



Research article

**Common infectious disease conditions and antibiotic resistance in pediatric population**K Sumathi<sup>1</sup>, William Delphin Bencer<sup>2</sup>, Chandrasekar Keerthana<sup>2\*</sup><sup>1</sup>Government Medical College Hospital, Ooty, Nilgiris, Tamil Nadu, India<sup>2</sup>Department of Pharmacy Practice, JSS College of Pharmacy, JSS Academy of Higher Education & Research, Ooty, Nilgiris, Tamil Nadu, India**ABSTRACT**

Bacterial cells are multiple times (at least 10 times) more abundant than human cells in our bodies. The majority of agents that cause sickness in human beings are viruses or bacteria. Microbes in the human gastrointestinal tract have around 10 trillion living beings, addressing every 1,000 species. Microbes produce nutrients, separate food into nutrients that can be absorbed, and boost our immune system. Infectious diseases are a main source of death around the world, notably in low-income countries, particularly in pediatric populations. Resistance to antibiotics is one of the very best challenges to public health today. There are numerous approaches to prevent drug-resistant infections. Immunization may be a prospering and efficient public strategy that saves millions of lives annually. This review aims to highlight the infectious conditions within the pediatric population and the antibiotic resistance in pediatrics.

**Keywords:** Antibiotics, Global epidemiology, India, Infectious disease, Prevention, Pediatrics.

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**INTRODUCTION**

Around 15 million (>25%) of the 57 million annual deaths worldwide result from infection. The World Health Organization has listed three infectious diseases among the top ten causes of death worldwide: Lower respiratory infections remained the most lethal communicable disease in 2016, killing 3.0 million people worldwide. The death rate from diarrheal diseases decreased by nearly one million between 2000 and 2016, but 1.4 million people died in 2016. Similarly, the number of deaths from tuberculosis has decreased during the identical period but continues to be among the top ten, with 1.3 million deaths. In 2016, 1.0 million people were killed in comparison with 1.5 million in 2000, HIV/AIDS is not one of the world's top ten deaths. Another communicable disease, malaria, account for a high reason behind death in low financial gain countries. The newly found coronavirus disease (COVID-19) is an infectious disease. To date, statistics indicate that children under the age of 18 constitute approximately 8.5% of reported cases, with relatively few deaths compared to various classes of age and usually mild disease.

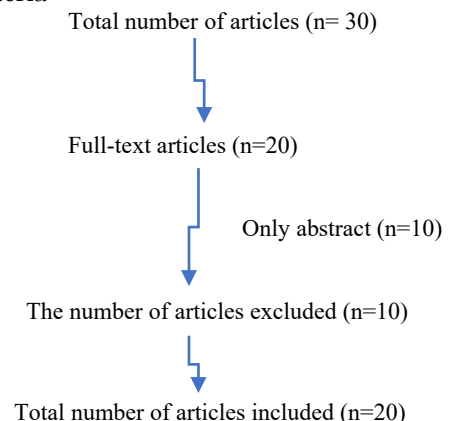
**Pathogens and their impact on our health**

Pathogenic microbes have a variety of effects on the immune system. Viruses cause disease by cell destruction or cell function. Fever (which inactivates several viruses), the release of a synthetic called interferon (which stops viruses from reproducing),

and mobilization of the immune system's antibodies and different cells to attack the invader are all common responses. Many bacteria cause us to become ill in the same way, but they even have other tactics at their disposal. Bacteria can grow so quickly that they force out host tissues and cause normal functions to be disrupted. Now and again they kill cells and tissues outright. They sometimes destroy cells and tissues completely. They occasionally produce pollution that can paralyze, damage metabolic equipment in cells, or trigger a massive immune response that is toxic in and of itself.

**MATERIALS AND METHODS**

Article selection criteria

**RESULTS AND DISCUSSION****Epidemiology and Burden of Infectious Diseases**

Asian countries have been highly susceptible to endemic diseases since the beginning of the 21st century. In India, this is

particularly true because of its population, with 10 outbreaks such as Severe Acute Respiratory Syndrome (SARS), Zika (ZIKV), and the disease of Nipah virus (NiV) in the last 20 years. Kerala State had recorded a total of 19 cases of NiV and 17 deaths as of 17 July 2018: 18 of them were laboratory-confirmed and thus the deceased was suspected of possession of NiV but could not be verified. The outbreak was confined to two districts in the State of Kerala: Kozhikode and Malappuram. Since 1<sup>st</sup> June 2018, no new cases or deaths are reported and human-to-human NiV transmission has been included within the state of Kerala as of 30 July 2018.

