# INCIDENCE OF ACTIVE TUBERCULOSIS IN CLINICALLY SUSPECTED PATIENTS WITH AND WITHOUT PULMONARY ANTHRACOSIS

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**ABSTRACT**

**Objective:** Pulmonary Anthracosis is commonly observed during bronchoscopy with undetermined etiology and clinical implication. Higher incidence of tuberculosis is reported with it but exact etiology remained undetermined.

**Study Design:** Descriptive study

**Place and Duration:** August 2012 to December 2013 in pulmonology department of services institute of medical sciences (SIMS) Lahore.

**Methodology:** Two hundred and fifty six patients with suspected pulmonary tuberculosis (clinical & radiological basis) were underwent bronchoscopy. Patients having Anthracosis were included in "case group" while age, sex matched patients without Anthracosis were included in "control group". Broncho-alveolar lavage and biopsies of each patient were processed for AFB culture and sensitivity. Incidence of tuberculosis was noted each group and compared with chi-square.

**Results:** Forty (15.6%) patients out of 256 having clinical suspicion of tuberculosis had pulmonary anthracosis. Sixteen (40%) patients had culture positive tuberculosis in case group while 15 (37%) patients had tuberculosis in control group (13 AFB culture positive and 2 histologically found granulomas). Comparison between both groups with chi-square analysis shows value of (0.053) with p = 0.818 that was statistically insignificant.

**Conclusion:** Incidence of tuberculosis is almost equal in patients with and without Anthracosis in a subgroup with high clinical suspicion of tuberculosis.

**Key words:** Bronchoscopy; Pulmonary Anthracosis; Tuberculosis

This article may be cited as: Hussain M, Ashraf M, Chima K. Incidence of active tuberculosis in clinically suspected patients with and without pulmonary Anthracosis. Pak J Chest Med 2015; 21(3): 104-8

## INTRODUCTION

Anthracosis is a black pigmentation of the bronchus of undetermined etiology and is commonly seen in coal miners, sufferers of air pollution, biomass and cigarette smokers. Coal deposits are present as black plaques in the bronchi.[1] Patients without significant exposure to smoke or coal can have Anthracosis such as patients of air ways inflammation, tuberculosis, Sarcoidosis or malignancy.[2-4]

Anthracosis can be endobronchial visualized during bronchoscopy or it can be a histological diagnosis. Etiology, clinical implications and incidence are different from the endobronchial Anthracosis observed during bronchoscopy.[5] Pulmonary Anthracosis can be patchy or diffuse while "bronchial anthracofibrosis" is defined as a clinical entity with bronchial lumen narrowing and anthracotic pigmentation visible on bronchoscopy.[6] Bronchogenic carcinoma and endobronchial tuberculosis (TB) are two main causes of anthraco-fibrosisthat can be accompanied by peri-bronchiallymph node enlargement and atelectasis leading to obstruction, inflammation and anthracosis.[7]

Hilar and sub-carinal lymphadenopathy commonly cause endobronchial patchy Anthracosis on carina and both main bronchii. Endobronchial obstruction because of tumor growth, foreign body, aspergilloma or cavitations causes anthraco-fibrosis or patchy Anthracosis.[8] Earlier studies have shown increased incidence of active tuberculosis in patients with pulmonary Anthracosis. However comparative analysis with the suspected patient without Anthracosis was not done. These studies have not

discussed whether endobronchial Anthracosis correlates with radiologically active disease segments or presence of endobronchial inflammation in anthracotic segments. These patients were not compared with strongly suspected patients on clinical grounds. Pathogenesis of Anthracosis makes a sense of end stage of inflammation. Its implication as indicator of active tuberculosis is controversial. We compare the incidence of tuberculosis in suspected tuberculosis with and without Anthracosis and further analyzed radiologically active disease segments with the anthracotic segments.

## METHODOLOGY

Two hundred and fifty six patients of clinically suspected pulmonary tuberculosis (having suggestive history and infiltrates on CXR/HRCT) and sputum smear negative were included in the study and underwent bronchoscopy after informed consent during August 2012 to December 2013 in department of pulmonology. Ethical concern were not involved in the study as bronchoscopy was performed as recommended work up for non-resolving infiltrates/ pulmonary cavities or pyrexia of unknown origin not for the study purpose only.

