

## A cross-sectional study to find out the co-morbidities of asthma in adult patients in a tertiary care hospital at Eastern India

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### Abstract

**Introduction:** This cross-sectional institution based observational study aims to find out the common co-morbidities of asthma. The co-morbidities of asthma are well described in literature. The Global initiative for Asthma (GINA) also advocates about prompt diagnosis and proper management asthma and its co-morbidities. Presence of co-morbidity increases morbidity and mortality. The management of asthma is inadequate without proper management of its co-morbidities. Asthma is one of the leading causes worldwide for morbidity and mortality. The health expenditure for uncontrolled asthma is grave. So, a proper study was required for finding out the co-morbidities of asthma and to understand the complex interaction between asthma and its co-morbidity. **Materials & Methods:** This study was conducted in a tertiary teaching hospital, Durgapur, West Bengal. The study done between December 2019 to November 2020, over a period of one year. It was a cross sectional observational, institution-based study. The study population was patients attending the hospital with the complaints of asthma. The sample size for this study was 90. Patients diagnosed by spirometry with reversibility tests were included in this study. Proper history, general physical examination and respiratory system examinations were done. To confirm the comorbidity, patients were sent to the concerned specialty. The result of this study was tabulated in a scientific way. The results were expressed in percentage. **Results:** Total 90 patients were enrolled in this study. The mean age was 48.2 years, Male 52 and female 38. Among the comorbidities reported, sinusitis was present in 49(54.4%) patients, obesity was present in 38(42.2%) patients, 40(44.4%) patients were suffering from GERD, psychological disturbances was found in 22(24.4%) patients, vocal cord dysfunction was present in 18(20%) patients, obstructive sleep apnea was reported in 27(30%) patients, 5(5.5%) patients had underlying bronchiectasis, atopic dermatitis was found in 9(10%) patients while recurrent respiratory Infection was noted in 13(14.4%) patients. **Conclusion:** Co-morbidities are associated with poor asthma control. Although their presence may vary over different geographical region, treating physician should try to find out the comorbidities. Comorbidities adversely affect asthma management. Proper diagnosis and management are necessary for optimum asthma control.

**Keywords:** Asthma, comorbidity, adult, Eastern India.

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## Introduction

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation [1]. Studies have shown that, 1-18% of population may be affected by asthma in different countries [2]. Patients with difficult to treat or severe asthma has several comorbidities. Active management of comorbidities is recommended because they may contribute to symptom burden; impair quality of life, drug interaction, and poor asthma control. Comorbidities of asthma—such as rhinitis, vocal cord dysfunction (VCD), gastro-esophageal reflux disease (GERD), psychiatric disorders, obesity and obstructive sleep apnea (OSA), bronchiectasis, recurrent respiratory infections, atopic dermatitis are common but often missed [3-6]. This leads to clinical confusion and treatment related complication. Despite widespread occurrence, there is no standard definition of comorbidity in the literature [7]. Comorbid conditions carry a major economic burden on health care facility. The prevalence of asthma comorbid conditions increases with age [8]. It is a great matter of concern as population is ageing globally. Asthma comorbid conditions have not been studied extensively in this part of the world. This study aims to find out the common comorbid conditions associated with asthma. This knowledge will help the treating physician to be vigilant about the interference of comorbid conditions and ensures adequate asthma management.

## Materials & methods

This study was conducted in a tertiary teaching hospital, Durgapur, West Bengal. The study done between December 2019 to November 2020, over a period of one year. It was a cross-sectional, observational, institution-based study. Prior permission from institutional ethics committee was taken. The study population was patients attending the hospital

