

## **IMPACT OF AIRBORNE MICROBES ON PULMONARY HEALTH OF PRESCHOOL CHILDREN IN RURAL AND URBAN SITES OF KANDY, SRI LANKA**

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### **Abstract**

Children of today's world face numerous health challenges, especially those of airborne origin. The prevalence of childhood respiratory diseases is reported to be considerably high in many parts of the world including Sri Lanka. Few studies on the topic have been addressed so far and exact reasons are yet to be determined. The objective of our study was to determine the concentration and distribution of airborne microorganisms with respect to the prevalence of respiratory diseases among preschool children. Our study area, Kandy is one of the most rapidly urbanizing districts in the country, where the urbanization seems dense only at the city core within an area of 24 km<sup>2</sup>, whereas the areas outside the core are essentially rural. Two preschools, one representing the densely urbanized area (Mulgampola, Kandy) and the other from a rural area (Yatinuwara, Kandy) were considered for our study. Out of the total study populations, 27.9% of urban and 17.1% of rural students were noted as those suffering from at least one respiratory disease. Air samples were taken during the period of October - December 2017, adopting three methods; natural sedimentation method (NSM) for 1 hour and single-stage viable air sampler (28.3 m<sup>3</sup>/min, Anderson cascade impactor, Tisch, USA) for 2-5 minutes and fine particulate air sampler (16.2 m<sup>3</sup>/min, Envirotech, India) for 1 hour. For Anderson air sampling, both filter papers and solid media were incorporated and for fine particulate air sampler, both PM 2.5µm and PM 10µm filter papers were used. All the sampling procedures were done at 1m, the average height to the breathing zone of preschool children. Luria Bertanii agar was used for all microbiological purposes including isolation of each morphologically dissimilar organism for identification. As per the total microbial counts calculated using the fluorescence count method, in both indoor and outdoor environments, counts were high in urban preschool premises (indoor- 1.4 x 10<sup>6</sup> vs 7 x 10<sup>5</sup> cells ml<sup>-1</sup> m<sup>-3</sup>, outdoor 2.5µm-3.6 x 10<sup>7</sup> vs 1.0 x 10<sup>6</sup> cells ml<sup>-1</sup> m<sup>-3</sup>, outdoor 10µm- 4.9 x 10<sup>7</sup> vs 9.1 x 10<sup>5</sup> cells ml<sup>-1</sup> m<sup>-3</sup>). After 24h incubation at room temperature, in indoor; NSM plates of urban preschool reported a higher culturable count (2.6 x 10<sup>4</sup> CFU/m<sup>2</sup> vs 1.9 x 10<sup>4</sup> CFU/m<sup>2</sup>) whereas in outdoor

opposing results were observed ( $1.2 \times 10^4$  vs  $3.5 \times 10^4$  CFU/m<sup>2</sup>). A higher organism diversity was observed in the rural area but proportion wise opportunistic pathogens are higher in the urban area. Microorganisms identified includes *Pseudomonas* sp., *Enterobacter* sp., *Bacillus* sp., *Aspergillus* sp., *Micrococcus* sp., *Staphylococcus* sp., *Fusarium* sp. *Escherichia* sp., *Citrobacter* sp. etc. out of which majority are likely to cause infections in humans opportunistically. Hence, the concentration and distribution of organisms with respect to the pollution level could be a risk factor for the pulmonary health of preschool children, and needs further investigation for confirmation.

**Keywords:** Pre-School Children, Airborne Microbes, Air Sampler, Opportunistic Pathogens