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ORIGINAL ARTICLE

Eight Year Audit of Fibreoptic Bronchoscopies Performed at King Abdul Aziz Hospital, Makkah, Saudiarabia

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ABSTRACT

Background and Objectives: Since the introduction of the first flexible fiberoptic bronchoscope by Shigeto Ikeda in 1966, Fibreoptic bronchoscopy has been a valuable tool in the diagnosis of pulmonary diseases. Flexible bronchoscopy is very safe and has a high diagnostic yield. The objectives of this study were to analyze the spectrum of diseases diagnosed on bronchoscopy in our hospital during the designated study period and compare our findings with those reported in literature.

Design and setting: This is a retrospective study of Fibreoptic bronchoscopy performed at King Abdul Aziz Hospital, Makkah, Saudi Arabia during the eight year period from 1420-1427AH (April 1999 to Jan 2007).

Material and Method: In addition to demographic data, we collected, in each case, information regarding indication of the procedure, clinical features, radiological findings and the results of bronchoscopy, including analysis of bronchial aspirate and histopathology of biopsy specimen.

Results: A total of 399 patients underwent the procedure during the study period. All FOBs were performed without premedication and were free from any complication. A specific diagnosis was obtained in 101 (25.2%) patients. Bronchial biopsy and washing confirmed the diagnosis of bronchial carcinoma in 64(16%) patients. Small cell carcinoma, squamous cell carcinoma and adenocarcinoma had almost similar incidences with large cell carcinoma relatively uncommon. 37(9.3%) patients were diagnosed as pulmonary tuberculosis, 22(5.5%) showing caseating epitheloid granuloma on biopsy and 15(3.7%) positive for acid fast bacilli in the bronchial aspirate. Biopsy and histopathology confirmed 2(0.5%) cases of sarcoidosis.

Conclusion: Diagnostic bronchoscopy is a useful and safe tool for the diagnosis of pulmonary lesions particularly bronchogenic carcinoma and pulmonary tuberculosis. It has a good positive diagnostic yield and should be used liberally wherever indicated.

BACKGROUND:

Flexible bronchoscopy is a safe diagnostic and therapeutic procedure. In the absence of risk factors, complications such as bleeding are rare[1]. The diagnostic yield of fiberoptic bronchoscopy (FOB) is high, though it depends on the indication and the technique used[2-5]. Performance of outpatient fiberoptic bronchoscopy has resulted in facilitation of health care services and lower costs[6,7].

The American Thoracic Society has listed only four contraindications to bronchoscopy. These are absence of informed consent, operator inexperience, inadequate facilities, and inability to assure adequate oxygenation during the procedure. Thus, severe

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cardiac conditions, such as acute myocardial infarction, angina pectoris, acute severe bronchial asthma, severe laryngeal and tracheal stenosis and massive hemoptysis, which may jeopardize oxygenation, may be considered contraindications to bronchoscopy. Prolonged hypoxemia during the procedure can lead to cardiac arrhythmias, myocardial infarction, mental status changes, and respiratory failure. In fact, some experts suggest that uncorrectable hypoxemia, hypertension, or elevated intracranial pressures are relative contraindications to bronchoscopy. Premedication is not essential to comfort and safety.[8-10]

There are numerous indications for diagnostic bronchoscopy. The major indications for bronchoscopy include, but are not limited to, the evaluation of CXR or CT lesion, unexplained cough, hemoptysis, non-resolving pneumonia, and the staging of lung cancer. Another very common indication of FOB is in ICU where it is done to obtain specific bacteria that cause sepsis; persistent lung collapse (atelectasis) or collapse of the small air sacs in the lungs is sometimes evaluated using FOB. The diagnostic yield of bronchoscopy and biopsy of an endobronchially visible carcinoma is above 90% [11], with metastatic cancer and infection following close behind.

Cancers of the lung comprise 16% of all malignancies and account for 28% of cancer deaths worldwide. Bronchogenic carcinomas comprise the vast majority of lung cancers presenting for resection and can be classified into four major types: small cell, large cell, squamous cell and adenocarcinoma.

