v. 3, n. 96, 2023

International Journal of Health Science

ACUTE PANCREATITIS IN CHILDREN: RARE?

Karina de Oliveira Pinheiro
http://lattes.cnpq.br/7659480981845965

Pamela dos Santos Monteiro
http://lattes.cnpq.br/7821405819401835

Julye Tainah de Fátima Seminari Pagani
http://lattes.cnpq.br/4316305813880631

Beatriz Tezzon
http://lattes.cnpq.br/9870580664819360

Roberta Rezende Lara
http://lattes.cnpq.br/7549662396065921

Ethel Chehter
https://lattes.cnpq.br/0972445363483141

Abstract: **INTRODUCTION**: Acute pancreatitis is a necroinflammatory tissue reaction to the functional and/or structural damage of acinar cells and rarely necrosis of ductal cells, caused by non-infectious factors. In acute pancreatitis, there is extensive release of pancreatic enzymes along with their intrapancreatic activation, which can cause peripancreatic necrosis. In children, this disease is little studied. Therefore, the objective of this study is to understand the profile of acute pancreatitis in children. **METHOD**: A horizontal systematic review of acute pancreatitis in children was carried out using the PRISMA method in the Pubmed database. Descriptors: "acute pancreatitis AND [children OR child OR childhood]". Also added articles related to the topic/sessions "cited by" and "similar articles". **RESULTS**: Of the initial 43, 12 articles were selected, with the United States being the country with the largest number of published works. The white ethnic group had a higher incidence of cases and the ratio among women varied between 32.4% and 59.5%; and men, between 40.5% and 67.5%, and it is not possible to say that there is gender prevalence. The average age of patients ranged from 5 to 11.6 years. The main etiologies identified by the studies were: biliary tract diseases, idiopathic causes, medication and systemic disease. **DISCUSSION**: Surprisingly, we found few articles, making it difficult to analyze the topic, as case reports and retrospective studies on acute pancreatitis in children were found without standardization regarding age range and etiology, with large variations regarding which etiologies were being taken into consideration and the ages minimum and maximum. Therefore, considering the available information, it can be concluded that biliary tract diseases constitute the main etiology of acute pancreatitis in children, which coincides with literature on the etiology of acute pancreatitis in adults. **CONCLUSION**: The lack of consensus on diagnostic parameters and the neglect of gastric symptoms in children may have led to an underdiagnosis of cases of acute pancreatitis. Furthermore, underreporting of these cases has led to little available literature on acute pancreatitis in children and perhaps a false idea of a rare disease. Therefore, it is important to have a new look at gastrointestinal symptoms in children and a better diagnostic standard for this disease.

Keywords: Acute pancreatitis, Children, Etiology, Review

INTRODUCTION

ANATOMY OF THE PANCREAS

The pancreas is an accessory gland of the digestive system, which has a retroperitoneal location and transversely crosses the posterior abdominal wall, lying behind the stomach and between the duodenum and the spleen. The organ has endocrine and exocrine portions. The enzymes are stored and secreted by cells of the exocrine portion, arranged in acini made up of serous cells that surround a lumen. The pancreatic islets (islets of Langerhans) are responsible for hormone synthesis and consist of groups of endocrine epithelial cells. There is a connective tissue capsule that surrounds it and sends septa inside, dividing it into lobes. In addition, there is also a vast capillary network, essential for the secretion process. [5]

Its anatomical division consists of head, neck, body and tail. The head is the dilated part of the organ that is surrounded by the curvature of the duodenum. The neck is short and extends over superior mesenteric vessels. The body is the continuation of the neck and is located to the left of the superior mesenteric artery and vein. The tail is related to the splenic hilum and the left flexor colli. [4]

The pancreatic duct begins at the tail

of the pancreas and continues towards the head, where it curves inferiorly and joins the common bile duct. The common bile duct, in turn, may be inserted into the head of the pancreas or cross its posterosuperior surface. The union of the pancreatic and common bile ducts gives rise to the hepatopancreatic ampulla (ampulla of Vater), which flows into the apex of the major papilla of the duodenum. [4]

