MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES (MUHAS)

SCHOOL OF MEDICINE

DEPARTMENT OF ANATOMY/HISTOLOGY

ESTABLISHMENT OF THE TERMINATION PATERN OF THE PANCREATIC AND COMMON BILE DUCTS AMONG TANZANIANS

BY

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MSc (Anatomy)

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Anatomy of the Muhimbili University of Health and Allied Sciences (August 2009).

DECLARATION

I here by confirm that this dissertation is my original work and has not been presented elsewhere for examination.

Dr. Gabriel J. Mchonde.

Signature..... Date..25th August 2009

This dissertation is being submitted with my approval as the University Supervisor:

Prof. Ainory Peter Gesase (MD, PhD).

Signature..... Date..25.08.09.....

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DEDICATION

This dissertation work is dedicated to my uncle Mr. Guvette, B.P. and his family for their love and encouragements through out my education life which make me who I am today.

Also to my beloved father, the Late Mr. Jackob Mchonde and to my mother the late Ms. Hilda Guvette for their love which was given to me during their lives.

ABSTRACT

BACKGROUND: Pancreas is an intra-abdominal organ with endocrine and exocrine secretory end pieces. The exocrine pancreas is drained by the duct system which involves fusion of several smaller interlobular ducts forming a much larger main pancreatic duct that runs from the tail part to the head and opens either directly into the duodenum or unites with the common bile duct which drains the gallbladder, before opening into the duodenum. The pattern and termination of the pancreatic and common bile ducts are considered to be the same in human being. However most of the studies on the pattern and termination of the pancreatic duct together with the references available are based on the European subjects, while there is no sufficient studies which has been done among the African subjects. **OBJECTIVE:** To establish the gross anatomy of pancreatic and common bile ducts and their termination in the duodenum among the Tanzanians. **STUDY DESIGN:** A descriptive cross-sectional study. **MATERIALS:** Eighty six human autopsy subjects from the Muhimbili National Hospital and human cadavers from the Department of Anatomy/Histology of Muhimbili University of Health and Allied Sciences were used regardless of their sex or age. **METHODS:** Midline abdominal incision was made to expose the abdominal visceral. The pancreas and duodenum were explored for dissection by displacing of other abdominal viscera's. The pancreatic and common bile ducts were displayed and patterns recorded. Fluid (water) was introduced in each duct under pressure and ejected fluid through the duodenal opening was observed. Samples with common channel, length measurements of the common channel were taken. Those without common channel, the distances between the entrances of the pancreatic and common bile ducts into the duodenal wall were measured by using a ruler and recorded. Also their duodenal openings were recorded. Photographs of the representative patterns were also taken. Data were managed and analyzed using SPSS 11.5 for Windows. **RESULTS:** 37.2% (32) of the studied cases had separate entry of the common bile and pancreatic ducts into the duodenum, in which 10.5% (9) had false union while 26.7% (15) have complete no union between the two ducts. 17.4% (15) of the studied cases had extramural union of the common bile and pancreatic ducts resulting into the formation of the common channel with mean length

of 1.01 cm (range 0.7-1.5 cm), while 45.3% (39) had separate entrance into duodenal wall but they fuse intramurally. The duodenal opening of the common bile and pancreatic ducts was observed to vary among the subjects, 51.2% (44) had single opening for the two ducts, and 45.3% (39) had two duodenal openings, while 3.5% (3) were observed to have three duodenal openings. Prevalence of accessory pancreatic duct was observed to be 29.1% (25) in the studied cases. **CONCLUSION:** The termination pattern of the common bile and pancreatic ducts among Tanzanians is a little bit different from those reported elsewhere. The prevalence of separate emptying of the common bile and pancreatic ducts, and accessory pancreatic duct draining the pancreas is high among Tanzanians compared to those reported elsewhere. The common channel formed by the union of the bile and pancreatic ducts is much shorter among Tanzanians. **RECOMENDATIONS:** Further work is needed to study the pathophysiological implication of the shorter lengths of the common channel with the occurrences of the pancreatitis by the use of radiographic imaging techniques among the diseased individuals.

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LIST OF ABBREVIATIONS

mL.....milliliters

cm .....centimeters

mm.....millimeters

SO.....sphincter of Oddi

i.e. .....that is

USA.....United States of America

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Pancreas is an intra-abdominal organ with endocrine and exocrine secretory end-pieces. The endocrine part contains cells that secrete various hormones such as insulin that is involved in glucose metabolism. The exocrine pancreas secretes enzymes and zymogens [7, 8, 19] that travel via a smaller duct system to enter much larger duct, the major pancreatic duct, that open into the second part of the duodenum where they perform their role on the digestion of food. Occassionary the accessory pancreatic duct has been described and found to be patent in 9% of the population [14, 15].

The past decades have witnessed a dramatic increase in research interest on the pancreas gland on its endocrine (hormonal secretion) and exocrine functions (digestive enzymes) with much emphasis on the synthesis/production activities. One reason for this heightened interest has been the importance of the gland in the incidence of diabetes mellitus. The researches on the pancreas involvement on diabetes mellitus have been successful and have yield successful results [18].

Exocrine pancreas produces digestive enzymes that travel via duct system to enter the lumen of the second part of the duodenum. The smallest ducts begin within the secretory unit at the centroacinar simple squamous cells. From here secretion enters the intercalated ducts, intralobular ducts, interlobular and finally into the larger main pancreatic duct.

The pancreatic duct join the common bile duct which drains the gallbladder to form a common channel before it enter into the duodenal wall or may drain the pancreas gland directly into the duodenum.

However these duct systems has also been involved in diseases or pathological conditions that affect the performance of the exocrine pancreas. A good example is the inflammation of the pancreas (pancreatitis), which could be acute or chronic. There are various etiological factors, which are associated with the condition including the reflux of chemicals secreted by the pancreas and gall bladder through their duct systems. Since the pancreatic duct may share a common orifice on the papilla of Vater with the common bile duct [17, 20]; this indicates the possibility for the biliary secretions to enter the pancreatic duct during the reflux of the ampullary contents hence lead to acute pancreatitis. However, this phenomenon has not been fully explored as it calls for a wide research into the termination of the common bile and pancreatic duct.

1.2 Problem of study

The pancreas like other organs in the human body, suffer from various disease conditions such as pancreatitis, pancreatic trauma, and pancreatic carcinoma, which lead to the interference on its physiological functions.

Pancreatitis is one of the major pathological processes affecting the pancreas. This inflammatory disease of the pancreas may be acute or chronic. Although good data exist concerning the frequency of acute pancreatitis (about 5000 new cases per year in the United States, with a mortality rate of about 10%), the number of patients who suffer with recurrent acute pancreatitis or chronic pancreatitis is largely undefined [11].

The pathologic spectrum of acute pancreatitis varies from edematous pancreatitis, which is usually a mild and self-limited disorder, to necrotizing pancreatitis, in which the degree of pancreatic necrosis correlates with the severity of the attack and its systemic manifestations.

