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CHRONIC KIDNEY FAILURE AND ACUTE PANCREATITIS (study about 334 cases)

Thesis

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Complications- Mortality

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List of abreviations

- AP** : acute pancreatitis
- CBD** : commun bile duct
- CCK** : cholecystokinin
- CHA** : commun hepatic artery
- CKD** : chronic kidney disease
- CKF** : chronic kidney failure
- CT** : computed tomographic
- GDA** : gastroduodenal artery
- GEA** : gastroepiploic artery
- HTG** : hypertriglyceridemia
- ICU** : intensive care unit
- IMA** : inferior mesenteric artery
- IMV** : inferior mesenteric vein
- IROA** : inferior pancreaticoduodenal artery
- IVC** : inferior vena cava
- LGA** : left gastric artery
- LGV** : left gastric vein
- LOH** : loop of henle
- MPD** : main pancreatic duct
- PCT** : proximal convoluted tubules
- RGV** : right gastric vein
- SMV** : superior mesenteric vein
- SPDA** : superior pancreaticoduodenal artery
- UPT** : uretero pelvic junction

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INTRODUCTION

Chronic kidney failure refer to a progressive lost of kidney s functions, due to Reduction of functional renal parenchyma During various diseases. the definition and classification of (CKF) is based on the presence of kidney damage or decreased kidney function for 3 months or more.

In the end stage of chronic kidney failure, dialysis is one of the last choices remain to maintain a normal life for the patient .during this procedure many complications rise to the surface and make the disease harder to manage .

Acute pancreatitis (AP) is one of the complications that may appear during dialysis (peritoneal and hemodialysis) ,in this case It contributes to an increased morbidity and mortality in patients who are already suffering from renal failure.

even that few studies have been conducted to investigate the link between chronic kidney failure and severe episodes of acute pancreatitis, the high prevalence of (AP) noticed after long-term dialysis hypothesized to some that dialysis might be also a risk factor of acute pancreatitis (AP).

the main goal of our study is to assess the risk of acute pancreatitis in patients on long term peritoneal dialysis and long term haemodialysis compared with the general population, to evaluate its clinical course and outcome, and to identify possible etiological factors.

THEORIC PART

I. Anatomy

1. Pancreas

a. Overview

The pancreas, named for the Greek words *pan*(all) and *kreas* (flesh), is a 12–15-cm long J-shaped (like a hockey stick), soft, lobulated, retroperitoneal organ. It lies transversely, although a bit obliquely, on the posterior abdominal wall behind the stomach, across the lumbar (L1–2) spine (see the image below). [1.2.3.4.5]

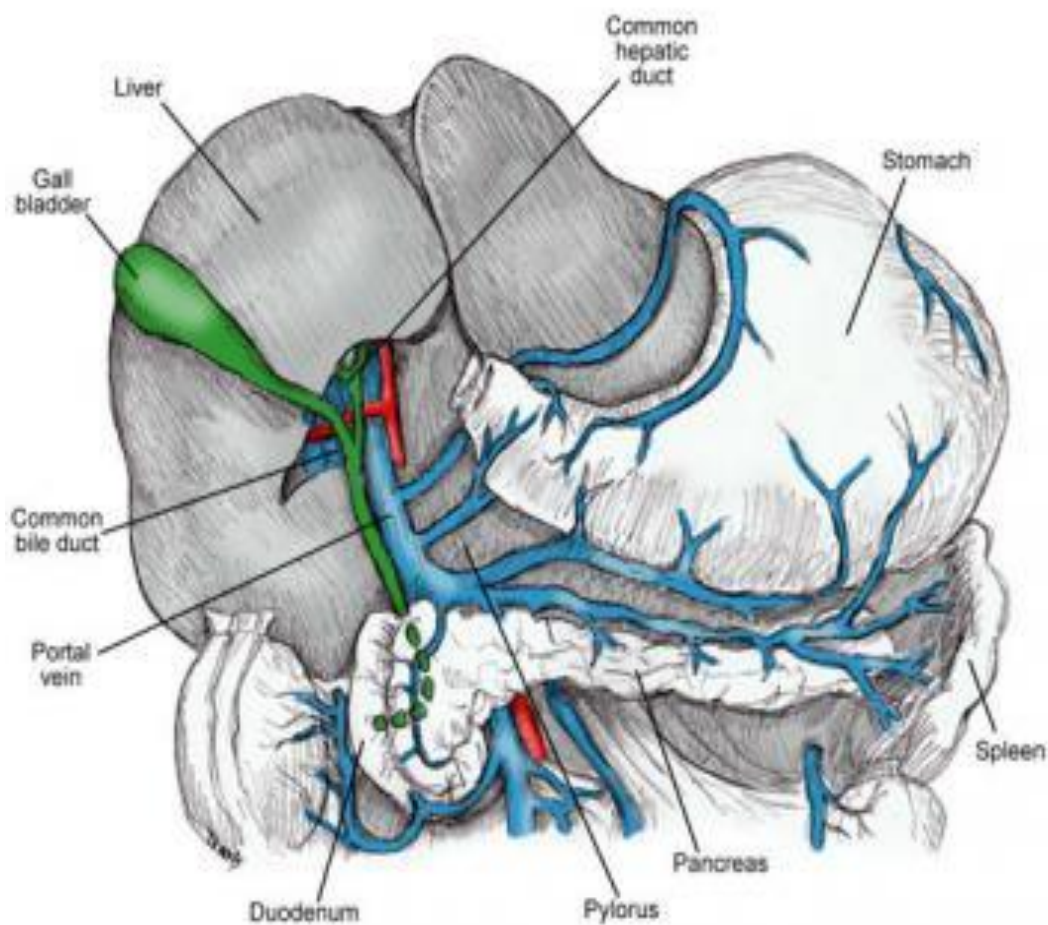


Figure 1. overview of pancreas

b. Embryology

The pancreas develops as 2 buds (outpouchings) of endoderm from the primitive duodenum at the junction of the foregut and the midgut. A small ventral bud (pouch) forms the lower (inferior) part of the head and the uncinata process of pancreas, whereas a large dorsal bud (pouch) forms the upper (superior) part of the head as well as the body and tail of the pancreas. The ventral bud rotates behind the duodenum dorsally from right to left and fuses with the dorsal bud, and the duct of the distal part (body and tail) of the dorsal bud unites with the duct of the ventral bud to form the main pancreatic duct (of Wirsung). Because the common bile duct (CBD) also arises from the ventral bud, it forms a common channel with the main pancreatic duct. The remaining proximal part (head) of the duct of the dorsal bud remains as the accessory pancreatic duct (of Santorini).

c. Gross Anatomy**• Anatomic anatomy**

The duodenum (25 cm long) is horseshoe shaped (with its inferior limb being longer than the superior) and has 4 parts: (1) superior (5 cm) at the level of L1; (2) descending, or C loop (7.5 cm), at L1–L3; (3) horizontal, or transverse (10 cm), at L3; and (4) ascending (2.5 cm), leading to the duodenojejunal flexure (junction). [1.2.3.4.5]

The pancreas is prismoid in shape and appears triangular in cut section with superior, inferior, and anterior borders as well as anterosuperior, anteroinferior, and posterior surfaces.

The head of the pancreas lies in the duodenal C loop in front of the inferior vena cava (IVC) and the left renal vein (see the following images). The uncinata process is an extension of the lower (inferior) half of the head toward the left; it is of varying size and is wedged between the superior mesenteric vessels (vein on right, and artery on left) in front and the aorta behind it.

The lower (terminal) part of the CBD runs behind (or sometimes through) the upper half of the head of pancreas before it joins the main pancreatic duct (MPD) of Wirsung to form a common channel (ampulla).

The neck of the pancreas lies in front of the superior mesenteric vein, splenic vein and portal vein junction. The body and tail of the pancreas run obliquely upward to the left in front of the aorta and left kidney. The pancreatic neck is the arbitrary junction between the head and body of the pancreas. Portal vein lies behind the neck of the pancreas. The narrow tip of the tail of the pancreas reaches the splenic hilum in the splenorenal (lienorenal) ligament.

The pancreatic head constitutes about 50% and the body and tail the remaining 50% of the pancreatic parenchymal mass.

The transverse mesocolon (with the middle colic vessels in it) is attached to the anterior surface of the lower (inferior) part of body and tail—most of the gland is thus located in the supracolic compartment. The body and tail of the pancreas lie in the lesser sac (omental bursa) behind the stomach.

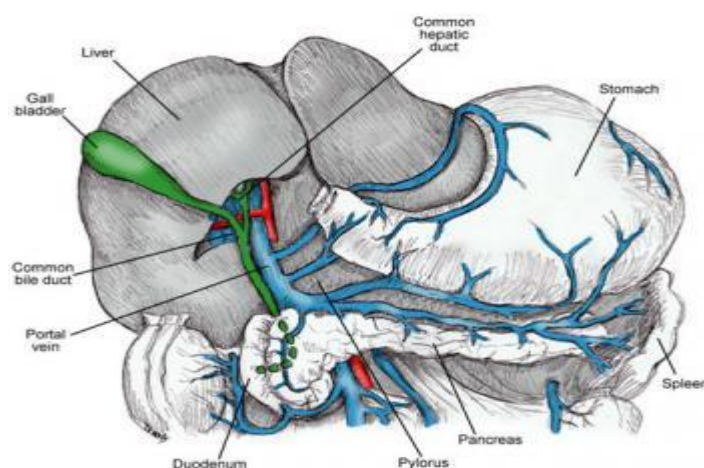


Figure 2. The duodenum and pancreas

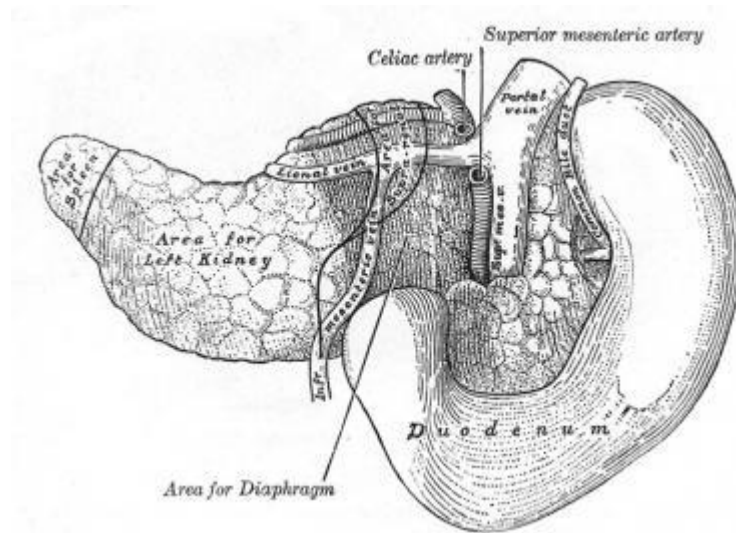


Figure 3. The pancreas and duodenum, posterior view.

- **CT anatomy**

The pancreas is best evaluated with a triphasic (arterial, portal venous, and systemic venous phases), contrast-enhanced (after intravenous injection of contrast medium), computed tomographic (CT) scan with 3-dimensional (3-D), triplanar (axial, coronal, and sagittal planes) reconstruction. Because the pancreas lies obliquely, all parts of the pancreas are not at the same transverse level and are not seen in 1 section (cut) of the CT scan—the pancreatic head is lower (at the level of L2) than its body (L1) and tail (T12). The normal pancreatic duct may be just seen in the head (3–4 mm) and proximal body (2–3 mm) of the pancreas on CT scan. See the images below.

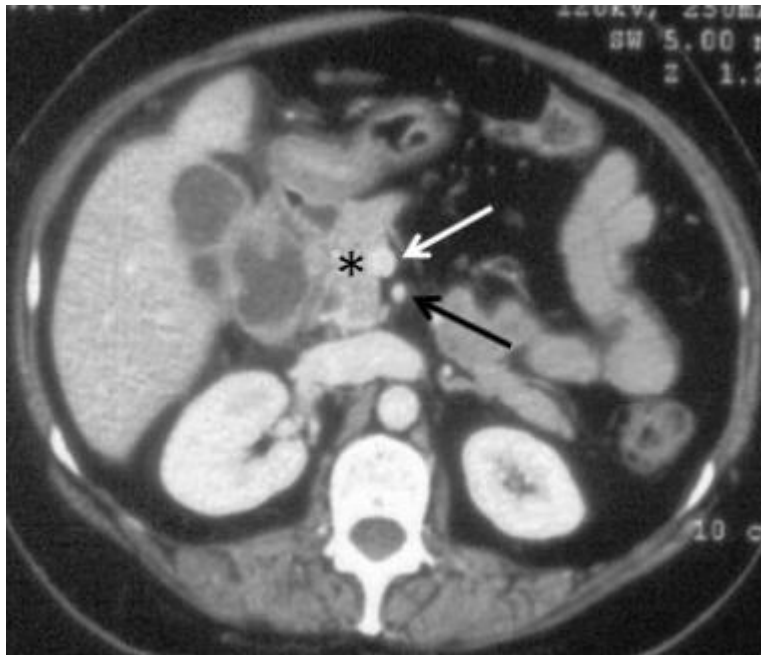


Figure 4 . Computed tomography (CT) scan showing the pancreas head (*) and the superior mesenteric artery (black arrow) and vein (white arrow).



Figure 5. Computed tomography scan of the body of the pancreas (*) with the splenic vein (arrow) behind it.

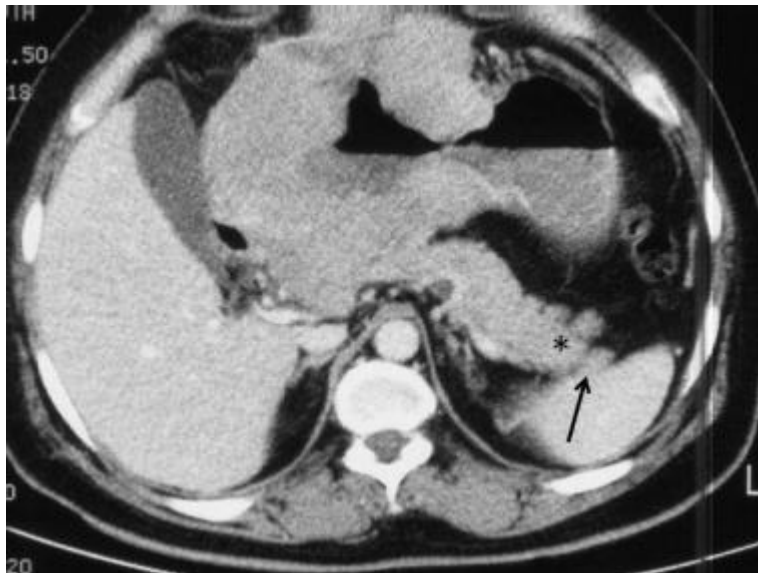


Figure 6. Computed tomography scan of the tail of the pancreas (*) reaching the hilum of the spleen (arrow).

- **Endoscopic anatomy**

The main pancreatic duct (of Wirsung) runs from the tail through the body to the head of the pancreas where it descends into the lower (inferior) part of the head. There, it joins the duct of the uncinete process coming from left and then the lower part of the common bile duct to form a common channel (called the hepatopancreatic ampulla, when dilated), which runs through the medial duodenal wall and opens on the dome of the major duodenal papilla (a nipplelike projection on the medial wall of the middle segment of the second part [C loop] of the duodenum). Both the ampulla and papilla are eponymously related to Vater.

A smooth muscle sphincter (of Oddi) is present around the common channel of the pancreatic duct and the common bile duct; this prevents reflux of duodenal juices into the pancreatic duct (and the common bile duct). Another individual smooth muscle sphincter is present around the terminal part of the main pancreatic duct before it joins the common bile duct; this prevents reflux of bile into the pancreatic duct (a similar sphincter present around the lower part of the common bile duct

prevents reflux of pancreatic juices into the common bile duct).

An accessory pancreatic duct drains the upper (superior) part of the head of the pancreas and opens in the duodenum at the minor duodenal papilla 2 cm anterosuperior to the major papilla (see the following image). The 2 pancreatic ducts (main and accessory) often communicate with each other.

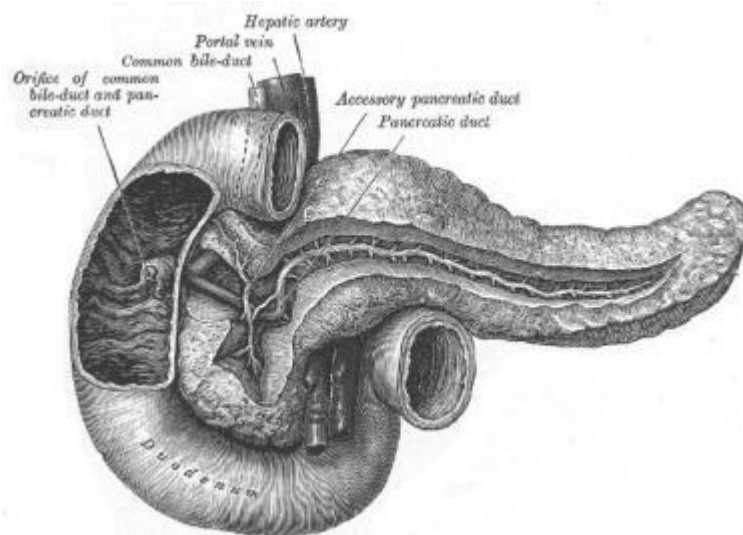


Figure 7. The pancreatic duct.

- **Blood supply**

Pancreas derives a rich blood supply from both celiac axis and superior mesenteric artery; that is why when angiography is done for bleeding as a complication of acute pancreatitis, chronic pancreatitis or pancreatoduodenectomy both celiac axis and superior mesenteric artery should be evaluated.

The celiac trunk (axis) comes off from the anterior surface of the aorta at the level of T12-L1. It has a short length of about 1 cm and trifurcates into the common hepatic artery (CHA), splenic artery, and left gastric artery (LGA). The CHA runs toward the right on the superior border of the proximal body of the pancreas, and the splenic artery runs toward the left on the superior border of the distal body and tail of the pancreas. [1.2.3.4.5]

The superior mesenteric artery (SMA) comes off from the anterior surface of the

aorta just below the origin of the celiac trunk at the level of L1 behind the neck of the pancreas. Then, it descends down in front of the uncinate process and the 3rd (horizontal) part of the duodenum to enter the small bowel mesentery.

The gastroduodenal artery (GDA), a branch of the CHA, runs down behind the first part of the duodenum in front of the neck of the pancreas and divides into the right gastro-omental gastroepiploic artery (GEA) and superior pancreaticoduodenal artery (SPDA), which further bifurcates into anterior and posterior branches. The inferior pancreaticoduodenal artery (IPDA) arises from the SMA and also bifurcates into anterior and posterior branches.

