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Infantile Hypertrophic Pyloric Stenosis (IHPS): Demographic, Clinical and Biochemical Profile and Outcome at a Tertiary Care Hospital

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ABSTRACT

Purpose: Etiology for occurrence of IHPS is largely unknown. Environmental factors seem to play role in its causation and over the decades many changes have occurred in the environment. The study here is done to find whether there are any changes in demographic, clinical, biochemical profile and outcome of this entity since its initial description.

Methods: This was a descriptive retrospective study, done at a tertiary care centre. Medical record of patients with final diagnosis of IHPS and/or ICD 10 coding of Q 40.0, operated from Jan 2015 to Dec 2019 were retrieved. The data extracted included age, sex, associated anomalies, clinical presentation, electrolytes and blood gas abnormalities on admission, operative complication, length of hospital stay and mortality. The statistical data was fed on Microsoft Excel worksheet® and analyzed.

Results: A total of 66 medical records were retrieved. Out of these 8 were females and only one case of preterm gestation. The age of presentation ranged from 20 to 94 days. All had gastric vomiting at presentation. The mean duration of vomiting was 18.75 days, with mean values of Na^+, K^+ and Cl^- as 133, 4.5 and 92 mmol/L respectively. A mean of 3.2 days were required for pre-operative stabilization. Two patients each had intra-operative mucosal perforations and delayed extubation. The mean duration of surgery was 31.9 minutes, without any mortality.

Conclusion: The present study brings out a different clinical profile of our subset of IHPS patients in comparison to western world but there are no changes in clinical and demographic profile of these patients since its initial description.

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Congenital Hypertrophic Pylorus Stenosis; blood gas; dyselectrolemia; hospital stay

Introduction

Etiology for occurrence of IHPS is largely unknown. Environmental factors seem to play role in its causation. Over the decades many changes have occurred in the environment which led to global warming and increased levels of many pollutants in air, soil and water. There are also changes in incidence and type of formula feeds. Late marriages and women empowerment has led to increased age of first child bearing and elderly primigravida. Furthermore availability of medical facilities too has increased in last few decades helping in faster diagnosis of entity so enabling patient to reach surgical centre without biochemical abnormalities. The study here is done to find whether there are any changes in demographic, clinical, biochemical profile and outcome of this entity since its initial description.

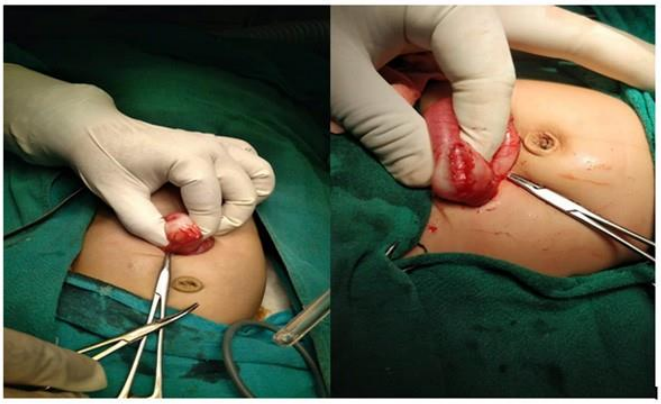

Figure 1. Open Ramstedt's pyloromyotomy.

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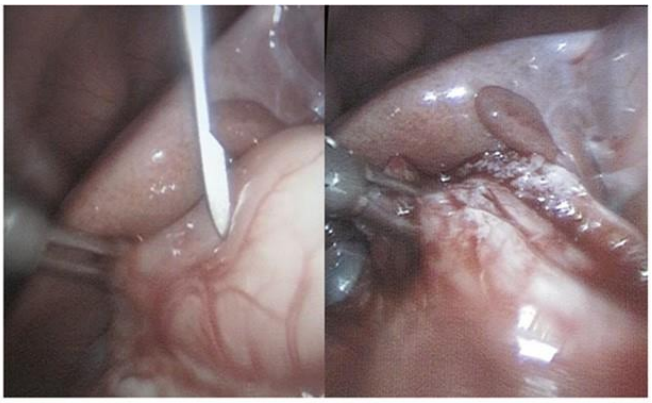

Figure 2. Laparoscopic pyloromyotomy.

