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#### MANAGEMENT OF GASTROSCHISIS: KENYAN PERSPECTIVE

Prof. Kuremu Robert Tenge, MBChB, M. Med Surg, FCS (ECSA) Associate Professor of Surgery Department of Surgery & Anaesthesiology, Moi University P.O. Box 4606 – 30100 ELDORET, Kenya, Dr. Peter Saula, MBChB, M. Med Surg., M. Med Med Sc. (Paed Surg) Lecturer & Consultant Paediatric Surgeon, Department of Surgery & Anaesthesiology, Moi University. P.O. Box 4606 – 30100 ELDORET, Kenya, Dr. Phillipe Kuradusenge MBChB, M. Med Surg., FCS (ECSA) General Surgeon, Moi Teaching & Referral Hospital (MTRH) P.O. Box 3 – 30100, ELDORET, Kenya, Dr. Rose Shitsinzi, MBChB, M. Med Anaesthesiology & Critical Care Medicine, Department of Surgery & Anaesthesiology, Moi University P.O. Box 4606 – 30100, ELDORET, Kenya.

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R. T. KUREMU, P. SAULA, P. KURADUSENGE, and R. SHITSINZI

#### ABSTRACT

**Background:** Gastroschisis is an anterior abdominal wall defect occurring in up to 4 babies per 10,000 live births. Though the anomaly is rarely associated with other disorders, it poses serious pathophysiological challenges that negatively affect outcome. Review of the management of gastroschisis at Moi Teaching & Referral Hospital (MTRH) from 2013-2016 was done to determine the outcome.

**Materials and Methods:** A four year (2013-2016) retrospective review of gastroschisis management at MTRH was undertaken. Theatre records were used to track all files of babies admitted and operated on. The primary outcome of data analysis was survival. Secondary outcomes analyzed were age at admission, maternal age, birth order, associated anomalies and complications.

**Results:** Records that were available for analysis were 107. Males were 58 (54%). Male to female ratio was 1.1:1. Mean age at admission was  $1.35 \pm 0.06$  days. Weight ranged from 1250-3800 gm with a mean of 2330 gms. Majority were first born. Mean maternal age was  $21.25 \pm 3.62$  years. Complex gastroschisis occurred in 12 (11%). Overall survival was 43%. However, of those who reached the stage of definitive treatment of containment (either primary closure or staged silo placement), had 48% survival rate. Survival rate was highest in the group who weighed 2500 gms and above. Poor outcomes were noted in the premature and low birth weight neonates, and those with complications. Sepsis was the leading cause of mortality. Length of hospital stay was an average of 24 days for the survivors.

**Conclusions & Recommendations:** Prematurity, low birth weight, and complications negatively influenced survival. Improving obstetric care, establishment of paediatric surgical centres and neonatal support services are key to turning around the survival of neonates with this severe surgical anomaly.

#### INTRODUCTION

Gastroschisis is the herniation of abdominal contents through an abnormal anterior abdominal

wall defect. The defect is usually on the right of the umbilicus, though a few occur on the left. The herniated viscera are usually intestines without a covering sac (1, 2).

The incidence is up to 4 in 10,000 live births, though world reports indicate a general increase (1, 2, 3). The herniated intestine becomes inflamed, thickened and oedematous, and develops an inflammatory peel of adherent exudates following exposure to amniotic fluid (1, 2, 3, 4). This damage is progressive with exposure time to amniotic fluid (4).

The babies face serious pathophysiological challenges leading to increased morbidity and mortality. Clinical outcomes have however been steadily improving from the uniform fatal outcome in the early twentieth century to the current survival of about 90% (1, 2, 3, 4, 5) in developed countries.

The resource scarce regions of the world however still register poor outcomes (6). Since MTRH reported its first case of gastroschisis in 2005 (7), steady effort has been made in managing this serious congenital anomaly in the face of significant challenges. This review points out what has been achieved in outcomes and the challenges that need to be addressed.