The anterior and posterior branches of the SPDA and IPDA join each other and form anterior and posterior pancreaticoduodenal arcades in the anterior and posterior pancreaticoduodenal grooves supplying small branches to the pancreatic head and uncinate process of the pancreas as well as the 1st, 2nd, and 3rd parts of the duodenum (vasa recta duodeni). Multiple pancreatic branches (including a great pancreatic artery or arteria magna pancreatica) of the splenic artery supply the pancreatic body and tail. Multiple, small pancreatic branches of a dorsal pancreatic artery from the splenic artery and an inferior pancreatic artery from the superior mesenteric artery supply the body and tail of pancreas.

The arterial supply of the pancreas forms an important collateral circulation between the celiac axis and superior mesenteric artery.

Veins accompany the SPDA and IPDA. Superior pancreaticoduodenal veins (SPDVs) drain into the portal vein and inferior pancreaticoduodenal veins (IPDVs) drain into the superior mesenteric vein (SMV). A few small, fragile uncinate veins drain directly into the SMV. Some veins from the head of the pancreas drain into the gastroduodenal trunk. Numerous small, fragile veins drain directly from the pancreatic body and tail into the splenic vein.

The SMV lies to the right of the SMA in front of the uncinata process and the 3rd part of the duodenum. The splenic vein arises in the splenic hilum behind the tail of the pancreas and runs from left to right on the posterior surface of the pancreatic body. Union of the horizontal splenic vein and the vertical SMV forms the portal vein behind the neck of the pancreas.

The inferior mesenteric vein (IMV) joins the splenic vein (or the junction of the splenic vein and SMV, or even SMV). The portal vein receives the SPDVs, right gastro-omental (gastroepiploic vein, left gastric vein (LGV), and right gastric vein (RGV); then, it runs up (superiorly) behind the first part of the duodenum in the hepatoduodenal ligament behind (posterior to) the common bile duct on the right and proper hepatic artery on the left.

The portal venous system (splenic vein, SMV, and portal vein) has no valves.

- **Lymphatic drainage**

The head of the pancreas drains into pancreaticoduodenal lymph nodes and lymph nodes in the hepatoduodenal ligament, as well as prepyloric and postpyloric lymph nodes. The pancreatic body and tail drain into mesocolic lymph nodes (around the middle colic artery) and lymph nodes along the hepatic and splenic arteries. Final drainage occurs into celiac, superior mesenteric, and para-aortic and aortocaval lymph nodes [1.2.3.4.5]

- **Nerve supply**

The pancreas receives parasympathetic nerve fibers from the posterior vagal trunk via its celiac branch. Sympathetic supply comes from T6–T10 via the thoracic splanchnic nerves and the celiac plexus [1.2.3.4.5]

2. Kidney

a. Overview

The kidneys are paired retroperitoneal structures that are normally located between the transverse processes of T12–L3 vertebrae, with the left kidney typically somewhat more superior in position than the right. The upper poles are normally oriented more medially and posteriorly than the lower poles.

The kidneys serve important functions, including filtration and excretion of metabolic waste products (urea and ammonium); regulation of necessary electrolytes, fluid, and acid–base balance; and stimulation of red blood cell production. They also serve to regulate blood pressure via the renin–angiotensin–aldosterone system, controlling reabsorption of water and maintaining intravascular volume. The kidneys also reabsorb glucose and amino acids and have hormonal functions via erythropoietin, calcitriol, and vitamin D activation.^[6]

The kidney anatomy is shown in the image below.

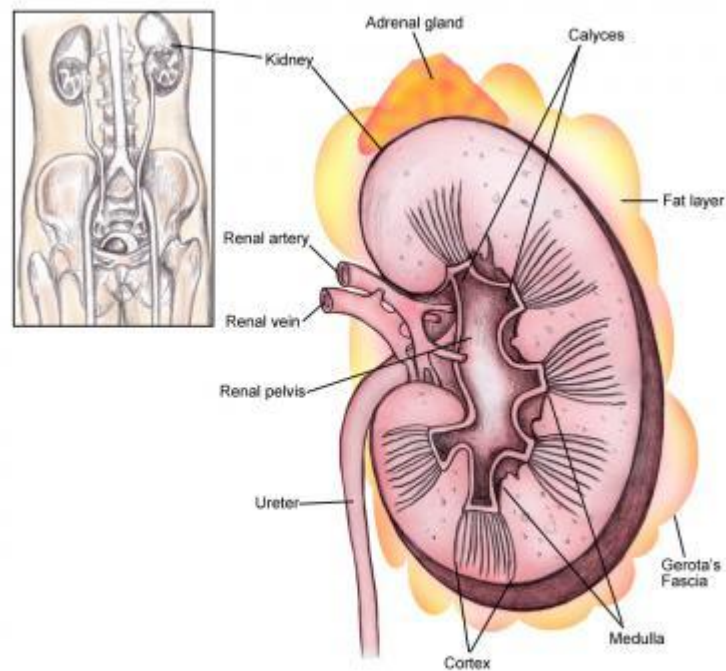


Figure 8. Renal anatomy, renal fascia

b. Gross Anatomy**• Anatomic anatomy**

Grossly, the kidneys are bean-shaped structures and weigh about 150 g in the male and about 135 g in the female. They are typically 10–12 cm in length, 5–7 cm in width, and 2–3 cm in thickness. [7]

The relationship of neighboring organs to the kidneys is important, as described below:

- Superiorly, the suprarenal (adrenal) glands sit adjacent to the upper pole of each kidney
- On the right side, the second part of the duodenum (descending portion) abuts the medial aspect of the kidney
- On the left side, the greater curvature of the stomach can drape over the superomedial aspect of the kidney, and the tail of the pancreas may extend to overlie the renal hilum
- The spleen is located anterior to the upper pole and is connected by the splenorenal (lienorenal) ligaments
- Inferiorly to these organs, the colon typically rests anteriorly to the kidneys on both sides
- Posteriorly, the diaphragm covers the upper third of each kidney, with the 12th rib most commonly crossing the upper pole
- The kidneys sit over the psoas (medially) and the quadratus lumborum muscles (laterally)
- The images below further depict kidney anatomy and positioning

- **Vasculature**

The kidneys receive approximately 20% of the cardiac output. The blood supply to the kidneys arises from the paired renal arteries at the level of L2. They enter into the renal hilum, the passageway into the kidney, with the renal vein anteriorly; the renal artery; and the renal pelvis posteriorly.

The first branch off of the renal artery is the inferior suprarenal artery. The renal artery then branches off into 5 segmental branches. The posterior segmental artery supplies most of the posterior kidney, with the exception of the lower pole. The anterior branches are the superior segmental artery, anterior superior segmental artery, anterior inferior segmental artery, and inferior segmental artery. These arteries branch into interlobar arteries, which travel in a parallel fashion in between the major calyces and then branch further into arcuate arteries that run within the cortex across the bases of the renal pyramids.

They then radiate into interlobular arteries, which extend into the cortex of the kidney to finally become afferent arterioles, then peritubular capillaries to efferent arterioles. Some of the terminal branches of the interlobular arteries become perforating radiate arteries, which supply the renal capsule. Renal pelvic and superior ureteric branches also originate from the renal artery and supply the upper portion of the collecting system.

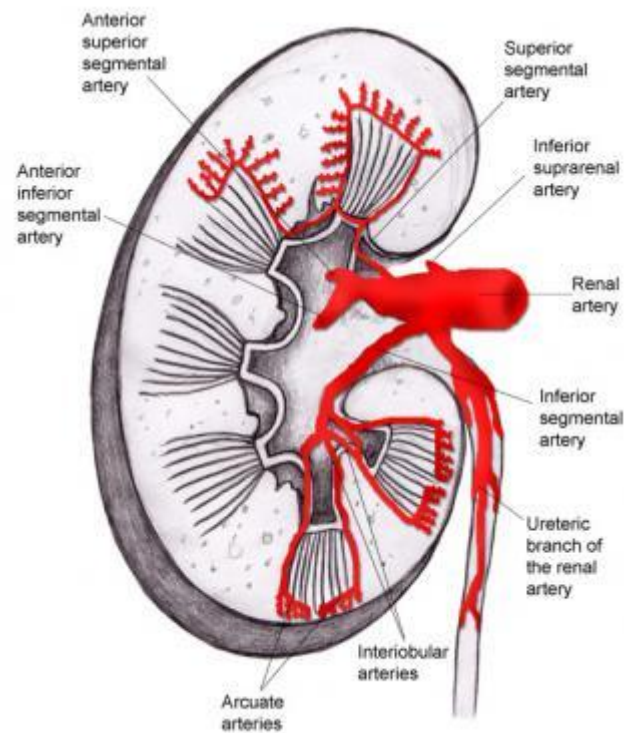


Figure 9. Intrarenal arteries

The renal veins drain the kidneys in a similar distribution, and the renal vein is generally anterior to the renal artery at the hilum. The left renal vein is longer than the right as it crosses the midline to reach the inferior vena cava (IVC). Generally, the left gonadal vein drains into the left renal vein inferiorly, while the left suprarenal vein drains into the superior aspect of the renal vein at approximately the same level. Posteriorly, the left second lumbar vein typically drains into the left renal vein as well. The left renal vein then crosses under the origin of the superior mesenteric artery to reach the IVC. On the right side, the renal vein and gonadal vein drain separately and directly into the IVC.

- **Renal lymphatics**

The lymphatic drainage parallels the venous drainage system. After leaving the renal hilum, the left primary lymphatic drainage is into the left lateral aortic lymph nodes, including nodes anterior and posterior to the aorta between the inferior mesenteric artery and the diaphragm. On the right, it drains into the right lateral caval lymph nodes.^[8]

- **Collecting system**

Once the filtrate gets to the collecting ducts in the medulla of the kidney, they converge to a renal papilla, which represents the tip or apex of the renal pyramid. Urine then collects in typically 9–12 minor calyces, which then converge into 3–4 major calyces (significant variation is possible).

The major calyces then empty into the renal pelvis, which passes urine through the ureteropelvic junction (UPJ) and into the ureter, which then propels urine distally to the bladder through peristalsis. The ureter may course posterior to the renal artery (or a lower pole branch) at its superior point, cross over the psoas muscle, and then pass posteriorly to the gonadal vessels. As it proceeds further distally, it passes over the iliac vessels and into the pelvis, finally traversing an intramural tunnel into the bladder and ending at the ureteral orifice on the trigone of the bladder.

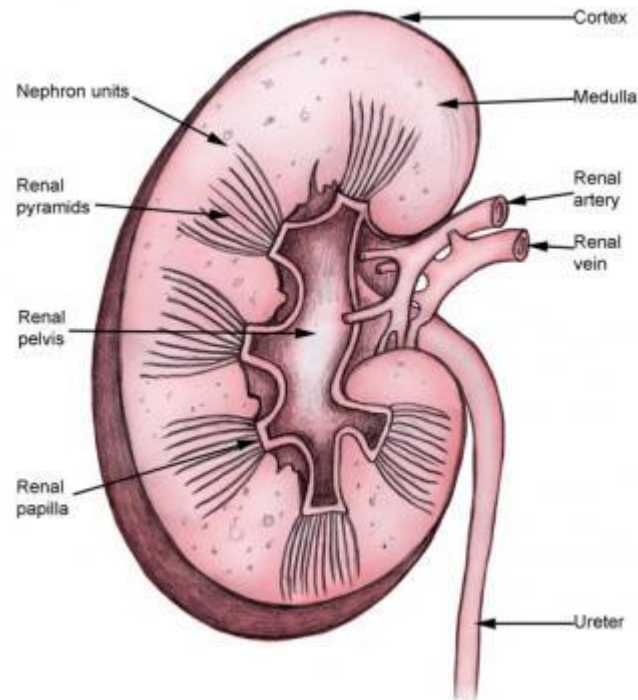


Figure 10. Anatomy of collecting system

- **Renal nerve anatomy/autonomic innervation**

The kidney receives autonomic supply via both the sympathetic and parasympathetic portions of the nervous system. The preganglionic sympathetic nervous innervation to the kidneys arises from the spinal cord at the level of T8–L1. They synapse onto the celiac and aorticorenal ganglia and follow the plexus of nerves that run with the arteries. Activation of the sympathetic system causes vasoconstriction of the renal vessels. Parasympathetic innervation arises from the 10th cranial nerve (X), the vagus nerve, and causes vasodilation when stimulated.

II. Histology

1. Pancreas

The pancreas is a composite gland containing both exocrine and endocrine components. Acini, formed of zymogenic cells around a central lumen, are arranged in lobules. Each lobule has its own ductule, and many ductules join to form intralobular ducts, which then form interlobular ducts that drain into branches of the main pancreatic duct.

Under stimulation of secretin and cholecystokinin (CCK), the zymogenic cells secrete a variety of enzymes — trypsin (digests proteins), lipase (digests fats), amylase (digests carbohydrates), and many others. Ductular cells produce bicarbonate, which makes the pancreatic fluid (juice) alkaline.

Scattered throughout the gland are pancreatic islets (clusters) (of Langerhans) containing beta cells (about 75% of islets; these secrete insulin), alpha cells (about 20% of islets; these secrete glucagon), delta cells (these secrete somatostatin), and several other hormone-secreting cells. Islets constitute only about 2% of the pancreatic parenchyma.

2. Kidney

The kidney is divided into the cortex and medulla. Renal pyramids in the medullary areas are separated by the cortical tissue called renal columns (of Bertin).

The functional renal unit is the nephron, which is composed of the following:

- The renal corpuscle: glomerulus and Bowman capsule
- Proximal convoluted tubules (PCT, located in the renal cortex)
- Descending loop of Henle (LOH)
- Ascending limb (which resides in the renal medulla, leading to the thick ascending limb)
- Thick ascending limb
- Distal convoluted tubule
- Collecting duct (which opens into the renal papilla)

Blood from the afferent glomerular arteriole passes through the juxtamedullary apparatus to the glomerulus. The glomerulus is a network of capillaries that filters blood across Bowman capsule into the proximal convoluted tubule.

The glomerulus contains podocytes and a basement membrane allowing water and certain solutes to be filtered across. This filtrate then reaches the PCT, which reabsorbs glucose and various electrolytes along with water as the filtrate passes through. Meanwhile, after being filtered at the glomerulus, the blood passes into the efferent glomerular arteriole and then descends into the renal pyramid (see the images below).

III. Pathophysiology

The sequence of events in the pathophysiology of acute pancreatitis can be divided into three major phases: initiation phase, perpetuation phase, and secondary escalation phase. The initiation phase includes the intra-acinar events that leads to cellular injury and start of local inflammation within the pancreas primarily through NF- κ B. The perpetuating phase involves the progression of initial inflammatory response into systemic inflammation, which involves recruitment of immune cells mainly leukocytes and release of various inflammatory cytokines and chemokines. An out of proportion or dysregulated immune response may result in early onset organ failure with a high mortality. The other important events in this phase are microcirculatory and coagulation disturbances that also contribute to severity of AP and organ dysfunction. In the secondary escalation phase, superadded infection of the necrotic pancreatic/peri-pancreatic tissue/fluid collections leads to further worsening of the pre-existing local and systemic inflammation. Organ failure may also develop late during the course of the disease due to septic complications. There are three major drivers of systemic inflammation in acute pancreatitis: pancreas itself, intestine, and adipose tissue. While the injury starts in the pancreas, intestine and adipose tissue get affected as bystanders and contribute significantly to systemic injury.

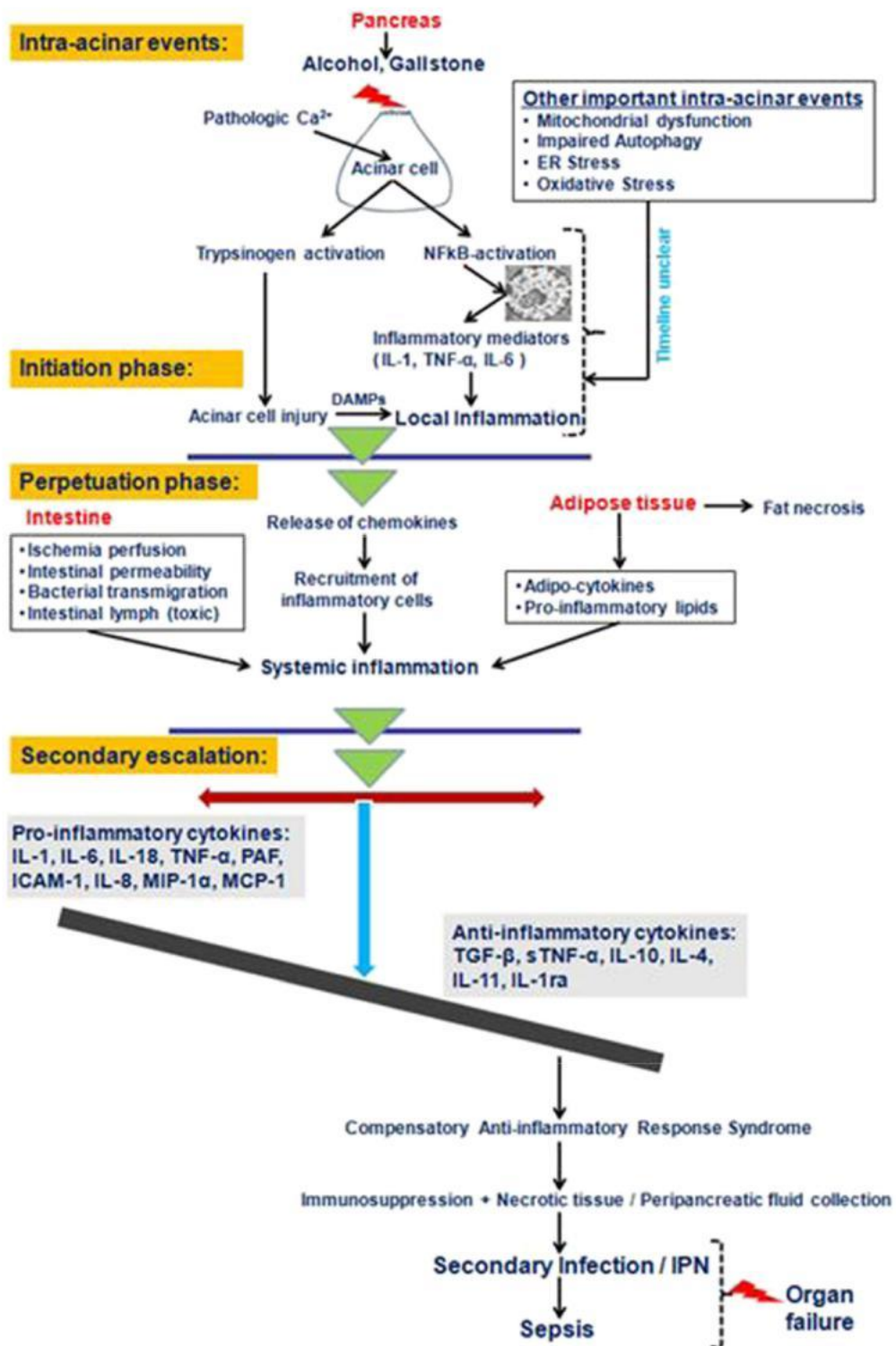


Figure 11. Pathophysiology of AP

IV. Diagnosis of acute pancreatitis

1. Clinical diagnosis

Acute pancreatitis is an acute inflammatory process of pancreas .it s a common condition that carries a significant risk of morbidity and mortality, It is mainly characterized by intra-acinar cell activation of digestive enzymes and a subsequent systemic inflammatory response governed by the release of proinflammatory cytokines. In 80% of patients the disease runs a self-limiting course, but in the rest, pancreatic necrosis and systemic organ failure carry a mortality rate of up to 40%. The key to management is early identification of the patients liable to have a severe attack and require treatment in a high-dependency or critical-care setting by a specialist team.

