

Level and predictors of anxiety in patients undergoing diagnostic bronchoscopy

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Abstract:

AIMS: Flexible bronchoscopy is a common procedure performed in pulmonary medicine, critical care, and thoracic surgery. In this study, we aimed to assess the prevalence and predictors of anxiety in patients undergoing diagnostic bronchoscopy.

METHODS: This is a prospective study conducted at King Abdulaziz University Hospital, Jeddah, Saudi Arabia. All patients undergoing diagnostic bronchoscopy filled the State-Trait Anxiety Inventory questionnaire before the procedure. Bronchoscopy was performed either through the mouth or the nose, based on the bronchoscopist preference. Lidocaine (1%–2%) spray was used for administering topical anesthesia. Results were collected, and statistical analysis was performed using *t*-test to measure statistically significant ($P < 0.05$).

RESULTS: A total of 117 patients participated in this study. High anxiety score was found in 45% of the patients. Older patients significantly showed higher anxiety score than younger patients (53 years vs. 46 years, $P = 0.034$). Similarly, patients with higher body mass index (BMI) showed a statistically significant increase in anxiety score (28 vs. 25, $P = 0.041$). Premedication with pethidine significantly reduced the anxiety levels (26.9% vs. 73.1%, $P = 0.031$). Logistic regression demonstrated that old age and outpatient settings were significant predictors of higher anxiety scores.

CONCLUSION: Diagnostic bronchoscopy can cause high anxiety in many patients. Prebronchoscopy anxiety assessment can help bronchoscopists to anticipate the anxiety levels of patients, and then further use it to tailor sedation requirements. Special attention should be given to older patients, patients with high BMI, and the ones undergoing bronchoscopy in outpatient settings.

Keywords:

Anxiety levels, bronchoscopy, predictors of anxiety, state anxiety scale

Flexible bronchoscopy (FB) is an important diagnostic tool enabling direct visualization of the nose, pharynx, larynx, and the tracheobronchial tree.^[1] It is used in the diagnosis and treatment of a variety of conditions in pulmonary, critical care medicine, and thoracic surgery.^[2] FB can be performed with mild-to-moderate sedation which is responsible for its popularity. It is a safe procedure, but some complications can occur, such as vocal cord injury or bleeding from the site of the biopsy.^[3] With

the improvement in modern anesthesiology techniques, patients can now be evaluated more safely as compared to the past.^[2,4-7] However, it is commonly observed that the decision to undergo an interventional or diagnostic procedure itself creates anxiety in an individual, irrespective of the type of the interventional or diagnostic method involved.^[8,9] Patients undergoing bronchoscopy may be anxious because of the invasive nature of the procedure and exhibit fear of pain, breathing difficulties, loss of control, and fear of the unknown.^[9] Anxiety elevates cortisol level, blood pressure, heart rate, and respiration.^[10-13] In addition, many patients reported a negative experience

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with bronchoscopy due to their unpleasant feelings.^[14] Nevertheless, there is a paucity of data about the relevant predictors of anxiety in those patients. Determining these factors and working toward resolving them will aid in minimizing patient discomfort during the procedure. Therefore, it is imperative to ascertain the predictors of high anxiety in patients. Modalities such as multimedia pre-bronchoscopy information, music, and sedation are all valid strategies used to improve patient's comfort and to alleviate anxiety.^[15,16] In this study, we aim to evaluate the anxiety levels of patients undergoing bronchoscopy and to determine the relevant predictors of high anxiety.

Methods

Setting and study design

This is a prospective study conducted between April 2017 and March 2018 at King Abdulaziz University Hospital in Jeddah, Saudi Arabia, on the patients who had undergone diagnostic bronchoscopy.

Participants and procedure

All consecutive patients undergoing diagnostic bronchoscopy, during the study period were considered. We included patients aged 18 years or more who consented to participate in the study. We excluded all patients who had therapeutic bronchoscopy, patients in the critical care units and operative theater, patients with significant language or cognitive impairment that affects their ability to understand, communicate or fill the questionnaire. Ethical approval was obtained, and the enrollment in the study did not affect the patient's management plan or types of procedure performed.

