Annals of Pediatric Surgery

ORIGINAL RESEARCH Open Access

Pyloric stenosis at a tertiary hospital in Uganda

Innocent Okello[1*], Rovine Naluyimbazi[1], Alicia Massenga[1], Sarah Ullrich[2], Nasser Kakembo[3], Phyllis Kisa[3], John Sekabira[1] and Stella Nimanya[1]

Abstract

Background: Worldwide, infantile hypertrophic pyloric stenosis has an incidence of 3 in 1000 livebirths, with an unknown etiology. Even when babies present with characteristic symptoms, it is often misdiagnosed leading to late referral for appropriate surgical care. The purpose of this study was to document our experience in management of pyloric stenosis within our setting.

Results: A total of 33 patient records were reviewed. All the patients presented with non-bilious vomiting. The ratio of males to females was 4.5:1. Of these patients, 76% had electrolyte imbalance with low chloride count in the majority of patients. All the patients underwent an open Ramstedt pyloromyotomy, and 91% had a good outcome.

Conclusion: Management of IHPS has very good outcomes in our setting. Earlier referral of patients leads to improved outcomes.

Background

Infantile hypertrophic pyloric stenosis (IHPS) occurs in about 3 of every 1000 live births [1], affecting males 4 times as often as females [2]. The exact etiology of pyloric stenosis is not well-defined but is likely multifactorial with genetic and environmental factors both playing a role. Hypertrophy of the smooth muscles of the pylorus results in narrowing of the lumen and eventually gastric outlet obstruction [3]. It characteristically presents as non-bilious vomiting in a baby and is often accompanied by severe electrolyte derangements, mainly hypochloremic, hypokalemic metabolic acidosis [1]. IHPS is diagnosed by abdominal ultrasound scan as having a thickened pyloric muscle with an elongated diameter [2]. After adequate resuscitation, surgical treatment with a Ramstedt pyloromyotomy [2]. There have been some reports about pyloric stenosis in sub-Saharan Africa; however, there is no research on IHPS in Uganda since a single review in 1970 [4], and hence, this study aims to assess the management and outcomes of IHPS in our setting.

Methods

Using the pediatric surgery database, records of patients with pyloric stenosis admitted at Mulago hospital were identified from a prospectively created database. The review looked at a 2-year period from 2017 to 2019. Descriptive analysis was performed using SPSS Statistics 24.0 (IBM Corp, Armonk, New York). Mann-Whitney *U* and Chi squared were used as appropriate. The patients' caretakers/parents consented to the surgery, and approval for the data collection was sort from the hospital IRB for the pediatric database. The diagnoses for pyloric stenosis were made clinically with the backing of ultrasound scan whereby most reports suggested increased pyloric sizes but not documenting the actual measurements. One patient with equivocal findings on ultrasound had an upper gastrointestinal contrast done that suggested IHPS.

* Correspondence: innomd@gmail.com
[1]Mulago National Referral Hospital, P.O.Box 7051, Kampala, Uganda
Full list of author information is available at the end of the article

Results

A total of 33 patient records were reviewed. All of them presented with non-bilious vomiting, and a third of them reported dehydration and weight loss, with the minority presenting with a palpable olive (n = 2) or visible peristaltic wave (n = 2) (Table 1). The average age at presentation was 7.4 ± 3.2 weeks, ranging from 2 to 12 weeks.

Our patients were predominantly male, with a male to female ratio 4.5:1. Of the 33 patients, 81% were male (Fig. 1)

The majority (76%) of our patients had electrolyte imbalance (Fig. 2). These were recorded as low, normal, or high for each electrolyte during this data collection. Of those with electrolyte imbalance, 80% had abnormalities in more than one electrolyte. Chloride imbalance was the most common among the patients seen (Fig. 3).

Majority of our patients arrived at the hospital with deranged electrolytes.

Fifty-five percent were referred to Mulago from another hospital. On average, patients got to the theater within 5 days (4.4 ± 2.8) after presenting to the ward. During this time while on the ward, the patients were resuscitated and optimized for surgery. All the patients underwent a Ramstedt pyloromyotomy via open laparotomy. The operations were performed by the pediatric surgery fellows and pediatric surgeons.