Their indication of bronchoscopy and clinical presentation were noted. Radiology especially CT chest was evaluated by pulmonologist and radiologist separately. Radiologically affected disease segments were noted. Video bronchoscopy was performed and bronchoscopic findings especially anthracotic and inflamed segments, narrowed bronchus or presence of pus was noted. Broncho-alveolar lavage (BAL) was performed in radiologically active or bronchoscopically diseased segments irrespective of site of Anthracosis. Biopsies (endobronchial/Transbronchial) were taken if indicated. BAL was processed for cytology, bacterial, AFB and fungal cultures and sensitivities.

Forty (15.6%) patients having pulmonary Anthracosis were included in the study as `anthracotic group` and Age and sex matched 40 patients with suspected TB on clinical grounds (history, radiology)but without Anthracosis on bronchoscopy, were selected randomly in "control group" before the final microbiology result to avoid bias.

All the data was noted on a pre-set proforma. Data was analyzed by SPSS 16.0. Sample size was calculated with 95% confidence interval and 7% margin of error for the magnitude of 7% according to Samareh Fekriet et al.[14]

Chi Square test ($X^2$) with 95% confidence limit (95% CI) were used to evaluate the significance of difference between the groups. P value $\leq$0.05 was considered as statistically significant.

## RESULTS

Forty out of 256 patients had pulmonary Anthracosis. 40 patients of control group completed the study. Mean age of Anthracotic group was 60.5$\pm$14.0 while control group had 59.6$\pm$10.18. Majority of the patients were from 60-70 years in both groups (55%, n=22 Anthracotic, 50%, n=20 control). In the Anthracotic group female patients were predominant 62% (n=25) while in control group these were 65% (n=26). Major indication for the bronchoscopy was non-resolving infiltrates in both groups followed by cavitary lung disease. Comparative demographics, symptomatology, previous history of ATT intake and smoking history are listed (table 1). All these features were comparable in both groups.

In Anthracosis group 16 patients (40%) had positive cultures for mycobacterium and all were sensitive to 1$^{st}$ line ATT (Rifampicin, Isoniazid, Ethambutol, Pyrazinamide and Streptomycin). Among the control group 15 patients (37.5%) had final diagnosis of tuberculosis. Among these 13 patients had positive cultures for mycobacterium; 2 patients had streptomycin resistance while rest were sensitive to 1$^{st}$ line ATT. Two patients were diagnosed tuberculosis on histological confirmation of granulomatous disease with caseating necrosis typical for the tuberculosis. Their sample was collected by transbronchial needle aspiration (TBNA) as there BAL results were negative. Chi-square test value was (0.053) with p value 0.818. Detail calculation is given in (table 2). As the p value was greater than 0.05, so we have to accept the null hypothesis that both groups have same prevalence of TB and the difference was statistically insignificant p= 0.82.

Further analysis showed that most of the Anthracosis was patchy 70% (n=28) followed by extensive 17.5% (n=7) and diffuse12.5% (n=5).

Incidental finding was a significant discrepancy between the segments of radiologically active disease and Anthracotic segmentson bronchoscopy as 82% (n=33) patients has different anthracotic segments as compared to radiologically suspected active disease segments p =0.003. Seven out of 40 patients (17.5%) had Anthracosis in the same lobe or segment as on HRCT and these had local disease like tumor, external compression or aspergilloma.

**Table 1: Characteristics of Patients Included in the study, age distribution, smoking, and ATT and presenting symptoms.**

| Characteristic | Anthracotic group | Control group |
|---|---|---|
| **Age(years)Mean±SD** | 60.5 ±14.0 | 59.63±10.18 |
| **Range** | Number (%) | Number (%) |
| <50 | 08 (20%) | 10 (25%) |
| 50-59 | 04 (10%) | 04 (10%) |
| 60-70 | 22 (55%) | 20 (50%) |
| >71 | 06 (15%) | 06 (15%) |
| **Sex** | N (%) | N (%) |
| Female | 25 (62.5%) | 26 (65%) |
| Male | 15 (37.5%) | 14 (35%) |
| **Smoking** | | |
| Former Smoker | 06 (15%) | 05(12.5%) |
| Ex-smoker | 10 (25%) | 10 (25%) |
| Non-smoker | 21(52.5%) | 23(57.5%) |
| Active-smoker | 03(07.5%) | 02 (05%) |
| **Hx. of ATT** | | |
| Yes | 08 (20%) | 07 (17.5%) |
| No | 32 (80%) | 33 (82.5%) |
| **Presentation** | | |
| SOB | 28 (70%) | 26 (65%) |
| Chronic cough | 22 (55% ) | 24 (60%) |
| Hemoptysis | 09 (22%) | 08 (20%) |
| Anorexia, weight loss | 06 (15%) | 10 (25%) |
| Non resolving infiltrates | 26 (65%) | 26 (65%) |
| Cavitary infiltrates | 10 (25%) | 08 (20%) |
| Hilar LAP | 04 (10 %) | 06(15%) |

