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Success and Recurrence Rate of Hydrostatic Reduction and its Associated Factors Among Intussusception Patients in Tibebe Ghion Specialized Hospital, Northwest, Ethiopia

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**SUCCESS AND RECURRENCE RATE OF HYDROSTATIC REDUCTION
AND ITS ASSOCIATED FACTORS AMONG INTUSSUSCEPTION PATIENTS
IN TIBEBE GHION SPECIALIZED HOSPITAL, NORTHWEST, ETHIOPIA**

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**A THESIS RESEARCH SUBMITTED TO BAHIR DAR UNIVERSITY,
COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF
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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
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NOVEMBER 2022

BAHIR DAR, ETHIOPIA

Declaration

This is to certify that the thesis entitled “success and recurrence rate of hydrostatic reduction of intussusception in Tibebe Ghion Specialized Hospital, Northwest Ethiopia from January 1, 2021 to August 30, 2022, submitted in partial fulfillment of the requirements for the specialty in General surgery. The record of original work carried out by me and has never been submitted to Bahir Dar University or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Dr. Abrham Molla(MD)

Name of the candidate

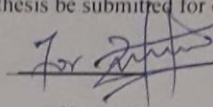
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Approval of the advisors

I hereby certify that I have supervised, read, and evaluated this thesis titled "success and recurrence rate of hydrostatic reduction of intussusception in Tibebe Ghion Specialized Hospital, Northwest Ethiopia from January 1, 2021 to August 30, 2022" by Dr. Abrham Molla prepared under my guidance. I recommend the thesis be submitted for oral defense.

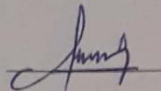
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Abbreviations and acronyms

AOR	Adjusted Odds Ratio
CI	Confidence Intervals
EPHI	Ethiopian Public Health Institute
IRB	Institutional Review Board
LMICs	Low Middle Income Countries
SD	Standard Deviation
SPSS	Statistical Product and Service Solutions
SSA	Sub Saharan Africa
TGSH	Tibebe Ghion Specialized Hospital
GIT	Gastrointestinal Tract

Abstract

Background: Intussusception is the second most common cause of gastrointestinal obstruction in infants and children. Non-operative; hydrostatic reduction of intussusception is well established in developed countries, its practice in developing countries including Ethiopia is less common due to late presentation, lack of facilities and appropriate expertise. In Ethiopia, there is limited studies because most common management of pediatrics intussusception is operative currently non-operative management becomes the gold standard and increasing practice.

Objective: This study aims to assess success, recurrence rate and its associated factors of hydrostatic reduction of intussusception in Tibebe Ghion Specialized Hospital (TGSH), Northwest Ethiopia from January 1, 2021 to August 30, 2022”.

Methods: Institutional based cross sectional study was employed among 110 intussuscepted pediatrics patients who had undergone hydrostatic reduction from January 1, 2021 to August 30, 2022 at TGSH in Bahir Dar City. Data were collected by reviewing patient charts using a census sampling method. Data were entered into the Epi data version 3.1 and exported to SPSS version 23 for further analyses. A binary logistic regression model was fitted to identify the associated factors. Bi-variable and multivariable regressions were performed and adjusted odds ratio (AOR) with its 95% confidence intervals (CI) was estimated to identify the factors associated with the success and recurrent rate of hydrostatic reduction.

Results: This study 110 patient charts was included out of 120 charts. This study show that; 14(12.7%, 95% CI: 6.4-19.1%) and 10(9.1%, 95% CI: 4.5-14.5%) of hydrostatic reduction procedure was failed and recurrent respectively. Rural residence (AOR=9.04, 95% CI: 1.41-57.78), and visible abdominal mass (AOR=15.15, 95% CI: 1.79-128.10), procedure takes more than 10 min (AOR=30.28, 95% CI: 2.52-363.67) were significantly affects the outcomes of hydrostatic reduction

Conclusions: The rate of failed hydrostatic reduction and recurrent intussusception was comparable to similar studies. Rural residences, visible abdominal mass, and duration of procedure were significantly associated with the outcomes of hydrostatic reduction.

Keyword: Intussusception, hydrostatic reduction, Bahir Dar, Success rate, recurrence rate

1. Introduction

1.1 Background

Intussusception is the invagination of a portion of the intestine into the lumen of the immediately adjoining part (1-3). Intussusception is one of the most frequent causes of intestinal obstruction in infants and children(4). It can lead to vascular compromise, necrosis of the intestine, and death when not reduced by enema or during surgery(5). Intussusception is common in 1-2 years and in male children (6, 7). The common types of intussusception are ileocolic, ileo-ileal, and colo-colic (7, 8). In 1876, Hirschsprung first reported the technique of hydrostatic reduction(9).

Approximately, 90% of pediatric intussusceptions are primary or idiopathic(2, 3). Some cases of naturally occurring intussusception are caused by anatomical lead points. Studies identified that intussusception caused by adenoviruses, human herpes viruses(10), intussusception can also occur after respiratory or gastrointestinal infections(6). Intussusception is seen after structural lesions of the gastrointestinal tract; lymphadenopathy, an appendix related condition was seen in intussusception patients(6).

