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Ultrasound Evaluation of Scrotal Pain and Swelling According to Age Group

Mahmood Najdi Haidar[1*] and Aska Jamal Farooq[2]

[1]Candidate of Radiology and medical imaging program at Kurdistan higher council of medical specialties, Erbil, Iraq
[2]Department of surgery (radiology branch), college of medicine, Hawler medical university, Erbil, Iraq.
*Corresponding author: mahmudbazzaz8433@yahoo.com

ABSTRACT

Background: Scrotal pathologies are common emergency diseases in male population. The ultrasound is non-invasive tool useful in diagnosis of different disorders.
Methods: An observational cross-sectional study conducted in Radiology department of Rizgary Teaching hospital and Rojhalat Emergency hospital at Erbil city, Kurdistan region, Iraq within two years from March 1, 2023, to February 28, 2025 on sample of one hundred males with scrotal pain and swelling. Clinical diagnosis of cases was done in emergency department and obtained from their records. The ultrasound diagnosis was implemented by researchers after completing their ultrasound examination
Findings: Clinical diagnosis revealed hydrocele in 40% of patients and varicocele in 42% of them. By ultrasound, the hydrocele was present in 32% of patients and varicocele in 38% of them, while normal testes were detected by ultrasound in 70% of patients. Generally, the present study found that most of studied scrotal pathologies are varied with age of patients.
Conclusions: The ultrasound is a highly accurate and cost-effective imaging tool in differential diagnosis of scrotal pain and swelling. Scrotal pathologies detected by ultrasound examination are variable in regard to different age groups.

KEYWORDS: Scrotum, Pain, Swelling, Age, Ultrasound.

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INTRODUCTION

The epididymis, testicles, and the lower portion of the spermatic cord are all located in the fibromuscular cutaneous sack known as the scrotum. Neoplastic diseases, simple inflammatory diseases, and congenital abnormalities are among the pathological conditions that impact these structures [1]. The definition of acute scrotum is pain, whether or not there is scrotal oedema. It is considered as a medical emergency that occur accompanying localized or systemic symptoms [2, 3]. Spermatic cord torsion and acute epididymitis or epididymoorchitis are two of the most common differential diagnosis for acute scrotum. Rare diagnoses include idiopathic scrotal oedema, segmental testicular infarction, testicular tumour, and strangulated hernia [4]. This discussion will focus solely on those experiencing acute pain without a prior history of trauma or the presence of a tumour before the discomfort's beginning. The clinical symptoms of the many aetiologies of acute scrotal discomfort exhibit overlapping [5].

Information explicitly detailing the occurrence of acute scrotum as a presenting symptom is few; however, male genitourinary problems are believed to constitute between 0.5% and 2.5% of total visits to emergency rooms. On the other hand, testicular torsion is thought to occur once per 4000 years. It is expected that 1 out of 160 males may get spermatic cord torsion within the first twenty-five years of their lives [6]. The occurrence, while conceivable at any age, significantly declines into adulthood. Among youngsters, the predominant cause of acute scrotal pain is torsion of the appendix testis, rather than torsion of the spermatic cord. The most frequent cause of acute scrotal pain in adults is epididymitis. Annually, it is predicted that more than 600,000 instances are identified in emergency rooms across the United States, with this ailment accounting for One out of 144 ambulatory visits for men aged 18 to fifty years old. Due to varying associated risks and microbial aetiologies, the illness typically has a bimodal age occurrence [7].

A physical examination that involves observation, inspection, and eliciting indicators such cremasteric reflux may be inconclusive due to the patient's pain and discomfort, and a physical exam alone frequently is unable to differentiate between the reasons of acute scrotum since signs and symptoms can coincide [8]. Urine dipsticks, urine cultures, and microscopy are examples of laboratory tests that can only support clinical judgment [9]. Given its quick diagnostic capabilities, ultrasonography has become the gold standard for assessing acute scrotal diseases. Imaging is crucial in this situation. When paired with colour Doppler, high-resolution grayscale ultrasound delivers comprehensive anatomical and vascular information, enabling quick and precise diagnosis [10].