Patient- and procedure-related characteristics were noted to determine comparability between groups. Procedure-related anxiety was measured using the State-Trait Anxiety Inventory (STAI) scale in the bronchoscopy suite before starting the procedure.^[17] Instructions pertaining to this self-administered questionnaire were provided to each patient by a research assistant specially trained in questionnaire administration. The research assistant was available to answer questions while patients completed their questionnaires. Research assistant collected data on patient's demographics, indications for the procedure, comorbidities, smoking status, appointment duration, and whether patients received pre-bronchoscopy medications.

The STAI scale is composed of 40 self-reported measures of state and trait anxiety. The state anxiety scale consists of 20 questions that evaluate how respondents "feel right now" by using items that measure subjective feelings of apprehension, tension, nervousness, worry, and activation/arousal of the autonomic nervous system.

The trait anxiety scale consists of 20 questions that evaluate relatively stable aspects of "anxiety proneness," including general states of calmness, confidence, and security that assess how respondents "generally feel." For this study, we only used the State Anxiety scale. For each question, the respondents circle the number on the test form to the right of each statement that best describes the intensity of current feelings "at this moment." The choices are (1) not at all, (2) somewhat, (3) moderately so, and (4) very much so.

The confidentiality of responses was ensured using patient-identification numbers. At the end of the study period, the questionnaires were scored by adding the weighted (1–4) scores of each item using the directions and scoring key provided in the Manual for the State-Trait Inventory (Form Y). The scores could vary from a minimum of 20 to a maximum of 80. The scoring of the STAI scale was done by a research assistant who had no earlier knowledge of the study protocol, and who was also blinded to other patient-related study data.^[17] The higher score indicated greater anxiety. However, we elected to use the median score as the cutoff point for high anxiety versus low or moderate anxiety. We considered scores higher than the median score to represent high anxiety level and scores lower than median score to represent low-to-moderate anxiety level.

Bronchoscopy was performed either through the mouth or the nose based on the bronchoscopist preference. Lidocaine (1%–2%) sprays were used for topical anesthesia. Midazolam and fentanyl were used for sedation. Some bronchoscopists preferred to use premedication such as pethidine and lidocaine inhalation to be given when patients get called to the bronchoscopy units. Hemodynamic monitoring for oxygen saturation, pulse rate, blood pressure, and electrocardiogram leads were provided throughout the procedure. All procedures performed during bronchoscopy were documented, and all complications were assessed.

Ethical considerations

In addition to the informed written consent for the bronchoscopy, a separate consent to participate in the study was obtained from all patients. Participants were assured of the confidentiality of their responses and that all findings would be used solely for research purposes. No incentive was provided for their contribution. Permission to conduct this study was granted by the Biomedical Ethics Research Committee of King Abdulaziz University.

Statistical analysis

All data were collected and entered into the computer. Statistical analyses were performed using Statistical Package of Social Science (SPSS) Version 16 (Chicago,

IL, USA). The quantitative data were presented in the form of mean and standard deviation (SD). Student's *t*-test was used for quantitative data of two groups and one-way ANOVA for more than two groups. The qualitative data were presented in the form of number and percentage. Statistical significance was considered at value of $P < 0.05$.

Results

We included 117 patients out of 180 consecutive patients who underwent bronchoscopy during the study. A total of 63 patients were excluded from the study. These included 46 patients who had bronchoscopies done in the critical care unit, 11 patients who had therapeutic bronchoscopies and 6 patients who were unable or refused to give consent. Out of the 117 patients, there were 71 (60.7%) male and 46 (39.3%) female patients and the mean age of all patients was 50.23 years [Table 1]. Among all patients, 61 (52.2%) had primary-high school education whereas 56 (47.8%) had university or higher education. There were only 24 (20.5%) smokers and only 30 (25.6%) had previous upper or lower gastrointestinal endoscopies or bronchoscopy [Table 1].

Overall, the median anxiety score for all the study patients was 49 and the mean (SD) anxiety score was 49.4 (4.23). To assess potential differences in anxiety state between individuals having either high anxiety (>49) or low and moderate anxiety (<49), we stratified patients around this median. We found 53 (45.3%) patients having higher anxiety score and 64 (54.7%) patients having low and moderate anxiety scores [Table 2].

Table 3 shows information about patients' preparation for bronchoscopy and indications of the procedure. Bronchoscopy was done mainly to investigate pulmonary infiltrates in 56 (47.9%) patients with mean appointment duration of 3.5 days. Most patients, specifically 68 (58%), did not receive any pre-bronchoscopy medications on call to the procedure.