The smooth muscles located around these ducts are responsible for controlling bile flow. The common bile duct sphincter muscle is located around the terminal part of the common bile duct and controls the flow of bile. The pancreatic duct sphincter muscle is located around the terminal part of the pancreatic duct and prevents the backflow of bile into the pancreatic duct. The sphincter muscle of the hepatopancreatic ampulla (sphincter of Oddi) is located around the hepatopancreatic ampulla and prevents the duodenal contents from entering the ampulla. The accessory pancreatic duct drains the uncinate process and the lower part of the head of the pancreas, emptying into the duodenum through the minor papilla of the duodenum. Generally, this accessory duct communicates with the pancreatic duct, but in some people it may be a separate duct. [4]

The organ's irrigation is mainly derived from the splenic artery, which gives off branches forming the pancreatic arteries. The head and body of the pancreas are supplied by the anterior and posterior superior pancreaticoduodenal and inferior pancreatioduodenal arteries, the upper ones being branches of the gastroduodenal artery and the lower one being a branch of the superior mesenteric artery. Venous drainage occurs through the pancreatic veins, which are tributaries of the splenic and mesenteric parts of the liver portal vein, but most of them drain into the splenic vein. Lymphatic drainage, in turn, follows the blood vessels and most end in the pancreatic and splenic lymph nodes located along the splenic artery, but some end in pyloric lymph nodes. The efferent vessels of these lymph nodes drain, through hepatic lymph nodes, to superior mesenteric lymph nodes or to celiac lymph nodes. [4]

Pancreatic innervation is derived from the vagus and abdominopelvic splanchnic nerves that pass through the diaphragm. Sympathetic and parasympathetic nerve fibers pass along the celiac and superior mesenteric plexus arteries and reach the pancreas. Sympathetic and parasympathetic fibers distribute to acinar cells and pancreatic islets. Parasympathetic fibers are secretomotor, but secretion is essentially mediated by the hormone's secretin and cholecystokinin, formed in the duodenum and proximal part of the intestine. [4]

PANCREAS EMBRYOLOGY

The pancreas originates between the 6th and 8th week of the embryo, originating from endodermal buds that arise from the evagination and fusion of the ventral and dorsal endoderm that give rise to the acinar, endocrine and ductal cells that constitute this organ [7]. The pancreatic endoderm forms clusters of cells without mesenchyme around and between them.

The ventral bud projects from the hepatic diverticulum and becomes the head of the pancreas, the uncinate process, and the Wirsung duct. The dorsal bud, which is larger in size, originates from the anterior primitive intestine and becomes the neck, body, tail of the pancreas, the acinar ductal system and the duct of Santorini (main pancreatic duct). [8]

PHYSIOLOGY OF THE PANCREAS

THE PANCREAS CAN BE DIVIDED INTO TWO PARTS:

Exocrine: is the majority of the pancreatic mass, made up of acinar cells that produce inactive digestive enzymes (amylase, protease, lipases and nucleases) that are secreted into the pancreatic ducts and transported to the duodenum, where they are activated. Duct cells produce mucin and bicarbonate-rich fluids, which help neutralize acidic stomach contents [24].

Endocrine: formed by the Islets of Langerhans that contain 6 types of pancreatic cells [24]:

- α cells: synthesize and secrete glucagon, glycerin, GRPP, GLP and GLP2.
- β cells: they are the most numerous and responsible for the synthesis and secretion of insulin.
- δ cells: produce somatostatin, an efficient suppressor of insulin, glucagon and growth hormone secretion.
- PP cells (Y): synthesize pancreatic polypeptide
- G cells: produce gastrin
- ε cells: produce ghrelin

The hormones secreted by these cells have distinct functions that can be listed below:

- Insulin's synthesis is stimulated by glucose, amino acids and lipids and its metabolic effect is to increase peripheral glucose uptake, stimulate protein synthesis, block proteolysis, increase the synthesis of free fatty acids and glycogen and block lipolysis and production hepatic glucose.
- Glucagon's main physiological role is to stimulate the production of energy metabolites by the liver and increase the concentration of glucose and ketone bodies in the blood.
- Somatostatin is stimulated by meals rich in fats, carbohydrates and proteins and inhibits practically all gastrointestinal and pancreatic functions.
- Incretins stimulate insulin secretion in a food-dependent manner, being responsible for 50% of total insulin secretion after glucose ingestion.
- Pancreatic polypeptides regulate gastrointestinal functions such as contraction and emptying of the gallbladder, inhibit exocrine pancreatic secretion, modulate the emptying and secretion of gastric acids and decrease gastrointestinal motility.
- Ghrelin stimulates the secretion of growth hormone both through the production of hypothalamic GHRH and through its receptors in the pituitary somatotrophs. It also induces increased appetite, gastric acid secretion, increases gastric emptying and helps regulate energy balance.
- Ghrelin is related to the increase in plasma glycemia, both by increasing GH secretion and reducing insulin levels [24].