Since ultrasound reveals detailed anatomy of the testicles along with neighboring tissues and assesses arterial circulation in the present moment, it is a crucial method of imaging in the diagnosis of testicular and scrotal disease. Nonspecific manifestations including scrotal pain, swelling, or a palpable scrotal tumour are frequently found during a physical examination. In addition to identifying and characterizing intra-testicular or extra-testicular lesions, ultrasound can frequently differentiate between benign and malignant lesions and indicate circumstances that call for immediate surgery. Moreover, ultrasound examination is a secure, cost-effective, and easily accessible diagnostic technique that does not necessitate irradiation [11]. It has been shown that the diagnosis of scrotal swellings is significantly impacted by colour Doppler examination of the scrotum. Assessing acute scrotal oedema is the primary use of colour Doppler ultrasound, which can show scrotal blood flow, particularly in the differential diagnosis of testicular torsion and epididymoorchitis [12]. This study aimed to investigate age-specific variations in ultrasound

features of scrotal pain and swelling.

METHODS

Design of current study was an observational cross-sectional implemented within period of two years, from March 1, 2023, to February 28, 2025, in Radiology department of Rizgary Teaching hospital and Rojhalat Emergency hospital at Erbil city, Kurdistan region, Iraq. The subject cohort consisted of males with scrotal pain and swelling. Males in various age groups presented with scrotal pain and swelling referred for ultrasound assessment were eligible to participate. Those with previous diagnosis, systemic diseases and patients who declined to participate were excluded. The study protocol received approval from the Kurdistan Higher Council of Medical Specialists Ethics Committee, hospital administration, and oral informed consent of patients or their parents (pediatric patients). Following their eligibility for inclusion and exclusion criteria, one hundred males with scrotal pain and swelling were chosen.

Researchers obtained the information from the male patients who were enrolled directly or from their saved records using a prepared questionnaire. The researchers created the survey. The survey asked about the following: age of enrolled male patients, clinical diagnosis of male patients, the ultrasound diagnosis of male patients regarding scrotal pain and swelling. Clinical diagnosis of cases was done by Urologists, Surgeons and Physicians in emergency department of the hospitals and obtained from their records. The ultrasound diagnosis was implemented by researchers after completing their ultrasound examination using (Mindray-Resona 7-2017, Philips hd11xe-2007 and Samsung R7-2011) equipments.

To statistically examine the collected data, the Statistical Package of Social Sciences software, version 26, was utilized. Categorical variables were examined using the chi square or Fisher's exact tests. Kappa statistic was applied to assess the agreement. The study employed a significance threshold of 0.05 or below.

RESULTS

Present study enrolled one hundred patients with scrotal pain and swelling, presented with mean age (31.7 years); 32% of patients were in age group 20-29 years and 34% of them were in age group of 30-39 years. (***Figure 1***)

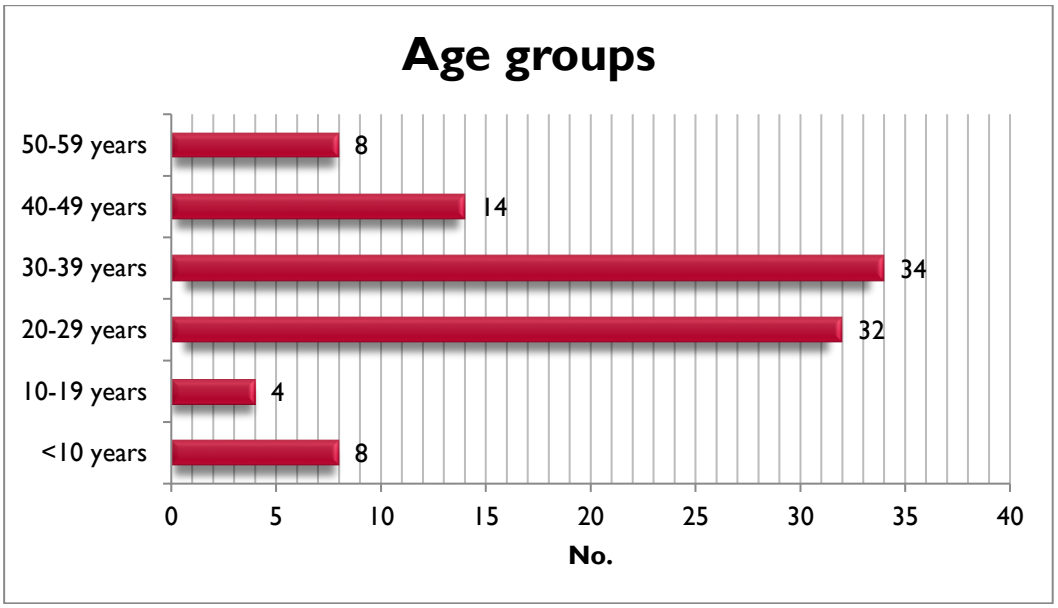

Figure 1: Patients age groups.

