

**RESEARCH  
ARTICLE**

# Antimycotic Sensitivity of Fungi Isolated from Patients with Allergic Bronchopulmonary Aspergillosis (ABPA)

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Received on: March 15, 2022 | Revised on: June 28, 2022 | Accepted on: September 29, 2022

**Citation :** Salem Milad Ali Ben Milad (2022). Antimycotic Sensitivity of Fungi Isolated from Patients with Allergic Bronchopulmonary Aspergillosis (ABPA). *Acta Biology Forum*. V01i02, 10-13. DOI: <http://dx.doi.org/10.5281/zenodo.7214059>

## ABSTRACT

This study was carried out to examine the antimycotic sensitivity of fungi associated with allergic bronchopulmonary aspergillosis patients towards the antimycotics of Econazole, Itraconazole, and Nystatin. Fifty-two swab samples were collected from patients suffering from bronchopulmonary aspergillosis (ABPA) at the Educational Hospital of Zliten, Libya in the period from January 2022 to July 2022. Fungal isolates included *Aspergillus fumigatus*, *Penicillium sp*, *Trichophyton sp*, *Mucor sp*, and *Bipolaris sp* representing, 58%, 23%, 12%, 5%, and 2% respectively. Antimycotic sensitivity test results have revealed that the antifungals of Econazole and Itraconazole were the most effective based on the inhibition growth zones diameter of *aspergillus sp* at 26 mm and 22 mm and *Penicillium sp* at 23 mm and 18 mm for both antifungals respectively. On the other hand, the antifungal of Nystatin showed the lowest effect on the rest of the isolated fungi as the minimum inhibitory growth zones were at 6 mm and 4.3 mm for *Trichophyton sp* and *Bipolaris sp* subsequently.

**Keywords:** Antimycotic sensitivity, isolated fungi, Allergic Bronchopulmonary Aspergillosis (ABPA)

## INTRODUCTION

The ailment of bronchopulmonary aspergillosis is brought on by *Aspergillus fumigatus*, a common mold (a type of fungus) that can be found both indoors and outdoors. Most people regularly inhale *Aspergillus sp* spores without becoming ill. However, those who already have lung conditions or compromised immune systems are more vulnerable to *Aspergillus*-related health issues. Allergies, lung infections, and infections in other organs are among the health issues brought on by *Aspergillus sp*. Some people with asthma or cystic fibrosis develop allergic bronchopulmonary aspergillosis (ABPA), which is an allergic response in the lungs to a particular type of fungus (most frequently *Aspergillus fumigatus*). *Aspergillus fumigatus* is a fungus that thrives in soil and taints food, water, and plant life. Some individuals who breathe the fungus may have a chronic allergic reaction and become hypersensitive [1].

People and animals regularly inhale numerous conidia of *Aspergillus fumigatus*, as it is one of the most common types of airborne saprophytic fungi. The only infections seen in immunocompetent hosts are aspergilloma and allergic bronchopulmonary aspergillosis, which are unusual clinical disorders. In immunocompetent hosts, innate immune processes often remove the conidia. As a result, *Aspergillus fumigatus* was thought to be a weak pathogen for a long time. However, invasive aspergillosis, the most prevalent mold infection in the world today, has dramatically increased with a rise in the number of immunosuppressed patients, making it more serious and frequently fatal [2].

Based on a study conducted by [3] between 1 and 15% of people with cystic fibrosis are prone to develop allergic bronchopulmonary aspergillosis. Furthermore, 2.5% of adults with asthma also had allergic bronchopulmonary aspergillosis (ABPA),



which equates to over 4.8 million people worldwide. An estimated 400,000 of the 4.8 million people with ABPA also have chronic pulmonary aspergillosis (CPA). Over 70,000 people are expected to develop CPA as a consequence of sarcoidosis, and another 1.2 million people are estimated to have CPA after having tuberculosis.

As [5] indicated, wheezing, coughing, shortness of breath and a slight fever are frequent symptoms of allergic bronchopulmonary aspergillosis. Except for the temperature, symptoms often worsen over time as patients may experience sputum, appetite loss, and not feeling generally well. It is challenging to avoid infection with *Aspergillus fumigatus* due to it being widespread in the environment.

It is possible to use drugs (bronchodilators) to widen the airways, facilitating the passage of the fungus and mucus. If prednisone is used initially in high doses and then gradually reduced over an extended period, lung damage may be avoided. The majority of physicians advise using corticosteroids. Corticosteroids taken orally and inhaled are ineffective in treating this condition. Usually, corticosteroids are combined with antifungal drugs such as Econazole, Itraconazole, and Nystatin to help eradicate the fungus in the lung; as lung damage may gradually worsen without any changes in symptoms are noticed, routine chest x-rays, lung function tests, blood eosinophil levels, and IgE antibody levels are performed. Eosinophil and antibody levels typically decrease as the disease is under control, but they occasionally increase as a precursor to an attack. This study's significance comes due to the indiscriminate and unregulated use of antibiotics, which creates favorable environmental conditions for the growth of bacteria and antibiotic resistance. For example, the *Aspergillus sp* fungus has caused many deaths due to its invasion of the central nervous system (CNS) due to its resistance to drugs and antifungals [7-8].