The diagnostic method of intussusception is ultrasound as the primary modality for diagnosis in all the patients(11). The most common clinical signs and symptoms of intussusception include; vomiting, abdominal distention, abdominal cramp, diarrhea, lethargy, abdominal mass(12, 13), fever, and bloody stool.

Management of intussusception can be operative or non-operative management(14). Some intussusception cases may resolve spontaneously. Study shows that, the first treatment option for intussusception remains non-operative management using an air enema was successful in 79.5% of cases(11). Delayed diagnosis leads to an increased number of open surgeries(14).

Hydrostatic reduction of intussusception is performed with barium, iodinated contrast material, water, or saline solution and carries the risks of electrolyte disturbances and contamination(15). Non-operative; hydrostatic reduction of intussusception is well established in developed countries, its practice in developing countries including Ethiopia is less common due to late presentation, lack of facilities and appropriate expertise. In Ethiopia, the most common management of pediatrics intussusception is operative(16), currently non-operative management becomes the gold standard and increasing practice.

1.2 Statement of the problem

In children, intussusception is the second most common cause of gastrointestinal obstruction, after pyloric stenosis, and results in annual hospitalization rates of at least 56 per 100,000 according to United States National Hospital Discharge Data(17).

A study in India shows the location of intussusception was ileo-colic in 85% of the cases. Nearly 54% cases were treated conservatively and 46% needed surgical intervention(18).

Early diagnosis and treatment is important however, if the diagnosis is delayed beyond 48h, complications and mortality could be higher(19). The cause of intussusception is known to be idiopathic but can also occur after respiratory or gastrointestinal infections, and is associated with various diseases such as lymphoma, Meckel's diverticulitis, and polyps(20). In China, the recurrent intussusception is relatively common. Delays in the diagnosis of intussusception and reduction can lead to serious complications, including bowel ischaemia, perforation and peritonitis(21).

In LMICs the mortality rate of pediatrics intussusception was 3.57% of all deaths. Among them, 54.17% of died before any intervention; 41.67% of died after surgery with no hydrostatic reduction attempted previously; and 4.17% of died following surgery after failed attempt of hydrostatic reduction(22).

In Ethiopia, intussusception was the second leading cause of pediatrics surgical admission (13.9%) and the management of pediatrics surgical patients was 67.8% operative, 25.1% non-operative and 7% conservative intervention (23). In Yirgalem Hospital, intussusception was the leading cause of surgical pediatrics patient admission 14.1%(24). In Ethiopia, particularly in the Amhara region, there are limited studies on the successes and recurrent rate of hydrostatic reduction of intussusception in children.

In Ethiopia pediatrics intussusception is the leading cause of children mortality and morbidity. Even though hydrostatic reduction of intussusception management is the gold standard management of intussusception, it is less common. Tibebe Ghion Specialized Hospital (TGTH) is the only hospital that manages intussusception non-operatively (hydrostatic reduction). Thus determining the success and recurrent rate of hydrostatic reduction of intussusception and

identifying their associated factors among children attending the TGSB is essential to plan informed decisions to solve the problem and narrow literature gaps in the fields.

1.3 Significance of the Study

This study is important to provide crucial information about the success and recurrence rate of hydrostatic reduction of intussusception in children. The finding of this study will be identifying the factors of success and recurrence rate of hydrostatic reduction of intussusception. This should help the physician and the patient to choose better treatment options.

The findings of this study will be used as inputs for program implementers at national as well as regional levels to improve treatment outcomes of hydrostatic reduction. This study can be used to guide a clinician for choosing the appropriate managements of intussusception.

Therefore, this study used as an input for other researchers to do further analysis.

2. Literature review

2.1 Success rate of enema reduction

A meta-analysis study in air versus liquid enema for intussusception reduction in children show that the enema reduction success rate in 44 studies of air enema (82.7%) was significantly higher than that for liquid enema (69.6%) (15). A study in LMICs hydrostatic reduction was attempted in 71.89% patients, and it was successful in 82.37% patients. The remaining 17.62% patients needed surgery. Although the median age of this cohort of 312 patients was 8 months, median ages of the patients with successful and failed hydrostatic reductions during this period were 9 and 7 months, respectively(22).

2.2 Recurrence rate

A meta-analysis study in air versus liquid enema for intussusception reduction in children show that the rate of first intussusception recurrence were 6.0% in air enema and 7.3% in liquid enema. Recurrence rate within 48 hours after enema reduction were 20% in air enema and 21% in liquid enema(15).

A study in China, a total of 45.5% of the recurrent cases experienced only one recurrence, 54.5% experienced multiple recurrences and the early recurrence rate (recurrence within 24hours) was 6.2%(21).