A comparison between the characteristics of the 53 patients in the high anxiety group and the 64 patients in the low or moderate anxiety group is shown in Table 4. A two-sample *t*-test for independent groups (high vs. low or moderate anxiety score) to detect any baseline differences in each of the pretest variables was performed and established a value of $P < 0.05$ as the level of significance [Table 4]. Older patients significantly showed higher anxiety score than younger patients (53 years vs. 46 years, $P = 0.034$). Similarly, patients with higher body mass index (BMI) showed a significant increase in anxiety score (28 vs. 25, $P = 0.041$). Furthermore, anxiety level was significantly lower among patients who received pethidine on call to the

Table 1: Demographic data of the patients in this study, $n=117$

Variables	Values (percentage of the total)
Age (years), range	50.23±17.71, 18-88
Gender	
Male	71 (60.7)
Female	46 (39.3)
BMI, range	25.7±6.27, 13.8-44.1
Educational level	
Primary-high school	61 (52.2)
University and higher	56 (47.8)
Duration of appointment (days), range	3.53±4.02, 1-21
Patient category	
Inpatient	79 (67.5)
Outpatient	38 (32.5)
Previous procedure*	
Yes	30 (25.6)
No	87 (74.4)
Smoking	
Yes	24 (20.5)
No	92 (79.5)
Comorbidities	
Yes 1 or more	41 (35)
No	76 (65)
CHF	
Yes	8 (6.8)
No	109 (93.2)
Renal	
Yes	7 (6)
No	110 (94)
DM	
Yes	33 (28.2)
No	84 (71.8)
Chronic lung disease	
Yes	21 (17.9)
No	96 (82.1)

*Previous procedure=Previous upper or lower gastrointestinal endoscopy or previous bronchoscopy. CHF=Chronic heart failure

Table 2: Anxiety score and prevalence of anxiety among the studied patients

Variable	Value (percentage of the total)
Anxiety score	
Mean±SD	49.40±4.23
Range	39-60
Median	49
Prevalence of anxiety	
High anxiety	53 (45.3)
Moderate and low anxiety	64 (54.7)

SD=Standard deviation

bronchoscopy suite (26.9% vs. 73.1%, $P = 0.031$), while inhaled lidocaine has no significant effect on reducing the anxiety levels. Scatter plot and regression line between total anxiety score and significant factors are shown in Figure 1. Interestingly, there is significant variation in anxiety scores in relation to whether bronchoscopy was

Table 3: Data about preparations of patients for bronchoscopy

Variables	Value (percentage of the total)
Duration of appointment (days)	
Mean±SD	3.53±4.12
Range	1-21
Premedication	
Pethidine	26 (22.2)
Inhaled lidocaine	23 (19.7)
No	68 (58.1)
Indication for bronchoscopy	
Pulmonary infiltrate	56 (47.9)
Malignancy	47 (40.2)
Sarcoidosis	6 (5.1)
ILD	5 (4.2)
Hemoptysis	3 (2.6)

SD=Standard deviation, ILD=Interstitial lung disease

done as outpatients or inpatients. High anxiety score was significantly more prevalent among patients who had bronchoscopies as outpatients ($P = 0.041$).

Table 5 shows logistic regression for prediction of anxiety among patients undergoing bronchoscopy. The univariate analysis determined significant predictors to be age, BMI and whether bronchoscopy was done as inpatient or outpatient setting. The significant predictors by multivariate analysis are older age and outpatients setting with $P = 0.03$ and 0.038 , respectively.

Discussion

Like any other invasive procedure, bronchoscopy is expected to create a sense of apprehension and anxiety in patients. Furthermore, the inception of disease and hospitalization are among the common causes of anxiety in patients.^[18,19] The main purpose of this study was to evaluate the prevalence, and factors that influence anxiety in patients undergoing diagnostic bronchoscopy. The high anxiety prevalence was observed at 45% and the most significant predictors of high anxiety level were age, outpatient setting, and high BMI. Surprisingly, other demographics such as gender, educational level, appointment duration, or comorbidities did not appear to have a significant impact on the anxiety level.

