History of Medicine, 2023, 9(1): 62–68
DOI: 10.17720/2409-5834.v9.1.2023.079

Relationship between viral and bacterial diarrhea in children suffering from the gastroenteritis infection

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Received: 20 January 2023 **Accepted:** 15 April 2023

Citation: Ahmed JAA, Al-Saffar AK (2023) Relationship between viral and bacterial diarrhea in children suffering from the gastroenteritis infection. History of Medicine 9(1): 730-737. https://doi.org/10.17720/2409-5834.v9.1.2023.079

Abstract

Introduction: Foodborne diseases are digestive system infections that are transferred by ingesting certain foods or beverages. Persistent diarrhea can occur in infections that last longer than 2 weeks but less than 4 weeks. The consumption of infected food or water might result in travelers' diarrhea. Rotavirus commonly causes severe, watery diarrhea and vomiting in infants and young children. Children may become dehydrated and need to be hospitalized and can even die. While in bacterial infection (Multidrug-resistant bacteria causes diarrhea infection has been found to be a carrier for A. baumannii through SIgA appeared to enhance A. baumannii GI tract colonization. the study's objective was to clarify the relationship between viral and bacterial diarrhea in children with gastroenteritis. Methodology: (50) samples were obtained between the period from (9/2021 to 12/ 2021) in Babylon province. Samples were Stool, blood, and a rectal swab. The virus was diagnosed by chromatographic immunoassay (rapid test) and polymerase chain reaction (PCR)technique to detect the NSP gene in Rotavirus, the bacteria were isolated and diagnosed in the laboratory and a DDT test was performed to detect their sensitivity to the treatment, then PCR was used to diagnose the bacteria through genes assay (Blaoxa-51, INT-2 and MCR-1) Results: 30 isolates of bacteria out of 50 specimens (60%) were detected. Moreover, (blaOXA-51) gene was investigated by PCR with25 (83%) results and play role for identification of A. baumannii, however, Int-1gene was detected in 15 (50%). and Mcr-1 gene was detected in 20(66%) while Rota virus detected by NSP –gene was detected in this study and by the rapid test was found in 20 (40%) PCR- NSP-gene in 15(75%) specimens. This study included the emergence of gastrointestinal tract spread by MDR A. baumannii and Rotavirus. Conclusion: Through this study, it was found that gastroenteritis caused by viruses is more virulent than bacterial infections, so it is recommended to give Roto vaccine to children because it is a major cause of this infection in addition. The possibility of controlling it is possible unlike a viral infection.

Keywords
Gastrointestinal (GI), Rotavirus, (Sig-A) secretory immunoglobulin -A, Mobilized Colistin gene MCR-1.

Introduction

Diarrhea and vomiting are symptoms of the fairly common disease known as gastroenteritis. Usually, a bacterial or viral stomach virus is at blame. Although it affects people of all ages, small

children are particularly susceptible. A virus known as rotavirus is to blame for the majority of illnesses in youngsters (Stuempfig, Seroy, & Labat-Butler, 2021). In children below the age 5 years the viral diarrhea cause mortality and morbidity (Badur et al., 2019). SP are share in the formation of virion, whereas NSP are share in host protein synthesis (Montero, Arias, & Lopez, 2006), to evade host I. S and to form the viroplasm (Tate et al., 2009). NSP has been reported to play a role in the fashioning of the viroplasm, where early stages of viral morphogenesis such as virua replication and the assembly of (DLPs)take place (Fabbretti et al., 1999). A. baumannii is an ESKAPE pathogen that endangers public health by inflicting severe, invasive (usually nosocomial), and fatal infections. In recent years, this pathogen shown (MDR)(Kyriakidis et al., 2021). The blaOXA-51-like gene was originally present on the chromosomes of A. baumannii isolates (Lee et al., 2012). Integrons are mobile genetic elements that can integrate, to site and carry antibiotic resistance genes. The classes of integrons -2 have been described (Rowe-Magnus & Mazel, 1999). MCR-1 plasmid-mediated colistin resistance is a member of the phosphoethanolamine transferase enzyme family, with expression in A. baumannii resulting in the addition of phosphoethanolamine to lipid A and resistance to colistin (Liu et al., 2016). The recent description the effect of viral and emergence of bacterial diarrhea in humans is a major concern worldwide.

