

# Pediatric Coccidioidomycosis Analysis

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# Context

Pediatric coccidioidomycosis (Valley fever) is a **fungal infection acquired by inhaling soil-dwelling fungal spores**, often presenting in children with symptoms like fever, cough, and extreme fatigue, though many infections are asymptomatic. Complications, more common in children than adults, can include pleural effusion, **empyema**, and mediastinal involvement, with rare but serious cases potentially leading to disseminated disease affecting the brain, spine, or bones. Diagnosis involves **serologic testing** and imaging, while treatment for moderate to severe cases uses **antifungal medications** like **fluconazole**, sometimes requiring lifelong therapy for central nervous system involvement.

## Symptoms

- **Common:** Fever, cough, fatigue, headache, muscle and joint aches, chills.
- **Chest-related:** Shortness of breath, chest pain.
- **Skin manifestations:** A rash and **erythema nodosum** (tender red bumps under the skin) can occur.
- **Severe complications:** Pleural effusions (fluid around the lung), empyema (pus in the chest cavity), and mediastinal involvement are more frequent in children.

## Severe & Disseminated Disease

- **Spread to other areas:** In rare cases, the fungus can spread from the lungs to other parts of the body.
- **Central Nervous System (CNS) involvement:** Coccidioidomycosis can infect the brain or spinal cord, which is a serious and life-threatening condition.
- **Bone and joint infections:** The infection can also cause bone or joint disease.

## Diagnosis

- **Imaging:**  
Chest X-rays and CT scans can show signs of the infection, such as lung nodules or inflammation.
- **Blood tests:**  
Serologic tests (antibody tests like IgM and IgG) are crucial for diagnosis.
- **Other tests:**  
In some cases, antigen tests and PCR (polymerase chain reaction) testing of blood, cerebrospinal fluid, or respiratory samples may be performed.

## Treatment

- **Supportive care:**  
Mild cases may only require rest and over-the-counter pain and fever reducers.

- **Antifungal medications:**

Moderate to severe infections or those with a high risk of complications are treated with antifungal drugs, most commonly fluconazole.

- **Serious infections:**

Amphotericin B may be used for severe, diffuse, or disseminated infections.

- **Lifelong therapy:**

Some very severe cases, such as those with meningitis (infections of the brain and spinal cord), may require lifelong antifungal treatment.

## **Prevention**

- **Reduce dust exposure:**

In endemic areas (like the Southwestern United States), efforts can be made to reduce dust during construction, and children may need to reduce outdoor play during windy conditions.

- **Wear masks:**

Face masks can protect children and adults from inhaling fungal spores in dusty environments.

# Data Exploration

## Data Loading and formatting

### Data Types:

- **Study ID:** Categorical. ID of the patient. (Not typical useful here)
- **Erythema nodosum:** Erythema nodosum is an inflammatory skin condition characterized by the development of painful, red, and tender nodules or lumps, typically on the shins (rash). Since it sounds like a more severe symptom, there should be an order on it, but we only have two categories (Yes or No) - Categorical without order.
- **Age at diagnosis:** Age - Continuous.
- **Ethnicity:** Without assume any superior ethnicity - Categorical without order.
- **Race:** Without assume any superior race - Categorical without order.
- **Gender:** Without assume any superior gender - Categorical without order.
- **Disseminated disease:** refers to a condition where an infection or other pathological process spreads throughout the body from its original site. It might be related to Erythema nodosum. - Categorical without order.
- **Associated hospitalization:** means the hospital within or in association with which a body corporate pursues its objects. (useful? maybe) - Categorical without order.
- **Antifungal treatment:** as it means. We do not know what happens after the treatment. - Categorical without order.
- **Comorbidity:**
  - **Pulmonary disease:** refers to a group of conditions that affect the lungs and respiratory system. These diseases can cause inflammation, damage, or obstruction of the airways, leading to various symptoms and complications. **This feature might be highly correlated to the rash.**
  - **DM:** diabetes.
  - **Primary or congenital immunodeficiency:** refers to a group of rare, genetic disorders where the immune system doesn't work correctly, leaving individuals vulnerable to recurrent, severe, or unusual infections. **This feature might be highly correlated to the rash.**
  - **Current malignancy:** refers to a pre-existing chronic condition or other disease (a "comorbidity") that coexists with cancer ("malignancy") at the same time.
  - **Prior malignancy:** Similar to the previous one. With cancer before.
  - **Immunosuppressant medication:** are drugs that weaken the immune system to prevent the body from rejecting transplanted organs or treating autoimmune disorders.
  - **Autoimmune disease:** the body's immune system mistakenly attacks its own healthy tissues and organs.
  - **HIV:** everyone knows.

- **Prematurity:** health issues that are more likely to occur in individuals born preterm, including respiratory problems (like bronchopulmonary dysplasia), infections due to immature immune systems. **This feature might be highly correlated to the rash.**
- **Congenital heart disease:** refers to structural defects in the heart that are present at birth.
- **comorbidities (choice=None):** Not sure what it is. Maybe it means comorbidity in general?
- All the categories of comorbidity are coded in yes or no. We can assign them categorical without order or take look at the correlations among them first.

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