Material and methods:

This is a retrospective study of Fibreoptic bronchoscopy (FOB) performed at King Abdul Aziz Hospital, Makkah, Saudi Arabia during the eight year period from 1420-1427AH (April 1999 to Jan 2007). Bronchoscopy was performed in these patients for any of the following indications: hemoptysis, lung infiltration, stridor, lung lesion requiring biopsy seen on chest X-ray or CT scan, collection of bronchial washing for bacteriology especially suspected tuberculosis, recurrent laryngeal nerve palsy of unknown etiology, investigation of collapsed lobes or segments and aspiration of mucus plug especially in ICU patients on mechanical ventilator.

A total of 399 patients who underwent the procedure were studied. All FOBs were performed without premedication. Patients were instructed to be NPO prior to the procedure. Informed consent was taken. A flexible Fibreoptic bronchoscope (Olympus) was introduced trans-nasally in majority of patients. The nasopharynx, larynx, vocal cords, trachea and the tracheobronchial tree were visualized under direct vision up to 4-5th generations. The bronchoscopy suite is equipped with a source for air, oxygen and contains resuscitation equipment and medication. Oxygen saturation, pulse and blood pressure were monitored with a monitor. Supplemental oxygen was administered by nasal cannula only if oximetry revealed a SaO_2 less than 88% prior to or during FOB.

Clinical files of the patients were studied. The following characteristics were analyzed in each patient: age, sex, nationality, symptoms and signs, smoking habit, history of

tuberculosis, chest radiographic and CT findings, bronchoscopic morphologic findings, localization of bronchial lesion and results of bronchial aspirate, bronchoalveolar lavage study and histopathology of biopsy specimen.

RESULTS:

A total of 399 patients were studied. Of these, 170 (42.6%) patients were under 50 years of age, 77(19.3%) were in the age group 50-59, 92 (23%) in the age group 60-69 and 60 (15%) patients were 70 years or over. The youngest patient was 13 years old and the eldest was 90 years old. (**Figure No. I**). 265 patients were male and 134 female.
92(23%) patients were Saudis, 65 (16.3%) were from other Arab countries, 84(21%) were from non-Arab Africa, 121(30.3%) from South Asia, 34(8.5%) from South East Asia, 2 (0.5%) were Chinese and 1 patient's nationality was unknown.(**Figure No. II**)
Cough (44.6%), fever (32.8%), dyspnea (27.6%), chest pain (24.8%), hemoptysis (22.3% and weight loss (20.3%) were the common symptoms in these patients as shown in (**Table No. I).** Uncommon clinical findings included pallor (12.5%), clubbing (9.5%), and lymphadenopathy (6.3%), hoarseness of voice (4.8%), renal failure (3.8%), abdominal pain (3.0%), pleural effusion (4.3%) and jaundice (3.5%).
203 patients (50.8%) were smokers and the rest (49.2%) non-smokers (**Figure No. III**). 30 patients (7.5%) had a history of tuberculosis in the past.

Chest X-rays and CT scan had been reviewed and reported by a consultant radiologist in our hospital. 385 patients (96.5%) had abnormality on plain chest x-ray or CT scan or both, while 14 patients (3.5%) had normal X-ray chest and CT scan. Radiologically, lesions were in the right lung in 211(52.9%) cases studied - 115(28.8%) in the right upper lobe, 54(13.5%) in the right middle lobe and 44(11.0%) in the right lower lobe; in the left lung in 121(30.3%) patients – 52(13.0%) in the left upper lobe, 31(7.8%) in the lingula and 38(9.5%) in the left lower lobe. In 53(13.3%) patients radiological lesions were either bilateral or involving more than one lobe.

During bronchoscopy, 19(4.8%) patients were found to have vocal cord paralysis, 5(1.25%) had tracheal stenosis and 3(0.75%) showed mass in the trachea. 61(15.3%) patients had carinal widening. 152(38.1%) patients had lesion in the right lung with majority 49(12.3%) in the right main bronchus. 99(24.8%) patients had lesion in the left lung (**Table No. II**).