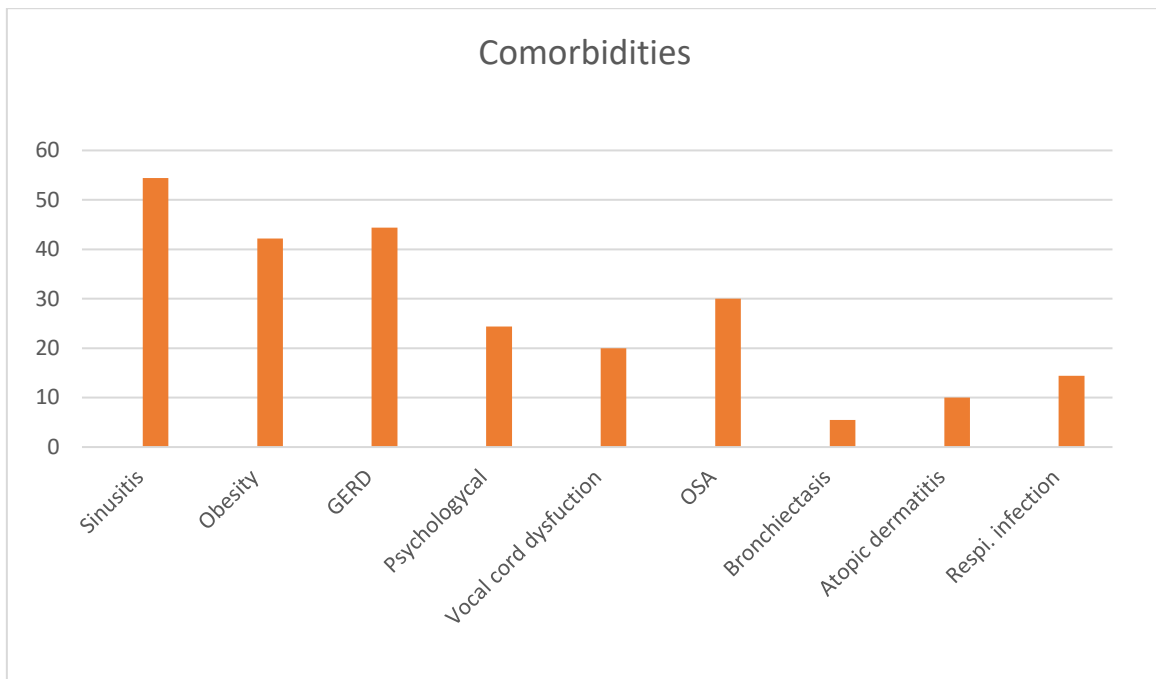
with the complaints of asthma. The sample size for this study was 90. A written consent was taken from the patient. The patients who gave consent were enrolled in the study, while patients who refused were excluded from the study. The inclusion criteria were asthma patients who were diagnosed on the basis of spirometry and bronchodilator reversibility test. We excluded patients with COPD, active case of tuberculosis and active hemoptysis. Age group participated in this study was 18 years to 75 years. A detailed history was taken from the patients. After obtaining the history, general physical examination and systemic examinations were done. Previous documents were checked for valuable input. The spirometry with reversibility test was noted. Once the asthma diagnosis was confirmed, a generous attempt was made to find out the comorbid conditions. To confirm the comorbidity, patients were sent to other concerned specialties for opinion. Once the comorbid condition was found, attempts were made to treat those diseases also. The data collected from patients were scientifically tabulated to use further in the study. Numbers of patients found to have comorbidity were expressed in percentage.

## Results

The result of our study is depicted in table 1. Total 90 (N=90) patients were enrolled in our study. Out of which male patients were 52 and female patients were 38. The mean age was 48.2 years. Among the comorbidities, sinusitis was present in 49 (54.4%) patients, obesity was present in 38(42.2%) patients, 40(44.4%) patients were suffering from GERD, psychological disturbances was found in 22(24.4%) patients, vocal cord dysfunction was present in 18(20%) patients, obstructive sleep apnea was reported in 27(30%) patients, 5(5.5%) patients had underlying bronchiectasis, atopic dermatitis was found in 9(10%) patients while recurrent respiratory infection was noted in 13(14.4%) patients. The percentages are depicted in bar diagram (Fig.1).