Risk Factors for Acute Pancreatitis

- Anatomic or functional disorders (e.g., pancreas divisum, sphincter of Oddi dysfunction)
- Autoimmune (e.g., systemic lupus erythematosus)
- Choledocholithiasis
- Chronic alcohol consumption
- Congenital anomalies Drug-induced hypertriglyceridemia (triglycerides greater than 1,000 mg per dL [11.30 mmol per L])
- Gallstones
- Hypercalcemia, hyperparathyroidism
- Hypothermia
- Idiopathic
- Infections (e.g., viral, bacterial, parasitic, fungal)
- Pancreatic or ampullary tumors

- Traumatic or postprocedure (e.g., endoscopic retrograde cholangiopancreatography or after abdominal surgery)
- Vascular (e.g., vasculitis)

Clinical presentation

The hallmark symptom of acute pancreatitis is the acute onset of persistent upper abdominal pain, usually with nausea and vomiting. The usual locations of the pain are the epigastric and periumbilical regions. The pain may radiate to the back, chest, flanks, and lower abdomen. Patients are usually restless and bend forward (the knee–chest position) in an effort to relieve the pain because the supine position may exacerbate the intensity of symptoms

Although these are common symptoms, they are not always present, a Simple abdominal pain may be the sole symptom, other Signs are less common and indicate severe disease, include:

- Grey–Turner's sign refers to bruising of the flanks, the part of the body between the last rib and the top of the hip. The bruising appears as a blue discoloration, and is a sign of retroperitoneal hemorrhage, or bleeding behind the peritoneum, which is a lining of the abdominal cavity. Grey Turner's sign takes 24–48 hours to develop, and can predict a severe attack of acute pancreatitis.
- Cullen's sign which present a superficial edema and bruising in the subcutaneous fatty tissue around the umbilicus.

This sign takes 24–48 hours to appear and can predict acute pancreatitis, with mortality rising from 8–10% to 40%.

- Pleural effusions

2. Paraclinical diagnosis

a. Biology

No single laboratory or clinical sign is pathognomonic for acute pancreatitis; many biomarkers and inflammatory mediators for predicting the severity of acute pancreatitis are being evaluated. The initial laboratory evaluation should include amylase and lipase levels; complete blood count with differential; metabolic panel (blood urea nitrogen, creatinine, glucose, and calcium levels); triglyceride level; urinalysis; and arterial blood gases.⁹ Amylase and lipase, secreted by the acinar cells of the pancreas, are the most common laboratory markers used to establish the

Elevated amylase and lipase levels can be nonspecific, depending on the time since onset of pain, other intra-abdominal processes, and concomitant chronic diseases such as renal insufficiency.

Amylase levels may be normal in patients with alcoholism who present with acute pancreatitis, especially if they have had previous attacks of alcoholic pancreatitis; thus, serial testing may not be helpful, for that Plasma lipase is more sensitive and specific than plasma amylase.

Recent research has examined potential biologic markers for predicting the severity and prognosis of pancreatitis ,Trypsinogens and pancreatic proteases involved in the autodigestive processes of acute pancreatitis appear promising. Other investigational serologic markers include trypsinogen activation peptide, C-reactive protein, procalcitonin, phospholipase A2, and the cytokines interleukin-6 and interleukin-8.^{11,12,14,15} Currently.

These markers have limited clinical availability, but there is significant interest in better understanding markers of immune response and pancreatic injury because these could be valuable tools for reliably predicting the severity of acute pancreatitis

and supplementing imaging modalities.

b. Radiology

➤ **Ultrasonography**

Ultrasonography (US) is one of the tests to be performed at first in every patient in whom acute pancreatitis is suspected.

It enables visualization of findings associated with acute pancreatitis such as pancreatic enlargement, inflammatory changes around the pancreas and ascites, it is useful in making a diagnosis of acute pancreatitis.

It is reported that the visualization rate of the pancreas by US is 62–90% and that of inflammatory changes around the pancreas are 62–90% for the anterior pararenal cavity, 90% for the lesser mesentery, and 65% for the mesentery, respectively

Visualization of the pancreas and peripancreatic tissues may be poor in severe cases under the influence of images of intra-intestinal retention of gas bubbles but it is really effective in detecting biliary lithiasis responsible for acute pancreatitis and differentiating acute pancreatitis from other abdominal diseases.

➤ **CT SCAN**

Is the most useful imaging examination for making a diagnosis of acute pancreatitis. It is also useful in a differential diagnosis from other intra-abdominal diseases such as perforation associated with gastroduodenal ulcer.

Should be performed aggressively when a definitive diagnosis of acute pancreatitis on the basis of clinical manifestations, hematological examination, urinalysis and US is impossible.

CT enables visualization of objective local images of the pancreas free from the influence of gas bubbles in the alimentary tract and fatty tissues in the abdominal wall and cavity

CT findings useful in a diagnosis of acute pancreatitis include the enlargement of the pancreas, increased concentrations of adipose tissue in the parapancreatic and retroperitoneal cavities (mainly in an anterior pararenal space) and mesocolon and mesenteriolum, fluid collection, pseudocyst formation, uneven density of the pancreatic parenchyma, pancreatic necrosis, fatty necrosis in the retroperitoneal space and mesentery, hematoma, images of pancreatic fissure associated with trauma.

Gas images in and around the pancreas are often caused by fistula formation between the intestinal tract and infections with gas-forming bacteria .

CT also helps in assessing the severity of acute pancreatitis which is important in deciding treatment policy .

T2-enhanced MRI imaging is needed in some case to visualize clearly the pancreas edema.

3. Diagnosing the severity of acute pancreatitis

It is crucial to determine the place of hospitalization adapted to the severity of the disease and to evaluate prognosis .in 70to 80% of cases , the pancreatitis is benign , edematous and cured in few days .

those cases can be hospitalized in medicine department .in the present case , the aim is to determine the cause in order to prevent its recurrence.in 20 to 30% of cases , the pancreatitis is severe and can lead to death.

The global mortality in 5%, but in severe cases it can reach 20%.

a. Clinico- biological:

Acute pancreatitis can be severe from the start , or can get serious after many days or weeks. to predict a Complicated evolution of the disease , many markers and score are accredited.

The most reliable biological marker is C-reactive protein, its elevation is significant from the second day of the starting of the disease. it s an alarm sign.

Several scoring systems can predict the severity of pancreatitis, and recent work has attempted to compare their relative predictive values. Ranson's criteria, the Imrie scoring system, the Acute Physiology and Chronic Health Evaluation (APACHE II) scale, have been developed and validated to predict adverse outcomes, including mortality, in patients with pancreatitis .

But since 2012, revised atlanta classification took the major place in predicting the severity and prognosis of acute pancreatitis.

✓ Ranson s criteria**• At admission:**

1. Age in years > 70 years
2. White blood cell count > 18000 cells/mm³
3. Blood glucose > 12.2 mmol/L (> 220 mg/dL)
4. Serum AST > 250 IU/L
5. Serum LDH > 400 IU/L

• Within 48 hours:

1. Serum calcium < 2.0 mmol/L (< 8.0 mg/dL)
2. Hématocrite fall > 10%
3. Oxygen (hypoxémia PaO₂ < 60 mmHg)
4. BUN increased by 0.7 or more mmol/L (2 or more mg/dL) after IV fluid

_____ hydration

5. Base deficit (negative base excess) > 5 mEq/L

6. Sequestration of fluids > 4 L

- if the score ≥ 3 , severe pancreatitis likely
- if the score < 3 , severe pancreatitis is unlikely
- the score can also predict mortality:
- score 0 to 2 : 2% mortality
- score 3 to 4 : 15% mortality
- score 5 to 6 :40% mortality
- score 7 to 8 : 100% mortality

✓ **Apache II (acute physiology and chronic health evaluation ii)**

The point score is calculated from a patient's age and 12 routine physiological measurements :

- PaO₂
- temperature
- mean arterial pressure
- pH arterial
- Heart rate
- Respiratory rate
- Sodium (serum)
- Potassium (serum)
- Creatinine
- Hematocrit
- White blood cell count
- Glasgow coma scale

✓ **revised Atlanta criteria 2012**

Mild: no organ failure and no local complications

Moderate: transient organ failure <48hours , local complications+/-
 severe:persistent organ failure> 48 hours

b. Radiology

✓ **Balthazar scoring**

It is a grading system used to determine the severity of acute pancreatitis.

Tableau 1. Balthazar classification

Balthazar grade	Appearance on CT	CT Grade Points
GRADE A	Normal CT	0
GRADE B	Focal or diffuse enlargement of the pancreas	1
GRADE C	Pancreatic gland abnormalities and peripancreatic inflammation	2
GRADE D	Fluid collection in a single location	3
GRADE E	Two or more fluid collections and /or gas bubbles in pancreas	4

V. Treatment

1. Initial supportive care

Initial management of a patient with acute pancreatitis consists of supportive care with fluid resuscitation, pain control, and nutritional support.

a. Fluid resuscitation

Patients with acute pancreatitis lose a large amount of fluids to third spacing into the retroperitoneum and intra-abdominal areas.

Accordingly, they require prompt IV hydration within the first 24 hours. Especially in the early phase of the illness, aggressive fluid resuscitation is critically important. This cannot be overemphasized.

There is no universal consensus definitively favoring one type ; both crystalloids and colloids are used.

Resuscitation should be sufficient to maintain hemodynamic stability. they usually involves a continuous infusion at a rate of 250–500 ml/h.

b. Pain control

Acute pancreatitis is accompanied by persistent severe abdominal pain. Analgesia is crucial .

The pain associated with acute pancreatitis may cause anxiety in patients and adversely affect their clinical course; this may include respiratory distress which should be relieved shortly after it develops. The non-narcotic analgesic buprenorphine has an effect superior to procaine and, unlike procaine, it does not exacerbate the pathology of acute pancreatitis by including the contraction of the sphincter of Oddi , Buprenorphine has an analgesic effect similar to that of pethidine.

c. Nutritional support

General guidelines for nutritional support of patients with acute pancreatitis include the following:

In patients with mild uncomplicated pancreatitis , no benefit is observed from nutritional support

in patients with moderate to severe pancreatitis, begin nutritional support early in the course of management , as soon as stabilization of fluid and hemodynamic parameters permits , optimally , nasojejunal feedings with a low fat formulation should be initiated at admission .

The oral feedings should be initiated once abdominal pain has resolved and the patient regains appetite, the diet should be low in fat and protein.

2. Antibiotic therapy

Antibiotics, usually drugs of the imipenem class, should be used in any case of pancreatitis complicated by infected pancreatic necrosis. However, they should not be given routinely for fever ,as it s a symptom secondary to inflammatory response and typically does not reflect infectious process.

this drug penetrates the pancreatic parenchyma and reduces the risk of intra abdominal infection, it offers some benefit in preventing infectious complications.

3. Surgical interventions

It concerns mainly biliary pancreatitis and its modalities are based on the severity of pancreatitis.

In mild pancreatitis, most authors recommend biliary surgery during the same admission, after normalization of clinical and biological parameters. Laparoscopic cholecystectomy is associated with peroperative cholangiography which can show a common bile duct stone. When operation is performed within 48 hours of onset of pancreatitis, common bile duct stones are found in up to 75% of patients, falls to 45% between day 2 and 4 and to 5% between day 5 and 7 because of spontaneous duodenal migrations of stones.

In severe pancreatitis, early biliary surgery worsens the prognosis . It has been suggested that early ERCP (Endoscopic Retrograde Cholangio–Pancreatography) associated with ES (Endoscopic Sphincterotomy) may improve the evolution by decompressing the pancreatic duct obstructed by the migrating gallstone.

VI. Complications

1. General complications

- shock and renal failure:pancreatic failure is associated with leakage of fluid in the pancreatic bed also ileus with fluid filled loops of bowel leading to pre renal azotemia and then acute tubular necrosis.
- hypoxia: ARDS due to micro thrombi in pulmonary vessels.
- hyperglycemia: due to disruption of pancreatic islets.
- hypocalcemia: sequestration of calcium in fat necrosis.
- hypoalbuminemia: increased capillary permeability.

2. Pancreatic complications

- Necrosis
- Abscess:rising fever, leukocytosis,localized tenderness and epigastric mass.it may be associated with left sided pleural effusion and enlarged spleen due to splenic vein thrombosis.
- Pseudocyst: encapsulated fluid collection with high enzyme content , usually less than 6 cm sized pseudocysts resolve spontaneously .they may become secondarily infected requiring drainage of abscess.
- Ascites:gradual increase in abdominal girth and persistent elevation of serum amylase in the absence of frank abdominal pain ? it results from rupture of pancreatic duct or drainage of pseudocyst into the pancreatic cavity.

3. gastrointestinal complications

- Upper GI bleeding : gastric or duodenal erosion
- Duodenal obstruction: compression by pancreatic mass
- Obstructive jaundice: compression of common bile duct

METHODOLOGY

OF THE STUDY

I. Study design:

It s a retrospective descriptive and comparative study

II. Patients:

Our study is at the first place comparative , it includes two groups of patients over 18 years old:

- Patients without CKF who suffered from an episode or more of acute pancreatitis
- Patients with CKF under dialysis who presented acute pancreatitis.

III. Methodes:

1. Consulted documents:

A non-computerized search using as supports:

The consultation register:

- The hospitalization register: All patients admitted for acute pancreatitis in context or not of chronic kidney failure in between the 1st of January 2012 and the 31th of December
- operative reports
- Medical charts

A computer search on “the data collection computer system” of University Hospital Hassan II Fez “HOSIX”, using Patients’ Identification (IP) .

2. Inclusion criteria:

- We included all patients over 18 years old , who had been admitted to either the department of abdominal surgery A or department of nephrology for an episode of acute pancreatitis proved by a level of lipase over 3 times the normal level , in addition to a CT results compatible with the diagnosis.
- For the patients with CKF history , we included those who had been undergoing dialysis for at least 3 months before the start of our study.

3. Exclusion Criteria:

- ❖ For CKF group:
 - Patients undergoing dialysis for less that 3 months before the start of our study

4. Studied parametrs:

We collected all the clinical , biological and radiological data for each patient using their medical fields. a data sheet was used the simplify the gathering of all the medical informations.

❖ Statistical analysis :

The patient data were coded and entered on an Excel file. After validation, statistical analysis was performed using the analysis software IBM SPSS Statistics23 following 3 steps:

- **Step 1:** We performed a descriptive analysis of data collected. The results were presented as a percentage and mean \pm standard deviation.
- **Step 2:** univariate analysis for comparing averages and percentages using statistical tests Student and khi 2 and fisher.
- **Step 3:** Multivariate analysis by logistic stepping down regression. The results are reported in graphs and tables commented. A $p < 0.05$ was considered significant.

The data were expressed as means \pm standard deviations using Student's t-test for continuous variables and the χ^2 test for dichotomous variables.

IV. Goal of the study:

10% of the population worldwide is affected by chronic kidney disease (CKD), and millions die each year ; According to the 2010 Global Burden of Disease study, chronic kidney disease was ranked 27th in the list of causes of total number of deaths worldwide in 1990, but rose to 18th in 2010.

That leads us to think about the amount of complications that comes with such a fatal disease.

Anemia ,Bone and heart diseases , high phosphorus and potassium , Fluid buildup are the frequent ones

But, the relationship between long-term hemodialysis and acute pancreatitis has never been established.

Our primary aim of this study is to investigate the incidence of acute pancreatitis among patients on long-term hemodialysis versus the general population.

To evaluate the severity, mortality rate of AP in ESRD patients in comparison to the general population.

RESULTS

I. Epidemiological data

1. Annual patients recruitment

Our survey is in the first place comparative, we studied two different groups of patients From January 2013 to December 2015.

a. Control group

All patients who were admitted for an episode or more of acute pancreatitis(AP), and were hospitalized in the general surgery department of the University Hospital Hassan II of Fez

The hospitalization register shows 324 patients, after excluding 7 patients:

3 Postpartum pancreatitis

2 trauma of The pancreatic lodge

2 patients with CPK that we concluded in the second group

The final number of patients who satisfied our inclusion criteria are 317 patients

b. Dialysis group

Our second group, includes all the patients with chronic kidney failure (CKF)who have been through dialysis (hemodialysis or peritoneal dialysis) for more than 3 months and presented one episode or more of AP during the period of our study .

232 patients with CKF were reported in the dialysis register ,27 among them presented an episode of AP.

18 files were found and complete, after excluding 3 patients with dialysis less than 3 months and including 2 patients from the control group ,we end up with 17 patients .

The total number of patients included in our 3 years study is 334 patients.