Out of the 399 bronchoscopies performed, a specific diagnosis was obtained in 101 (25.2%) patients. Bronchial biopsy and washing confirmed the diagnosis of bronchial carcinoma in 64(16%) patients. The pathological diagnosis of primary lung cancer was in accordance with the revised World Health Organization (WHO) classification of lung tumors. Of these, 23(5.8%) were small cell carcinoma , 19(4.8%) squamous cell carcinoma, 16(4%) adenocarcinoma,1(0.2%) large cell carcinoma and 5(1.2%) other types of carcinoma. 37(9.3%) patients were diagnosed as pulmonary tuberculosis, 22(5.5%) showing caseating epitheloid granuloma on biopsy and 15(3.7%) positive for

acid fast bacilli in the bronchial aspirate.(**Figure No. IV**). Biopsy and histopathology confirmed 2(0.5%) cases of sarcoidosis.
No complication occurred during the procedure in any of the patients.

DISCUSSION:

Bronchoscopy is a useful diagnostic tool, particularly for bronchial carcinoma and pulmonary tuberculosis not confirmed by other means. It is an essential procedure for the diagnostic evaluation of a localized lesion in the lung with nonspecific findings. It is also helpful as a therapeutic intervention for atelectasis and massive collapse caused by intrabronchial mucus plugs especially in post operative patients and patients on mechanical ventilator.
It is a short, easy and safe procedure and can be performed as an outpatient without the need for general anesthesia and without premedication other then topical anesthesia. Premedication has been used by some physicians and has consisted of regimens of intramuscularly administrated atropine and codeine, meperidine hydrochloride, hydroxyzine pamoate or intramuscularly administrated atropine and intravenously administered diazepam. No premedication was needed or used and no complication was seen in any of the patients who underwent the procedure in our hospital. Previous studies of outpatient FOB have shown complications requiring hospitalization in 0.14 [12], 0.58 [13] and 0.31[14] percent of cases. Results of several studies indicate that bronchoscopy may be performed safely in outpatients and without premedications[12,15,16]. Two British studies have found FOB with intravenous sedation to be safe in patients 80 years old or more[17,18]. Sixty of our patients were over 70 years, none required or were given premedication and no complication or intolerance to the procedure was encountered. We believe that outpatient FOB without premedication is desirable and safe even in the elderly. Adverse effects of sedation obviously are avoided and patients report being comforted by the idea of an immediate return home.
Approximately two-thirds of the patients were male. The preponderance of males is probably related to their smoking habit, smoking being rare in females in this country, as well as their greater exposure to environmental pollutants. Tobacco use is by far the most important risk factor in the development of lung cancer. In 1979, the US Surgeon General estimated that 90% of lung cancer deaths in males and 79% in females are due to cigarette smoking[19]. Smoking more than 20 cigarettes a day has been shown to confer a risk of between 15-25 fold relative to nonsmokers[20-22]. Also of relevance may be the tendency of men to seek medical help more and earlier.
Patients who underwent bronchoscopy were of a wide age range; the youngest patient 13 years and the eldest 90 years of age. This is so because of the diverse indications, including neoplastic and inflammatory pathology, for which the procedure was performed.
The patients included a wide variety of nationalities, Saudis making up 23%, the rest including other Arabs as well as South East Asians, South Asians, Africans and Chinese. The city of Holy Makkah is the centre of Islamic pilgrimage. It has a mixed population of Saudis, expatriate workers as well as a dynamic population of pilgrims from all over the world. This explains the variety of nationalities among the subjects who underwent bronchoscopy in our study.

The most common presenting symptom was cough (44.6%) followed by fever (32.8%), dyspnea (27.6%), chest pain (24.8%) and hemoptysis (22.3%). In our study the most common presenting symptom, similar to the previous studies[23-26], was cough (44.6%). A study of lung cancer in Saudi Arabia reports a higher incidence of symptoms apparently due to the cases being more advanced[27]. Cough may be due to local growth in the main airway or it may be a feature of large airway obstruction causing post obstructive pneumonia. Bovine cough was seen in our patients with lung cancer infiltrating recurrent laryngeal nerve[28]. Fever occurred in 32.8% in our study which was due to acute infective process in most of the patients. Pulmonary tuberculosis was found in 7.5% of patients and it is an important cause of fever in our study.

Dyspnea was seen in 27.6% of our patients; it was due to either occlusion of major airway due to endobronchial mass, massive pleural effusion, phrenic nerve paralysis with an elevated diaphragm, lung disease or involvement of heart and pericardium[23-26].

Chest pain was the presenting symptom in 24.8% of our patients. This figure is less common than previous studies[27]. Chest pain may be the result of infection or malignant infiltration of pleura or invasion of ribs or vertebrae by the tumor.