Irrigation occurs through the fenestrated capillaries of the pancreatic islets and is centrifugal, meaning that the cells located in the center (β cells) are the first to receive blood flow. They are richly innervated by fibers of the autonomic nervous system, sympathetic and parasympathetic, which are responsible for modulating hormonal secretion through neurotransmitters and neuropeptides [24].

- Acetylcholine stimulates release of insulin, glucagon and pancreatic polypeptide
- Vasoactive Intestinal Polypeptide (VIP) increases intracellular calcium concentration
- Gastrin-releasing polypeptide (GRP) stimulates the secretion of insulin, glucagon, somatostatin and pancreatic polypeptide
- Noradrenaline, galanin and neuropeptide Y inhibit insulin secretion.

MOST COMMON PANCREATIC DISEASES

In this category, pancreatic ductal adenocarcinoma stands out, which is one of the most aggressive and lethal malignancies due to its late detection. It develops in the exocrine portion, preferably in the head of the pancreas [20]

Among the most common diseases of the pancreas, we have developmental anomalies, pancreatic neoplasms, cystic neoplasms, or neuroendocrine tumors and inflammatory diseases. [17]

DEVELOPMENTAL ANOMALIES OF THE PANCREAS

It is known that the pancreas comes from the union of a large dorsal bud with a small ventral bud [7]. However, during the union of such structures, disturbances may occur that impair the correct embryogenesis of the organ in question. Among the anomalies, the following stand out:

Pancreas divisum, in which there is no union of the dorsal and ventral buds, causing abnormal drainage of the pancreatic duct: duct of Santorini to the minor papilla and duct of Wirsung to the major papilla. [18]

Annular pancreas, the ventral and dorsal buds form a ring around the duodenum due to non-migration of the ventral bud. [19]

PANCREATIC NEOPLASMS

Despite the relatively low incidence, pancreatic cancer is the 4th most common neoplasm in terms of mortality. The majority of which are ductal adenocarcinomas located in the head of the pancreas. The main risk factors for this neoplasm are chronic pancreatitis, smoking and genetic factors. [15]

CYSTIC NEOPLASMS OF THE PANCREAS

These neoplasms have several subtypes and each of these subgroups has specific characteristics. Mucinous cystic neoplasia is the most common, its resection is curative, but when it is an invasive adenocarcinoma, it has a poor prognosis. Intraductal papillary mucinous neoplasia is preferably located in the cephalic portion of the pancreas, has a very good prognosis when there is only borderline atypia, but it can become an adenocarcinoma. Furthermore, we have two cystic neoplasms that are benign in nature, serous cystic neoplasm, which is asymptomatic in most cases, and pseudopapillary solid cystic neoplasm, which can rarely lead to nodal or extranodal metastasis. [15]

NEUROENDOCRINE TUMORS

They are functionally classified according to the hormones that are produced and secreted by tumors, thus: insulinoma, gastrinoma, VIPoma, glucagonoma, somatostatinoma that secrete, respectively, insulin, gastrin, VIP, glucagon and somatostatin [21].

INFLAMMATORY DISEASES OF THE PANCREAS

Among the inflammatory diseases of the pancreas, the most common are acute and chronic pancreatitis. Chronic pancreatitis causes chronic and irreversible damage to the pancreas, such as chronic inflammation, fibrosis, destruction of ductal, exocrine and endocrine tissues. Mainly caused by exposure to risk factors, such as alcohol, and genetic factors. This results in a deficiency in the endocrine and exocrine production of the pancreas, structural and even visible deficiencies.

Acute pancreatitis is a necro-inflammatory tissue reaction caused by the large release of pancreatic enzymes and their intrapancreatic

activation [13].

ACUTE PANCREATITIS

EPIDEMIOLOGY OF ACUTE PANCREATITIS

Regarding its epidemiology, the number of cases worldwide per year is 34 per 100,000 [1]. There is no difference between men and women, but it predominantly affects middle-aged or older people. Furthermore, people with acute pancreatitis, even mild, are more likely to develop DM [1]. Mortality following one episode of acute pancreatitis per year is 1.16 per 100,000 people. Which is related to organ failure and infected pancreatic necrosis [1]. Speaking of acute pancreatitis in children, there are 3-13 cases per 100,000 people per year [2].