2.3 Complication

A meta-analysis study in air versus liquid enema for intussusception reduction in children show that enema perforation rate in undergoing air enema was 0.39% and undergoing air enema and liquid enema showed no significant difference in perforation rate (15). A study in LMICs the mortality rate of after hydrostatic reduction undergo was 0.15% died, and 1.49% died after surgery (22).

A study in Tikur Anbesa Hospital showed that 96.7% of surgical pediatrics patients were discharged cured or improved without major disabilities documented and 2% died(23).

2.4 Associated factors

2.4.1 Sociodemographic factors

A national wide study in Korea shows that; the number of males was almost twice (64.0%) the number of female (36.0 %) patients, and 82.7% was aged between 2 and 36 months. The

incidence per 100,000 individuals aged up to 2 years was 196.7. Infectious diseases were more common in the younger children, while systemic diseases were more common in the older(25).

A study in LMICs the ratio of boys to girls was 2.46:1.0, and their ages ranged from 1 month to. The median ages of the patients with successful and failed hydrostatic reductions were 9 and 7 months, respectively(22).

A study in China, the median age of the patients was 2 years (80 days–11 years), and 61.26% of patients were male. Age (>1year) were significantly predictive of recurrent intussusception and there was no seasonal pattern of recurrence (21). A study in India shows that majority of intussuscepted patients were males (71%), infants (69.5%), and more in summer season(18).

In Sub Saharan Africa (SSA) the age distribution of intussusception in the first year of life with cases peaking at 4-6 months of age. However, not all countries that undergo surgery and often require bowel resection for the treatment of intussusception, and show the variability of treatment outcomes in different countries(26).

A study in Tikur Anbesa Hospital showed that the pediatrics surgical patients present after 5 days of illness (40%), and >3 days in (53.4%), only 19.6% of them come within 24 hours of the illness. The majority of pediatrics surgical patients were in the age group of 3-5 years (72.2%), 16.7% were 5 years old or above and 11.1% were less than 3 years of age. About 66.5% were males (23).

2.4.2 Clinical related factors

A national wide study in Korea shows that; the number of patients with structural lesions of the gastrointestinal tract (GIT) that could lead to intussusception was 1207 (4.8%), while patients with acute gastrointestinal infectious disease were 4541 (18.1%). Among the structural lesions of the GIT that could be the leading cause of intussusception, lymphadenopathy (56.6%) was the most common seen in patients and an appendix-related condition was (31.9%) patients(25).

A study in China shows that symptom duration (≤ 12 hours), Meckel's diverticulum, polyps, tumors the absence of vomiting, mass location (right abdomen) and pathological lead points were significantly predictive of recurrent intussusception(21).

A systematic review and meta-analysis study shows that shorter duration of symptoms (< 24hr and abdominal pain were associated with the success. Age < 1 year, fever, rectal bleeding, and

vomiting were associated with the failed reduction. The ascites, left-sided intussusception, and trapped fluid on US were associated with the failed reduction(27).

