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Research Article

Incidence of left indirect inguinal hernia in the paediatric age group in Najaf city, Iraq

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Abstract

Inguinal hernia represents a common cause of referral to a paediatric surgery clinic in infancy and early childhood. It has a bimodal distribution, with peaks below one year and in the third to fourth decade of life. Inguinal hernia is 5-10 times more common in males than in females. Worldwide, right-sided inguinal defect is the most frequently encountered; nevertheless, in Najaf city, Iraq, left-sided inguinal hernia is predominant. In our study, we included 622 children under 14 years old over the period from Jan 2017 to Dec 2025. All the patients who were operated on primarily for left inguinal hernia were checked for right-sided inguinal defect. The hernias were 100% indirect; ninety-five percent of the cases were males, 71.5% were left-sided, 17.5% were right-sided, and 11% were bilateral. The repair was accomplished uneventfully using the standard open approach; no complications have been reported, and no death incidents have occurred. The objective of this paper is to examine the incidence of left-sided inguinal hernia in Najaf city, Iraq, compared to that in other areas around the world and to lay the groundwork for future studies examining the factors contributing to this result.

1. Introduction

Inguinal hernia is a common birth defect involving the lower abdominal wall that occurs in 1%-5% of full-term boy babies [1]. In male patients, inguinal hernia has a bimodal distribution, occurring below one year and in middle age [2]. The peak age of presentation in boys is during the first year of life, whereas in females, the age of presentation is around 4.7 years [3].

The inguinal hernia is classified into congenital (approximately 99% of indirect types) [1] and acquired (direct type). Worldwide, the incidence of right-sided inguinal hernia is exceeding 60%, the left-sided is 30%, and both sides' defects make up only 10% of male children [3]. This has been explained by various anatomical and embryological reasons [1, 4]. Prematurity, congenital weakness in abdominal wall musculature, and increased intra-abdominal pressure are known risk factors [2].

Patients typically presented with a painless groin lump that enlarges with crying or straining [1]. Other causes of inguinal masses, such as hydrocele, undescended testes, lymphadenopathy, testicular torsion or tumour, and varices, should be excluded with careful history, examination, and relevant investigations [1].

Inguinal hernia is one of the most common surgical conditions encountered in infants and children, representing a frequent cause of referral to paediatric surgical services worldwide. It occurs when abdominal contents protrude through a patent processus vaginalis into the inguinal canal. In children, nearly all inguinal hernias are of the indirect type, while direct inguinal hernias are distinctly uncommon in the

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paediatric age group [2, 3]. The estimated incidence ranges from 1% to 5% in full-term infants and rises significantly in premature and low-birth-weight neonates [1, 5].

The condition demonstrates a marked male predominance, occurring approximately 5–10 times more frequently in boys than girls. This sex difference is mainly related to the embryological process of testicular descent and delayed closure of the processus vaginalis. The peak age of presentation is during the first year of life, particularly within the first few months after birth, although some children may present later depending on hernia size and parental recognition [4, 6].

Clinically, patients usually present with an intermittent painless groin swelling that becomes more prominent during crying, coughing, or straining and may disappear at rest. Complications such as incarceration or strangulation require urgent surgical intervention. Careful history, physical examination, and selective use of ultrasonography are helpful in differentiating hernia from hydrocele, lymphadenopathy, undescended testis, torsion, or other groin masses [7, 8].

Although the worldwide pattern consistently favors right-sided inguinal hernia, preliminary observations in Najaf city, Iraq, suggest an unusual predominance of left-sided disease among male children. Investigating this variation may provide important epidemiological, anatomical, and genetic insights. Therefore, the present study aimed to evaluate the incidence of left-sided paediatric inguinal hernia in Najaf city and compare it with internationally reported data [9, 10].

Aims and objectives of the study:

1. To examine the incidence of the left-sided inguinal hernia in Najaf city, Iraq.
2. To compare the result with the incidence of left-sided inguinal hernia worldwide.
3. To encourage new researchers to find factors attributed to our result.

2. Methods

Six hundred twenty-two children have been enrolled in our study. Medical records were reviewed retrospectively, described, and categorized by age, sex, laterality of the inguinal defect, associated risks, surgical technique, and complications. Data have been analysed using appropriate statistical tests. Demographic features of the patients are demonstrated below:

Table 1: Demographic Character

Demographic Character	Category	Number	Percentage
Age	Below 2 months	76	(12%)
	2 to 12 months	281	(45%)
	13 to 60 months	215	(34%)
	More than 60 months	50	(8%)
Sex	Male	604	(97%)
	Female	18	(3%)
Place of living	Rural area	210	(33%)
	Urban area	412	(67%)

Children who primarily presented with left-sided inguinal hernia have been checked clinically and by groin ultrasound for the presence of contralateral patent process vaginalis (PPV). Ultrasound represents an important tool in detecting an occult PPV with high accuracy [5]. Cases of undescended testis and hydrocele have been excluded from the study.