According to the Disease Outbreak News published on May 31, 2018, Kozhikode District, Kerala State, reported three deaths on May 19th due to NiV infection. By constant polymerase chain reaction (RT-PCR) and IgM ELISA for NiV, three of the four reported deaths were confirmed positive for NiV. Infected patients developed acute respiratory distress syndrome and encephalitis. This was the first NiV (Nipah Virus) outbreak in Kerala State and the third in India; the two previous outbreaks occurred in West Bengal in 2001 and 2007. The Ministry of Health and Family Welfare-Government of India (MoHFW) registered three laboratory-confirmed cases of Zika virus disease on May 15, 2017, in the Bapunagar town, Ahmedabad District, Gujarat State, India.

Between February and October 2006, the WHO Regional Office for South-East Asia recorded 151 cases of chikungunya fever in eight Indian states/ provinces. The affected states are Andhra Pradesh, the Andaman and Nicobar Islands, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Kerala, and Delhi. Over 1.25 million suspected cases have been reported in the country, with Karnataka accounting for 752,245 and Maharashtra accounting for 258,998. Attack rates have been reported to reach 45 percent in some areas.

In 2015, worldwide typhoid and paratyphoid fever was estimated to be 17 million, with the largest burden and incidence in South Asia, in Southeastern Asia, and Sub-Saharan Africa. With 178,000 fatalities assessed worldwide in 2015, both typhoid and paratyphoid fever may be fatal. A review of the global burden revealed that only 13 countries, only two of them in Africa- Egypt and South Africa had population-based surveillance of typhoid fever from 1954 to 2000. Strategies for control of typhoid and preventive measures: sanitation and hygiene infrastructures, socio-demographic determinants, test methods for diagnosis, and therapeutic procedures both in countries that are endemic to typhoid fever and between them suggest that no single solution can eliminate enteric fever. The accessibility of the new conjugate Tybar TCV (Typhoid Conjugate Vaccine, used as a complementary tool to the usual public health water supply and disinfection recommendation, will give hope to

control enteric fever<sup>(1-4)</sup>.

*Ascaris Lumbricoids* take place globally but are more in tropical and subtropical regions, in humid and warm climates, and areas of poverty, poor hygiene, and poor sanitation. Global infection is more than 800 million, and the burden for young children is the greatest. *Ascaris lumbricoides* is one of the most common human helminthic intestinal parasites infecting around 1.2 billion people. Global estimates of 2011 show that South Asia accounts for almost 70 percent of global STH prevalence, with *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm infections of 298, 140, and 101 million people, respectively. India accounts for 21% of global prevalence. *Ascaris* is an infectious and persistent parasite; its large size and tissue migration increase its risk to public health. It is very important to increase awareness in the area of fecal waste disposals and regular waste worming to promote good hygiene and creative programs<sup>(5, 6, 7)</sup>.

*Streptococcus pneumonia* is a major contributor to pulmonary stress; *Hemophilus influenzae*, Respiratory syncytial virus, and *influenza* are others. Pneumonia is the sixth most common cause of death and the only infectious disease in the United States among the top 10 causes of death. Pneumonia is the leading cause of death for children under 5 years of age; more than 800,000 children died from pneumonia in 2017. In India, fifty percent of the world's pneumonia deaths occur, indicating that in India, about 3.7 lakh children die annually of pneumonia.

Human brucellosis is a common multisystem disease that affects approximately 500,000 people worldwide each year. Brucellosis is an endemic disease in India. India needs to have an effective plan to control the disease either by vaccination or by easily implementable policy for the removal of the infected animals of a herd. The challenge persists as the country has various religious beliefs. With a much higher prevalence observed in humans, the effective strategies for controlling the disease require immediate and stern action<sup>(8, 9)</sup>.

Shigellosis is a leading cause of diarrhea in India. Even though they are endemic in the country and have been linked to numerous outbreaks, accurate estimates of morbidity and mortality from shigellosis are lacking. According to the limited information available, *Shigella* is a significant foodborne pathogen in India. The majority of cases involve children under the age of five. Shigellosis, a more serious infection in HIV-infected individuals, can cause bacteremia and unusual symptoms such as keratitis and pneumonia, failure to respond to adequate therapy, necessitating long-term treatment, and recur after treatment is completed<sup>(10)</sup>.