2.5 Conceptual framework

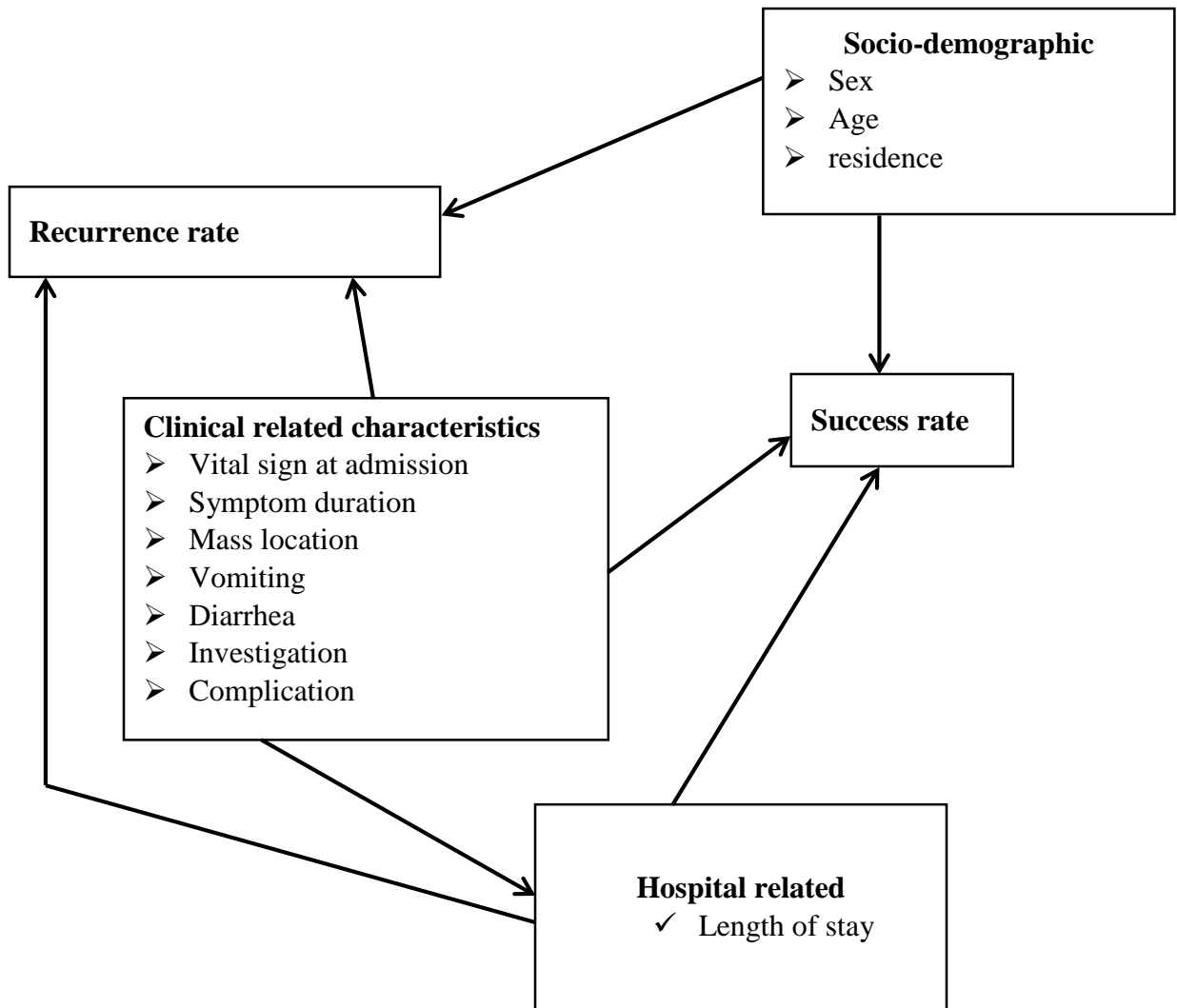


Figure 1: conceptual framework

3. Objectives

3.1 General Objective

- To assess the success rate, recurrence rate and associated factors of hydrostatic reduction of intussusception in Tibebe Ghion Specialized Hospital, Northwest Ethiopia from January 1, 2021 to August 30, 2022.

3.2 Specific Objectives

- To estimate the success rate of hydrostatic reduction of intussusception management in TGS
- To estimate the recurrence rate of hydrostatic reduction of intussusception in TGS
- To identify the associated factors of hydrostatic reduction of intussusception in TGS

4. Methods and materials

4.1 Study Area and Period

The study was conducted in TGSB from April 20 to May 20, 2022. TGSB found in Bahir Dar city is the capital city of Amhara regional state, found in northwest Ethiopia, 565 Km far from Addis Ababa; the capital city of Ethiopia.

Bahir Dar city, there are three hospitals; one general (Addis Alem) and two referral hospitals (FHCSB and TGSB). A Bahir Dar city government hospital serves more than 7 million populations. TGSB surgery department has 100 surgical beds and equipped with 31 surgeons; one Gastrointestinal, two hepatobiliary, one head and neck, two uro-surgeons, one neurosurgeon, two pediatrics surgeon, two fellow and nineteen general surgeon and forty seven residents.

4.2 Study Design

An institutional-based retrospective cross-sectional study was conducted

4.3 Population

4.3.1 Study population

All intussuscepted pediatrics patients admitted and treated from January 1, 2021 to August 30, 2022 were as study populations.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All intussuscepted pediatrics patients who had undergone hydrostatic reduction in the study period were included.

4.4.2 Exclusion criteria

Patients with incomplete documentation and unknown discharge results were excluded.

4.5 Variables of the Study

4.5.1 Dependent variables

- Success rates
- Recurrent rate

4.5.2 Independent variables

❖ Socio-demographic characteristics including;

- ✓ Sex
- ✓ Age
- ✓ Residence

❖ Clinical related characteristics

- ✓ Vital sign at admission
- ✓ Vital sign at admission
- ✓ Symptom duration
- ✓ Mass location
- ✓ Vomiting
- ✓ Diarrhea
- ✓ Investigation
- ✓ Complication

❖ Hospital related variables:

- ✓ length of hospital stay

4.6 Operational definition and term definitions

Recurrent rate: the recurrence of intussusception after air enema reduction

Signs of success rate: the mass is disappear and the saline is passing the ileocecal valve on ultrasound

Hydrostatic reduction: a method of intussusception reduction using ultrasound guiding with tap water, normal saline or Ringer's lactate solution.

4.7 Sample size determination and sampling procedure

TGSH was included based on adequate information it has been provided and its number of patients flow for the study area. From the registration log book there were 120 intussuscepted children charts diagnosed and who underwent hydrostatic reduction from January 1, 2021 to August 30, 2022. All patients during the study period were included.

4.8 Data collection tools and methods

Data were collected by chart review retrospectively using structured pre-tested questioners and checklist. The English language version questioners and checklist was used that adapted from different pieces of literature. The questionnaire and checklist contain; socio-demographic, disease and clinical characteristics. The data were collected by trained two BSc Nurses and supervised by the principal investigator.

