

## SUBSTANCE ABUSE AND ASTHMA

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**Abstract:** Common drugs of abuse include cocaine, marijuana, heroin and alcohol. Abuse of these drugs may causes acute asthma exacerbations, increases the frequency of asthma exacerbations, worsens symptoms, and increases the consumption of medical resources. Here is a brief review of the relationship between drug abuse and asthma.

**Keywords:** Asthma; Substance abuse

### 1 COCAINE AND ASTHMA

Common drugs of abuse currently include cocaine, marijuana, incense Cigarettes, heroin, alcohol, etc. These drugs may cause asthma exacerbations. The precipitating factors of sexual seizures require clinicians to increase their awareness and vigilance. For people with asthma, drug abuse may cause acute exacerbations Risks such as increased frequency and aggravation of symptoms are also due to the outpatient and inpatient Increased hospital frequency leads to consumption of medical resources. Drug abuse has been proven Can accelerate the decline of lung function and increase life-threatening asthma exacerbations The number of sexual attacks increases, and the mortality rate from asthma also increases. american disease The latest data report from the Centers for Control and Prevention shows that currently about 7.7% of Americans have asthma, and as many as 11.2% have one of Experience an asthma attack in your lifetime, and more than 4,000 people die each year in asthma[1]. In addition, data shows that approximately 9% of Americans have drug substance abuse, only 10% of whom receive medical intervention and treatment treatment. Among these groups, 94% reported no treatment at all necessary[2]. Among people who abuse drugs, the incidence of chronic diseases (including asthma) is higher than that of normal people. The incidence of some diseases can even be higher than that of normal people. to more than double [3]. Therefore, there is a need to strengthen the prevention of drug abuse Medical attention for patients with asthma.

Cocaine is a strong central stimulant, and its abuse can lead to serious adverse reactions in the circulatory, respiratory, nervous and digestive systems. Compared with intravenous injection, snorting high-purity cocaine through the nose can be absorbed more quickly and produce a euphoric feeling. This method of snorting can most strongly stimulate bronchial epithelial cells and cause bronchospasm. The reason may be due to the respiratory tract induced by inhaling cocaine or mixtures. Caused by epithelial cell inflammation [4]. Tashkin et al. [5] conducted airway dynamics examinations on patients who ingested cocaine through various routes, and found that snorting cocaine can produce acute bronchoconstriction, while intravenous cocaine does not produce this effect. Therefore, in patients with cocaine-induced asthma, special attention should be paid to patients using snorting methods. Asthma patients may be at high risk for severe asthma exacerbations when snorting cocaine, depending on the degree of airway hyperresponsiveness, the dose of cocaine inhaled, and the nature of the contaminants or mixtures during snorting [6].

The U.S. Controlled (Special) Drug Administration estimates that the number of chronic cocaine users in the United States is about 3.6 million, of which high-purity cocaine users account for about 40%. This is also the main reason for illegal drug emergency relief [7]. McNagny et al. [7] conducted a prospective study in an emergency center and found that 39% of young men tested positive for cocaine in their urine, and 72% of the patients with positive results stopped using illegal drugs such as cocaine 3 days ago. One item contains 13 A study of patients showed that for cocaine-positive response results, only 3 (23.1%) patients actually admitted to having used cocaine [8]. A recent study reported that 59 patients who presented to the emergency department with bronchospasm were tested for cocaine metabolites. Positive results were found in 21 (36%) of the patients, compared with only 15% of patients in a randomized control group (age-and gender-matched, with no history of respiratory disease) [9]. This finding suggests a link between cocaine and new-onset bronchospasm or relapse of asthma. Another study co-led by Gaeta and Hammock found that 44 of 100 asthma patients (44%) admitted or tested positive for illegal drugs, while only 20 (20%) of the control group had positive results [10]. Together, these findings underscore the scale of the current cocaine epidemic and suggest that self-reports of illicit drug use are unreliable and need to be actively examined.

