Impact of Rotavirus Vaccine on Rotavirus Diarrhea-Associated Hospitalizations Among Children Under 5 Years of Age in Uganda

Dr, Cissy Nalunkuma

Pediatrician/ Rotavirus surveillance site Co-ordinator

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Rotavirus Diarrhoea.

- Vaccine-preventable diseases remain a significant cause of mortality. ; with about 25% of the 10 million deaths occurring annually among children under five years.

- With availability of newer vaccines, many more children under 5 can be protected, and therefore the rollout of these vaccines make a significant contribution to United Nations SDG 3.

- Rotavirus (RV) diarrhea contributes a significant morbidity and mortality in childhood. Estimates at 108,000 child deaths in 2021 **Black ER, Perin J et al. Estimated global and regional causes of deaths from diarrhea in children younger than 5 years during 2000-21: a systematic review and Bayesian multinomial analysis. Lancet Global health 2024.**

- Prior to the introduction of a RV vaccine in Uganda, rotavirus infection was highly prevalent among infants and young children seeking care for acute gastroenteritis, with detection rates of 33%–45% in hospital settings. **Nakaweesi et al 2006**

Rotavirus vaccines.

- The World Health Organization (WHO), recommended the introduction of Rotavirus (RV) vaccines into national immunization programs globally in 2009.
- Uganda has had a national Rotavirus surveillance that is coordinated by WHO since 2006.
- Uganda introduced the RV vaccines in June 2018. ROTATRIX, a monovalent vaccine was used till March 2025, A new vaccine type ROTASIL was rolled out in March 2024.
- RV vaccines have been shown to reduce severe diarrheal episodes, though their effectiveness has been reported to be lower in low income settings. Burnett E et al; Rotavirus vaccine effectiveness stratified by national-level characteristics: an introduction to the 24-country MNSSTER-V Project, 2007-2023. *J Infect Dis*. Nov 28 2024;doi:10.1093/infdis/jiae597
- As such, the continued monitoring of the effectiveness and impact of the rotavirus vaccine is needed to support the immunization programs and inform rotavirus vaccine-policy decisions in these settings.

The study

- **We sought to assess population - level reductions in rotavirus gastroenteritis hospitalizations following Rotarix introduction in Uganda**
- **Methods**

- Data from RV active sentinel surveillance sites was used from 3 hospitals in Kampala.
- Children aged <5 years who presented at participating hospitals from January 2013–December 2023 with **acute watery diarrhea (AWD)** were included in the analyses.
- A standardized data collection form was used to capture the demographic characteristics of children upon enrollment.
- Rotarix vaccination history was obtained through direct review of the child's vaccine card, when available
- Stool specimens were collected and tested with a rotavirus enzyme immunoassay.
- Impact of RV was compared between 2 time periods; the period before introduction, (January 2013–December 2017) and after ROTATRIX introduction (January 2019–December 2023).

Results.

- During January 2013–December 2023, a total of 7,517 children were enrolled in the diarrhea surveillance system, of which 7,023 (93%) met the inclusion criteria for AWD.
- Of these, 409 (6%) were excluded because stool was collected >48 hours after presentation, 311 (4%) because EIA testing results were unavailable, and one due to age >5 years.
- A total of 3,337 (53%), 1,978 (31%), and 987 (16%) children were enrolled from Mulago, Lubaga, and Naguru hospitals, respectively.
- **RV was detected in 1,127 (38%) of 2,985 stool specimens** before Rotarix introduction, and in **623 (24%) of 2,596 stool specimens in the vaccine era**

Rotavirus positivity among children aged <5 years visiting hospitals for AWD before (2013–2017) and after (2019–2023) rotavirus vaccine introduction, **by age group**, in Kampala, Uganda

Age group	% of diarrhea-related hospital visits that were rotavirus positive		Rate reduction % (95% CI)	P	Adjusted rate reduction % (95% CI)[c]	P
	Pre-vaccine (2013–2017)[a]	Post-vaccine (2019–2023)[b]				
0–59 mo	1127/2985 (38)	613/2596 (24)	37 (31–43)	<.0001	43 (36–49)	<.0001
0–11 mo	711/1826 (39)	318/1494 (21)	45 (38–52)	<.0001	50 (42–56)	<.0001
12–23 mo	363/964 (38)	237/844 (28)	25 (12–37)	0.0004	31 (17–42)	<.0001
24–59 mo	53/195 (27)	58/258 (22)	17 (-20–43)	0.3179	36 (6–57)	0.0264