PATHOPHYSIOLOGY OF ACUTE PANCREATITIS

In acute pancreatitis there is an extensive release of pancreatic enzymes along with their intrapancreatic activation [13]. This inflammation can cause peripancreatic necrosis. Peripancreatic collection associated with necrosis can be an acute necrotic collection or isolated necrosis [14]. The first is observed in the first 4 weeks and has necrotic tissue involving the parenchyma and/or peripancreatic tissue. Isolated necrosis is an encapsulated collection of very precise inflammatory boundaries that most often occurs 4 weeks after the onset of acute pancreatitis [14].

Furthermore, acute pancreatitis is classified according to its degree of necrosis by the Determinant-Based Classification (DBC) and according to the degree of organ failure and complications by the Revised Atlanta Classification (RAC) [13].

The causes of acute pancreatitis in adults can be: cholelithiasis, alcohol, hypertriglyceridemia, drugs, endoscopic retrograde cholangiopancreatography [3].

In children, it is more associated with pancreatic anomalies, the most common being pancreas divisum; genetic mutations, such as mutation in the PRSS1 gene, in the cystic fibrosis transmembrane generator, in SPINK1 and in the chymotrypsin C genes; and medication, mainly valproic acid, asparaginase, thiopurines, mesalazine and corticosteroids [2].

CLINICAL CONDITION

The main symptom is abdominal pain, present in 95% of patients. It is normally acute, with sudden onset, without prodromes, located in the upper portion of the abdomen, with dorsal radiation and moderate to strong intensity. Has worsening eating habits or alcohol use. Pain is accompanied in 90% of cases by nausea and vomiting [23].

The findings on physical examination are proportional to the severity of the condition. Abdominal examination shows pain in the right hypochondrium and/or epigastrium with muscular guarding, but rarely painful decompression. There may be abdominal distension and decreased peristalsis due to adynamic ileus determined by the pancreatic inflammatory process. Variable tachycardia and hypotension are due to hypovolemia secondary to fluid sequestration [23].

Some findings are specific to complications of acute pancreatitis. Changes in lung auscultation may be indicative of pleural effusion, commonly on the left, which may accompany more severe cases. The presence of ecchymosis on the left flank (Gray-Turner sign) or in the periumbilical region (Cullen sign) are indicative of retroperitoneal hemorrhage that can occur in cases of severe pancreatitis [23].

DIAGNOSIS

The diagnosis is established if the patient presents 2 of the following factors: [6]

- Significant abdominal pain compatible with the disease
- Serum lipase and/or amylase levels greater than 3 times the upper limit of normal
- Characteristic findings on imaging exams

Serum amylase and lipase increase on the first day of acute pancreatitis and return to normal within 3 to 7 days. Both may be elevated in renal failure, perforated ulcers, mesenteric vascular occlusion, intestinal obstruction, but lipase is more specific for pancreatitis. Fractionation of total serum amylase into pancreatic-type (p-type) and salivary-type (s-type) amylase increases the accuracy of serum amylase. Levels of these enzymes may remain normal if previous episodes caused destruction of acinar tissue that made it difficult for sufficient enzyme release. [6]

Laboratory tests may also show an increase in leukocyte count, an increase in hematocrit and blood urea nitrogen. [6]

Computed tomography with IV contrast is the imaging test of choice and must be done at the beginning of the condition, in order to diagnose the disease or exclude other possible causes. This examination must be repeated at a later stage to identify possible complications of the disease such as; liquid collection, pseudocyst and necrosis. [6]

When gallstones or dilation of the common bile duct are suspected, an abdominal ultrasound is necessary. [6]

Endoscopic retrograde cholangiopancreatography (ERCP) is done to evaluate bile duct obstruction in patients with biliary pancreatitis who have an elevated serum bilirubin level and signs of cholangitis. [6]

The differential diagnosis of acute pancreatitis includes mesenteric infarction, perforated gastric or duodenal ulcer, intestinal obstruction due to strangulation, aortic aneurysm, appendicitis, diverticulitis, biliary colic and acute inferior wall myocardial infarction. [6]

Justification: pancreatitis in children is not much studied or known, so there are no updated articles on the topic.

GOAL

Know the epidemiology of acute pancreatitis in children.

