Chapter 10

Conclusive summary
and
future prospects
The study presented here reports for the first time characterization of rotavirus infections in adolescent and adult cases of acute gastroenteritis from India at the two time points, 1993-1996 and 2004-2007.

Highlights of the study include—


An increase in the group A rotavirus positivity from 5.2% to 17.2% was detected in the adolescent and adult patients with acute gastroenteritis at the two time points investigated in the study. Among the commonly circulating rotavirus strains (G1P[8], G2P[4], G3P[8], G4P[8] and G9P[8]), G2P[4] strains predominated (23.5% in the 2000s, 26.5% in the 1990s). The infections with unusual and mixed rotavirus strains also occurred at significant levels (7.8%-41.2%) at these time points. Rotavirus infections were markedly high (46.7%-58.1%) in the patients aged 19-40 years. Winter and rainy months displayed increased activity of rotavirus. Homology of VP6 genes from nontypeable [for VP7(G) and VP4(P)] rotavirus strains detected in the year 2007 with those of bovine and simian rotaviruses indicated circulation of human-animal reassortant rotavirus strains in the human population.

2. Detection of rotavirus strains in ELISA negative stool specimens from adolescent and adult cases of acute gastroenteritis

Polyacrylamide gel electrophoresis was found to be useful to detect RNA migration patterns specific to group A and group B rotaviruses in 2.4% of the ELISA negative samples.
3. Sequence and Phylogenetic analysis of the VP4 and VP7 encoding genes of rotavirus strains recovered from adolescent and adult cases of acute gastroenteritis

The association of VP4 (P[4] / P[8]) genotypes with common (G1-G4 and G9) and nontypeable VP7 genotypes was significantly different (p<0.01) in the 1990s and 2000s. However, at these time points no significant difference (p>0.05) was noted in the association of VP7 genotypes with common, unusual, mixed and nontypeable VP4 genotypes. Cocirculation of multiple genetic lineages within VP7 (G1, G2, G3, G4 and G9) and VP4 (P[4], P[8] and P[6]) genotypes revealed by this study indicated intragenotypic diversity in the rotavirus strains that caused infections of gastroenteritis in adolescents and adults.

Lineages / sublineages of rotavirus VP7 genotypes that circulated in adolescents and adults differed from those of children from the same region and period. Circulation of genetic / antigenic variants of G2, G3 and G4 genotypes were noted for the first time in adolescent and adult cases of acute gastroenteritis. Variations in the antigenic regions, A and / or B and / or C and / or D and / or F of the rotavirus VP7 genotypes identified in the study indicated possibility of altered immunogenicity of the VP7 proteins.

4. Sequence and Phylogenetic analysis of the VP6 and NSP4 encoding genes of rotavirus strains recovered from adolescent and adult cases of acute gastroenteritis

Distribution of VP6 genogroups in different lineages/ sublineages in the 1990s and 2000s, indicated intragenotypic diversity in the VP6 genes at both time points. Sequencing and phylogenetic analysis of the NSP4 genes showed higher amino acid divergence within the genotype B strains than in genotype A strains at the two-time points. The striking rate of discordance noted in the genetic linkage between VP6 and NSP4 genes was predominated by NSP4 genotype B (E1) and VP6 genogroup I (I2) (a characteristic feature of animal rotaviruses) at both time points studied.
5. Analysis of genetic linkage of VP7, VP4, VP6 and NSP4 encoding genes of rotavirus strains detected in adolescent and adult cases of acute gastroenteritis

Sequence analysis of VP4, VP6, VP7 and NSP4 encoding genes indicated a high frequency (52.2 - 69.2%) of discordance in the genetic linkage of rotavirus strains detected in adolescent and adult cases of acute gastroenteritis.

6. Characterization of group B rotavirus strains detected in adolescent and adult cases of acute gastroenteritis

Sequence analysis of VP4, VP6 and VP7 genes of group B rotavirus strains classified all four strains in the Indian-Bangladeshi lineage of genotype G2.

Overall, a vast diversity in the rotavirus strains revealed by the study emphasizes the need for continuous surveillance and characterization of rotaviruses circulating in adolescent and adult cases of acute gastroenteritis.

Future prospects:
1. Isolation and characterization of unusual rotavirus strains.
2. Comparative analysis of antigenic regions of the VP7 genes of common and unusual rotavirus strains by homology modeling approach.
3. In vivo studies to understand the host immune response against unusual rotavirus strains.