

Measurement of Pancreatic Volume In Saudi Population Using Computerized Tomography; Age, Gender, and Height Correlation

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Abstract

The current research was a descriptive cross-sectional study that measures average pancreatic volume in the Saudi population using Computed Tomography from June to September 2021. The problem of this study was that there needed to be reference values for a pancreatic book to compare it with international ones. The study aimed to measure the normal pancreas and show the relationship between values and individual age, gender, and height. The data was collected from 60 patients with normal pancreas by data collection sheet containing all the variables and analysis using statistical programs for social and sciences and presented as tables and figures. The results of this study showed that the mean of individual age, height, and pancreas volume was 37.55, 168.35, and 23.27, respectively. Also, no relationship between age and the importance of the pancreas p-value ($0.19 > 0.05$) was found in this study. However, there, a connection between height and volume of the pancreas p-value ($0.029 < 0.05$) was found in this study. The percentage between size and importance of pancreas relationships was about 74 %. The significance between gender and volume shows that there is a moderate relationship between them (61 %) (p-value is 0.062), and the book values more for males (mean=23.35) than females (mean=22.75). The study recommended measuring all pancreatic diameters with a larger sample size and another modality to compare the results.

Keywords: Computed Tomography, Pancreas, Diameters

Introduction

In recent years, Due to the rapid growth of deep neural networks in recent years [8,14], computer-aided diagnostics and clinical picture processing have both advanced rapidly (CAD). This research concentrates on a crucial requirement for CAD [6,18], which is the automated segmentation of tiny organs (such as the pancreas) using CT-scanned images. The challenge is primarily caused by the target organs' limited volume and considerable anatomical diversity. Researchers occasionally create a unique segmentation strategy for each organ [1,12].

When it comes to segmenting major organs, the pancreas is particularly challenging because it frequently exhibits a significant degree of variability in terms of its size, shape, and position [12] and only takes up a tiny portion (e.g., 0.5 % 0.5 %) of the total CT volume. In these scenarios, the surrounding region, which makes up a significant portion of the receptive field and contains complex and varied contents, has the potential to interfere with deep neural

networks. As a result, the segmentation outcome is erroneous, particularly at the boundary zones [19]. The pancreas is an essential gland in the body. (The pancreas length is almost 20 cm, and it weighs 75-90 grams). The pancreas is located in the upper abdominal cavity behind the stomach at the level of the first lumbar vertebra and the second L1 and L2 vertebrae. The pancreas extends sideways from right to left, starting from the annular portion of the duodenum until the navel (entrance) of the spleen [16].

Since the pancreas is a highly concealed part of the body, diagnosing its malformations has proven challenging. Traditional diagnostic techniques in the past now include angiography and ultrasonography. Ultrasound is widely used because it is reliable and safe [15]. Angiography has established itself as the most reliable assessment method [9]. With the development of computed tomography (CT) scanning, it is now feasible to see a healthy pancreas and identify any anomalies [2]. Our initial experience with a CT diagnostic of

pancreatic and peripancreatic abnormalities is the focus of this research. On a 4- or 8-slice GE LightSpeed scanner with a pitch range of 3 to 6, a kVp of 120 m ranging from 240 to 360, and a nominal slice width of 5 mm at reconstructing intervals of 2.5 mm, computed tomography scans were conducted. Images were uploaded to the GE Advantage Workstation (GE Healthcare, Inc., Waukesha, Wis.; workstation version 4.0), and dimensions of the pancreas head, body, and tail were made in one size [17].

Previous estimates of the average pancreatic size have varied, as evidenced by the higher values identified by [10], especially in comparison to those found in the investigation of (Balthazar et al., 2009). This discrepancy has been attributed to the absence of measurement techniques that nearby vascular structures would have complicated. As a result, the measures may be distorted and result in

a higher reading than intended, demonstrating the necessity for clarity and separation between structures close to the pancreas. We used an extensive case collection of individuals with nonpancreatic indications to build a standard methodology by integrating and improving current measuring methodologies. This data may be consulted when accurate pancreatic measures are required in a clinical or research situation [11].

The study aimed to measure average pancreas volume and lengths using a computerized Tomography Scan in the Dammam population, (i) To correlate between the volume of the pancreas and individual height, (ii) To correlate between individual age and gender with pancreatic volume, (iii) To establishes reference values in Dammam population and compare it with international.

Materials and Methods

Study design

A descriptive cross-sectional study. The study was conducted from June to September 2021 in king Abdelaziz hospital, Taif, Saudi Arabia. The average pancreatic size of the population comes to the CT department for an abdominal scan with no known pancreatic disease. Data were collected with a serial number (IRB Registration Number With KACST, KSA: HAP-02-T-067). The sample size was minimal, with 60 patients with no known pancreatic disease.