METHODS

A horizontal systematic review was carried out on acute pancreatitis in children. We used the Pubmed electronic database for the bibliographic review with no start date until March 7, 2023. We applied the following MeSH descriptors: "acute pancreatitis AND [children OR child OR childhood]". In addition to the articles found using this methodology, we also reviewed the articles related to these, which were arranged in the "cited by" and "similar articles" sections, performing manual inclusion. The article selection processes considered as inclusion criteria publications in the period 2007-2023, patients between 0-19 years old, articles written in English or Spanish.

Regarding the exclusion criteria, articles on chronic pancreatitis, recurrent acute pancreatitis, autoimmune pancreatitis and hereditary pancreatitis were disregarded. It is important to highlight that recurrent acute pancreatitis is more similar to chronic pancreatitis when compared to acute pancreatitis, despite the name indicating the opposite.

For this reason, it was disregarded for the preparation of this article. Furthermore, articles with a publication date greater than 15 years ago were excluded; case reports; articles that do not provide metrics on etiology;

articles focusing on: treatment complications, disease management and radiographic findings; and articles whose language was not English or Spanish. Regarding language, it is worth noting that no articles were found on this topic written in Portuguese.

The primary study articles were selected by 5 independent researchers, initially by screening according to title by all researchers. After that, the abstract was analyzed by independent reviewers and subsequently revised by the senior reviewer. Therefore, the independent reviewers read the articles completely and recorded them.

RESULTS

Twelve articles were selected (table 1) that are consistent with the objective of the work - to know the incidence of acute pancreatitis in children.

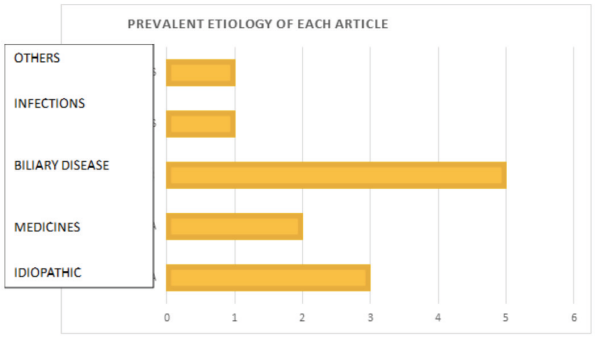
Provenance: All selected articles were published in the last 15 years. Regarding the place of origin, the United States of America was where the largest number of studies were obtained, totaling three. We also obtained two articles from China and two from Italy.

Ethnicity: Only two articles specified the ethnicities involved in the study and all presented a white majority (above 60%).

Sex: Nine articles specified the relationship between men and women in the study, among them the percentage of women varies between 32.4% and 59.5%; and men, between 40.5% and 67.5%.

Age: All articles determined an average age ranging between 5 years and 15 years. Furthermore, one of the articles only analyzed children under 3 years of age, in which the average was 20 months.

Etiology: 5 articles indicated the main cause as biliary tract diseases, 3 as idiopathic causes, 2 as medication and 1 as systemic disease.



Graph 1: Prevalent etiology of each article

DISCUSSION

Although there is a vast literature that discusses the etiologies and case series of acute pancreatitis in adults, data on this same pathology in children are incipient. What we have are single center articles or even case reports, there is no standardization that clearly defines the metrics that must be used, especially regarding age group and etiology. Therefore, our research became quite difficult, requiring an active search for articles.

Despite this, biliary tract diseases can be identified as the main etiology of acute pancreatitis in children, regardless of gender or age.

We believe that the small number of articles comes from the fact that acute pancreatitis in children is little investigated. Perhaps because there is no well-defined guideline that can be followed to standardize studies. Thus, there is an idea that it is a disease that is not very prevalent and, therefore, must not be studied as much.

The most common type of study found was retrospective and we believe that this occurred, as it is the most viable study given the published information and the purpose of the work. Retrospective studies analyze previous information about exposure factors for a given disease, which helps us investigate the most frequent etiologies, in addition to creating an overview over a determined period of time.

