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Sonographic Comparison of Patellar Tendon Thickness with Height in Chronic Diabetic Patients and Normal Individuals

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Research Article

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ABSTRACT

Background: Diabetes mellitus causes damage to the musculoskeletal system, but the severity depends upon its duration and level. It is to be widely considered that the knee joint is the most accessible joint for clinical examination. For both accuracy and reproducibility when compared to the clinical exam knee ultrasound was proven to be superior.

Objective: To determines the Sonographic comparison of patellar tendon thickness with height in chronic diabetic patients and normal individuals.

Methods: The study was conducted at the civil hospital Jamrud Khyber Agency, in six months. Point of care ultrasound (GE logic book) with high-frequency transducer was used. All the patients were enrolled voluntarily after explaining the procedure to the patient thoroughly. An informed consent form was signed from each. Age, height, weight, right and left patellar tendon, proximal and distal part thickness were measured for both diabetics and non-diabetics individuals.

Results:

proximal part & distal part of right patellar tendon thickness and the proximal part & distal part of left patellar tendon thickness of p-value 0.00, 0.01, 0.00 and 0.023 respectively with height.

Conclusions:

comparison of patellar tendon thickness with height in chronic diabetic patients and normal individuals.

INTRODUCTION

Diabetes mellitus is a metabolic disorder which concerns with the different type of complications and also many diseases. These include eye disease retinopathy [1], nervous system diseases nephropathy [2], bone-related disease like osteoporosis [3], and delay healing of wound [4].Diabetes mellitus is characterized by hyperglycemia, is the outcome of defects in insulin secretion and insulin action, or both [5]. Prolong duration and high level of Diabetes mellitus causes to damage musculoskeletal system [5-9]. Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and also Ultrasound (US) imaging of musculoskeletal sys-tem for diabetic patients reported in alterations in their tendon structures [10]. Clinical demonstration of tendon pathologies in diabetic patients with poor blood sugar control often suffer from musculoskeletal pain, the incomplete Range of Motion (ROM) of the joints of body and tendon tears risk present each movement of life [11]. The frequency of connective tissue diseases, such as

increased in both patients with type 1 and type 2 diabetes [12-14]. In healthy individuals, the musculoskeletal system tendons are strong whitish rubbery while to on other hand in patients suffering from diabetes the musculoskeletal system tendons are altered their normal shape into yellowish, weak & atrophic [15,16]. It is to be generally thought that in the human body the knee joint is the easiest available joint for medical assessment. For both accuracy & research studies when compared to the medical assess-ment knee joint sonography was demonstrated to be advanced [17]. In the knee joint, Quadriceps muscle distally has an extension named the patellar tendon. That patellar tendon starts from the patella and inserts at the tibial tuberosity [18]. The length of the knee joint varies from one individual to another. Normally its length is 3 to 6 cm. Similarly, the thickness of the patellar tendon in anterior-posterior thickness also varies from one individual to another i.e. 4 to 5 mm in normal adults [19]. Different types of games that need running and jumping, for example, basketball and volleyball, the knee joint region is the most frequently injured part of the human body [20]. There are different types of radiological equipment such as CT, MRI and US are used for knee joint examinations but unluckily, the outcome of those imaging modalities is unclear for Patellar Tendon (PT) injuries. These examinations are better to provide information that made diagnosis better for the Patellar Tendon (PT) pathology but help to rule out other causes & to evaluate the cruelty of the injury [20,21]. Ultrasound is now taking recognition to diagnose those types of pathologies [21]. Patellar Tendon (PT) in the knee joint is the tubular organ that joint the tibial bone to the lower part of the patella can clearly evaluate with the help of ultrasound [22]. Ultrasound is an easily available and its cost is also affordable so that is why it also getting popularity among the doctors and also the public [20,23]. In the human body, the knee joint patellar tendon (PT) echo texture of the patellar tendon is thicker like conic proximally having a large and thinner nature, and become smaller distally to a slim and broad at tibial insertion [24,25]. The knee joint in the human body differs from person to person with regards to its structure and morphology. There-fore, the purpose of my study was to take a comparison and to assess variation in patellar tendon thickness in diabetic patients and normal individuals with height.