Hemoptysis was present in 22.3% of the patients in our study, a frequency slightly lower than previous studies[23-26]. Hemoptysis is a well recognized symptom of both pulmonary tuberculosis and bronchogenic carcinoma.

Weight loss was found in 20.3% of our patients. Weight loss is common in tuberculosis, lung cancer and other chronic pulmonary diseases (**Table No. I**).

X-ray chest and CT scan play a pivotal role in the diagnosis of both bronchogenic carcinoma and pulmonary tuberculosis. Of the cases in our study, almost all (96.5%) had abnormality on chest radiography. Lesions were more common in the right lung compared to the left in our study (53% versus 30.5%). Right upper lobe was the most commonly involved lobe (29%) and multilobar involvement was present in 13.5%. It is accepted knowledge that upper lobes are more susceptible to both lung cancer and pulmonary tuberculosis; this may be related to the fact that the upper lobes are less vascular, better aerated and more affected by smoking. CT scan is more sensitive then Chest x-ray in the diagnosis of pulmonary lesions.

Fibreoptic bronchoscopy showed lesion more commonly in the right lung compared to the left (38% versus 25%).The lesion was obviously inoperable on bronchoscopy in 22%, the reasons being vocal cord involvement, tracheal mass or stenosis and widening of carina.(**Table No: II**)

Bronchial biopsy and washing confirmed the diagnosis of bronchial carcinoma in 16% (n=64) of patients in our study. In our study small cell carcinoma, squamous cell carcinoma and adenocarcinoma have almost similar incidences with large cell carcinoma relatively uncommon. Cancer incidence report, Saudi Arabia 1999-2000 showed a lower incidence of small cell carcinoma (10%), with adenocarcinoma (30%) and squamous cell carcinoma (27%) being more common[29]. A recent study of lung cancer at a university hospital in Saudi Arabia showed a high incidence of squamous cell carcinoma (52%) [27]. In USA, adenocarcinoma followed by squamous cell carcinoma are the most common histologic subtypes of lung cancer[30,31].

According to the cancer incidence report Saudi Arabia 2005, there were 347 cases of lung cancer accounting for 4.6% of all diagnosed cases in year 2005. Lung cancer ranked third among male population and twelfth among female population. It affected

261 (75.2 %) males and 86 (24.8%) females with a male to female ratio of 303:100 [32]. The five regions with the highest ASR were Eastern region at 8.2/100,000, Riyadh region at 5.0/100,000, Makkah region at 4.7/100,000, Northern region at 3.3/100,000 and Tabuk region at 2.8 /100,000. The median age at diagnosis was 63 years among males (range 0-94 years) and 61 years among females (range 17-90 years).

Pulmonary tuberculosis was diagnosed in 9.3% of our patients through biopsy and bronchial aspiration. The value of Fibreoptic bronchoscopy in the diagnosis of pulmonary tuberculosis is widely accepted[33-35]. Using transbronchial biopsy samples, Wallace et al.[36] showed immediate microscopic evidence of mycobacterial infection in 48% of their patients and So and colleagues[37] obtained an exclusive diagnosis in 12% of their patients. Tuberculosis is a pathology with one of the highest diagnostic sensitivities for transbronchial biopsy[38,39], a method of sample collection that uses a Fibreoptic bronchoscope and has a low incidence of complications. In developed countries with no limitations on resources/diagnostic facilities, early use of FOB seems to be the best course of action in a patient with suspected sputum smear-negative pulmonary tuberculosis (SSN-PTB).

Two cases were confirmed as sarcoidosis on histopathology. Sarcoidosis is believed to be rare in Saudi Arabia but studies by Samman Y *et al* [40], Al-Khouzaie TH *et al* [41] and Khan J *et al* [42] have shown the occurrence of sarcoidosis in native Saudis. The epidemiology of sarcoidosis among native Saudis requires further studies. Flexible bronchoscopy is an important tool in the diagnosis of sarcoidosis for the pulmonary physician. The procedure is safe, well tolerated, and less invasive than alternatives. Sarcoid granulomas can involve any part of the respiratory tract. Being aware of mucosal abnormalities can lead to a correct diagnosis, such as when Mariotta *et al*[43]. confirmed sarcoidosis by sampling a patient's abnormal arytenoids during bronchoscopy. Several case series using rigid bronchoscopy demonstrate positive biopsies in 24% to 44% of patients[44-46]. Introduction of FB opened this diagnostic modality to non-surgeons.