Title	Age average	Gender	Etiology	Ethnicity
Pancreatitis in pre-adolescent children: a 10-year experience in the pediatric emergency department 2019 D.O.I: 10.1186/s12873-019-0281-y.	8 years	41% boys (35), 59% girls	26% idiopathic, 20% autoimmune disease, 19% medication (mostly valproate), 16% cholelithiasis, 15% structural or genetic problem	–
Acute Pancreatitis in Childhood: A 10-Year Experience from A Thai University Surgical Center 2022 Digital identifier: 10.1097/ MPA.0000000000002109	10.4 years	47% boys (37), 53% girls (42)	39.3% medication (mostly chemotherapy), 11.4% structural anomalies, 8% surgical interventions, 30% idiopathic, 2.5% gallstones, 2.5% metabolic disorders and 2.5% trauma	–
Incidence and Clinical Associations of Childhood Acute Pancreatitis 2016 Digital identifier: 10.1542/ peds.2016-1198	11,2 years	51% (48) boys, 49% (46) girls	37% idiopathic, 19% medication, 13% gallstones, 7% organic acidemia, 7% hereditary, 5% anatomical anomalies, 3% viral infections, 2% systemic diseases, 1% trauma. Drugs: asparaginase (28%), azathioprine (17%) and sodium valproate (17%)	61% white, 28% Asian, 5% African. 69% Pakistani children
Etiology and clinical characteristics of pediatric acute pancreatitis in Saudi Arabia: a 20-year experience from a single tertiary center 2018 D.O.I: 10.1016/j.ijpam.2018.01.001.	11,6 years	–	42% idiopathic, 34% pancreaticobiliary problems (22% of the total was choledocholithiasis), 4% medication	–
Etiology and outcome of acute pancreatitis in infants and toddlers 2008 Digital identifier: 10.1016/j. jpeds.2007.05.050	20 months	51.7% (45) boys and 48.2% (42) girls	Multisystem disease 34%, systemic infections 18%, idiopathic 17%, biliary disease 9%, trauma 8%	63% Caucasian, 16% African American and 1% Asian
Acute Pancreatitis and Recurrent Acute Pancreatitis in Children: A 10-Year Retrospective Study 2022 Digital identifier: 10.1155/2022/5505484	12 years	49.1% boys 50.9% girls	Biliary tract infection (37.1%), viral infection (21.5%) and idiopathic infection (21.1%)	–
Acute and recurrent pancreatitis in children: exploring etiological factors 2012 Digital identifier: 10.3109/00365521.2012.729084	11 years	67.6% boys 32.4% girls	Medication 32%, biliary tract diseases 26%, idiopathic disease 14%, systemic disease 12%, infections 9% and hereditary mutations 6%	–
What's unique about acute pancreatitis in children: risk factors, diagnosis and management 2017 Digital identifier: 10.1038/ nrgastro.2017.13	5 to 18 years	–	Gallstone 33%, medications 26%, idiopathic 20%, systemic diseases 10%, trauma 9%, viral 8%, metabolic 5%, other 7%	–
Etiology, case fatality, recurrence, and severity in pediatric acute pancreatitis: a meta-analysis of 48 studies 2022 Digital identifier: 10.1038/s41390-021-01454-1	0 to 18 years	–	Gallstones 33%, systemic disease 31%, infection 29% in Asia, trauma 32%, idiopathic 25%, systemic disease 16%, infection 16% in Oceania, idiopathic 26%, systemic disease 13%, infection 13% in Europe, idiopathic 25%, systemic disease 16%, alcohol 16%, medication 16%, genetics 16%, biliary stones 16%, infection 16% in North America, idiopathic 29%, medication 19%, anatomical anomalies 15% in South America	–

Spectrum of acute, recurrent and chronic pancreatitis in children 2020 Digital identifier: 10.47391/JPMA.540	Under 16 years old	54.9% boys and 45.1% girls	gallstones (37.25%), idiopathic (29.5%), anatomical malformations (13.8%)	–
Acute pancreatitis in children: a tertiary hospital report 2014 Digital identifier: 10.3109/00365521.2014.882403	15 years	40.5% boys and 59.5% girls	Biliary disease (24.3%), trauma (16.2%), medication (10.8%), ERCP (8.1%). One case of pancreas divisum, one case of cystic fibrosis, one case of solid pseudopapillary neoplasm and two idiopathic cases	–
Acute Pancreatitis in Children: The Clinical Profile at a Tertiary Hospital 2021 Digital identifier: 10.7759/cureus.14871	8,46 years	58% boys (33), 42% (23) girls	41.1% biliary, 23.2% idiopathic, 19.6% traumatic and 8.93% drug induced.	–

Table 1: Article details

Something important to highlight is the diversity of places that were studied. There was a total of 8 different countries: Italy, Portugal, England, United States, Bahrain, Pakistan, Saudi Arabia and China. This suggests that there is no great impact of ethnicity or specific cultural habits on the incidence of this pathology.

