ORIGINAL RESEARCH

Analysis of Pediatric Surgical Disease Spectrum in a Tertiary Hospital

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ABSTRACT

Objective • To analyze the main disease composition of children hospitalized in pediatric surgery, explore the correlation between disease types and gender, and provide a reference for hospital management and pediatric disease prevention.

Methods • Using ICD-10 codes as the classification standard for disease diagnosis, a statistical analysis was conducted on the disease composition of children hospitalized in the Pediatric Surgery Department of the Second Affiliated Hospital of Xi'an Jiaotong University from January 1, 2015, to December 31, 2015, followed by the establishment of a clinical database. A total of 1647 male patients and 817 female patients were enrolled in the study, resulting in a male-to-female ratio of 2:1. The age range of the patients spanned from 0 to 18 years, with a marked imbalance in patient distribution among the various age groups. Statistical analysis was conducted using SPSS version 18.0 software. A chi-square test was performed to analyze the differences in the composition of disease systems and the composition of major diseases in terms of sex and age.

Results • Pediatric patients were admitted with complex and diverse diseases in 2015, involving 15 systems of the human body and 400 diseases. Digestive system diseases, tumors, congenital malformations, and genitourinary system diseases were the top four diseases accounting for 83.5% of all pediatric cases. 561 patients were aged 0 years, accounting for 22.3% of all cases, while 1,801 patients fell within the 0-5 years age group, constituting 73.1% of the total. The differences in disease system composition among different sex and age groups of pediatric surgical inpatients were statistically significant (P = .001). There are statistically significant differences in the length of hospital stay and hospitalization costs among pediatric surgical inpatients in different age groups (P = .001).

Conclusion • To strengthen the diagnosis and treatment of pediatric surgical diseases, we should strengthen the construction of key departments, optimize the consultation process according to the characteristics of children's disease spectrum, and improve the level of diagnosis and treatment of pediatric surgical diseases. (*Altern Ther Health Med.* 2024;30(6):149-153).

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INTRODUCTION

The total population of children in China is about 260 million, and the prevalence of pediatric diseases is approximately 12.33% on average.[1] The prevalence of systemic diseases in pediatric surgery is similar to that in adult patients. However, pediatric tumors are less prevalent than adult tumors.[2] However, there is a notable scarcity of research on the pediatric surgery disease spectrum available in databases such as CNKI and Wangfang.[3] Pediatric surgery is characterized by an increasing number of patients, complex disease types, and high risk of medical and nursing staff. The allocation of human resources within pediatric surgery departments directly impacts the development of pediatric medical care and service quality, with profound implications for child safety and disease prognosis. In light of these considerations, the imperative to acquire timely insights into the consultation patterns and disease spectrum of pediatric surgery becomes unequivocal. Such insights are paramount not only for the efficient allocation of medical and nursing personnel and medical equipment resources but also to guarantee the highest possible quality of pediatric surgical care.[4,5]

The pediatric surgery department at The Second Affiliated Hospital of Xi'an Jiaotong University was founded in 1958, is the first batch of master's degree-granting sites in pediatric

surgery since 1979 and one of the famous pediatric surgery treatment and specialist training bases in China. The children admitted to the hospital come from Shaanxi Province and the surrounding areas, and the wide range of caseloads can reflect the overall characteristics of pediatric surgery patients in Shaanxi Province and the surrounding areas.

MATERIALS AND METHODS

Research population

Children hospitalized in the Department of Pediatric Surgery in The Second Affiliated Hospital of Xi'an Jiaotong University from January 1, 2015, to December 31, 2015, were enrolled as the study population.

Inclusion and exclusion criteria

Inclusion criteria. All patients who were admitted to our hospital for pediatric surgery from January 1, 2015, to December 31, 2015, were recruited.

Exclusion criteria. Patients discharged less than 24 hours after admission, patients who died within 24 hours of admission, and patients older than 19 years of age.

Research methods

Data Sources. The retrospective clinical survey research method was employed for this study. The primary data sources were the patient case room and the Hospital Information System (HIS) of the hospital. These sources provided access to comprehensive patient records and medical information related to children hospitalized in the pediatric surgery department from January 1, 2015, to December 31, 2015.

