ASSESSING CATASTROPHIC HEALTHCARE EXPENDITURES IN THE EMERGENCY SURGICAL CARE OF CHILDREN WITH INTUSSUSCEPTION: INSIGHTS FROM A TERTIARY HOSPITAL IN NIGERIA

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ABSTRACT

Background: **Emergency and essential surgery should be affordable, accessible, and timely. However, this is not the narrative in our setting as patients present late with complications requiring operative treatment which has an attendant healthcare expenditure often tending towards household income depletion. This study assessed the proportion of patients who incurred catastrophic healthcare expenditures following operative treatment for intussusception in our facility. Catastrophic healthcare expenditure was defined as spending >10% of Gross Domestic Product per capita. Health care expenditures were reported in US dollars.**

Materials & Methods: **A prospective cohort study of children 15 years of age and younger who were operatively treated for intussusception at the Paediatric Surgery unit of Federal Medical Centre, Umuahia from January 2017 to December 2020.**

Results: **Sixty-six (84.6%) out of the 78 children who presented with intussusception within the period had 72 laparotomies. Only 6.1% (4/66) of the patients were enrolled in the National Health Insurance Scheme. The insured patients presented earlier than the uninsured patients (median 4 versus 6 days, p=0.04). The median total health expenditure was $458 (Inter Quartile Range $372.4 – $707.1) for the uninsured patients. The total health expenditure exceeded 10% of GDP per capita ($209.71) for all the uninsured patients but not for any of the insured patients, giving an overall catastrophic expenditure rate of 93.9% (62/66). The median daily health expenditure was about one-third of 10% of GDP per capita for those who were uninsured.**

Conclusion: **All the uninsured patients experienced catastrophic health expenditures; with onset from the fourth day on admission. Financial risk protection by implementing payment strategies aimed at reducing user fees to non-catastrophe levels may help.**

Keywords: Catastrophic health expenditure; Children; Intussusception; Out-of-pocket payment.

INTRODUCTION

Acute intestinal obstruction is a priority area as contained in the third edition of the Disease Control Priorities (DCP).[1] Intussusception is the commonest cause of acute intestinal obstruction in infancy and early childhood.[2] Intussusception occurs when a segment of the bowel invaginates into an adjacent part of the bowel leading to ischemic necrosis of the bowel; which can be life-threatening.[1,3] Intussusception has an annual incidence of 34 in 100 000 infants; accounting for 1 death in every 10 admissions in under-5 in Africa.[4] This suggests a significant contribution to infant and under-5 mortality rate.[1,2] A large portion of patients in Africa still present late with complications with a tendency to operative treatment.[2,3-5] It has been noted that the cost of health care for intussusception is higher with delayed presentation. With the over-reliance on out-of-pocket (OOP) expenditure in sub-Saharan Africa, many families are likely to forgo health care rather than experience financial hardship.[3,6-11] This implies a significant threat to Universal Health Coverage and attainment of Sustainable Development Goal (SDG).[3]

Financial risk protection for children requiring emergency surgery guarantees access to safe and quality health services without incurring catastrophic health expenditure which has been defined as out-of-pocket payment of greater than 40% of non-food household expenditure or greater than 10% annual household expenses.[8,12-14] When the annual household expenditure is not known or unreliable, the Gross Domestic Product per capita may be used.[14,15] Three point seven

billion people, globally, are at risk of catastrophic health expenditure if they will require surgery; with 81.3 million people driven to financial catastrophe annually.[15] The risk of experiencing catastrophic health expenditure in the surgical care of children is disproportionately high in the low-and middle-income countries with many households incurring debt, selling assets, anxiety, depression, disruption of family relationships, neglect of siblings and sacrificing basic goods and services including education.[8,10,16-18]

Operative treatment for intussusception like other emergency surgeries in children are unplanned and unavoidable.[3,5] The Global Initiative for Children's Surgery (GICS), in a recent report, stated that data related to financial catastrophe in the surgical care of children is scant.[16] There is a need to quantify the proportion of patients who encounter financial catastrophe in the operative treatment of intussusception. This will guide, inform and advance local, national, regional and global policies on the care of these children especially where financial risk protection is concerned. This study adds to the body of work dealing with the problem of access to timely emergency and essential surgical care for children in Africa. It uncovers the proportion of families who undergo household income depletion in other to get emergency surgical care for intussusception while highlighting the role of healthcare insurance.