## METHODOLOGY

Fifty-two swab samples were collected from ABPA patients (those who are confirmed to be not using antibiotics) of different ages and genders at the Educational Hospital of Zliten, in the State of Libya throughout the first six months of 2022 with the help of the pulmonologist and qualified technicians. Collected samples were transferred to the microbiology laboratory of the Faculty of Science, Alasmarya Islamic University for further

investigation and processing.

Fungi were isolated utilizing the medium of Sabouraud Dextrose Agar (SDA) by dissolving 65 gm of the medium in one liter of distilled water (as indicated on the bottle), then the medium was sterilized, cooled, and an amount of 0.25 mg/ml of the antibiotic chloramphenicol was added to prevent bacterial growth. The medium was distributed in Petri dishes and left to cool down and solidify then the samples were cultured applying the Streak Plate Method. Petri dishes were incubated at 37 °C for 72 hours, and after the emergence of fungal growths, fungal cultures were purified by replanting to obtain pure colonies [9]. Identification of fungal isolates was conducted based on morphological characteristics including (color, smell, texture, and so on) and microscopic features such as the shape of hyphae, septate, spores etc.

Antimycotic sensitivity test was carried out by placing the prepared antifungal tablets of Econazole, Itraconazole, and Nystatin separately in the middle of each Petri dish at the concentration of 30 µg/ml utilizing sterilized forceps. The minimum diameter of the inhibition zone was carefully measured and recorded in millimeters using the measuring tape [10].

## RESULTS AND DISCUSSION

Table 1 illustrates that *Aspergillus fumigatus* the fungus that accompanies most (ABPA) patients representing a percentage of 58% at several 30 colonies as the main cause of Allergic Bronchopulmonary Aspergillosis (ABPA) disease. [11] reported that *Aspergillus fumigatus* is an opportunistic saprophytic fungus that quickly spreads, due to it being naturally present in water, air, and soil. *A. fumigatus* moves through the air, which facilitates its access to the lungs through inhalation. The fungus is also known for its strong resistance to antibiotics and difficult conditions such as drought and lack of food. It can also produce aflatoxins that may cause several acute and chronic diseases and liver cirrhosis. Immunity weakness especially for people who suffer from chronic diseases and are under immunosuppressive drugs helps in the penetration of the fungus into the lung tissue, causing its damage.

*Penicillium sp* came in the second position in terms of percentage and the number of isolates at 23% and 12 respectively. *Penicillium sp* and *Aspergillus sp* are alike

in terms of resisting difficult conditions. In addition, *Penicillium* can grow in various environments and is known for its tremendous ability to reproduce [12]. [13] stated that *Trichophyton sp* is a fungus that infects the skin, infects the sinuses, and may move from it to the lungs, especially for immune suppression patients such as diabetics. *Trichophyton sp* has come in third place with 6 colonies, with a rate of 12%.

**Table 1:** Number and Percentage of Fungal Isolates from (ABPA) patients

Fungi	Number of Isolates	Percentage (%)
<i>Aspergillus fumigatus</i>	30	58
<i>Penicillium sp</i>	12	23
<i>Trichophyton sp</i>	6	12
<i>Mucor sp</i>	3	5
<i>Bipolris sp</i>	1	2
<b>Total</b>	<b>52</b>	<b>100%</b>

The inhibitory effect of the antifungals on fungi isolated from Allergic Bronchopulmonary Aspergillosis (ABPA) patients varied based on the antifungal applied. The antifungals of Econazole and Itraconazole showed the highest effect at an inhibition zone diameter of (26 mm and 22 mm) and (23 mm and 18 mm) for *Aspergillus fumigatus* and *Penicillium sp* respectively due to the ability of these two antifungals to create vacuoles through penetration into the cell membrane, which loses its ability to selective permeability. Hence, the death of the cell [14] on the contrary, the antifungal of Nystatin had the lowest effect on the rest of the isolated fungi as the minimum inhibitory growth zones were at 6 mm and 4.3 mm for *Trichophyton sp* and *Bipolris sp* subsequently as shown in table 2.

**Table 2:** Inhibition Zones Diameter (mm) Based on the Antifungal Applied

Fungi	Antibiotic Inhibition Zone (mm)		
	Econazole	Itraconazole	Nystatin
<i>Aspergillus fumigatus</i>	26	22	12
<i>Penicillium sp</i>	23	18	10
<i>Trichophyton sp</i>	17	11	6
<i>Mucor sp</i>	19	14	8
<i>Bipolris sp</i>	9	7	4.3

## CONCLUSION

In essence, *Aspergillus fumigatus* scored the highest presence percentage at 58% as it accompanies most

Allergic Bronchopulmonary Aspergillosis (ABPA) patients. Whilst, other fungi presence was in the order of *Penicillium sp*, *Trichophyton sp*, *Mucor sp*, and *Bipolris sp*. The antifungals of Econazole and Itraconazole showed the highest effect concerning inhibition zone diameter. However, the antifungal of Nystatin had the lowest effect on the rest of the isolated fungi.

## Acknowledgment

The author of this article would highly appreciate the endless support of Zliten Educational Hospital staff and doctors.

## Recommendations

The researcher would strongly recommend public authorities support scholars materially and morally to conduct more similar studies.

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