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Research Article

Ultrasonography Patterns for Diabetic Nephropathy according to the Body Shape

A.M. Abd Elgyoum[1,2], H. Osman[1,3], A. Elzaki[1,4] , E.Abd Elrahim[1,4]
[1] Taif University, college of applied medical science, P O Box 2425 post code 21944 .Taif KSA
[2] National Ribat University, Nile Street Burri, Postal Code 11111, Khartoum Sudan
[3] College of Medical Radiologic Science, Sudan University of Science and Technology P.O.Box 1908, Khartoum. Sudan
[4]Faculty of Radiology Science and Medical Imaging, Alzaiem Alazhari University, P.O.Box 1432 Khartoum North, Sudan

***Corresponding author**
Ala Mohammed Abd Elgyoum
Email: alas-sa@hotmail.com

Abstract: The objective of present study is to assess the validity of self-reported body size and shape Ultrasonography patterns for diabetic nephropathy. Ultrasonographic of the kidneys were performed on 205 patients with known Diabetic Mellitus (DM) , concerning on Kidney's Echogenicity, Cortico Medullary differentiation, right and left kidney length, and corticomedullary differentiation. The effect of age, gender, onset, renal parenchymal disease and pyelonephritis was statistically analyzed. It is found that there were association between patients shape, renal failure and renal parenchymal disease (P= 0.000, 0.429 and 0.068 respectively .relation was statistically significant since P<0.05. The study proved that diabetic patients were subject to multiple changes in kidneys that can be diagnosed by ultrasound, this supports the use of ultrasound in diabetic treatment units.
Keywords: Ultrasound,Shape of body, DM

INTRODUCTION

Apple shape refers to a waist - to - hip ratio greater than 0.8 (women) or 1.0 (men) with an extra weight carried out as a belly that sticks out in front of whilst pear shape refers to waist - to – hip ratio of less than 0.8 (women) or 1.0 (men) with an extra weight carried out on the butt, thighs, arms and neck (Figure 1). People who have metabolic syndrome typically have apple-shaped bodies, meaning they have larger waists and carry a lot of weight around their abdomens. It's thought that having a pear-shaped body — that is, carrying more of the weight around the hips and having a narrower waist — puts you at a lower risk of developing diabetes, heart disease and other complications of metabolic syndrome [1].

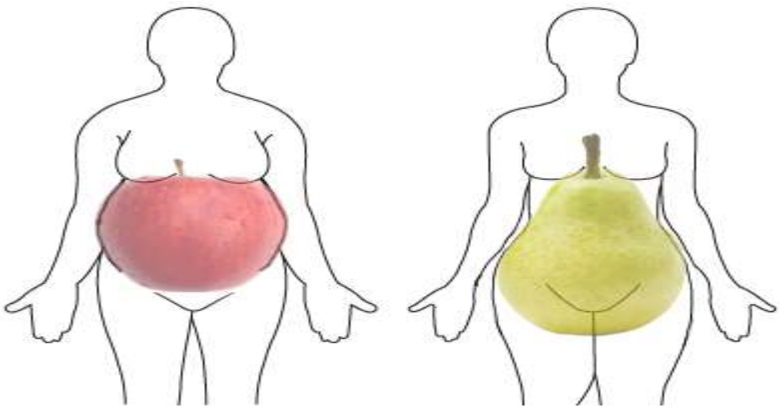

Fig-1: Apple and pear shape body

Diabetic nephropathy is kidney disease that is a complication of diabetes. It can occur in people with type II diabetes or in people with type I diabetes. Diabetic nephropathy is caused by damage to the tiniest blood vessels. When small blood vessels begin to develop damage, both kidneys begin to leak proteins into the urine[2].

Diabetic nephropathy is now the leading cause of end-stage renal disease, accounting for approximately 45% of new patients requiring chronic dialysis. The 2005 US Renal Data System showed that only 25% of patients initiated on hemodialysis due to diabetes survived 5 years. These disturbing statistics have resulted in increasing basic and clinical research on this topic[3]. Diabetic nephropathy is diagnosed using a number of tests including kidney ultrasound - enables the size, echo texture of the kidneys and cortico–medullary differentiation to be imaged[3].

Obesity has been found to contribute to approximately 55% type 2 diabetes, and decreasing consumption of saturated fats and fatty acids while replacing them with unsaturated fats may decrease the risk. Environmental toxins may contribute to recent increases in the rate of type 2 diabetes [4].

In one study we found that women with high blood pressure were three times more likely to develop type 2 diabetes as compared with women with optimal BP after adjusting for various factors such as age, ethnicity, smoking, alcohol intake, body mass index (BMI), exercise, family history of diabetes [5].

Ultrasonography today is an established method for the initial evaluation of kidneys. The ready availability of this method allows rapid diagnosis and therapeutic decisions, which is of extreme importance to keep in hospital time low [6].

Ultrasound Equipment

This study was performed using different ultrasound scanners available at the areas of study such as Aloka prosound SSD 4000 (Aloka holding Europe AG, Switzerland), Toshiba Nemio 20 (Toshiba, Japan), Siemens sonoline G60S (Siemens, USA), and Shimadzu SBU 2200 (Shimadzu Europe GmbH, Germany). All of these scanners drive convex probes produce a frequency of 3.5 MHz; alsothey were connected with printing facility through digital graphicprinter (Mitsubishi Corporation, Japan).