Materials and Methods

Virus screening: 50 specimens were obtained the period from (9/2021 to 12/2021) in Babylon province. The specimens (stool and rectal swab) were collected from patients for isolation of virus by chromatographic immunoassay (rapid test) for detected IGM, IGG and polymerase chain reaction for identification of the virus.

chromatographic immunoassay

Method for detecting the presence of the virus and by which the infection is determined, new or old. The method can be summarized by placing a quantity of stool or the rectal swab will throw 20 that they pass into a hole designated for this purpose, adding a drop of (diluent)to speed up the reaction, waiting for 10 minutes, and reading the results through red lines on the result, If the result (IGM) means a recent infection, and if (IGGry) is an old infection.

PCR

Additionally found and directly recognized was rotavirus from50 clinical specimens. positive by culture or antigen detection. PCR for Rotavirus and can detect viruses for use in laboratories with molecular. DNA was isolated from the infected culture and used as a template for amplification of a partial NSP gene (774 bp) using NSPgene specific primers.

Acinetobacter baumannii detection

50 specimens were obtained the period from (9/2021 to 12/2021) in Babylon / Iraq. After taking the samples, they were planted on the medium of Maconkey and Chromagar vines and incubated for 24 hours at a degree of 37. Confirmatory biochemical tests were also conducted and bacteria were diagnosed according to MacFaddin (2000).

AST- Test

The AST- Test for 30A. baumannii isolates were determined using the (DDT) Karby Bauer method and read the results as read the results. In this study used antibiotic included Ampicillin (100pg), ceftriaxine (30pg), cefotaxime (30pg), meropenem (10pg), amikacin (30pg), doxycycline (30pg) and ciprofloxacin (5pg) [CLSI,2021].

PCR for Detection of genes used in this study

The genetic analysis included extracting the DNA present by the (G-SPIN) company (Bioneer-Korea), which included the reaction (25pl) of its mixture of components (1pl primer (forward+revers) + 1pl DNA extraction + 11. 5pl of

N. F. W + 11. 5pl of M. MM), reading and posting the results by 1% agarose gel and contrasting them with (Ladder 100-1500) and from During the presence of pandas and knowing the value of (blaoxa-51), the gene (INT-2), (MCR-1) were identified in figure3,4 its results were (355bp) as in Figure (2) and it was 25 (83%) out of a sample of 30 bacteria. The sequences (bla0xa-51, INT-2, MCR-1) F5'-AGTCCGTTTGTTCTTGTGGC-3', R5'-GATCCTTGGTCTCGGCTTG-3'(MCR-1), F5'-TAA TGC TTT GAT CGG CCT TG-3', R5'-TGG ATT GCA CTT CAT CTT GG-3'(BlaOxa-51), F5'-CACGGATATGCGACAAAAAGGT-3', R5'- GTAGCAAACGAGTGACGAAATG-3' (INT-2) as for the NSP-gene had the sequence F5'-AAUUGGAUGACUGACUCUCGA-3', R5'-UCGAGAGUCAGUCAUCCAAUU-3' specific to the virus, its results were 774bp as shown in Figure (5).

Table (1): Genes and thermal cycler condition

Genes	PCR product	PCR-condition	Number of cycles	References
blaOXA-51	355bp	94°C /4m 94°C /25s 52°C /25s 70°C /2m 70°C /4m	35	(Turton et al., 2006)
INT-2	423bp	94°C /4m 94°C /25s 50 °C /25s 70°C /1m 70°C /4m	35	(Peymani et al., 2012)
MCR-1	320bp	94°C /4m 94°C /25s 55°C /25s 70°C /1m 72°C /4m	35	(Rebelo et al., 2018)
NSP	774bp	94°C /4m 94°C /25s 52°C /25s 70°C /1m 70°C /4m	35	(Montero et al., 2006)