*Pearson chi-square =0.053(1), p=0.818
ATT (Anti Tuberculosis Treatment), LAP (Lymph Adenopathy)

**Table 2: Tabular Explanation of Chi-square test the P-vaule > 0.05 favors the null hypothesis and rejects the alternative hypothesis.**

| | | Tuberculosis | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| **Anthracosis** | Present | 16(51.6%) | 24(49%) | 40(50%) |
| | Absent | 15(48.4%) | 25(51%) | 40(50%) |
| **Total** | | 31(100%) | 49(100%) | 80(100%) |

**Table 3: Comparison of previous studies who wing incidence, M/F ratio, tuberculosis with Anthracosis and without Anthracosis.**

| Author | Anthracosis | Male/Female Ratio (%) | TB with Anthracosis | TB without Anthracosis |
|---|---|---|---|---|
| Ghanei et al[16] | 7.7% | 45.8/54.2 | 57.8% | 10.6% |
| SamarehFekri et al.[13] | 20% | 44.4/55.6 | 6.9% | 2.7% |
| Rezaitalab et al.[14] | 22.5% | 41/59 | 23.5% | 10.6% |
| Mirsadraee et al.[15] | 21% | 50/50 | 30% | NR |
| Pazoki M et al.[12] | N.R | 58.7/41.3 | 28% | N.R |

## DISCUSSION

Pulmonary Anthracosis is commonly noted during the bronchoscopy but exact etiology and its clinical significance is unclear.[9] In previous studies prevalence of Anthracosis ranging from 2.5% to 40%(see table 3). In our study prevalence was 16.5%. This variation may be due to case selection or geographical variation. Etiology remains controversial. Some authorities feel it a final result of environmental (biomass fumes, smoking)[10,11] or occupational(coal mine workers)[19] insult while others associate it with malignancy[18] and tuberculosis.[17] Most of the work and case studies are from Asia and rarely from the European countries.

We found that the etiology of Anthracosis is variable including tuberculosis, malignancy, enlarged lymph nodes, aspergilloma or foreign bodies.[23] All these etiologies had association with endobronchial edema, inflammation and obstruction. The common factor is the inflammatory process and healing. Pazoki and colleagues found that Anthracosis was associated with increases incidence of active tuberculosis[12]; comparative incidence of tuberculosis by researchers is given in table 3. Incidence of tuberculosis was relatively more in patients with pulmonary Anthracosis as compare to other patients undergoing bronchoscopy and from the community. But when it was compare to thecontrol group of patients with high clinical suspicion of tuberculosis on history, examination and radiology we found that incidence of tuberculosis was almost same and statistically insignificant (40% Anthracosis group vs 37.5% control group). Previous studies found more incidences likely because these patients were investigated and had bronchoscopies due to high clinical suspicion of active disease based on radiographic changes and worsening of symptoms.

Although most of the demographics, smoking history, ATT intake and age were same in both groups but females were participant were more in the anthracotic group. We couldn`t found age matched control with high suspicion of tuberculosis. Whether gender has effect on the pulmonary Anthracosis is unknown and needs further studies. We found that Anthracotic segments were significantly different from theradiologically diseased segments while bronchoscopic examination correlated well with the radiology and were suitable for the BAL in 95% of cases.

Actually pulmonary Anthracosis is the end result of inflammation and healing process caused either by endobronchial infection,[20] foreign body,[21] occupational dust exposure,[22] lymphadenitis or mucosal compression by tumor. It was small sample study and subject needs more studies with large sample size with randomization.

## CONCLUSION

Difference of Incidence of active tuberculosis in clinically suspected patientswas statistically insignificant with and without Pulmonary Anthracosis. Radiological and bronchoscopic affected areas are more helpful guide for the BAL.

## REFERENCES

1. Chung MP, Lee KS, Han J, Kim H, Rhee CH, et al.Bronchial stenosisdue to anthracofibrosis. Chest 1998; 113: 344-350.

2. Bircan HA, Bircan S, Oztürk O, Ozyurt S, Sahin U, et al. Mediastinaltuberculouslymphadenitis with anthracosis as a cause of vocal cord paralysis.Tuberk Toraks 2007; 55: 409-413.

