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A Detail Review on Norovirus

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ABSTRACT
Although noroviruses (NoVs) were the first viral agents linked to gastrointestinal disease, for a long time they have been considered secondary cause of gastroenteritis, second to rotaviruses as etiologic agents. The development of molecular techniques in diagnosing NoV provided a clearer insight into the epidemiological impact of these viruses, which are currently recognized not only as the leading cause of non-bacterial gastroenteritis outbreaks, but also as a major cause of sporadic gastroenteritis in both children and adults. This review focuses on the required knowledge to understand their morphology, genetics, transmission, pathogenesis, and control. Since no vaccine is available, prevention of NoV infection relies mainly on strict community and personal hygiene measures. In this review, we describe the basic virology and immunology of noroviruses, the clinical disease resulting from infection and its diagnosis and management, as well as host and pathogen factors that complicate vaccine development. Additionally, we discuss overall epidemiology, infection control strategies, and global reporting efforts aimed at controlling this worldwide cause of acute gastroenteritis. Prompt implementation of infection control measures remains the mainstay of norovirus outbreak management.
Keywords: Norovirus; gastroenteritis; diarrhea. Vomiting.

I. INTRODUCTION

Human norovirus, previously known as Norwalk virus, was first identified in stool specimens collected during an outbreak of gastroenteritis in Norwalk, OH, and was the first viral agent shown to cause gastroenteritis (1). Illness due to this virus was initially described in 1929 as “winter vomiting disease” due to its seasonal predilection and the frequent preponderance of patients with vomiting as a primary symptom (2).

Noroviruses (formerly called ‘‘Norwalk-like viruses’’), which were discovered in 1972 (Dolin et al., 1972; Kapikianet al., 1972), Norovirus, an RNA virus, belong to the genus Norovirus in the family Caliciviridae (Green et al., 2000a; van Regenmortel et al.,2000).Noroviruses are a group of related viruses that can cause gastroenteritis (GAS-tro-en-ter-I-tis), which is inflammation of the stomach and intestines. Norovirus is not related to the flu (influenza), which is a common respiratory illness caused by the influenza virus. Age distribution of norovirus positives detected in Kolkata, India from November 2007 to October 2009. &, NVGI; %, NVGII. Norovirus is a very contagious virus that causes vomiting and diarrhea. Anyone can get infected and sick with norovirus. You can get norovirus from: Having direct contact with an infected person, consuming contaminated food or water, touching contaminated surfaces and then putting your unwashed hands in your mouth. [2]

Currently, most gastroenteritis in children are con-sidered to be caused by viruses included in four di晉erent families: Reoviridae (rotavirus), Caliciviridae (norovirus and sapovirus), Astroviridae (astrovirus), and Adenoviri-Currently, most gastroenteritis in children are considered to be caused by viruses included in four different families: Reoviridae (rotavirus), Caliciviridae (norovirus and sapovirus), Astroviridae (astrovirus), and Adenoviridae (adenovirus)7

The norovirus was originally named the "Norwalk agent" after Norwalk, Ohio, in the United States, where an outbreak of acute gastroenteritis occurred among children at Bronson Elementary School in November 1968 (although an outbreak had already been discovered in 1936 in Roskilde, Denmark, where it is commonly known as "Roskilde syge" or "Roskilde illness"). In 1972,

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electron microscopy on stored human stool samples identified a virus, which was given the name "Norwalk virus". Numerous outbreaks with similar symptoms have been reported since. The cloning and sequencing of the Norwalk virus genome showed that these viruses have a genomic organization consistent with viruses belonging to the family Caliciviridae.The name "norovirus" (Norovirus for the genus) was approved by the International Committee on Taxonomy of Viruses (ICTV) in 2002). [3]

NOROVIRUS BIOLOGY:

Small, nonenveloped RNA viruses known as NoVs are members of the Caliciviridae family. Two structural proteins (VP1, VP2) and six nonstructural proteins are encoded by the viral genome's open reading frames. 180 molecules of the capsid viral protein 1 (VP1) are organised as dimers in the icosahedral structure of NoV particles, and each dimer has a shell (S) and a projecting domain (P). The P1 and P2 subdomains of the P domain are important for immune recognition and receptor binding, respectively. [4]

There is a lot of genetic variability among NoV strains. The ten genogroups that make up the norovirus family include GI, GII, GIV, VIII, and IX, which are known to infect people. Genotypes are another level of subdivision within a genotype, and certain genotypes are further separated into variations. [5] There are 39 distinct genotypes among the 5 genogroups that cause human infections; the most common ones, GIs and GIIs, are split into 9 and 27 genotypes, respectively. Genogroup II, genotype 4 (GII.4) pandemic lineages of viruses have been the main target of classification of variations. [6]

VIRAL PARTICLE STRUCTURE OF NOROVIRUSES

Virions consist of a capsid and a nucleic acid measuring about 27 to 30 nm in diameter. They have no envelope. The nucleocapsid is rounded and exhibits an icosahedral symmetry. The surface structure reveals a regular model with distinct features8. The capsomere arrangement is clearly visible (Figure 1).