Regarding the most recurrent etiology, we believed that the main cause would be medication due to the easy access and prescription of medications for children today - making it easier for an incorrect dosage to be administered and intoxication to occur, for example. However, the current study suggests that there has been a change in children's lifestyles. This is because a 1999 study places trauma as the main etiology of acute pancreatitis in children at the time, accounting for 13-30% of cases [22]. This was possibly due to a change in children's leisure habits, as in the past it was common for them to play outside the home and engage in more dynamic activities that require physical effort, such as sports, cycling, climbing walls and running. Currently, children are engaged in more static activities within their homes, with video games, cell phones, computers and tablets being the main means of entertainment for this age group. It is also important to highlight the safety that booster seats and car seats provide in the face of automobile accidents, in addition to stricter traffic laws, both through stricter safety standards and through the regulation and standardization of how children must be accommodated within the facilities. carriage. Furthermore, the change from natural or low-processed foods to a diet based on ultra-processed and fatty foods may have led to a higher incidence of gallstones. Finally, this change in dietary parameters and new habits led to an increase in childhood obesity and possibly an increase in the occurrence of gallstones at younger ages.

There was no consensus on gender predominance, as the information was contradictory, as in some studies the predominance was male and in others, female. This may have occurred because there was also divergence regarding the predominant etiologies, which hinders the definition of the predominant sex, as both are related.

One challenge we encountered was the divergence of information between some articles, whether in relation to the most frequent etiology, whether or not there is a predominance of one sex, or in relation to the medications that most commonly cause drug-induced pancreatitis. Perhaps there is this divergence regarding some topics because it is a subject little studied and little elucidated. Furthermore, if the disease is underdiagnosed, the results of the studies will be harmed. This becomes clearer when there are a large number of patients with idiopathic acute

pancreatitis. Therefore, we emphasize, once again, the importance of better evaluation of these patients and the standardization of medical procedures.

Only 3 of the articles listed analyzed ethnicity, but in all 3 articles there was a clear predominance of Caucasian ethnicity. However, these articles were written in the USA and England, which may be just a reflection of the predominance of Caucasians who inhabit these regions.

Regarding age, the selected studies do not establish an age range to be studied or a period of child development. What we have are articles that analyze different age ranges, making it impossible to infer which is the highest incidence. Furthermore, due to this incongruity, it is not possible to draw any parallels regarding the influence or otherwise of puberty hormones on acute pancreatitis.

The limitations of this study are: contradictory results, few articles on the topic, a non-specific definition of the disease and the lack of standardization of the age group to be studied.

CONCLUSION

Thus, the main cause of acute pancreatitis in children is diseases of the biliary tract, there is no gender predominance and it was not possible to establish an average age or predominant ethnicity. It is worth mentioning that the low incidence of patients diagnosed with the disease resulted in a small number of articles on the topic. This made it difficult to correlate patient data.

Despite the apparent low incidence, we believe that there is an underdiagnosis of acute pancreatitis. Therefore, it is important to take a new look at children's gastrointestinal symptoms. As well as a consensus regarding the diagnostic standard.

It was also possible to conclude that it is up to pediatricians to attempt a slightly more invasive diagnosis. Given this scenario, it is appropriate to use other tools, such as tomography. In addition to the usual ones: ultrasound, amylase and lipase. Since perhaps some diagnoses are going unnoticed and tomography is more sensitive for diagnosing acute pancreatitis.

REFERENCES

1. Petrov MS, Yadav D. Global epidemiology and holistic prevention of pancreatitis. Nature Reviews Gastroenterology & Hepatology. 2018 Nov 27;16(3):175–84.doi: 10.1038/s41575-018-0087-5.

2. Uc A, Husain SZ. Pancreatitis in Children. Gastroenterology [Internet]. 2019 May 1;156(7):1969–78. doi: 10.1053/j.gastro.2018.12.043.

3. Szatmary P, Grammatikopoulos T, Cai W, Huang W, Mukherjee R, Halloran C, et al. Acute Pancreatitis: Diagnosis and Treatment. Drugs. 2022 Sep 8;82(12). doi: 10.1007/s40265-022-01766-4

4. Moore KL, A M R Agur, Dalley AF. Anatomia orientada para a clínica. Rio De Janeiro (Rj): Guanabara Koogan; 2006.

5. Carlos Junqueira, LC, Carneiro J, Kelley RO. Histologia básica. 13ª edição. Rio de Janeiro - RJ: Guanabara Koogan, 2017.