Acute and chronic pancreatitis is frequently associated with other disease entities, such as disease conditions affecting the pancreatic duct and sphincter of Oddi. The pancreatic duct and common bile duct open closely to the common drainage; this may allow reflux of the bile or pancreatic juices (enzymes) into the pancreatic duct hence results in the chemical inflammation of the gland (chemical pancreatitis). Gallstones lying within the common bile duct are commonly known to be associated with the pancreatitis especially during the passage of it through the hepatopancreatic ampulla [10, 11] where it causes complete or partial blockage of the ampulla, and due to closeness of the two ducts, therefore it may result into reflux of the secreted chemicals leading to chemical pancreatitis.

However most of these findings have been obtained from studies done in the developed world. Unpublished reports from the leading surgeons at Muhimbili Hospital have shown a lower incidence of acute pancreatitis in Tanzanians compared with the reported incidence in Europe. The reason for this observation is not clear and it emphasizes the need to do a study on the termination pattern of the pancreatic and common bile ducts.

1.3 Problem justification

Recent reports on pancreatitis in developing countries (Africa and Southeast Asia) indicate that many patients with pancreatitis (tropical pancreatitis) have a form of hereditary pancreatitis caused by mutations of the genes that code for pancreatic secretory trypsin inhibitors [11, 13]. In developed countries, roughly 70% to 80% of patients with pancreatitis have their pancreatitis in association with either biliary tract stone disease or ethanol abuse. Also it has been said that in 10% to 15% of pancreatitis cases, no etiology can be identified and 10% to 15% of patients, pancreatitis is associated with one of many possible miscellaneous etiologies [17, 20].

However there is no report, which indicates the association of the termination pattern of both the pancreatic and common bile ducts to be as the associated factor for the incidence of the pancreatitis occurrence due to chemical reflux. This necessitates the research on the gross anatomical termination pattern of the two ducts so as to try to associate it with the condition.

Also most of the available literatures on the termination pattern of the common bile duct and pancreatic duct which are used today are based on observations obtained elsewhere in America or Europe. So this indicates that there is a need to do the research on the termination pattern of the common bile and pancreatic ducts among Tanzanians in order to see the trend.

Also a comprehensive understanding of the termination pattern of the two ducts among the Tanzanians is a prerequisite for the identification of the cause of pancreatitis especially in those with unknown etiology.

1.4 OBJECTIVE OF THE STUDY

1.4.1 General objective

To establish the gross anatomy of the pancreatic and common bile ducts and their termination in the duodenum among Tanzanians

1.4.2 Specific objective

The specific objectives were;

1. To identify the number of pancreatic ducts.
2. To identify how the bile and pancreatic ducts opens into the duodenum.
3. To determine the prevalence and types of variations in the termination pattern of the common bile duct and pancreatic duct.

CHAPTER TWO

2.0 MATERIALS AND METHODS

2.1 Materials:

Human autopsy subjects from the Muhimbili National Hospital mortuary and human cadavers from the Department of Anatomy/Histology at Muhimbili University following ethical approval from the Ethical Review Committee of the Muhimbili University of Health and Allied Sciences (MUHAS).

The subjects were taken regardless of their age or sex.

Sampling method used was the convenience sampling due to availability of the human subjects.

Sample size was calculated by the following formula

$$n = \frac{Z^2 P q}{d^2}$$

Where n =sample size

Z = Standard normal distribution set at 1.96 (confidence interval 95%)

P = Proportion of the pattern of the two ducts in the population (but it is not known so we used 50%)

q = Power of study (i.e. 1-P)

d = Degree of accuracy desired, set at 0.10

NB: sample size used was 86 human subjects.

2.2 Methods:

Midline abdominal incision was made to expose the abdominal visceral. The pancreas was exposed for dissection by dividing the two layers of peritoneum, which descend from the great omentum, turning the stomach upwards and then cutting through the ascending layer of the transverse mesocolon.

The duodenum was opened by a pair of scissors on its convex side of the second part (descending part). After being opened, the luminal (mucosa) surface was cleaned by tap water to remove all the duodenal contents. The duodenal papilla was displayed following observation on the medial luminal surface of the descending part of the duodenum.

Then by observing the position of the duodenal papilla, the estimated entrance point of the pancreatic and common bile ducts on the outer surface of the duodenal wall was made. Upon removal of some connective tissues on the estimated site of entrance, the duct penetrating the duodenal wall was displayed.

The pancreatic duct was exposed by removal of some pancreatic tissues on the dorsal aspects starting from the junction of the duct on the duodenal wall or common bile duct, then proceeding towards the tail of the pancreas. The common bile duct was exposed by removing some tissues on top of it that hold it on its position. The patterns of the two ducts were recorded.

Minor incision was made on the duct at the middle of the gland, and then blunt probe was inserted to loosen the duct lumen.

The tap water was injected into the common bile duct and pancreatic duct and pumped under pressure using a syringe and a metal canulla. Then the ejected fluid was observed on the duodenal papilla to determine location of where they open.

For fused ducts [i.e. those with common channel (a duct formed after union of the common bile and pancreatic ducts)], the fluid (tap water) coming out of the duodenal papilla opening was found to have the similar volume, while those with no fusion, the fluid ejected was found to have different volumes. Those fluids from the common bile duct were much larger in volume than those fluid ejected from the pancreatic duct. For the separate and accessory ducts they were just observed much more clearly.

For samples with common channel, length measurements of the common channel were taken by placing a thread on the entire length of the duct, and then measure the thread with a ruler.

Those without common channel, the distances between the entrances of the two ducts were measured together with their duodenal openings. Photographs of the representative patterns were also taken.

Statistical analysis of the research data

The research data were analyzed by using the statistical package for social sciences (SPSS 11.5 for Windows).

2.3 Definition of variables

Termination pattern of bile and pancreatic ducts

Extramurally union- Union of common bile and pancreatic ducts proximal (outside) to the duodenal wall

Intramurally union- Union of common bile and pancreatic ducts within the duodenal wall

Common channel – Duct formed following union of the common bile and pancreatic ducts

Duodenal papilla - Either of the small elevations (major and minor) on the mucosa of the duodenum:

- The major at the entrance of the conjoined pancreatic and common bile ducts.
- The minor at the entrance of the accessory pancreatic duct.

CHAPTER THREE

3.0 RESULTS

Observations were made on the pancreas and duodenum of 86 human cadavers, from which 81 were male and 5 were female. The specimens were obtained from dissection room at the Muhimbili University of Health and Allied Sciences and during autopsy at Muhimbili National Hospital. 61 of the subjects were found to have one pancreatic duct draining the pancreas while 25 had two pancreatic ducts draining the gland. Also all 86 had one common bile duct draining the gallbladder.

Observation of the injected fluid coming out of the duodenal papilla opening resulted in grouping the subjects into two groups; those with united pancreatic and common bile ducts and those in which their ducts did not unite. Pancreatic duct was observed to be united with common bile duct in 54 out of 86 (49 males and 5 females) to form a common channel (duct formed after union of the two ducts) that traverse the duodenal wall. Remained 32 subjects (all male) had separate entrance (no union of the two ducts) of the two ducts into the duodenal wall.