Disease classification criteria. The ICD-10 code was used as the classification standard for disease diagnosis. For those with discrepancies between the admission diagnosis and the final diagnosis, the final diagnosis prevailed. If the same patient was diagnosed with two or more diseases concurrently, the first diagnosis was used for statistical analysis.

Potential Biases and Errors. The data collected were limited to patients hospitalized in the hospital during the specified study period. Patients who sought treatment elsewhere or those with less severe conditions not requiring hospitalization may not be included, potentially leading to a selection bias; Human errors during data entry, coding, or transcription could introduce inaccuracies into the dataset. To minimize this risk, double-checking and validation procedures were implemented during data collection. Efforts were made to identify and address such gaps in the data. In conclusion, the data collection process for this study involved meticulous retrieval and integration of information from patient records and the HIS. While efforts were made to minimize biases and errors, the above-mentioned potential sources of bias and error should be considered when interpreting the results of this research.

Research content. The analysis of pediatric surgical disease composition includes the main disease composition of patients and the differences in disease composition between sexes and ages.

Table 1. Systematic classification of pediatric surgery diseases and number of diseases

Diseases	case	Percentage (%)	Cumulative percentage (%)	Number of diseases
Digestive System	882	35.8	35.8	89
Tumors	454	18.4	54.2	74
Benign Tumors	391	15.9		50
Malignant Tumor	50	2.0		17
Other Tumors	13	0.5		7
Congenital malformation	451	18.3	72.5	76
Urogenital	271	11.0	83.5	33
Examination Consultation	200	8.1	91.6	12
Skin	50	2.0	93.6	29
Injury poisoning	27	1.1	94.7	20
Unclassifiable	25	1.0	95.8	17
Skeletal system	23	0.9	96.7	10
Circulatory system	22	0.9	97.6	4
Perinatal related disease	16	0.6	98.2	9
Hematopoietic system	14	0.6	98.8	8
Respiratory system diseases	13	0.5	99.3	10
Infectious diseases	10	0.4	99.7	5
Metabolic diseases	6	0.2	100.0	4
Total	2464	100.0		400

Statistical analysis

The data of this study were processed and analyzed by SPSS version 18.0 software. A chi-square test was performed to analyze the differences in the composition of disease systems and the composition of major diseases in terms of sex and age. $P < .05$ denotes the statistically significant difference for the inter-group comparison.

RESULTS

Classification of disease systems and the number of diseases in pediatric surgical inpatients.

Pediatric patients in the year 2015 were admitted with complex and diverse diseases affecting 15 different systems of the human body and consisting of around 400 different diseases. Among the different diseases, digestive system diseases were the most common with 882 cases recorded in hospitalized children. These cases contained 89 different diseases and accounted for 35.8% of the total number of cases. The second most common type of disease was oncological diseases with 454 patients recorded and 74 different diseases accounting for 18.4%. Congenital malformations ranked third with 451 cases containing 76 diseases, accounting for 18.3%. Genitourinary system diseases ranked fourth with 271 patients, containing 33 diseases and accounting for 11.0% of the total number of cases. (Table 1).

The differences in disease system composition among different sex and age groups

The differences in disease system composition among different sex and age groups of pediatric surgical inpatients were statistically significant ($P = .001$). Table 2-3).

The department of pediatric surgery in the hospital recruited 1647 male patients and 817 female patients in 2015, with a male-to-female ratio of 2:1. The top three disease systems for male patients were, in order, digestive system diseases (39.2%), congenital malformations (20.6%), and genitourinary system diseases (15.8%), accounting for 75.6% of the total number of male patients. The top three disease systems for female patients were, in order, tumors (31.79%),

digestive system (28.9%), and follow-up examinations (14.2%), accounting for 74.89% of the total number of female patients.

The differences in the composition of disease systems of children in different age groups were statistically significant.

The top three disease systems that affect children aged 0 years are tumors (40.3%), congenital malformations (23.0%), and digestive system diseases (18.5%). These three systems account for 81.8% of patients aged 0 years. Among children aged 1-4 years, the top three disease systems are the digestive system (41.9%), congenital malformations (16.5%), and genitourinary system (13.9%), accounting for 72.3% of the total number of patients in this age group. Similarly, for children aged 5-9 years, the top three disease systems are the digestive system (37.0%), congenital malformations (16.8%), and genitourinary system (15.5%), accounting for 69.3% of the total number of patients in this age group. Finally, for patients aged 10-18 years, the top three disease systems are the digestive system (44.4%), congenital malformations (19.0%), and tumors (14.6%), accounting for 78.0% of patients in this age group.