6. Tenner S, Baillie J, DeWitt J, Vege SS. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. American Journal of Gastroenterology. 2013 Sep;108(9):1400–15. doi: 10.1038/ajg.2013.218

7. Ogias D, Oriá RB, Bevilacqua E. Embriologia do Pâncreas e Sistema Hepatobiliar. 2016 Nov 1; doi: 10.5151/9788580391893-07

8. Ehrhardt JD, Gomez F. Embryology, Pancreas. 2022 Aug 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 31424827.

9. Suzuki M, Sai JK, Shimizu T. Acute pancreatitis in children and adolescents. World J Gastrointest Pathophysiol. 2014 Nov 15;5(4):416-26. doi: 10.4291/wjgp.v5.i4.416

10. Abu-El-Haija M, Kumar S, Quiros JA, Balakrishnan K, Barth B, Bitton S, et al. Management of Acute Pancreatitis in the Pediatric Population. Journal of Pediatric Gastroenterology and Nutrition [Internet]. 2018 Jan [cited 2019 Sep 27];66(1):159–76. doi: 10.1097/MPG.0000000000001715.

11. Gupta R, Patel K, Calder PC, Yaqoob P, Primrose JN, Johnson CD. A randomised clinical trial to assess the effect of total enteral and total parenteral nutritional support on metabolic, inflammatory and oxidative markers in patients with predicted severe acute pancreatitis (APACHE II > or =6). Pancreatology. 2003;3(5):406-13. doi: 10.1159/000073657

12. Petrov MS, van Santvoort HC, Besselink MGH, Cirkel GA, Brink MA, Gooszen HG. Oral refeeding after onset of acute pancreatitis: a review of literature. The American Journal of Gastroenterology [Internet]. 2007 Sep 1 [cited 2022 Jun 29];102(9):2079–84; quiz 2085.

13. Beger HG. The pancreas. Oxford ; Malden, Ma: Blackwell Science; 1998.

14. Leppäniemi A, Tolonen M, Tarasconi A, Segovia-Lohse H, Gamberini E, Kirkpatrick AW, et al. 2019 WSES guidelines for the management of severe acute pancreatitis. World Journal of Emergency Surgery [Internet]. 2019 Jun 13;14(1).

15. Sleisenger MH, Fordtran JS. Gastrointestinal disease : pathophysiology, diagnosis, management. Philadelphia: Saunders; 1993.

16. Uc A, Fishman DS. Pancreatic Disorders. Pediatric Clinics of North America. 2017 Jun;64(3):685–706.

17. Helmberger T, Colosimo C. Diseases of the Pancreas. 2018 Jan 1;145–56.

18. Ferri V, Vicente E, Quijano Y, Ielpo B, Duran H, Diaz E, et al. Diagnosis and treatment of pancreas divisum: A literature review. Hepatobiliary & pancreatic diseases international: HBPD INT [Internet]. 2019 Aug 1 [cited 2023 Apr 12];18(4):332–6.

19. Sandrasegaran K, Patel A, Fogel EL, Zyromski NJ, Pitt HA. Annular Pancreas in Adults. American Journal of Roentgenology. 2009 Aug;193(2):455–60.

20. Sarantis P, Koustas E, Papadimitropoulou A, Papavassiliou AG, Karamouzis MV. Pancreatic ductal adenocarcinoma: Treatment hurdles, tumor microenvironment and immunotherapy. World Journal of Gastrointestinal Oncology. 2020 Feb 15;12(2):173–81.

21. Sun J. Pancreatic neuroendocrine tumors. Intractable & Rare Diseases Research. 2017;6(1):21–8.

22. Uretsky G, Goldschmiedt M, James K. Childhood pancreatitis. American Family Physician [Internet]. 1999 May 1 [cited 2023 Jun 28];59(9):2507–12.

23. Guimarães-Filho MA, Maya MC, Leal PR, Melgaço A de S. Pancreatite aguda: etiologia, apresentação clínica e tratamento. Revista Hospital Universitário Pedro Ernesto [Internet]. 2009;8(1).

24. Oriá RB, Brito GA. Sistema Digestório: Integração Básico-Clínica [Internet]. Editora Blucher; 2016.