Accessory pancreatic duct was observed to unite with the common bile duct in 6 out of 54 subjects who had union of pancreatic duct and common bile duct.

The termination pattern of the common bile and pancreatic ducts were also observed. Among 86 subjects: 61 were observed to have one duodenal papilla for both pancreatic and common bile ducts to open onto the duodenal lumen: 25 were found to have two duodenal papilla.

Also out of 86 subjects: 44 had a single duodenal papilla opening, 39 had two, and 3 had three duodenal papilla openings.

3.1 Observation on the gross anatomy of the common bile and pancreatic ducts

Dissection of the common bile and pancreatic ducts revealed interesting features regarding the pattern and termination of these ducts. The features includes; presence of two pancreatic ducts draining the pancreas; union of the common bile duct and pancreatic duct either outside or within the duodenal wall; false fusion of the two ducts; and presence of one or two duodenal papilla (Table 1).

Table 1: Table showing the number and percentages of different observations on the termination patterns of the common bile duct (CBD) and pancreatic duct (PD) amongst Tanzanians

S/N	OBSERVED FEATURE		NUMBER OF CASES	PERCENTAGE %
1	Separate entry of the CBD and PD into the duodenal wall and lumen	Complete no fusion	23	26.7
		False fusion of CBD and PD	9	10.5
2	Fusion of the common bile and pancreatic ducts	Extramural fusion	15	17.4
		Intramural fusion	39	45.3
3	Accessory pancreatic ducts (i.e. two pancreatic ducts)		25	29.1
4	Number of duodenal opening observed	One	44	51.2
		Two	39	45.3
		Three	3	3.5

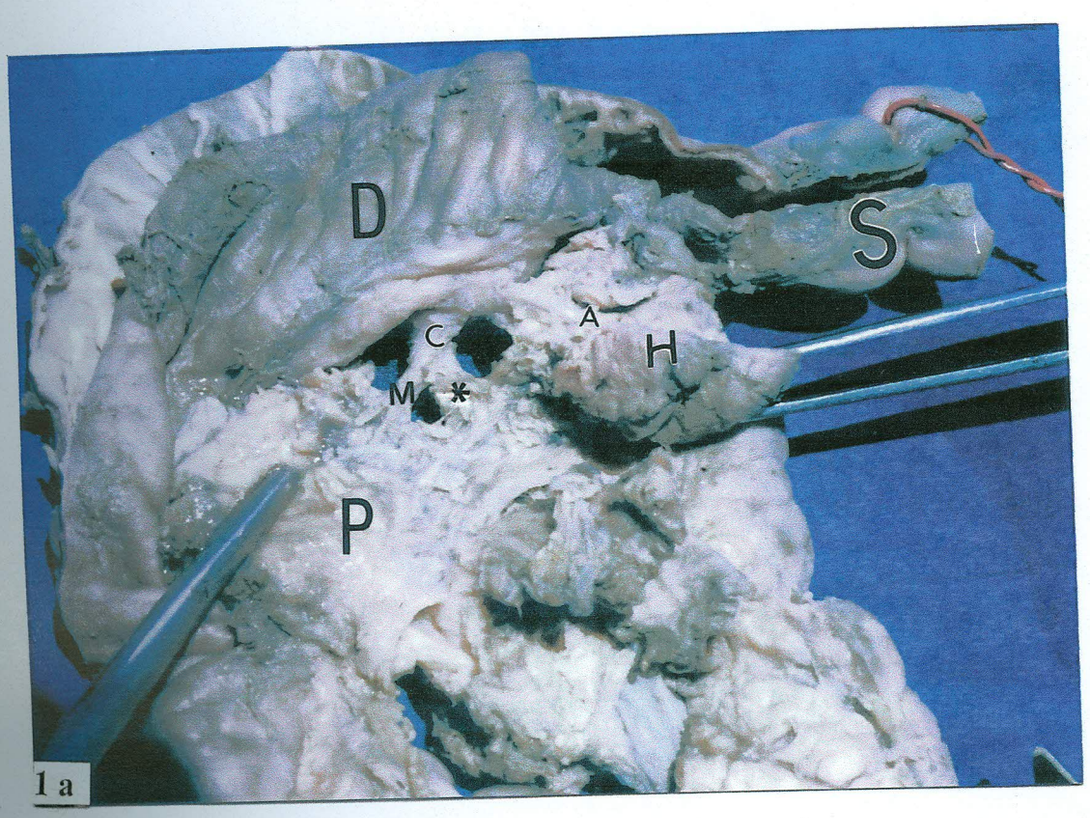
Note that: The sample size (n) was 86 cases.

3.2 Number of pancreatic ducts

Observation on the ducts that drains the pancreas showed variations; 61 pancreases cases appeared to be drained by one pancreatic duct that opened into the duodenum. 25 pancreases showed two pancreatic ducts; these include main and accessory pancreatic ducts (Fig. 1). But among these cases, the accessory pancreatic duct was found to be united with the common bile duct to form a common channel in sample number 1, 7, 22, 29, 33 and 48 of which all were adult male subjects (Fig. 2).

Table 2: The frequency distribution table showing the prevalence of the number of pancreatic ducts that observed draining the pancreas gland

Number of ducts observed	Frequency	Relative frequency (%)	Cumulative frequency (%)
One duct	61	70.9	70.9
Two ducts	25	29.1	100
	86	100	



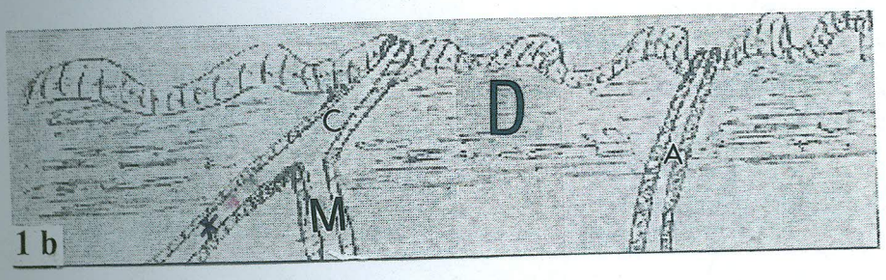


Figure 1a, b: Photograph and the drawing illustrating the main and accessory pancreatic ducts. **a**. Photograph of the pancreas (*P*) and duodenum (*D*) from an adult male cadaver showing the main pancreatic duct (*M*) and the accessory pancreatic duct (*A*). The main pancreatic duct (*D*) unites with the common bile duct (Asterisks) to form a common channel (*C*). The accessory pancreatic duct (*A*) from the head of the pancreas (*H*) opens directly into the duodenum (*D*) through the minor duodenal papilla. Note the distal part of the stomach (*S*). **b**. Shows diagrammatic representation of the main (*M*) and accessory pancreatic (*A*) ducts opening into the duodenum.