4.9 Data quality control

Before the actual data collection, data collectors will be trained intensively on the contents of the questionnaire, checklist, data collection methods, and ethical concerns. Therefore, data collectors become familiar with the questionnaire.

Five percent of the sample was pre-tested and the questionnaire was modified and edited based on the findings. During data collection, the principal investigator have checked the data for its completeness and missing information at each point. Furthermore, data were checked during entry and compilation before analysis.

4.10 Data Processing and Analysis

The collected data were coded, entered into EPI data version 3.1 software, and exported to statistical product and service solutions (SPSS) version 23 software packages for further

analysis. Descriptive statistics were used to summarize the data in the form of frequency, mean, standard deviation (SD), and cross-tabulation. A binary logistic regression analysis was carried out to identify the association between the outcome variable and independent variables.

Variables with P-value <0.25 in bi-variable logistic regression were used for multivariable logistic regression. A p-value <0.05 were considered statistically significant. Adjusted odds ratio (AOR) with 95% confidence intervals (CI) was used. Model fitness tests were checked using Hosmer-lemeshow goodness of fit to assess whether the necessary assumptions are fulfilled.

4.11 Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of the College of Medicine and health sciences, Bahir Dar University, Ethiopia. Then legal official letter was written to the TGSB.

Confidentiality was secured by avoiding writing the patient's name and the data will not give to the third person. The data extractions were conducted in a separate room. Moreover, confidentiality was secured during data collecting, analyzing, and reporting.

4.12 Dissemination of the Result

The plan of dissemination of the research result includes a presentation at Bahir Dar University College of Medicine and Health Sciences, Research Conferences. The report paper will also be disseminated to, Bahir Dar city health administration and regional health bureau. Publication in Scientific journal and online dissemination will also be considered.

5. Results

5.1 Socio-demographic characteristics

In this study 110 patient charts were included out of 120 charts, 10 incomplete and missed charts were excluded. About 70(63.6%) of the patients were urban residence, and 73(66.4%) were male. The mean age was 11.85 ± 7.22 (means \pm SD) with a range 3 to 72 months and 49 (44.5%) patient's age was 13-59 months (Table 1).

Table 1: Socio-demographic characteristics of hydrostatic reduction of intussusception in TGSH, Northwest Ethiopia, 2022

Variables	Categories	Frequency	Percentage
Residence	Urban	70	63.6
	Rural	40	36.4
Sex	Male	73	66.4
	Female	37	33.6
Age in months	0-6 months	16	14.5
	7-12 months	45	40.9
	13 -59 months	49	44.5

5.2 Clinical related characteristics

This study revealed that 62.8% of patients arrived after 24 hours, 10.9% of patients has visible abdominal mass, 88.2% of patients were presented with ileocolic intussusception and 35.5% of patients' the location of intussusceptions were hepatic flexure. From the clinical symptoms, 77.3% of patients had vomiting, 15.5% had fever, 95.5 % had abdominal cramping, 26.4% had diarrhea, and 49.1% had abdominal distention. Moreover, 36.4%, 22.7%, 17.3% of patients had history of URTI, history of diarrhea and history of both URTI and diarrhea respectively. The general appearances of 96.4% of patients were active and 16.4% of patients had some DHN (Table 2).

Table 2: Clinical related characteristics of hydrostatic reduction of intussusception in TGSB, Northwest Ethiopia, 2022

Variables	Categories	Frequency	Percentage
Symptom duration in hours	<24 hours	41	37.3
	24-48 hours	37	33.6
	49-72 hours	24	21.8
	73-96 hours	4	3.6
	>96hours	4	3.6
Visible abdominal mass	Yes	12	10.9
	No	98	89.1
Type of intussusception	ileocolic	97	88.2
	Others ^a	13	11.8
Location of intussusception	Ascending colon	36	32.7
	Descending colon	12	10.9
	Hepatic flexure	39	35.5
	Splenic flexure	23	20.9
Vomiting	Yes	85	77.3
	No	25	22.7
Bloody diarrhea	Yes	29	26.4
	No	81	73.6
Palpable abdominal mass	Yes	64	58.2
	No	46	41.8
Abdominal Cramp	Yes	105	95.5
	No	5	4.5
Abdominal distention	Yes	54	49.1
	No	56	50.9
History of URTI	Yes	40	36.4
	No	70	63.6
History of diarrhea?	Yes	25	22.7
	No	85	77.3
History of URTI & diarrhea?	Yes	19	17.3
	No	91	82.7
Fever	Yes	17	15.5
	No	93	84.5
General appearance	Active	106	96.4
	Lethargic	4	3.6
CVS	No DHN	92	83.6
	Some DHN	18	16.4

^a ileocolocolic, ileo-ileocolic, Colo-colic

Vital sign

Doppler ultrasound was done for all patients and the finding was viable. All patients pulse rate and respiration rate was normal heart beat, 93(84.5%) patients had temperature $\leq 37.5^{\circ}\text{C}$ and only 17(15.5%) patients had $>37.5^{\circ}\text{C}$. CBC was done for all intussuscepted patients; 71(64.5%) of patients WBC was normal, 87(79.1%) of platelet was normal and 109(99.1%) patients hemoglobin was greater than 10g/dL (Table 3).

