Epidemiology of intussusception among infants in Ethiopia, 2013-2016

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Abstract

Introduction: intussusception is a condition in which one segment of the bowel prolapses into another causing obstruction. Information on the epidemiology of intussusception in sub-Saharan Africa is limited. We describe the sociodemographic and clinical characteristics of children with intussusception in Ethiopia.

Methods: active surveillance for children < 12 months of age with intussusception was conducted at six sentinel hospitals in Ethiopia. Limited socioeconomic and clinical data were collected from enrolled children. Characteristics among children who died and children who survived were compared using the Wilcoxon rank sum test for continuous variables and Chi-square tests for categorical variables.

Results: total of 164 children < 12 months of age with intussusception were enrolled; 62% were male. The median age at symptom onset was 6 months with only 12 (7%) of cases occurring in the first 3 months of life. Intussusception was reduced by surgery in 90% of cases and 10% were reduced by enema; 13% of cases died. Compared to survivors, children who died had a significantly longer time to presentation to the first health care facility and to the treating health care facility (median 3 days versus 2 days, p = 0.02, respectively).

Conclusion: the high mortality rate, late presentation of intussusception cases, and lack of modalities for non-surgical management at some facilities highlight the need for better management of intussusception cases in Ethiopia.
Introduction

A previously licensed rotavirus vaccine in the United States (RotaShield, Wyeth) was associated with an increased risk of intussusception, a condition in which one segment of the intestine prolapses into another causing obstruction. The risk was estimated at 1 excess intussusception case per 10,000 vaccinated infants, and RotaShield was subsequently removed from the US market [1]. Consequently, the World Health Organization mandated careful monitoring for intussusception with subsequent rotavirus vaccines [2]. Post-licensure evaluations for the two currently widely available rotavirus vaccines, RV1 (Rotarix, GlaxoSmithKline) and RVS (RotaTeq, Merck), have identified a low-level increased risk of intussusception following rotavirus vaccination in several high and middle income countries [3-7]. However, no increased risk of intussusception was identified in the 7 days following either dose of RV1 in a pooled analysis of data from seven sub-Saharan African countries, including Ethiopia, in the African Intussusception Surveillance Network [8].

Despite no increased risk of intussusception following rotavirus vaccination in Sub-Saharan Africa, information on the epidemiology of intussusception in Ethiopia is limited. A retrospective study to assess patterns and seasonal variation of pediatric intussusception was conducted in Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa from 2011 to 2014 and found that there was a delay in presentation of intussusception cases and the management was almost purely surgical [9]. The study identified 136 cases of intussusception and of which, 77.7% were <2 years-old and the majority (70.8%) were reduced with surgical intervention [9]. Another study done in 2014 at TASH found a substantial increase in non-operative management of intussusception in the hospital. The use of hydrostatic reduction decreased the surgical intervention rate by three fourth and had a success rate of 87% [10]. In this report, we describe the epidemiology of intussusception cases enrolled as part of the African Intussusception Surveillance Network in Ethiopia.

Methods

Active surveillance for intussusception was conducted at six sentinel tertiary care hospitals across Ethiopia - Assela Teaching Referral Hospital (Assela), Ayeder Referral Teaching Hospital (Mekelle), TASH (Addis Ababa), Dessie Referral Hospital (Dessie), Gondar University Hospital (Gondar), and Hawassa Referral Hospital (Hawassa) - from December 2013 to December 2016, as previously described (Figure 1) [8].