**Table 1: Co-morbidities among asthma patients**

Diseases	No. of patients (N=90)	Percentage (%)
Sinusitis	49	54.44
Obesity	38	42.2
GERD	40	44.4
Psychiatric	22	24.4
Vocal cord dysfunction	18	20
OSA	27	30
Bronchiectasis	5	5.5
Atopic dermatitis	9	10
Respiratory infection	13	14.4



**Fig 1: Co-morbidities among asthma patients**

## Discussion

Asthma can be controlled by regular medication. But, in few cases, the symptoms are not adequately controlled. That warrants the treating physician to search for the cause for non-responsive asthma or difficult to treat asthma. There is a tendency to increase the inhaled corticosteroid dose in non-responsive cases. Still the patient's complaints are not resolved completely. Most of the time, the comorbid condition is the culprit to cause uncontrolled asthma symptoms. The treating physician should find out the co-morbidities existing in the patient. Asthma patients often may complaints of running nose, cough, shortness of breath, chest tightness, recurrent cold, wheeze, recurrent upper respiratory infection and nasal polyp. Patients do take inhaler medication for asthma but their upper respiratory and ENT complaints are not properly addressed most of the time. That interferes with the quality of life, asthma control, sleep, adherence to medication. As a result of it, patients give up asthma medication after some time. Chronic rhinosinusitis with nasal polyps is estimated to occur in 7% of all asthmatics, whereas asthma is reported to occur in 26–48% of patients with chronic rhinosinusitis with nasal polyps [9]. Untreated patients often face more severe attack of life-threatening asthma and ICU

admission [10]. So, every time a case of asthma is diagnosed, its comorbidity should also be looked for.

Multiple study conducted in different countries, found that asthma patients do suffer from rhinitis. This may be due to a similar inflammatory process in asthma and paranasal sinuses. Meticulous evaluation should be done to rule out the presence of rhinitis in asthma patients. Whenever found, it should be treated as per the guideline by intranasal corticosteroid. In another study, it was found that, treatment of rhinitis in asthma patients was associated with improved quality of life, better symptom control, adherence to medication and less frequent exacerbations. But few studies didn't find any difference. Sinusitis may cause obstructive sleep apnoea, which will further compromise the respiratory function of the patient, leads to poor treatment outcome.

In our study, we reported 52% of the patients had rhinitis. In another study done by Bresciani et al. found that 75% patients were having rhinitis [11]. In another study done by Togias et al. found that the prevalence of rhinitis in asthma patients varies from 6 to 95% [12]. So, it can be concluded that, the prevalence of rhinitis in asthma patients varies in different studies, but it still remains as one of the most important contributing factors for the difficult to treat asthma.

GERD is very much common in asthmatics. The mechanism may be due to vagal tone, decrease in

lower oesophageal sphincter, micro aspiration of gastric acid and irritation of the laryngeal or respiratory mucosa. The patients may often complain of heartburn. When there is a decrease in the tone of gastro-oesophageal junction, the gastric acid reaches into larynx and pharynx. Patients complain of hoarseness of voice, frequent clearing of throat, chest tightness, heartburn. The symptoms of GERD sometimes mimic asthma. So, patients often get over diagnosed with asthma and get inhaler medication. The low pH of gastric acid irritates the mucosa of upper and lower respiratory tract and thus worsens asthma. Patients should be asked for any GERD symptoms. Once diagnosed, GERD should be treated for optimum management.

In few studies it was reported that, the GERD managed by PPI reduces the asthma symptoms and increases the quality of life [14,16]. But few studies failed to demonstrate a clear improvement in asthma control. On the other hand, asthma medication like oral corticosteroid, theophylline will cause GERD as an adverse effect and will worsen asthma. So, a meticulous history should be obtained from the patients and in follow up visit, the adverse effect of the drugs should be looked for.

In our study we have found that, 44.4% of the patients had GERD. In another study done by Havemann et al. found that 58% patients were having GERD. In another study, it was found that, GERD symptoms were reported in 50-80% of patients [17, 18]. The prevalence of GERD varies in different studies and in different geographical region, but the occurrence of GERD in asthma patients cannot be denied. So once diagnosed it should be treated with proper medication along with lifestyle modification.

