

## Case Report

# Asthma related to gastroesophageal reflux disease: a case report and review

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## ABSTRACT

Asthma is a common respiratory disorder that characterized by airway hyper-reactivity and chronic inflammation. Asthma and gastroesophageal reflux disease can occur together, both can affect each other. We represent 41 years old male patient with chief complaint of asthma that preceded burning sensation on his throat and also heartburn over the last three months. Patient had visited his family doctor but his symptom still occurred. He had been experienced six episodes of these symptoms since three month ago. On physical examination there were wheezing both of his lung and prolong expiration phase. There was no abnormality on the electrocardiogram, chest X-ray and complete blood count. After administration of short acting bronchodilator and proton pump inhibitor agent, patient clinical status improved dramatically. Patient then given salmeterol fluticasone inhaler, antacid, ANT proton pump inhibitor as take-home medication. On his follow up visit to polyclinic on first, fourth- and eight-week patient denied any shortness of breath and heartburn anymore. Various pathological processes play a role in the pathogenesis of GERD and Asthma. There were two theories that suggested in the mechanism that caused GERD induced Asthma, including reflux and reflex theory.

**Keywords:** Asthma, Gastroesophageal reflux disease, Pulmonary function

## INTRODUCTION

Asthma is a common respiratory disorder that caused by airway hyper-reactivity and chronic inflammation in which had complex immunologist mechanism. It is estimated that asthma affected 241 million people worldwide. Asthma is a clinical syndrome, with multiple algorithms have been used to make diagnosis of asthma. This multiple algorithm includes history of shortness of breath, wheezing, chest tightness, atopic history, reversible airflow obstruction that respond to treatment.<sup>1,2</sup>

Asthma that difficult to control in an individual, may have other treatable comorbidities that cause high intensity asthma treatment alone not effective in controlling the asthma symptoms. This common treatable comorbidity including allergic and non-allergic rhinitis, gastroesophageal reflux disease (GERD), obesity, obstructive sleep apnea, mental disorder such as anxiety and also depression.<sup>1-3</sup> The prevalence of GERD among Asthma patient vary widely. Asthma and GERD can occur together, both can worse and arise each other. Here we present a case of 41 male patients asthma with GERD as comorbidities.

## CASE REPORT

41 years old male patient came to the emergency department of Karangasem hospital with chief complaint of shortness of breath, since this evening. The shortness of breath was also accompanied by wheezing sound. Patient said the complaint didn't improve nor worsened with a change of body position. Patient also had nonproductive cough along with the shortness of breath. Patient also experienced burning sensation on his throat and also heartburn just before the shortness of breath occurred. This heartburn begun when patient laid down in his bed after eating large portion of meals. Patient denied any history of dysphagia or odynophagia. Patient had experienced at least 6 episodes of the same complaint during this last 3 months. He said his complaint had been preceded by burning sensation of his throat and heartburn.

Patient visited his family doctor 2 week ago because of the same complaint and got nebulization therapy. Doctor then gave him inhaler that contains salmeterol and fluticasone for his symptoms and an antacid drug. Patient had history of asthma since he was childhood but had never been relapsed over the past ten years. Patient was an office worker. Patient never smoked cigarette nor taking alcoholic drink, patient also denied history of cooking using firewood. Neither the patient nor his family had history of heart disease. Patient denied history of food allergy or specific allergy to any substance.

Patient could still talk a single word, his blood pressure 130/70 mmHg, with 110 pulse/minute, 30 breath per minute and peripheral saturation of 94% that were measured by pulse oximeter. Patient BMI was 28 kg/m<sup>2</sup>. On physical examination there is no additional heart sound, but there is prolong expiration phase and wheezing on both of the lung field. The jugular venous pressure was normal. On abdominal examination there was epigastric tenderness, without any palpable mass. There was not any palpable lymph node that was found. On electrocardiogram examination was found sinus rhythm without any sign abnormality. Patient than treated with salbutamol and ipratropium bromide combination nebulization, and was given pantoprazole injection. Patient clinical status was dramatically improved under observation for about 1 hour. His complaint of shortness of breath was relieved, and there were no wheezing that found on auscultation. Patient than underwent chest X-ray to exclude or to find any possible differential diagnosis. There were no any abnormalities were found on his chest X-ray. Complete blood count patient result revealed no increased in eosinophilic count, other parameters were found within normal limit. Spirometry examination can't be done because there weren't any spirometry tools available.

Patient was given salmeterol and fluticasone inhaler, oral antacid, and omeprazole as take home medications, he got discharged afterward. On his follow up visit to

policlinic on first, fourth- and eight-week patient denied any symptoms of shortness of breath and heartburn anymore. Patient could do his daily activities normally.