Comparison of characteristics of patients who died versus those who survived

Compared with patients who survived, those who died had a similar sex distribution (63% vs 60% male, p = 0.76) and age at onset (median = 5 months vs 6 months; p = 0.25) (Table 1). The sociodemographic characteristics of the two groups were also similar. Notably, compared to survivors, those who died had a significantly longer time of presentation to the first healthcare facility and to the treating health care facility (median 3 days versus 2 days, p = 0.02, respectively). There were no significant differences in the diagnostic modality used between participants who survived and died (Table 2). No patient who received an enema to reduce the intussusception (n = 16) died. One hospital accounted for 75% of all intussusception cases during infancy occurred in the first 3 months of life. Over half of participants had electricity, television, or a telephone in their homes (Table 1). Fifty-six percent (n = 74/132) of participants were transferred from the initial healthcare facility where they presented at to a sentinel site, with a median transfer time of 0 days (IQR = 0 - 1). Infants with intussusception had a median of 2 days (IQR = 1-3) of symptoms before presenting to a healthcare facility (Table 1). Intussusception was reduced by surgery (90%; n = 137/153) in the majority of cases with 10% (n = 16) being reduced by liquid or air contrast enema (Table 2). Four of the six sentinel hospitals reduced at least one case by enema, but only one hospital performed more than 5 enema reductions during the study period. Of children with a final disposition (n=151) recorded, 87% (n = 131) were discharged home, 1% (n = 1) were transferred to another facility and 13% (n = 19) died.
Significant delays in presentation to health care facilities following onset of symptoms was observed and these delays were associated with an increased risk for mortality. Furthermore, among patients requiring surgery, those who died were more likely to require intestinal resection than those who survived. This is likely because patients who required resection had bowel necrosis and other complications associated with late presentation for treatment. Similar findings have been observed in other African countries [12-15]. Many barriers can contribute to delayed presentations such as rural location, lack of transportation, poverty, patient age, and lack of healthcare literacy. The longer patients delay treatment, the more likely they are to have ischemic bowel, and require surgical resection, which puts patients at risk for mortality.

The mainstay treatment for intussusception in Ethiopia is surgery and 90% of cases in this analysis were treated surgically. While the high surgical rate may reflect clinical need in part due to the late presentation of cases, it may also reflect a reduced comfort with, or lack of availability of, non-surgical management at some facilities. Pediatric surgeons with specialized training and radiographic facilities to guide non-operative management are not available at all hospitals that treat intussusception patients in African countries. Indeed, in our study, one of the six study hospitals accounted for nearly three-quarters of all enema reductions preformed. This aligns with standard of care in the region, including a previous retrospective study done in Ethiopia [9]. Retrospective studies of intussusception in Tanzania and Nigeria showed that 100% and 91% of cases, respectively, were treated surgically with 46% and 9%, respectively, requiring bowel resection [12, 14].

In contrast, enema is often used for diagnosis and treatment of intussusception in the US with success of 83% for pneumatic and 70% for hydrostatic reduction [16]. A 2014 study done at one of our study hospitals, TASH, found that hydrostatic reduction had a success rate of 87% resulting in a decrease in surgical intervention by 75% [10]. Increased availability of radiologic diagnosis and less invasive treatment procedures such as air or hydrostatic reduction enema has resulted in lower mortality rates due to intussusception in many regions of the world [11]. However, high mortality rates have persisted in sub-Saharan Africa, including in Ethiopia, due to lack of qualified personnel for radiologic diagnosis and non-surgical reduction of intussusception [17]. Efforts to increase training in, and availability of facilities for, non-surgical management of intussusception should be explored.

Our analysis has several limitations. First, surveillance was conducted at sentinel teaching and referral hospitals throughout Ethiopia which may not be representative of the diagnosis and treatment of intussusception cases at all hospitals in the country. Similarly, the treatment seeking behaviors of intussusception cases at these facilities may not be representative. Cases from rural areas may die before reaching the hospital and therefore the mortality rate may be underestimated. Finally, the small number of intussusception deaths enabled us to look at crude risk factors for mortality but we were not able to conduct multivariate analyses.

Conclusion
Rotavirus vaccines were not associated with an increased risk of intussusception in a previous evaluation in sub-Saharan Africa. This analysis found that intussusception cases rarely occur in the first three months of life when rotavirus vaccine is recommended for infants. However, the high mortality rate, late presentation of intussusception cases, and lack of modalities for non-surgical management at some facilities highlight the need for better management of intussusception cases in Ethiopia.

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What is known about this topic
- Rotavirus vaccines have been associated with an increased risk of intussusception in some high and middle income countries but not in countries in sub-Saharan Africa;
- Data on the epidemiology of intussusception in sub-Saharan African are sparse.

What this study adds
- Intussusception rarely occurs in the first three months of life in Ethiopia when rotavirus vaccine doses are given;
- Children with intussusception who die are more likely to present later for treatment than children who survive.
Competing interests

The authors declare no competing interests.

Authors’ contributions

AT, KP and JET performed the analyses and prepared drafts. All authors contributed to the conceptualization and protocol development, data collection, and participated in the editing of the manuscript before publication. All authors have read and agreed to the final version of this manuscript.

