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Determination of risk factors for the spread of unique *Cryptosporidium* subtypes in Kuwait population

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Background: Cryptosporidiosis is recognized worldwide as a significant cause of diarrheal diseases in both adults and children especially in children less than 2 years of age. There has been an increase in the incidence of cryptosporidiosis especially in the tropical and sub-tropical countries.

Importance: Kuwait is home to more than 2 million migrant worker, the majority of which comes from the countries where *Cryptosporidium* infection is endemic. Furthermore, due to relative increased transmissibility of this infection it is important to determine the incidence of this infection in Kuwait especially in the children, the major high risk age-group. Thus the *Cryptosporidium* species were isolated from young children in Kuwait positive for Cryptosporidiosis and were further characterized at the molecular level to understand the transmission of infection. Detailed socio-demographic data of all included in the study were collected to determine the risk factors for the transmission. The study was approved by the Ethical Committee of Faculty of Medicine, Kuwait. Over a period of 2 years, fecal specimens from 200 Kuwaiti children with persistent diarrhea found to be positive for *Cryptosporidium* species. By microscopy they were genotyped and sub-typed with a small subunit rRNA-based PCR-restriction fragment length polymorphism analysis. An approved detailed socio-demographic data was obtained from all included in the study. Informed consent was taken from all individuals included in the study. The median age of infected children was 4.9 years and the majority of the infections (>70%) occurred during the cooler months January to April, indicating a marked seasonal variation. More than 85% of the children with cryptosporidiosis had only *Cryptosporidium* infection. Socio-demographic information did not reveal any particular mode of transmission of infection. Genotyping of the organisms isolated showed that ninety-two (95%) of the children had *C. parvum*, 4 (4%) had *C. hominis*, and 1 (1%) had both *C. parvum* and *C. hominis*. Altogether, 9 subtypes of *C. parvum* and *C. hominis* were observed. The analysis of the socio-demographic data revealed a close association of *C. parvum* 2a subtype, that showed increased symptoms, with decreased nutritional status ($p<0.03$), consumption of stored water rather than piped-water supply ($p<0.05$) and presence of an infected case in the family ($p<0.05$).

Conclusion: Our study revealed a very different distribution of *Cryptosporidium* genotypes in Kuwaiti children as compared to other tropical countries. The study also showed a close association with the use of stored water and decreased nutritional status thus, highlighting the importance of testing the water supply. The genotypes and subtypes isolated are discussed with relation to the seasonality and possible mode of transmission of this infection in Kuwait.

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Liver disease in particular, acute on chronic liver failure (ACLF)

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Liver disease in particular, acute on chronic liver failure (ACLF) is a result of an acute insult to the liver on a previously compensated underlying chronic liver disease. ACLF has been defined as an acute hepatic insult manifesting as jaundice (serum bilirubin level >5 mg/dl) and coagulopathy (international normalized ratio >1.5), complicated within 4 weeks by ascites and/or encephalopathy in a patient with previously diagnosed or undiagnosed chronic liver disease. Liver transplant remains the only definitive therapy. This treatment option is limited due to lack of donors, high costs, lack of wide spread availability and limited expertise. There is need for other treatment option. The property of blood-derived stem cells that differentiate into multiple cell lineages provides an exciting opportunity of using these cells for tissue repair. For liver regeneration, bone marrow derived stem cells can provide a useful option. Recent studies have shown that G-CSF (granulocyte stimulating factor) induces mobilization of CD34 + bone marrow derived stem cells, increases hepatocyte growth factor and induces replication of hepatic progenitor cells. Studies have also shown use of G-CSF in acute on chronic liver failure also reduces the risk of sepsis, HRS, improves survival and reduces severity scores (CTP, MELD, SSOFA).

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