Obesity is another important comorbid condition adding more challenge to treat asthma. The mechanism of obesity interfering with asthma is not clear [19]. The prevalence of obesity varies in different countries. The occurrence also varies in different age groups. Obesity is troublesome for both children and adult. Obese patients often complain shortness of breath on exertion, chest tightness, snoring, and wheeze. These symptom complex mimics asthma. Frequently patients are falsely diagnosed as asthma that is not actually asthmatic. The relation between obesity and asthma is not clear; it is thought to be due to a similar inflammatory process in the body. Obesity influences the asthma treatment directly and indirectly [20, 21]. On diagnosis of asthma, the presence of obesity should be noted.

In different studies conducted over different region found that, there is a relation between obesity and asthma. Obese patients are more prone to develop

asthma later in their life. Obese patients also experience poor asthma control, low quality of life, high drug burden, frequent hospital visits, severe exacerbation and poor outcome [22, 23]. Worldwide, the prevalence of obesity is increasing day by day, adding to a greater challenge managing asthma patients [24].

There is a complex interplay between asthma and obesity. Some of the asthma medication like, corticosteroid causes increase in bodyweight, which will again cause poor symptom control. Weight reduction should be advised to the patients. In a few studies it is demonstrated that, weight reduction is associated with better symptom control, a smaller number of exacerbation and improves quality of life [25].

Obesity is also a risk factor for developing sleep apnoea [26]. Sleep apnoea will further complicate the respiratory function leads to nocturnal desaturation and cardiac complications. In our study we have found that, 42.2 % of the patients had obesity. In other studies, it was found that, 21-48% of asthmatics were having obesity [27-30]. In another study done by Taylor B et al. in The National Asthma Survey, 2008 recorded persistence of symptoms, greater use of inhaled beta agonists and corticosteroids, increased work absence and decrease in asthma control in obese patients [31]. The prevalence of obesity varies in different studies and in different geographical region, but the occurrence of obesity in asthma patients cannot be denied. So once identified, attempt should be made for weight reduction, promote physical activity along with lifestyle modification. Weight reduction has a positive effect on asthma control and self-esteem.

Asthma patients do experience high level of stress due to the symptom complex. Commonly anxiety and depression are noted [32]. Major randomised trials have been done to find out the prevalence of psychiatric illness in asthmatics. It is evident that, the prevalence of psychiatric comorbidities is higher in asthma patients compare to normal population [33]. P. J. Vuillermin et al. in his study found that, asthmatic symptoms are more in patients with anxiety compare to normal population [34]. World Health Organization survey of psychiatric comorbid conditions in 85,000 patients with asthma, using a standardised, structured psychiatric interview with trained interviewers, reported an estimated prevalence of 2–26% for major depression [35]. It is also suggested that, psychiatric patients are in increased risk of developing asthma. There is a complex interplay between asthma and psychiatric illness. Patients who suffer from anxiety

and depression do not take medicine properly. So, they face more frequent exacerbation, poor asthma symptom control, poor quality of life and morbidity and mortality. Globally the depression is increasing, so the prevalence of asthma.

The patient with psychiatric illness as a comorbid condition should be dealt with utmost care. There should be a dedicated caregiver to ensure a proper adherence of asthma medications. The optimum management of asthma always include the treatment of comorbid condition as well. Few studies were conducted to see the difference in asthma control by giving anti-psychotic medication, but failed to demonstrate a clear evidence of improvement in asthma symptom control. Another study showed that, there was improvement in asthma outcome after treating the underlying psychiatric condition.

In our study we have found that, 24.4% of the patients had psychiatric illness. In another study done by Scott et al. found that 1-9% of asthmatics were having psychiatric illness too [35]. In another study done by Dennis K Ledford et al. found that anxiety and depression were reported in 16-52% patients of asthma [24]. Fasmer et al. recently assessed how frequently drugs used to treat asthma and psychiatric co-morbidity and he confirmed the presence of psychological disorder in asthma patients [36]. Goodwin et al. looked at the association between asthma and mental disorders and the impact of asthma and mental disorder in Canada, where he concluded that, asthma was associated with a significantly increased likelihood of a range of mental disorders among adults [37]. Prevalence of psychiatric illness varies in different studies and in different geographical region, but the occurrence of psychiatric illness in asthma is well established. So once diagnosed, attempt should be made to treat the underlying psychiatric illness also for a better asthma management.