3. Alois D.Pneumoconioses: Definition. In: Stellman JM (ed), Encyclopediaof Occupational Health and Safety. Geneva: International Labour Organization 1998:10-32.

4. Castranova V, VallyathanV.Silicosis and coal worker's pneumoconiosis.Environ Health Perspect 2000; 108: 675-684.

5. Grobbelaar JP, Bateman ED. Hut lung: a domestically acquired pneumoconiosis of mixed aetiology in rural women. Thorax 1991; 46: 334-340.

6. Gold JA, Jagirdar J, Hay JG, Addrizzo-Harris DJ, Naidich DP, et al. Hutlung. A domestically acquired particulate lung disease. Medicine (Baltimore) 2000; 79: 310-317.

7. Kala J, Sahay S, Shah A. Bronchial anthracofibrosis and tuberculosispresenting as a middle lobe syndrome. Prim Care Respir J.2008; 17: 51-55.

8. Long R, Wong E, Barrie J. Bronchial anthracofibrosis and tuberculosis:CT features before and after treatment. AJR Am J Roentgenol 2005; 184: S33-36.

9. Choe HS, Lee IJ, Lee Y. The CT findings of bronchial anthracofibrosis:comparison of cases with or without active tuberculosis. J Korean Radiol Soc.2004; 50: 109-114.

10. Moon WK, Im JG, Yeon KM, Han MC. Tuberculosis of the central airways:CT findings of active and fibrotic disease. AJR Am J Roentgenol 1997; 169: 649-653.

11. Comert SS, Dogan C, Caglayan B, Fidan A, Kiral N, et al. The Demographic, Clinical, Radiographic and Bronchoscopic Evaluation of Anthracosis and Anthracofibrosis Cases. J Pulmonar Respirat Med 2012;2:119. doi:10.4172/2161-105X. 1000119

12. Pazoki M, MoazamiGoodarzi H, HashemiTaheri AP, Seirad S, Nematollahi N, Paknejad O. Prevalence of Tuberculosis in Patients with Anthracosis: Study on 150 Subjects. Arch Iran Med. 2012; 15(3): 128 – 130.

13. SamarehFekri M, Lashkarizadeh M, KardoostA, Shokoohi M. Bronchial anthracosis and pulmonary tuberculosis. Tanaffos 2010; 9: 21-25.

14. RezaeiTalab F, Akbari H. Relationship between anthracosis and pulmonary tuberculosis in patients examined through bronchoscopy. Journal of Birjand University of Medical Sciences 2007; 14: 9 – 15.

15. Mirsadraee M, Saeedi P. Anthracosis of the lung: Evaluation of potential causes. Iran J Med Sci. 2005; 30: 190 – 193.

16. Ghanei M, Aslani J, Peyman M, Asl MA, Pirnazar O. Bronchial anthracosis:A potent clue for diagnosis of pulmonary tuberculosis. OMJ 2011; 26: 19 – 22.

17. Park HJ, Park SH, Im SA, Kim YK, Lee KY CT differentiation of anthracofibrosis from endobronchial tuberculosis. AJR Am J Roentgenol 2008;191:247-251.

18. Mirsadraee M, Saeedi P Anthracosis of lung: evaluation of potential underlying causes. J Bronchology Interv Pulmonol 2005;12: 84-87.

19. Wynn GJ, Turkington PM, O'Driscoll BR Anthracofibrosis, bronchial stenosis with overlying anthracotic mucosa: possibly a new occupational lung disorder: a series of seven cases From one UK hospital. Chest 2008;134: 1069-1073.

20. Torun T, Tahaoglu K, Ozmen I, Sevim T, Atac G, Kir A, et al. The role of surgery and fluoroquinolones in the treatment of multidrug-resistant tuberculosis. Int J Tuberc Lung Dis 2007;11: 979-985.

21. Kim YJ, Jung CY, Shin HW, Lee BK Biomass smoke induced bronchial anthracofibrosis: presenting features and clinical course. Respir Med 2009;103: 757-765.

22. Naccache JM, Monnet I, Nunes H, Billon-Galland MA, Pairon JC, Guillon F, et al. Anthracofibrosis attributed to mixed mineral dust exposure: report of three cases. Thorax 2008;63: 655-657.

23. Sigari N, Mohammadi S. Anthracosis and anthracofibrosis. Saudi Med J 2009;30:1063-106.