Our aim was to assess the proportion of patients who will experience financial catastrophe following operative treatment of intussusception among the insured and uninsured children. We also sought to identify the effect of the health insurance on time to presentation, time to surgery, length of hospital stay and mortality in these patients. We hypothesized that a significant proportion of children's families incur financial catastrophe during hospital admission for operative treatment of intussusception especially those who are uninsured.

MATERIAL AND METHODS

Study design and setting

A prospective cohort study of children 15 years of age and younger who were operatively treated for intussusception at the paediatric surgery unit of Federal Medical Centre, Umuahia from 1st January 2017 to 31st December 2020. This study was conducted in line with Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines. Federal Medical Centre, Umuahia is a public tertiary hospital situated in the South-eastern part of Nigeria with a well-established Paediatric Surgery Unit. The study was approved by the Health Research and Ethics Committee of Federal Medical Center, Umuahia with reference number: FMC/QEH/G.596/Vol.10/545. The minimum sample size for this study was defined using the WHO recommendation of the sample size for health studies[19] and determined to be 59. Using the proportion of children in the low and middle income countries who encountered financial catastrophe following surgical care as estimated in a previous study, 94.9%[16] and a confidence level of 90%; 59 patients will be required to estimate the proportion of patients with catastrophic health expenditure allowing a precision of 5% and an attrition rate of 10%.

Patient recruitment and intervention

At presentation, consecutive patients were clinically assessed and diagnosed. They had fluid resuscitation; electrolyte imbalance and anemia were corrected. The diagnosis of intussusception was confirmed by abdominal ultrasonography. Ultrasound-guided hydrostatic reduction was attempted in the absence of intestinal perforation, peritonitis, gross abdominal distension, prolapsing gangrenous intussusception, failed enema reduction at home or in another facility and non-responsive shock. Patients who did not qualify or had failed hydrostatic reduction with/without perforation proceeded to operative treatment. The type of surgery performed depended on the viability of the bowel, ease of reduction of the intussusception and the overall state of the patient. The patients were followed up for a period of 6 weeks in the paediatric out-patient clinic.

Cost computation

The admission bed fees, cost of surgery and cost of feeding were extracted from the hospital bill for each patient. The cost of medications, hospital consumables, investigations including grouping and cross matching for blood were calculated for each patient using their payment receipts. The cost of feeding, transportation and productivity loss (indirect cost) of the caregiver were not considered in this study.

For the purposes of this study, the total health expenditure for each patient, was the sum of the bed fee, surgery fee, feeding fee, medications expenditure and money expended on hospital consumables, and investigations for the patient. Daily health expenditure, for each patient, was derived by the dividing the total health expenditure by number of days on admission for the patient. Health care expenditures were reported in US dollars. Patients under National Health Insurance Scheme (NHIS) paid only 10% of the fee for items and services that were covered. Items that were covered but unavailable when needed were sought (and fully paid for) from private shops and pharmacies.

The patients who were uninsured relied on out-of-pocket payment and paid fully for all items and services which were used for their care. At the time of the study, the official Naira to U.S. dollar exchange rate was ₦381 to $1[20]; the GDP per capita was $2097.1[21] and the annual minimum wage was ₦360,000 ($944.88).

Study outcomes

The primary outcome was the proportion of patients with catastrophic health expenditure. Catastrophic Healthcare Expenditure was defined as spending >10% of GDP per capita. We used this definition, as was also used in a similar study[14], because we did not have a reliable household expenditure data. Where the household data is unavailable, the Gross Domestic Product per Capita is used.[15] The secondary outcome measure was the effect of the health insurance on time to presentation, time to surgery, length of hospital stay and mortality.

