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Tiny needles, major benefits: acupuncture in child health

Xiaobin Ge[1], Gonglei Yue[1], Guangzhong Du[1] and Xue Fang[2*]

Abstract

Objective To retrospectively investigate the utilization patterns and clinical indications of acupuncture within the pediatric population in general hospitals from 2015 to 2020, including disease spectrum characteristics and relevance to pediatric subspecialties.

Methods The clinical data of pediatric inpatients consulted by Acupuncture-Moxibustion and Tuina Department of Qilu Hospital of Shandong University was collected from January 1, 2015, to December 31, 2020. The data collected include the number of wards in which consultation was requested, the diseases that require consultation, the distribution of pediatric tertiary disciplines and the system of disease affiliation.

Results This study summarizes 55 types of pediatric diseases treated with acupuncture. The most common health issues addressed include peripheral facial paralysis, diarrhea, reduced limb mobility or decreased muscle strength, postoperative bloating, and Guillain-Barré syndrome. Acupuncture is utilized across all pediatric subdisciplines, with notable applications in neurology, critical care medicine, general surgery, respiratory medicine, and orthopedics. The classification of diseases for acupuncture consultations primarily focuses on disorders of the nervous system, respiratory system, neoplasms, and digestive system (according to ICD-11).

Conclusions In summary, acupuncture has a broad range of applications in the treatment of pediatric diseases and can serve as a valuable complementary and alternative therapy. The advancement of Traditional Chinese Medicine (TCM) acupuncture in general hospitals is closely linked to the involvement of pediatric practices. The findings of this study provide valuable insights for clinical practice, acupuncture education, pediatric healthcare systems, and social research.

Keywords Complementary and alternative medicine, Acupuncture therapy, Pediatrics, Disease spectrum, General Hospital

*Correspondence:
Xue Fang
fangxue0912@163.com
[1]Department of Acupuncture-Moxibustion and Tuina, Qilu Hospital of Shandong University, Jinan, China
[2]Department of Acupuncture, Affiliated Hospital of Shandong University of Traditional Chinese Medicine, No.42 Wenhua West Road, Jinan City, Shandong Province 250011, P.R. China

Introduction

Acupuncture, a widely used treatment modality in complementary and integrative medicine has been widely used in internal medicine, surgery, gynaecology, etc. Acupuncture is among the complementary and alternative medicine therapies most frequently recommended by internists and family physicians and is currently practiced in over 140 hospitals in the United States [1]. Despite its prevalence in adult healthcare, acupuncture remains underutilized in pediatrics [2–4], with utilization rates as low as 1.78–5.34% in certain regions [5]. One study from High-quality systematic reviews and Cochrane systematic reviews suggests that the efficacy of acupuncture for five diseases (cerebral palsy, nocturnal enuresis, tic disorders, amblyopia, and pain reduction) is promising [6]. Acupuncture has also shown therapeutic potential in treating various other conditions, including pediatric anorexia, Tourette Syndrome, Attention-Deficit/Hyperactivity Disorder, thoracic spinal cord injury, and postoperative pain and nausea [7–11]. Although these studies demonstrate acupuncture's potential in pediatric care, a comprehensive analysis of the diseases treated by acupuncture in this population has not been conducted. A comprehensive analysis of acupuncture's utilization across pediatric subspecialties remains absent. This study retrospectively analyzed acupuncture consultation cases in the pediatric ward of a general hospital from 2015 to 2020, systematically assessed the application scope and clinical significance of acupuncture in the treatment of pediatric diseases.

Methods

Object of study

Consultation data from Department of Acupuncture-Moxibustion and Tuina at Qilu Hospital of Shandong University, covering the period from January 1, 2015, to December 31, 2020, was collected through the hospital's network information center. This dataset included patient names, gender, age, hospitalization numbers, consultation dates, and referring departments. All patient information was encrypted, and the data was subsequently imported into an Excel spreadsheet.

Inclusion criteria and exclusion criteria of cases

The keywords "Pediatrics", "Pediatric Surgery", and "Pediatric Internal Medicine" were used to obtain the relevant information from the Excel spreadsheet. The non-pediatric consultation information was deleted. The pediatric cases requesting acupuncture consultation were included. Cases without acupuncture therapy were excluded. The study flow is shown in Fig. 1.

