FOURTEENTH INTERNATIONAL

ROTAVIRUS SYMPOSIUM

MARCH 14–16 **2023** BALI INDONESIA

Learn more on www.sabin.org

Assessment of nutritional status and its association with clinical severity among under five children admitted with diarrhea in India

Dr Namrata Kharat

Research Fellow

The Wellcome Trust Research Laboratory,

Christian Medical College, Vellore

Dr Gayathri S, Ms Ragavi L, Dr Varsha Chaudhary, Dr Venkata Raghava Mohan, Dr Prasanna Samuel, Dr Gagandeep Kang

Outline

- Background
- Objective
- Methods
- Results
- Conclusions

Background

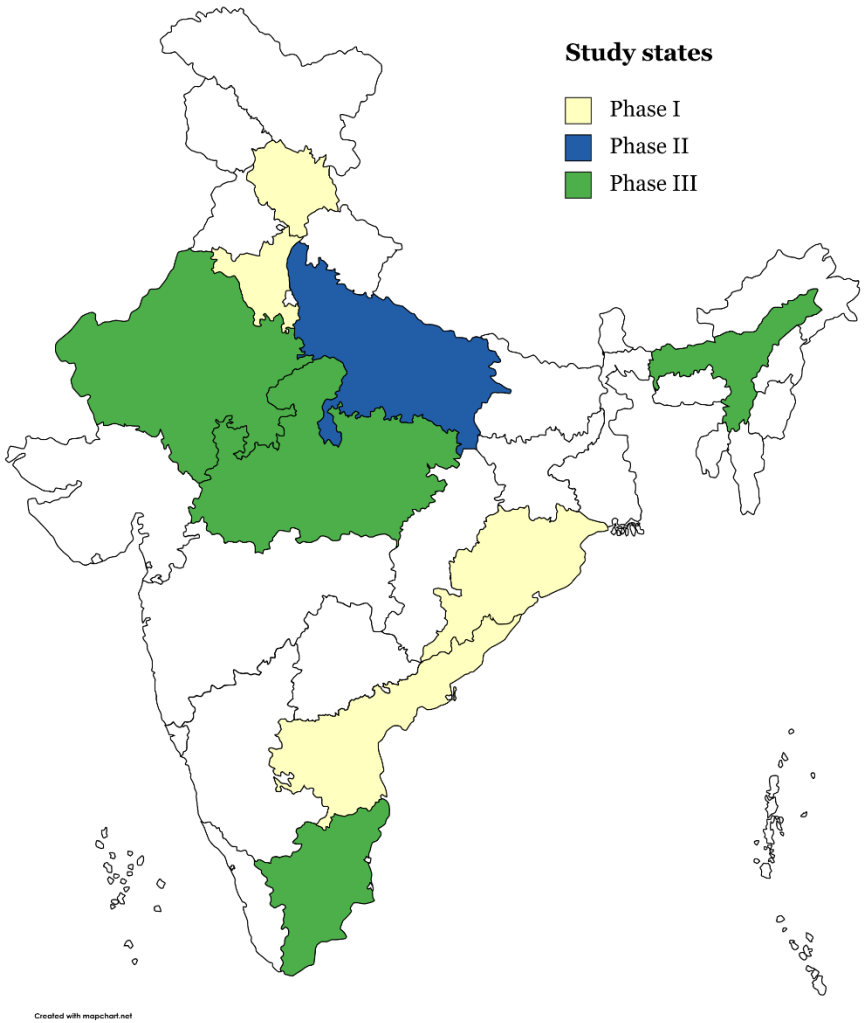
- Diarrhea and malnutrition – globally common causes of morbidity and mortality among under five-year-old children[1]
- Diarrhea accounts for more deaths than those due to AIDS, malaria, and measles in most settings[2]
- Malnutrition contributes directly and indirectly to one-third of non-neonatal deaths by lowering immune response and increasing susceptibility to illnesses like diarrhea which reduces appetite, causes nutritional depletion, as well as impairing absorption[(3-4)]
- Indian children have high burden of 19.3% short-term (acute) and 35.5% long-term (chronic) undernutrition[5]