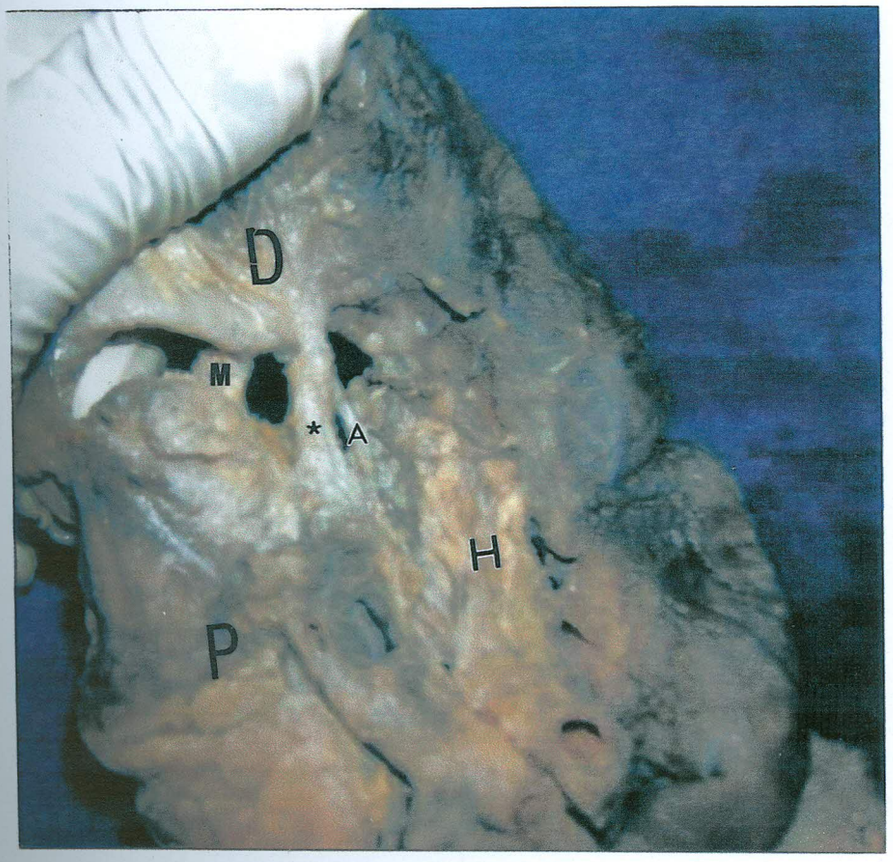


Figure 2: Photograph of the pancreas (*P*) and duodenum (*D*) from an adult male cadaver showing main pancreatic duct (*M*), the accessory pancreatic duct (*A*) and the common bile duct (*Asterisks*). The main pancreatic duct (*M*) enters separate into the duodenum (*D*) while, the accessory pancreatic duct (*A*) from the head of the pancreas (*H*) unites with the common bile duct (*Asterisks*).

3.3 Union of the common bile duct and pancreatic duct

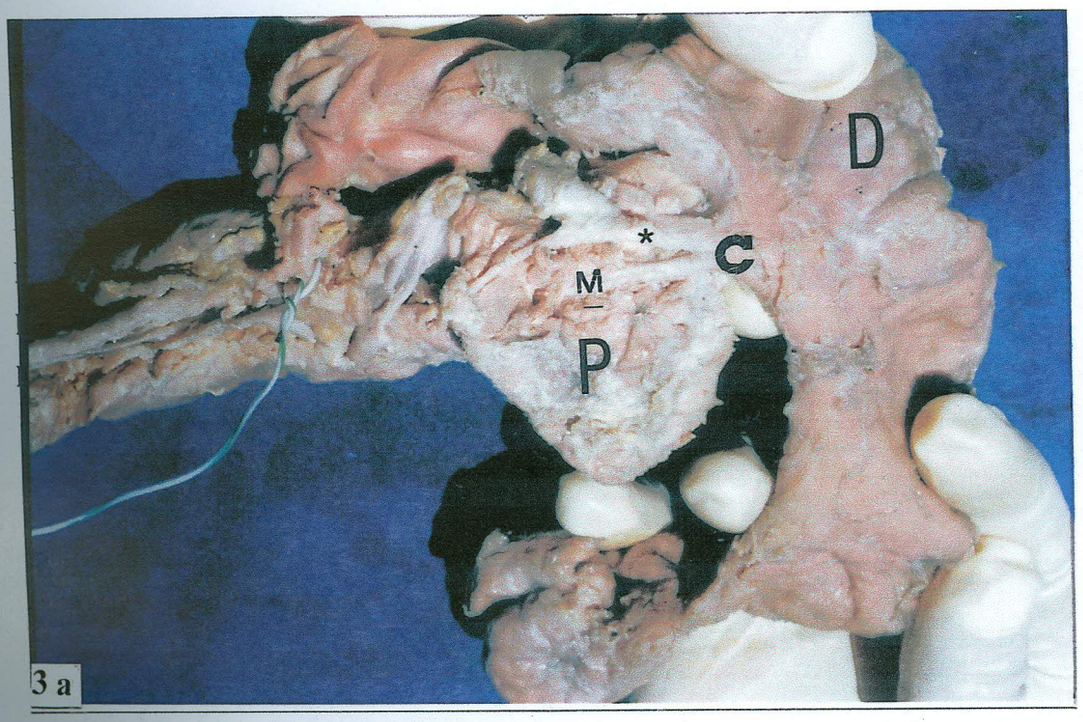
Observation of the pancreas and duodenum in 86 studied cases, revealed the union of the common bile and pancreatic ducts in 54 cases (49 adult males and 5 adult females); and 32 cases (all males) did not show union between them. Union appeared to occur outside (extramural) the duodenal wall and some had union within (intramural) the duodenal wall (Table 3).

Extramural union was observed in 15 out of 54 cases. Here the pancreatic duct was observed to join the common bile duct obliquely between 2 -10 mm from the duodenal wall (Fig. 3). The resulting common channel measured between 0.7 – 1.5 cm long and traversed the duodenal wall to open into the duodenum.

The remaining 39 out of 54 of those who had union of the two ducts they were observed to have an intramural union. In these cases the common bile and pancreatic ducts entered the duodenal wall separately but they united to form common channel that opened into a single duodenal papilla and single duodenal opening. The separating distance between the two ducts before entering the duodenal wall measured between 1 -13 mm. The intramural union was observed when the fluid (water) was introduced into the ducts and the resultant ejected fluid from the common opening seen to have similar volume. The dissection of the duodenal wall reveals the intramural union of the two ducts but with variations in positions of union; these includes the union too close to the duodenal wall and some within the duodenal mucosa (Fig. 3 and Fig. 5). This union resulted into the formation of a common duodenal ampula (common channel) which measured between 1 - 3 mm long. .