In addition, there is a correlation between cocaine use and fatal status asthmaticus [11]. The prevalence of cocaine use may be a major contributor to increased asthma severity and mortality, particularly among younger patients. Patients with acute asthma attacks also have higher rates of cocaine use [9,12]. Levine [12] reported that among adult patients seeking treatment for acute asthma attacks, the use rate of cocaine or heroin reached 42.8%, and the use of cocaine was associated with a higher rate of tracheal intubation, longer hospitalization time, and higher morbidity and mortality. There is a correlation with intensive care unit (ICU) admission rates. Levenson et al. [13] examined patients who died from asthma and found that 31.5% of the patients who died had drug abuse or alcohol intake. The most commonly used drug was confirmed by drug toxicology to be cocaine. Therefore, physicians should be alert to acute asthma attacks caused by cocaine use and actively screen patients who come to the hospital with acute asthma attacks in cocaine-endemic areas.

## 2 CANNABIS AND TOBACCO AND ASTHMA

### 2.1 Cannabis

Cannabis is extracted from the cannabis plant and is currently used as a psychiatric drug [14]. Cannabis abuse can impair short-term memory, learning and collaboration, increase heart rate and lung damage, and may increase the risk of mental illness. The tar content in cannabis smoke is similar to that of cigarette smoke and contains up to 50% or more carcinogens [15]. Compared with ordinary cigarettes, smoke from cannabis filter products can be inhaled deeper into the lungs, thereby greatly increasing the tar content in the lungs and distributing it to a wider range [16-17]. Clinical reports indicate that cannabis smokers will develop a series of chronic respiratory symptoms [18]. Marijuana use is associated with severe asthma and asthma exacerbations [10,19]. Some symptoms of marijuana smoking can highly indicate the possibility of bronchial asthma in the early stages, including cough and sputum production [20-21]. Marijuana users have a high prevalence of morbidity and consume more medical resources due to respiratory and other diseases [22]. Clinicians should carefully inquire about their patients' marijuana use.

### 2.2 Tobacco

Smoking can directly lead to an increase in the incidence of asthma, and can also strongly predict the probability of new asthma among allergic people [23]. Compared with non-smoking asthma patients, smoking asthma patients have an increased risk of developing severe asthma symptoms and have a poorer quality of life due to irregular outpatient and inpatient treatment [24]. Smoking and asthma patients have higher

There is a correlation between frequency of exacerbations, life-threatening asthma exacerbations and higher asthma mortality. Patients with asthma who smoke have higher bronchial asthma severity and poorer asthma control. More asthma is observed in patients who smoke more than 20 packs per year. complications [25]. In most studies, smoking has been shown to increase the severity of airflow obstruction in patients with asthma, thereby accelerating the decline of lung function in patients [26]. Fortunately, quitting smoking can reverse the decline in lung function [27].

Compared with non-smokers with asthma, smokers with asthma are less sensitive to inhaled glucocorticoids and therefore benefit less from glucocorticoid use. Despite this, glucocorticoids are still the main treatment method for patients with smoking-insensitive asthma, but their treatment duration, dosage form, and administration method (inhaled or oral) may vary [28]. Several clinical trials have studied the reversal of glucocorticoid insensitivity in smoking patients with asthma. One item included in 68 A non-controlled study on smoking asthma patients showed that low-dose theophylline combined with inhaled beclomethasone propionate can improve lung function and asthma symptoms in smoking asthma patients [29]. Another randomized clinical trial suggested that leukotriene receptor antagonists may be beneficial in mild smokers with asthma, but no other clinical trials have demonstrated the reliability of their effects [30]. In addition, a study on the relationship between smoking cessation and glucocorticoid responsiveness showed that the forced expiratory volume in one second (FEV1) and sensitivity to glucocorticoids in smoking asthma patients after quitting smoking were both decreased. Significant improvements occurred [27].

Smoking can worsen asthma symptoms, so quitting smoking is very important for asthma patients. The patient's clinical symptoms and lung function can be significantly improved after quitting smoking. Clinicians should strengthen education for asthma patients, inform them that smoking can cause asthma exacerbation, and actively help and intervene patients to quit smoking.