Data management

Data regarding age at presentation, sex, point of referral, distance travelled as measured for point-to-point distance using google maps, time from onset of symptoms to presentation, socioeconomic class based on the overall average score by taking the mean of the occupational and educational scores (as proposed by Oyedeji[22] in 1985), clinical symptoms and signs, time to surgery from admission, treatment given, complications of surgery within 30 days postoperatively, need for reoperation, length of hospital stay, in-hospital mortality, and health expenditure were collected.

Data was analysed with Statistical Package for Social Sciences (SPSS) of IBM SPSS statistics for windows, version 20 (SPSS Inc., Chicago, Illinois). Numerical data was assessed for normality using Shapiro-Wilks test. Categorical variables were described with frequencies and percentages and presented in tables. Numerical variables were expressed with mean ± standard deviation, and median (Inter Quartile Range). T-test, Mann Whitney U test and Fisher's exact test were used as appropriate. All statistical tests were two-tailed. P-value <0.05 was considered statistically significant.

RESULTS

A total of 635 operations were done in the Paediatric Surgery Unit during the period of the study. There were 232 emergency operations and 201 laparotomies (emergencies and elective inclusive). Seventy-eight children presented with intussusception, during the period; 59 patients had laparotomy primarily while 7 patients who had failed saline hydrostatic also had laparotomy. 66 patients had 72 laparotomies for intussusception during the period. Therefore, laparotomy for intussusception represented 35.8% (72/201) of laparotomies within the period. There was no death noted prior to surgical intervention.

The median age at presentation was 6.0 (4 – 27) months. 68.2% were boys and 31.8% were girls giving a male to female ratio of 2.1:1. Majority of the patients (81.8%) were from the middle and lower class. Only 6.1% of the patients were enrolled in the National Health Insurance Scheme; the rest (93.9%) relied on out-of-pocket payment. Most of the patients were

Table 1: Demographic characteristics of the patients

Variables	(N=66)
Age (in months), median (interquartile range)	6.0 (4 – 27)
Sex, n(%)	
Male	45 (68.2)
Female	21 (31.8)
Socioeconomic class, n(%)	
I	4 (6.1)
II	8 (12.1)
III	30 (45.4)
IV	13 (19.7)
V	11 (16.7)
Distance travelled (km), median (interquartile range)	22.9 (2.9 – 70.8)
Time to presentation from onset of symptoms (days), median (interquartile range)	5.0 (4 – 7)
Point of referral, n (%)	
Health center	17 (25.7)
General hospital	11 (16.7)
Private hospital	20 (30.3)
Faith-based hospital	8 (12.1)
Self-referral	10 (15.2)

referred from private hospitals (30.3%) and primary health centers (25.7%). None of the patients presented within 48 hours of onset of symptoms (Table 1).

All the patients had abdominal pain, bilious vomiting, fever and rectal bleeding. Most (74.2%) patients had abdominal distension (Table 2). Mean peak peri-operative temperature was 38.5 ± 0.6°C (range 37.8 – 40.0°C). The haemogram at presentation ranged from 9.4 ± 1.0 (range 7.0 - 11.3). All the patients had dyselectrolytemia, the commonest being hypokalemia - 2.8 ± 0.5 (range 2.1 – 3.4).

Table 2: Clinical features of the patients (N=66)

Clinical feature	Frequency, n(%)
Abdominal pain	66 (100.0)
Bilious vomiting	66 (100.0)
Fever	66 (100.0)
Palpable abdominal mass	22 (33.3%)
Abdominal distension	49 (74.2%)
Rectal bleeding	66 (100.0)
Prolapsed intussusception	7 (10.6)

The time to surgery from admission was 30 ± 11.2 (12 – 48) hours. 6 (9.1%) patients had manual reduction, 60 (90.9%) had resection and anastomosis done. Twelve patients (18.2%) had 14 postoperative complications. The commonest postoperative complication was surgical site infection – 8.3% (Table 3). There were 6 (8.3%) reoperations for anastomotic leak and/or wound dehiscence. Median length of hospital stay was 8.0 (5 – 11). 5 patients died - 3

Table 3: Postoperative complications (N=72)

Complication	Frequency, n (%)
Surgical site infection	6 (8.3)
Wound dehiscence	3 (4.2)
Anastomotic leak	4 (5.6)
Adhesive bowel obstruction	1 (1.4)

following re-operation for anastomotic leak and 2 following overwhelming sepsis - giving a mortality rate of 7.6%. All the patients who had reoperation were uninsured.