Table 3: Table below shows the frequency distribution of number of cases who had fusion of the common bile duct and pancreatic ducts either extramural or intramural resulting in the formation of the common channel. Also separate entry of the two ducts into the duodenal wall.

Fusion of the ducts observed	Frequency	Relative frequency (%)	Cumulative frequency (%)
Extramural fusion	15	17.4	17.4
Intramural fusion	39	45.4	62.8
Separate entry	32	37.2	100
	86	100	



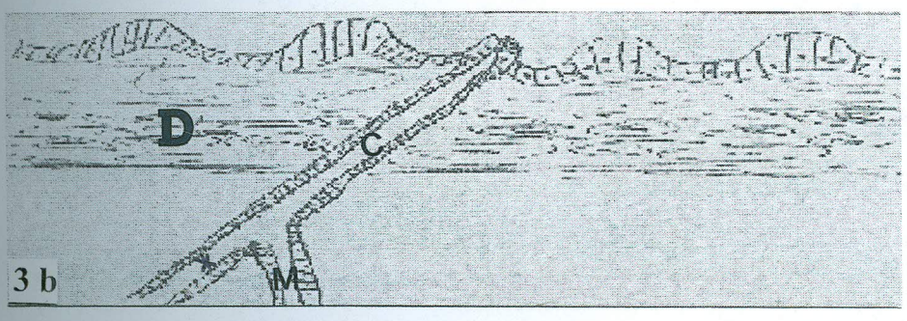
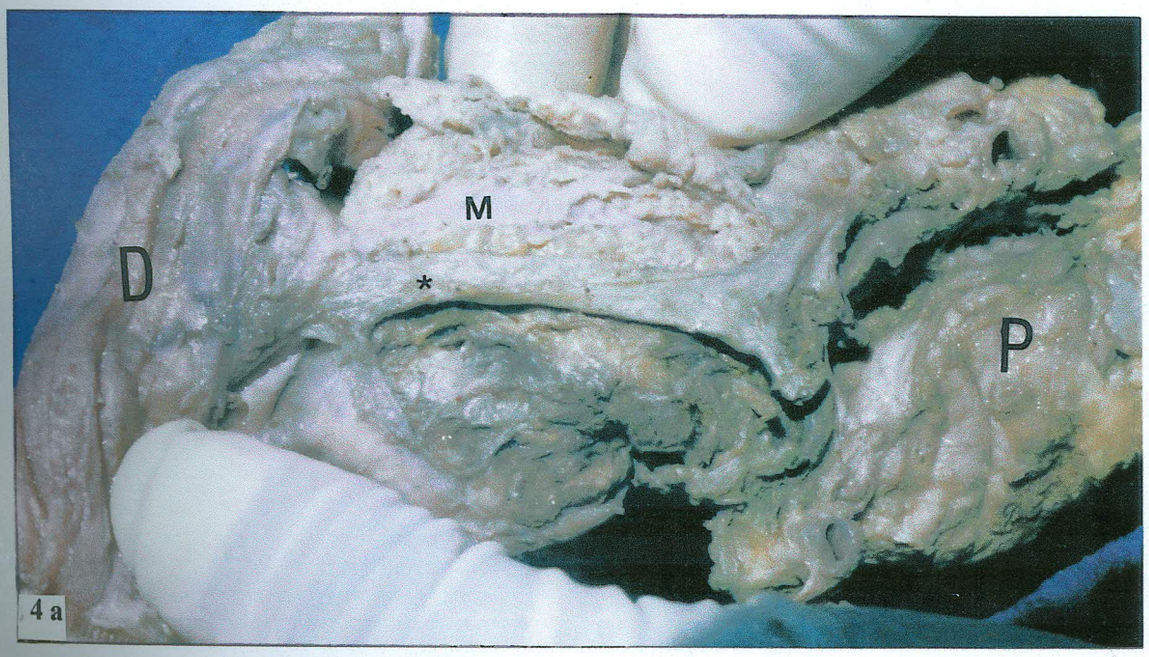


Figure 3a, b: Photograph and the drawing illustrating the main and accessory pancreatic ducts. **a**. Photograph of the pancreas (*P*) and duodenum (*D*) from an adult male cadaver displaying the extramural fusion of the common bile duct (*Asterisks*) and pancreatic duct (*M*) resulting into the formation of a common channel (*C*). **b**. Shows the diagrammatic representation of how the common bile duct (*Asterisks*) and pancreatic duct (*M*) unite to form common channel (*C*) that traverse the duodenal wall.



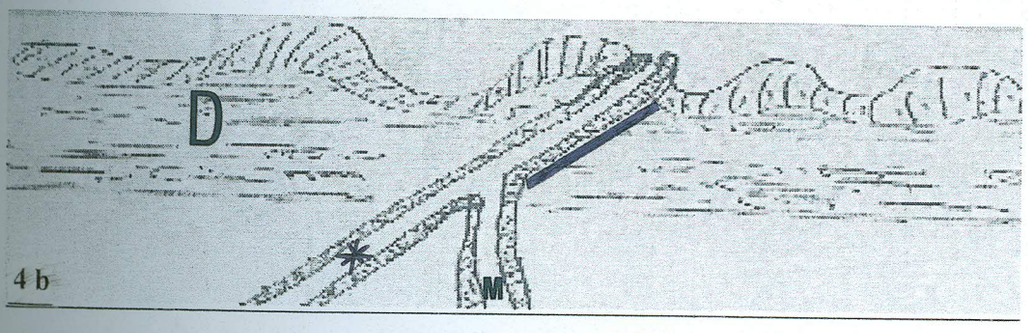
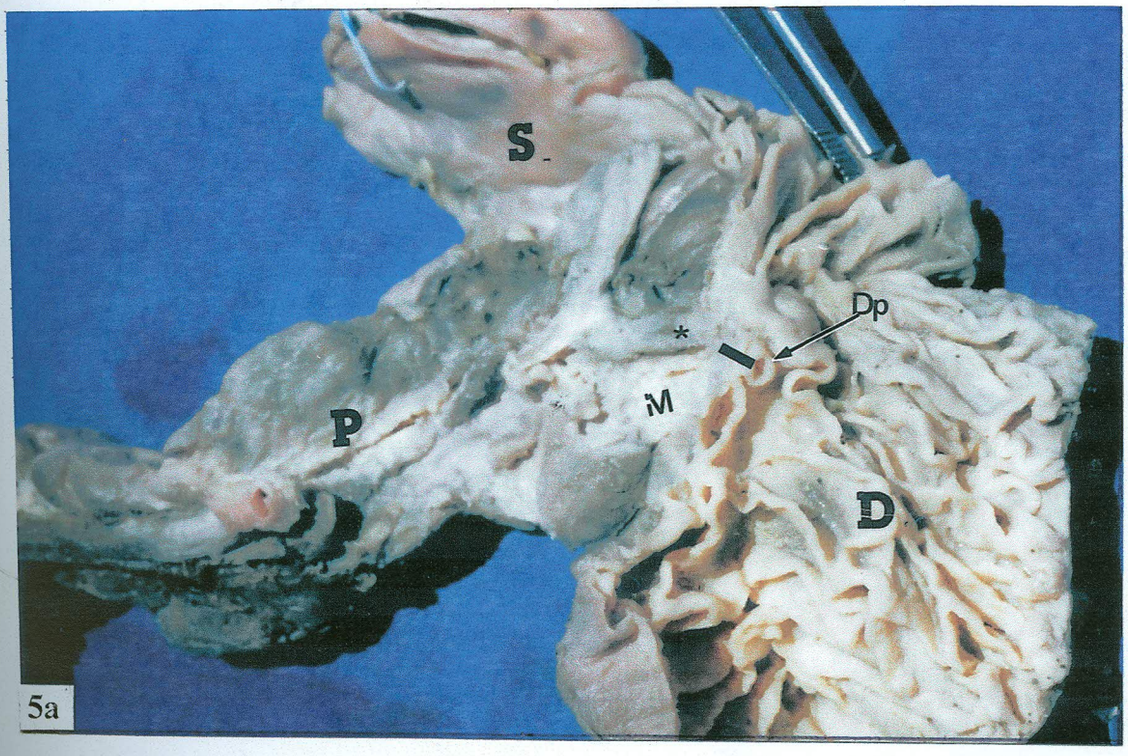