#### MATERIALS AND METHODS

A four year (2013-2016) retrospective review of management of gastroschisis at the MTRH was undertaken. MTRH is the national tertiary referral hospital in Western Kenya with a catchment of about 40% (16 million) of the population. All complex paediatric surgical disorders are referred here. Records of neonates admitted with gastroschisis with complete information were included in the review.

The primary outcome in the analysis was survival. Demographic data analyzed were age at admission, maternal age and birth order. Secondary outcomes analyzed were associated anomalies, complications and length of hospital stay.

The standard practice of managing the defect in this hospital is primary closure where possible or staged closure that involves placement of a fashioned silo from fluid bag followed by bedside reduction of the silo and eventual fascial closure in operating theatre when adequate reduction has been achieved. Babies are managed in the New Born Unit pre- and post-operatively. Respiratory support is by External Continuous Positive Airway Pressure (CPAP) as there are no ventilation machines for neonates at MTRH.

#### RESULTS

A total of 107 records were available for review. Of the 107 neonates, 58 were male. Male to female ratio was 1.1:1. Mean age at admission post delivery was 1 day. The mean maternal age was  $21.25 \pm 3.62$  years and majority of the neonates 58 (54%) were first born. Weight ranged from 1250 gm to 3800 gm with a mean of 2330 gm.

Referrals were 103 (96%) while 4 (4%) were delivered at MTRH. Of the 103 referrals documented home deliveries were 8 (7.8%). Counties of origin are as shown in Table 1.

**Table 1**  
*Counties of Origin*

County	Number
Bungoma	15
Uasin Gish	12
Nandi	10
Kisumu	4
Kakamega	11
Busia	9
Homabay	10
Kericho	8
Kisii	8
Baringo	3
Nakuru	3
Siaya	1
Trans Nzoia	7
Vihiga	2
Nyamira	3
Not Indicated	1
Total	107

Associated anomalies were intestinal atresia in 1, congenital talipes equino virus in 1, and PDA in 1. Complex gastroschisis occurred in 12 (11%), consisting of intestinal ischaemia 7(6.5%), intestinal perforation 4 (3.7%) and intestinal atresia

1(1%). Two (2.8%) were misdiagnosed as omphalocele. Complications noted at admission and during the period of treatment are as shown in Table 2.

**Table 2**  
*Complications*

Complication	N (%)
Dehydration	33 (30.8%)
Hypothermia	21 (18.7%)
Respiratory failure	30 (28%)
Anaemia	41 (38.3%)
Sepsis	76 (73%)
Jaundice	8 (7.5%)
Thrombocytopenia	47 (44%)
Hypoglycaemia	2 (1.9%)
Electrolyte imbalance	63 (59%)
Sclerema	11 (10%)
Wound dihesence	3 (2.8%)
Convulsions	2 (1.9%)
Intestinal Perforation	4 (3.7%)

Primary closure was possible in 5(4.7%) two (40%) of them surviving. Ten (9.3%) died before surgical intervention. Therefore, those who were started on the definitive treatment were 97, five (4.7%) of them having had primary closure. Of the 92 who had staged silo placement, 35 did not complete the

process as they died before adequate reduction and eventual fascial closure. Those who completed the staged process were 57 with 44 (77.2%) surviving. Median time between silo placement to complete fascial closure was 6 days. Survival per year is shown in Table 3.

**Table 3**

Year	Admitted	Survival n (%)
2013	23	10 (43.5)
2014	25	10 (40%)
2015	31	9 (29%)
2016	28	17 (61%)

Definitive treatment on day of arrival was only possible in 39 (36.5%). The rest 68 (63.5%) required stabilization before surgery. Female survivors were 23 (46%) and males were also 23 (40% of

males). The overall outcome for study period was survival of 46 (43.4%) and a mortality of 61 (57.6%). The effects of different parameters on mortality are shown in the Tables 4 and 5.