Vocal cord dysfunction (VCD) is one of the common comorbidities in asthma patients, making asthma difficult to treat. VCD patient is having abnormal adduction of vocal cord during inspiration and expiration. The mechanism may be due to abnormal vagal stimulation. Patients complain of wheeze or stridor, cough, shortness of breath. The symptom of VCD mimics asthma in the absence of asthma in a particular patient [24]. The symptom complex is almost same for both the diseases. This leads to clinical confusion for the treating physician. Both these diseases can occur simultaneously in a same patient or can occur in different clinical setting. At the diagnosis

of asthma, the treating physician should search for VCD by a direct laryngoscopy or by a CT scan.

Our study we have found that, 20% of the patients had Vocal cord dysfunction. In another study done by Low k et al. found that 50% patients were having VCD [38]. In another study done by Yelken k et al. found that 19% patients were having VCD [39]. The prevalence of VCD varies in different studies and in different geographical region, but the occurrence of VCD in asthma patients is well described in literature. So once diagnosed, attempt should be made to treat the underlying VCD. It is an established fact that, presence of VCD in asthmatics associated with poor asthma control, low quality of life, and frequent hospital visits. Treatment of VCD may be initiated by behavioural therapy or by CPAP along with the regular asthma medications. Speech therapy is the cornerstone of treatment [40].

Bronchiectasis is another common entity which may exist with asthma. The symptoms of bronchiectasis include shortness of breath, wheeze, recurrent respiratory infection, productive cough and copious amount of sputum production. This symptom mimics asthma. Most of the time, a bronchiectasis patient receives asthma medication after wrong diagnosis. A spirometry with bronchodilator reversibility test may be done to differentiate these clinical conditions. Similarly, bronchiectasis patients can develop allergic bronchopulmonary aspergillosis (ABPA) which worsen asthma outcome. A difficult to treat asthma patient, who is not responsive to usual medication, search for ABPA should be done. A CT scan of thorax, immunologic tests may help in establishing the diagnosis of bronchiectasis and ABPA. Similarly in a proven case of bronchiectasis, a search for asthma should be done. For optimum control of asthma, its comorbidity should also be identified and treated simultaneously. This will lead to good asthma control and improve in the quality of life.

In our study we have found that, 5.5% of the patients had bronchiectasis. Dennis K. Ledford et al. in his study mentioned bronchiectasis is one of the comorbidities of asthma [24]. The prevalence of bronchiectasis varies in different studies and in different geographical region, but the occurrence of bronchiectasis in asthma patients is established in literature. So, once diagnosed, attempt should be made to treat the underlying bronchiectasis.

Recurrent respiratory infections are one of the common comorbid condition of asthma. Both paediatric and adult patients do experience recurrent respiratory infection. This is commonly encountered in winter season. Most of the time, the aetiology is being a virus,

although exacerbation by bacteria may also be seen. Recurrent respiratory infection leads to increase in morbidity and mortality. Recurrent infection will cause more hospital stay and high drug burden. The long duration of hospital stay will further affect by loss of daily wages. Thus, the expenditure to manage asthma increases many folds by managing its comorbid conditions as well. In large multi-centre study showed that asthma patients having more than one comorbidity will need more expenses by health care. The magnitude of the diseases burden is high. Poorly controlled asthma patients are increased risk of ICU admission and mortality. Every infection will affect the lung adversely and will cause a fall in lung function.

In few studies done with large number of sample size, suggested that, there is an increased risk of developing pneumonia by using asthma medication like inhaled corticosteroid. So, a judicious use of inhaled or oral corticosteroid is warranted. In our study we have found that, 14.5% of the patients had recurrent chest infection. In another study done by Mirabelli et al. mentioned recurrent respiratory infections were common in asthmatics [41]. Xinming et al. Study pointed out that, recurrent respiratory infections were one of the comorbidities of asthma [42]. The prevalence of recurrent infection varies in different studies and in different geographical region, but the occurrence of recurrent infection in asthma patients is well recognised in literature. So once diagnosed, attempt should be made to treat the underlying infection.