Research methods

Patient cases were systematically queried in the digital medical record retrieval system of Lianzhong Hospital, developed by Shanghai Lianzhong Co., Ltd. (version number 2019.3.9.2702). The admission number, primary diagnosis of the initial disease, and consultation history of each patient were verified and corrected as necessary. An analysis was conducted on the consultation diseases, distribution across disciplines, and the primary diseases associated with each consultation. The frequency of these variables was subsequently recorded.

Results

From January 1, 2015, to December 31, 2020, a total of 624 cases of pediatric consultations were recorded in the Department of Acupuncture-Moxibustion and Tuina at Qilu Hospital of Shandong University. This figure represents 3.01% of the total consultations in the department and 0.7% of all pediatric inpatient cases. Among the consultations, there were 374 males (59.93%) and 250 females (40.07%), resulting in a male-to-female ratio of 1.5:1. The age of the patients ranged from 13 min (after birth) to 14 years.

Our linear regression analysis demonstrates that the predictive effect of year on case numbers is nonsignificant ($\beta = 1.429$, $p = 0.792$), indicating the absence of a statistically significant linear trend in the data. The regression model did not pass the significance test ($p = 0.792 > 0.05$), suggesting no significant linear trend between year and case numbers. From 2015 to 2020, the number of pediatric cases exhibited a fluctuating trend, reaching a peak of 130 cases in 2017, dropping to a minimum of 87 cases in 2019, and showing a slight increase to 102 cases in 2020. See Table S1 for further details.

Distribution of diseases in pediatric consultations

The highest number of consultations was for peripheral facial paralysis, treated with acupuncture, which accounted for 25.96% of the cases. The second most common condition was diarrhea, comprising 12.66% of consultations. Acupuncture is widely used in the treatment of facial nerve paralysis and diarrhea. Adverse limb movement or muscle weakness, postoperative abdominal distension, and Guillain-Barré syndrome accounted for 7.85%, 5.93%, and 5.77%, respectively. However, its application in the management of acute flaccid quadriplegia, acute disseminated encephalomyelitis, and myelitis is less common and requires further statistical analysis to evaluate its efficacy. Shown in Fig. 2, Table S2.

Disciplinary distribution of consulted diseases and symptoms

Neurology and critical care medicine in pediatrics were the most frequently consulted specialties, comprising 449