Clinical diagnosis revealed hydrocele in 40% of patients and varicocele in 42% of them. Normal testes were detected clinically in 24% of patients, while testicular torsion was detected clinically in 20% of patients and torsion of appendix testes was present in 30% of them. Epididymo-orchitis was detected clinically in 44% of patients and orchitis in 48% of them. The cysts were detected clinically in 32% of patients, while epididymal microlitiasis was detected clinically in 8% of patients. Haematocele was detected clinically in 12% of patients, while spermatocele was detected in 8% of them and pyocele in 8% of them. Reducible hernia was detected clinically in 30% of patients, while strangulated inguinal hernia was detected clinically in 6% of patients and tumors were present in 16% of them. (***Figure 2***)

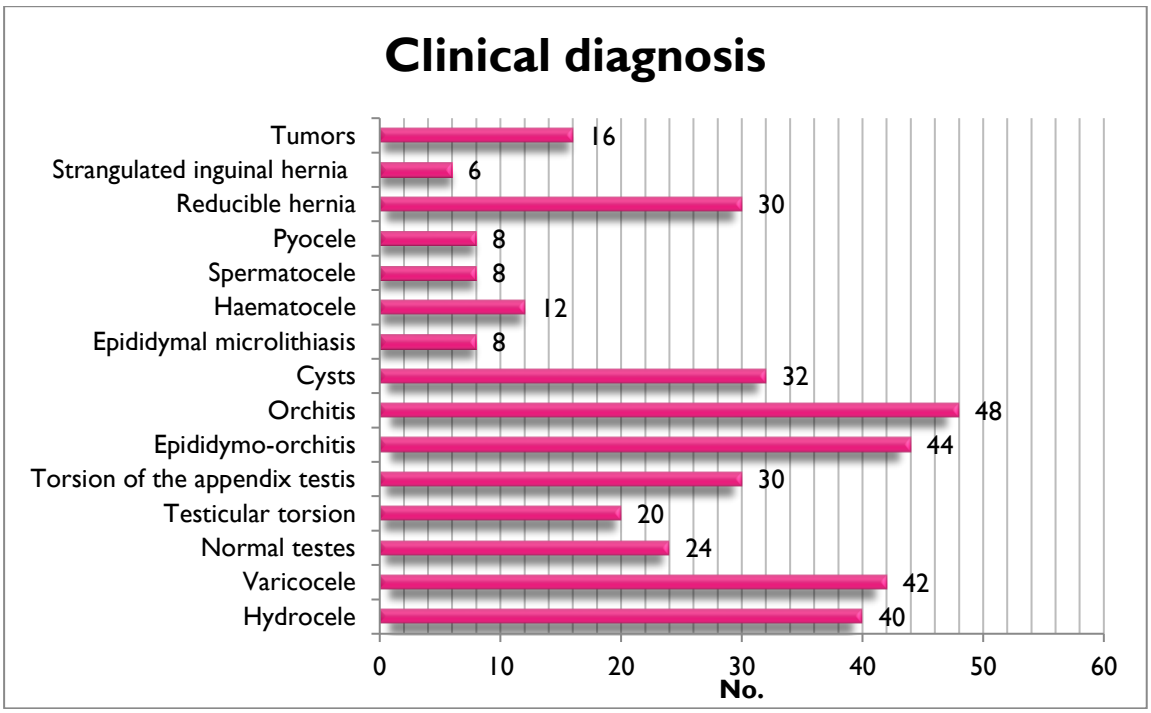

Figure 2: Clinical diagnosis of scrotal pain and swelling.