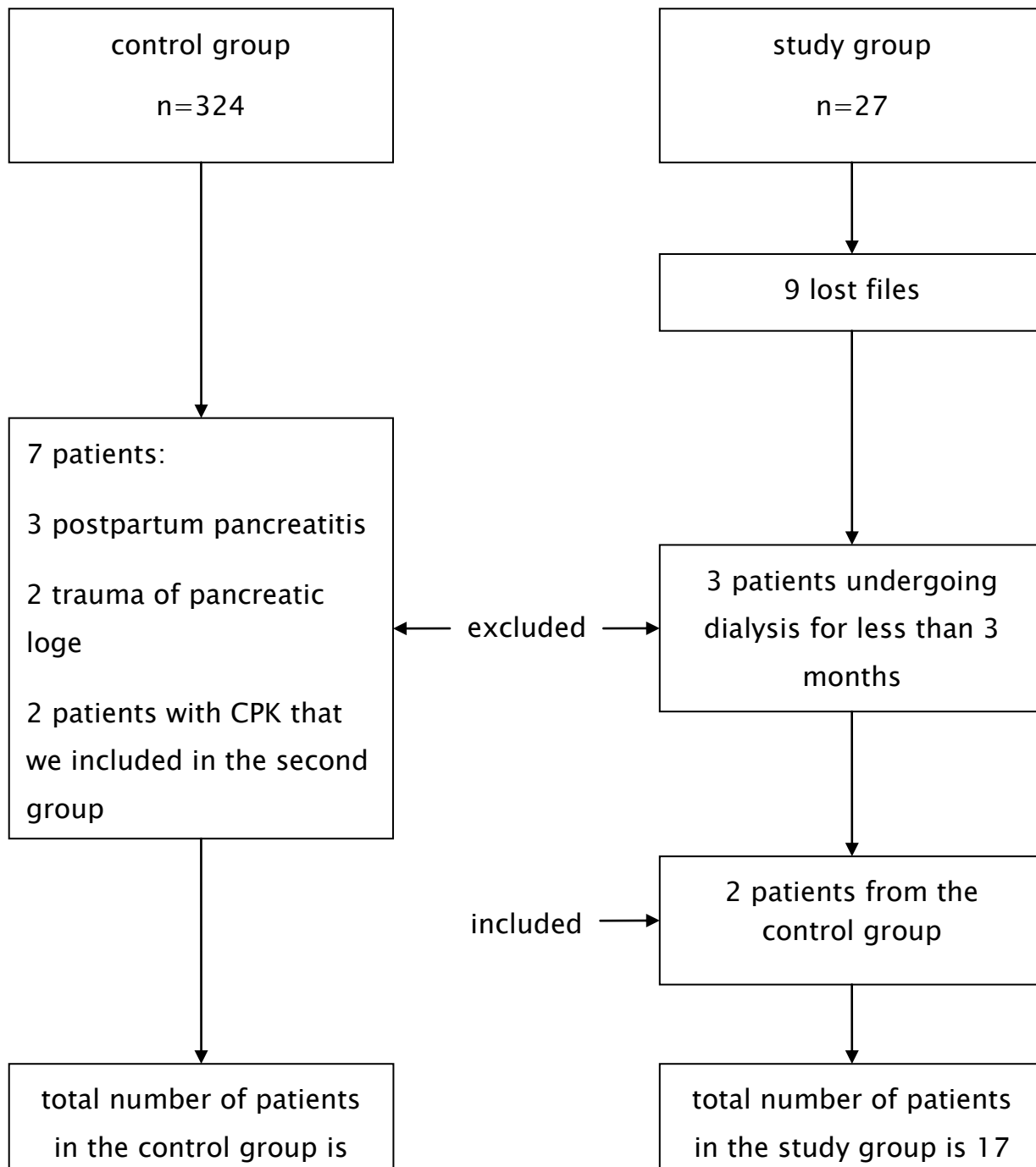


Figure 12. Sample distribution

Table 2. Distribution of patients per year of admission (control group)

YEAR	PATIENTS(n=317)	Percentage
2013	153	48.26%
2014	79	24.92%
2015	85	26.81%
Total	317	100%

Table 3. Distribution of patients per year of admission (CKD group)

YEAR	PATIENTS (n=17)	Percentage
2013	4	23.52%
2014	4	23.52%
2015	9	52.94%
Total	17	100%

2. Distribution by Age

For our control group, The average age is 51years, our patients age is mainly range between 26 to 80 years.

There is no huge difference between the control group and the study group where the average age is 61 years with extremes of 28 and 87.

3. Distribution by gender

Comparing the gender distribution, we can notice clear women predominance in the control group, otherwise our study group shows no gender difference.

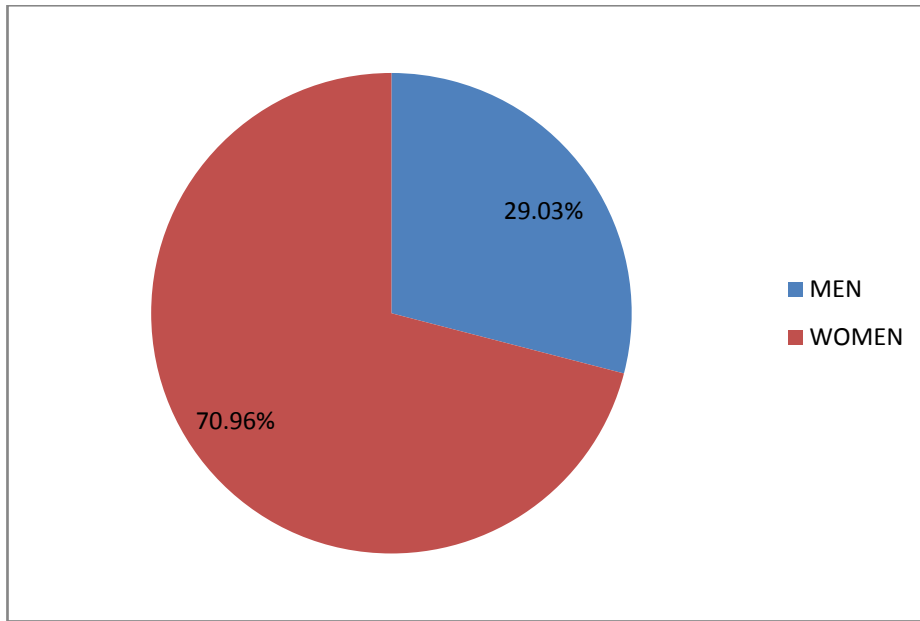


Figure 13. Distribution by gender for control group

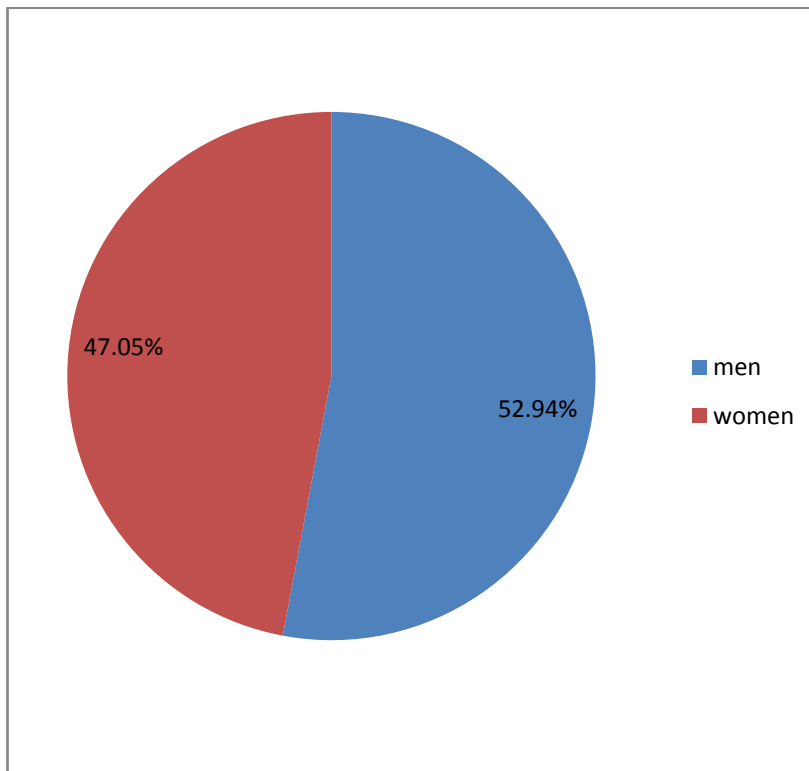


Figure14. Distribution by gender for study group

4. Incidence

Acute pancreatitis is increasingly one of the most important acute gastrointestinal conditions throughout much of the world, although incidence varies across countries and regions .it can range from 4.6 to 100 per 100 000 population [9].

In our study, the incidence of AP in the control group was 27.56/100 000 persons and 1.2/1000 persons in the study group.

II. Backgrounds

1. Comorbidities

Our comparative study includes a total number of 334 patients in both groups. Diabetes and high blood pressure are the two dominant comorbidities in both groups.

2. Risk factors

The physiopathology of acute pancreatitis is still unclear till now. researchers tried for years to identify some risk factors that help reveal the most attacked part of the general population.

Alcohol and Hypertriglyceridemia(HTG) are among the highest risk factors mentioned in the literature.

This two specific risk factors are highly present in our control group , 19.35% has hypertriglyceridemia and 6.45% are alcohol consumers

Meanwhile in our study group, no patients has a HTG history , and one patient is known for alcohol consumption.

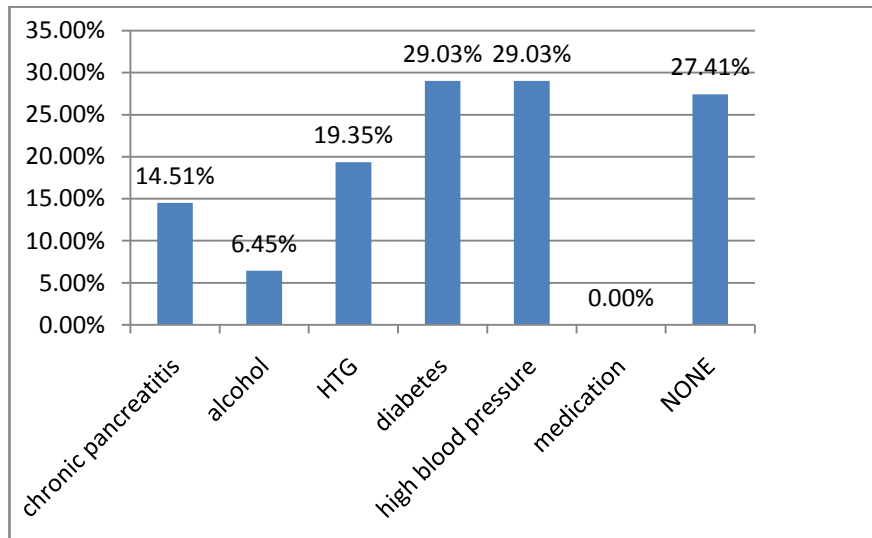


Figure 15. Comorbidities and risk factors for control group

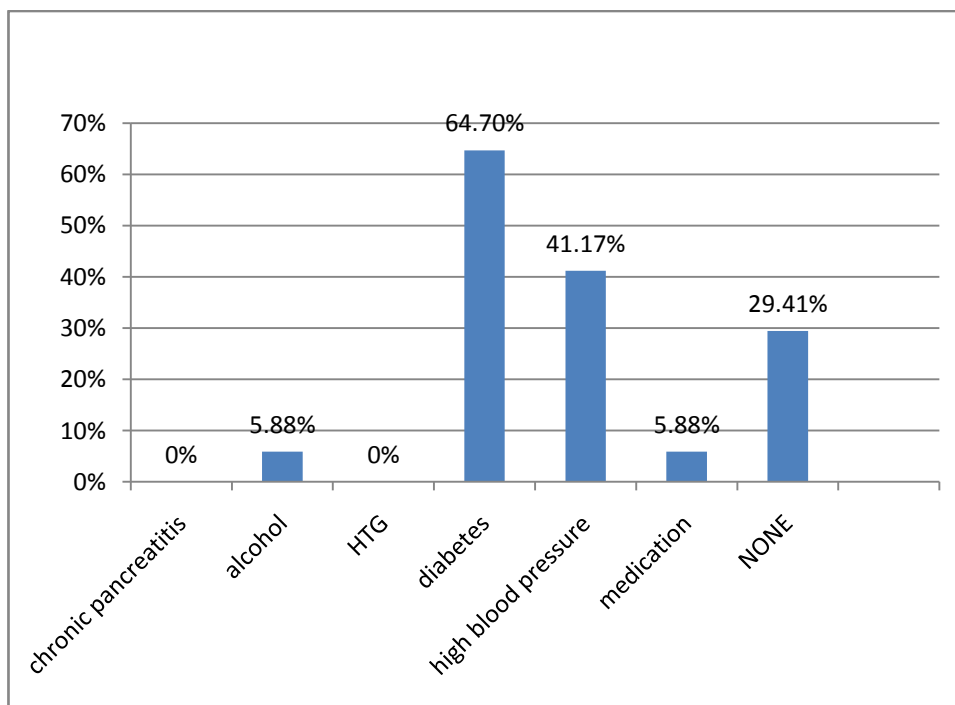


Figure 16. Comorbidities and risk factors for study group

III. Clinical Study

1. Clinical signs

The cardinal symptom of acute pancreatitis is abdominal pain, which is characteristically dull, boring, and steady. Usually, the pain is sudden in onset and gradually intensifies in severity until reaching a constant ache. Most often, it is located in the upper abdomen, usually in the epigastric region, but it may be perceived more on the left or right side, depending on which portion of the pancreas is involved. The pain radiates directly through the abdomen to the back.

In our study , and in both groups 100% of patients were admitted for abdominal pain .

Vomiting and nausea , were in the second place in the control group , 265 patients presented an episode or more of vomiting and 113 patients had nausea for the study group , 10 out of 17 patients had vomiting as a second leading symptom , and 7 presented nausea.

Icterus was present in 3.22% of the control group , versus none in our study group as we excluded all the PA that has a biliary stone as an etiology.

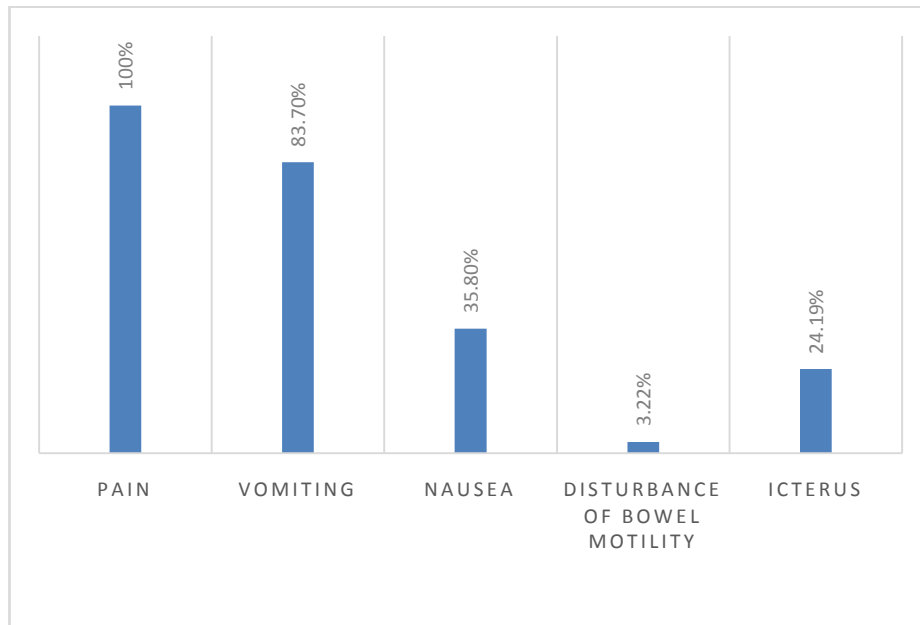


Figure 17. Clinical signs for control group

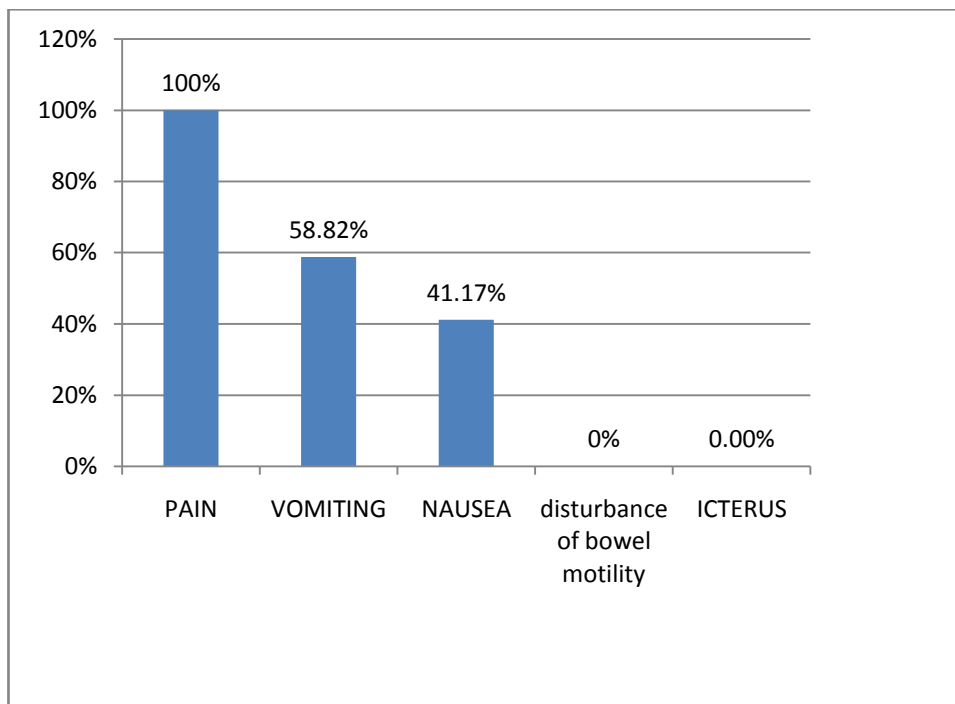


Figure 18. Clinical signs for study group

Other signs like tachypnoea , tachycardia and fever existed in both groups.

2. Diagnosis

Beside the character of the abdominal pain and medical history of the patient, it is clinically hard to diagnose an episode of AP, para-clinical exams are the effective tools to confirm the diagnosis.

IV. Para-clinical parameters

1. Biology

The biological diagnosis is essentially based on the lipase level.

All the patients included in our study have a lipase level 3 times higher than the normal value.

The period between the start of the symptomatology and the realization of biological tests is significantly different in the two groups. Lipase level was performed before 48h in 64.70% of the study group, versus only 27% in the control group.