Obstructive sleep apnoea is frequently diagnosed due to awareness and improved diagnostic modality and availability of polysomnography. OSA is also increasing due to the aging population and increase in prevalence of obesity. The prevalence of OSA in asthma patients were reported to be 40-50% [43,44]. The patients of OSA having inflammatory mediators in the circulation will lead to more severe form of asthma symptoms. There is a complex interplay between asthma and OSA. Asthma patients suffer from OSA may be due to obesity, rhinitis, vocal cord dysfunction, drug induced vocal cord myopathy and inflammatory cytokines. OSA affects every organ of our body adversely. OSA causes more severe asthma exacerbation [45]. Becerra et al. study demonstrated that, there was an increase in length of stay in hospital in patients with asthma and OSA [46]. There is nocturnal desaturation, which promotes cardiovascular, pulmonary, neurological and metabolic complications. Patients complain of, lethargy, poor concentration, excessive day time sleepiness, irritability, memory disturbances, sexual dysfunction, heart failure,

pulmonary hypertension, arrhythmia, hypertension, diabetes mellitus, shortness of breath.

OSA should be suspected in asthma patients with above mentioned symptomatology. Prompt management of asthma can be done by a proper diagnosis and treatment of its comorbidities. If neglected, patients will have poor asthma control, frequent exacerbation and hospital visit, more drug burden. A suspect of OSA may be evaluated by doing polysomnography (PSG) study. Along with regular asthma medication patients are advised to use continuous positive airway pressure (CPAP) device for greater symptom control.

In our study we have found that, 30% of the patients had concurrent OSA. In other studies, it is mentioned that, OSA possibly influence asthma control [47, 48]. The prevalence of OSA varies in different studies and in different geographical region, but the occurrence of OSA in asthma patients is well documented in literature. So once diagnosed, attempt should be made to treat underlying OSA. Mehra et al. suggested that, OSA could cause oxidative stress on lower respiratory tract and influence asthma [49].

Atopic dermatitis occurs in few asthmatics. The mechanism may be due to the inflammatory markers. The atopic dermatitis may be associated with food allergy. Patients experiences itching, swelling, redness over skin and more severe form shortness of breath. Care should be taken to treat the underlying comorbidities for a better asthma control. In our study we have found that, 10% of the patients had atopic dermatitis. In another study done by Illi s et al. found that asthma patients were having atopic dermatitis [50]. In another study done by de Groot EP et al. found that food allergy and atopic dermatitis was associated more ICU admission of asthma patients [51]. The occurrence of atopic dermatitis in asthma patients is well documented in literature. So, clinician should actively search for the presence of atopic dermatitis and once diagnosed, attempt should be made to treat.

These are the co-morbidities found in our study. With the limited resource and time, we could establish these co-morbidities playing a vital role in asthma management. This topic needs further population-based study with large sample size. A thorough knowledge about asthma and its comorbid condition will ensure better management and reduce the burden on health care. Similarly, judicious use of medication is warranted. In follow up visit, inhaler technique, adherence to medication, dosage, comorbidity, triggering factor, review of medications, emotional support and patient education can be done. A written asthma action plan is

required as per the GINA guideline for better monitoring.

### Conclusion

The management of asthma is incomplete without treating the underlying comorbidity. A proper history, physical examination and laboratory investigation is required to find out the presence of asthma and its comorbidities. Whenever possible a spirometry with bronchodilator reversibility test should be done to confirm the diagnosis. Thorough investigation should be done to enlist the comorbid conditions. Before increasing the dose of oral or inhaled corticosteroid, other possibilities of difficult to treat asthma should be excluded. For better adherence to asthma medication, the comorbid condition should also be taken care of. Factors that trigger asthma exacerbation like cold, smoke, dust, emotional stress, viral infection, irregular use of medication should be identified. Patient education also plays a significant role.

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