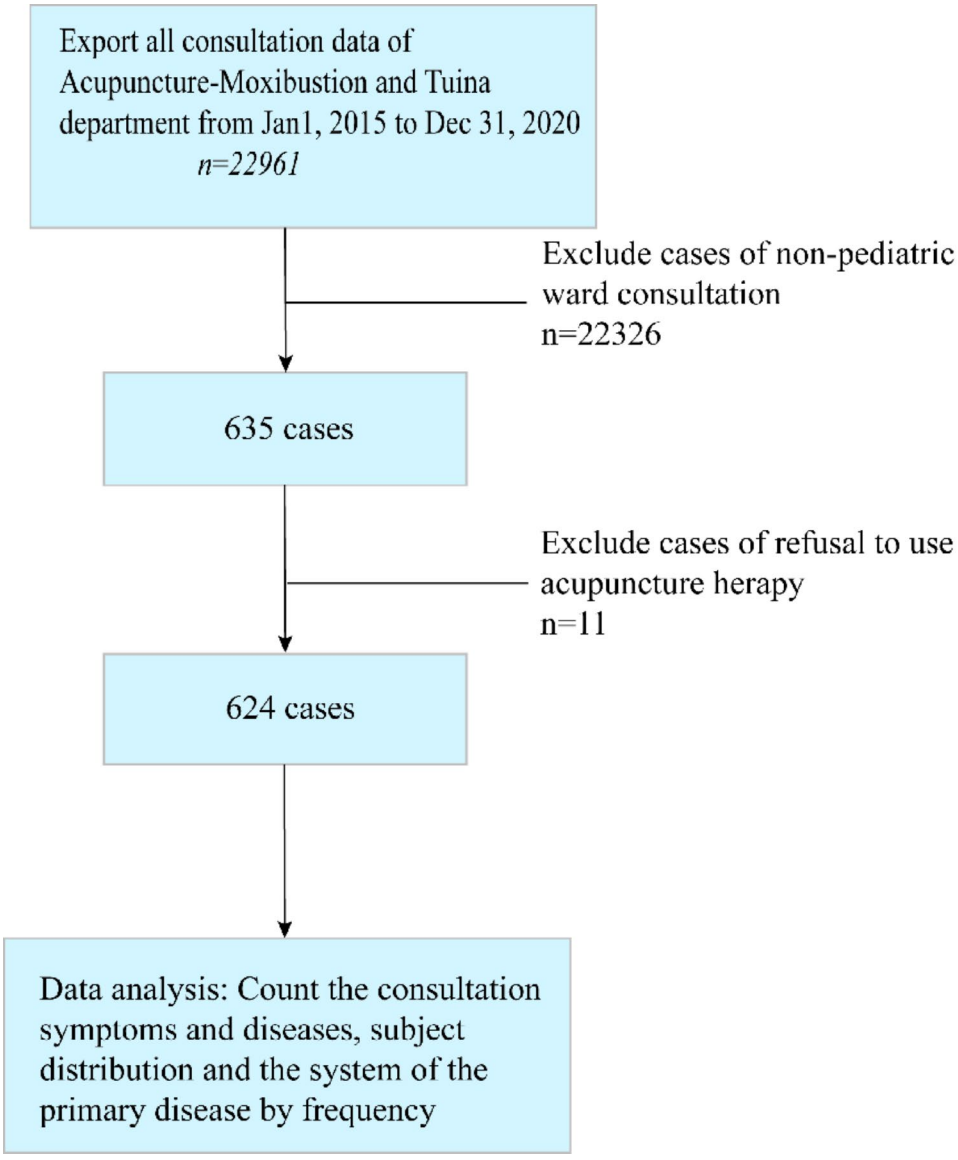

Fig. 1 Study flow

cases, which accounted for 71.96% of the total consultations. This distribution highlights a significant concentration of pediatric consultations in Neurology and Critical Care Medicine, suggesting that these areas may experience higher incidences of pediatric health issues requiring specialist attention. Other significant specialties included general surgery, respiratory medicine, orthopedic surgery, hematology, and neonatology (as presented in Fig. 3).

Statistics of primary diseases during the acupuncture consultations

The primary diseases of the consultation cases involve 17 systems: nervous system, respiratory system, neoplasms, digestive system, developmental anomalies and injury, poisoning or some other consequences of an external cause. Nervous system diseases are predominant, accounting for 68.43% (shown in Table 1). The demand for acupuncture consultations among children primarily focuses on the field of neurology, while also encompassing a variety of diseases affecting other systems.

Safety and adverse events reporting

Regarding the safety of acupuncture in children, systematic reviews indicate that when administered by licensed and rigorously trained acupuncturists following well-researched and detailed protocols, the procedure is generally safe [5, 12, 13]. In this study, all acupuncture procedures were performed by licensed acupuncturists with at least five years of pediatric experience.