Ninety-one percent of our patients had a good outcome and were discharged home in good condition. Three patients died after surgery. Two of those that died had respiratory depression post-operative while the third had a bleeding disorder.

On descriptive analysis, symptom duration > 4 days was associated with potassium imbalance (χ^2 4.080, P = 0.043) but was not significantly associated with age at presentation, sodium or chloride imbalance, referral, or hospital days before surgery. Electrolyte imbalances were not associated with any difference in hospital days before surgery or survival.

Discussion

Mulago hospital is the only general national referral hospital in Uganda and has the only pediatric surgery referral center in the country. A variety of conditions are seen and managed here, including IHPS. Pyloric stenosis is a very common cause of gastric outlet obstruction in infants [5]. Its subtle presentation of vomiting with dehydration can easily be missed, and child is managed for other conditions that present with dehydration. The hallmark symptom was seen in all our patients.

Table 1 Clinical findings

Symptom	*n* (%)
Non-bilious emesis	33 (100%)
Dehydration	11 (33%)
Weight loss	10 (30%)
Palpable epigastric olive	2 (6%)
Visible gastric peristalsis	2 (6%)

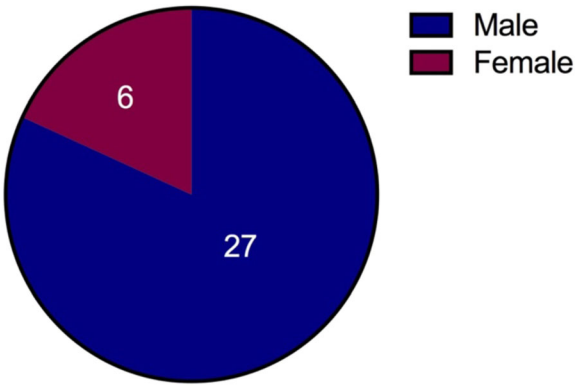

Fig. 1 Our patients were predominantly males, with a male to female ratio 4.5:1. Of the 33 patients, 81% were male

All our patients had non-bilious vomiting, and this is consistent with various studies done all over the world, including in settings similar to ours [1, 3].

In our setting with an ever improving referral system, the patient care is getting much better. Most (55%) of our patients were referrals, and with this, they arrived after significant resuscitation which likely accounts for the lack of difference in wait time to surgery (average 4.4 days) and good outcomes. A study done in South Africa found the presurgery waiting time to be more than 5 days, with an average of 6.5 days [6].

