**Epidemiology and burden of Cryptosporidium diarrheal diseases in under five children in three sub-Saharan African countries, 2015-2018**

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### Background
- **Cryptosporidium** is associated with 88 million global diarrheal episodes among children <5 years and 48,000 under 5 deaths per year, 88% of these deaths are in Sub-Saharan Africa (1, 2).
- **Cryptosporidium** is the third most common cause of moderate-to-severe diarrhea (MSD) in children <5 years in low-income countries (3).
- The Vaccine Impact on Diarrhea in Africa (VIDA) study is a 36-month case-control study, which takes place in The Gambia, Mali and Kenya, following rotavirus (RV) vaccine introduction.
- Here, we present the epidemiology of Cryptosporidium in an endemic setting, post-RV vaccine introduction.

### Objectives
- Assess MSD cases attributed toCryptosporidium in children less than 5 years old.
- Assess the severity and clinical presentation of Cryptosporidium associated MSD and compare it to that of Rotavirus and other attributed watery diarrhea.
- Assess the temporal trend of Cryptosporidium attributed MSD cases.

### Methods

#### Data collection
- MSD cases were enrolled in 3 age strata (0-11, 12-23, 24-59 months) from Sentinel Health Centres within the demographic surveillance system (DSS).
- 1-3 diarrhea-free controls were enrolled within 2 weeks of the case and were matched on age, gender, and residential area.
- Demographic, epidemiological, and clinical information were collected from each participant.
- Height/length, weight, and mid-upper arm circumference (MUAC) were measured at enrollment.
- At least 4 grams of stool was collected at enrollment.

#### Laboratory testing
- **TaqMan Array Card (TAC)-quantitative polymerase chain reaction (qPCR) used to detect 26 enteropathogens, including the 18S rRNA gene of Cryptosporidium species.**
- **Quantification cycle (Cq) values <35 indicate pathogen presence (a positive result).**

#### Data analysis
- The episode specific attributable fraction (AFe) for each case child was estimated using the odds ratio from an adjusted conditional logistic regression.
- **Etiologic detection:** When the AFe was ≥ 0.5 for a particular pathogen it was assumed that the child’s episode was attributed to this pathogen. These are described as attributable cases.
- Chi-squared tests of significance were used to compare categorical variables.
- The weighted (by age group and site) number of **Cryptosporidium** etiologic and non-etiologic cases were used when assessing seasonality.

### Results

- **A total of 4765 cases and 4775 controls were tested by qPCR for Cryptosporidium.** Off them, 1106 (23.2%) cases and 873 (18.3%) controls were positive for Cryptosporidium.
- At all sites and in all age groups, Cryptosporidium was more commonly detected in MSD cases than controls (Table 1).
- Etiologic detections of Cryptosporidium were more common among infants and toddlers compared to older age group at all three sites and were highest in The Gambia compared to Mali and Kenya (Table 1).
- **Cryptosporidium**-attributed cases were less severe overall (modified Vesikari score p <0.001) compared to RV-attributed cases (Table 2).
- **Cryptosporidium**-associated cases experienced more prolonged diarrhea than RV and all other attributed cases of watery diarrhea (p <0.001 for both) (Table 2).
- Cryptosporidium-attributed MSD cases were more likely to have severe acute malnutrition (MUAC <11.5 cm) at the time of enrollment than RV-attributed cases and all other attributed cases of watery diarrhea (P<0.001 for both) (Table 2).
- **Cryptosporidium**-attributed MSD in The Gambia and Mali displayed strong seasonal peaks which coincided with the highest rainfall, but clear annual trends were not observed in Kenya (Figure 1).

<table>
<thead>
<tr>
<th>VesiKari score</th>
<th>Points</th>
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<th>RV attributed MSD n = 598</th>
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<th>Watery non-Cryp attributed n = 1,928</th>
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<td>261 (13.5%)</td>
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### Conclusion
- **Cryptosporidium spp.** is predominant pathogens after introduction of RV vaccine in younger children.
- **Cryptosporidium**-attributed MSD cases were less severe overall (modified Vesikari score) compared to RV-attributed cases and experienced a prolonged duration of diarrhea episode.
- **Cryptosporidium**-attributed MSD cases were more likely associated with malnutrition compared to RV-attributed cases & other attributed watery diarrhea.
- **Cryptosporidium**-attributed MSD displayed a strong seasonal peak which coincided with the rainy season in The Gambia and Mali.

### References

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