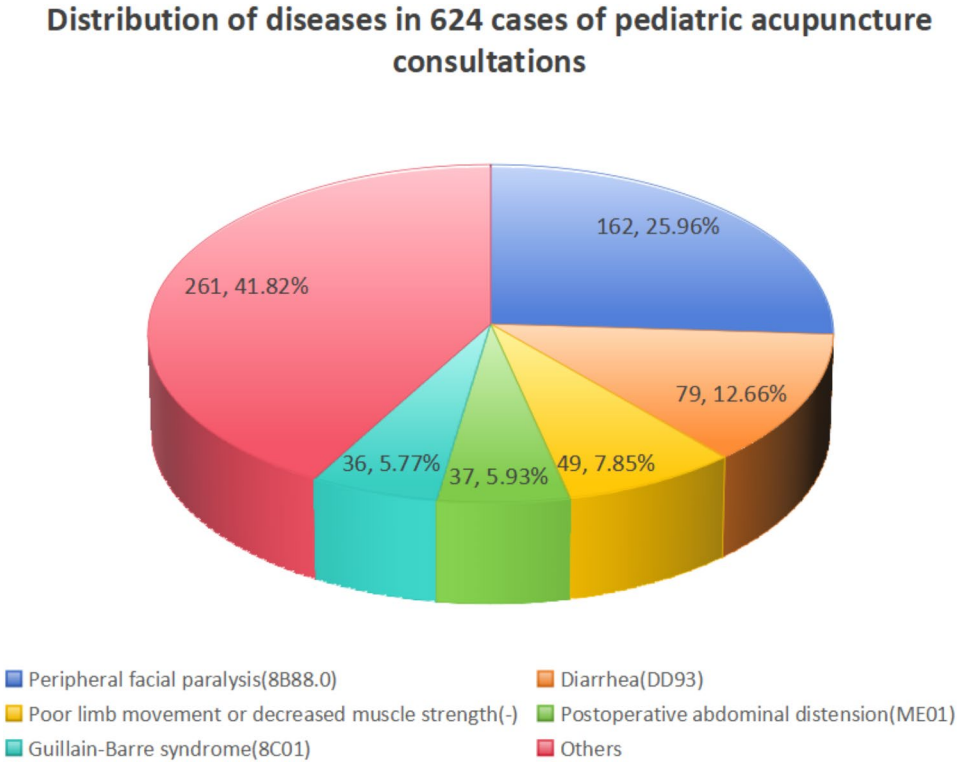

Fig. 2 Distribution of diseases in 624 cases of pediatric acupuncture consultations

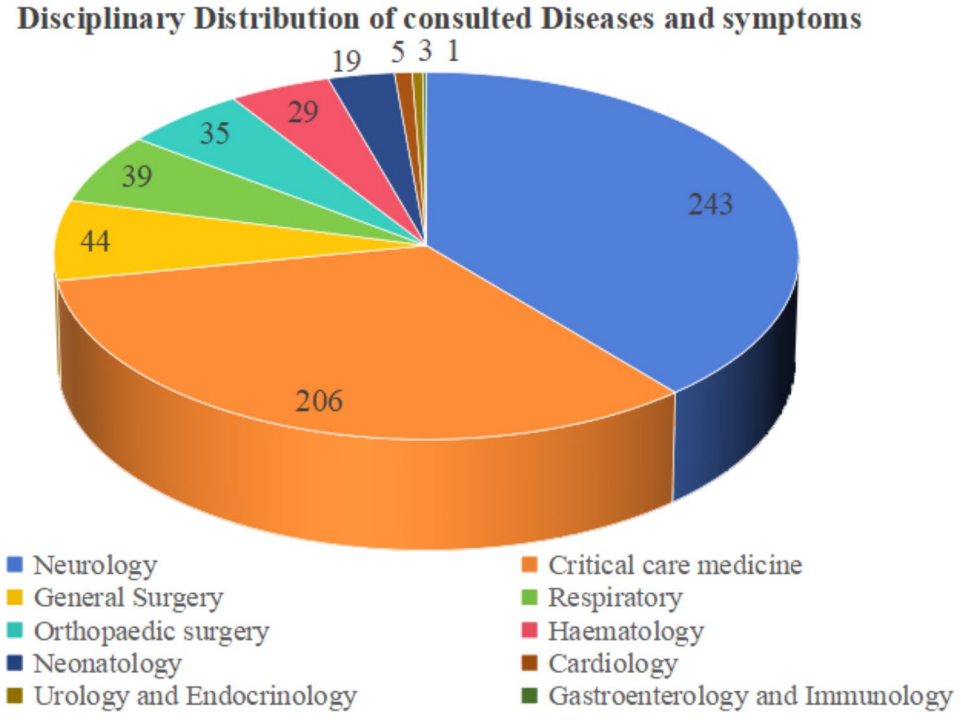

Fig. 3 Disciplinary Distribution of consulted Diseases and symptoms. Notes: 1. The figure reflects the number of consultation cases in different subspecialties within the field of pediatrics. 2. According to the Simple Table of Discipline Classification and Code of the People's Republic of China (National Standard GBT 13745 – 2009), pediatric surgery belongs to the third-level discipline of pediatrics, and the discipline code belongs to surgery. For the convenience of research, this study is unified as pediatric research. 3. Urology and endocrinology, gastroenterology and Immunology are located in the same ward, and this classification is not separated

Table 1 Distribution of primary diseases in 624 cases of pediatric acupuncture consultations