**Table 4**

## Weight on Mortality

Weight(gms)	Admitted	Mortality
1000 – 1400	5	5 (100%)
1500 – 1900	15	11 (73%)
2000 – 2400	44	21 (48%)
2500 and above	43	20 (40%)

**Table 5**

## Gastroschisis complexity and mortality

Anomaly	Admitted	Mortality
Intestinal Ischaemia	7	7 (100%)
Intestinal Perforation	4	3 (75%)
Intestinal Atresia	1	1 (100%)

The leading cause of mortality was sepsis. The average duration of hospital stay for the survivors was 24 days.

## DISCUSSION

Managing a new born is challenging particularly one with additional problems of prematurity, low birth weight and presence of a serious congenital anomaly like gastroschisis.

It is a daunting task responding to the physiological requirements imposed by these disorders. Emboldened by the first reported survivor in 2005 (7), MTRH embarked on management of gastroschisis in earnest. Its catchment area is expansive and is poorly resourced.

Transportation of neonates who need surgical service is hence over long distances. Though only 8 were recorded as home deliveries, on average 60% of deliveries in Kenya occur at home. This environment does not allow for resuscitation and proper packaging of a baby with gastroschisis to minimize deterioration of physiological functions. Only 3(37.5%) of the 8 survived. Ante-natal diagnosis of gastroschisis is among the advances that have improved outcome in the developed world (8). Majority of the neonates, 103 (96%) were referred by hospitals in the region. None of the mothers of babies treated was referred to deliver in MTRH.

Most likely because ante-natal diagnosis was never made yet this circumvents the major challenges associated with referral process and neonatal transport. Delivery in this centre would lead to improved outcome (1, 2, 7, 9). Packaging of neonates with this condition met serious setbacks. Herniating viscera mainly intestines were covered variously by referring institutions. Some were covered by polythene bags, while others by wet gauze, wet cotton, baby towels and bed sheets. Poor packaging leads to early complications, particularly dehydration as was evident on arrival. Immediate intervention was therefore not possible in the majority. The region is yet to apply the good practices of specific packaging of neonates with

gastroschisis and neonatal transport that influence positive outcome (11). Despite the high morality of 57%, as commonly seen in most developing countries (36) the outcome of babies who made it to the stage of containment (primary closure or silo) of 48% survivors and 77.2% in those who completed the stages of containment is an improvement whose sustainability may approach the outcomes in the first world (5, 12).

Therefore, ensuring that babies arrive in stable condition for immediate containment will improve the outcome at this centre. Correct actions by referring hospitals will be a collaborative effort to reward the costly resource intensive care of these babies at MTRH (8).

Establishing paediatric surgical centres in major hospitals in the region is another way that will bring change. As noted in the study, majority of neonates came from counties nearest to MTRH supporting the need for more centres to improve access. Parenteral nutrition was not available however infusion of albumin and amino acids to neonates with gastroschisis became our routine from 2016. The unavailability of TPN necessitated the practice of initiating trophic oral feeds earlier than practiced by other centres in the literature. We routinely initiate oral feed on average – day 3 post fascial closure and the majority of the neonates are able to retain feeds by day 7 post fascial closure.

Sepsis remains a major challenge in the management of these babies at MTRH. This is not unique to MTRH but has been noted by other studies (3, 5, 6, 7, 8, 12). However, delayed intervention and improper coverage of extruded contents are likely to worsen the situation. Just like other studies have reported, (7, 14), prematurity and low birth weight were other factors that negatively affected outcome.

## CONCLUSIONS & RECOMMENDATIONS

Significant improvement has occurred in the management of gastroschisis at MTRH. Prematurity and low birth weight, complications and complexity of gastroschisis negatively affected outcome. Improving obstetric care, establishing paediatric surgical centres in the region and improving neonatal support service are key to turning around the outcome of this severe surgical anomaly.

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