Increased awareness of pancreatic TB is required, not only in endemic areas but also concerning HIV infection and other clinical

conditions associated with immunocompetence. To develop a definitive diagnosis, cytological and histological confirmation is needed. The absence of vascular invasion, lack of pancreatic ductal dilation, and hypodensity/ hypo echogenicity are characteristics of pancreatic tuberculosis infection. Increase clinician awareness of pancreatic TB (Tuberculosis) may reduce the costs of healthcare-associated with unnecessary diagnostic testing but also avoid risky and unsatisfactory procedures for patients<sup>(11, 12, 13)</sup>

The 2019 coronavirus disease has hundreds of thousands of people worldwide (COVID-19). In general, children are milder than adults and deaths are very rare. Deaths have become very rare. Of the 2143 patients, Dong et al recorded that 56.6% were boys. Children tend to have many infections with viruses, especially younger children. The immune system can be supported if repetitive exposure to the virus is SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2). SARS-CoV-2 S protein has also been suggested to bind to the angiotensin-converting enzyme (ACE) 2 and to protect children against SARS-CoV-2 due to its less mature enzymes at the youngest ages. There are important changes to the immune system<sup>(14)</sup>.

A high incidence of skin rashes in patients with IM (Infectious Mononucleosis) who were treated with antibiotics, particularly ampicillin, was first reported in the 1960s. A leading infectious disease textbook states that "the administration of ampicillin or amoxicillin produces a pruritic, maculopapular eruption in 90% to 100% of the patients [with IM (Infectious Mononucleosis)]." Monocytosis and lymphocytosis were the most common hematological changes. Mononucleosis of hepatitis, seldom linked to hepatomegaly or jaundice, requires laboratory diagnostic tests, and splenomegaly is common<sup>(15, 16)</sup>.

AK (Acanthamoeba Keratitis) is one of the most challenging and/or difficult infections to manage. According to the German Acanthamoeba Keratitis Registry, 47.6% of acanthamoeba keratitis patients had herpetic keratitis, 25.2% had mycotic keratitis, and 3.9% had bacterial keratitis. *Streptococcus pneumoniae* is the third most common pathogen of meningitis in infants and children, as well as a common cause of pneumonia, otitis media, and bacteremia. Pertussis remains a major public health problem in both developing and developed countries. Data are scarce on the exact burden and occurrence of pertussis in developing countries (incl. India)<sup>(17, 18)</sup>.

#### ANTIBIOTIC RESISTANCE IN PEDIATRIC POPULATION

Antibiotics are useful however increasing resistance may be a major problem. The situation is aggravated by drug-resistant infections since the limited range of child and baby treatments has decreased. Every year, more than 214,000 babies die as a result of drug-resistant infections. In low and medium countries, most of these deaths are caused.

Antibiotic resistance is a drug resistance that can survive antibiotic exposure by a microorganism. The first cause of antibiotic resistance is a bacterial genetic mutation. Resistance genes, on the other hand, can be horizontally transferred between bacteria via conjugation, transduction, or transformation. As a result, a gene for antibiotic resistance that evolved naturally is also shared. Antibiotic exposure, for example, causes evolution to favor the antibiotic-resistant phenotype. Several antibiotic resistance genes are found on plasmids, which aids in their transmission. If a microorganism possesses a large number of resistance genes, it is referred to as multi resistant or, more colloquially, a superbug or super microorganism. The most frequent cause of resistance is the inappropriate and overuse of antimicrobials.

#### Strategies to overcome antimicrobial resistance

Awareness of their plan of action, sensitizing members of their society towards this issue, is increasing in patients, doctors, and several medical organizations. The selection of narrow-spectrum antimicrobials with lower-resistance properties will be very useful in combating this negative outcome of antibiotic therapy. All antimicrobials must be used optimally. For the exact time required for treatment or prevention of infection, all patients should be treated with the most importantly effective, safe, and least costly antibiotics. In addition to the wise overall use of antibiotics, drugs should be encouraged with a narrow antimicrobial spectrum or older antibiotics. Physicians should circulate national protocols and guidelines for the treatment of common infections. The protocols should be updated regularly and as needed. Another tool for combating antimicrobial resistance is antibiotic resistance surveillance. A "world antimicrobial resistance control strategy" has been developed by the WHO. The development of antibiotic policies for hospitals, research into new medications, and vaccinations should be promoted to provide health education for the public, and quacks and practitioners and weaning of antibiotics should be prevented. The WHO issued a six-point antimicrobial resistance strategy package on the eve of World Health Day. These combined steps would certainly help to reduce the resistance to antibiotics (1, 2, 3).

#### CONCLUSIONS

Infectious diseases can be avoided by practicing good hygiene, avoiding the source of contact, using a mask when cleaning dusty areas, getting vaccinated, and providing a safe and healthy environment in a child care facility. These actions can have a significant impact on the health and well-being of millions of children.

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