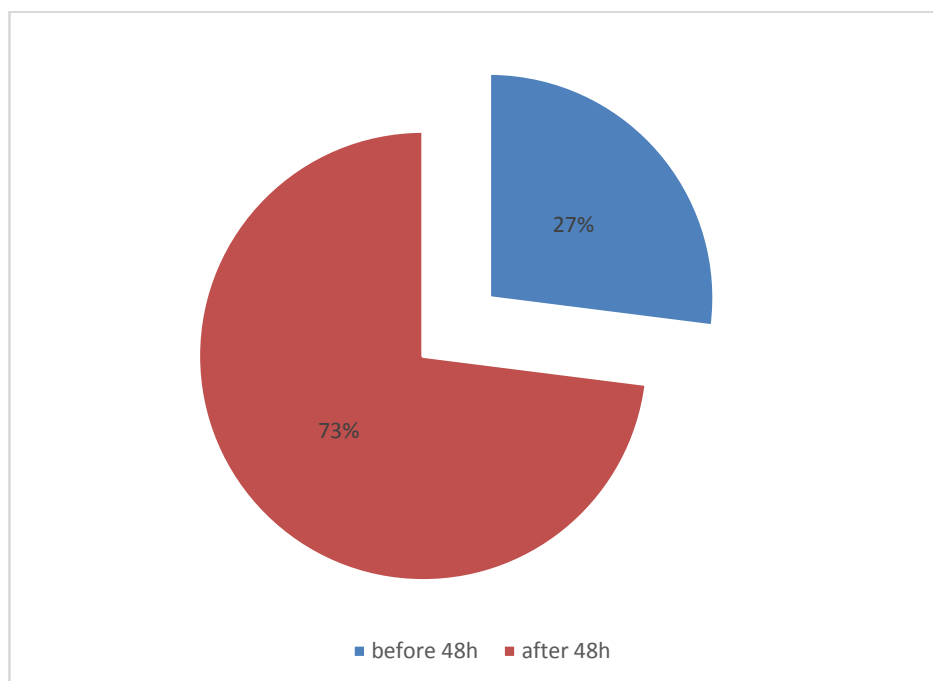


Figure 19. Timing of lipasemia level test for control group

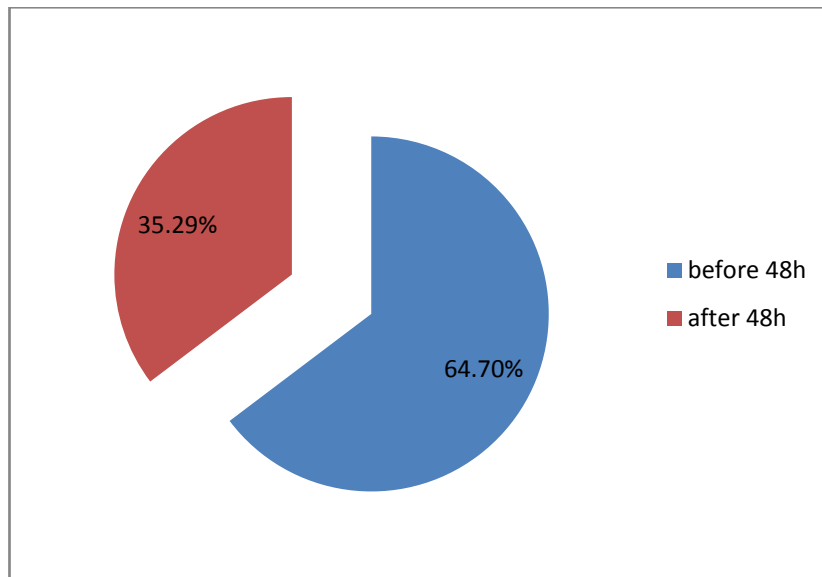


Figure 20. Timing of lipase level test for study group

2. Ultrasonography

Abdominal ultrasounds was practiced among all of the 317 patients in the control group, in contrary to the study group where none of our patients benefited from it.

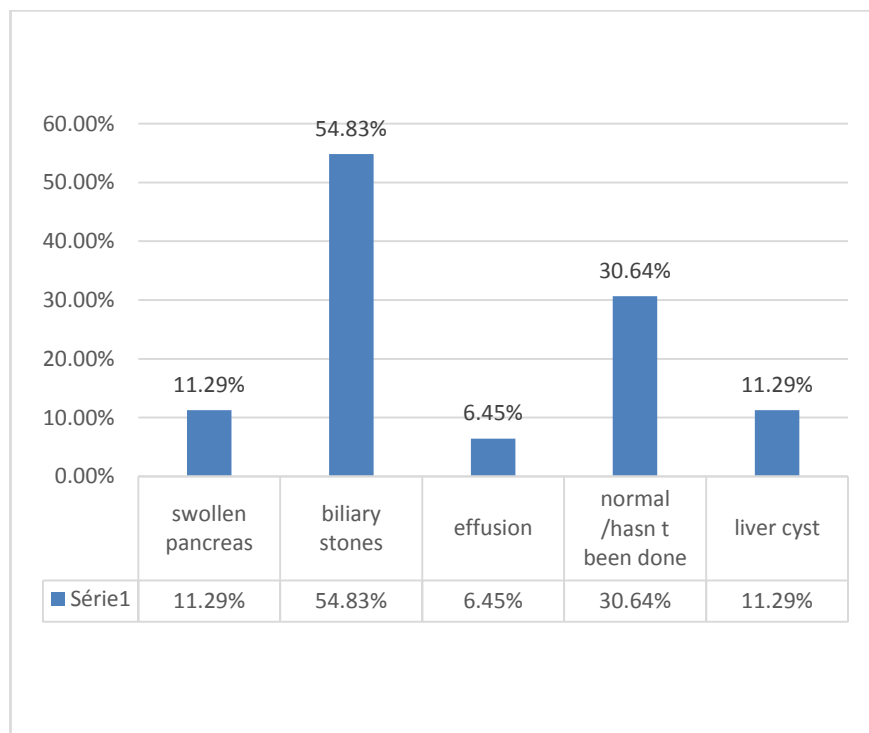


Figure 21. Abdominal ultrasound's results in the control group

3. CT SCAN

The main imaging examination for making a diagnosis of acute pancreatitis. It is also useful in the differential diagnosis from other intra-abdominal diseases .

Biliary stones were diagnosed in 204 patients in the control group.

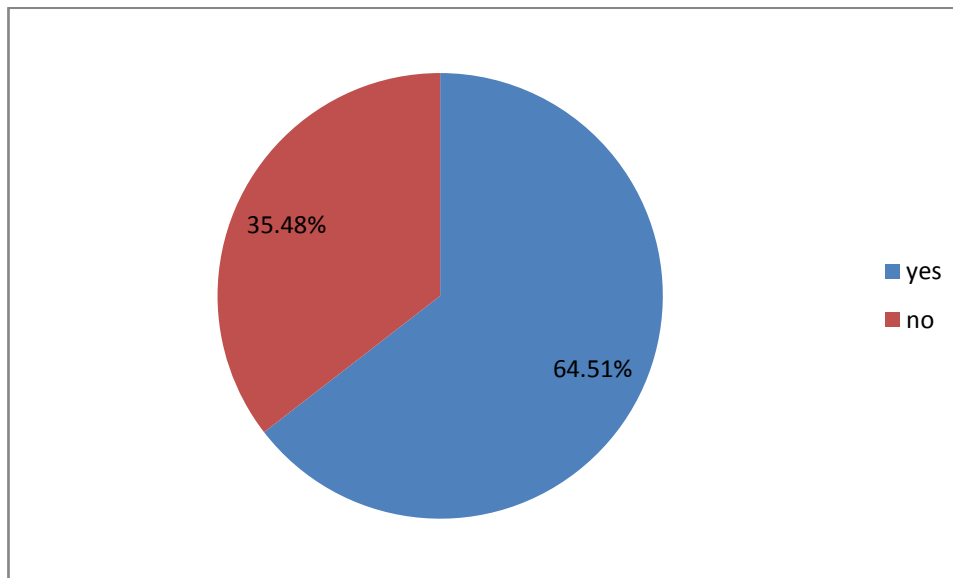


Figure 22. VISUALISATION OF BILIARY STONE IN CT SCAN (control group)

V. Diagnosing the severity of acute pancreatitis

The severity of an AP attack must be emphasized to determine the place of hospitalization and to evaluate prognosis .

1. Clinico-biological:

The most reliable biological marker is C-reactive protein. Its elevation is significant starting from the second day of the symptomatology.

In our study, and in both groups we can notice a high level of CRP in general.

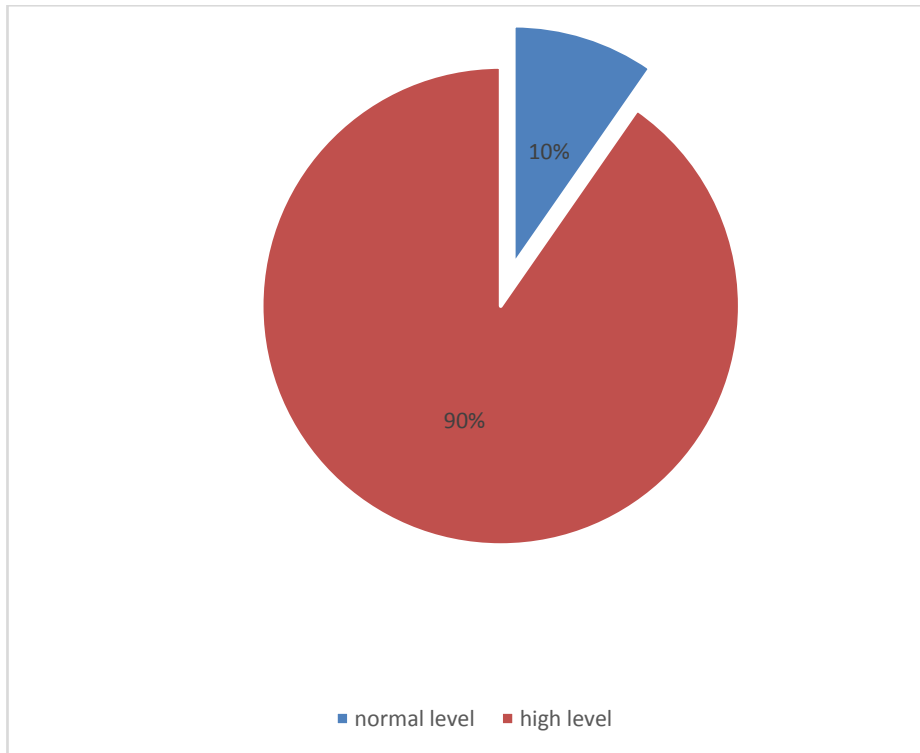


Figure 23. C- reactive protein level in control group

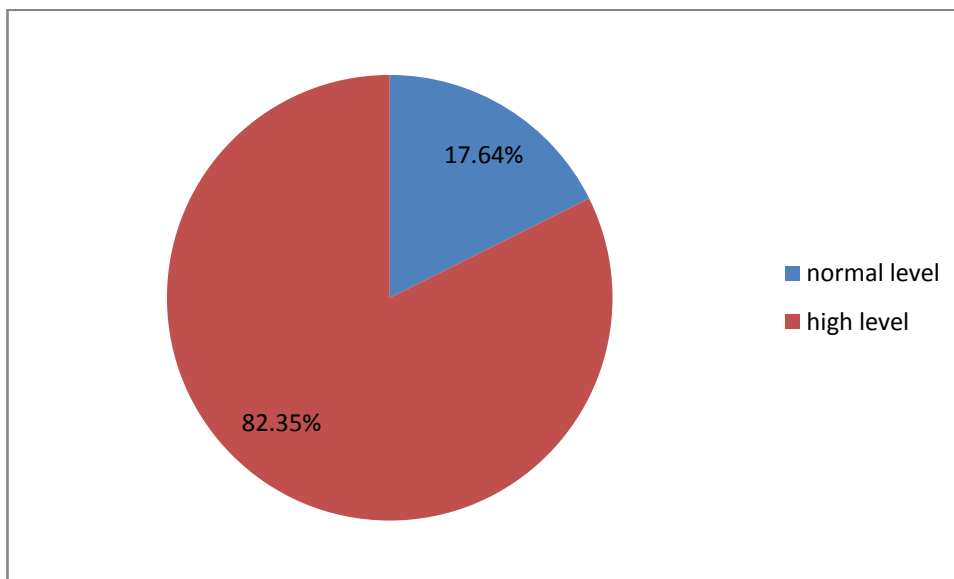


Figure 24. C- reactive protein level in study group

Different scores were previously used to identify the severity of AP, we selected the standard revised ATLANTA classification 2012 in our study as it provides definitions of clinical severity of AP.

In the control group, we notice the diversification and the presence of all stages. The **benign** form is the dominant one in the study group with 10 patients out of 17.

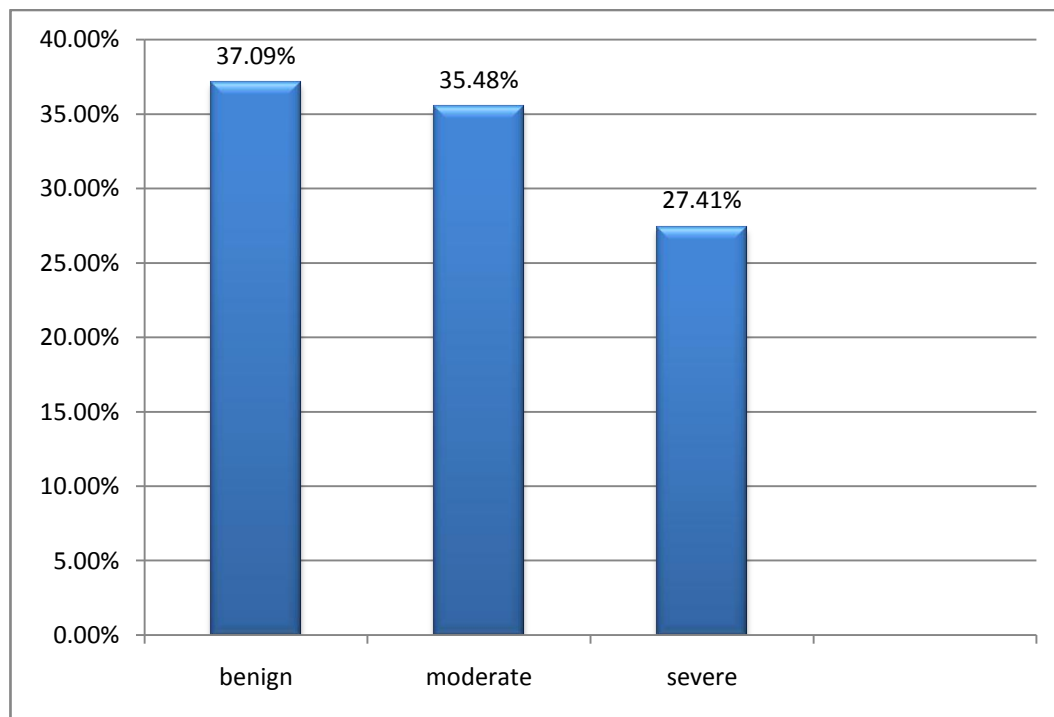


Figure 25. Atlanta classification for control group

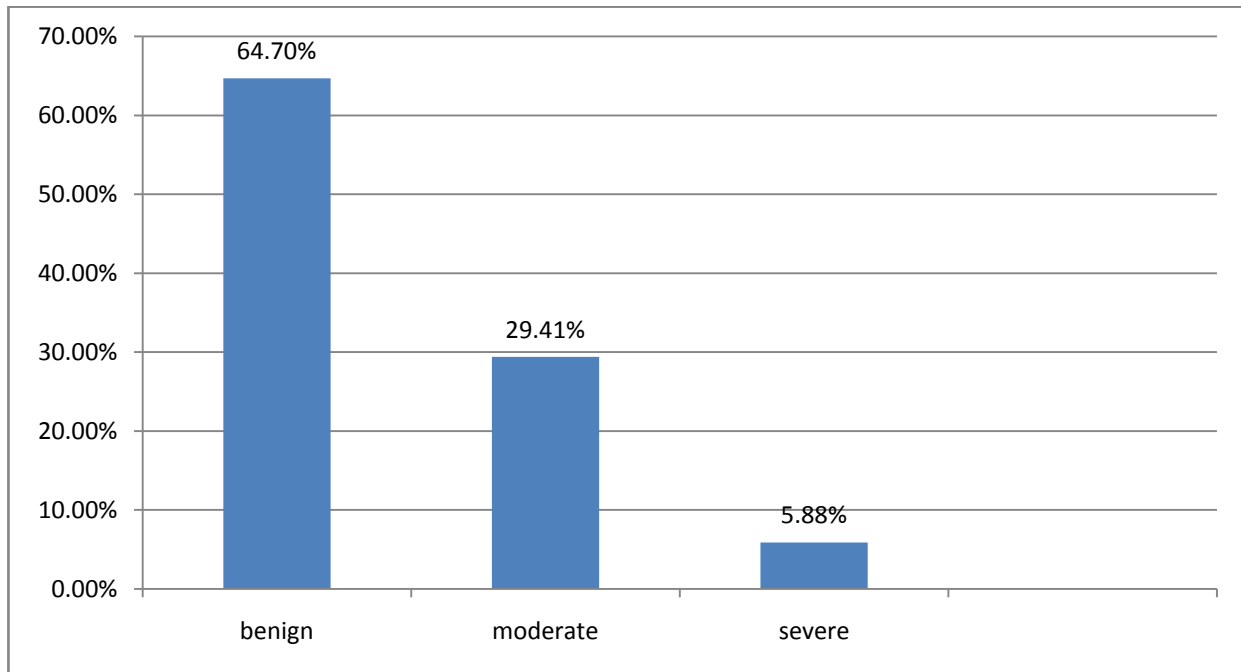


Figure 26. Atlanta classification for study group

2. Radiology

Balthazar classification is the most used to predict the severity of an AP attack.

Attacks in our study group were less severe than the ones in the control groups.

1 patient only suffered from a stage E pancreatitis versus 95 in the control group.

