples were diagnosed in the Chest Ward Laboratory, Central Hospital, Benin City, Edo State (being the Referral Centre for the state).

**Sample collection:** The screw-cap containers were given to the patients to cough into. Collection of samples was done in a secluded and open air area. All collections were done in the morning and immediately screened. The screw-cap containers were labeled carefully using serial numbers ranging from 001-050 for active smokers and 051-100 for the category of passive smokers.

**Ziehl-neelsen's staining of *Mycobacterium tuberculosis*:** Each patient sputum sample was collected using the screw-cap container and a sterilized wire loop was used to collect the purulent part of the sputum and a smear made on a sterilized microscopic slide. This slide was passed through a flame of fire to heat fix the organism on the slide and the slide was passed on the staining rack to air dry for 15 minutes. Carbol fuchsin was then used to flood the slide and flame was passed through the bottom of the slide to allow the cell wall of the organism to open up in order to retain the stain. After 10 minutes, the stain (Carbol fuchsin) was washed off the slide using water and thereafter, excess water was drained off the slide. Acid alcohol was then used to flood the slide and left for 3 minutes after which, it was washed off the slide using water. The acid alcohol acted to decolorize the smear because; if the smear is not properly decolorized it could make the smear not to appear pale pink. On this basis, acid alcohol is continuously used to flood the slide until the slide is decolorized. This was followed by the flooding of the slide with Methylene blue which acted as a counter strainer. The slide was left in methylene blue for 1 minute. The stain was then washed off the slide using water and the back of the slide was wiped using cotton wool and placed on a drying rack to air dry. After 15 minutes, immersion oil was dropped on the smear and placed on the stage of the microscope and the X100 objective Lens was used to view the slide. This process was carried out on all the 100 screened sputum.

**Interpretation of results:** On viewing with the microscope, a blue background and bacilli in chains appearing red in colour indicated positive (presence of *M. tuberculosis* causing organism) and depending on the numbers of red coloured bacilli per field as indicated below:

1 -10 per field.....+  
10-100 per field.....++  
100 and above per field.....+++

On the other hand, a blue background with bacilli in chains and appearing blue in colour showed negative (absence of *M. tuberculosis* causing organism).

## Results

Table 1 and Figure 1 represent the distribution and frequency of individuals that tested positive to *Mycobacterium tuberculosis* among Passive and Active smokers with age distribution. The results revealed that both passive and active smokers alike tested positively to the presence of *Mycobacterium tuberculosis*, the causative agent of pulmonary tuberculosis with active smokers having higher casualties. It also showed more individuals from the 36-40 age brackets as the most vulnerable group compared to 25-30 and 36-40 age groups. Table 2 shows individuals in the different age groups that were positive to *M. tuberculosis*. It revealed very clearly that, all age groups studied had *Mycobacterium tuberculosis* infection irrespective of being passive or active smoker but with more infection recorded at 31-35 age group.

**Table 1:** The distribution of individuals who were positive to *M. tuberculosis* among different age groups of 25-40 years of age.

Age group	Number of patient screened	Number of positive patients	Ratio of positive patients	%age of positive patients
25-30	40	8	0.2000	20%
31-35	18	6	0.3333	33%
36-40	42	18	0.4285	43%
Total	100	32	-	-

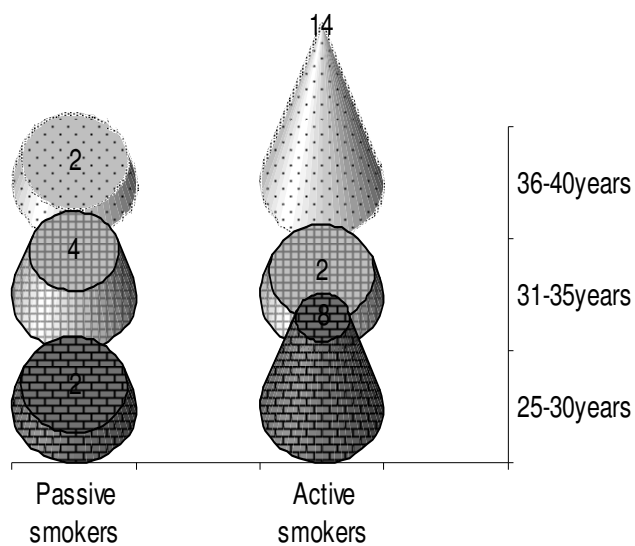


Figure 1: Frequency of individuals that tested positive to *Mycobacterium tuberculosis* among Passive and Active smokers with age distribution.

**Table 2:** The distribution of pulmonary tuberculosis among Passive and Active smokers.

	PASSIVE SMOKERS		ACTIVE SMOKERS	
Age group	Number Examined	Number Infected	Number Examined	Number Infected
25-30	20	2	16	8
31-35	14	4	4	2
36-40	16	2	30	14
<b>Total</b>	<b>50</b>	<b>8</b>	<b>50</b>	<b>24</b>

$$\text{Passive Smokers} = 8/50 \times 100/1 = 16\%$$

$$\text{Active Smokers} = 24/50 \times 100/1 = 48\%$$

## Discussion

The resurgence of pulmonary tuberculosis disease as a serious health problem in many parts of the world, and knowing that this disease is more infectious and easily contacted than the Human Immunodeficiency Virus (HIV) (WHO, 1998) is not in doubt. This pre-supposes that, adequate care must be taken to note the factors that expose individuals to this disease that is dreaded by all. This study was therefore necessitated by the indiscriminate exposure to cigarette smoke as many passive smokers are unaware of the inherent dangers cigarette smoke possess to the unguided public.

This research work showed that, pulmonary tuberculosis is an infection that is common not only to active smokers but to unsuspecting passive smokers in the society. The results revealed a high prevalence of pulmonary tuberculosis; 42.85% in age 36-40years, 33.33% in age 31-35years, and 20% in age 25-30years (see Table 1). This finding agrees with the work of Ritesh *et al*, (2006) who reported that, there was an increased frequency of pulmonary tuberculosis amongst 125 men with a mean age of 34 years. The percentage infection rates of 48% active smokers and 16% among passive smokers (see Table 2) suggests that, the unsuspecting public stand a great risk, as do those who voluntarily engage in the art of smoking. If smoking in public places is unattended to adequately by the prohibition of cigarette smoking in places designated as public places or where such laws prohibiting cigarette smoking in such places have been enacted, enforcement should be strictly adhered to. Otherwise, the gradual inhalations of cigarette smokes by such unsuspecting public have a long adverse effect on the general health of the citizenry. This adversity can be compounded since drug resistance strain has been reported. This thinking substantiated the claim of Wolfart (1990) who attributed the emergence of drug resistant strain as the reason for 20% of pulmonary tuberculosis epidemic cases being resistant to standard treatment from 2000-2004 and 2% resistant to second-line drug.

## Conclusion

Smoking of cigarette and other harmful substances portend danger to both the smokers and the innocent unsuspecting citizenry. If individuals, despite the general caution by manufacturers' of cigarette that "smokers are liable to die young", decide to smoke by choice, then members of the public who choose otherwise should be protected by the government by enacting laws that prohibit smoking of cigarette and

other related harmful substances in public places. When this is done, appropriate agencies saddled with the enforcement of such laws should be well motivated to ensure strict compliance. This is important in order that, the health of the general public be protected as the health of every nation is the first wealth that should be celebrated.

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