Table 3: Vital sign and investigation profile of hydrostatic reduction of intussusception in TGSH, Northwest Ethiopia, 2022

Variables	Categories	Frequency	Percentage
Temperature	$\leq 37.5^{\circ}\text{C}$	93	84.5
	$>37.5^{\circ}\text{C}$	17	15.5
WBC	Leucopenia	6	5.5
	Normal	71	64.5
	Leukocytosis	33	30.0
Platelet	Thrombocytopenia	7	6.4
	Normal	87	79.1
	Thrombocytosis	16	14.5
Hemoglobin	$\leq 10\text{g/dL}$	1	0.9
	$>10\text{ g/dL}$	109	99.1

Ninety two (83.6%) of hydrostatic reduction was a single attempt, of 14 failed hydrostatic reduction 7(50%) managed by manual reduction, and 7(50.0%) bowel resection and anastomosis was done. The leading point was LAP 6(85.7%) and 1(14.3%) Meckel's diverticulum. More than half 60(54.5%) of hydrostatic reduction took 5-10 minutes and the mean duration of procedure was 12.92 ± 5.09 with a range of 5 to 25 minutes. 91(82.7%) of patients discharged after one day. The average length of hospital stay was 1.54 ± 1.34 with a range of 1 to 6 days (Table 4).

Table 4: Management of intussusception in TGSH, Northwest Ethiopia, 2022

Variables	Categories	Frequency	Percentage
Number of attempt	1 times	92	83.6
	2 times	18	16.4
Type of management for failed hydrostatic reduction	Manual reduction	7	50.0
	Bowel resection	7	50.0
Leading point	LAP	6	85.7
	Meckel's diverticulum	1	14.3
Duration of procedure	5-10 minutes	60	54.5
	>10 minutes	50	45.5
Length of Hospital stay	1 day	91	82.7
	>1 day	19	17.3

5.3 Success rate of hydrostatic reduction

About 14(12.7%, 95% CI: 6.4-19.1%) of hydrostatic reduction procedure was failed, and patients of this 7 manual reduction 7 bowel resection was done. There was no complication. The leading points were LAP and Meckel's diverticulum (Fig 2).

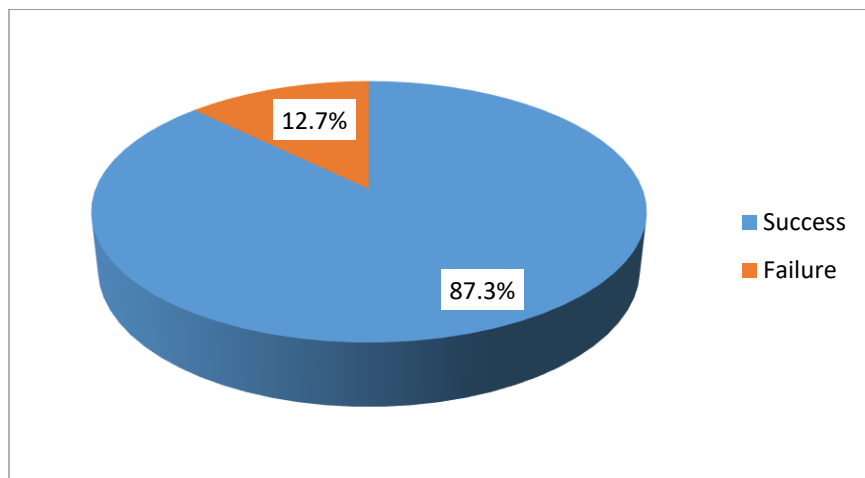


Figure 2: Success rate of hydrostatic reduction, TGSN Northwest, Ethiopia 2022

5.4 Recurrent rate of hydrostatic reduction

The recurrent rate of hydrostatic reduction was of 10(9.1%, 95% CI: 4.5-14.5%) All recurrent hydrostatic reduction was managed with hydrostatic reduction. All recurrent intussusception patients were ileocolic types of intussusception the level of location was 4(40.0%) ascending colon, and 4(40.0%) hepatic flexure. All recurrent intussuscepted patients presented with a complaint of abdominal cramping and have not abdominal mass. Five (50.0%) of recurrent patients had abdominal distention and 6(60.0%) patients had history of URTI.