By ultrasound, the hydrocele was present in 32% of patients and varicocele in 38% of them. Normal testes were detected by ultrasound in 70% of patients, while testicular torsion was detected in 4% of patients with no diagnosis of torsion of appendix testes. Epididymo-orchitis was detected by ultrasound in 16% of patients and orchitis in 14% of them. The cysts were detected by ultrasound in 26% of patients, while epididymal microlitiasis was detected in 12% of patients. Haematocele was detected by ultrasound in 8% of patients, while spermatocele was detected in 4% of them and pyocele in 4% of them. Reducible hernia was detected clinically in 6% of patients, while strangulated inguinal hernia was detected clinically in 4% of patients and tumors were not diagnosed by ultrasound. (***Figure 3***)

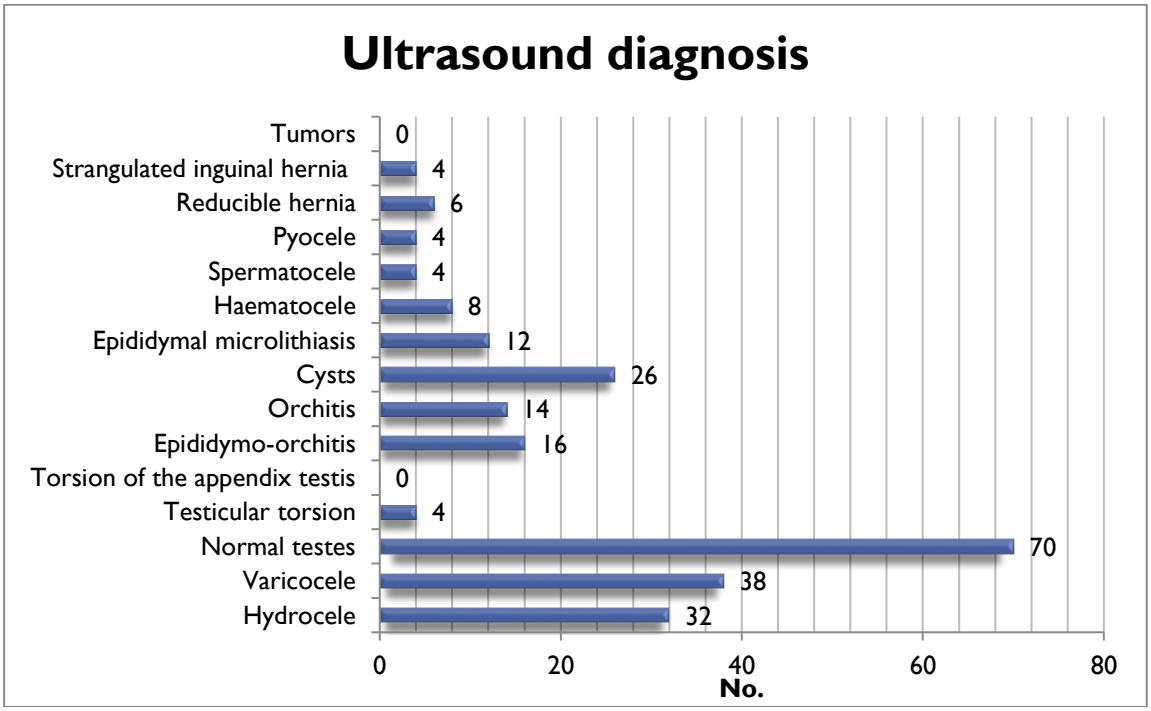

Figure 2: Clinical diagnosis of scrotal pain and swelling.

The hydrocele cases were significantly varied by age groups ($p<0.001$), as increased with elderly age groups. Varicocele cases were significantly predominant in middle age groups ($p=0.002$). Normal testes were significantly higher in childhood age group ($p=0.001$). Testicular torsion was significantly prevalent in adolescent age group ($p<0.001$). Epididymo-orchitis was significantly higher in middle age groups ($p<0.001$). No statistically significant differences between cases with age groups in regard to orchitis, cysts, spermatocele, pyocele and reducible hernia. The epididymal microlitiasis cases were significantly varied by age groups

(p=0.01), as increased with childhood. Haematocele cases were significantly predominant in childhood (p<0.001). Testicular torsion was significantly prevalent in middle age group (p<0.001). (***Table 1***)

Table 1: Ultrasound diagnosis in regard to age groups.