Differences in length of hospital stay and hospitalization costs among different age groups.

There are statistically significant differences in the length of hospital stay and hospitalization costs among pediatric surgical inpatients in different age groups (P = .001), (Table 4-5). K-S normality tests were conducted on the length of hospital stay and hospitalization costs of pediatric inpatients, and the results indicated that both variables exhibited skewed distributions. The median and quartiles were used to represent the data.

Table 2. Differences in disease system composition by gender

Disease system Classification	Sex	
	Male	Female
Digestive system	646(39.2)	236(28.9)
Tumors	195(11.8)	259(31.7)
Congenital malformations	340(20.6)	111(13.6)
Urogenital	261(15.8)	10(1.2)
Follow-up examinations	84(5.1)	116(14.2)
Skin	31(1.9)	19(2.3)
Injury poisoning	16(1.0)	11(1.3)
Other	74(4.5)	55(6.7)
Total	1647(100.0)	817(100.0)

Note: Comparison between sexes: $\chi^2 = 316.405$, $P = .001$.

Table 3. Differences in disease system composition by age

Disease system Classification	Age group			
	0	1-4	5-9	10-18
Digestive system	104(18.5)	461(41.9)	198(37.0)	119(44.4)
Tumors	226(40.3)	125(11.4)	64(12.0)	39(14.6)
Congenital malformations	129(23.0)	181(16.5)	90(16.8)	51(19.0)
Urogenital	9(1.6)	153(13.9)	83(15.5)	26(9.7)
Follow-up examinations	46(8.2)	90(8.2)	50(9.3)	14(5.2)
Skin	13(2.3)	22(2.0)	10(1.9)	5(1.9)
Injury poisoning	0(0.0)	14(1.3)	10(1.9)	3(1.1)
Other	34(6.1)	54(4.9)	30(5.6)	11(4.1)
Total	561(100.0)	1100(100.0)	535(100.0)	268(100.0)

Note: Comparison between age groups: $\chi^2 = 342.074$, $P = .001$.

Table 4. Differences in length of hospital stay among different age groups

Age group	Average Length of Hospital Stay (days)
0	6.45 (4.46~9.71)
1-4	4.18 (2.53~6.65)
5-9	3.27 (1.96~6.44)
10-18	2.97 (2.03~6.52)

Note: Comparison between age groups: $Z = 0.322$, $P = .001$.

Table 5. Differences in hospitalization costs among different age groups

Age group	Average Hospitalization Costs (in RMB)
0	7689.27 (5459.86~11937.56)
1-4	4859.36 (3382.67~7523.16)
5-9	4362.27 (2884.81~7628.75)
10-18	5116.79 (3613.25~8913.27)

Note: Comparison between age groups: $Z = 22.5209$, $P = .001$.

DISCUSSION

Diseases in the department of pediatric surgery

Pediatric patients were admitted with complex and diverse diseases in 2015, involving 15 systems of the human body and 400 diseases.

Distribution of diseases. The distribution of disease systems in order was 35.8% for digestive system diseases, containing 89 diseases, 18.4% for tumors, containing 74 diseases, 18.3% for congenital malformations, containing 76 diseases, and 11.0% for genitourinary system diseases, containing 33 diseases. The present title page of the case history is considered insufficiently scientific for pediatric surgery and fails to accurately depict the disease spectrum of patients. The inaccurate measurement of the incidence of various congenital malformations and malignant tumors in pediatric surgery is biased against the development of the discipline. The information on the title page of case-history requires further improvement and optimization to facilitate future analysis.