Health Expenditure for the uninsured patients (who relied on out-of-pocket payment)
Bed Fee:
Median bed fee was $8.4 (Interquartile range $5.2 – $11.5)
Those who had reoperation paid higher bed fees compared to those who had no reoperation (median $13.1 versus $6.8, p = 0.03).
Surgery Fee:
Median surgery fee was $183.7 (Interquartile range $183.7 – $275.6)
Those who had reoperation paid higher surgery fees compared to those who had no reoperation (median $367.4 versus $183.7, p = 0.03).
Feeding Fee:
Median feeding fee was $21.0 (Interquartile range $13.1 – $28.9)
Those who had reoperation paid higher feeding fees compared to those who had no reoperation (median $32.87 versus $17.1, p < 0.01).
Medications and Hospital Consumables Fee:
Median medications and hospital consumables fee was $175.7 (range $121.0 – $230.4)
Those who had reoperation paid higher medications and hospital consumables fees compared to those who had no reoperation (median $250 versus $134.0, p < 0.01).

Median Investigations including Grouping and crossmatching of Blood fee was $55.4
(Inter quartile range $53.0 – $57.7)

Those who had reoperation paid higher investigations including Grouping and crossmatching of Blood fees compared to those who had no reoperation (median $62.0 versus $55.0, p = 0.01).

Catastrophic Health Expenditure
Median total health expenditure was $458 (Interquartile range $372.4 – $707.1). The total health expenditure exceeded 10% of GDP per capita ($209.71) for all the patients. The median daily health expenditure was $71.8 which was 34.2% of 10% of GDP per capita.

Insured Patients
The insured patients presented earlier than the uninsured patients (median 4 versus 6 days). However, there was no difference between the insured and uninsured patients with reference to time to surgery (16.7 ± 5.1 versus 30.6 ± 13.2), length of hospital stay (median 7.5 versus 9.5 days) and mortality (25% (1/4) versus 6.5% (4/62)).

Median total health expenditure was $73.9 (Interquartile range $60.5 – $106.2). Some of the insured patients relied on out-of-pocket payment for medications and hospital consumables. The total health expenditure was less than 10% of GDP per capita ($209.71) for all the insured patients.

DISCUSSION
We found that the total health expenditure exceeded 10% of GDP per capita ($209.71) for all the uninsured patients. The median daily health expenditure was about

one-third of 10% of GDP per capita for those who were uninsured. This means that the onset of financial catastrophe was from about the fourth day on admission for this group of patients. Among the uninsured patients, those that had reoperation had a significantly higher bed fee, surgery fee, feeding fee, medications and hospital Consumables fee, and investigations including grouping and crossmatching of blood fee. Those who were insured were protected from catastrophic health expenditure.

All the uninsured patients encountered catastrophic health expenditure. There was no form of prepayment risk pooling to ensure financial risk protection. Seyi-olajide *et al.*[14], made a similar observation in their study of 32 Nigerian children who required emergency laparotomy for typhoid intestinal perforation. However, all patients in their study, insured and uninsured, encountered financial catastrophe; only 3.1% (1/32) of their patients had health insurance. This is different from what was obtained in this study where the patients who were insured were protected from financial catastrophe. The National Health Insurance Authority (NHIA) formerly known as National Health Insurance Scheme (NHIS) was signed into law in May, 2022 under the NHIA Act by the Federal Government of Nigeria to improve access to quality health care.[23] NHIS only had a coverage of <5% of Nigerians who were mainly in the formal sector in a country of over 200 million people with over 33% unemployed and over 80% of those who are employed, self-employed.[23,24] This was evident in this study where over 80% were from the middle-and low-income group and only 6.1% (4/66) were insured. NHIA emerged to ensure the inclusion of the unemployed people and those in the informal sector.[23] The situation is slightly different in Ghana; Stewart *et al* [25] reported that 70% of the patients in their study were insured, although, 54% of the patients still encountered financial catastrophe. This may be because health insurance does not cover all the items and services required for quality health care. A study done among children who required surgical care in Uganda reaffirmed this as health insurance did not cover some diagnostic imaging investigation required for some of their patients.[26] Our patients who were insured had adequate coverage of required items and services but they had to pay out of pocket when some items were not available in the hospital.