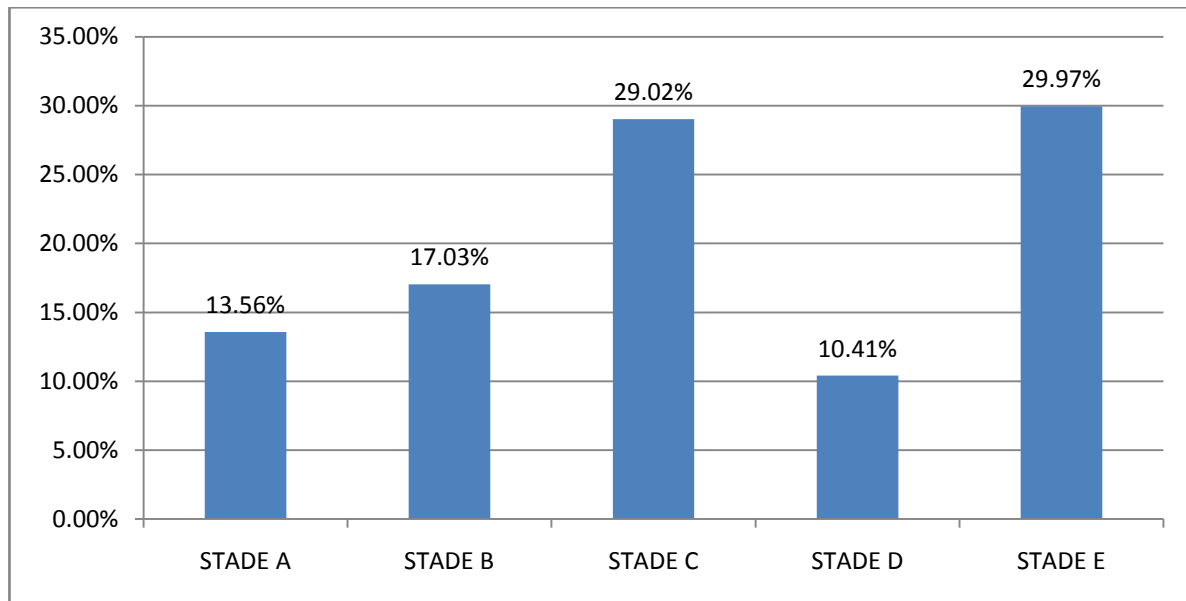


Figure 27. Balthazar classification for control group

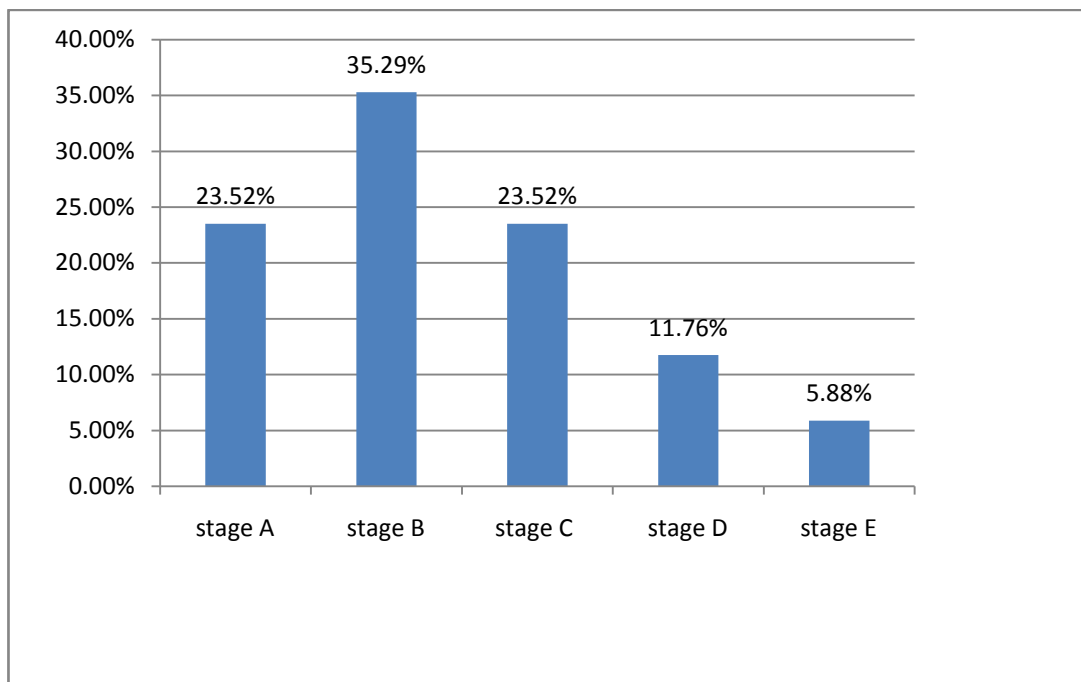


Figure 28. Balthazar classification for study group

Necrotizing or severe pancreatitis is defined as stage D and E according to BALTHAZAR classification. in the control group, they cover approximately 40% versus 17 % in the study group with ($p= 0.1$)

Table 4. Necrotizing pancreatitis rate

	Control group n=317	Study group n=17	P value
Stage D	10.41%	11.76%	0.1
Stage E	29.97%	5.88%	
Necrotizing pancreatitis	40.38%	17.64%	

VI. Treatment

1. Place of treatment

All the patients included in the study, were hospitalized either in the general surgery department or nephrology , at the university hospital of Hassan 2.

21.14% of the patients in the control group were transferred to an IUC department due to the severity of their AP , versus 11% in the study group (p=0.015).

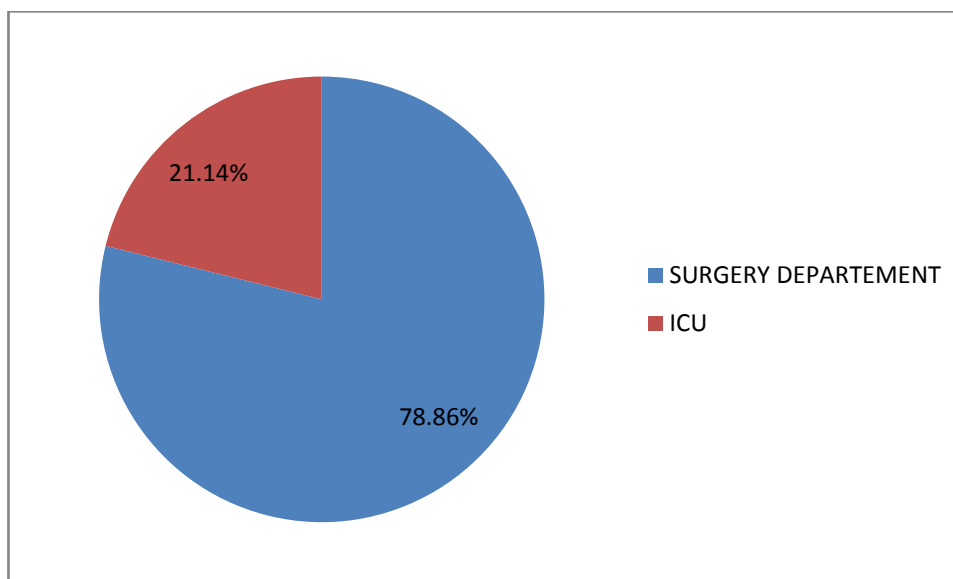
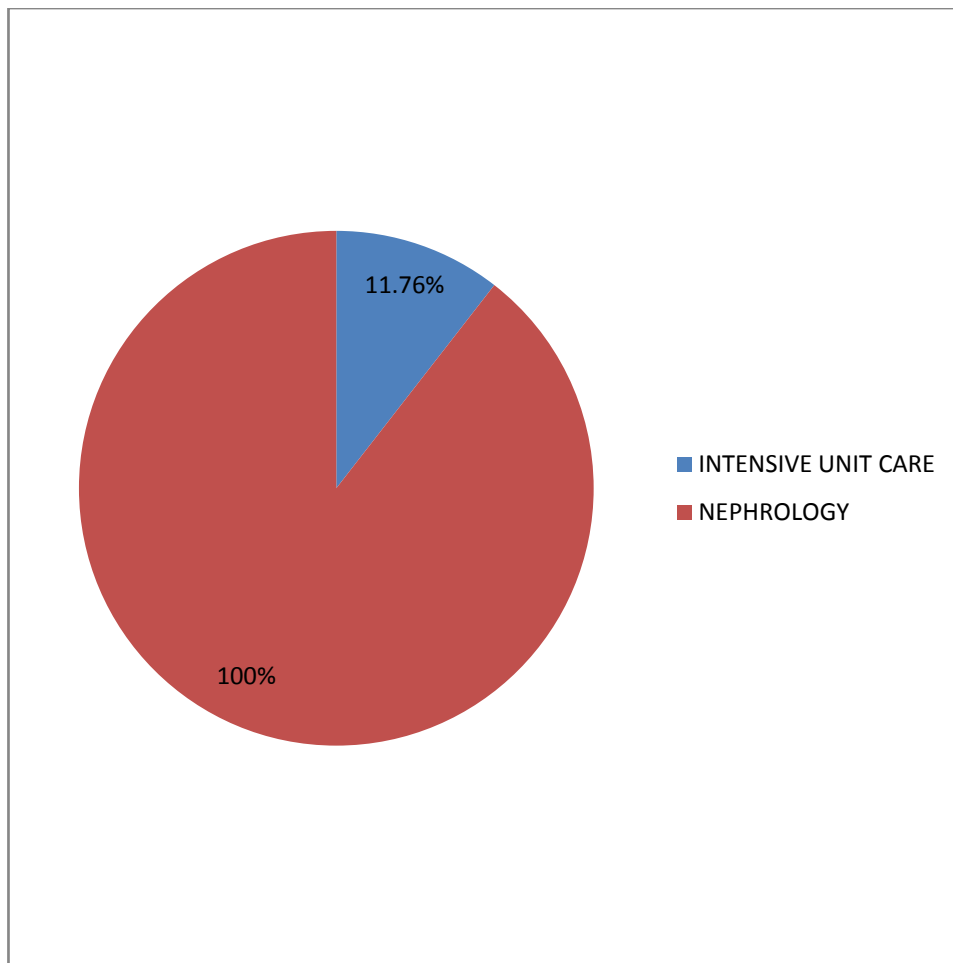


Figure 29. ICU transfer for control group**Figure 30. ICU transfer for study group****Table 5. ICU transfer rate**

	Control group n=317	Study group n=17	P value
Icu unit stay	21.14%	11.76%	0.015

2. Mean length hospital stay:

The average period of hospitalization was the same in both groups , with a period of 12 days

The extremes are respectively between 4–32 days and 5–26 days for control

group and study group.

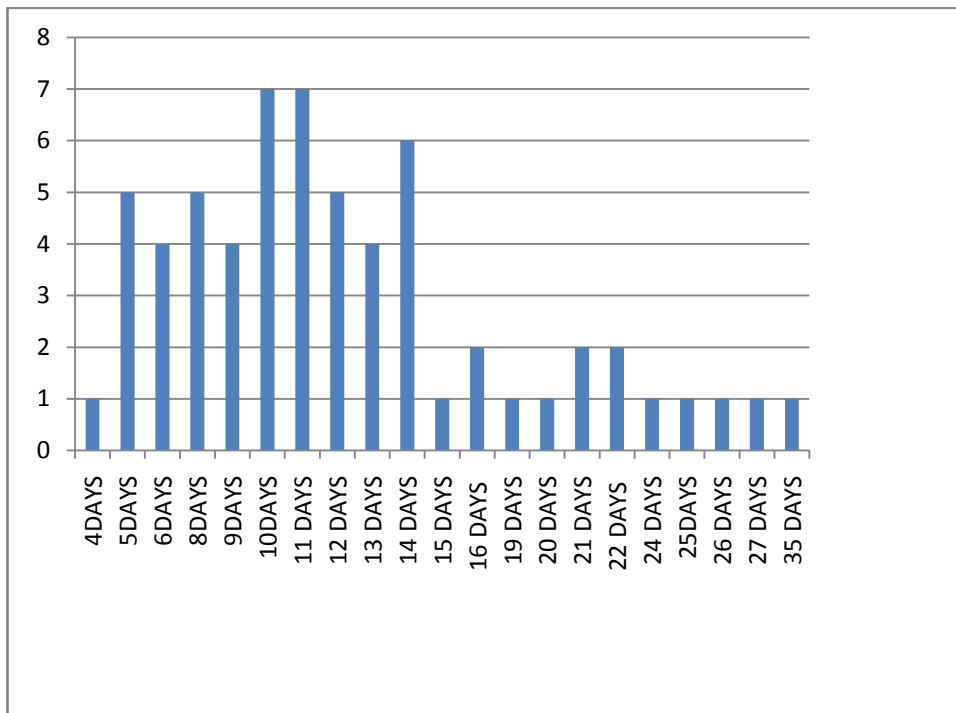


Figure 31. Hospital length stay for control group

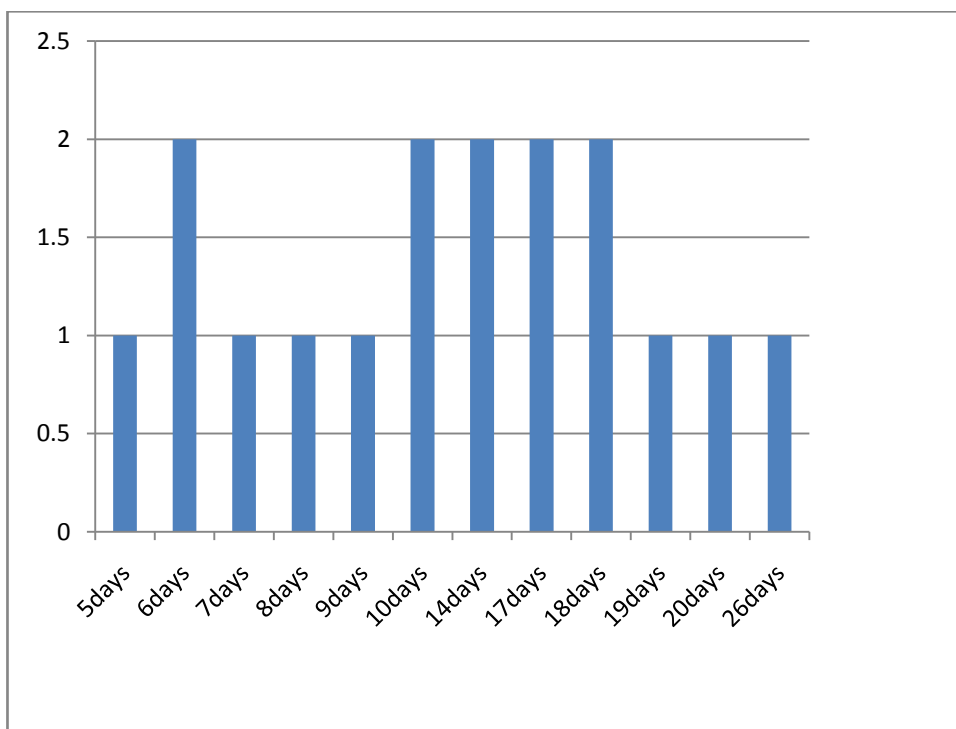


Figure 32. Hospital length stay for study group

3. Modes of treatment

a. Initial supportive care:

All our patients benefited from every part of the initial supportive care once they were admitted in our services .this include Fluid resuscitation, nutritional support, pain control.

b. Antibiotic therapy

c. Surgery

Surgery refers in that context to Cholecystectomy. this procedure was reserved to the control group where the biliary stones were the main etiology .

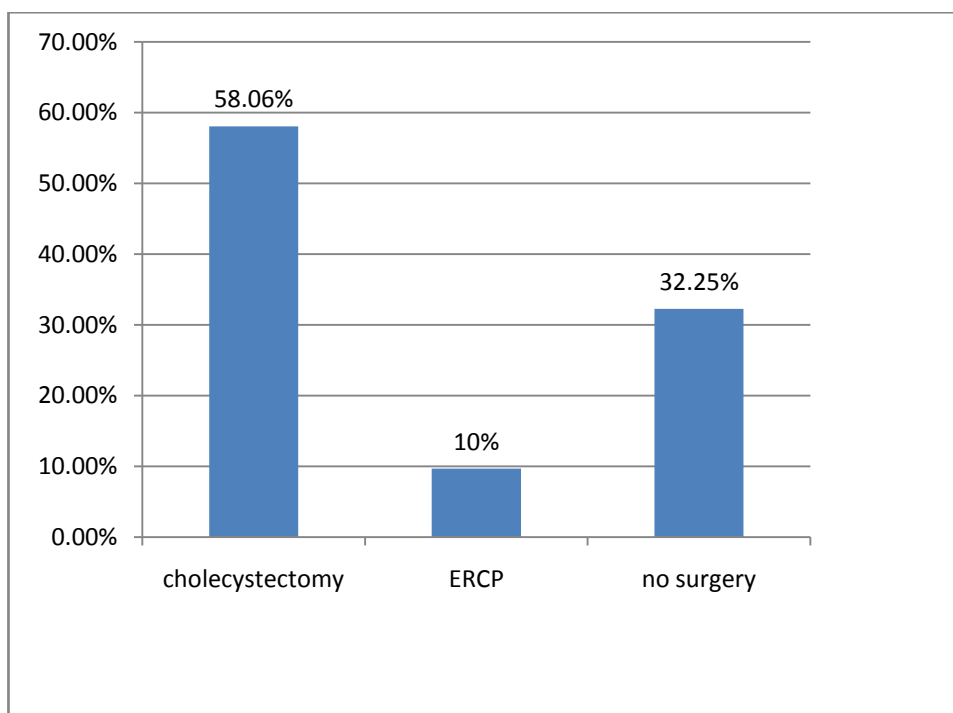


Figure 33. Types of treatment for study group

VII. Evolution

Benign evolution dominates among the two groups, with 92.44% in the control group and 94.12% in the study one.

Complications took place also with 7.56 % and 5.88% in the control and study group respectively.