US diagnosis	Age groups						P
	<10 y.	10-19 y.	20-29 y.	30-39 y.	40-49 y.	50-59 y.	
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Hydrocele							**<0.001**[S]
Positive	4 (50.0)	4 (100.0)	0	10 (29.4)	6 (42.9)	8 (100.0)	
Negative	4 (50.0)	0	32 (100.0)	24 (70.6)	8 (57.1)	0	
Varicocele							**0.002**[S]
Positive	0	0	14 (43.8)	20 (58.8)	4 (28.6)	0	
Negative	8 (100.0)	4 (100.0)	18 (56.3)	14 (41.2)	10 (71.4)	8 (100.0)	
Normal testes							**0.001**[S]
Positive	8 (100.0)	0	28 (87.5)	20 (58.8)	10 (71.4)	4 (50.0)	
Negative	0	4 (100.0)	4 (12.5)	14 (41.2)	4 (28.6)	4 (50.0)	
Testicular torsion							**<0.001**[S]
Positive	0	4 (100.0)	0	0	0	0	
Negative	8 (100.0)	0	32 (100.0)	34 (100)	14 (100.0)	8 (100.0)	
Epididymo-orchitis							**<0.001**[S]
Positive	0	0	2 (6.3)	14 (41.2)	0	0	
Negative	8 (100.0)	4 (100.0)	30 (93.8)	20 (58.8)	14 (100.0)	8 (100.0)	
Orchitis							0.12 [NS]
Positive	0	0	6 (18.8)	8 (23.5)	0	0	
Negative	8 (100.0)	4 (100.0)	26 (81.2)	26 (76.5)	14 (100.0)	8 (100.0)	
Cysts							0.1 [NS]
Positive	0	0	8 (25.0)	12 (35.3)	2 (14.3)	4 (50.0)	
Negative	8 (100.0)	4 (100.0)	24 (75.0)	22 (64.7)	12 (85.7)	4 (50.0)	
Epididymal microlithiasis							**0.01**[S]
Positive	4 (50.0)	0	4 (12.5)	2 (5.9)	2 (14.3)	0	
Negative	4 (50.0)	4 (100.0)	28 (87.5)	32 (94.1)	12 (85.7)	8 (100.0)	
Haematocele							**<0.001**[S]
Positive	4 (50.0)	0	0	0	4 (28.6)	0	
Negative	4 (50.0)	4 (100.0)	32 (100.0)	34 (100)	10 (71.4)	8 (100.0)	
Spermatocele							0.1 [NS]
Positive	0	0	0	4 (11.8)	0	0	
Negative	8 (100.0)	4 (100.0)	32 (100.0)	30 (88.2)	14 (100.0)	8 (100.0)	
Pyocele							0.1 [NS]
Positive	0	0	0	4 (11.8)	0	0	
Negative	8 (100.0)	4 (100.0)	32 (100.0)	30 (88.2)	14 (100.0)	8 (100.0)	
Reducible hernia							0.2 [NS]
Positive	0	0	0	4 (11.8)	2 (14.3)	0	
Negative	8 (100.0)	4 (100.0)	32 (100.0)	30 (88.2)	12 (85.7)	8 (100.0)	
Strangulated inguinal hernia							**<0.001**[S]
Positive	0	0	0	0	4 (28.6)	0	
Negative	8 (100.0)	4 (100.0)	32 (100.0)	34 (100)	10 (71.4)	8 (100.0)	

S=Significant, NS=Not significant.

According to Kappa statistics, stronger agreement between clinical diagnosis and ultrasound diagnosis was shown regarding strangulated inguinal hernia (kappa=0.79), haematocele (kappa=0.77), pyocele (kappa=0.64) and varicocele (kappa=0.58), while lowest agreement was shown regarding hydrocele (kappa=0.48), epididymo-orchitis (kappa=0.39), epididymal microlithiasis (kappa=0.33), orchitis (kappa=0.3), testicular torsion (kappa=0.29), cysts (kappa=0.27) and reducible hernia (kappa=0.25). No significant agreement was reported between clinical diagnosis and ultrasound diagnosis was shown regarding torsion of appendix

testes, spermatocele and tumors. (***Table 2***)

Table 2: Comparison between clinical and ultrasound diagnosis.