**Figure 1: Patient chest X-ray after administration short acting bronchodilator.**

## DISCUSSION

Gastroesophageal reflux is a movement of bolus content backward in to esophagus. GERD was referred when this retrograde movement causing a symptom. A large study that was conducted in Europe found that 4.8% of GERD patient have asthma.<sup>3,4</sup>

According to global initiative for asthma management and prevention (GINA) 2020, asthma defined by heterogeneous disease that characterized by chronic airway inflammation that manifest as respiratory tract disorder that includes: wheezing, shortness of breath, nonproductive cough and chest tightness along with a long with expiratory airflow limitation that vary in intensity over period of time.<sup>5</sup>

Several studies had shown high prevalence of GERD in asthma patient. In a meta-analysis study that included of 5706 children under 18 years old revealed that the prevalence of GERD was 22% in asthma, while only 4.8% prevalence in control with pooled OR 5.6 (95% CI: 4.3-6.9).<sup>6</sup> A descriptive study of 308 adults patients in Turkey revealed that 24.1% of patient asthma had GERD symptoms.<sup>7</sup> Various pathological happened in the pathogenesis of GERD related to asthma, but up until now, there is no theory that really prove whether it is GERD induced asthma or otherwise asthma that induced GERD. There are two theory that have been suggested in the mechanism that caused GERD induced asthma, there are a direct mechanism or "reflux theory" and indirect mechanism or "reflex theory".<sup>8,9</sup>

Reflux theory stated that, GERD induced asthma occurred because the pulmonary tree was damaged by a micro aspiration whether it is gastric content or duodenal contents. Pulmonary symptoms than occurred caused by direct aspirate stimulation on the pharynx or larynx. The stimulation furthermore caused tracheal reflex or bronchial reflex that trigger or caused cough, or more severe symptom.<sup>4,9</sup>

Physiology mechanism of lower esophageal sphincter (LOS) and upper esophageal sphincter (UOS) under normal circumstance prevent the reflux occurred. Failure of this normal physiology mechanism was suggested to be the cause of “reflux theory” that responsible in inducing the Asthma symptom in GERD patient.<sup>4,9</sup> The relevance of reflux theory mechanism had been proven and explained by several. A study that measured 24 hours esophageal and pH monitoring showed decreased in PEF and tracheal pH on GERD patient that developed asthma symptom. A study that performed by Pauwels et al found the presence of bile acids in sputum of 8/29 asthma patient. Although several studies had proven the reflux theory relevance, it is still difficult to describe the exact role of microaspiration in human due to ethical issue.<sup>4,10,11</sup>

In contrast to direct mechanism theory or reflux theory, the reflex theory stated that broncho-constriction occurred was caused by the stimulation effect of distal esophagus that stimulates the vagal reflex. It is known that tracheobronchial tree and esophagus from the same embryonic origin that explained the neural link between them. Esophagus and tracheobronchial tree share the same neural innervations, this explains why respiratory symptoms mediated vagal reflex that induced by esophagus stimulation can occurred. Gastric content also can stimulate acid sensitive esophageal receptor that further increase bronchial hyperactivity. A study that evaluates the effect of expiratory flow following the esophageal acid infusion using isocapnic hyperventilation of dry water methacoline in asthmatic patient with and without GERD, it is found that there is significantly lower methacoline that needed to reduced FEV1 by 20% in acid infusion compared normal saline infusion. This study suggests the interaction of bronchial cholinergic and acid esophageal response that led to increasing bronchotor response to other stimulation.<sup>4,9</sup>

GERD symptom can also induce by Asthma. A bronchoconstriction that occurred in patient asthma can induce GERD. Broncho-constriction increase the negative pressure in pleura that lead to increase in gradient pressure between abdominal cavity and thoracal cavity.<sup>4,9</sup>

Patient with asthma should be suspect induced by GERD if the onset of symptoms followed by heartburn or acid regurgitation usually after eating large portion meals that worsened in the supine position, epigastric discomfort, nausea, noncardiac chest pain.<sup>9,12-14</sup> Although GERD

should always be considered in poorly control asthma especially dry cough symptom, but patient with poorly asthma control should only be screening of GERD if they had suggested reflux symptoms.<sup>5,9,12</sup>

Management of Asthma that induced by GERD, aims to treat both Asthma and GERD. According to GINA 2020 guideline, patient with poor control asthma should be given with anti-reflux agent only if they are experiencing reflux symptoms.<sup>2</sup> Other than anti-reflux agent, other treatment option include lifestyle changing and surgical therapy.<sup>5,9</sup> Typical drugs that commonly used to treat asthma such as  $\beta$ -adrenergic agonist, corticosteroid, and theophylline could exacerbated the GERD symptom. Hence increasing dosage or combination in asthma patient could exacerbated the symptom of GERD leading to worsened asthma attacks symptoms.<sup>5,15,16</sup> Recent studies that evaluated the effect of GERD treatment with asthma symptom showed mixed result, but overall study in general showed a decrease in asthma symptoms.<sup>15</sup>

## CONCLUSION

GERD and Asthma were commonly clinical condition that often occurs together. Causal relation is hard to establish, because GERD may worse asthma symptom and arise each other. There are two pathophysiology mechanism that explain how GERD could induced asthma symptoms it is reflex and reflux theory. Patient with poorly control asthma should be treated with anti-reflux agent only if they are experiencing reflux symptoms.

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