## 3 HEROIN AND ASTHMA

Heroin is an opioid that produces a powerful euphoria, slows breathing and may increase the risk of serious infection when given intravenously. Other opioids with legitimate medical uses include morphine, oxycodone, methadone, fentanyl, and pethidine (meperidine), among others. However, their non-medical use or abuse can lead to the same harmful consequences as heroin. There is currently an upward trend in the use of heroin worldwide [31]. Its popularity is characterized by an increasing number of new and young users, and the method of use is mostly inhalation (snorting) instead of the previous single intravenous injection. Reports from cities such as Chicago and New York show that the most common method used by heroin users is to smoke. This inhalation method can improve the utilization of high-purity heroin [32]. Numerous reports have shown an association between injection of heroin and inhalation of heroin or morphine and asthma exacerbations [33-34]. Hughes et al [35] reported three cases of heroin abuse and admission to the ICU for mechanical ventilation, one of which had an acute wheezing attack after heroin abuse. Cygan et al [33] reported 5 cases of status asthmaticus after inhaling heroin (4 of them were smoked and 1 was inhaled through cigarettes). Common characteristics of these patients include a history of asthma, severe exacerbations, reduced beta-agonist responsiveness, relatively long duration of endotracheal intubation, and elevated peripheral blood eosinophils. Four patients required endotracheal intubation, and one patient was also considered for endotracheal intubation. Therefore, heroin may be a risk factor for the need for endotracheal intubation. Krantz et al [36] compared asthma patients admitted to ICU with Differences in medication history among patients with diabetic ketoacidosis, with higher rates of heroin use in patients with severe asthma compared with the latter. Levine et al [12] found that the incidence of asthma exacerbation among adults due to heroin use was higher in urban populations. One of the reasons for the high incidence of asthma in urban areas is the widespread misuse of drugs in cities. Therefore, screening for heroin abuse in patients with acute asthma exacerbations in areas where illicit drug use is endemic should be strengthened.

Heroin use may cause asthma exacerbations for the following reasons. First, direct thermal injury can occur after heroin inhalation [37]. Secondly, heroin and its metabolite morphine have bronchoconstrictive effects. Studies have shown that opioids can cause mast cells to degranulate and secrete various inflammatory mediators such as histamine, thereby causing bronchoconstriction [38]. Thirdly, talcum powder used in the production of heroin may also be involved in the process of causing bronchospasm [39]. In addition, patients with asthma will compensate for the relative hypoxemia caused by bronchoconstriction by increasing respiratory rate, and opioids can cause respiratory depression. It is also possible that heroin causes respiratory depression or at least partially hinders the patient's ability to compensate, thus exacerbating one of the causes of asthma attacks.

#### 4 ALCOHOL AND ASTHMA

As a central nervous system depressant, alcohol can damage the brain, liver and various organs of the body. The areas most susceptible to alcohol damage are the cerebral cortex, hippocampus and cerebellum.

Alcohol has a long history as a treatment for asthma. The earliest record is from Egypt around 2000 BC [40]. In ancient Greece, Hippocrates believed that alcohol could treat various diseases and believed that alcohol could reduce the production of phlegm, which was one of the reasons for the aggravation of asthma patients [41]. In the 19th century, Hyde reported that three patients with severe asthma had significant improvement in their asthma symptoms after strict abstinence from alcohol. Before the American Medical Association banned alcohol in the early 20th century, American physicians continued to use alcohol to treat asthma. After the ban was announced in 1933, more and more people participated in research on alcohol's treatment of asthma. In 1963, Herxheimer et al. [42] measured the vital capacity of normal people and asthma patients after ingesting brandy, vodka, or pure ethanol. Studies have found that normal people's vital capacity does not change significantly after consuming alcohol, but most asthma patients' vital capacity increases by 6% to 38% after consuming alcohol, and most of them are accompanied by improvement in subjective symptoms. The vital capacity of asthmatic patients begins to improve 2 to 10 minutes after ingesting alcohol, reaches a peak around 30 minutes, and returns to the baseline level after 2 hours. Studies have shown that alcohol has a significant antiasthmatic effect, which is the same as the earlier Hyde study. In addition, in a clinical study on the relationship between alcohol consumption and asthma conducted by Ayres et al. [43], the changes in airflow after ingesting different concentrations of pure ethanol were measured in 5 normal subjects and 5 asthmatic patients. The results showed that after quickly drinking 20% alcohol within 5 minutes, the airway conductivity of two normal subjects and three asthma patients showed a slight decrease; while when the alcohol concentration was increased to 60%, only slow drinking After one sip, 4 asthmatics were 5 min A significant increase in airway conductivity occurred later. This study shows that although alcohol can cause immediate upper respiratory tract irritation, a slow bronchodilator effect can be observed in patients with asthma.

