

## OBSERVATIONS

# An observation: Could the spread of Adenovirus in South Asia pose a hazard to global public health?

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## Abstract

**Background:** One of the most pressing issues in healthcare today is the prevention of Adenovirus (AdV) infections. Children and the elderly, both of whom have weaker immune systems than healthy adults, are more vulnerable to infection.

**Discussion:** India has been the epicenter of a recent AdV epidemic in the South Asian area. Most of the nations, bordering India are still developing and have very low per capita incomes, yet their citizens often cross into India for trade, medical care, and vacation.

**Conclusion:** We are concerned that an epidemic of the AdV might occur in the Indian subcontinent, spread to other nations, and eventually affect the whole world if effective preventative and diagnostic measures are not taken.

## KEYWORDS

Adenovirus, child health, global health, South Asia, viral infection

## 1 | BACKGROUND

The *Adenoviridae* family consists of all the human Adenoviruses (HAdVs). It was first found in the adenoids of humans. In the absence of effective therapy, more than 50% of patients with severe AdV pneumonia or disseminated illness risk death. Under the names HAdV-A through -G, more than 52 serotypes and more than 100 genotypes of the AdV virus have been put into seven different species. Certain kinds of AdVs have been shown to cause serious problems, especially in people with weak immune systems.<sup>1</sup> The reactivation of a dormant virus or interaction with an infected person can both lead to Adenovirus (AdV) infection.<sup>2</sup> AdVs can be found all over the world, especially in dirt that has been contaminated by human waste or sewage. They can easily spread from one person to another through droplets in the air, contact with surfaces that have

been contaminated, and feces-to-mouth transmission. AdV infection has been recorded in a wide range of solid organ transplant recipient groups, including patients having heart, lung, liver, intestine, and renal transplants.<sup>3</sup> Dissemination occurs in 10–30% of AdV-infected hematopoietic stem cell transplantation patients.<sup>4</sup> AdV has been identified as a cause of hepatitis in immunocompromised children.<sup>5</sup> The virus can cause a wide variety of clinical manifestations, such as tiredness, fever, sore throat, body aches, and coughing. In severe cases, AdVs can cause pneumonia, acute respiratory distress syndrome, and even death.<sup>6,7</sup> The ever-expanding spectrum of HAdV types revealed by genomic investigations poses a challenge for molecular screening techniques.<sup>3</sup> Besides, there is no specific medicine that can be used to treat AdV infections. The main purpose of medical care for a patient is to ease their symptoms and provide them with support. Recent AdV outbreaks have raised alarm India

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and across the world, particularly during the COVID-19 pandemic.<sup>8</sup> In India, there have been 12,000 confirmed cases, and 19 children have died as of March 28, 2023. Fear of dissemination of the disease around the world has started to stir owing to a recent rise in the number of children in hospitals in Bangladesh having the same symptoms as those infected in Kolkata.<sup>9</sup> The frequency of human AdV outbreaks is troubling, as these outbreaks can affect apparently healthy persons who are not normally at risk of serious illness.<sup>10</sup> The recent outbreak in India could be a warning to South Asia and the rest of the world in the absence of proper and timely precautions.

## 2 | PREVIOUS TRANSMISSION OF ADV

Rowe et al. discovered AdVs in 1953 while researching acute respiratory disease.<sup>11</sup> Since then, AdVs have been linked to a wide range of human and animal disorders, including pulmonary, alimentary tract, and ophthalmic infections.<sup>11</sup>

AdV generates sporadic epidemics with no discernible pattern. Clinicians are not obligated to test for or report instances of AdVs to health departments or the CDC since the illness is not a nationally notifiable disease in the US. Therefore, it is likely that many cases of AdV outbreaks go unreported.<sup>12</sup> In the mid-19th century, AdV type 4 and 7 infections posed a severe concern to military personnel.<sup>13,14</sup> It compelled the US government to research a vaccine.<sup>15</sup> The AdV type 14 epidemic (2007–2008) largely affected the United States and Canada, with over 1000 cases documented, including numerous fatalities. The virus was discovered to have mutated from a type previously linked with relatively minor respiratory illness.<sup>16</sup> The 2018 AdV epidemic in the United States happened in a pediatric long-term care facility, resulting in many deaths. AdV type 7 was found to be associated in this epidemic.<sup>17</sup> The National Children's Hospital in Hanoi, Vietnam, documented approximately 2,900 AdV infections in just 3 weeks in 2022, including some fatalities.<sup>12</sup> As of April 21, 2022, at least 169 cases of acute hepatitis of unknown origin had been reported from 11 countries, with AdV being found in at least 74 of them.<sup>18</sup> Infections with AdV are relatively prevalent, although outbreaks are not usually discovered or reported.

## 3 | INDIAN ADV OUTBREAK

Infections caused by the AdV have recently spread throughout India. According to an article in *The Guardian*, more than 12,000 confirmed cases of AdV were reported in West Bengal between January and March of 2023.<sup>19</sup> This highly contagious illness has already claimed the lives of children, and many more are currently being treated in hospitals. The most vulnerable members of society, including children, are at grave risk because of this new trend. The viral epidemic in India has the potential to have far-reaching consequences for public health and disease transmission throughout Asia and the rest of the world. Since Bangladesh and India share such a sizable border, there is constant traffic going back and forth. Young

individuals with flu-like symptoms have been reported from hospitals in underdeveloped nations, including Bangladesh.<sup>9</sup> However, because of a lack of diagnostic resources, there have been no verified instances. Therefore, the possibility of viral transmission between the two nations may increase as a result of the circulation of sick people.