Sample Size

Two hundred and five samples of Sudanese diabetic patients between the ages of 28 to 96 years were selected according to the positive evidence of diabetes, among the outflow of the patients in two ultrasound departments at National Ribat University Hospital, Renal Transplant Hospital (Khartoum North) at Khartoum State, Sudan.

Testing Procedure (Protocol)

The patient**s** were told to prepare themselves carefully for the scan by abstaining from food for the last 6 hours prior to investigation with continuous taking their drugs, imposing dietary restrictions, walking for 30 min before the examination, water contrast[7]. Usually the examination was carried out with the patient in supine position. Additional scans in the lateral decubitus and prone were useful in some situations. A coupling agent gel was used to ensure good acoustic contact between the transducer and the skin[7]. After informing the patients about the procedure and obtaining verbal consent from each of them, the area of interest in the abdomen was completely evaluated in at least two scanning planes. Surveys were used to set correct imaging techniques, to rule out pathologies, and to recognize any normal variants [8].

Statistical Analysis Used

The data was analyzed using SPSS version 16. The associations between the conclusion's different results and the body measurement are tested using chi-square test; level of significant 0.05 was used.

RESULTS AND DISCUSSION

Regarding to patient's shape and height, it was analyzed into three groups, those who were short including 24 patients, the percentage of them was (11%), those who were medium including 81 patients, the percentage of them was (40%) and those who were taller including 100 patients, the percentage of them was (49%), from this out of 205 diabetic patients the majority of patents were taller, there was no significant relation since ($P= 0.741 < 0.05$).

The cross tabulation between body shapes, kidney's length, echogenicity and corticomedullary differentiation shows (P= 0.253, 0.066, 0.000 and 0.005) there was significant relation since $P<0.05$ and the correlation factor for patient shape was 0.232 and for the height was 0.031 for the Rt kidney, the (sig=0.001 and 0.0662) and for Lt kidney correlation factor for patient shape was 0.235 and for the height was 0.001, the (sig=0.001 and 0.05) that means there was positive relation. These matches with [8] they revealed that the prevalence of adults with diabetes increased with increasing weight classes, from 8% for normal weight individuals to 43% for individuals with obesity class 3; suggesting a state of higher severity of disease. It matches also with [9,10,11]. They found that when absence of adiposity was added to the other 4 low-risk lifestyle factors, incidence of diabetes was 89% lower. Overall, 9 of 10 new cases of diabetes appeared to be attributable to these 5 lifestyle factors.

Table -1 : Distribution of patients' shape.

Patient Shape	Frequency	Percent
Slim(> or = 50 kg)	42	20%
Moderate (between 50 & 100 kg)	90	44%
Obese (< or = 100 Kg)	73	36%
Total	205	100%

Table -2 : Distribution of patients' height

Patient Height	Frequency	Percent
Short (> or = 150 cm)	24	12%
Medium (between 150 and 180 cm)	81	40%
Taller (< or = 180 cm)	100	49%
Total	205	100%

Table-3 : Distribution of patient's corticomedullary differentiations

Cortico-Medullary Differentiation	Frequency	Percent
Preserved	155	75.6%
Lost	5	2.4%
Worst	45	22.0%
Total	205	100.0%

Table -4 : Distribution of Kidney's Echogenicity

Kidney's Echogenicity	Frequency	Percent
Hyper echoic	45	22.0%
Hypoechoic	8	3.9%
Normal	152	74.1%
Total	205	100.0%

Table-5 : Distribution of patients' right kidney length

Right kidney length	Frequency	Percent
Small (Less than 8.5cm)	46	22.4%
Normal (between 8,5 to 12.5cm)	155	75.6%
Large (more than 12.5cm)	4	2.0%
Total	205	100.0%

Table-6 : Distribution of patients' left kidney length

Left kidney length	Frequency	Percent
Small (Less than 8.5cm)	42	20.5%
Normal (between 8,5 to 12.5cm)	155	75.6%
Large (more than 12.5cm)	8	3.9%
Total	205	100.0%

Table-7: Distribution of cross tabulation between variables

parameter	Patient Shape	Kidney's Echogenicity	Right kidney width	Left kidney width	Right kidney length	Left kidney length
Renal Failure	0.084	<0.000	<0.000	<0.000	<0.000	<0.000
Renal Parenchymal disease	0.494	0.124	1	1	0.429	1
R.F+R. Parenchymal disease	0.149	<0.000	0.106	0.208	0.167	0.001
pyelonephritis	0.793	0.004	1	1	0.068	0.121

Table -8: Distribution of relation between variables

Variables	Kidney's Echogenicity	Cortico Medullary differentiation	Right kidney length	Left kidney length
Patient Shape	0.253	0.066	<0.000	0.005
Patient Highest	0.124	0.099	0.368	0.411

Table-9 : Distribution of variable between Right and Left Kidney

Variable	Right kidney length		Left kidney length	
parameter	Correlation factor	sig	Correlation factor	sig
Patient Shape	0.232	0.001	0.235	0.001
Patient Highest	0.031	0.662	0.137	0.05

CONCLUSIONS

Renal changes in diabetic patients are detectable by conventional ultrasound only in very advanced stages of the disease. Even later in life, combined lifestyle factors are associated with a markedly lower incidence of new-onset diabetes mellitus.

RECOMMENDATIONS

Therefore it is recommended that more centers to cover whole of Sudan as the disease is spreading throughout the country, the relatively high incidence of abnormal abdominal ultrasound findings in the kidneys of diabetic patients supports the need for ultrasound screening to assess diabetic patients.

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