Inclusion and Exclusion criteria

All patient comes for abdominal CT. The exclusion criteria comprised the patient with pancreatic disease. The dependent variables were to find average pancreatic diameters, and the independent variable was age, gender, and height data collected using a data collection sheet containing all variables.

Machine used

Axial images were obtained using a Toshiba 64-slice CT scanner on 60 subjects who underwent abdominal CT scanning and were found to have normal pancreas and no diabetes history or other diseases affecting the pancreas. A dosage of 2 mg kg⁻¹ of iodinated contrast

medium was administered. The patient was positioned in a supine position and fully inspired for the CT scans. The scan's coverage area was the lung base to the iliac crest's lower edge. The irradiation settings were 250 mA and 120 kVp.

Method of Pancreas Measurement

Anteroposterior (AP) measures of the body and tail thicknesses parallel to the long axis of the organs were made in the pancreas section (head, body, and tail and volume) being investigated. The readings were acquired from the operator council of the CT machine (mm). The pancreatic head's AP thickness was typically measured using its actual AP parameters. The pancreas head, body, and tail were measured and assigned pancreas textural numbers (measured in Hounsfield Unit).

Statistical Analysis

SPSS version 16 for Windows was used to record and analyze all the study's data. The sex-related variations were estimated using the independent samples t-test. The relationship between the subject's age, various body characteristic factors, and pancreas size was assessed using Pearson's correlation coefficient.

Results

The current study was conducted in Taif city from June to September 2021. This descriptive cross-sectional study was conducted on the general Saudi population over a short period. The study deal with measuring the average pancreatic volume of 60 patients. There was a

relation between the individual's gender and the pancreas volume; the female had a smaller volume than the male. The result of this study shows that 52 out of 60 (86 %) were male, while 8 out of 60 (13.3 %) were females (**Table 1**).

Table 1. Distribution of gender.

SEX				
	Frequency	Percent	Valid Percent	Cumulative Percent
Male	52	86.7	86.7	86.7
Female	8	13.3	13.3	100.0
Total	60	100.0	100.0	

The study showed that age, height, and volume mean 37.55, 168.35, and 23.27, respectively (**Table 2**). The descriptive statistics of the variables showed that the minimum value for age was 15, and the maximum was recorded at 78, followed by 155 minimum values for

height and 185 maximum values. Compared to age and height, the volume showed the lowest value of 18 cm and the highest value of 29 cm. The standard deviation for age, height, and volume was 11.67, 6.147, and 3.55, respectively.

Table 2. Minimum and maximum of each variable

Descriptive Statistics					
	N	Minimum value	Maximum value	Mean	Std. Deviation
Age	60	15	78	37.55	±11.677
Height	60	155	185	168.35	±6.147
Volume (cm)	60	18	29	23.27	±3.550
N	60				

Furthermore, the study shows the age frequency distribution as follows (lower than 20), (20-29), (30-39), (40-49), (50-59), (60-69), and (70-79) is (1) (1.7 %), **[12]** (20 %), (30) (50 %), (9) (15 %), (5) (8.3 %), (1) (1.7 %) and (2) (3.3 %) respectively (**Table 3**). The age frequency showed that more people were suffering from abdominal pain and were tested through CT scans in the hospital which were 30, and their percentage was half of the all-others age groups. The second

most tested and reported patients were from the 20-29 group, 12 people, and their percentage was 20 %, followed by 9 and 5 individuals from the 40-49 and 50-59 age categories. The small number of patients interviewed or tested for the pancreatic problem was 1 from the lowest than 20 age group and 60-69. The highest cumulative percentages were 96.7, 95, and 86.7, shown by the 60-69, 50-59, and 40-49 age groups, respectively.

Table 3: Age frequency distribution

Age's Class Interval	Frequency	Percent	Valid Percent	Cumulative Percent
lowest than 20	1	1.7	1.7	1.7
20 - 29	12	20.0	20.0	21.7
30 - 39	30	50.0	50.0	71.7
40 - 49	9	15.0	15.0	86.7
50 - 59	5	8.3	8.3	95.0
60 - 69	1	1.7	1.7	96.7
70 - 79	2	3.3	3.3	100.0
Total	60	100.0	100.0	

The Pearson correlation was carried out for the relationship between age and volume. The analytic data showed no correlation between age and volume of pancreas p-value ($0.19 > 0.05$) found in this study. At a 5 % significance level, with a p-value of $0.19 > 0.05$, the previous studies conclude that there is no relationship between the pancreas volume and age (**Table 4**).

The correlation between height and volume is significant at 0.05 level when significant (2-tailed) was applied. At a 5 % significance level, with a p-value of $0.029 \leq 0.05$, researchers conclude that there is a relationship between the pancreas volume and the height. The relationship between height and volume of the pancreas shows moderate relations (74 %) (**Table 4**).