In 1947, Brown first reported the use of intravenous alcohol to treat asthma. In the study, children with severe asthma attacks who were ineffective with conventional asthma treatments were treated with intravenous injection of 5% ethanol. Five of the six patients were treated with intravenous alcohol. Asthma symptoms were improved and no adverse reactions occurred [44]. Research shows that pure alcohol has a bronchodilatory effect and does not worsen asthma. However, Breslin et al. [45] reported 11 cases of asthma patients who experienced bronchospasm after ingesting alcoholic beverages. Finally, through experiments, they found that the substances that caused asthma exacerbation were mainly non-alcoholic components in alcoholic beverages, and cromolyn disodium was used. Alcoholic beverage-induced bronchospasm may be prevented by inhibiting mast cell degranulation. Another study also demonstrated that sulfur dioxide in red wine, rather than the alcohol itself, may trigger bronchospasm in asthmatics [46]. These studies indicate that whether alcohol affects airway function is primarily influenced by purity (pure ethanol vs. alcoholic beverages) and route of ingestion (oral vs. intravenous injection).

Acetaldehyde is a metabolite of ethanol. Acetaldehyde has long been considered a cause of asthma in Asians, which is called alcoholic bronchial asthma [47]. The reason why the most susceptible population is Asians may be that aldehyde dehydrogenase isomer-2 (Aldehyde dehydrogenase isomer -2, ALDH-2) has a relatively low function, which can be determined through genetic testing and/or ethanol challenge tests [48]. About half of the Japanese people have insufficient ALDH-2 activity and cannot effectively metabolize acetaldehyde. Japanese asthma patients can experience bronchospasm after ingesting alcohol. This is closely related to the ALDH-2 genotype. The mechanism is after mast cell degranulation. Causes the release of histamine and other bronchoconstrictors [47,49]. However, Myou et al. [50] found that inhaling ethanol did not trigger bronchospasm in Japanese alcoholic asthma patients, and histamine-mediated bronchospasm was observed in guinea pigs after aerosol inhalation of acetaldehyde instead of ethanol. Therefore, it was considered The reason may be due to the inability of respiratory epithelial cells to metabolize ethanol to acetaldehyde [51]. Pure ethanol is a short-acting bronchodilator that reduces airway smooth muscle tone without triggering asthma, even in susceptible individuals with ALDH-2 gene defects. The mechanism of bronchodilation induced by pure alcohol is currently poorly studied and may include receptor- and non-receptor-mediated signal transduction pathways involving calcium ions and nitric oxide as second messengers.

#### 5 ASTHMA TREATMENT FOR PEOPLE WITH SUBSTANCE ABUSE DISORDERS

Substance abuse is more common among patients with asthma and other diseases [52-53], and these patients receive relatively little medical attention [54]. Baxter et al [55] showed that the use rate of controller drugs in asthma patients

related to drug abuse was lower than that in patients without drug abuse. Possible reasons are less medical attention, poor treatment compliance and some substandard medical care. Another study by Baxter et al. [56] concluded that about half of non-drug abuse patients are receiving special asthma treatment and care based on outpatient clinic settings as well as drug abuse patients, which may lead to reduced benefits for drug abuse patients. Therefore, a comprehensive management approach is needed to improve the quality of treatment for substance abuse patients.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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