The presence of both sides' inguinal hernia in a phenotypic female child may alert the surgeon to the possibility of androgen insensitivity syndrome (testicular feminisation), where the hernial sacs contain testes [2]. Postoperatively, patients have been followed up for a minimal period of 2 years for the development of right-sided inguinal hernia or accidentally discovered contralateral PPV.

Table 2: Complications of surgery

Complications	Number	Percentage
Recurrence	None	0%
Right-sided inguinal hernia	7	1.1%
PPV	Not detected	Not detected

3. Discussion

The incidence of inguinal hernia is 5% among full-term boy children [11, 12]. It occurs 5-10 times more in males than in females. The peak age of presentation in boys is during the first year of life, whereas in females, the age of presentation is around 4.7 years [13, 14].

Patients typically present with a painless lump on the lower abdominal wall that often disappears when they lie down. Although the family might attribute crying spells to that bulge, this should alert the surgeon to the possibility of strangulation [15]. Questions about the child's general health and family history are crucial for informing treatment options and subsequent follow-up.

Examination should be carried out in supine and standing positions; the cough impulse test may be helpful in an older cooperative child [16] to exclude similar conditions such as undescended testes, hydrocele, inguinal lymphadenopathy, and lipoma. Checking the right inguinal side is a fundamental step if an infant presents with a left-sided inguinal defect, and the reverse is correct as well, because a significant number of patients have an occult PPV that may develop into a future hernia [17, 18]. Laparoscopic technique facilitates direct visualization and repair of contralateral PPV intraoperatively [19].

Inguinal hernia represents a common cause of referral to paediatric surgery services in infancy or early childhood [20]. More than 90% on inguinal hernia cases are associated with an ipsilateral undescended testis or a hydrocele [21, 22]. Although various hypotheses have been suggested, the "WATER-TRAPE" theory remains the most recent and acceptable one [21]. Conditions such as prematurity, genitourinary abnormalities, cystic fibrosis, family history, ascites, connective tissue disorders, mucopolysaccharides, glycogen storage diseases, congenital abdominal wall defect, and chronic lung disease are strong risk factors [20].

Table 3: Risks and Associations

Risks and associations	% of right inguinal hernia	% of left inguinal hernia	% of bilateral inguinal hernia	Total number
Prematurity	1	2	15	18
Genitourinary anomalies	None	None	None	None
Cystic fibrosis	None	None	None	None
Mucopolysaccharides	None	None	None	None
Glycogen storage diseases*	None	None	2	2
Ascites (V-P shut, CAPD)	1	2	1	4
Family history	None	None	None	None
Chronic lung disease	None	None	None	None
UDT, hydrocele	108	326	41	475
None				123

CAPD (Continuous Ambulatory Peritoneal Dialysis), V-P shunt (Ventriculoperitoneal Shunt), UDT (Undescended Testes). None was detected in the study sample.

Inguinal hernia in children is essentially of an indirect type that results from patent process vaginalis (PPV) [20]. The reasons why the PV failed to obliterate are unknown [22]. However, this has been explained by various embryological and anatomical factors [19]:

1. Later descent of the right testicle leading to delayed obliteration of the right process vaginalis and the difference between the sides [22, 23].
2. Protective (buttressing) effect of the sigmoid colon on the left side.
3. Failure of apoptosis of smooth muscle involved in testicular descent [21].

For reasons not well understood, data collected from Najaf city in Iraq demonstrated that 71.5% (445 out of 622) of the male children were presented primarily with left-sided inguinal defects and only 17.5% had right-sided hernia, while 11% had both sides affected. Interestingly, girl children in Najaf city didn't follow the aforementioned pattern and showed that the right and the left sides are equally affected.