Over the years, anxiety level in patients undergoing bronchoscopy seems to remain a common problem, though studies have been done on different populations. Poi *et al.* reported the first observational prospective study about fears of patients undergoing bronchoscopy, which documented high anxiety level in 58% of patients. The prevalence of high anxiety in this study was high at 45%, but it is lower than what was reported in the earlier study. The difference in prevalence of anxiety level is likely related to the cultural or ethnic backgrounds and related to differences in the methodology of both studies.

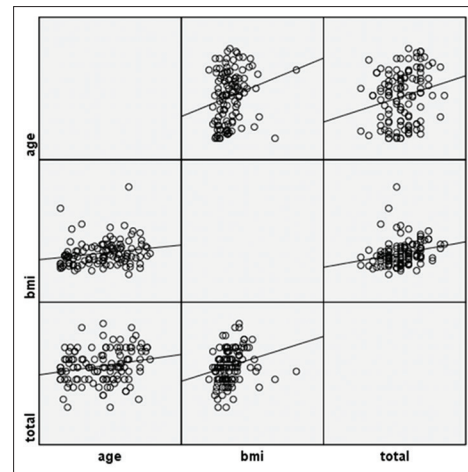


Figure 1: Scatter plot and regression line between total anxiety score and significant factors

One of the main findings in this study is that older age is predictive of anxiety, which is in contrast to other studies where younger age is associated with higher anxiety in bronchoscopy patients or has no effect in endoscopy patients.^[9,20] Older people are expected to have more experience with procedures and health facilities and perhaps can tolerate invasive procedures with stoicism and wisdom. Nevertheless, in this study older people were more anxious, which may be explained by the fear of complications or death during the procedure because of the advanced age. Again, the impact of age on anxiety is variable among studies likely because of cultural factors.

As with many clinical interventions, the risk of complications from bronchoscopy and the associated fear and anxiety is often presumed to be more common in obese patients.^[21] Based on the data derived in our univariate analysis, obesity was found to be a significant predictor of high anxiety. However, the logistic regression model revealed that obesity was not a significant predictor of high anxiety. In another study by Khan *et al.*, they did not find any clinically significant difference in sedation needs or an increase in complications in obese versus nonobese patients.^[22] The association between anxiety and obesity is contradicting.^[23] There is moderate evidence that shows obesity is positively associated with anxiety. However, no casual relationship could be established with the existing evidence.^[24]

Our observed results were in concurrence with Mitsumune *et al.*,^[25] where authors have shown that anxiety is predictive of patient's discomfort and that sedation can help in reducing it. We found that patients who received short-acting pethidine on call to the bronchoscopy unit were significantly less anxious than those who did not receive it. Two bronchoscopists in our hospital prefer this practice, though there is no strong evidence to support it.^[26,27] It might be desirable to tailor

Table 4: Demo-graphic and clinical data among studied patient according to the level of anxiety

Variables	High anxiety (n=53)	Low and moderate (n=64)	P
Age (years)	53.37±18.71	46.37±16.25	0.034
Gender			
Male	33 (46.5)	38 (53.5)	0.44
Female	20 (43.5)	26 (56.5)	
BMI	28.69±5.53	25.68±6.25	0.041*
Educational level			
Primary-high school	25 (47.2)	36 (56.2)	0.214
University and higher	28 (52.8)	28 (43.8)	
Duration of appointment (days)	3.9±4.65	3.2±3.41	0.32
Patient category			
Inpatient	31 (39.2)	48 (60.8)	0.041*
Outpatient	22 (57.9)	16 (42.1)	
Previous procedure*			
Yes	14 (46.7)	16 (53.3)	0.51
No	39 (44.8)	48 (55.2)	
Smoking			
Yes	10 (41.7)	14 (58.3)	0.50
No	43 (44.8)	49 (56.2)	
Comorbidities			
Yes 1 or more	17 (41.5)	24 (58.5)	0.39
No	36 (47.6)	40 (52.6)	
CHF			
Yes	2 (25)	6 (75)	0.208
No	51 (46.8)	58 (53.2)	
Renal failure			
Yes	2 (25)	5 (71.4)	0.30
No	51 (46.8)	58 (53.6)	
DM			
Yes	15 (45.5)	18 (54.5)	0.89
No	38 (45.2)	46 (54.8)	
Chronic lung disease			
Yes	11 (52.4)	10 (47.6)	0.315
No	42 (43.8)	54 (56.2)	
Psychiatric disease			
Yes	3 (37.5)	5 (62.5)	0.45
No	50 (46.3)	58 (53.7)	
Sedation			
Pethidine	7 (26.9)	19 (73.1)	0.031*
Inhaled lidocaine	11 (47.8)	12 (52.2)	
No	34 (50)	34 (50)	