METHODS

A cross-sectional observational study was conducted at the civil hospital Jamrud Khyber Agency, Khyber Pakhtoonkhwa, Pakistan from 1st July 2017 to 1st February 2018. GE Logic BOOK ultrasound with the linear transducer, frequency range from 7 to 10 MHz was used in this research study. The study sample size was 410, sampling techniques were convenient sampling and study duration was 9 months. The inclusion criteria were containing that participants were classified into two groups (Diabetic group, Group of Normal Individual) on the basis of their sugar levels. For the Diabetic group, participants had characteristics Dia-betic patients for a minimum of 3 years, Age above 25-year of both female and male and not having any symptoms of pain, swell-ing or edema or other disorder. Similarly, the groups of normal individual participants were having characteristics, non-diabetes, healthy individuals, from the same population with the same range of Body Mass Index (BMI), both female and male of age above 25 years & not having any symptoms of pain, swelling or edema or other disorder. Exclusion criteria were for non- cooperative individuals, Non- healthy individual & below 25 years and above 70 years. Ethical approval was obtained from the Committee of the University of Lahore before study. Approval was taken from the hospital management for the collection of data. The privacy of participants kept up all over research study. Patients have explained the research procedure, benefits to the medical science and written informed consent form signed by each participant. Research moral principles were the spectator as that research study contains human beings as research study items. All these individuals have differed body composition. Global sonographic techniques & examination procedures were applied in that research study. The height of each participant was taken in centime-ter. All patients were scanned in the supine position with knee joint flexed with 35 degrees. The probe has placed on knee joint transversely and longitudinally that is head of the probe toward the patient right side and patient head respectively. Measurement of both right and left knee joint patellar tendon proximal and distal thickness was taken with the probe keeping in longitudinal way [26]. While following international and departmental protocols, Data of patellar tendon thickness were collected from patella inferior side 5 mm away at the proximal side and 5 mm distal side of patellar tendon at superior side of the tibia, for both right and left knee joint in each individual that take parts as a subject in that research study. All the 410 participants were divided into non-diabetic and diabetic individuals. Then that individual from both diabetic and non-diabetic further divided into female and male groups to take examines for their patellar tendon of knee joint with help of ultrasound imaging using high-frequency linear array transducer. All the above groups of participants were further divided into different age groups in each diabetic and non-diabetics individual related to both male and female groups. Keeping that principal, data were collected in such a method of ultrasound using a high-frequency probe that each value that obtained was placed in their own subgroups. All that principals, procedures and techniques made that research study able to collect its data to fulfill the universal law and protocols.

RESULTS

All the 410 participants were divided into 223 (54.4 %) non-diabetic and 187 (45.6 %) diabetic individuals. Similarly, male 196 (47.8 %) and female 214 (52.2 %) gender was also separated as shown in the following **(Table 1)**.

Table 1: Frequency of Baseline Variables

VARIABLES	FREQUENCY	PERCENT
Male	196	47.8
Female	214	52.2
Diabetic	187	45.6
Non-Diabetic	223	54.4
Total	410	100

