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Ultrasonography along with Clinical Finding is enough for the Diagnosis of Infantile Hypertrophic Pyloric Stenosis

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Abstract **Original Research Article**

Introduction: Infantile hypertrophic pyloric stenosis (IHPS) is characterized by hypertrophy of the pyloric muscular propria, predominantly involving the circular layer and subsequent narrowing of the pyloric outlet. Aim of the Study: To see the ultrasonographic diagnosis of infantile hypertrophic pyloric stenosis. ***Material & Methods:*** This retrospective study was conducted in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during the period conducted from February 1997 to October 1998 in a period of 21 months. The data were collected for all 31 patients. Following, collection of all the required data, these were checked and tabulated into the computer using the SPSS/PC software 23. ***Results:*** During the study period February 1997 to October 1998 total surgical admission was 4006 and infantile hypertrophic pyloric stenosis patients (IHPS) were 31. So IHPS represented .77% of the total surgical admission during the study period in DSH. Correlation of clinical and ultra-sonogram findings with operative finding, clinical findings true +ve 20(64.52%), true –ve 2(6.45%), false +ve 1(3.23), false –ve 8(25.81) and ultra-sonogram observation true +ve 27(87.10%), true –ve 2(6.45%), false +ve 2(6.45%), false –ve 2(6.45%) and then finally operation needed IHPS ware 29(93.35%) also others than IHPS 2(6.45%). Correlation of pattern of sensitivity and specificity in clinical findings 93.1% and 50%, ultra-sonogram findings 71.43% and 66.67%. ***Conclusion:*** In conclusion, we would like to advise that infantile hypertrophic pyloric stenosis is the most common cause of non-bilious projectile vomiting in an infant. The diagnosis being mode primarily by non-bilious projectile vomiting in a neonate, which usually starts 2-4 weeks after delivery and ultrasonography can confirm the diagnosis.

Key words: Clinical findings, Infantile, Hypertrophic Pyloric Stenosis, Ultrasonography.

INTRODUCTION

In 1627, Hildanus first described pyloric stenosis. More characteristic clinical and postmortem findings of HIPS were reported by Patrick Blair in 1717. Hirsch sprung a Danish Pediatric Surgeon, described clinical findings of the disease and established the pyloric stenosis in 1888 at a major pediatric congress and awareness of the condition was aroused in the medical world. Infantile hypertrophic pyloric stenosis (IHPS) is characterized by hypertrophy of the pyloric muscular propria, predominantly involving the circular layer and subsequent narrowing of the pyloric outlet [1]. Infantile hypertrophic pyloric stenosis is one of the most common abnormalities occurring in the first few months of life, responsible for non-bilious vomiting [2]. There is marked hypertrophy of the circular muscles in the pylorus. The pyloric canal is lengthened and the whole pylorus becomes olive-shaped and firm. In early years surgical treatment of pyloric stenosis carried an unacceptably high mortality rate 2, [3]. But with the development of operative technique and early diagnosis [4], barium meal study and more commonly used noninvasive U. S. technique, advances in fluid therapy and anaesthesia [5], improved treatment of metabolic alkalosis, and appropriate treatment before developing serious complication. So today mortality rate has come down to about 0.4% or less [8]. Immediate and permanent relief of symptoms is obtained by a simple operation pyloromyotomy. The incidence of infantile hypertrophic pyloric stenosis is about 3 per thousand live births [9]. It is most common in whites, less common in black; and rare in oriental individuals. Boys are more often affected with an average male-female ratio 4:1; 10. The disorder often occurs in a firstborn male children, and there is a strong familial pattern of inheritance [11]. The expression of

pyloric stenosis is dependent upon the genetic influence [12]. Now a day's diagnosis of IHPS is not difficult. In most cases, it is possible to diagnose by clinical findings alone. The diagnosis of IHPS being made primarily by palpation of the hypertrophied pylorus. Where clinical confirmation is in doubt, ultrasonography accurately diagnoses the case of IHPS. Telle and Smith first described the use of ultrasonography to diagnose IHPS in 1977. In difficult clinical situations, sonographic examination for pyloric stenosis is simply repeatable and avoids the risk of radiation therapy to barium meal examination. Pyloromyotomy can be performed by open laparotomy or by laparoscopy with permanent relief of symptoms.

