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# LIST OF ABBREVIATIONS

RAS renal artery stenosis

u/s ultrasound

PSV peak systolic velocity

RI resistive index

RBF renal blood flow

CT computerize tomography

MRI magnetic resonance imaging

GFR glomerular filtration rate

ACE angiotensine converting enzyme

RVT renal vein thrombosis

CKD chronic kidney disease

TPR total peripheral resistance

BMI body mass index

ECG electrocardiography

AMS acute mountain sickness

PO2 partial pressure of oxygen

HAPE high altitude pulmonary edema

HACE high altitude cerebral edema

ESRD end stage renal disease

RAR renal aortic ratio

PI pulsitility index

CA contrast angiography

PRF pulse repetition frequency

AT acceleration time

ESP early systolic peak

# الخلاصة

الحجم العادي للكلى هو متغير ويتأثر بالجنس والعمر ومؤشر كتلة الجسم. والتغير في حجم الكلى يتجلى في العديد من الإمراض مثل ارتفاع ضغط الدم. ويعتبر ضيق الشريان الكلوي السبب الأكثر شيوعا لارتفاع ضغط الدم الثانوي وربما يؤدى إلى نقص تروية الكلية والفشل الكلوي. ومن المعروف إن سكان المناطق العالية لديهم أمداد الأكسجين منخفض في الأنسجة , وأن الكلى تلعب دورا حاسما في التأقلم لأنها تقوم بتنظيم سوائل الجسم و الشارد (الكترولايت) والتوازن الحمضي. واستخدمت الموجات الصوتية العادية و الدوبلر لتصوير حجم الكلى والكشف عن ضيق الشريان الكلوي بين مرضى ارتفاع ضغط الدم. في هذه الأطروحة تم دراسة طول وعرض وسمك الكلى بواسطة الموجات الصوتية للمرضى اللذين يعيشون في علو شاهق. تم حساب حجم

الكلى أيضا لمرضى ارتفاع ضغط الدم. تم أيضا تقييم مدى فائدة الموجات الصوتية العادية والدوبلر في الكشف عن حجم الكلى. تهدف الدراسة إلى تأسيس قيم مرجعية لحجم الكلى و الكشف عن ضيق الشريان الكلوي لمرضى ارتفاع ضغط الدم.
واستخدمت عوامل دوبلر خارج الكلية للكشف عن هذا الضيق. تصف الدراسة مراحل تطور ضيق الشريان الكلوي وتقيس حجم الكلى وتقارنه بالمصابين وغير المصابين بضيق الشريان الكلوي. العمل الحالي لديه قسمين رئيسيين ، قياس حجم الكلى لسكان أصحاء وقياس الحجم لمرضى ارتفاع ضغط الدم يعيشون في مناطق مرتفعة بواسطة استخدام الموجات الصوتية. الدراسة هي تطبيقية وتم فيها استخدام التقنيات القياسية للموجات الصوتية والتي يكون فيها المريض مستلقي على ظهره. استخدمت الدراسة جهاز (Logic3)ومسبار ذو تردد 3ز 5 ميقاهيرتز. عينة الدراسة هم سكان القاطنون في منطقة عسير على ارتفاع 2200متر. في الجزء الأول من الدراسة تم فحص 325 شخص وكان متوسط الحجم يتراوح بين 57.1 إلى 147.78سم $^3$ و 57.46 إلى 147.83 للكلية اليمين واليسار على التوالي. كان حجم القشرة الكلوية 1.8 سم للجانبين. أما المجموعة الثانية فقد تم فحص 175 مريض بارتفاع ضغط الدم وكان الحجم 85.65 و 87.38سم $^3$ للكلية اليمين واليسار على التوالي. نسبة ضيق الشريان الكلوي في هذه المجموعة كانت 13.14 % وحجم الكلية عند المصابين بضيق الشريان الكلوي كان 57.08 و 65.17 سم $^3$ للكلية اليمين واليسار على التوالي. أظهرت الدراسة أهمية الموجات الصوتية باعتبارها أداة مفيدة لقياس حجم الكلى والكشف عن ضيق الشريان الكلوي. وقد لوحظ تباين كبير في حجم الكلى بين الذكور والإناث والفئة العمرية والجانب الأيمن والأيسر.تعتبر عوامل الدوبلر خارج الكلية أسلوب جيد وكافي للكشف عن ضيق الشريان الكلوي. وقد توصلت الدراسة إلى قيم مرجعية لحجم الكلى لسكان المناطق المرتفعة و مرضى ارتفاع ضغط الدم وتوصى الدراسة انه من الضروري أجراء دراسات إضافية لتحسين المعلومات الاحصائية ومقارنة نتائج الدراسة بمناطق مرتفعة مختلفة .

.

# Abstract

The normal size of a kidney is variable and is affected by age, gender and body mass index. Renal artery stenosis (RAS) is the

commonest secondary cause of hypertension and may result in renal ischemia with resultant renal failure. Natives of high altitude are known to have a low oxygen supply in the tissues and the kidneys play a crucial role in acclimatization because they regulate body fluids, electrolytes and acid base homeostasis. Gray scale and Doppler ultrasound were used to depict the renal size and to detect (RAS) among hypertensive patients. In this thesis, measurement of renal volume was studied by ultrasound in term of length, width and thickness for patients living in high altitude. Renal volume was also calculated for hypertensive patients. The usefulness of gray scale and Doppler ultrasound in detecting renal volume was evaluated. The study intended to establish a reference values for renal size and volume. The incidence of (RAS) among hypertension group was also evaluated. Extrarenal Doppler parameters are used to detect (RAS). The study describe the progression of (RAS) and also measure the volume kidneys with (RAS) and compare it with volume of other hypertension patients without (RAS). The present work has two major parts; measurement of renal size in normal population and measurement of the size in hypertensive patients living in high altitude by gray scale and Doppler U/S. The study is prospective one, in which a standard technique of U/S with the patients supine are used. Logic 3 U/S machine with 3.5 MHZ transducer is used. The study sample is population living in Aseer region at (2400m) altitude. For the first part of the study, a total of 325 patients were investigated. The mean volume were range from 57.1 to 147.78 $cm^3$

for right and 57.46 to 147.83 $cm^3$ for left kidney. The cortical size was 1.8 to cm in both side. For the second group, (175) hypertensive patients were investigated by gray scale and Doppler U/S. The mean volume were 85.65±1.3 and 87.38±1.8 $cm^3$ for right and left kidney respectively. The incidence of (RAS) was 13.14%. The mean volume in (RAS) group was 57.08 and 65.17 $cm^3$ for the right and left respectively. The cortical size in both side was 1.5cm. The study showed the important of ultrasound as a useful tool to measure renal volume and to detect (RAS). Considerable variation were observed among renal volume between male and female, age group and the side. The extrarenal parameters are considered as a good standard technique for detection of RAS). The study established a reference values for renal volume in normal and hypertensive patients living in high altitude. However, additional studies are necessary to improve statistical information by including .parts from different high altitude areas

# Dedication

,To the soul of my father

,to my mother

,to my wife

and to my kids

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