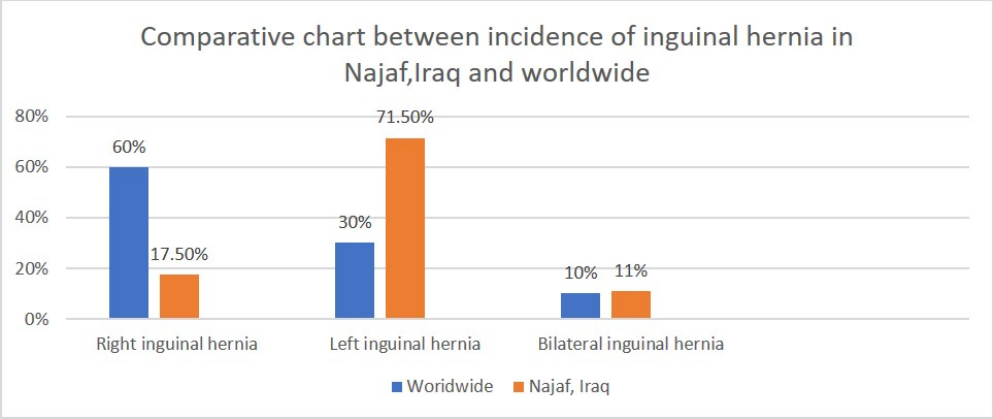

Figure 1: Comparative chart between the incidence of inguinal hernia in Najaf, Iraq and worldwide

The findings of the present study demonstrating a predominance of left-sided inguinal hernia contrast with the widely reported global pattern, where right-sided hernias are more common. Classical paediatric surgical literature, including Pediatric Surgery [4] and Essentials of Pediatric Surgery [7], consistently reports right-sided dominance, attributing this to delayed descent of the right testis and later closure of the right processus vaginalis [4, 7]. The deviation observed in this study suggests the possibility of regional, genetic, or environmental influences that may affect embryological development in this population.

One possible explanation for the increased incidence of left-sided hernias could be anatomical variation in the closure timing of the processus vaginalis. Although the sigmoid colon is traditionally thought to provide mechanical support on the left side, reducing hernia formation, this protective mechanism may vary among populations. Studies such as those by Ein SH and Grosfeld JL have emphasized that contralateral patent processus vaginalis can exist even in clinically unilateral cases, suggesting that laterality may be more dynamic than previously assumed [1, 7].

Additionally, the role of prematurity and associated risk factors must be considered. Premature infants exhibit a higher incidence of inguinal hernia due to incomplete obliteration of the processus vaginalis. Research published in journals such as Journal of Pediatric Surgery indicates that both sides may remain patent in early life, with later clinical manifestation depending on intra-abdominal pressure and developmental changes [8]. This could partially explain the increased detection of left-sided hernias in certain cohorts.

Another important consideration is diagnostic and reporting bias. Increased awareness, improved access to healthcare, and variations in clinical examination techniques may influence the observed distribution of hernia laterality. Ultrasonographic evaluation, now more commonly used in paediatric practice, has enhanced the detection of subtle or asymptomatic hernias, including those on the left side that might previously have been overlooked [5, 8].

Furthermore, genetic predisposition and familial clustering may contribute to this atypical pattern. Although not extensively studied in Middle Eastern populations, emerging evidence suggests that connective tissue composition and collagen disorders may influence hernia formation and laterality [6, 8]. Future multicenter studies incorporating genetic and environmental variables are recommended to better understand these associations.

In summary, while the predominance of left-sided inguinal hernia observed in this study differs from established global trends, it highlights the importance of regional epidemiological research. These findings underscore the need for further investigation into anatomical, genetic, and environmental factors that may influence the development and presentation of paediatric inguinal hernia.

4. Result

Six hundred twenty-two under-14-year-olds have been selected, examined, and operated for inguinal hernia through the open approach. The standard high herniotomy was undertaken uneventfully; no complication was reported, and no deaths occurred. 445 (71.5%) were identified as having left-sided inguinal hernia, 17.5% (108 children) have right-sided inguinal hernia, and sixty-eight children making up (11%) showed bilateral inguinal defect on presentation. 604 (97%) were boys, and the peak age of presentation was 2 months – 12 months (45%) followed by 13 months – 60 months (34%).

All children presented and operated primarily for left-sided inguinal hernia have been examined clinically and ultrasonically for the presence of an occult contralateral PPV.

Out of the six hundred twenty-two children in the study cohort, 18 (3%) were premature, and 15 out of them (83%) had bilateral inguinal defects.

Two children (0.3%) have ascites, four have a ventriculoperitoneal (AV) shunt (0.6%), and four have a CAPD (0.6%). 2 cases of Ehler-Danlos syndrome have been operated on for bilateral inguinal hernia among the study group. Also, an undescended testis was identified in the ipsilateral side in seventy-six percent (475) of the children.

Limitations

Retrospective design; single-region data; potential referral/selection bias; incomplete long-term follow-up in some cases; absence of laparoscopic confirmation in all patients; no direct causal analysis.

5. Conclusion

The incidence of left-sided inguinal hernia is doubling (71.5%) that of the left-sided inguinal hernia worldwide (30%) in under 14-year-olds in Najaf city, Iraq. More studies need to examine the factors attributed to our result.

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