Transbronchial biopsy with fluoroscopic guidance has been the usual procedure for the evaluation of solitary pulmonary nodule and peripheral lesions of the lung. More recently endobronchial ultrasound (EBUS) guided transbronchial lung biopsy in solitary pulmonary nodules and peripheral lesions by F.J.F.Herth *et al* [47], Herth F *et al* [48] and Shannon JJ *et al* [49] has been shown to have a favorable diagnostic yield.

Our study showed a positive diagnostic yield of 25.2% with Fibreoptic bronchoscopy – 16% carcinoma and the rest tuberculosis and sarcoidosis. A much higher positive diagnostic yield of 80% in a lung cancer study in Saudi Arabia is apparently related to the selection of more advanced cases.

CONCLUSION:

Diagnostic bronchoscopy is a useful tool for the diagnosis of pulmonary lesions particularly bronchogenic carcinoma and pulmonary tuberculosis. Fibreoptic bronchoscopy can play a major role in both diagnosis and treatment. Our study shows the procedure to be safe, well tolerated, cost effective and less invasive with a good positive diagnostic yield

Table I: Signs and symptoms in patients studied

Clinical findings	Number	Percentage
Cough	178	44%
Fever	131	32.8%
Dyspnoea	110	27.6%
Chest Pain	99	24.8%
Haemoptysis	89	22.3%
Weight Loss	81	20.3%
Anaemia	50	12.5%
Clubbing	38	9.5%
Lymph adenopathy	25	6.3%
Hoarseness of voice	19	4.8%
Renal failure	15	3.8%
Abdominal pain	12	3.0%
Pleural effusion	17	4.3%
Jaundice	14	3.5%

Table II: Bronchoscopic findings in patients studied

Site of findings during bronchoscopy	Number	Percentage
Vocal cord paralysis	19	0.5%
Tracheal stenosis	5	0.12%
Tracheal mass	3	0.07%
Carinal widening	69	15%
Right main bronchus mass	49	12%
Right upper lobe bronchus mass	36	0.9%
Right middle lobe bronchus mass	43	10%
Right lower lobe bronchus mass	24	0.6%
Left main bronchus mass	33	0.97%
Left lingual mass	23	0.5%
Left lower lobe bronchus mass	12	0.3%