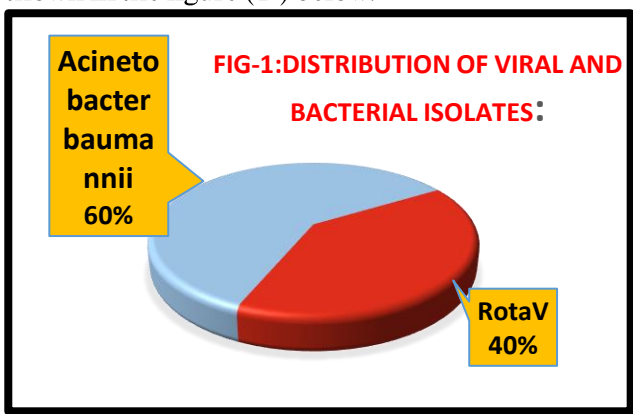
Result and discussion

The results in this study were summed up that out of 50 samples collected 30 (60%) were for bacteria (A. baumannii) and the results were 30 (60%) compared to results (Al-Warid, 2014) where the results are higher than their results, which found the isolation rate was 50%. Despite the results of Al-Saleem (2013), it was found that bacteria Its proportion is 13%, and a study conducted by (9) revealed that the percentage of bacteria isolation is 9.51% (Lee et al., 2012), and a study of bacteria with a percentage of (55.6%) where the difference in isolation rates is due to bacteria due to reasons including the geographical location from which the samples were isolated, environmental and other factors. Rotavirus (RV)strains isolated in hospitals, from 50 (Stool, rectal swab, blood) specimens of hospitals patients, with acute Gastroenteritis diseases, from September 2021 to January 2021 from several hospitals in Babylon / Iraq, were studied by restriction enzyme analysis of genomic DNA with. All different fragment patterns were compared with the respective prototypes. The identified Rotavirus was recorded in table No (1).

The Rate of Viral and bacterial isolated:

Distribution of viral and bacterial isolates:

Includes bacterial and viral distribution as shown in the figure (1`) below:



The AST Results

All isolates (100%), were resistant to Piperacillin/Tazobactam, that similar to local studies in Babylon province by Al-Saleem (2013), found (100%), resistance for this antibiotic. Carbapenems group including Imipenem showed resistance rate in 15 isolates (75%), another study by Mshachal et al. (2017), showed resistance rate (50%), for imipenem, which varied from different hospitals in Thailand. However, Al-Warid (2014) found the resistant 100% for imipenem, and different from the study of Mirzaei et al. (2020) who found (100%)resistance rate to imipenem. On the other hand, Cefotaxime showed highest resistance rate 20 (100%) which was simillar to local studies in different hospitals in Baghdad by Al-Saleem (2013) who found that bacteria isolates were resistant (100%) to Cefotaxime, while different from the study of Thirapanmethee et al. (2020). Cephalosporin showed resistance 20(100%) which was identical to study in Babylon province by Garnacho-Montero and Timsit (2019) who found resistance for Cefepime, in (100%), in and high resistant to Amikacin and tetracycline (100%) for each one . This agreement to the results that conducted by Chan et al. (2020). Known as multiple drug resistance (MDR), multidrug resistance, or multiresistance, antimicrobial resistance is the inability of a kind of bacterium to be treated by at least one antimicrobial treatment from three or more antimicrobial categories.

Molecular Detection of genes (blaOXA-51, INT-2, MCR-1, NSP) by polymerase technique:

The polymerase technique was used in the research for characterization of (blaOXA-51, INT-2, MCR-1, NSP) genes, fragments of four genes (blaOXA-51, INT-1, MCR-1, NSP) represented amplicon size ranged from (355 to 774) bp in (blaOXA-51 to NSP) (Figure. 2,3,4,5). The detection rates were as following; (blaOXA-51) gene in 25 isolates out of 50 (83%), while, INT-2 gene showed 15(50%) out of 30 A. baumannii isolates respectively. However, NSP gene showed 20 (40%) results. Compared with another study conducted in Baghdad, Abdul-Hussein et al. (2019) recorded that blaOXA-51 was detected in 45 (73.77%) isolates among 61 carbapenem -resistant A. baumannii isolates. and studies by Al-Hindawi and Jarallah (2018), blaOXA-51 was detected in A. baumannii isolates in Babylon hospitals of (100%), Also studies in Tailand by Thirapanmethee et al. (2020), suggested the presence of the blaoxa-51-like gene, was detected in all clinical isolates 183specimens,while INT-2 gene showed another study by (Hu et al., 2021; Xu et al., 2020) , who recorded that in Class 2 integron 13. 51(10/74), and another study by Halaji et al. (2018), who mentioned that integron-2 was detected in 63. 9% of the A. baumannii isolates. And also another study by Amin et al. (2019), who established the 77 MDR A. baumannii isolates, 34 had only int-2about 10 out of A. baumannii isolates. And a study by Zeighami et al. (2019), who recorded that Class- 2integron (67%) out of 100 A. baumannii isolates. The current study showed the PCR amplification of mcr-1 gene in 20 isolates out of 30 (66%) Comparable with another study by Kareem (2020) was detected mcr-1 gene in 22 isolates out of 205 (11%) and other study by Al-Kadmy et al. (2020), who established that detected mcr-1gene

