

# Pseudomonas Aeruginosa Bacteria in Upper Respiratory Specimens: A Diagnostic Dilemma - Experience from a Clinical Referral Laboratory

Dr. Renuka Upadhyaya; M.B.B.S, DNB<sup>1\*</sup>, Dr. Jagadeesha M; M.B.B.S, MD<sup>2</sup>, Dr. Samith Alva, M.B.B.S, MD<sup>3</sup>

<sup>1</sup>Department of Clinical Microbiology, Aster DM Healthcare, Dubai, United Arab Emirates

<sup>2</sup>Department of Pathology and Laboratory Medicine, Aster DM Healthcare, Dubai, United Arab Emirates

<sup>3</sup>Department of Pediatrics, Aster DM Healthcare, Dubai, United Arab Emirates

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\*Corresponding author: Dr. Renuka Upadhyaya

## Abstract

*Pseudomonas aeruginosa* persists as a dreaded organism causing increased mortality both in developing and industrialized countries. Published literature elaborates novel rapid molecular diagnostics and strategies for discovering newer antibiotics for this highly resistant organism. It is also an established fact that the primary focus of infection remains unknown in majority of the cases. Unfortunately there exists a paucity of data from outpatient clinics and stand-alone referral laboratories. Such a system of health care delivery is common in many parts of the world including United Arab Emirates. This article enlists two pediatric clinical cases which elucidate early *Pseudomonas* diagnosis in the community leading to prompt treatment and recuperation. The role played by referral diagnostic laboratories needs to be discussed in the context of existing guidelines, local epidemiology and healthcare practices. We would like to add a microbiologist's perspective and emphasize on prompt identification and susceptibility pattern, in a community setting by referral diagnostic laboratories. The relevance of whether a bacteria is pathogenic/colonizer/contaminant need to be understood with clarity which will be helpful during the evolution of the newer guidelines. This article also elaborates on the effective communication between clinicians and laboratory which is the invaluable for any robust health care system.

**Keywords:** *Pseudomonas* infections; upper respiratory specimen; children; out-patient clinics; referral laboratories.

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## CASE STUDIES

**Patient 1:** 5 year old child attended outpatient clinic with complaints of high grade fever and sore throat for the duration of 3 days. On examination, pharynx was congested, lymph nodes were enlarged and bilateral rhonchi were present. Rapid test for streptococcal antigen was negative. Throat specimen was sent to microbiology laboratory for culture. Empirically, child was put on Amoxicillin-clavulanate. The child was brought back to the clinic after a day and on examination, appeared dehydrated. There was no defervescence in his febrile status. He was referred for hospital admission. Hematological investigations revealed Hemoglobin-12.5g/dl, WBC count 16.00k/ $\mu$ L with neutrophils 33.4%, lymphocytes 54.8% and ESR of 37. The child was started on intravenous fluids and antibiotic Cefixime on provisional diagnosis of septicemia.

**Patient 2:** 7 year old girl presented in child clinic with complaints of fever, restlessness and breathing difficulty of 2 days duration. On Examination, tonsillar area was found inflamed. Chest

auscultation revealed bilateral rhonchi. Throat swab and blood culture samples were collected and sent to referral microbiology laboratory. The child was started on antibiotic cefixime. Unfortunately, condition of the child deteriorated and was taken to the emergency. Investigations showed WBC count of 14.00k/ $\mu$ L and hyponatremia. Supportive treatment and antibiotic Ceftriaxone were initiated immediately for the child.

## METHODS

In laboratory, both throat samples grew iridescent colonies with greenish hue on sheep blood agar and Mac-conkey agar, identified as *Pseudomonas aeruginosa* (BD Phoenix<sup>TM</sup> (Becton, Dickinson) on the second day of aerobic culture. In both cases, bacteria were found to be sensitive to antibiotics Ciprofloxacin, Ceftazidime and Carbapenems only. Microbiology laboratory, before releasing of results confirmed current clinical status of both children. Cystic fibrosis, associated with *Pseudomonas aeruginosa* infections was also ruled out by discussing relevant history. This was mandatory as *Pseudomonas aeruginosa* is sometimes isolated from upper respiratory samples of healthy

children too. The antibiotic sensitivity was conveyed to the concerned physicians. Antibiotic escalation to Imipenem led to fast recovery for patient 1. For Patient 2, ciprofloxacin was added to the initial treatment. Both children were discharged subsequently in hemodynamically stable condition, duration of stay being 3-4 days after communication of laboratory reports. It is imperative to understand that blood culture samples sent immediately after hospital admission were reported sterile. This was probably due to initial antibiotic intake.

## DISCUSSION

Common pathogens elucidated in etiology of community acquired pneumonia do not include *Pseudomonas aeruginosa* [1]. In spite of the significant inroads made in the diagnosis, one major clinical diagnostic dilemma that exists for this organism is to treat/not treat early in disease. The reason lies in the fact that this bacillus is also a commensal found in the skin, throat and intestinal flora of healthy individuals [2-4]. Due to paucity of evidence demonstrating clinical relevance, many referral laboratories do not report these organisms, considering them environmental contaminants. Sputum samples have better diagnostic yield but are challenging in pediatric age group hence throat specimens are the commonest sample available in such clinical settings.

The System of health care delivery which is insurance linked involving clinics and referral laboratories is common in many parts of the world including United Arab Emirates. It effectively benefits majority of the patient population who do not have to access to outpatient treatment at hospitals thereby enhancing coverage, reducing burden on hospitals and optimizing Cost.

There is abundant data available from hospitals covering pathogenesis, resistance pattern and risk factors of *Pseudomonas* infections [5, 6]. The above mentioned cases highlight the need for more published literature from the community and referral laboratories. This can help in formulation of diagnostic guidelines specifically for stand-alone referral laboratories.

While searching literature on community acquired pneumonia, one common observation which can also be extrapolated in our cases that, there is little concordance between clinical signs in ambulatory children and chest X-rays. Hence guidelines do not recommend routine x-rays in suspected childhood pneumonia [7, 8]. This highlights the challenges faced by microbiology laboratory to confirm early infection in positive throat specimens. Our experience emphasizes that *Pseudomonas aeruginosa* in throat specimens should be considered with caution and not discarded as contaminants.

Our study highlights that the primary infective focus of this multi-drug resistant organism can be reported early and treated effectively especially in children. In this era of increasing antibiotic resistance, the standard pragmatic approach of giving initial broad spectrum antibiotic will not work. This will reduce the burden on hospitals and decrease *Pseudomonas* linked mortality.

Also in our experience, continuous interchange of information between the clinics and referral laboratory initiated timely intervention. Effective communication between the microbiologist and clinicians is a major roadblock in such a healthcare system where laboratories and clinics are separated by several kilometres. This article elaborates on this fruitful feedback mechanism which led to faster recovery.

## CONCLUSION

In this health care setting prevalent in UAE, laboratory utilization should be assessed and policies implemented judiciously keeping in mind epidemiology of resistant bacteria like *Pseudomonas aeruginosa*. Maybe the accreditation bodies, which are the watchdogs of our laboratories, can formulate diagnostic criteria. This shall increase inter-laboratory reproducibility, benefit clinicians and direct human, economic resources effectively.

This pragmatic approach in community settings can transform the primary care delivery especially in pediatric age group.

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