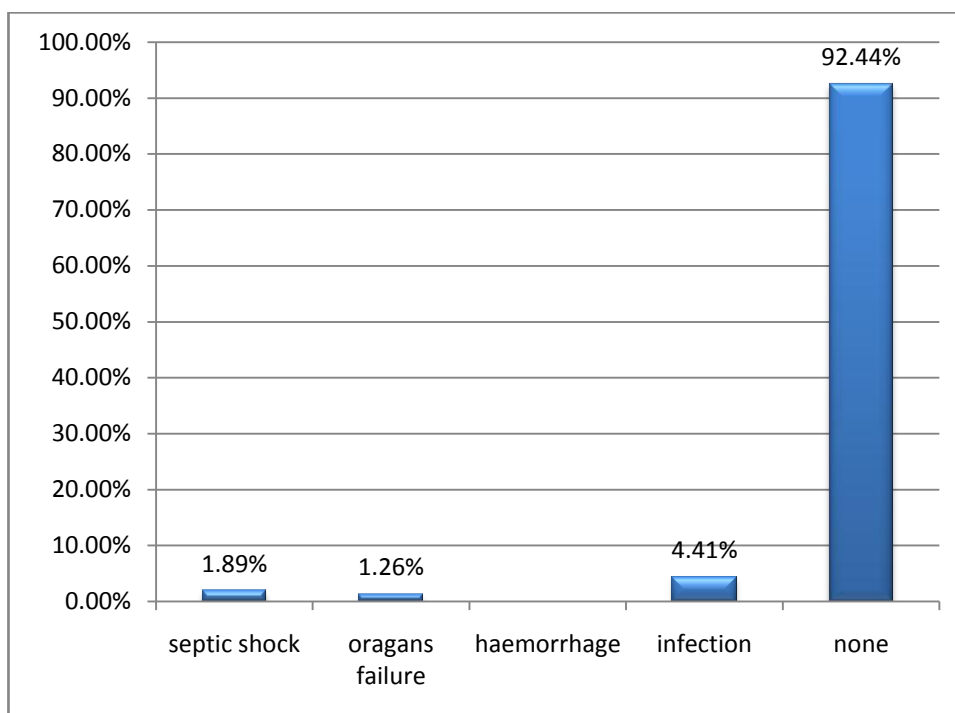


Figure 34. Complications among control group

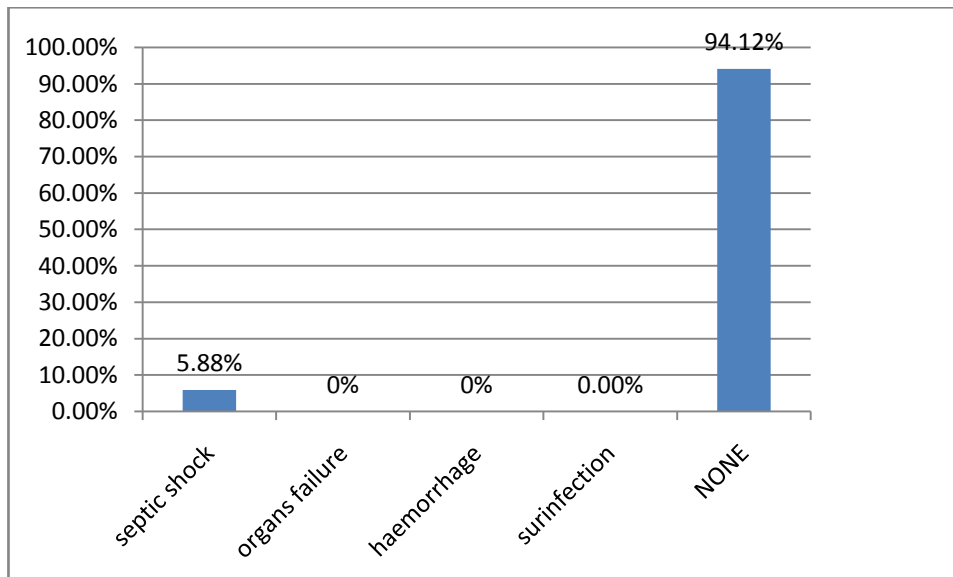


Figure 35. Complications among study group

14 patients from the control group had pancreas necrosis, 7 of them were treated by drainage. In the study group, none of our patients presented pancreas necrosis ($p=0.04$)

Death was reported in 1.26% among the control group versus 5.88% in the study group ($p=0.3$)

DISCUSSION

I. Sample size :

The prevalence of chronic kidney diseases is increasing [10]. Patients with end-stage renal disease (ESRD) are more likely to develop pancreatic diseases [11]. One such disease, acute pancreatitis (AP), can occur with a severe, complicated course—associated with a high mortality rate [12] and increased economic burden[13]

Our study is considered to be one of few studies to show interest to that subject.

the early studies that discuss this combination was MJ.BRUNO study in Netherlands in 1989[41].it s was a retrospective comparative study where MJ.BRUNO took a total number of 397 patients with CKD undergoing dialysis for more than 6 weeks and compared the incidence of AP attacks in that group to the general population .

His study was published on the 5th of October 1999.

The dilemma came back to the surface , and more scientists were interested in showing the reality about this combination .

Late 1999 in Taiwan , Hung–JuiChen,Jhi–JoungWang,Wen–IngTsay,Shwu–HueyHer,Cheng–HengLin, Chih–Chiang Chien[40] worked on a large sample to analyze the data more efficiently. this study included 67 078 patients with 10years follow up, their work was published in January 2017.

in 2007, Sheng–Wen Hou, Yi–Kung Lee, Chen–Yang Hsu, Ching–Chih Lee, Yung–Cheng Suin[39] conducted another study in Taiwan , with a sample of 775 743 patients , the study was published in august 2013 .

On a national level , a similar study was done by F. El Mazania, I. Kermab, F. El Ouariachic, W. Fadilid, I. Laouadb[42] in Marrakech's university of medicine with a sample of 234 patients followed up for 4 years .

Our sample was humble compared to all the big studies around the world with a total of 334 patients .

Table 6 : Sample size according to different authors

Series	country	Year	Sample size
Francisco M. Joglar and Marien Saad	Puerto Rico	1985	18
MJ.BRUNO [41]	Netherlands	1989	397
Hung–Jui Chen[40]	Taiwan	1999	67 078
Sheng–Weng–Hou[39]	Taiwan	2007	775 743
Marrakech[42]	Morocco	2008	234
Our serie	Morocco	2017	334

II. Demographic

1. Age

The mean age in our study is 51 in control group, and 61 in the study group .

There was no significant difference between our control group and CKD group

The mean age in our study was in line with the average for other series.

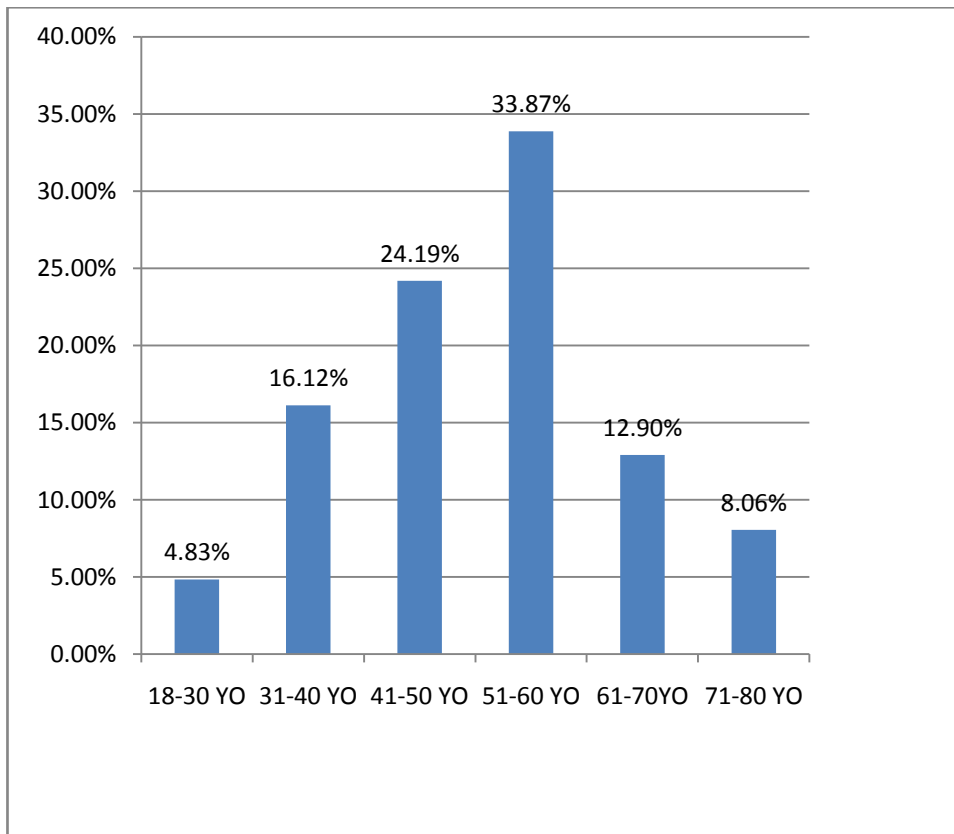


Figure 36. Age distribution in control group

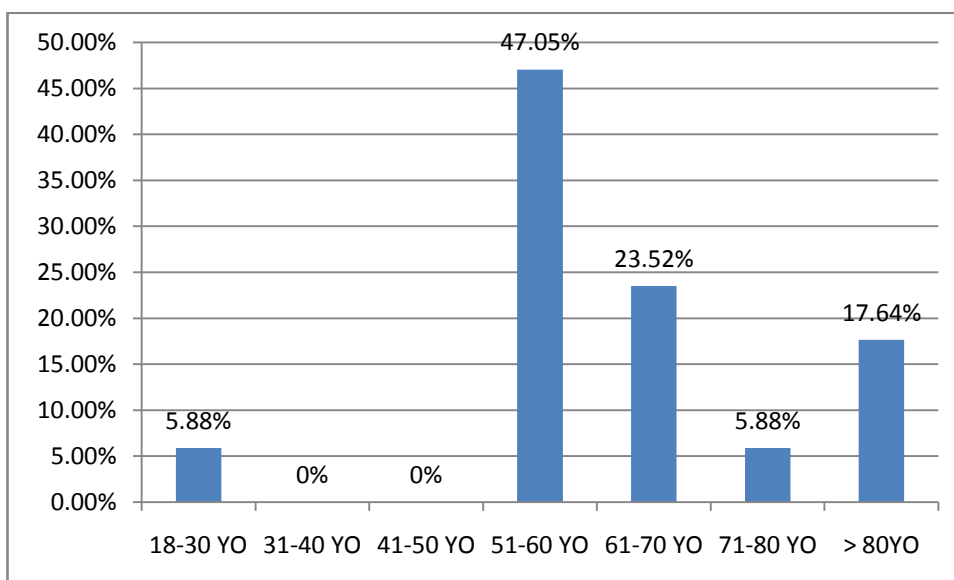


Figure 37. Age distribution in study group

Table 7: Main age according to different series

SERIES	Mean age (study group)	mean age (control group)
Francisco M. Joglar and Marien Saad	52	43
Sheng–Weng–Hou[39]	69	40–45
Hung–Jui Chen[40]	65	53
Our series	61	51

2. Distribution by gender

In general population, if we don't take in consideration the variation depending on the etiology, males have higher chances to present acute pancreatitis[14.15]

Both references that we based our discussion on, show that males are less attacked in both groups leading us to deduce a feminine ascendancy when it comes to acute pancreatitis.

Table8. Male distribution in different series

references	Control group	Study group	P value
Sheng– wen hou[39]	48.4%	49.1%	0.515
Hung–jui chen[40]	47.8%	41%	0.001

Our study	29.03%	52.94%	0.3
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3. Incidence

The incidence of acute pancreatitis, has grown over the years .the risk is different depending on the localization of the study and the peculiarities of each population .

CKD patients undergoing dialysis is a specific sample where AP attacks were hung jui chen series found an incidence of 5.17 per 1000 persons in ESRD Dialysis patients.

Lankisch PG [16] study in Germany reported an incidence of 0.67/1000 persons, and Quraishi ER [17] series found an incidence of 2.66/1000 persons.

In our study the reported incidence was 1.2/1000 persons.

Table 9. Incidence of AP among ESRD patients

Referencs	Incidence per 1000 persons
Hung jui chen[40]	5.17
Lankisch PG[16]	0.67
Quraishi ER[17]	2.66
Our study	1.2

III. Predisposing Conditions and Risk Factors

In our study group , diabetes is a specific element in medical history that dominates our sample with 64.70%

Nearly half of sheng wen hou study sampler had a history of diabetes with1046 patients of 2603 which present 40% of the total number of patients.

Hung-JuiChen study , was on the same side with 720 patients out of 1383 (52.06%).

Table 10. Diabetes history in the study group

References	Sample size	Diabetes patients
Sheng wen hou[39]	2603	1064
Hung-jui chen[40]	720	1383
Our study	17	11

IV. Diagnosis

1. Clinical profil

The hallmark symptom of acute pancreatitis is the acute onset of persistent upper abdominal pain. The usual locations of the pain are the epigastria and per umbilical regions. The pain may radiate to the back, chest, flanks, and lower abdomen. Patients are usually restless and bend forward (the knee–chest position) in an effort to relieve the pain because the supine position may exacerbate the intensity of symptoms [18].

The overall incidence of pain in literature is 95%de [19].in our study all of the patients presented abdominal pain.

2. Diagnostic procedures

Along with the typical symptoms of acute pancreatitis and physical examination of the patient, Clinicians are interested to confirm the diagnosis and

exclude the differential ones. In addition to the abdominal pain (acute onset of persistent and severe epigastric pain, often radiating to the back); serum lipase (or amylase) activity at least three times the upper limit of normal ;the characteristic findings of acute pancreatitis on contrast-enhanced CT or, less often, MRI [20] can prove the diagnosis.

Imaging exam is essential in patients with a slight enzyme elevation. Importantly, pancreatic enzyme concentrations on admission are not associated with disease severity[20] , as the disease can be serious, even fatal, although the enzymes are only slightly increased (<three-times normal).

a. Lipasaemia/ amylasemia level:

The sensitivity and specificity of blood lipase in a diagnosis of acute pancreatitis are reported to be 85–100 and 84.7–99.0%, [21] and blood lipase is shown to be more sensitive than blood amylase [22, 23, 24] . Abnormal values of blood lipase last longer than those of blood amylase [25], so blood lipase is useful in a diagnosis of acute pancreatitis when blood amylase level is normal. Also, blood lipase has almost equal diagnostic value as that of blood p-amylase [24]. he is also reported to be useful because of its high sensitivity in a diagnosis of alcohol-induced acute pancreatitis [26].

In our both groups, 100% of our patients had a lipasemia level three times higher than the normal.

b. Other biological parameters

❖ **hyperglycemia**

The revelation of hyperglycemia (2g/l) during an abdominal pain syndrome lead to the suspicion of AP, and combined with a high level of blood amylasemia makes

the diagnose more clear.

- In our study, glycemia is measures for all our patients .hyperglycemia was revealed in 12.4% in our control group and 14.9% in our study group.

❖ Calcemia

Hypercalcemia constitute an etiology of AP, and hypocalcemia has a prognostic value if it s revealed in the first 48hours [27].

In our study , 3 cases of hypocalcemia are detected in the study group and 2 cases in the study group.

❖ Blood count :

Polynucleosis is common during PA, indeed it makes a part of some prognostic scores .

- in our study , blood count was conducted in all patients in both groups , the elevation of white blood cells is the rule , joining nearly all our references.

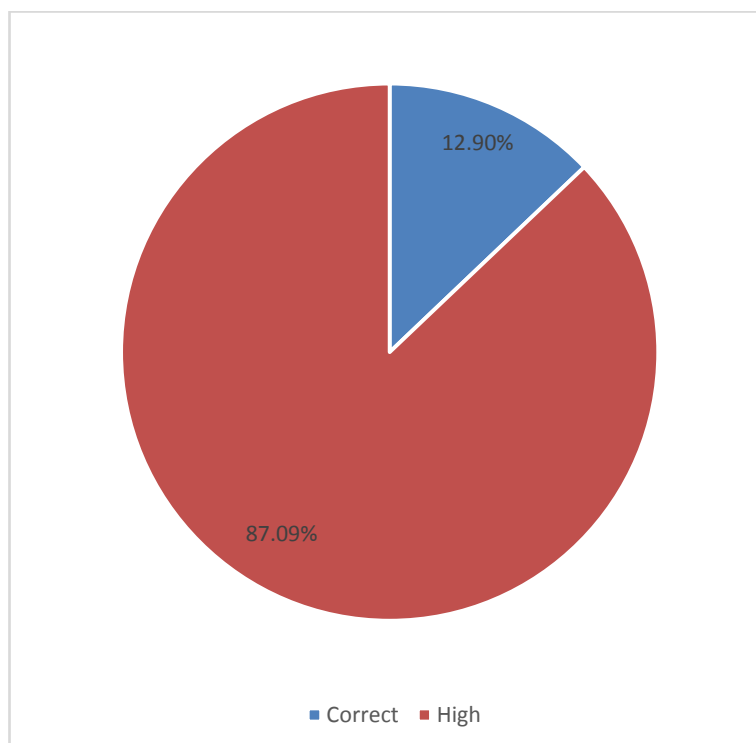


Figure 38. Blood cell counting in control group

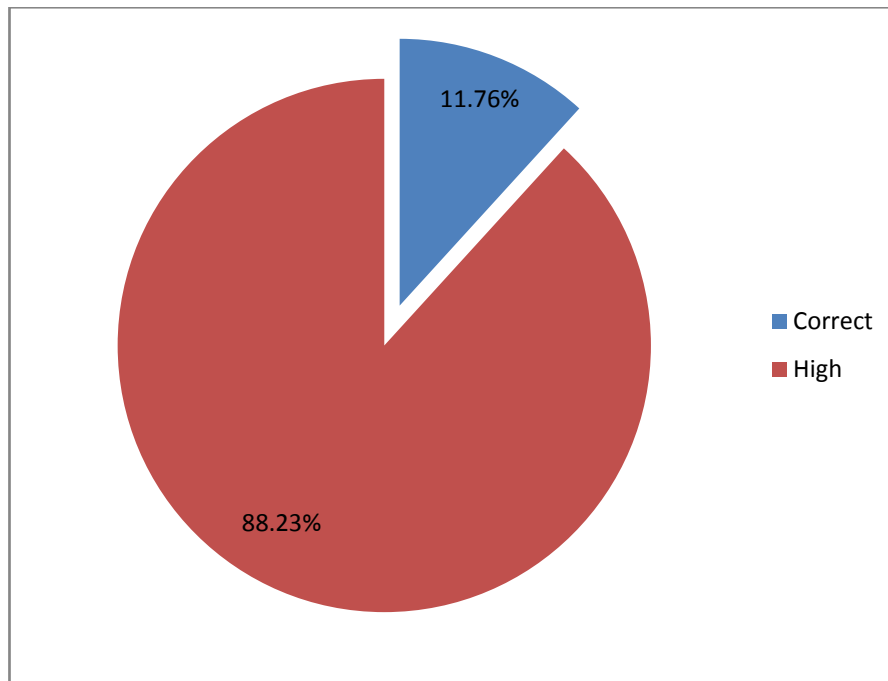


Figure 39. Blood cell counting in study group

❖ **C-Reactive Protein measure**

It s a major parameter to define the severity of AP attack [28].

In our study 100% of our patients had a CRP test , it was high in 82.5% of the cases.

c. Imaging techniques :

Imaging techniques commonly used for the diagnosis and severity assessment of AP include ultrasound, CT scan, magnetic resonance imaging MRI. Ultrasound is primarily used for assessment of biliary stones and biliary obstruction to elucidate the aetiology of AP. at a later stage US is helpful for characterization of pancreatic collection by differentiating fluid from non liquid material and guiding diagnostic or therapeutic interventions [29.30]

Only 69.36% of our control group patients has benefit from US , were the results was dominated by biliary stones with 54% ,unlike our study group where CT scan was the first exam to perform.