[c] adjusted for hospital site

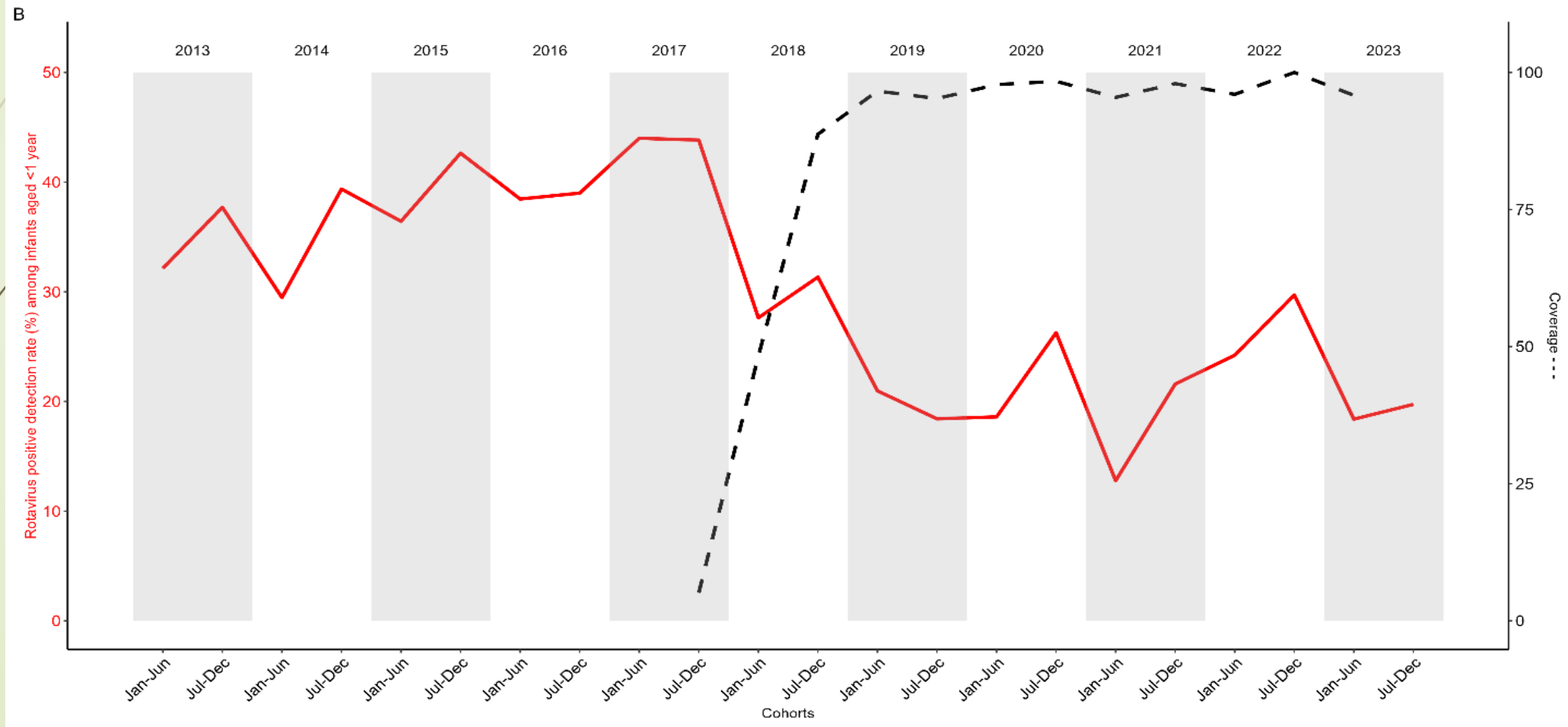
Rotavirus positivity among children aged <5 years visiting hospitals for acute watery diarrhea pre-vaccine era (2013-2017)and post-vaccine introduction (2019-2023) , by year, Kampala, Uganda.

Year	Rotavirus positive/total enrolled (%)	Rate reduction % (95% CI)	P	Adjusted rate reduction % (95% CI)	P
(2013–2017)	1127/2985 (38)	ref		ref	
2019	138/609 (23)	40 (28–50)	<.0001	44 (33–54)	<.0001
2020	97/413 (23)	38 (23–49)	<.0001	43 (29–54)	<.0001
2021	119/523 (23)	40 (27–50)	<.0001	45 (33–55)	<.0001
2022	163/626 (26)	31 (19–41)	<.0001	37 (25–47)	<.0001
2023	96/425 (23)	40 (26–51)	<.0001	54 (32–56)	<.0001

Rotavirus positivity among children aged <5 years visiting hospitals for acute watery diarrhea before (2013–2017) and after (2019–2023) Rotavirus vaccine introduction, **by surveillance site**, Kampala, Uganda

Site	Rotavirus positive/total enrolled (%)	Rate reduction % (95% CI)	P
Mulago			
2013–2017	807/2256 (36)	ref	
2019-2023	161/737 (22)	39 (28–48)	<.0001
Lubaga			
2016–2017	233/528 (44)	ref	
2019-2023	266/1182 (23)	49 (39–57)	<.0001
Naguru			
2016–2017	87/201 (43)	ref	
2019-2023	186/677 (27)	37 (18–51)	0.0005

Association between Rotatrix coverage and Rotavirus positivity.



Discussion

- 10 years of rotavirus surveillance data show an overall reduction of 43% in the proportion of AWD hospitalizations attributable to rotavirus among children <5 years of age in Kampala following the introduction of Rotarix.
- Decreased proportion of AWD hospital visits due to rotavirus were more pronounced among infants <1 year of age compared to reductions seen in older children.
- Reductions in rotavirus detection rates were evident as early as the first-year post-vaccine introduction (2019), and reductions were sustained for an additional 4 years (2020–2023).
- Proportions of those who received >1 dose of Rotatrix vaccine increased from ~5% to 84% with each consecutive cohort of children born during 2017 and 2018, with a noted decline in rotavirus positivity in admission cohorts.

Conclusions

- The reduction in RV positivity was about **50%,** Is comparable to the reduction of 23-76% reported from other studies in similar age groups. **Mwenda ET et al; Impact of rotavirus vaccines in Sub-Saharan African countries. *Vaccine*. Nov 12 2018;36(47):7119-7123.**

- Reductions in the rotavirus detection rates were evident in each of the surveillance hospitals.
- Our highlights the population-level benefits afforded by rotavirus vaccines under conditions of use among young children in Uganda.
- Continued prospective surveillance of rotavirus will be needed given a switch to a new formulation of the vaccine (Rotasil) in Uganda.

Appreciation

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