The system to which the disease belongs(ICD-11)	Total/Proportion	Consultation of primary disease (cases)
Diseases of the nervous system	427/68.43%	Peripheral facial palsy (158), Guillain-Barre syndrome (36), Encephalitis (29), Acute myelitis (25), Cerebral infarction (20), Encephalomyelitis (13), Epilepsy (11), Hemiplegia (10), Spinal Cord Injury (10),Myelitis (9), Moyamoya disease (9), Peripheral neuropathy (9), purulent meningoencephalitis (9),Acute Disseminated Encephalomyelitis (8), Autoimmune Encephalitis (8), Acute Flaccid Quadriplegia (6), Intracranial Infection (5), Brachial Plexus Injury (5), Brachial Plexus Palsy (4), Brachial plexus birth trauma (3), Neuromyelitis Optica (3), Peroneal nerve palsy (2), Intracranial haemorrhage (2), Paralysis syndrome (2), Brain stem inflammation (2), Post-encephalitis syndrome (2), Hypoxic-ischemic encephalopathy (2),Infantile spasms (2),Ulnar nerve injury (2),Mitochondrial encephalomyopathy (2), Paroxysmal disease (1),Peroneal nerve damage (1), Myasthenia (1), Acute disseminated encephalitis (1), Acute cerebellar ataxia (1), Myelopathy (1), Paraplegia (1),Sequelae of epidemic encephalitis (1), Chronic inflammatory demyelinating polyneuropathy (1), Incomplete paraplegia (1), Encephalopathy (1), radial nerve damage (1), Toxic encephalopathy (1), Sciatic nerve damage (1), Benign intracranial Hypertension (1), Lower limb paralysis (1), Cerebellar infarction (1), Epstein-Barr virus encephalitis (1), Cerebral palsy (1)
Diseases of the respiratory system	48/7.69%	Bronchopneumonia (23), Severe Pneumonia (10), Pneumonia (10),Acute bronchitis (2),Acute asthmatic bronchitis (1), Acute upper respiratory tract infection (1), Mycoplasma infection (1)
Neoplasms	35/5.61%	Acute lymphoblastic leukaemia (24), Acute myeloid leukaemia (5), Acute leukaemia (1), Acute promyelocytic leukaemia (1), Craniopharyngioma (1), Nephroblastoma (1), Adrenal neoplasm (1), Benign hepatic neoplasms (1)
Diseases of the digestive system	29/4.65%	Intestinal obstruction (8), Intestinal obstruction with adhesions (4), Infantile diarrhea (3), Incomplete intestinal obstruction (2), Acute gastroenteritis (2), Peritoneal adhesions with intestinal obstruction (1), Colitis (1), Diarrhea (1), Hirschsprung's disease (1), Gastritis (1), Postoperative gastrointestinal dysfunction (1), Infantile hepatitis syndrome (1), Gastrointestinal dysfunction (1),Achalasia (1), Acute appendicitis with peritonitis (1)
Developmental anomalies	21/3.37%	Congenital megacolon (2), Congenital atresia of the jejunum (2), Talipes equinovarus (1), Neurofibromatosis (1), Brain dysplasia (1) Cerebellar tonsillar hernia malformation (1),Diaphragmatic hernia (1),Encephalo-facial angiomatosis (1),Ovarian cyst (1),Cerebral artery stenosis (1),Mesosalpinx cyst (1),Congenital aganglionic megacolon (1), Congenital atresia of the small intestine (1), Epidural cyst (1), Duplication of the kidney (1), Intraspinal mass (1), Bile duct dilatation (1), Common bile duct dilatation (1), choledochal cyst (1)
Injury, poisoning or certain other consequences of external causes	18/2.88%	Supracondylar fracture of the humerus (2), Open abdominal injury (2), Craniocerebral trauma (2), Thoracic spinal cord injury (2), Endobronchial foreign body (1), Fracture of humerus shaft (1), Cervical spinal cord injury (1), Subluxation of cervical vertebra (1), Brain contusion (1), Fracture of lumbar vertebra (1), Double J tube removal after hydronephrosis surgery (1),Lumbar spinal cord concussion and oedema (1), Traumatic shock (1),Postoperative dislocation of hip joint (1)
Certain infectious or parasitic diseases	11/1.76%	Sepsis (6), Fungal meningitis (1), Fever due to infection (1), Streptococcal infection syndrome (1) and Acute paralytic poliomyelitis (1), Brain abscess (1)
Certain conditions originating in the perinatal period	10/1.60%	Birth Asphyxia (2) Neonatal Intestinal Obstruction (2) Neonatal Pneumonia (2) Short Bowel Syndrome (1), Neonatal Hypoxic-Ischemic Encephalopathy (1), Neonatal Hyperbilirubinemia (1),Short Bowel Syndrome (1)
Diseases of the circulatory system	5/0.80%	Basal ganglia infarction (2), Acute gangrenous appendicitis with periappendicitis (1), Hemorrhagic shock (1), Acute myocarditis (1)
Diseases of the genitourinary system	4/0.64%	Hydroureter (2), Hydronephrosis with nephrolithiasis (1), Hydronephrosis (1)
Symptoms, signs or clinical findings, not elsewhere classified	4/0.64%	Sepsis (1),Growth retardation (1), Intracranial space-occupying lesion (1), Fever (1)
Endocrine, nutritional or metabolic diseases	3/0.48%	Hypoglycemic encephalopathy (1), Multiple acyl-CoA dehydrogenase deficiency (1), Nutritional wasting (1)
Diseases of the visual system	3/0.48%	Oculomotor neuritis (2), Oculomotor palsy (1)
Factors influencing health status or contact with health services	2/0.32%	Colostomy status (1), Postoperative internal fixation of funnel chest (1)
Diseases of the musculoskeletal system or connective tissue	2/0.32%	Torticollis (1), Scoliosis (1)