in 89(73.5%) out of 121 A. baumannii isolates. While the gene (NSP) in Rotavirus showed 20(40%) results. Compared with another study conducted by Persson et al. (2021) and study by Hu et al. (2021) while study by Yu et al. (2022) showed results for hexon gene present in Rotavirus agree sith present study. Through the results, we find that bacterial pneumonia is more dangerous than viral, because this type of pneumonia is resistant to most treatments, and thus the infection is more dangerous.

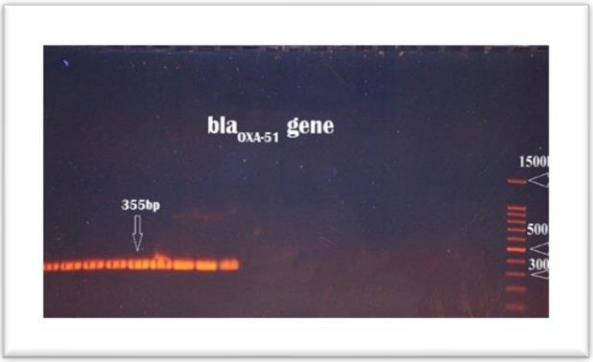


Figure (2): - Gel electrophoresis for PCR product of (blaOXA-51 gene)show 355bp

Figure (3):- Gel electrophoresis for PCR product of (int-2 gene)showed 423bp

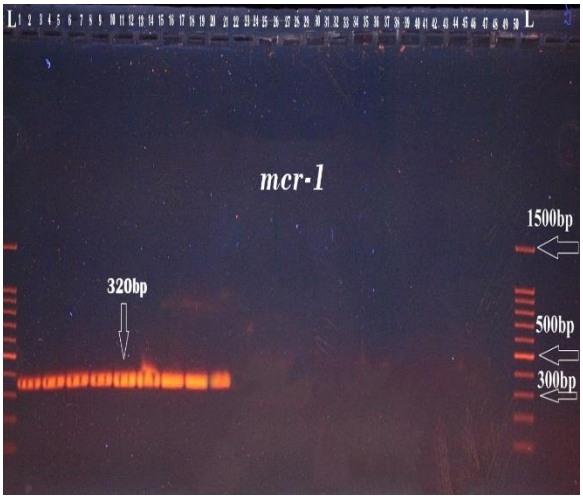


Figure (4):- Gel electrophoresis for PCR product of (MCR-1 gene)showed 320bp

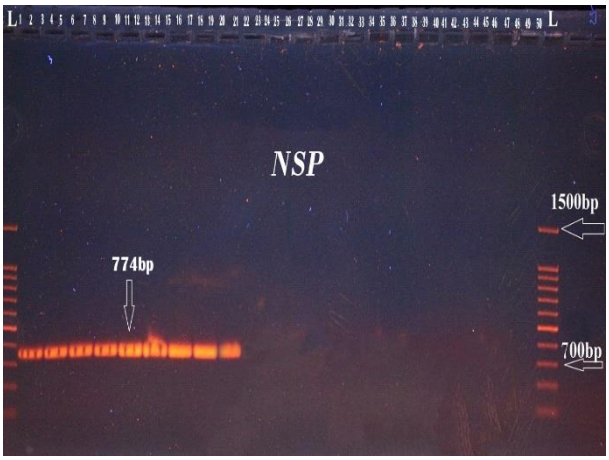


Figure (5):- Gel electrophoresis for PCR product of (NSP gene)showed 774bp

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