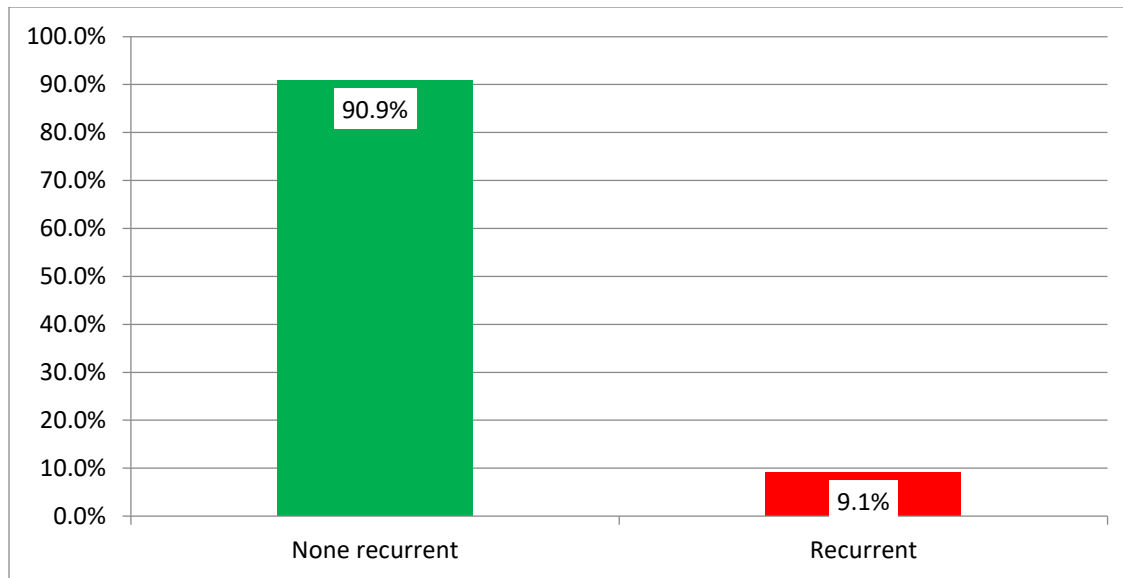


Figure 3: Recurrent rate of hydrostatic reduction, TGSH Northwest, Ethiopia 2022

5.5 Associated factors of success of hydrostatic reduction

On bi-variable analysis; residences, visible abdominal mass, abdominal distention, history of URTI and duration of procedure were associated with success of hydrostatic reduction. On multivariable analysis; residences, visible abdominal mass, and duration of procedure were significantly associated with the outcomes of hydrostatic reduction.

The odds of failed hydrostatic reduction in rural residence patients were 9.04 times higher as compare to urban residence patients (AOR=9.04, 95% CI: 1.41-57.78)

Those intussuscepted patients with visible abdominal mass were 15.15 times more likely to have failed hydrostatic reduction as compared to patients who had no visible abdominal mass (AOR=15.15, 95% CI: 1.79-128.10).

The odds of failed hydrostatic reduction in a procedure takes more than 10 min were 30.28 times higher as compare to a procedure takes less than 10 minutes (AOR=30.28, 95% CI: 2.52-363.67) (Table 5)

Table 5: Factors affecting success of hydrostatic reduction of intussusception in TGSH, Northwest Ethiopia, 2022

Variables	Categories	Hydrostatic reduction		COR with 95% CI	AOR with 95% CI	P-value
		Success	Failed			
Residence	Rural	30(75.0%)	10(25.0%)	5.50(1.60-18.95)	9.04(1.41-57.78)	0.020
	Urban	66(94.3%)	4(5.7%)	1	1	
Visible abdominal mass	Yes	6(50.0%)	6(50.0%)	11.25(2.94-43.09)	15.15(1.79-128.10)	0.013
	No	90(91.8%)	4(8.2%)	1	1	
Abdominal distention	Yes	42(77.8%)	12(22.2%)	7.71(1.64-36.36)	4.83(0.81-29.04)	0.085
	No	54(96.4%)	2(3.6%)	1	1	
History of URTI	Yes	38(95.0%)	2(5.0%)	0.25(0.05-1.20)	0.29(0.05-1.91)	0.199
	No	58(82.9%)	12(17.1%)	1	1	
Duration of procedure	5-10 min	59(98.3%)	1(1.7%)	1	1	0.007
	>10 min	37(74.0%)	13(26.0%)	20.73(2.60-165.11)	30.28(2.52-363.67)	

6. Discussion

This study included 110 patient charts out of 120 charts. This study show that; 14(12.7%, 95% CI: 6.4-19.1%) and 10(9.1%, 95% CI: 4.5-14.5%) of hydrostatic reduction procedure was failed and recurrent respectively. The common clinical symptoms were 77.3% vomiting, 15.5% fever, 95.5 % abdominal cramping, 26.4% diarrhea, and 49.1% abdominal distention.

This study revealed that 87.3% of hydrostatic reduction was successes. This finding was supported with a meta-analysis study conducted (82.7%) of air enema and (69.6%) liquid enema (15). A study in LMICs hydrostatic reduction was attempted in 71.89% patients, and it was successful in 82.37% patients. The remaining 17.62% patients needed surgery(22).