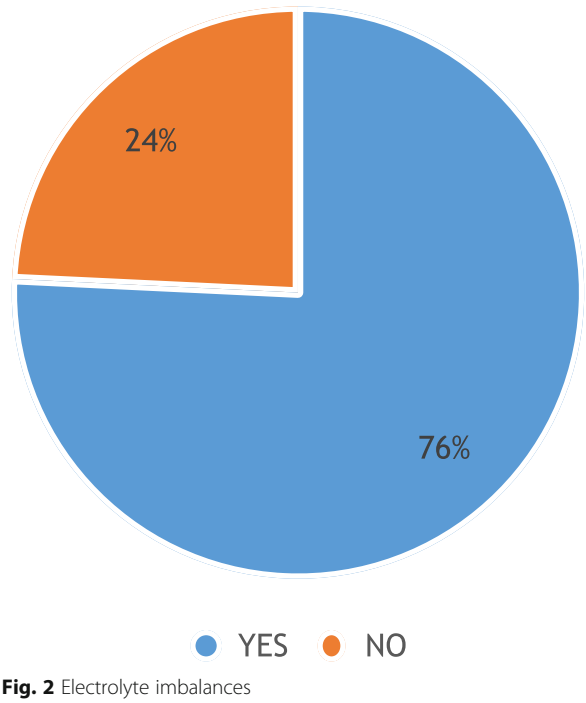

Fig. 2 Electrolyte imbalances

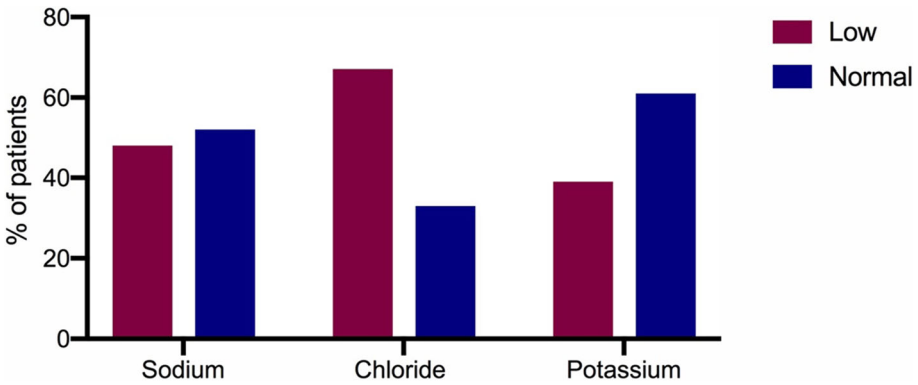

Fig. 3 Different electrolyte levels

Many of our patients had good outcomes, and this can be attributed to the early referral and resuscitation of these babies, which is due to the increased use of ultrasound scans for diagnosis and availability of pediatric surgeons and pediatric anesthesiologists. There was no recurrence of IHPS in the patients in our cohort, with the last recorded patient for this study more than 8 months prior to writing this manuscript.

Majority of our patients had electrolyte derangements; however, many studies have shown less children with electrolyte abnormalities such as in South Africa [6]. These derangements were mainly with chloride ions, and these have been shown to determine outcome in previous studies. In our series, electrolyte derangements were not associated with worse outcomes or delays in operations.

Although, IHPS has been shown to occur in preterm babies [3], in our setting, none of the children diagnosed with IHPS were born preterm. This may be due to the low overall survival of preterm infants in our setting or failure to recognize and refer these infants as they often present atypically.

Conclusion

Outcomes of pyloric stenosis management are usually good and this is consistent with outcomes seen elsewhere. In our setting, management of IHPS has very good outcomes, as seen in this study. With a high index of suspicion, the finding of non-bilious vomiting in an infant between 2 and 8 weeks of age should alert the health worker to the possibility of pyloric stenosis. With the improving referral system, increasing availability of health workers, and increasing awareness about pediatric surgical conditions, outcomes can only get better.

Abbreviations

IHPS: Infantile hypertrophic pyloric stenosis

Acknowledgements

We are grateful to the Department of surgery at Mulago hospital and the friends of pediatric surgery for the support given during this study. Special thanks to the medical staff of pediatric surgery unit for capturing this data.

Authors' contributions

IO came up with the idea for this study. IO, RN, AM, and SN collected the data for this study. IO and SU analyzed the data for the publication. IO, JS, PK, and NK proof read the manuscript for publication. All authors have read and approved the manuscript.

Funding

No funding was obtained for this study.

Availability of data and materials

Data is available from the hospital pediatric database and the hospital record registry.

Ethics approval and consent to participate

Approval was from Hospital Research and Ethics committee through the Pediatric Surgery database approval. The database is approved for data collection and publication (MREC 464).

Consent for publication

Not applicable

Competing interests

Not applicable

Author details

[1]Mulago National Referral Hospital, P.O.Box 7051, Kampala, Uganda. [2]Yale school of Medicine, New Haven, USA. [3]Makerere University College of Health Sciences, Kampala, Uganda.

Received: 30 March 2020 Accepted: 1 September 2020
Published online: 29 September 2020

References

1. Bakal U, et al. Recent changes in the features of hypertrophic pyloric stenosis. Pediatr Int. 2016;58(5):369–71.
2. Chalya PL, et al. Infantile hypertrophic pyloric stenosis at a tertiary care hospital in Tanzania: a surgical experience with 102 patients over a 5-year period. BMC Res Notes. 2015;8:690.
3. Ndongo R, et al. Infantile hypertrophic pyloric stenosis: a 4-year experience from two tertiary care centres in Cameroon. BMC Res Notes. 2018;11(1):33.
4. Bwibo NO. Congenital pyloric stenosis in African infants. EastAfrican Medical Journal. 1970;47(7):377–82.
5. Dalton BG, et al. Optimizing fluid resuscitation in hypertrophic pyloric stenosis. J Pediatr Surg. 2016;51(8):1279–82.
6. Acker SN, et al. Current trends in the diagnosis and treatment of pyloric stenosis. Pediatr Surg Int. 2015;31(4):363–6.

Publisher's Note