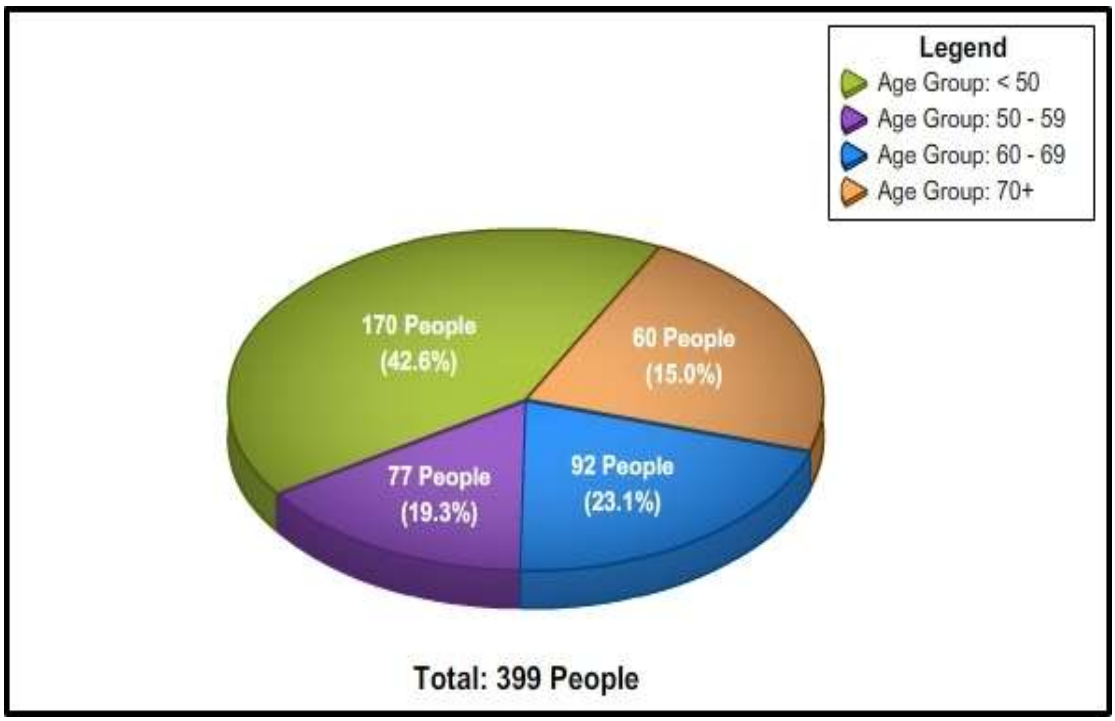

Figure No. I: Distribution of patients according to Age

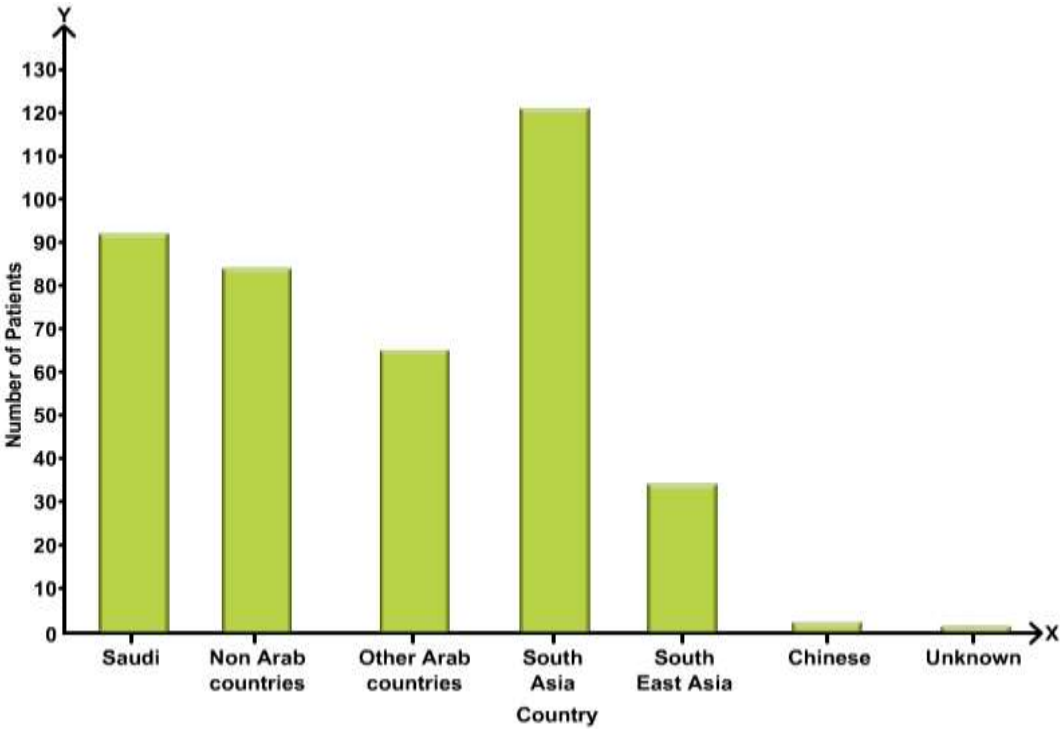

Figure No. II: Distribution of patients according to Nationality.