OBJECTIVES

a) General objective

- To see the role of ultrasonography in the diagnosis of infantile hypertrophic pyloric stenosis and avoid the invasive barium meal study of the upper gastrointestinal tract.

b) Specific objectives

- To gather knowledge regarding incidence, socioeconomic status, clinical presentation and management of infantile hypertrophic pyloric stenosis in the Bangladeshi population.

METHODOLOGY AND MATERIALS

This retrospective study was conducted in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during period from conducted from February 1997 to October 1998 in a period of 21 months. In each case, information about the patient was obtained in the form of a questionnaire (Appendix-I) after obtaining the consent of the parent or guardian on a consent form (Appendix-II). A detailed history was taken from the patient's mother or attendant. The questionnaire included age, sex, family history, weight, socio-economic status, address of the patient, antenatal and post-natal period, presenting complaints, previous treatment and detailed physical examination. A detailed history of onset of vomiting at age, whether the vomiting was projectile or non-projectile, whether it was whitish, bilious or non-bilious, whether it was blood mixed or coffee ground in color. The duration between feeding and onset of vomiting, demanding for food following vomiting, whether there was any visible peristalsis or mass in the upper abdomen. Was there any sign of dehydration and failure to thrive? All these were noted. The associated signs were also recorded. Information was sought regarding diagnosis and treatment. The information obtained through the above process was followed up and supplemented by records of physical findings, laboratory, radiology and imaging study, the treatment administered and the correlation of clinical diagnosis and ultrasonography diagnosis was reviewed finally by operative diagnosis and the outcome of the treatment. The data were collected for all 31 patients. Following, collection of all the required data, these were checked and tabulated into the computer using the SPSS/PC software 23.

Inclusion criteria

All patients suffering from the symptoms of infantile hypertrophic pyloric stenosis were admitted to the surgery department of DSH from February 1997 to October 1998 and undergone investigations and operative treatment.

Exclusion criteria

Patients with symptoms of infantile hypertrophic pyloric stenosis but operations were not done. Patients with non-bilious vomiting and over 1 year of age.

RESULTS

During the study period, February 1997 to October 1998 total surgical admission was 4006 and infantile hypertrophic pyloric stenosis patients (IHPS) were 31. So IHPS represented .77% of the total surgical admission during the study period in DSH (Figure-1). The gender distribution of the participant's male ware 27(87.10%) and the female were 4(12.90%). The age of the patients in the overall group ranged from 0 - 5 months. The highest number of patients was within 1-2 months age group was 22(70.97%) and lowest number of patients was above 2-5 months age group was 3(9.68%) and lower number of patients 0-1 month age group was 6(19.35%).In Socioeconomic conditions, the lower-income group was 9(29.03%), middle-income group 19(61.29%) and higher income group 3(9.68%). Inhabitant of the patient's Rural area 19(61.29%) and urban area 12(35.71%). Although the number of patients varied from season to season, there was little relationship between the admission in the surgical unit and admission of infantile hypertrophic pyloric stenosis patients. A little number of patients was found during and following winter season was 20(64.52%) and others season was 11(35.68%) show in (Table I). The patient with infantile hypertrophic pyloric stenosis in this series presented with a number of symptoms. Projectile non-bilious vomiting following feeding 30(96.77%) was the commonest mode of presentation. It was found in all most all cases. The second highest presentation was a mass moving across the upper abdomen was 24(77.42%) and demanding food following vomiting 29(93.55%), Failure to thrive 11(35.48%), Constipation 7(22.58%) and Jaundice 1(3.22) show in table-II. An Ultra-sonogram of the abdomen was done in all patients clinically diagnosed or suspected as infantile hypertrophic pyloric stenosis. Hypertrophied pylorus was found in 29 patients (93.55%) and No hypertrophied pylorus 2(6.45%).Clinical findings palpable mass 21(67.74%) and no palpable mass 10(32.26%) Table-III shows ultra-sonogram findings of IHPS patients. Correlation of clinical and ultra-sonogram findings with operative finding clinical