Patients who had reoperation significantly paid more hospital bills compared to those who did not have reoperation. Other studies noted a similar finding.[14,27] As expected, the hospital stay is longer, another surgery fee will have to be paid and more medications, hospital consumables and investigations including grouping and cross matching of blood will be done. Reoperation is a risk factor for catastrophic health expenditure.[10,27] Low socioeconomic status, rural residence, and utilization of a private health care provider are other significant determinants of catastrophic health expenditure.[10,28] The risk of financial hardship is highest in sub-Saharan Africa where most of the patients rely on out-of-pocket payment.[7,8] The odds of incurring catastrophic health expenditure were found to be 17 times more in the low and middle income countries.[16] This was established in a survey of members of the Global Initiative for Children's Surgery where it was found that only 5.1% of patients in the low-and middle-income countries were able to pay for their direct medical costs with the assistance available to them.[16] This is similar to findings of the current study. According to a recent report, 63% of persons living in Nigeria are multi-dimensionally poor[29], hence there is an urgent need to curtail the ranks of catastrophic health expenditure.

On the road to universal health coverage, the mandate of the National Health Insurance Authority (NHIA) to ensure inclusion of those who are not in the formal sector should be backed up by conscious efforts by the Government. Other prepayment financial risk pooling mechanisms should be employed locally to ensure user fees are subsidized.[30] It has been suggested that the cost of health care for emergency abdominal surgeries done at the District and General hospitals tend to be less compared to what is obtainable at the tertiary hospitals.[14] The Optimal Resources for Children's Surgical Care (OReCS) which provides guidelines for different levels of care, stipulates that intussusception should be managed at the secondary level of care.[31] However, in our setting, most cases of intussusception are managed at the tertiary and private hospitals due to poorly functioning secondary level of health care. There is a need to scale up effective and efficient health services in the secondary level of health care. The Abuja declaration of 2000 where African Union member states met in Abuja, Nigeria and committed to allocate 15% of their budget to health should be upheld.[32] This will greatly decrease the number of people using out-of-pocket payment. The participation of the Non-Governmental Organizations (NGOs) in health care financing in Africa should be encouraged.[33]

This study is limited by the fact that the cost of transportation (cost of getting to care) and follow up were not considered. Also, the indirect cost to the parents of these ill children was not taken into consideration. This suggests that the total health care cost was underestimated. However, we were able to show that all the uninsured patients incurred financial

catastrophe. Moreover, we were not able to identify the source of funds for out-of-pocket payment as some parents might have borrowed money or sold assets in order to pay hospital bills. Despite, these limitations we believe this study has created the consciousness on the urgent need to protect the caregivers of children requiring emergency laparotomy for intussusception, in Africa, from catastrophic health expenditure.

CONCLUSIONS

All the uninsured patients experienced catastrophic health expenditures; with onset from the fourth day on admission. Health insurance protected the insured patients from financial catastrophe. Financial risk protection by implementing payment strategies aimed at reducing user fees to non-catastrophe levels may help including increase in coverage of the population by NHIA should be made. Locally-adapted, sustainable surgical care financing models for children in the low and middle income countries should be the focus of future research.

Authors' contribution

IC contributed to the study conception or design; the acquisition, analysis, or interpretation of data; and drafting. UE, SE, LO, CU and CI-C revised it critically for important intellectual content. All authors commented on previous versions of manuscript. All authors approved the version to be published and agreed to be accountable for all the aspects of the work.

Declaration of competing interest

The authors declare no conflicts of interest

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