1. Walker CL, Rudan I, Liu L, et al. Global burden of child- hood pneumonia and diarrhea. Lancet. 2013;381:1405–16. https://doi. org/10.1016/S0140-6736(13)60222-6 PMID: 23582727
2. United Nations Children's Fund. Levels and trends in child mortality, 2011 report. [Internet] New York: UNICEF; 2011. Available at:https://www.unicef.org/media/files/Child_Mortality_Report_ 2011_Final.pdf.
3. Black RE, Victora CG, Walker SP, et al. Maternal and child malnutrition and overweight in low-income and middle- income countries. Lancet. 2013;382:427–51. https://doi.org/10.1016/S0140- 6736(13)60937-X
4. Martorell R, Yarbrough C, Yarbrough S, Klein RE. The impact of ordinary illnesses on the dietary intakes of mal-nourished children. Am J Clin Nutr. 1980;33:345–50. https://doi.org/10.1093/ajcn/33. 2.345.
5. International Institute for Population Sciences. National Family Health Survey (NFHS-5), 2019–21, India Fact Sheet. Mumbai: IIPS. Available at: http://http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf.

Objective

To estimate the burden of undernutrition and its association with clinical severity among under-five children admitted with diarrhea in India

Study states



- 31 hospitals in India collected information and samples from children hospitalized with acute gastroenteritis
- Study conducted as a collaboration between Centers for Disease Control and Prevention, Atlanta; John Snow Inc. India; Translational Health Science and Technology Institute; Faridabad and Christian Medical College, Vellore
- Funded by the Bill and Melinda Gates Foundation

Methods

- Prospective observational surveillance for rotavirus in children under five years of age admitted for acute gastroenteritis (AGE) in 31 hospitals across nine Indian states from 2016 to 2020 (following vaccine introduction in the national immunization programme)
- For all eligible cases, written informed consent was collected from parents /caregivers
- Case report form with sociodemographic, anthropometric and clinical data was completed for all enrolled children
- Clinical severity of AGE was assessed using the modified Vesikari clinical score grading system[6]

6. Ruuska T, Vesikari T. A prospective study of acute diarrhea in Finnish children from birth to 2 1/2 years of age. Acta Paediatr Scand. 1991;80:500–7.

Methods

Children with acute gastroenteritis (AGE) ≤7 days with ≥3 unformed stools/24 hours recruited from sentinel sites

After Informed Consent

Stool samples collected, stored at -20^{0}C and transported to the Referral Lab (CMC Vellore) for ELISA Testing and Genotyping

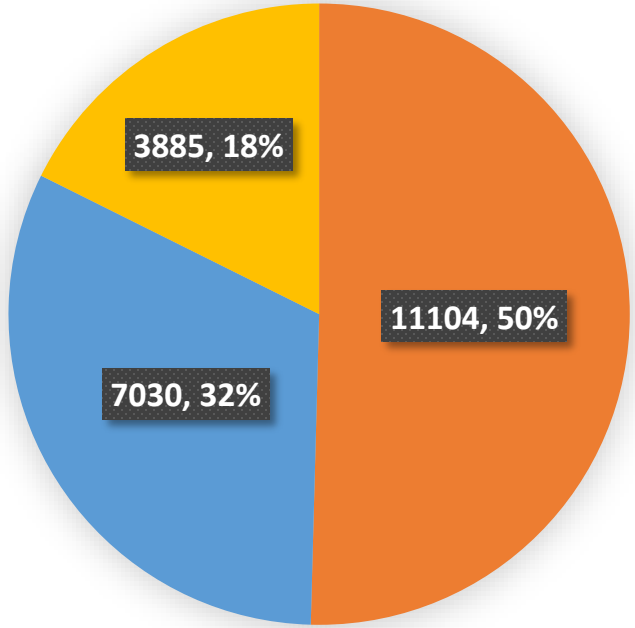
Every month

Results shared with sites; Data entry, cleaning and analysis; monthly report to the investigators; constant monitoring and evaluation of participating sites

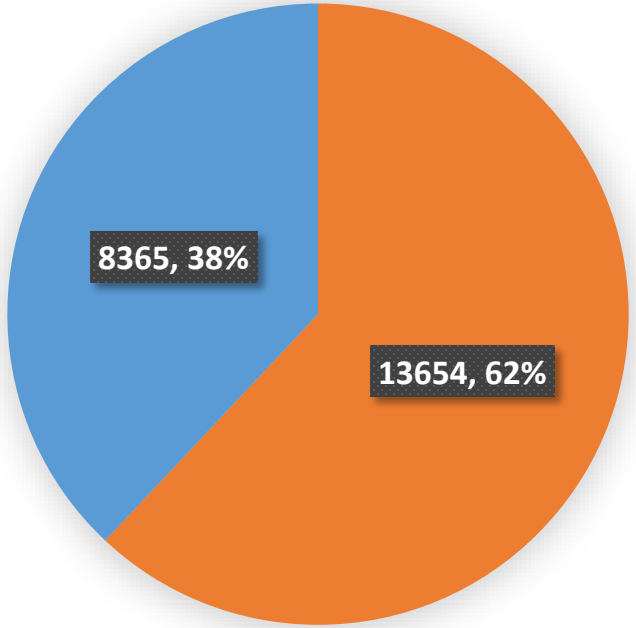
Results

Of the 23732 enrolled cases, 22019 were eligible for analysis.