## 4 | CONSEQUENCES OF ADV ON PUBLIC HEALTH WORLDWIDE

Recent outbreak patterns of AdV suggest that the disease might cause the start of a new worldwide pandemic. Similar to severe acute respiratory syndrome coronavirus 2, it has previously been noted that when a virus initially appears in one country, it spreads quickly to the adjacent nations via travelers bearing the infection. Human-to-human transmission has been documented, and this should serve as a dire warning to the entire region.<sup>20</sup> Aerosolized droplets can be breathed in, inoculated through the conjunctiva, transmitted from feces to the mouth, or disseminated by contact with infected surfaces. Public health services in this region were already struggling to keep up with the needs of its vast population and complex healthcare system before the epidemic hit. AdV infections currently have no cures. Therefore, hospitals should have sufficient resources (including an adequate number of intensive care units and beds) to offer palliative care. There was a significant dearth of hospital beds and critical care unit space, as well as effective treatment and preventative measures, in many poor and undeveloped countries when the COVID-19 infection was at its height lately.<sup>21,22</sup> Therefore, growing economies should be ready to take on developing economies.

## 5 | INFECTION CONTROL AND PREVENTION CHALLENGES IN DEVELOPING WORLD

Infection with the AdV is a big problem in nations that are still developing. The diagnostic facilities are not very robust here because most developing nations have limited resources.<sup>23</sup> The preventative measures are also inadequate, particularly in locations with a high population density. No vaccine against AdV is yet available to the general public.<sup>24</sup> In addition to this, the virus is able to travel quickly and easily over international borders, as was demonstrated by the fast proliferation of COVID-19 in these nations.<sup>25</sup> Isolation and quarantine may be necessary to put a stop to the recent outbreak of AdV. However, the stringent execution of isolation and quarantine have already taken a mental toll on the general populace. It is only natural that they would have little interest in adhering to the current standards of medical care. Since AdV is a highly infectious virus, it poses a major risk to the general population in terms of its potential for fast transmission. As a result of the COVID-19 epidemic, public health services are under an incredible amount of strain. The present AdV outbreak is one of the factors that will put pressure on the public health authorities in various countries.

## 6 | RECOMMENDATIONS AND FUTURE DIRECTIONS

The current viral epidemic calls for prompt action and the implementation of stringent precautions. Since a viable therapy for AdV has not yet been developed, prevention is crucial. Seminars and workshops should be held to teach people in rural areas how to provide better healthcare for themselves. Mechanical breathing and other life-sustaining therapies should be readily available in epidemic hotspots. It is important to have security in places like hospitals, newborn nurseries, mental or long-term care institutions, schools, and dorms where large numbers of people congregate. Human-to-human transmission of AdV necessitates rapid isolation of infected patients to prevent spread to healthy people and the use of personal protective equipment by healthcare workers. To stop further spread of infectious illnesses, it is critical that diagnostic services be made available in afflicted regions as soon as possible. Combating the virus requires the testing and development of vaccinations and antiviral medications. The development of an effective vaccination against AdV requires immediate attention from scientists and the dissemination of this information to the general public. Finally, those infected with the virus will show symptoms that must be correctly diagnosed to provide successful treatment.

There is a significant impact on the general population's physical and mental health from the massive quarantine and isolation measures taken in reaction to COVID-19. Isolation and quarantine are already difficult for the general public, and this new virus has the potential to make matters far worse. Therefore, it is critical for healthcare providers, governments, and other authorities to work together to curb epidemics and educate the public on how to stay safe. In addition to researching possible vaccines and medicines, the appropriate health authorities should devise comprehensive policies for preventing and treating viral infections. Researchers and authorities should be mindful of the possibility of an AdV epidemic in light of recent outbreaks of other viral illnesses, such as COVID-19 and monkeypox. To lessen AdV's negative effect on public health and forestall future epidemics, further study of the virus, its symptoms, and available therapies is crucial.

## 7 | CONCLUSION

The latest Indian AdV outbreak has aroused worries of a global pandemic, especially for youngsters. Respiratory droplets, infected surfaces, and fecal-oral transmission spread the virus. Bangladesh's potential rise suggests worldwide expansion. AdV infections are treated with supportive care because there are no specific treatments. The recent outbreak warns South Asia and the globe about the virus pandemic. AdVs can cause severe illness, especially in children and people with compromised immune systems, so governments, scientists, and epidemiologists must remain vigilant and take immediate preventative measures to avoid another pandemic like COVID-19.

## AUTHOR CONTRIBUTIONS

**Rayhan Ahamed:** Conceptualization; writing—original draft. **Iftekhar Ahmed:** Conceptualization; writing—original draft. **Lazima Faiah Bari:** Conceptualization; writing—original draft. **Syed Masudur Rahman Dewan:** Conceptualization; supervision; writing—review and editing. All authors have read and approved the final version of the manuscript.

## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.


## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no data sets were generated or analyzed during the current study. S. M. R. D., corresponding author, has full access to all the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

## TRANSPARENCY STATEMENT

The lead author Syed Masudur Rahman Dewan affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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**How to cite this article:** Ahamed R, Ahmed I, Bari LF, Dewan SMR. An observation: Could the spread of Adenovirus in South Asia pose a hazard to global public health? *Health Sci Rep.* 2023;6:e1567. doi:10.1002/hsr.2.1567