Table 1 (continued)

The system to which the disease belongs(ICD-11)	Total/Proportion	Consultation of primary disease (cases)
Diseases of the immune system	1/0.16%	Hemophagocytic syndrome (1)
Diseases of the blood or blood-forming organs	1/0.16%	Thrombocytopenic Purpura (1)

Notes:

1. The classification of the primary diseases system was based on ICD-11 MMS
2. Similar diagnoses were not combined to ensure the authenticity of the diagnosis of primary diseases

Comprehensive safety measures were implemented, including standardized needle sterilization, age-appropriate needling techniques.

No serious adverse events, such as pneumothorax, organ injury, or infection, were documented. Mild transient reactions, including localized bruising or mild pain at the needle insertion site, were observed in 3.8% of cases ($n = 24$). All minor events resolved spontaneously within 24–48 h without requiring medical intervention.

Discussion

According to the classification of diseases, facial palsy in children has the characteristics of a short course of treatment, quick recovery and good prognosis compared with adults. However, several limitations exist in the methodology used to analyze the data. Specifically, detailed information regarding acupoint selection, treatment methods, and needle retention time, types of needles applied was not collected, and data on treatment efficacy or follow-up outcomes were not included. Acupuncture has become an alternative treatment for facial paralysis in children [14]. Electro-acupuncture (EA) is an effective method for treating peripheral nerve injury, promoting the repair of peripheral nerves [15]. According to the classification of disease systems, the largest proportion of cases was related to the nervous system (69.55%), followed by the digestive system (21.79%) and the circulatory system (4.6%) (as shown in Fig. 2 and Table S2). These findings are consistent with previous research indicating that acupuncture can alleviate symptoms such as pain and nausea/vomiting [5]. It is noteworthy that, although the number of cases for conditions such as headache (migraine), dysphagia, and urinary retention was relatively small, the clinical treatment outcomes in pediatrics were favorable [16, 17]. The effectiveness of acupuncture in treating headaches and migraines in children has been substantiated by numerous studies. Additionally, as recommended by the National Institute for Health and Clinical Excellence (NICE) guidelines for the diagnosis and treatment of headaches in young adults, acupuncture is considered a viable option for the prophylactic treatment of chronic tension-type headaches and migraines when first-line medications are unavailable or ineffective [18].

According to the subject distribution of consultation diseases and symptoms, acupuncture is closely associated with neurology and critical care medicine in pediatrics, being utilized in the treatment of serious conditions such as severe encephalitis and myelitis. Furthermore, acupuncture is recognized for its efficacy in addressing neuromuscular diseases in adult populations [2, 19]. Notably, in pediatric patients, acupuncture offers advantages such as immediate therapeutic effects and a reduced treatment duration compared to adults. Additionally, acupuncture plays a vital role in managing postoperative