Figure 4a, b: Photograph and the drawing illustrating the pancreatic duct (*M*) and common bile duct (*Asterisks*). **a**. Photograph of the pancreas (*P*) and second part of the duodenum (*D*) from the adult male cadaver showing the surface union of the common bile duct (*Asterisks*) and pancreatic duct (*M*). **b**. Shows diagrammatic representation of the fusion of the two ducts at the surface of the duodenal wall (surface junction), resulting in the formation of the intramural common channel (*black bar*).

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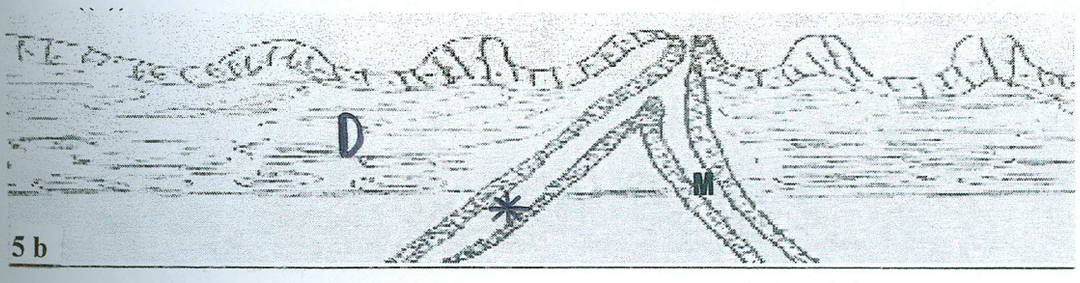


Figure 5a, b: Photograph and the drawing illustrating the pancreatic duct and the common bile duct. **a**. Photograph of the opened duodenal wall (*D*) and pancreas (*P*) from the adult male cadaver showing the intramural fusion of the common bile duct (*Asterisks*) and pancreatic duct (*M*) forming shorter common channel (*black bar*). Note the duodenal papilla (*Dp*) and the distal part of the stomach (*S*). **b**. Shows diagrammatic representation of the fusion of the common bile duct (*Asterisks*) and pancreatic duct (*M*) within the duodenal wall (Intramural fusion).

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3.4 Separate entry of the common bile duct and pancreatic duct

Observations revealed that, 32 of the studied cases had separate entrance of the common bile duct and pancreatic duct into the duodenal wall and open separately on the duodenal lumen. The remaining 54 cases out of 86 were observed to have union of the two ducts. However among those cases with separate entry, 23 cases had complete separate entry (complete no union) and 9 cases had false fusion of the two ducts.

In those cases with complete no union between the common bile and pancreatic ducts, the two ducts entered duodenal wall separately and open on the duodenal mucosa separately (Fig. 6). The separating distances between them before entering the duodenum measured 0.2-1.5 cm. Also in these cases, the pancreatic duct enter either proximal to or opposite side of the common bile duct.

False union of the common bile and pancreatic ducts was observed in 9 cases out of 86 of the studied cases (Fig. 7a and Fig. 7b). In these cases the two ducts join and form a false union before entering the duodenal wall. They continue in that way and traversed the duodenal wall and open on a single duodenal papilla with two separate duodenal openings into the lumen. When the fluid was introduced into the ducts under pressure, the ejected fluid through the duodenal papilla was observed to be coming from two different openings (Fig. 7c). When these duodenal papilla were opened (dissected), they display a thin membrane that separate the two ducts in the middle.