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Fig.1: Viral particle structure of noroviruses

EPIDEMIOLOGY

Norovirus is a well-described cause of epidemic gastroenteritis in both adult and pediatric populations across a wide range of geographic regions. The U.S. Centers for Disease Control and Prevention (CDC) estimates that norovirus is responsible for 60% of acute gastroenteritis cases (with a known cause), or 21 million cases, in the United States each year. With the addition of molecular methods, norovirus has also been increasingly implicated in sporadic disease. A systematic review of all reports of norovirus detected by reverse transcriptase PCR (RT-PCR) attributed 5 to 31% of cases of gastroenteritis in hospitalized patients and an additional 5 to 36% of cases in all patients seeking outpatient evaluation to norovirus.

CLINICAL FEATURES OF NOROVIRUS INFECTION

Asymptomatic Infection

Fecal excretion of norovirus infection in asymptomatic individuals is common, especially in children (Table 1). Asymptomatic excretion of norovirus was detected in 19 of 163 (11.7%) children in Leon, Nicaragua (27), while in periurban Mexico City, norovirus was detected in stool samples of 31 of 63 (49.2%) asymptomatic children (28). Over a 2-year period, 37.5% of 56 children attending a day care center in central Brazil had at least one episode of asymptomatic fecal excretion of norovirus (29).

Asymptomatic excretion of norovirus has diagnostic implications. Diarrhea due to another cause in an asymptomatic carrier may be misdiagnosed as being due to norovirus infection.

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Carriage also has epidemiological implications. A study in South Korea detected norovirus RNA in the stool samples of 66 of 6,441 (1.02%) asymptomatic food handlers (33). A smaller study found that 26 of 776 (3.4%) asymptomatic food handlers at elementary schools in Incheon, South Korea, were excreting the virus (34).

Symptomatic Infection Incubation Period

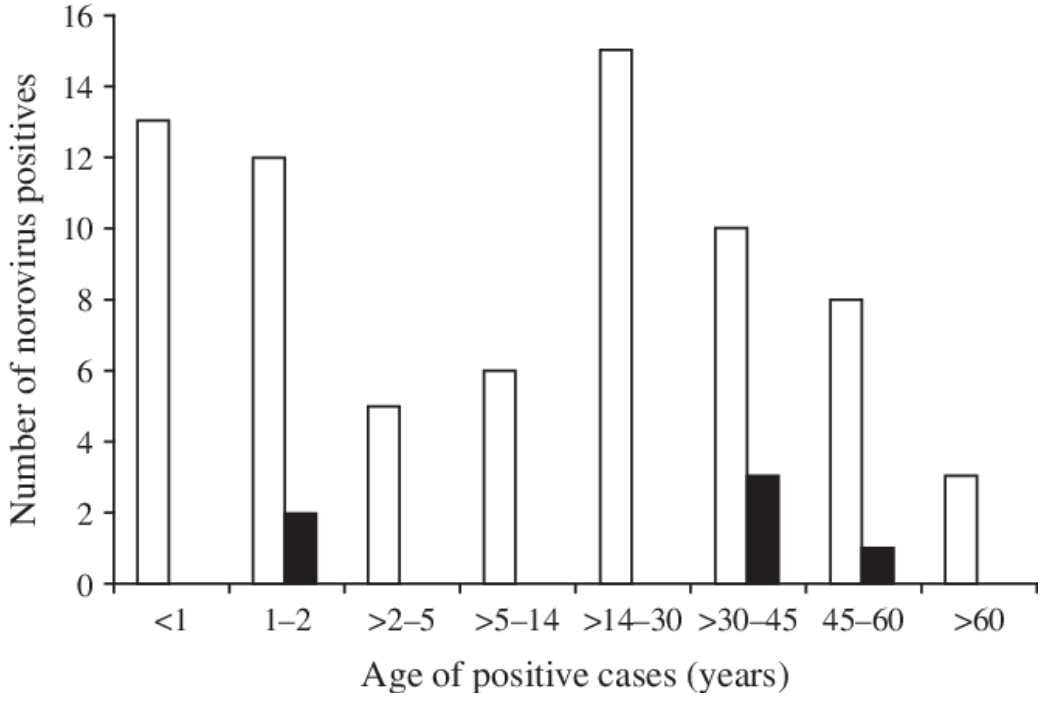
Amination of the onset of secondary cases in the index outbreak in 1968 led to an estimated incubation period of 48 h (3). In a Swedish outbreak involving children and staff at day care centers, the mean incubation period after foodborne transmission was 34 h, while that for secondary person-to-person transmission to household members was 52 h (36). A recent systematic review of the literature concluded that the median incubation period for genotype I and II infections is 1.2 days (95% CI, 1.1 to 2.2 days) (37). In contrast to these findings, Rockx and colleagues reported that the median duration of illness was 4 days in community acquired cases (38).