complications, which constitute 12.66% of the total cases. It is particularly effective for addressing complications such as abdominal distension and intestinal obstruction, as well as other gastrointestinal recovery issues in general surgery. The clinical manifestations of postoperative intestinal obstruction were abdominal distension, nausea and (or) vomiting, inability to eat by mouth, decreased or disappeared bowel sounds, delayed anal exhaust and defecation [20]. Acupuncture has a significant effect on postoperative intestinal obstruction [21, 22] and can significantly enhance patients' degree of abdominal distension and gastrointestinal function. The intervention of acupuncture can significantly promote the exhaust of children and alleviate the obstruction, shorten hospitalization time and reduce hospitalization expenses. Studies have shown that acute pain is reduced in children after acupuncture [23–27]. Therefore, a study on postoperative pain management of acupuncture therapy can be carried out in future clinical studies.

In the aspect of primary disease in acupuncture consultation, acupuncture still needs to be deeply excavated into nervous system diseases. Central nervous system infections are a serious threat to children's health, one of the major diseases causing death or disability in children [28]. It has been reported that the incidence of sequelae of severe encephalitis is as high as 70%. Severe sequelae affect children's normal physical and mental health [29] and lead to neurological dysfunction, such as headaches and changes in the level of consciousness [30]. The role of acupuncture as an adjuvant in treating children with severe encephalitis is mainly reflected in promoting consciousness awakening and early limb recovery. Acupuncture plays an important role in treating coma children with severe encephalitis in pediatrics. Studies have shown that acupuncture can significantly shorten the time of disturbance of consciousness, and improve cognitive and motor recovery [31–33]. EA at Shuigou (GV26) acupoint can promote the recovery of consciousness and reduce the duration of disturbance of consciousness [34]. In addition, acupuncture also has a good adjuvant therapeutic effect on limb weakness and contracture. Clinical trials and meta-analyses show that acupuncture can reduce muscle spasms [35], increase muscle strength [36], and alleviate muscle atrophy caused by limb disuse in children. Several studies [37–39] have shown that early acupuncture intervention is the key to preventing and reducing the occurrence of sequelae.

Although acupuncture has demonstrated efficacy in pediatric care, its adoption in pediatric care still faces many challenges. First, conventional perceptions of children's fear of needles hinder broader acceptance of acupuncture [40]. Variations in cultural backgrounds, educational disparities, and perceptions of traditional medicine may also influence parental decision-making. Further, healthcare providers' attitudes and knowledge of acupuncture are key factors influencing its use. Pediatricians rarely recommend for complementary and integrative medicine including acupuncture [41]. Finally, the lack of standardized clinical guidelines and evidence-based protocols for pediatric acupuncture remains a significant barrier to widespread adoption. Consequently, the establishment of clinical guidelines specific to pediatric acupuncture is an important step in promoting its use. Multidisciplinary collaboration between acupuncturists and pediatricians is encouraged to develop treatment protocols aimed at improving treatment efficacy and safety. Finally, targeted educational initiatives-such as scientific lectures, informational brochures, and social media campaigns-should emphasize the safety, efficacy, and appropriate indications of acupuncture to address parental concerns and foster acceptance.

Conclusion

In summary, this retrospective analysis demonstrates that acupuncture was applied across multiple pediatric subspecialties in a general hospital, primarily targeting neurological and digestive disorders. These results provide preliminary observational data regarding acupuncture's clinical utilization patterns in pediatric inpatient care. Nevertheless, prospective trials with randomized or propensity-matched designs (pediatric neurological conditions/postoperative abdominal distension, etc.) are imperative to isolate its therapeutic effects from confounding factors.

Abbreviations

TCM	Traditional Chinese Medicine
EA	Electro-acupuncture

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

XG conceptualized and designed the study and analyzed data and seriously drafted the initial manuscript; GY collected and interpreted the data and contributed to the review section. GD contributed to the review section of the article; XF designed the study and seriously edited the manuscript and contributed to the overall conception and design of the study. All authors reviewed and revised the manuscript and approved the final manuscript.

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Data availability
Data is provided within the manuscript or supplementary information files. All raw data are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
We conducted this study in accordance with the Helsinki Declaration. This study was approved by the Research Ethics Committee of Qilu Hospital of Shandong University (KYLL-202205-014-1). The ethics committee approved the waiver of informed consent from parents/guardians of the minors, because the present study was a retrospective analysis of clinical data and all methods were performed in accordance with the ethical guidelines.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Clinical trial number
Not applicable.

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