Methodology

This was a retrospective descriptive study at pediatric surgery department of a tertiary care hospital. The medical records of operated patients with final diagnosis of IHPS [ICD 10 code Q 40.0], from Jan 2015 to Dec 2019 were retrieved. The data extracted included age, sex, associated anomalies, clinical presentation, electrolytes and blood gas abnormalities on admission, operative complication, length of hospital stay and mortality.

The data was entered on MS excel and subjected to descriptive statistics to estimate range, median and frequency for various variables. The correlation co-efficient was calculated for biochemical abnormalities and post-operative length of hospital stay. Data analysis was performed using SAS 9.2 statistical software. Ethics clearance for the study was obtained from the Institutional Ethical Committee with waiver of consent.

Results

Total 66 patients were included for the study. Out of these 58 were boys and 8 girls [M: F=7.25:1]. All but one had term gestation at birth. The age at presentation ranged from 20 to 94 days, with a mean age of 42.8 days. All had gastric vomiting at presentation, with palpable lump documented in 10 [15.15%]. The mean duration of vomiting was 18.75 days (ranged from 2 to 70 days). 2 cases had associated anomalies; one preterm gestation baby had bilateral inguinal hernias and other had umbilical hernia.

Out of 66, 42(63.6%) cases had abnormal Na^+ levels and 31(46.9%) had abnormal K^+ levels. The abnormal Cl^- levels were noted in 42 (63.6%) cases. The mean values of Na^+, K^+ and Cl^- were 133, 4.5 and 92 mmol/L respectively. The pH and HCO3 values could be retrieved from records in 36 and 34 cases respectively. Abnormal pH values noted in 27/36 (75%) and abnormal HCO3 levels in 21/34 (61.7%). The duration between admissions to surgery varied from 1 to 8 days, with a mean duration of 3.2 days for pre-operative stabilization. All patients underwent open Ramstedt's pyloromyotomy except one (laparoscopic).[Fig 1 and 2] Two patients each had intra-operative mucosal perforations and delayed extubation (3%). The duration of surgery ranged from 20 to 60 minutes, with mean duration of 31.9 minutes. 25 cases out of 66 did not receive any antibiotics during hospital stay (37.8%).All these were the cases admitted in later two years where we followed strict antibiotic policy. 3 cases had positive septic screen and so later required admission of antibiotics. Patients admitted before this had received antibiotics as per the hospital antibiotic protocol for intestinal obstructions. The post-operative length of hospital stay ranged from 0 to 8 days, with mean duration of 3 days. There were no mortalities.

Discussion

IHPS is considered a disease of the Western World and is rare in the developing world including sub-Saharan Africa [1]. The incidence in Whites is 2.4 per 1000 live births, 1.8 in Hispanics, 0.7 in Blacks, and 0.6 in Asians [2]. In India it is estimated to be 0.28 per thousand live births [3].

Many large series from tertiary care centres have reported mean age at presentation 5.2 ± 1.2 weeks [4-8]. Studies from India and our study too have similar experience of age of presentation with maximum cases presenting between 4 to 8 weeks [9,10]. We had youngest case of 20 days neonate and eldest of 94 days of life, implying the need of keeping IHPS as one of differentials for gastric outlet obstruction even at these extremes of age.

IHPS have been linked to male sex since its initial description. The M: F ratio was reported to be 4.7:1 by Chalya et al and Kedir et al. [5,6] Ndongo et al found it 4.25:1 [8]. An Indian study by Das and Mukherjee found it 4.5:1 [9]. We found a ratio of 7.25:1. Another study from China too had significant male preponderance of disease [7]. Although the disease is more common in males, negligent attitude of our society towards female child could be a contributory factor for such high male preponderance in our study.

The characteristic feature of IHPS has been traditionally non-bilious projectile vomiting, because of physical occlusion of pyloric canal. But medical science is considered a science of exceptions. Piroutek et al. reported bile-stained vomiting in 5 (1.5%) out of 354 IHPS patients in a retrospective analysis [11]. Das and Mukherjee also had 5 out of 50 cases (10%) presenting with bilious vomiting [9]. Our series had gastric vomiting in all patients in collaboration with other studies [5,7,10].