Classification of pediatric surgery diseases. Pediatric surgical conditions can be classified as congenital malformations, solid tumors, infections, and trauma, with congenital malformations occupying the highest percentage and involving all systems. Common diseases in pediatric surgery, such as developmental malformations related to sphingomyelin including inguinal hernia, syringomyelia, and testicular descent insufficiency; gastrointestinal malformations including anorectal malformations, duplication malformations, congenital atresia/stenosis, dilated common bile duct, and biliary atresia; urological malformations including obstruction of the ureteropelvic junction, vesicoureteral reflux, and repetitive malformations; bronchopulmonary developmental malformations, congenital heart disease, vascular/lymphatic malformations, spinal/skeletal joint developmental disorders, and other developmental malformations account for the vast majority of hospitalizations. Congenital malformations are the most important systemic disease in hospitalized children, which is

related to the scope of pediatric surgical admissions and economic development. Thus, increased investment in the diagnosis and treatment of congenital structural malformations and disciplinary development is a priority for the further development of hospitals and government departments at all levels. This suggests that the government needs to promote the standardization of prenatal counseling and intervention and increase investment in perinatal medicine. Reasonable pricing and appropriate expansion of the scope and intensity of assistance for congenital structural malformation diseases will provide access to effective treatment for more patients with congenital malformations.

Tumor patients. In the present study, tumor patients accounted for 18.4% and contained 74 diseases, among which infant patients accounted for 66.3%, which may be attributed to the abnormal embryonic development from which most infant malignant tumors (embryonic developmental solid tumors) are derived.[6] Thus, there are more patients with oncological chemotherapy in this age group. The types of malignant tumors in children differ from those in adults and may involve all systems, but the prognosis of malignant tumors in children is better, with a 5-year survival rate greater than 60%, of which 80% can be cured.[7]

Characteristics of sex distribution of pediatric surgical inpatients

In this study, the ratio of male to female patients was 2:1, and there was significantly more male than female patients, which may be explained by the following: for a single disease, there were a total of 392 cases of inguinal hernia/hypothorax, 342 male patients and 50 female patients, with a male-to-female ratio of 6.8:1.

A study by Kuang et al.[8] found that patients with inguinal hernia/hypothorax occupied the top five patients discharged from children's hospitals, which is consistent with the high proportion of patients with inguinal hernia/hypothorax among inpatients in the present study. Another study reported a total male-to-female ratio of 10.46:1 for inguinal hernia/hypothorax,[9] which is lower in the present study. Syringomyelia was found in a total of 181 male patients. These two diseases are exclusive to males and account for a larger proportion of the disease composition, resulting in a higher proportion of male patients in the disease spectrum composition.

In pediatric surgical diseases, there are no significant sex differences in the epidemiological characteristics of many diseases, such as congenital anorectal malformations,[10] bronchopulmonary developmental malformations, and vascular malformations.

However, in the present study, significant male-to-female differences were observed among the actual hospitalized patients. For example, for congenital anorectal malformations, there were 21 cases of male patients and 6 cases of female patients, with a male-to-female ratio of 3.5:1. Possible reasons for this are associated with male gender preference, where girls may have a lower chance of receiving medical treatment, resulting in a higher proportion of male patients in the disease composition.

In addition, according to the classification of disease systems, digestive system diseases and congenital malformations account for a larger proportion of the disease composition, and male children have a higher proportion of digestive system diseases and congenital malformations, with a ratio of 2.7:1 and 3.1:1 for males and females, respectively, resulting in a higher proportion of male children.

Among the tumor patients, there were 195 males and 259 females, and the ratio of males to females was 0.8:1. Tong's study showed the lack of a national-level pediatric cancer registry in China to date,[11] and Dong's study suggested no significant change in the incidence of embryonal malignant solid tumors in children in some regions of the country, but a significant increase in the incidence in male children was observed.[6] Therefore, exact national data on the incidence and prognosis of childhood cancer are missing to determine the existence of gender differences in potential tumor cases.

The high male predominance among hospitalized children may also be linked to the current imbalance in the sex ratio at birth in China, which is similar to the findings of Li et al. who analyzed the disease spectrum of 100 135 hospitalized children in Ningxia with a ratio of 1.8:1 between male and female children.[12]

Age distribution characteristics of children hospitalized in pediatric surgery: The age range of pediatric surgical admissions includes all patients with surgical diseases from 0-18 years old, and the distribution of children between the age groups is considerably uneven. There were 561 children aged 0 years, accounting for 22.3% of the total number of children, and 1801 children aged 0-5 years, accounting for 73.1% of the total number of children, which may be attributable to the congenital malformations being treated surgically at this age.