Percentage of the total. *Previous procedure=Previous upper or lower gastrointestinal endoscopy or previous bronchoscopy. BMI=Body mass index, CHF=Chronic heart failure, DM=Diabetes mellitus

Table 5: Logistic regression for prediction of anxiety among patients undergoing bronchoscopy

Predictor	B	Significance	Exp(B)	95.0% CI for Exp(B)	
				Lower	Upper
Age	-0.025	0.03	0.975	0.954	0.998
BMI	0.014	0.591	1.014	0.963	1.068
Inpatient	-0.882	0.038	0.414	0.18	0.953
Constant	3.23	0.014	25.267		

BMI=Body mass index, CI=Confidence interval

the doses of sedatives and analgesics to each patient to obtain an appropriate level of sedation. The more anxious patients should receive more sedatives.

Surprisingly, the outpatient setting was a significant predictor for higher anxiety level when compared to the inpatient setting. This might be explained by the fact that those patients who had their bronchoscopy done as outpatients were new to the hospital settings, while inpatients who were already accustomed to the hospital settings were more adapted, and therefore, showed less nervous psychology. These results are in agreement with earlier reports that establish the fact that performing bronchoscopy for an outpatient can lead to anxiety and discomfort.^[28] One of the key reasons that have been cited for this condition is that there has not been sufficient optimization of the levels of sedation

customized for outpatient bronchoscopy. Generally, sedation is performed with the same protocol regardless of whether the patients were outpatient or inpatient.

In general, it was suggested that the longer the examination time, the greater the anxiety the patient perceived.^[25] We used multiple regression analysis to adjust several confounding factors in the present study. Consequently, neither the duration of the procedure nor the duration of the appointment accounted for significant influences on anxiety. Duration of the procedure time was reported as the most important factor in patient discomfort due to anxiety.^[29]

Interestingly, some of the factors that we examined were not found to be significant predictors, like gender, comorbidities or previous bronchoscopy, which is in stark contrast to published studies.^[3] For example, in a study by Poi *et. al*, it was found that females were significantly more fearful and anxious than males while undergoing diagnostic bronchoscopy.^[9] Furthermore, it has been reported that prior experience of bronchoscopy helps in reducing anxiety levels and makes patients better prepared for the procedure.^[30] However, we did not find prior experience of bronchoscopy a significant predictor in our analysis. While this study sheds light on several interesting aspects related to the predictors of anxiety in patients undergoing bronchoscopy, it also possesses the potential to influence patient management and willingness to undergo the procedure again in the future. Moreover, this study explicitly addresses the anxiety in bronchoscopy patients using the STAI questionnaire, which is considered a gold standard tool for the assessment of anxiety.

The results of this study should be interpreted in view of its limitations. First, this is a single center study, so results may not be applicable to other hospitals or patients. Second, the lack of a control arm may limit the conclusions drawn about how common is anxiety compared to other patients admitted to the hospital for other procedures or outpatients clinic visits. However, the primary focus of this study was to initially establish the prevalence and predictors of anxiety among bronchoscopy patients and attention to comparative studies is warranted in the future.

Conclusion

This study suggested that the prevalence of anxiety in bronchoscopy patients is still high at 45%. Furthermore, we found that older age, BMI and outpatient setting are the most significant predictors of high anxiety during diagnostic bronchoscopy. Therefore, it is recommended that the patient's anxiety level be determined using a questionnaire before bronchoscopy with special attention must be paid to older, or obese patients and

outpatients setting bronchoscopy. Prebronchoscopy anxiety assessment, as suggested in this paper, can help bronchoscopists in tailoring sedatives to the anxiety level of the patient, and consider administering more sedatives to more anxious patients. Future studies addressing the effect of special intervention directed toward prebronchoscopy anxiety, such as assessing multimedia information to orient patients about the procedure and the effect of premedication in a specific protocol to alleviate anxiety are recommended.

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Conflicts of interest

There are no conflicts of interest.

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