The new generation pediatric surgeons seem to lack patience for palpating olive. Vinycomb et al. identified downtrend in the number of palpated olives over time (P = 0.013) [4]. Glatsein *et al*. found that only 13.6% of

infants had a palpable 'olive' at presentation, compared to more than 50% of infants in older studies [12]. Our study had similar rate of palpable olives (15.1%).

There is no conclusive evidence of any benefits of preoperative nasogastric tube placement in IHPS patients [13]. We did not place NG tube in any of our patients. Before proceeding to surgery, all our patients had USG confirmed IHPS as per standard described parameters.

Although with improvement in medical facilities, it is expected to have earlier presentation of entity. This should result in less number of patients with dehydration, metabolic disturbances and dyselectrolytemia. In spite of this we have seen an average delay of 18.75 days. So in our cohort of patients 63.6% had abnormal Na^+ and Cl^- levels, 46.9% had abnormal K^+ levels. On interpretation of coefficient correlation between various electrolyte disturbances and duration between admission and surgery, no moderate negative/positive correlation could be found in our study.

Preoperative correction of alkalosis before subjecting to anesthesia is known to improve morbidity related to anesthesia. Alkalosis enhances oxygen affinity of hemoglobin, decreases the ionized calcium levels and increasing seizure potential, thus need to be corrected well [14]. There has been decline in anesthesia related morbidity rate, from about 3.7 % to almost nil [15,16]. In our series, 2 cases with partially corrected alkalosis and dyselectrolytemia had delayed extubations.

Vinycomb et al. in their series of 626 patients, had 13 intra-operative perforations (2.1%)and 0.3% reoperations [4]. Chalya et al reported 5.9 % intra-operative mucosal perforations [5]. Kedir H et al studied 2946 cases of IHPS [6]. They had 6% (n = 165) overall rate of complications. Our series had 3% (2 cases) intra-operative mucosal perforation rate and no incomplete pyloromyotomy or post-operative complications. There was no mortality with mean length of total hospital stay of 6.2 days.

The mucosal perforation has been correlated with age of patients, with incidence higher in older age [17]. This may be due to varied tissue characteristics. Both our patients who had intraoperative mucosal perforation were 45 and 60 days old.

Acker et al studied trends in the diagnosis and treatment of pyloric stenosis in total of 433 patients, dividing them in modern and historic cohorts [18]. There was no clinically significant differences in two cohorts in terms of serum electrolytes or blood gas parameters, nor in time from surgical evaluation to operating room (17.8 h modern vs 13.8 h historic; p = 0.73). Rate of all operative complications including perforations, postoperative hernia, or wound infection were also constant (3.5 % modern vs. 2.9 % historic; p = 0.79).

There is contrast difference in mortality rates following surgery for IHPS between developed and developing countries. Ghanaian and Iranian studies reported overall mortality rate in IHPS of 3.6 and 2.3 % respectively [19,20]. Chalya et al. documented mortality of 4.9% (all on post-operative day1) [5]. Though we had no mortality, these studies signify importance of pre-operative stabilization with fluid resuscitation and electrolyte corrections. This stabilization helps in post-operative monitoring, easy post-operative course and minimizing need of ICU care.

Graham *et al.* did a comparison of immediate feeding (up to 6 hours postoperatively) with delayed feeding (after 6 hours postoperatively) and found that immediate feeding resulted in more severe postoperative vomiting, without any significant impact on length of hospital stay [21]. In all our patients, feeding was started after 6 hours postoperatively and gradually increased as per tolerance. This gradual feeding policy helped us in minimizing risk of complications like aspiration pneumonia.

Limitations

The potential limitation of our study is the fact that some of the records had incomplete information in view of retrospective nature of the study. This might have caused some bias in our findings. Also, the numbers of cases were less as compared to large studies available. Despite these limitations; our study provides local data that can be used to compare results with western literature and to improve the care of IHPS patients in our local setting.

Conclusion

The present study brings out a different clinical profile of our subset of IHPS patients in comparison to western world. There is not much change in clinical and demographic profile due to present environmental situations. Society education to avail available medical facilities timely is required to avoid delay in presentations and subsequent biochemical abnormalities.