The high proportion of children aged 0 years may be connected with the high proportion of children with hemangioma among children aged 0 years. Hemangioma is a common disease in infants and children, with a prevalence between 5-10% and a rapid growth rate up to 1 year of age,[13] resulting in a high number of hospitalized children in this age group. The results of this study remain consistent with previous studies.

The higher proportion of children aged 0 years may also be related to the higher number of children treated with chemotherapy for tumors at age 0 years. 226 cases of tumors at age 0 years accounted for 40.3% of the total number of children hospitalized at age 0 years, and some of the infant malignancies (embryogenic solid tumors) are derived from abnormal embryogenesis.[6] Therefore, more children with chemotherapy for oncology in this age group lead to a higher percentage of children aged 0 years.

The high proportion of children aged 0 years may also be attributed to the growing incidence of perinatal birth defects in China, which reached 15.323 per 1000 in 2011.[14] Possible

factors also include a yearly increasing trend in the overall incidence of birth defects in Shaanxi Province from 2006 to 2010,[15] leading to an increase in the number of children with potential birth defects. Previous studies reported that children under 5 years of age accounted for more than 2/3 of hospitalized patients, which is consistent with the results of the present study.[16]

Study Limitations

This study also has certain limitations. The data for this study were collected from a single hospital, limiting the generalizability of the findings. Pediatric surgical disease patterns and patient demographics may vary across different regions and healthcare settings; The study employed a retrospective clinical survey research method, which relies on historical data. Retrospective studies are susceptible to incomplete or missing records, data entry errors, and inherent biases associated with retrospective data collection; The study did not have access to national-level data on pediatric surgical diseases, making it challenging to contextualize the findings within a broader national healthcare perspective; In conclusion, while this study provides valuable insights into the disease composition and patient demographics of pediatric surgical inpatients, it is essential to interpret the findings with caution due to the mentioned limitations. Future research efforts should consider addressing these limitations for a more comprehensive and accurate understanding of pediatric surgical care.

CONCLUSION

Children hospitalized in the Department of Pediatric Surgery, particularly infants and young children, predominantly present with congenital malformations, and there is a higher incidence among males. Given the negative impact of childhood diseases on individuals, families, and society, it is suggested that the government should attach importance to the prevention and control of childhood diseases, and provide support from multiple channels such as human, financial, material, and information resources. Such as: Establishing a nationwide multi-center prevention and control system, focusing on major pediatric surgical diseases, and developing, and implementing a robust policy and regulation system that outlines guidelines and standards for the prevention, diagnosis, and treatment of major pediatric surgical diseases. It is crucial to establish a system that ensures consistency and quality of care across healthcare facilities. An information monitoring system can also be put in place to track the prevalence and incidence of pediatric surgical diseases. Timely data collection and analysis will help facilitate evidence-based decision-making and resource allocation.

Creating a collaborative network focused on major pediatric surgical conditions can foster collaboration among healthcare institutions, researchers, and policymakers, and promote knowledge-sharing and research activities. Additionally, a financial assistance system should be established to support families facing the financial burden of pediatric surgical treatments. A comprehensive medical insurance policy should also be developed, specifically tailored to major pediatric surgical diseases, ensuring that necessary treatments are covered and accessible to all children.

Investing in the infrastructure and expertise of pediatric surgical treatment is essential. Medical facilities must be adequately equipped to provide high-quality care to children with surgical diseases. Encouraging and funding scientific research dedicated to understanding the etiology and prevention of major pediatric surgical diseases should also be prioritized.

Furthermore, comprehensive prevention and education campaigns targeting parents, caregivers, and healthcare professionals are necessary. These campaigns should increase awareness of risk factors, early detection, and preventive measures.

This study underscores the paramount importance of addressing pediatric surgical disease comprehensively and proactively, and its findings have the potential to drive transformative changes in the field of pediatric surgery. By taking these measures, we hope to better protect children's health and reduce the burden of pediatric surgical diseases on individuals, families, and society. and strive to create a future where children's health is protected, families receive the necessary support, and society benefits from a reduced medical burden.

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