All the above groups of participants were further divided into different age groups in each diabetic and non-diabetic indi-viduals, related to both male and females gender groups showed in **(Figure 1)**, there were 28-40, 41-50, 51-60 and 61-70 have 86(21%), 102(24.9%), 127(31%), and 95(23.2%) frequency and percentage respectively as shown in **(Table 2)** and **(Figures 2 and 3)**. There was minimum, maximum, mean and Standard Deviation for variables that are Age in years, height in cm, weight in kg, RBS, right patellar proximal, right patellar distal, left patellar proximal, left patellar distal and history of Diabetes Mellitus in years. Age in years has minimum, maximum, mean and standard deviation were 28, 70, 50.29 and ± 11.46 respectively as showed in **(Table 3)**. Height in centimeter has the minimum, maximum, mean and standard deviation were 105.00, 194.00, 163.65 and ± 8.50 respectively as shown in **(Table 3**). Right patellar proximal have the minimum, maximum, mean and standard deviation were 0.26, 0.84, 0.50 and ± 0.10 respectively as showed in table 3. Right patellar distal have the minimum, maximum, mean and standard deviation were 0.20, 0.56, 0.34 and ± 0.06 respectively as showed in **(Table 3)**. Left patellar distal have the minimum, maximum, mean and standard deviation were 0.27, 0.89, 0.50, and ± 0.10 respectively as showed in **(Table 3)**. Left patellar distal have the minimum, maximum, mean and standard deviation were 0.18, 0.52, 0.34 and ± 0.06 respectively as showed in **(Table 3)**.

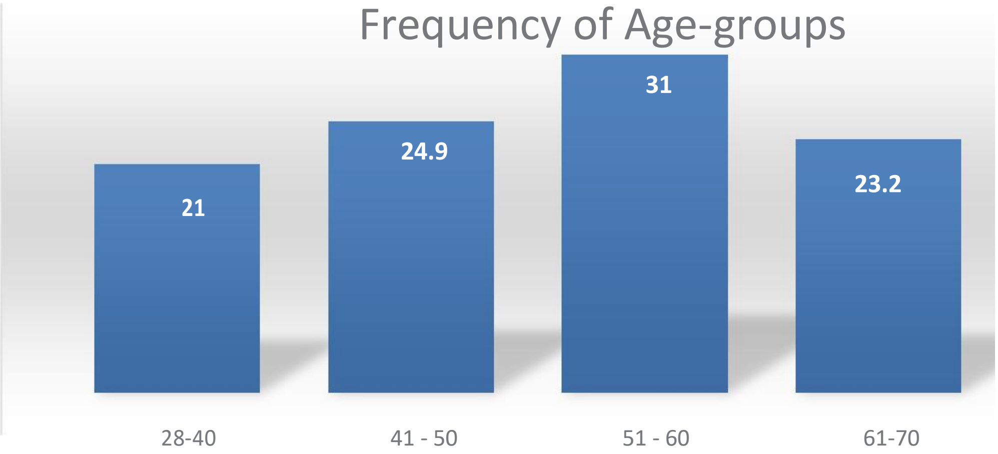

Figure 1: Frequency of Age Groups

Table 2: Age-Group Frequency Table

AGE GROUPS	FREQUENCY	PERCENT
28-40	86	21
41 - 50	102	24.9
51 - 60	127	31
61-70	95	23.2
Total	410	100

Table 3: Mean, Standard Deviation

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age in years	410	28	70	50.29	11.46
Height in cm	410	105	194	163.65	8.5
Weight in Kg	410	41	114	71.64	15.07
RBS	410	100	600	205.3	112.86
Right Patellar Proximal	410	0.26	0.84	0.5	0.1
Right Patellar Distal	410	0.2	0.56	0.34	0.06
Left Patellar Proximal	410	0.27	0.89	0.5	0.1
Left Patellar Distal	410	0.18	0.52	0.34	0.06
History of Diabetes Mellitus in Years	410	3	25	3.57	5.25