This study show that only 9.1% of hydrostatic reduction procedure recurred. This finding was supported with a meta-analysis study; the rate of intussusception recurrence was 6.0% in air enema and 7.3%. Recurrence rate within 48 hours after enema reduction were 20% in air enema and 21% in liquid enema(15). Another study in China, a total of 45.5% of the recurrent cases experienced only one recurrence, 54.5% experienced multiple recurrences and the early recurrence rate (recurrence within 24hours) was 6.2%(21).

This study revealed that rural residence patients were significantly associated with failed hydrostatic reduction. In this study most of the rural patients delay to visit the hospitals, thus delayed presentation reduce the outcomes of hydrostatic reduction.

This study finding show that patients with visible abdominal mass were significantly associated with failed hydrostatic reduction. The structural lesions of the GIT that could be the leading cause of intussusception, lymphadenopathy was the most common seen in patients(25).

The odds of failed hydrostatic reduction in a procedure takes more than 10 min were 30.28 times higher as compare to a procedure takes less than 10 minutes. A systematic review and meta-analysis study shows that shorter duration of symptoms <24hr and abdominal pain were associated with the success(27).

Limitation of the study

Since the study depend on secondary data (medical records), some important variables might be missed and may be underestimated due to small sample size.

7. Conclusion and recommendation

7.1 Conclusion

This study shows that the rate of failed hydrostatic reduction and recurrent intussusception was comparable to similar studies. The common clinical symptoms were 77.3% vomiting, 15.5% fever, 95.5 % abdominal cramping, 26.4% diarrhea, and 49.1% abdominal distention.

This study identified that residences, visible abdominal mass, and duration of procedure were significantly associated with the outcomes of hydrostatic reduction.

7.2 Recommendation

For Minister of health: should empower the skills of health provider to improve the outcomes of hydrostatic reduction.

For health Care Professionals: should carefully examine the patients and quick hydrostatic reduction enhances the success of hydrostatic reduction.

For researcher: I recommend for further study including determinants of the recurrent of intussusception using large sample size.

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Annex

Annex I: Information sheet

My name is **Dr Abrham Molla** Currently I am a specialist student at Bahir Dar University, College of medicine and Health Sciences, School of Medicine, Department of Surgery. And now I am conducting a research to assess success and recurrence rate of hydrostatic reduction of intussusception in Tibebe Ghion Specialized Hospital.

Title of the research: Success and recurrence rate of hydrostatic reduction of intussusception in TGSH, Northwest Ethiopia from **January 1, 2021 to August 30, 2022**

Objective: To assess success and recurrence rate of hydrostatic reduction of intussusception in TGSH, Northwest Ethiopia from **January 1, 2021 to August 30, 2022**

Participants: Secondary data will be collected from patient chart

For further information: Dr Abrham Molla;

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Annex II: English Version Checklist

Instruction: Please read the questionnaires carefully and circle the alternative and fill the space provided.

Part I: socio demographic status

s/n	Questions	Response	Skip
101	Residency	1. Rural 2. Urban	
102	Sex	1. Male 2. Female	
103	Age in years	_____ years	

Part II: Clinical related characteristics

s/n	Questions	Response	Skip
201	Symptom duration	_____ days	
202	Does the patient have abdominal mass?	1. Yes 2. No	
203	Where is the intussusception?	1. Ileocolic 4. ileocolocolic 2. ileo-ileocolic 5. ileoileal 3. colo colic 6. can't define	
204	Level of locations	1. Ascending colon 4. splenic flexure 2. Descending colon 5. up to rectum 3. hepatic flexure	
205	Does the patient have vomiting?	1. Yes 2. No	
206	Does the patient have bloody diarrhea?	1. Yes 2. No	
207	Does the patient have abdominal cramp?	1. Yes 2. No	
208	Does the patient have abdominal pain?	1. Yes 2. No	
209	Does the patient have abdominal distention?	1. Yes 2. No	
210	Does the patient have visible abdominal mass?	1. Yes 2. No	
211	Does the patient have fever?	1. Yes 2. No	
212	Vital sign at admission	PR _____ bpm	
		T ^o _____ °C	
		RR _____ bpm	
213	Vital sign during procedure?	PR _____ bpm	
		T ^o _____ °C	
		RR _____ bpm	
214	CBC findings	WBC _____ RBC _____ Platelet _____ Hgb _____ Hct _____	
215	Does the patient diagnoses with ultrasound?	1. Yes 2. No	
216	If Q215, Answer is yes, what is the finding?	_____	
217	Does the patient have complication?	1. Yes 2. No	

218	If Q217, Answer is yes, what type of complication?	_____	
219	Does the procedure successful?	1. Yes 2. No	
220	Does the disease recurred?	1. Yes 2. No	
221	General appearance?	1. active 2. lethargic 3. comatose	
222	CVS	1. in shock 2. some DHN 3. No DHN	
223	Duration of procedure in minutes	_____min	
224	Length of Hospital stay?	_____days	

Thank you!!!