CT scan is the imaging method of choice for overall assessment of AP because of its accuracy and wide availability. In the initial phase, CT can provide the diagnosis when in doubt or suggest an alternative diagnosis, help triage patients with different grades of severity, and identify early local complications, such as pancreatic parenchymal necrosis. In the late phase, CT is essential for assessment of evolution of local complications, guidance of when and how to employ invasive treatment, and monitoring response to treatment [29,30].

MRI is an acceptable alternative to CT. MRI is as sensitive as CT for diagnosis and severity assessment, but superior to CT in characterization of pancreatic collections by accurately identifying non liquefied material [31]

MRI also allows for assessment of pancreatic duct integrity ; however, availability , longer scanning time, motion artefacts, the need for specialized MRI compatible monitoring equipments in critically ill patients , and high costs hamper the widespread use of MRI in AP[29.30]

V. Severity diagnosis

Acute pancreatitis is a heterogeneous disease entity that follows a variable clinical course .ranging from mild AP to cases of high morbidity and/or mortality(32).

There has long been an interest in classifying the severity of AP , and several classification systems have been developed.

From serum markers to scoring systems, efforts has been established to reduce the rate of morbidity and mortality of severe attacks.

Balthazar and 2012 revised Atlanta are the most efficient scores to evaluate the severity and prognosis of AP.

In our series, severe AP dominated the control group with 40.38%, unlike the

study group with only 17.64% (P=0.1)

In the literature, the studies has showed that the AP attacks among ESRD patients undergoing dialysis are much severe than the general population;

It s the case in SHENG WEN HOU study in Taiwan were the attacks were much critical than the general population

Recent study in India in 2012 [33]Showed that the morbidity and frequency of necrotizing pancreatitis is higher among ESRD patients under dialysis especially peritoneal modality .

HUNG JUI CHEN study concluded to the same results with 40% of severe cases(p=0.07)

In morocco, Marrakech's study also joined the other studies with 58,2% of severe AP attacks in the study group versus 28% in the general population (P<0.005).

Table 11. Severe AP among CKD patients

References	Severe AP in control group	Severe AP in study group	P value
Hung jui chen[40]	26%	40%	0.07
Marrakech study[42]	11%	42%	<0.005
Our study	40.38%	17.64%	0.1

VI. Aetiology

Different study groups, comes with different aetiology and causes of acute attacks

According to the majority of the studies around the world, biliary stones and alcohol consumption are the leading causes of AP in the general population.

With ESRD patients, it is hard to precise an aetiology .

Studies had suggest some hypothesis, even that the incidence of acute pancreatitis among patients with CKD not on HD is not clearly known. Abnormal exocrine pancreatic function has been found in 10–64% of patients with ESRD. This can contribute to malnutrition and diarrhea in this population.[34] Even though the common etiological factors for pancreatitis contribute to many of the cases of CKD, the etiology of pancreatitis cannot be ascertained in more than half of the patients in whom the cause remains idiopathic.[35] But, there are some factors that are specifically present in CKD patients, especially those who are on chronic dialysis [both HD and continuous ambulatory peritoneal dialysis (CAPD)]. High incidence of pancreatic anatomical abnormalities documented on postmortem examination; toxic substances in PD dialysate, bags, and tubing; alterations in serum calcium and parathyroid hormone; and bacterial and viral infections are some contributing factors.[36] “Local hypercalcemia” in the pancreas due to calcium in the PD solution has also been postulated[37]. Increase in various gastrointestinal hormones such as cholecystokinin, gastric inhibitory polypeptide, and glucagon in patients with CKD can stimulate hypersecretion of pancreatic enzymes such as trypsin which can contribute to impairment in pancreatic function [38].

HUNG JUI CHEN study also concluded that only a minority of dialysis patients with AP had known causes, as <20% of HD patients and <10% of PD patients with the disease had identifiable risk factors.

It had been hypothesized in MJ BRUNO study[41], that both elevated abdominal pressure during PD and a non physiological composition solution may contribute to premature proteolytic enzymes activation, leading to an AP attack .

VII. Treatment

1. Treatment place

Our sampler was composed from all the patients who had been hospitalized in either general surgery services or nephrology service ,but with critical cases , intensive care unit is the perfect place .

11.76% of our study group had been transferred to ICU (P=0.01).

out of hung jui chen study sample[40], 17.75% of the patients were transferred to ICU (P=0.43).

2. Hospital length stay

In our study, and for both groups the main length stay was 12 days with extremes at 4 and 32 days in control group, 5and 26 in study group.

VIII. Evolution and complications

Benign evolution was the rule in both groups, with 92.44% in the control group and 94.12% in the study one.

In the study group, complications are rarely present with only 5.88% versus 7.56% in the control group(p=0.04),unlike what is reported by litterature.

MARRAKECH'S study [42] , concluded that complications were more common in the study group with59,2% versus 22,7% (p<0.005).

IX. Mortality

In our study, mortality rate was 1.26% in control group, versus 5, 88% in study group (p=0.3).

In SHENG WEN HOU study mortality rate was 2, 1% in control group, versus 7,3% in study group (p<0.001) .

Hung jui chen study, shows a death rate of 9% among ESRD patients (p=0.4).

Table 12. Mortality rate in the study group

References	Death rate in the control group	Death rate in the study group	P value
Sheng wen hou[39]	2.1%	7.3%	0.001
Hung jui chen[40]	-	9%	0.4
Our study	1.26%	5.88%	0.3

CONCLUSION

The prevalence of chronic kidney disease is increasing .Patients with end–stage renal disease (ESRD) Have more chances to develop pancreatic diseases One such disease, acute pancreatitis (AP),it can occur with a severe, complicated course— associated with a high mortality rate and increased economic burden.

Our study investigated the correlation between long–term dialysis and AP.

Analyzing our database allowed us to determine the incidence of AP among ESRD patients in comparison to the general population.

Few studies showed interest to the association ,AP attacks and long term dialysis, our work proved indeed this combination , and analyzed the character of the attacks among the two studied groups, showing that AP in our study group are more benign but with a high risk of mortality.

Through literature, our study present potential physiopathology and etiological hypotheses in order to explain this occurrence.

As a result, Pancreatitis is an uncommon complication in patients on long term dialysis that should be taken in consideration every time an ESRD patient present

abdominal pain.

ABSTRACT

Abstract

The association of acute pancreatitis (PA) and acute kidney failure is widely known .but the link between the AP and chronic kidney failure (CKF) is rarely studied by scientists. The goal of our study is to estimate the frequency and severity of AP when it s associated to CKF and also to study the link between those two entity.

Our study involved 334 patients admitted for an episode of AP in either general surgery or nephrology service in the university hospital Hassan II between 1st of January 2013 and 31st December 2015

17 of them had a chronic kidney failure undergoing dialysis for more than 3 months (group A) ; 317 patients without CKD used as control group (GROUP B) .

AP was diagnosed by the elevation of lipasemia (higher than 3 times the normal limit), the confirmation by CT scan was the rule for all our patients.

The incidence of AP in GROUP A (CKD patients) was 1.2/1000 persons ,versus 27.56/100 000 persons in group B (general population).

Severe acute attacks (according to Atlanta classification) was 27.41% in group B

versus only 5.88% in group A .

For CT Scan (Balthazar classification) , PA was much severe in the group B were necrotizing pancreatitis (stage D; E) dominated with 40% versus only 17% of those stage in study group ($p=0.1$)

CKD patients had less need to intensive care 11.76% versus 21.14% ($p=0.015$)

14patients from the control group had pancreas necrosis, 7 of them were treated by drainage . in the study group ,none of our patients presented pancreas necrosis ($p=0.04$)

Death rate was 1.26% in the control group, versus 5.88% in the study group ($p=0.3$)

Résumé

L'association de pancréatite aiguë (PA) à l'insuffisance rénale aiguë est connue. En revanche, l'association de la pancréatite aiguë à l'insuffisance rénale chronique terminale(IRCT) est peu étudiée dans la littérature.

L'objectif de notre travail est d'estimer la fréquence et la sévérité de la PA associée à l'IRCT et d'étudier le lien de causalité entre ces deux pathologies.

Nous avons étudié 334 patients pris en charge pour épisode de PA dans les services de chirurgie viscérale A et de néphrologie du CHU Hassan II de Fès au cours de la période de 2013 à 2015. Dix-sept patients avaient une IRCT (sous dialyse pendant plus de 3 mois) (Groupe A) ; 317 patients sans IRCT (groupe B) ont servi des témoins.

PA a été diagnostiquée cliniquement et par l'élévation de la lipase (trois fois la limite supérieure de la normale). La confirmation par scanner était faite chez tous les patients.

L'incidence de PA était de 1.2/1000 personnes (IRCT) dans le group A et

27.56/100 000 habitants dans le group B (population générale)

L'incidence de la pancréatite aigue grave définie par classification d Atlanta était de 27.41% dans le groupe B et seulement 5.88% dans le groupe A.

Sur le plan scénographique (classification de Balthazar et Freeny), la PA était plus sévère chez les patients du groupe B avec prédominance des pancréatites nécrosantes (D;E) dans 40% des cas contre seulement 17% de ces grades chez les patients avec IRCT($p=0.1$) 14patients de notre groupe témoin ont présenté un faux kyste de pancreas, 7 ont été traité par drainage ($p=0.04$) le taux de mortalité été de 1.26% dans notre groupe témoin et 5.88% dans l autre groupe ($p=0.3$)

ملخص

ارتباط التهاب البنكرياس الحاد مع الفشل الكلوي الحاد هو معروف. بيد أن اقتران التهاب البنكرياس الحاد مع الفشل الكلوي في مرحلة غسيل الكلي قليلا ما يتم دراسته من طرف العلماء.

والهدف من عملنا هو تقدير وتيرة وشدة ارتباط التهاب البنكرياس الحاد المرتبطة الداء الكلوي بمراحله الأخيرة ودراسة العلاقة السببية بين هذين المرضين.

شملت دراستنا 334 مريضا تم انتقاها بمصلحة الجراحة الباطنية أ و مصلحة الكلي التابعة للمركز الإستشفائي الحسن الثاني بفاس، خلال الفترة من عام 2013 إلى عام 2015. سبعة عشر مريضا كان الداء الكلوي لديهم بمراحله الأخيرة (غسيل الكلى لأكثر من 3 أشهر) (المجموعة أ)؛ 317 مريضا (المجموعة ب) بمثابة المجموعة الضابطة.

تم تشخيص التهاب البنكرياس الحاد سريريا بارتفاع الليباز (ثلاثة أضعاف الحد الأعلى للطبيعي) و تم تأكيد التشخيص بإجراء الفحص بالأشعة لدى جميع المرضى.

متوسط حدوث التهاب البنكرياس الحاد في المجموعة الضابطة كان 100000/27.56 مقابل 1000/1.2 في

المجموعة التي شملتها الدراسة.

وكانت نسبة حدوث التهاب البنكرياس الحاد التي يحددها تصنيف أتلاندا 27.41% في مجموعة ب و فقط 5.88% في

مجموعة أ.

على الصعيد الفحص بالأشعة (تصنيف بالتأزر)، كان التهاب البنكرياس أشد في مرضى المجموعة الضابطة مع غلبة

الحالات الخطيرة في 40% من الحالات ضد فقط 17% من هذه الدرجات في المرضى الذين يعانون من الداء الكلوي بمراحله الأخيرة.

كانت نسبة الوفيات 1.26% في المجموعة الحافظة مقابل 5.88% في المجموعة المدروسة

REFERENCES

1. Agur AMR , Lee MJ , Grant JCB. grnt s atlas of anatomy.10th ed.london,UK.Lippincott Williams and Wilkins 199
2. Romanes GJ .Cunningham's Manuel of Practical Anatomy.15th ed.New York, NY :Oxford Medical Publications .Oxford University Press; 1986.Vol II :Thorax and Abdomeen
3. Grant JCB , Basmajian JV , Slonecker CE. Grant's Methodof Anatomy : A Clinical Problem–Solving Approach.11th ed.London ,UK: Williams and Wilkins 1989
4. Gray H.Leewis WH , ed.Gray's Anatomy of the Human Body 20th ed. New York, NY.Bartleby .com;2000
5. Sinnatamby CS.Last's Anatomy:Regional and Applied .10th ed.Edinburgh , UK: Churchill Livingstone ; 1999.
6. The Kidneys and How They Work.National Kidney and Urologic Diseases information Clearinghouse (NKUDIC)
7. Wein AJ, Kavoussi LR, Novick AC, Partin AW , Peters CA .Campbell–Walsh

- Urology. 9th Ed.Saunders ; 2007.Vol I: p 24
8. Wein AJ, Kavoussi LR, Novick AC, Partin AW , Peters CA .Campbell–Walsh Urology. 9th Ed.Saunders ; 2007.Vol I: pp 30–1
 9. The incidence and aetiology of acute pancreatitis across Europe
Stephen E. Roberts, Sian Morrison–Rees, Ann John, John G. Williams, Tim Brown, David G. Samuel
 10. Moeller S, Gioberge S, Brown G. ESRD patients in 2001: global overview of patients, treatment modalities and development trends. Nephrol Dial Transplant2002;17:2071–2076
 11. Hou SW, Lee YK, Hsu CY et al. Increased risk of acute pancreatitis in patients with chronic hemodialysis: a 4–year follow–up study. PLoS One 2013;8:e71801
 12. Shen HN, Lu CL, Li CY. Epidemiology of first–attack acute pancreatitis in Taiwan from 2000 through 2009: a nationwide population–based study. Pancreas2012;4:696–702
 13. Shen HN, LuCL.Incidence, resourceuse,and outcome ofacute pancreatitis with/without intensive care: a nationwide population–based study in Taiwan.Pancreas2011;40:10–15
 5. Rutsky EA, Robards M, Van Dyke JA et al. Acute pancreatitis in patients with end–stage renal disease without transplantation. ArchIntern Med1986; 146:1741–1745
 14. Dalzell DP, Scharling ES, Ott DJ, Wolfmann NT. Acute pancreatitis: the role of diagnostic imaging. Crit Rev Diagn Imaging 1998 ; 39 : 339–63. [
 15. Harrison DA, D'Amico G singer M ;The Pancreatitis Outcome Prediction(POP) Score:a new prognostic index for patients with severe acute pancreatitis.Crit

Care Med 2007,35:1703–8

16. Lankisch PG, Weber–Dany B, Maisonneuve P et al. Frequency and severity of acute pancreatitis in chronic dialysis patients. *Nephrol Dial Transplant* 2008;23:1401–1405
17. Quraishi ER, Goel S, Gupta M et al. Acute pancreatitis in patients on chronic peritoneal dialysis: an increased risk? *Am J Gastroenterol* 2005; 100:
18. Silen W. Acute pancreatitis. In: Silen W, Cope Z, eds. *Cope’s Early Diagnosis of the Acute Abdomen*. 18th ed. New York, N.Y.: Oxford University Press, 1999:123–31.
19. MOREAU JACQUES. Conférence du consensus gastro–enterol, clin, biol 2001,1 S8 édition Masson Paris..
20. Banks PA, Bollen TL, Dervenis C, et al, and the Acute Pancreatitis Classification Working Group. Classification of acute pancreatitis—2012: revision of the Atlanta classification and definitions by international consensus. *Gut* 2013; 62: 102–11.
21. Agarwal N, Pitchumoni CS, Sivaprasad AV. Evaluating tests for acute pancreatitis. *Am J Gastroenterol*. 1990;85:356–66
22. Thomson HJ, Obekpa PO, Smith AN, Brydon WG. Diagnosis of acute pancreatitis: a proposed sequence of biochemical investigations. *Scand J Gastroenterol*. 1987;22:719–24.
23. Nordestgaard AG, Wilson SE, Williams RA. Correlation of serum amylase levels with pancreatic pathology and pancreatitis etiology. *Pancreas*. 1988;3:159–61.
24. Apple F, Benson P, Preese L, Eastep S, Bilodeau L, Heiler G. Lipase and pancreatic amylase activities in tissues and in patients with hyperamylasemia. *Am J Clin Pathol*. 1991;96:610–4.

25. Orebaugh SL. Normal amylase levels in the presentation of acute pancreatitis. *Am J Emerg Med.* 1994;12:21–4.
26. Gumaste V, Dave P, Sereny G. Serum lipase: a better test to diagnose acute alcoholic pancreatitis. *Am J Med.* 1992;92:239– 42.
27. Bo l ognese A ; Mutt i l l o l . A ; Scop i naro F ; Banc i M and co l l . Biliscentigraphie contreéchographie dans le diagnostic étiologique de la pancréatite aigue. *Journal de chirurgie*, 1996, vol .133, no.2, pp : 78–81.
28. Lankisch PG, Weber–Dany B, Maisonneuve P, et al. Frequency and severity of acute pancreatitis in chronic dialysis patients. *Nephrol Dial Transplant.* 2008;23:1401–1405.
29. Thoeni RF. The revised Atlanta classification of acute pancreatitis: its importance for the radiologist and its effect on treatment. *Radiology* 2012 Mar;262(3):751 e64.
30. Bollen TL, van Santvoort HC, Besselink MG, et al. Update on acute pancreatitis: ultrasound, computed tomography, and magnetic reso– nance imaging features. *Semin Ultrasound CT MR* 2007. Oct;28(5):371 e83.
31. Morgan DE, Baron TH, Smith JK, et al. Pancreatic fluid collections prior to intervention: evaluation with MR imaging compared with CT and US. *Radiology* 1997;203:773 e8.
32. Forsmark CE, Baillie J. AGA Institute Clinical Practice and Economics Committee; AGA Institute Governing Board. *Gastroenterology* 2007;132:2022e44.

48 Bradley 3rd EL. A clinically based classification system for acute

- pancreatitis. *Ann Chir* 1993;47:537e41.
33. Renal Failure, 2012; 34(10): 1338–1340 Copyright © Informa Healthcare USA, Inc. ISSN 0886–022X print/1525–6049 online DOI: 0.3109/0886022X.2012.718951
34. Griesche-Philipp J, Otto J, Schwörer H, et al. Exocrine pancreatic function in patients with end-stage renal disease. *Clin Nephrol*. 2010;74(6):457–464.
35. Lankisch PG, Weber-Dany B, Maisonneuve P, et al. Frequency and severity of acute pancreatitis in chronic dialysis patients. *Nephrol Dial Transplant*. 2008;23:1401–1405.
36. Joglar FM, Saade M. Outcome of pancreatitis in CAPD and HD patients. *Perit Dial Int*. 1995;15:264–266.
37. Quraishi ER, Goel S, Gupta M, et al. Acute pancreatitis in patients on chronic peritoneal dialysis: An increased risk? *Am J Gastroenterol*. 2005;100:2288–2293
38. Owyang C, Miller LJ, DiMagno EP, et al. Pancreatic exocrine function in severe human chronic renal failure. *Gut*. 1982;23:357–361
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