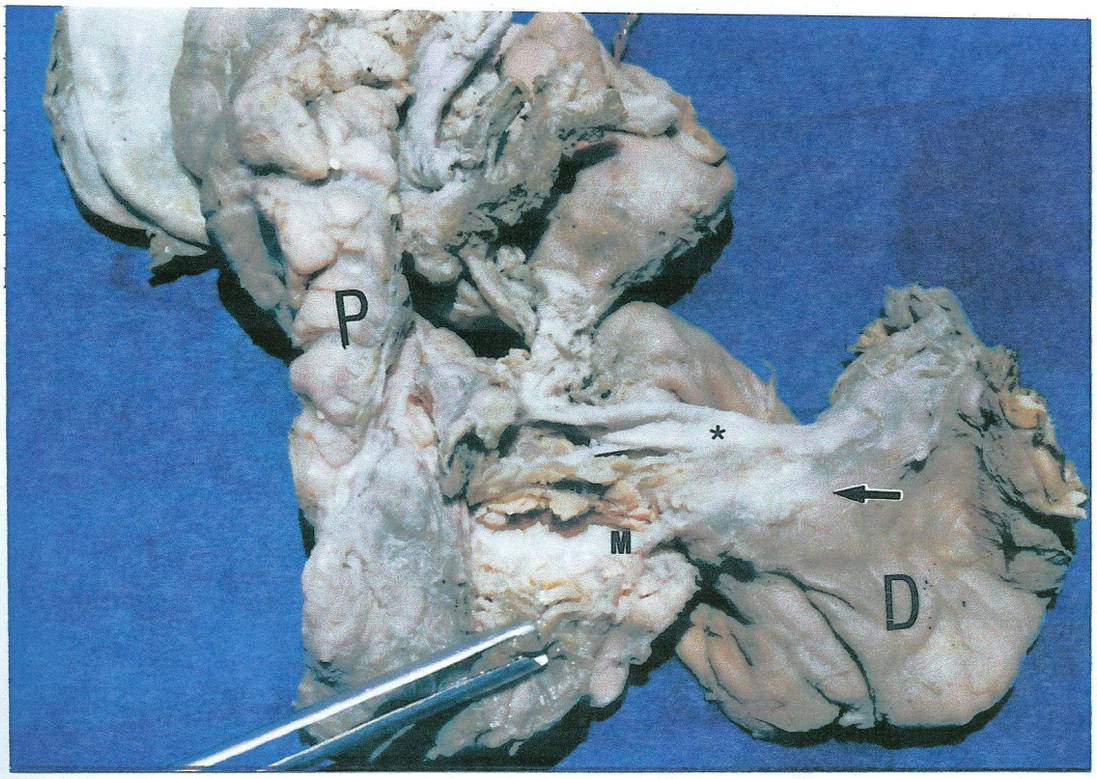
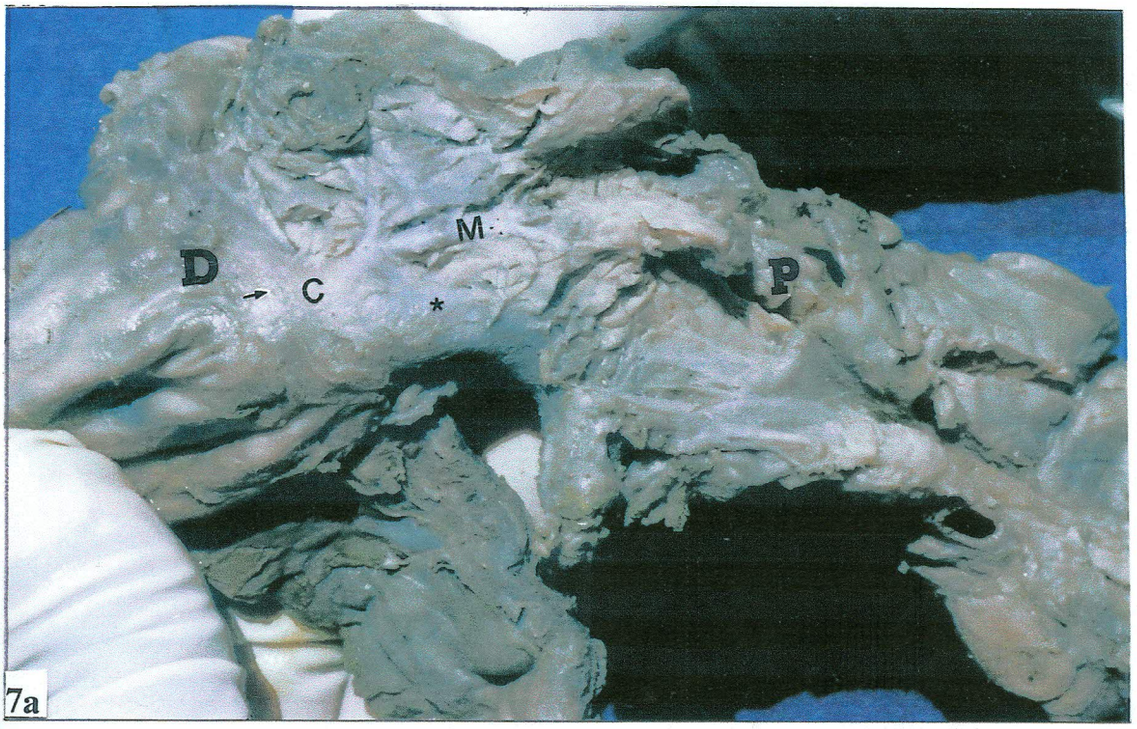


Figure 6: Photograph of the pancreas (*P*) and duodenum (*D*) from the adult male cadaver showing the separate entry of the common bile duct (*Asterisks*) and the pancreatic duct (*M*) into the duodenal wall (*Arrow*). The two ducts open separately in the duodenal lumen with two separate duodenal papilla.



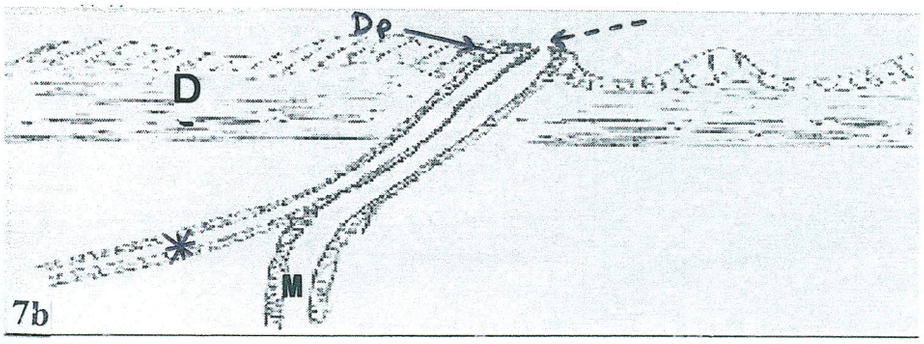


Figure 7a, b: Photograph and drawing illustrating the pancreatic duct (*M*) and the common bile duct (*Asterisks*). **a**. Photograph of the pancreas (*P*) and duodenum (*D*) from an adult male cadaver displaying the false union of common bile duct (*Asterisks*) and pancreatic duct (*M*) forming a false common channel (*C*) that traverse the duodenal wall (*Arrow*). **b**. Shows diagrammatic representation of false union of the common bile duct (*Asterisks*) and pancreatic duct (*M*) displaying two separate duodenal openings (*dashed arrow*) of the two ducts on the same duodenal papilla (*Dp*).



Figure 7c: Photograph of opened second part of duodenum (*D*) from an adult male cadaver (shown in fig. 7a above) displaying the two duodenal openings (*dashed arrow*) on a single duodenal papilla (*Dp*). Outside it has a false common channel.

3.5 Number of duodenal papilla and duodenal opening

The observation of the pancreatic and common bile ducts after traversing (entering) the duodenal wall revealed that, the two ducts open (terminates) on the small, rounded and firm duodenal mucosa projection called duodenal papilla.

Among the 86 studied subjects, single duodenal papilla was found in 61, on which may display one or two openings. While in 25 of the cases had two duodenal papilla; namely major and minor papilla. Major associated with the main pancreatic duct, while minor with the accessory pancreatic duct. Minor located anterosuperiorly 2.1 cm (1.2-3.5 cm) from the major papilla.

Observations of the duodenal papilla showed that;

i. 44 cases had one duodenal papilla opening that received a common channel formed by the union of the pancreatic and common bile ducts (Table 4).

ii. 39 cases had two duodenal papilla openings (Fig. 8). In these cases there some variations which were observed; these include those who had one duodenal papilla but with two openings (one for common bile duct and one for pancreatic duct) and some had two duodenal papilla (major and minor) each with its own papillary opening. The minor duodenal papilla opening was associated with the accessory pancreatic duct.

iii. 3 cases (sample number 18, 19 and 49) had three duodenal papilla openings which include two for pancreatic ducts (main and accessory) and third for common bile duct. In these cases they were observed to have two duodenal papilla but with variations in number of openings i.e. two duodenal papilla openings associated with major duodenal papilla, while



Figure 8: Photograph of opened second part of duodenum (*D*) from an adult male cadaver displaying the single duodenal papilla (*Dp*) with two duodenal papilla openings (*dashed arrows*).