Figure 2: Patellar Tendon Measurement

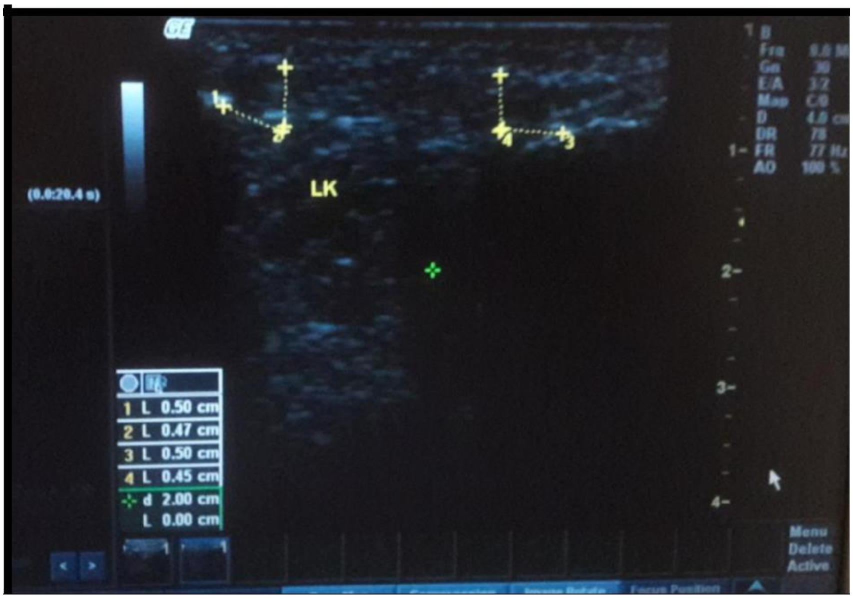

Figure 3: Patellar Tendon Measurement

History of DM in years has the minimum, maximum, mean and standard deviation were 3.00, 25.00, 3.57 and ± 5.25 respectively as showed in **(Table 3)**. The significant correlation was found between the proximal part & the distal part of the right patellar tendon thickness and the proximal part & distal part of the left patellar tendon thickness of p-value 0.00, 0.01, 0.00 and 0.023 respectively with height as shown in **(Table 4)**.

Table 4: Height and Patellar Tendon Thickness Correlation

		Right patellar proximal	Right patellar distal	Left patellar proximal	Left patellar distal
Height in cm	Pearson Correlation	.267**	.127**	.209**	.112*
	Sig. (2-tailed)	0	0.01	0	0.023
	N	410	410	410	410
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

DISCUSSION

In the research study conducted by Fevziye ÜNSAL-MALAS1 et al. in 2014 about the association among Hemoglobin Levels & Femoral Cartilage Thickness in the knee joint. They founded that Lower Hemoglobin levels seem to have the negative impact on the femoral cartilage thickness. My study agrees with it as the thickness of musculoskeletal system directly has the correlation with weight [27]. In other study regarding association of sonographic patellar tendon assessment techniques in elite junior female volleyball players thickness versus cross-sectional are studied by Uğur Toprak et al. in 1912, and they concluded that relationship was found among age & tendon thickness & among the thickness and area of the tendon, my study also agree with it that there is relation between age and patellar tendon thickness [28]. A research study about sonographic measures of tendon thickness that is Intra-rater, Inter-rater and Inter-machine reliability conducted by María Elena del et al. in muscles, ligaments and tendons journal, 2017 and they have resulted that tendon thickness can be measured reliably on different ultrasound devices, which is an important step forward in the use of this technique in daily clinical practice and research my study also agreed with it ultrasound can be successfully used for ligaments and tendons measurements [29]. A research study conducted having the title “sonographic measurements of Patellar Tendon Differences Depending on Previous Training by Roberto Seijas, et al. in the International Jour-nal of Orthopedics in 2017. An interobserver variability was checked while measuring the patellar tendon thickness, width, and length, among an expert in musculoskeletal ultrasonography (gold standard), an obstetric sonographer, an orthopedic surgeon and a third-year medical student. They concluded that there was very little variability among the observers while measuring the patellar tendon because this tendon has very distinct boundaries. They further added during learning Musculoskeletal ultrasound more focus should be given on ultrasound technique related skill and knowledge rather than anatomical domains. My research study also agrees same that the present paper represents an approach to learning systems in musculoskeletal ultrasound and counseling courses to focus on ultrasound technique knowledge rather than anatomical domains [30,31].

CONCLUSION

A significant correlation was found between the proximal part & the distal part of the right patellar tendon thickness and the proximal part & distal part of left patellar tendon thickness with height.

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