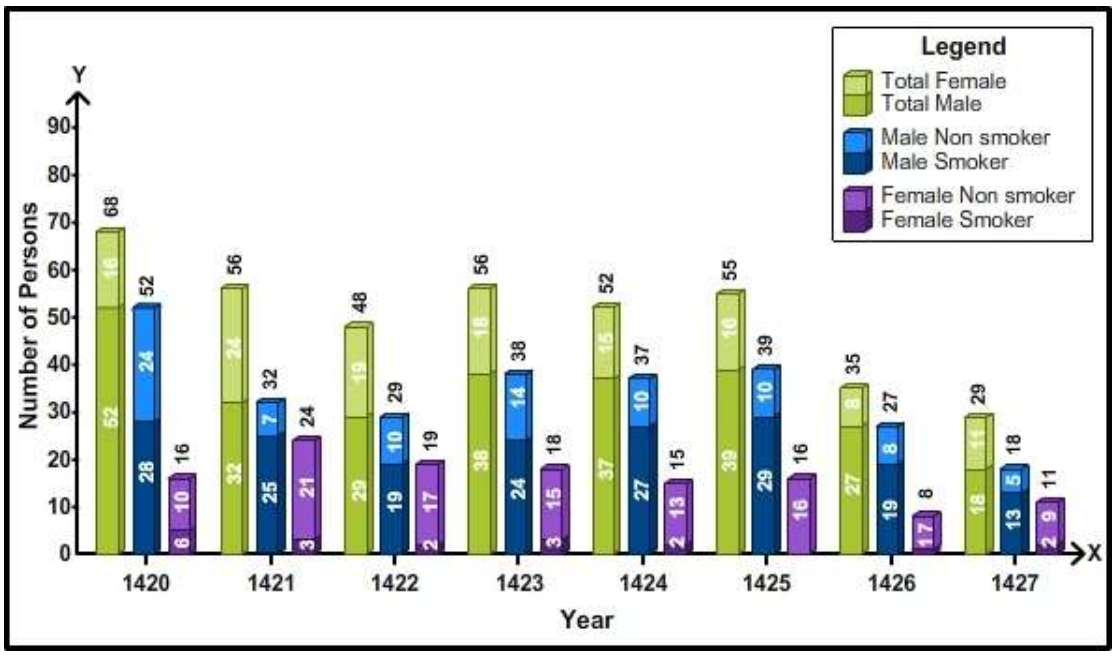

Figure No. III: Distribution of patient according to smoking habit.

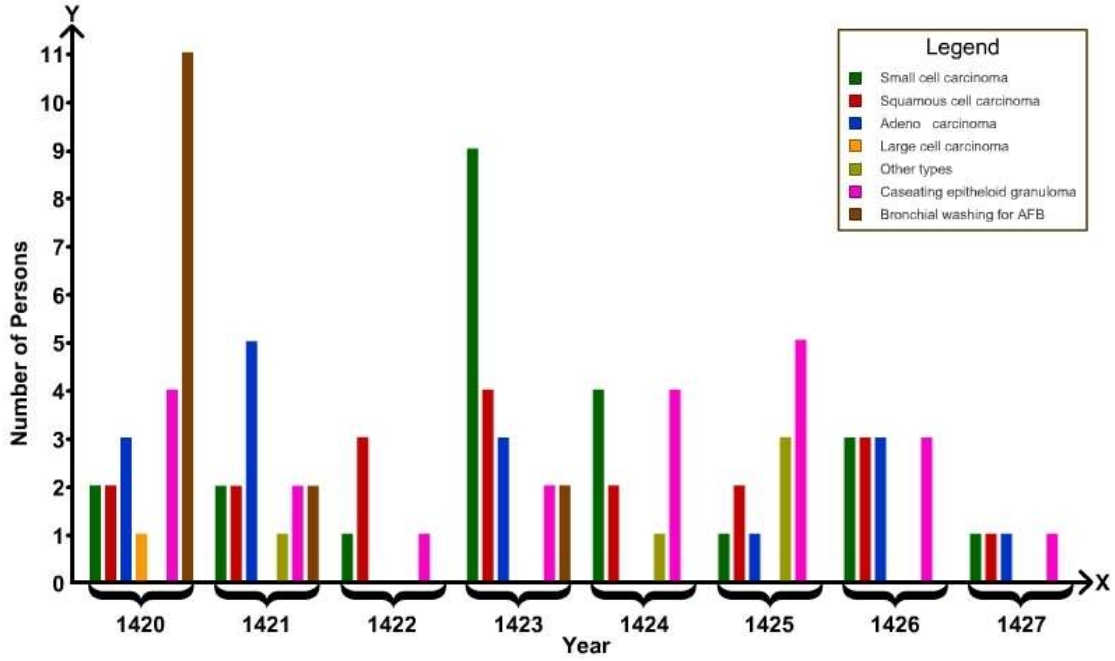

Figure No. IV: Distribution of lung cancer by histopathology and Bronchial washing.

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