findings true +ve 20(64.52%), true –ve 2(6.45%), false +ve 1(3.23), false –ve 8(25.81) and ultra-sonogram observation true +ve 27(87.10%), true –ve 2(6.45%), false +ve 2(6.45%), false –ve 2(6.45%) and then finally operation needed IHPS ware 29(93.35%) also others than IHPS 2(6.45%) show in table-IV. Correlation of pattern of sensitivity and specificity in clinical findings 93.1% and 50%, ultra-sonogram findings 71.43% and 66.67% show in table-V.

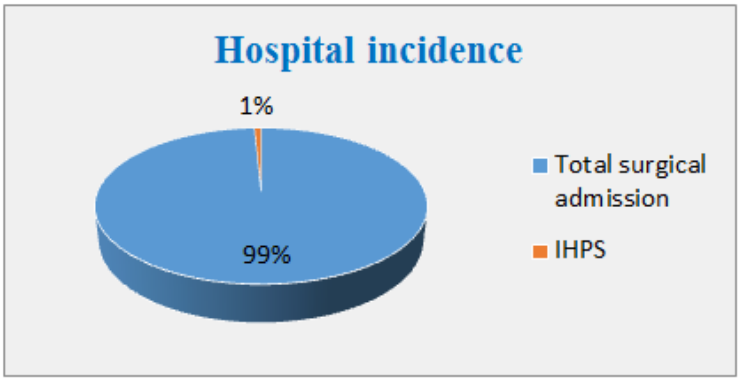

Fig-1: Hospital incidence of the Participants (N=31)

Table-I: Socio-economic characteristics of children with IHPS (N=31)

Variables	N	%
Age Distribution(months)		
Age group (Month)		
(0-1)	6	19.35
(1-2)	22	70.97
(2-5)	3	9.68
Socio-economic condition		
Socio-economic status		
Lower income group	9	29.03
Middle income group	19	61.29
Higher income group	3	9.68
Inhabitant of the patients		
Rural	19	61.29
Urban	12	38.71
Seasonal Variation		
Winter	20	64.52
Other season	11	35.48
Gender distribution		
Male	27	87.10
Female	4	12.90

Table-II: Physical findings of patient with IHPS (N=31)

Feature	N	%
Projectile vomiting (Non bilious)	30	96.77
Visible peristalsis in Upper abdomen	24	77.42
Demanding food following vomiting	29	93.55
Failure to thrive	11	35.48
Constipation	7	22.58
Jaundice	1	3.23

Table-III: Clinical findings and ultra-sonogram findings of IHPS (n=31)

Clinical Findings				Ultra-sonogram findings			
Palpable mass		No palpable mass		Hypertrophied pylorus		No hypertrophied pylorus	
N	%	N	%	N	%	N	%
21	67.74	10	32.26	29	93.55	2	6.45

Table-IV: Correlation of clinical and ultra-sonogram findings with operative finding (n=31)

Variables	Clinical findings				Ultra sonogram				Operative	
	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE	IHPS	Other than IHPS
	+ve	+ve	-ve	-ve	+ve	+ve	-ve	-ve		
N	20	1	8	2	27	2	2	2	29	2
%	64.52	3.23	25.81	6.45	87.10	6.45	6.45	6.45	93.55	6.45

Table-V: Correlation of pattern of sensitivity and specificity in clinical findings and ultra-sonogram findings (n=31)

Variables	Sensitivity (%)	Specificity (%)
Ultra-sonogram examination	93.1	50
clinical findings	71.43	66.67