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References

1. Bickler SW. Incidence of appendicitis and hypertrophic pyloric stenosis in a sub-Saharan African country. J Pediatr Gastroenterol Nutr. 2000; 3(2):39.
2. Schechter R, Torfs CP, Bateson TF. The epidemiology of infantile hypertrophic pyloric stenosis. Pediatric Perinat Epidemiol.1997; 11:407–427.
3. Joseph TP, Nair RR. Congenital hypertrophic pyloric stenosis. Indian J Surg. 1974; 36:221.
4. Vinycomb TI, Laslett K, Gwini SM, Teague W, Nataraja RM. Presentation and outcomes in hypertrophic pyloric stenosis: An 11-year review. J Paediatr Child Health. 2019;55:1183-7.
5. Chalya PL, Manyama M, Kayange NM, Mabula JB, Massenga A. 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; 8:690-695.
6. Kedir H, Miller R, Syed F, Hakim M, Walia H, Tumin D, et al. Association between anemia and postoperative complications in infants undergoing pyloromyotomy. J Pediatr Surg. 2019; 27:1-5.
7. Jing L, Wei G, Ji-min Z, Wei Z, Xiang L. Epidemiological and clinical characteristics of 304 patients with infantile hypertrophic pyloric stenosis in Anhui Province of East China, 2012–2015. J Matern Fetal Neonatal Med.2017; 31:2742-2747.
8. Ndongo R, Tolefac PN, Tambo FF, Abanda MH, Ngowe MN, Fola O, et al. Infantile hypertrophic pyloric stenosis: a 4-year experience from two tertiary care centres in Cameroon. BMC Res Notes. 2018; 11:33-37.
9. Das AK, Mukherjee AK. Infantile hypertrophic pyloric stenosis-a study of fifty cases. Indian J Pediatr.1986; 53:257-261.
10. Kumar A, Gupta UK, Gupta P, Singh SP, Gupta M, Singh P, et al. Study of clinical, biochemical evaluation and outcome in hypertrophic pyloric stenosis. Int J Contemp Pediatr. 2016; 3:473-6.
11. Piroutek MJ, Brown L, Thorp AW. Bilious vomiting does not rule out infantile hypertrophic pyloric stenosis. Clin Pediatr (Phila). 2012; 51: 214-8.
12. Glatsein M, Carbell G, Boddu SK. The changing clinical presentation of hypertrophic pyloric stenosis: the experience of a large, tertiary care pediatric hospital. Clin Pediatr. 2011;50:192-5.
13. Flageole HH, Pemberton J. Post-Operative Impact of Nasogastric Tubes on length of stay in infants with pyloric Stenosis (POINTS): A prospective randomized controlled pilot trial. J Pediatr Surg. 2015; 50:1681-5.
14. Barash PG, Cullen BF, Stoclging RK. Clinical Anaesthesia, 3rd ed, Philadelphia: Lippincott-Raven.1997.
15. MacDonald NJ, Fitzpatrick GJ, Moore KP, Wren WS, Keenan M. Anaesthesia for idiopathic hypertrophic pyloric stenosis: A review of 350 patients. Br J Anaesth.1987; 59: 672-7.
16. Moschini V, Sartori A, Sogni A, Lanata M. Anaesthesia in hypertrophic pyloric stenosis. Minerva Anaesthesiol. 1995; 61: 259-64.
17. Royal RE, Linz DN, Gruppo DL, Ziegler MM. Repair of mucosal perforation during pyloromyotomy: surgeon's choice. J Pediatr Surg. 1995; 30: 1430-2.
18. Acker SN, Garcia AJ, Ross JT, Somme S. Current trends in the diagnosis and treatment of pyloric stenosis. Pediatr Surg Internat. 2015; 31:363-366.
19. Rozeik AE, Elsherbini R, Almaramhy H. Double incomplete pyloromyotomy (A. Ezzat Technique): a new technique for infantile hypertrophic pyloric stenosis: preliminary study. Open J Pediatr. 2014; 4:253–6.
20. Leong MM, Chen SC, Hsieh CS, Chin YY, Tok TS, Wu SF, et al. Epidemiological features of infantile hypertrophic pyloric stenosis in Taiwanese children: a nation-wide analysis of cases during 1997–2007. PLoS One. 2011; 6(5).
21. Graham KA, Laituri CA, Markel TA, Ladd AP. A review of postoperative feeding regimens in infantile hypertrophic pyloric stenosis. J Pediatr Surg. 2013; 48:2175-9.