

Etiological Agents of Diarrheal Diseases Detected Among Under-5 Deaths in Manhiça and Quelimane Districts, Mozambique in the CHAMPS Network, 2017-2021

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INTRODUCTION

- Diarrhea is the 3rd leading cause of mortality in children under-5 globally, being responsible for 525,000 deaths worldwide each year [1,2];
- In Mozambique, The Global Enteric Multicenter Study-GEMS (2007-2012) showed that Rotavirus, *Cryptosporidium*, enterotoxigenic *Escherichia coli*, *Shigella* and Adenovirus 40/41 were associated with moderate-to-severe diarrhea in children <2 years of age in Manhiça district [3], however, there is a scarcity of studies assessing the specific role of etiologic agents of diarrhea in children under-5 mortality;
- The Child Health and Mortality Prevention Surveillance (CHAMPS) aims to investigate causes of death of children under-5, through post-mortem Minimally Invasive Tissue Sampling (MITS);
- In this analysis, we aim to describe the etiological agents causing diarrhea in deceased children in Manhiça and Quelimane districts, Mozambique in CHAMPS study from January 2017 - December 2021.

Keywords: Diarrhea, Etiology, Deceased children.

METHODOLOGY

- Stillbirths and children <5 years of age at the time of death were enrolled to CHAMPS study (www.champshealth.org/) ongoing in Manhiça and Quelimane districts from January 2017-December 2021;
- After death notification, families of eligible stillbirths/deceased children were approached for consent and MITS was performed within 24 hours;
- Rectal swabs samples were collected and Real-time polymerase chain reaction for detection of over 40 enteric pathogens was performed using TaqMan Array Cards (TACs; Thermo Fisher Scientific);
- A panel of experts determined causes of deaths by reviewing all available data including parasitology, microbiology and pathological results, clinical information from medical records, and verbal autopsies (Fig 1);
- Data regarding stillbirths was excluded from this analysis, since the causes of death typically reflect maternal conditions [4].

CHAMPS Determination of Cause of Death (DeCoDe)

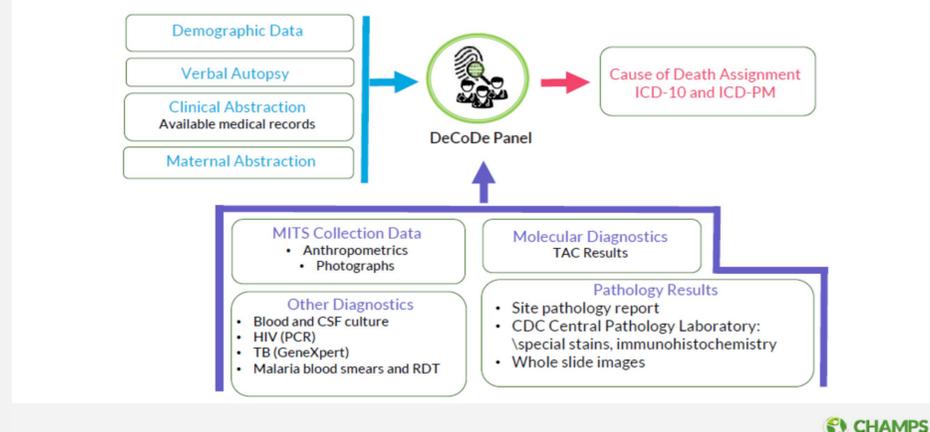


Fig 1. Flowchart of determination of Cause of Death process in CHAMPS Network [5].

RESULTS

1. Participants enrollment

Overall, 467 MITS were performed, of which 335 were from <5 years old. Among these (n=335), 196 were neonates (from birth to <28 days), 56 infants (28 days to <12 months) and 32 were older children (12-59 months).

2. Enteric pathogens detection

- At least one enteric pathogen was detected in 92% (307/335) of all deaths;
- When compared with viruses and protozoa, the bacterial pathogen predominated (98%), with frequent detection of Enterotoxigenic *E. coli* (EAEC) (45%), *Aeromonas spp.* (37%) and Enterovirus (14%) (Fig 2).

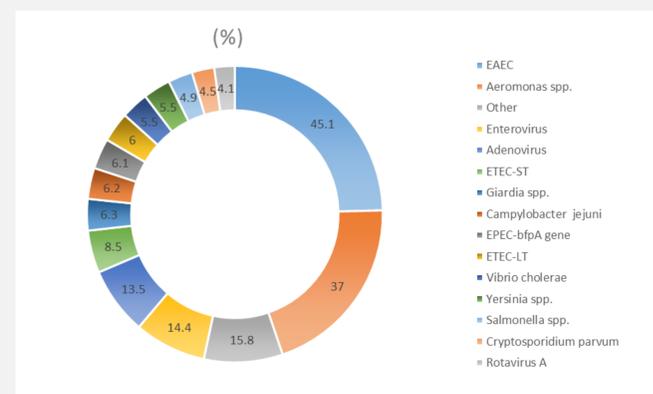


Fig 2. Frequency of diarrhea pathogens detected in deceased children in Manhiça and Quelimane districts from 2017-2021.

3. Cause of death attribution

- From the 335 deaths, 276 (82.4%) were attributed a cause of death;
- Diarrhea was the third leading cause of death with 8.7% (24/276) after Severe birth asphyxia (9.8%, 27/276) and Respiratory distress syndrome of the newborn (9.4%, 26/276);
- From the 24 children with diarrhea as cause of death, 1 was a neonate, 11 were Infants and 12 were older children (Table 1).

Table 1. Age distribution of Deaths with MITS procedure, cases with DecoDe results, deaths with enteric pathogen detected and deaths with diarrhea as cause of death, in Manhiça and Quelimane districts from 2017-2021.

Age at death (months)	All deaths	Deaths n (%)		
		Deaths with decode	Deaths with at least one enteric pathogen detected	Deaths with Diarrhea in the causal chain of cause of death
Neonate	196	159 (57.6)	139 (54.7)	1 (4.2)
Infant	56	46 (16.7)	44 (17.3)	11 (45.8)
Children (12-59)	83	71 (25.7)	71 (28)	12 (50)
Total	335	276	254	24

4. Enteric pathogens in the causal chain of deaths due to Diarrhea.

From the 24 deaths where diarrhea was the cause of death:

- 8.3% (2/24) were caused by Rotavirus A;
- 4% (1/24) were due to *Vibrio cholerae*;
- 1 (4%) by *Salmonella spp.*;
- 1 (4%) by Enteropathogenic *E. coli* (EPEC);
- 79.2% (19/24) were due to unspecified pathogens.

CONCLUSIONS

- Diarrhea was an important cause of death being responsible for 8.7% of the deaths;
- Rotavirus A, *Vibrio cholerae*, *Salmonella spp.* and EPEC were in the causal chain of deaths due to diarrhea;
- Although, EAEC and *Aeromonas spp.* were detected in high rates, they had low impact in the causal chain of deaths due to diarrhea;
- A high proportion of the diarrhea was due to unspecified pathogens, therefore a continuous molecular based surveillance of enteric pathogens is required to address the specific role of these pathogens in children under-5 mortality.

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