DISCUSSION

Among the 31 patients admitted during the study period, 29 patients were finally diagnosis as IHPS, and 2 patients were other than IHPS. Out of 29 patients with IHPS, 25 patients (86.2%) were male and 4 patients (13.8%) were female. Male: female ratio was 6.25:1. It is similar to another study. In several studies of a large group of children with pyloric stenosis, boys have been affected 5 times more often than girls. This study has also shown the fact of male predominance Male patients with pyloric stenosis (PS) were statistically significantly more likely to be firstborn, in one observation of pyloric stenosis (PS) firstborn male infants was 71%, [5]. This study has also shown the firstborn affected male patients with PS 58.06% which correlated with the above study. The age of the patients ranged from 0 months to 5 months in this study, Peak incidence was observed within 1 - 2 months and the lowest incidence was observed after 2 months of age. Out of 31 patients within 1 - 2 months were 22 patients (70.97%), within 1 month was 6 patients (19.35%) and 3 (9.68%) patients were between 2-5 months. There were no patients observed beyond 5 months of age. The typical presentation of IHPS usually commences at the age of 3 - 4 weeks [2, 5]. In one study all patients were aged less than 2 months [5]. In another study hypertrophic pyloric stenosis is exceedingly rare in patients over 6 months of age [14] which correlate with the present study. Family history of infantile hypertrophic pyloric stenosis was not informative in this study. No patient had a family history of IHPS [5] showed that of the 47 patients with pyloric stenosis there was also no family history. In this retrospective study, the total number of patients wore was 31. The exact aetiology was not found in this study. Many authors also noted that the aetiology of infantile hypertrophic pyloric stenosis remained obscured despite theories involving genetic, environmental and neurologic factors [6]. In Bangladesh most of the people are illiterate and they are not health conscious. Medical facilities are not well equipped. So most of the patients did not get adequate treatment before arrival at a specialised hospital. Before arrival at Dhaka Shishu Hospital, 5 (16.13%) patients came to initial contact with a specialist doctor, 19 (61 28%) patients with a qualified doctor, 1 (3.23%) patient with a homoeopathic doctor, 1 (3.23%) patient with pally doctor and 5 (16.13%) patients have got admitted directly. Patients in this series presented with non-bilious projectile vomiting (97.77%), visible peristalsis in the upper abdomen passing from left to right 77.42%, hungry following vomiting 93.55%, failure to thrive 35.48%, constipation 22.58% and jaundice was 3.22% cases. This study showed that palpable olive-shaped mass was found in 64.52% cases, dehydration 96.77% and anaemia was 6.45% cases, the complication depends upon the duration of symptoms. More the duration of symptoms, more and more will be complications. The usual complication was malnutrition, dehydration and metabolic alkalosis due to electrolyte imbalance, Hypo tonicity and lack of interest in feeding are serious important complication, suggesting a marked electrolyte upset. A subnormal temperature is also a serious sign [15] which was not found in the present study. The diagnosis of IHPS was based on the history of non-bilious projectile vomiting, a mass moving across the upper abdomen and palpation of pyloric mass in the right hypochondriac region. Ultra-sonogram was helpful in the diagnosis of IHPS even in atypical clinical presentation. In the present study among 31 patients, the ultra-sonogram investigation was done for all patients. Out of 31 patients finally, hypertrophic pyloric mass was confirmed by ultrasonography and operatively in 27 patients (87.1%). There were 4 diagnostic errors 2 patients (6.45%) with false-positive and 2 patients (6.45%) with false-negative by ultrasonogram study. Here sensitivity was 93.1% and specificity was 50% Godbole [7] shown that of the 75 patients with pyloric stenosis, ultrasound examination was confirmatory in 74 (98.6%) patients. There was one false-negative scan in an infant proven to have pyloric stenosis at surgery Ultrasound imaging, therefore, had a sensitivity of 97% and specificity of 100%. No false-positive scan was noted in the study which does not correlate with the present study. Still, now ultrasonogram is not widely used in the diagnosis of IHPS, because we need special paediatric probes. The result may vary with others. Because the diagnosis of IHPS with ultrasonogram is a high operator dependant. So skilled is an important factor for the diagnosis of IHPS by ultrasonogram. Besides this workload. Relaxed condition of the infant during ultrasonography and repeat scan often may not be possible due to financial