Disclaimer: the findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the World Health Organization.

References

1. Murphy TV, Gargiullo PM, Massoudi MS, Nelson DB, Jumaan AO, Okoro CA et al. Intussusception among infants given an oral rotavirus vaccine. N Engl J Med. 2001 Feb 22;344(8):564-72.
2. WHO. Safety of Rotarix and Rotatez Vaccines. 2010.
3. Patel MM, Lopez-Collada VR, Bulhhoes MM, De Oliveira LH, Bautista Marquez A, Flannery B et al. Intussusception risk and health benefits of rotavirus vaccination in Mexico and Brazil. N Engl J Med. 2011 Jun 16;364(24):2283-92.
4. Carlin JB, Macartney KK, Lee KJ, Quinn HE, Buttery J, Lopert R et al. Intussusception risk and disease prevention associated with rotavirus vaccines in Australia's National Immunization Program. Clin Infect Dis. 2013 Nov;57(10):1427-34 Epub 2013 Aug 26.
5. Weintraub ES, Bagg J, Duffy J, Vellozzi C, Belongia EA, Irving S et al. Risk of intussusception after monovalent rotavirus vaccination. N Engl J Med. 2014 Feb 6;370(5):513-9 Epub 2014 Jan 14.
6. Yang CF, Chan SP, Soh S, Tan A, Thoon KC. Intussusception and Monovalent Rotavirus Vaccination in Singapore: Self-Controlled Case Series and Risk-Benefit Study. N Engl J Med. 2014 Feb 6;370(5):513-9.
7. Stowe J, Andrews N, Ladhani S, Miller E. The risk of intussusception following monovalent rotavirus vaccination in England: A self-controlled case-series evaluation Ref. No: JVAC-D-16-01124. Vaccine. 2016;34(50):6115.
8. Tate JE, Mwenda JM, Armah G, Jani B, Omoke R, Ademe A et al. Evaluation of Intussusception after Monovalent Rotavirus Vaccination in Africa. N Engl J Med. 2018 Apr 19;378(16):1521-1528.
9. Gadisa A, Tadesse A, Hailemariam B. Patterns and Seasonal Variation of Intussusception in Children: A Retrospective Analysis of Cases Operated in a Tertiary Hospital in Ethiopia. Ethiop Med J. 2016 Jan;54(1):9-15.
10. Warkjira E, Sisay S, Zember J, Zewdneh D, Gorfu Y, Kebede T et al. Implementing ultrasound-guided hydrostatic reduction of intussusception in a low-resource country in Sub-Saharan Africa: our initial experience in Ethiopia. Emerg Radiol. 2018 Feb;25(1):1-6 Epub 2017 Aug 24.
11. Jiang J, Jiang B, Parashar U, Nguyen T, Bines J, Patel MM. Childhood intussusception: a literature review. PLoS One. 2013 Jul 22;8(7):e68482.
12. Archibong AE, Usoro IN, Ikpi E, Iyang A. Paediatric intussusception in Calabar, Nigeria. East Afr Med J. 2001 Jan;78(1):19-21.
13. Carneiro PM, Kisuski DM. Intussusception in children seen at Muhimbili National Hospital, Dar es Salaam. East Afr Med J. 2004 Sep;81(9):439-42.
14. Chalya PL, Kayange NM, Chandika AB. Childhood intussusceptions at a tertiary care hospital in northwestern Tanzania: a diagnostic and therapeutic challenge in resource-limited setting. Ital J Pediatr. 2014 Mar 11;40(1):28.
15. Ekenze SO, Mbgor SO. Childhood intussusception: the implications of delayed presentation. Afr J Paediatr Surg. Jan-Apr 2011;8(1):15-8.
16. Sadigh G, Zou KH, Razavi SA, Khan R, Applegate KE. Meta-analysis of Air Versus Liquid Enema for Intussusception Reduction in Children. AJR Am J Roentgenol. 2015 Nov;205(5):W942-9.
17. Mpabalwani EM, Mwenda JM, Tate JE, Parashar UD. Review of Naturally Occurring Intussusception in Young Children in the WHO African Region prior to the Era of Rotavirus Vaccine Utilization in the Expanded Programme of Immunization. J Trop Pediatr. 2017 Jun 1;63(3):221-228.