

Analysis of wastewater from medical institutions in India

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Abstract: The quality of surface water degraded especially due to entry of pharmaceuticals, hazardous material into it. These micro-pollutant are hard to degrade as well as detect in water or wastewater system. Based on research, organic and inorganic particles, as well as soluble organic and soluble inorganic substances, are contained in medical wastewater. Among these harmful and dangerous substances: vomiting, faeces, metal particles, hydrogen sulphide, urea and much more. In some countries, such as India and Ukraine, hospital wastewater is discharged to urban wastewater treatment plants. A survey was conducted in 75 hospitals, including 25 hospitals from the categories of high, medium and low. The average water consumption per bed per day in a hospital of Delhi ranges between 500–600 LPD. The annual water consumption in hospitals of Delhi is about 9,000 million litres. The study purpose is to study the details of water consumption in hospitals to develop recommendations for protection of the environment from hazardous pollutants.

Keywords: wastewater; medical institutions; pharmaceuticals; natural waters; wastewater discharge; India.

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Biographical notes: Aastha Dhingra did her doctorate from Jamia Millia Islamia in 2019. Her specialisation was environmental science (hospital wastewater). She obtained her Master's degree in the field of environment management during 2011–2012 from Delhi University. She is motivated, adaptive, technically-minded and hard-working environmental sciences professional with a wide array of experience and success in various sectors. She is always looking to further my progress in the environmental sector in order to better utilise my environmental degree and passion for the environment and nature conservation.

Nadeem A. Khan is pursuing his PhD from Jamia Millia Islamia, New Delhi. His recent accomplishments included 15 Coursera course completion certificates. He earned his MTech in Civil Engineering in 2011 with honours in Environmental Engineering from Aligarh Muslim University. He was associated with the Ministry of Environment and Forest for two years as a Junior Research Fellow in 2009–2011 and also worked with UNICEF as a Research Assistant on the topic GIS mapping and water quality parameter estimation including monitoring of Agra region for six months in 2012. ORCID: 0000-0003-4366-9639; Scopus Author ID: 56035431400.

Sirajuddin Ahmed is working as a Professor in Jamia Millia Islamia, New Delhi for more than 18 years. He was awarded his PhD in 2008 from University of Wales, UK. He did his post-graduation (MTech in Environmental Engineering) in 1992 from Delhi College of Engg. (Delhi University) and BTech, Civil Engineering in 1989 from Jamia. He was awarded young scientist in 2003-06 by Department of Science and Technology, GATE scholarship (1990–1992), merit scholarship from IDB (1985–1989), Jeddah KSA and merit scholarship from Jamia Millia Islamia. He is actively involved in various research activities and is a member of various professional bodies like Wessex Institute the UK, Institution of Engineers India, Indian Society for Environmental Management, Indian Society for Technical Education, JMI Chapter of Indian Society for Technical Education and Ecological Society of America, etc.

Siddhartha Gautam is currently Delhi Pollution Control Committee, India. He received his Bachelor and Master's degrees from India and his PhD degree from Jamia Millia Islamia, New Delhi. His research focuses on interdisciplinary environmental issues which are related to water/wastewater treatment, nanotechnology and green chemistry. He has many international peer-reviewed publications including scientific articles, book chapters, and conference papers. To be associated with an organisation with a dynamic environment that provides me a wide spectrum of experience and exposure on long-term basis, along with good promotional prospects in synchronisation with the growth of the organisation, all of which contributes in developing my personality and career.

Sergij Vambol was educated as a Mechanical Engineer in 1994. He obtained the Doctors of Science in Environmental Safety in 2014. He received the conferment diploma of academic degree Professor (Full) in Applied Mechanics in 2015. Since 2004, he has been working on research and development programs in environmental engineering, and he has been involved in teaching to masters and graduate students. For all the scientific and pedagogical experience, he has published over 200 scientific and educational works, including 10 monographs and 17 patents. ORCID: 0000-0002-8376-9020; Scopus Author ID: 57144568200.

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1 Introduction

The main source of biological pollution is household wastewater, hospital drains, bathhouses, laundries, and some types of food industry. Bacteria, viruses, bacteriophages, helminth eggs, yeast, mould fungi, microscopic algae, and protozoa can be found in wastewater. Most often, intestinal infections are transmitted through water, which is related to the concentration of their pathogens in the human intestine, their massive excretion into the aquatic environment and relative stability in water. Viruses have a particularly high resistance in wastewater and sediment (Saspugayeva and Khasanova, 2015).

The effluents from hospitals are generated due to numerous activities like microbiological laboratory testing, laundry and treatment of patients. In some countries, for example, in India and Ukraine, the exact waters of hospitals flow to urban wastewater treatment plants (Santoro et al., 2015). Especially, negative influence is exerted by medical wastewater containing medical waste, pharmaceuticals, disinfectants and other