Table 4: Correlation between age and pancreatic volume

Correlations			
		Age	Volume (cm)
Age	Pearson Correlation	1	.190
	Sig. (2-tailed)		.146
	N	60	60
Volume (cm ³)	Pearson Correlation	.190	1
	Sig. (2-tailed)	.146	
	N	60	60

The correlation between volume and height was again carried out by putting the volume as the dependent variable. The unstandardized and standardized coefficients were found for heights 0.163 and 0.281 by keeping the volume (cm³) as the dependent variable, and the standard

error was 0.073, which was very low. The data represent the value of the lower and upper bound as 0.017 and 0.308, respectively, at a 95 % confidence interval. The percentage between height and volume of pancreas relationships is about 74 % (**Table 5 A & B**).

Table 5A: Correlation between height and volume.

Correlations			
		Height	Volume (cm)
Height	Pearson Correlation	1	.281*
	Sig. (2-tailed)		.029
	N	60	60
Volume (cm)	Pearson Correlation	.281*	1
	Sig. (2-tailed)	.029	
	N	60	60
*Correlation is significant at the 0.05 level (2-tailed)			

Table 5B: Correlation between height and volume

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0 % Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-4.096	12.259		-.334	.739	-28.636	20.443
	Height	.163	.073	.281	2.234	.029	.017	.308
a. Dependent Variable: Volume (cm ³)								

The significance between gender and volume shows that there is a moderate relationship between them (61 %), and the p-value is more for males (mean=23.35) than females (mean=22.75) (**Table 6 A & B**). There was no significant difference between the standard deviation of the mean of the male and female pancreas volume. At a 61 % significance level, with a p-value of 0.062 < 0.05. The current

study concludes that there is a relationship between the pancreas volume and sex in light of previous studies. The independent sample Levene's test for equality of variance and t-test for equality of mean was also carried out, which showed that the pancreas volume is more for males with mean = 23.35, but for females, the mean is 22.75.

Table 6A: Significance between gender and pancreas volume.

Group Statistics					
	SEX	N	Mean	Std. Deviation	Std. Error Mean
Volume (cm)	Male	52	23.35	3.591	.498
	Female	8	22.75	3.454	1.221

Table 6B: Significance between gender and pancreas volume.

Independent sample test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	.062	Df	Sig. (2-tailed)
Volume (cm)	Equal variances assumed	.022	.061	.439	.062	.062
	Equal variances not assumed			.452	.061	.061

Discussion

The current study was descriptive cross-sectional research carried out in Taif city by comparing the average population's age, height, and volume of the pancreas. The study's retrospective analysis of 220 CT

scans revealed that the volume of women is lower than that of men (102 females, 118 males; age 16–82, average 56) [4].

In the first published series of 41 pancreases, the computed tomography-measured mean volumes of the normal pancreas were 40.4 9.3 cm³ [13], which was twice as less as in our series. Djuric-Stefanovic et al. used CT volumetry to estimate the size and volume of the normal pancreas in adults. They also examined the relationship between gender, age, body constitution, and the volume and diameters of the pancreas, which can be measured by cross-sectional imaging. The results showed that as age increased, the size of the body, tail and anteroposterior diameter of the pancreas also decreased moderately [4].

The analytic data showed no correlation between age and volume of pancreas p-value (0.19 > 0.05) found in this study. In research on Nepalese individuals conducted by Basnet et al. in 2011, the pancreas was categorized by age and sex. The weight and height were quantitatively measured. The thickness of the pancreas differed between male and female subjects, with the male individuals' pancreas being larger. Although there is a correlation between the

height and volume of the pancreas p-value (0.029 < 0.05) was found in this study.

The significance between gender and volume shows that there is a moderate relationship between them (61 %), and the p-value is more for males (mean=23.35) than females (mean=22.75) (**Table 6 A & B**). According to Geraghty et al. (2004), the mean volume of the normal pancreas measured by CT volumetry in a series of 113 patients was 64.4±18.1 cm³ for females and 87.4±21.3 cm³ for males, with ranges between 22.4 and 136.6 cm³, which was consistent with our findings.

Basnet et al. (2011) did a study to determine the pancreas' typical size. Thus, 40 pancreases from both sexes and various age groups were gathered from four medical institutions in Kathmandu, Nepal, and studied descriptively during eight years (2004–2011). Age and sex were used to categorize the pancreas. The size of the pancreas differed between male and female subjects as a result, with the male subjects' pancreas being larger.

Conclusion

This study estimates the volume of the normal pancreas in the Saudi population using computerized tomography. The pancreatic volume significantly correlates with the individual sex and height, but there was no correlation with age. Finally, the study recommended estimating all pancreatic volume users computed tomography and considering these measurements as reference values when the pancreas is to be evaluated. To validate these findings from the index

and aid in a more accurate diagnosis of the pancreatic issue that caused an increase in size or a decrease in density, broader descriptive analytic analyses employing another imaging technique, like MRI or US, are required (CT number). It is advised to employ CT scanning as a diagnostic tool for pancreatic disorders since it plays a significant role in pancreas imaging.

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