problems to diagnose IHPS with ultrasonogram accurately. In the present study, all patients were examined clinically carefully when the patient was relaxed to identify the pyloric mass. Sometimes it was done on several occasions to evaluate the presence of pyloric mass. Out of 31 patients, clinical examination for hypertrophic pyloric mass was positive in 20 (64.52%) patients. There was one false. Positive (3.22%) and 8(25.81%) were false negatives in our study. This large number of false-negative results may be due to failure to examine the infant in a fully relaxed condition. The pylorus mass may also not be detected clinically if it is sub-hepatic in location. It may also be the failure of the individual to palpate the bump. Our clinical examination had a sensitivity of 71.43% and specificity of 66.67% Godbole [7] showed that of 75 patients with pyloric stenosis, clinical examination was positive in 60 (80%) patient. There was one false positive examination. Pyloric stenosis could not be detected in 15 patients (20%). The false-negative result was 20%. Clinical examination, therefore, had a sensitivity of 72% specificity of 97% which do not correlate with the present study. Barium meal study of stomach and duodenum was done in 4 (12.9%) patients in this study, 2 patients showed features of gastric outlet obstruction and 2 patients showed normal study and dye easily passed into the small intestine. There was an absence of associated (GER) gastro-oesophagal reflux or malrotation in this study. Forman showed only 44% of those with an imaging examination was diagnosed as having HPS and in another series, it was 53% to 75%, which correlate with the present study. In the present study, all patients with IHPS had laparotomy for pyloromyotomy operation. During the process of pyloromyotomy one (3.2%) patient developed duodenal mucosal perforation which was repaired by omental patch and post-operative recovery of this patient as well. Royal [13] reported the rate of mucosal perforation during pyloromyotomy ranging from 0.3% to 11.5% which correlated with the present study. Poon (Poon et al. 1996) [16] shown that there were 7 (23%) instances of duodenal mucosal perforation out of 303 patients, which is almost similar to the present study. The most common postoperative complications in this study was vomiting in 8 (25.81%) patients, respiratory tract infection in 4 patients (12.9%), and one patent had wound infection and one patient - abscess in the limb. Poon [16] showed the rate of wound infection following pyloromyotomy was 3% to 9%, Khan [5] showed the rate of wound infection following pyloromyotomy was 2.1% which correlated with the present study. Mortality after pyloromyotomy is at present below 1% in many countries [5]. In this study, there was no mortality Rasmussen *et al*., showed that the rate of mortality among surgically treated patients of IHPS was 0.7%. Improvement in pre-operative resuscitation including correction of anaemia, dehydration and electrolyte imbalance and facilities in post-operative management is the reason for reduced mortality, which is now less than 1% [17, 5]. All patients in this series were advised to come for follow up but only 4 (12.9%) patients reported. The general conditions of all follow up patients were satisfactory. They had a good appetite, had satisfactory weight gaining and had no vomiting. There was no recurrence of IHPS or incomplete pyloromyotomy in this series. Parigi [18] reported the recurrence of IHPS in 7 weeks after the first operation. After the second pyloromyotomy patient recovered well and there was no complaint in follow up Rasmussen [17] showed 2 patients who underwent a second pyloromyotomy operation because of insufficiency of the initial pyloromyotomy. In this study no such experience in the present series.

Conclusion and Recommendations

In conclusion, we would like to advise that infantile hypertrophic pyloric stenosis is the most common cause of non-bilious projectile vomiting in an infant. The diagnosis being mode primarily by non-bilious projectile vomiting in a neonate, which usually starts 2-4 weeks after delivery. The vomiting is usually after each feeding. The diagnosis is made primarily by clinical findings and palpation of the hypertrophied pylorus mass but it is difficult to palpate. Ultrasound imaging is an available and noninvasive test to confirm the diagnosis of infantile hypertrophic pyloric stenosis. So ultrasound is a reliable test to diagnose of IHPS and for documentation and not needed any contrast invasive radiological examination.

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