HOW DO PEOPLE GET NOROVIRUS?

Noroviruses are found in the stool and vomitus of infected people. People get Norovirus infections in several ways such as eating food or drinking liquids contaminated with the Norovirus or touching surfaces or objects contaminated with norovirus and then touching their mouth before washing their hands. Noroviruses are easily transmitted person to person by having direct contact with a person who is ill with norovirus. Outbreaks of Norovirus have taken place in restaurants, cruise ships, nursing homes, hospitals, schools, banquet halls, summer camps, and family dinners. Anyone can get Norovirus, but it is more common in adults and older children.

What are the symptoms of Norovirus?

The symptoms of Norovirus are nausea, vomiting, and/or diarrhea accompanied by abdominal cramps. Some people complain of headache, fever, chills, and muscle aches. Symptoms are usually brief and last only one or two days. However, during that brief period, people can feel very ill and vomit or have diarrhea, often violently and without warning, many times a day.Symptoms usually begin 24-48 hours after exposure to the virus, but can appear as early as 12 hours after exposure. The infected person may feel very sick and vomit often, sometimes without warning, many times a day.



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Norovirus spreads very easily and quickly in different ways-

- Eat food or drink liquids that are contaminated with norovirus,
- Touch surfaces or objects contaminated with norovirus and then put your fingers in your mouth, or
- Have direct contact with someone who is infected with norovirus, such as by caring for them or sharing food or eating utensils with them.

Preventing Norovirus

Practice proper hand hygiene-

Wash your hands thoroughly with soap and water, after using the toilet or changing diapers, before eating, preparing, or handling food, before giving yourself or someone else medicine. Handle and prepare food safely, before preparing and eating your food, carefully wash fruits and vegetables, Cook oysters and other shellfish thoroughly to an internal temperature of at least 145°F.

Clean and disinfect surfaces

After someone vomits or has diarrhea, always thoroughly clean and disinfect the entire area immediately, put on rubber or disposable gloves and wipe the entire area with paper towels, then disinfect the area using a bleach-based household cleaner as directed on the product label.

Wash laundry thoroughly

Immediately remove and wash clothes or linens that may be soiled with vomit or feces, Handle soiled items carefully without agitating (shaking) them, Wear rubber or disposable gloves while handling soiled items and wash your hands afterwards.

How You Treat Norovirus

There is no specific medicine to treat people with norovirus illness. If you have norovirus illness, you should drink plenty of liquids to replace fluid lost from vomiting and diarrhea. This will help prevent dehydration.Antibiotic drugs will not help treat norovirus infections because they fight bacteria, not viruses.

Foods Involved

Ready to Eat Foods (Contaminated by infected person) Produce (e.g. cut fruit, salads) Shellfish, Contaminated water

Control

70% of Norovirus outbreaks are caused by food handlers, Monitor employee health, exclude employees with vomiting and diarrhea and confirmed Norovirus, enforce personal hygiene (wash hands after bathroom), Rinse produce with potable water, Clean and disinfect kitchen utensils and counters, Clean and disinfect any area with vomit.

II. CONCLUSION

Norovirus is an important cause of morbidity due to acute gastroenteritis both within health care institutions and in the broader community. Although mortality is typically limited to the extremes of age, the disease exacts a significant toll on the health care system. Therapeutic management is usually supportive, and advances in molecular diagnostics may lead to the earlier identification of outbreaks and a reduction in person-to-person transmissions, particularly in vulnerable patient populations. Ongoing global reporting initiatives will be enhanced by improved diagnostic methods. Additionally, global control efforts will benefit from the growing knowledge of the clinical implications of various norovirus strains. Several advances into understanding the relationship among the viral strain, the host human blood group antigen type, and disease susceptibility have recently been elucidated, but this work has not yet been extended to clinical practice. The interplay of norovirus and host immunity still poses many unanswered questions. Areas of future research may overcome technical limitations, such as the inability to cultivate norovirus in vitro, and may elucidate a way to directly measure neutralizing antibodies, which could pave the way for vaccine development. The recent demonstration of infectability of B cells by the human norovirus GII.4 Sydney due to the presence of Enterobacter cloacae expressing H antigen may represent an important advance in our ability to understand norovirus replication (394). Several additional factors, such as inherited host variability, noroviral genogroup diversity, and ongoing viral evolution, will continue to complicate the process of vaccine development. Until a broadly effective, sustainable vaccine is developed, outbreak management will depend primarily on infection control efforts.

Conflict of Interest:

The authors have no conflict of interest.

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