Age distribution



Gender distribution



Prevalence of undernutrition among under-five children admitted with AGE

Nutritional status	N	Number of children (%)	NFHS-5 %
Wasting (WHZ <−2 SD)	21638	7131 (32.5)	19.3
Stunting (HAZ <−2 SD)	21889	7856 (36.3)	35.5
Malnutrition (MUACZ <−2 SD)	17568	6447 (36.6)	Data unavailable

Prevalence of undernutrition among under-five children admitted with AGE

Nutritional Status	Frequency of characteristics		Chi-square
	Boys	**Girls**	
Wasting (WHZ <−2 SD)	*n= 13429*	*n= 8209*	χ2 = 5.40, df = 2, p=0.067
	4491 (33.4)	2640 (32.1)	
Stunting (HAZ <−2 SD)	*n= 13572*	*n= 8317*	χ2 = 36.68, df = 2, p=**<0.001**
	5072 (37.4)	2784 (33.5)	
Malnutrition (MUACZ <−2 SD)	*n=10880*	*n=6688*	χ2 =27.35, df = 2, p=**<0.001**
	4152 (38.2)	2295 (34.4)	

Clinical severity of diarrhea among under five children hospitalized with AGE (N=22019)

Based on Modified Vesikari Score	Number of children (%)
Mild (<7)	1265 (5.8)
Moderate (7 to 10)	6523 (29.6)
Severe (11 to 15)	13430 (61)
Very Severe (>15)	801 (3.6)

Association of nutritional status with clinical severity of diarrhea among under five children hospitalized with AGE

Variable	Clinical Severity (%)		OR (95% CI)	p value
	Severe to Very Severe (>10) (n=14321)	Mild to Moderate (≤10) (n=7788)		
Wasting (WHZ) n=21638				
Present	4778 (66.2)	2440 (33.8)	1.10 (1.04-1.17)	0.001
Absent	9212 (63.9)	5208 (36.1)		
Stunting (HAZ) n=21889				
Present	4996 (62.7)	2974 (37.3)	0.87 (0.82-0.93)	<0.001
Absent	9138 (65.6)	4781 (34.4)		
Malnutrition (MUACZ) n=17568				
Present	4480 (69.3)	1985 (30.7)	1.18 (1.10-1.26)	<0.001
Absent	7289 (65.7)	3814 (34.3)		

Association of nutritional status with clinical severity of diarrhea among under five children hospitalized with AGE

Variable	Clinical Severity (%)		OR (95% CI)	p value
	Very severe(>15) (n=801)	Mild to severe (≤15) (n=21218)		
Wasting (WHZ) n=21638				
Present	327 (4.5)	6891 (95.5)	1.47 (1.27-1.70)	<0.001
Absent	449 (3.1)	13971 (96.9)		
Stunting (HAZ) n=21889				
Present	315 (4)	7655 (96)	1.16 (1-1.34)	0.03
Absent	474 (3.4)	13445 (96.6)		
Malnutrition (MUACZ) n=17568				
Present	291 (4.5)	6174 (95.5)	1.47 (1.25-1.72)	<0.001
Absent	344 (3.1)	10759 (96.9)		

Conclusions

- Children hospitalized with diarrhoea were more likely to be wasted as compared to children surveyed in NFHS-5
- More boys were hospitalized than girls, probably reflecting prevailing practice for care of children with acute illness
- All forms of undernutrition were significantly associated with severe and very severe acute gastroenteritis
- Other studies have shown that undernutrition can be associated with reduced rotavirus vaccine effectiveness, therefore this is included in the vaccine effectiveness analytic plan

Acknowledgement

Prof. Gagandeep Kang

Bill & Melinda Gates Foundation, USA

CDC, Atlanta, USA

John Snow Inc. India

THSTI, Faridabad

Enrolled children and their families

Site Investigators and field team

WTRL Team, CMC

Data Management Team, CMC

Coordinating Team, CMC