CHAPTER FOUR

4.0 DISCUSSION

The common bile duct and pancreatic duct drains the gallbladder and the exocrine pancreas respectively to the duodenal lumen. According to the previous studies, the gross anatomy of the two ducts has shown that they may enter the duodenal wall separately or join together forming a common channel before opening into the duodenal lumen [3, 5, 10].

But interestingly in this study, the gross anatomy of the termination pattern of the common bile and pancreatic ducts was found to be variable, and it involved the presence of accessory pancreatic ducts, the length of the common channel and the presence of three duodenal openings.

Among 86 of the studied cases, 70.9% had one main pancreatic duct that drained pancreatic secretions to the duodenum. 29.0% observed two, main and accessory pancreatic ducts. This implies that the frequency of accessory pancreatic ducts is much higher among Tanzanians than those reported elsewhere [12, 14, 15]. Moore [14, 15] has reported that only 9% of people had complete separate accessory pancreatic duct that open into the duodenum at the minor duodenal papilla. Interesting finding is accessory pancreatic duct join the common bile duct to form a common channel that join duodenum.

The significance of the differences in the frequency of accessory pancreatic duct in its union with the common bile duct is not clearly known. It is also unclear as to whether the accessory

pancreatic duct has some clinical implications. Therefore, it calls for a wide study before we make the true association of the frequency of the accessory pancreatic duct with the occurrence of pancreatitis. Past studies proposed that its presence may be linked with a lower incidence of acute pancreatitis [4, 8, 9]. Clinical studies have showed that patients who suffer from acute pancreatitis have non-patent accessory pancreatic duct [9]. They proposed that a patent accessory pancreatic duct may prevent acute pancreatitis by lowering the pressure in the main pancreatic duct [8, 9] and that absence of accessory pancreatic duct will lead to increased pressure within the pancreas [4]. It is presumed that accessory pancreatic duct act as collateral a channel that lowers the pressure in the main pancreatic duct [8]. Excessive intraductural pressures could give rise to acute pancreatitis due to chemical irritations a result of backflow of secretions contained in the main duct system [4]. In Tanzania like many other African countries, there is no study on the status of anatomy of the accessory pancreatic duct. However, verbal communication with a consultant gastroenterologist at Muhimbili University of Health and Allied Sciences has showed that there is generally a lower incidence of acute pancreatitis as compared to European reports. Whether a lower incidence can be explained by the higher frequency of patent accessory pancreatic duct observed in the current study is open for future work. The result in this study calls for wider observations on the anatomy of the accessory pancreatic duct and its possible clinical implications.

In normal anatomy the pancreatic duct joins the common bile duct to form a common channel that enters the second part of the duodenum [1, 2, 4, 5, 14, 15] but in some cases the common bile and pancreatic ducts may open separately [5, 16, 22].

It is known that a common channel can be formed extramurally or intramurally before it enters the duodenum [16, 22]. Generally the intramural channels are shorter than the extramural channel. In the current study both channels appear to be shorter than the reported parameters. For example the extramural channel appeared to have an average length of 1.01cm compared to reported length of 0.8cm -1.9cm and 0.5cm -5cm [12, 13]. By definition a long channel is the one which is longer than 1.5 cm [6, 9, 13], but in this study we observed common channel with average length of 1.01cm. This provides a clue that the Tanzanians have shorter common channels. The significance of this observation is not clearly known at this time. Past studies have associated long common channels with a higher incidence of pancreatitis [10]. It has been speculated that it creates good environment for reflux of chemicals within the duct system (common channel) leading to pancreatitis [10]. Having the short common channel may ensure that all chemicals are poured into the duodenum and non-remains within the duct system to cause chemical reflux. It has also been proposed that short common channel may reduce the chances of having pancreatitis due to reflux of chemicals caused by the biliary stasis [1]. Since the gallstones will not be staying longer in the common channel hence prevents further aggregations of gallstones that may lead to the formation of larger stones which may block the channel either partially or completely [1].

In normal anatomy the pancreatic and common bile ducts may open separately. Past studies have showed that it shows a wide variation between 9% - 30% [3, 12, 21]. The current study has showed the frequency of 37% (Table 5). The reasons for these variations are not known and there may be individual variations. In forms of mobidity it is logical to speculate that it may reduce the chance of encountering the reflux chemical pancreatitis because there is no

common channel which allows the accumulation of both bile and pancreatic secretions. Also since the two ducts open separately, there is no common channel formed then no gallstones which may cause partial or complete blockage of the ducts which may lead to reflux of chemicals. Therefore, this further could explain the possible reason why do we Tanzanians have low incidence of pancreatitis.

Table 5: Table below shows the comparative samples of separate opening of the common bile duct and pancreatic duct into the duodenum from different populations.

Author	Nationality	Sample size	Prevalence of Separate opening
Di Magnio *et al.*, (1982)	USA	390	19% (74)
Van der Voot *et al.*, (1999)	USA	48	30% (15)
Kitunguu (2006)	Kenya	88	9% (8)
Mchonde (2008)	Tanzania	86	37.2% (32)

The current observation has also documented the presence of three duodenal papilla openings being two on the major duodenal papilla involving openings for common bile duct and main pancreatic duct, and single duodenal opening on the minor duodenal papilla for the accessory pancreatic duct. This shows that the Tanzanians besides having the higher prevalence of accessory pancreatic ducts, yet they still posses numerous number of duodenal papilla openings which further explains the variability of the termination of the common bile, main pancreatic and accessory pancreatic ducts into the duodenal lumen.

CHAPTER FIVE

5.1 CONCLUSSION

There are significant differences on termination pattern of the common bile and pancreatic ducts among Tanzanians. Their patterns displays a slightly variation from those reported elsewhere.

1. The number of complete accessory pancreatic ducts is higher among Tanzanians than those reported elsewhere.
2. The Tanzanians have shorter common channel compared to other findings and it is formed either by the union of the common bile duct and main pancreatic duct or by the union of common bile duct and accessory pancreatic duct.
3. The Tanzanians have higher prevalence of separate entrance of common bile and pancreatic ducts into the duodenal wall and duodenal lumen.
4. There is possibility that the 10% - 15% of pancreatitis patients in developed countries who have non-identified etiology pancreatitis, could have their pancreatitis associated with the long common channel.

5.2 RECOMMENDATIONS

1. This work has only provided a leading clue of how the termination pattern of the common bile duct and the pancreatic duct are among the Tanzanians. So further study should be done involving larger sample size and in different locality within the Tanzania boundaries to find out the actual anatomical termination pattern of the two ducts among the Tanzanians.
2. Further work should be done to study the actual pathophysiological implication of the shorter lengths of the common channel with the occurrences of the pancreatitis by the use of radiographic imaging techniques among the diseased individuals.

5.3 LIMITATIONS

The sample collection process was not very successfully due to denial of consent by the next of kin for the postmortem of the deceased.

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