Diagnosis	Clinical		Ultrasound		Kappa	P
	No.	%	No.	%		
Hydrocele					0.48	**<0.001**[S]
Positive	40	40.0	32	32.0		
Negative	60	60.0	68	68.0		
Varicocele					0.58	**<0.001**[S]
Positive	42	42.0	38	38.0		
Negative	58	58.0	62	62.0		
Normal testes					0.23	**<0.001**[S]
Positive	24	24.0	70	70.0		
Negative	76	76.0	30	30.0		
Testicular torsion					0.28	**<0.001**[S]
Positive	20	20.0	4	4.0		
Negative	80	80.0	96	96.0		
Torsion of the appendix testis					-	-
Positive	30	30.0	0	-		
Negative	70	70.0	100	100.0		
Epididymo-orchitis					0.39	**<0.001**[S]
Positive	44	44.0	16	16.0		
Negative	56	56.0	84	84.0		
Orchitis					0.3	**<0.001**[S]
Positive	48	48.0	14	14.0		
Negative	52	52.0	86	86.0		
Cysts					0.27	**0.006**[S]
Positive	32	32.0	26	26.0		
Negative	68	68.0	74	74.0		
Epididymal microlithiasis					0.33	**0.001**[S]
Positive	8	8.0	12	12.0		
Negative	92	92.0	88	88.0		
Haematocele					0.77	**<0.001**[S]
Positive	12	12.0	8	8.0		
Negative	88	88.0	92	92.0		
Spermatocele					-0.05	0.5 [NS]
Positive	8	8.0	4	4.0		
Negative	92	92.0	96	96.0		
Pyocele					0.64	**<0.001**[S]
Positive	8	8.0	4	4.0		
Negative	92	92.0	96	96.0		
Reducible hernia					0.25	**<0.001**[S]
Positive	30	30.0	6	6.0		
Negative	70	70.0	94	94.0		
Strangulated inguinal hernia					0.79	**<0.001**[S]
Positive	6	6.0	4	4.0		
Negative	94	94.0	96	96.0		
Tumors					-	-
Positive	16	16.0	0	-		
Negative	84	84.0	100	100.0		

S=Significant, NS=Not significant.

DISCUSSION

Numerous conditions, including infection, vascular pathology, trauma and tumors can affect the scrotum. Alongside an individual's history of illness and physical examination, ultrasound is the preferred image technique for evaluating scrotal diseases [13].

The current study found that average age of patients with scrotal pain and swelling was (31.7 years). This mean age is close to mean age of (34 years) reported by recent retrospective record-based study in Saudi Arabia on patients with scrotal diseases [14]. Our study found that common clinical diagnosis of patients with scrotal pain and swelling was orchitis (48%), followed by; epididymo-orchitis (44%), varicocele (42%) and hydrocele (40%). These findings are close to results of recent cross sectional Indian study which revealed that orchitis, hydrocele and varicocele were the common clinical diagnosis of adult patients with scrotal pain and swelling [15].

The ultrasound examination of present study for patients with scrotal pain and swelling found that 70% of cases had normal testes, while cysts were detected by ultrasound in 26% of patients, epididymo-orchitis was detected by ultrasound in 16% of patients and orchitis in 14% of them. These findings are in agreement with results of previous review study conducted in United States of America which stated that ultrasonography is accurate in diagnosis of scrotal pathology with main findings of normal testes, cysts, epididymo-orchitis and orchitis [11]. However, our study findings are inconsistent with results of previous prospective cross sectional Iraqi study which reported the hematocele as the common ultrasound findings in patients with scrotal swelling [16]. This inconsistency might be attributed to differences in etiologies of scrotal pathology between different country areas. Another previous study carried out in Nepal revealed that epididymitis was the main ultrasound finding, followed by cysts and normal testes [17]. In general, there was a wide gap between clinical diagnosis and ultrasound finding regarding normal testes (24% vs. 70%). This finding is similar to results of previous study implemented in United Kingdom which reported that ultrasound is highly accurate tool in diagnosis of scrotal diseases and saving high cost[18].

Generally, the present study found that most of studied scrotal pathologies are varied with age of patients. Consistently, recent cross sectional study implemented in Iraq on documented that scrotal diseases assessed by ultrasound are varying with different age groups of patients [19]. The hydrocele cases were increased with elderly age groups ($p<0.001$). This finding coincides with results of recent study in Nepal [20]. Middle age patients were significantly related to varicocele, epididymo-orchitis and strangulated inguinal hernia. These findings are close to results of recent Turkish study [21]. In our study, adolescent and children age patients were significantly related to normal testes, testicular torsion, epididymal microlitiasis and hematocele. Similarly, recent Polish study reported that common sonography findings of scrotal pain in pediatrics and adolescents were testicular torsion, epididymal microlitiasis and hematocele [22].

In present study, stronger agreement between clinical diagnosis and ultrasound diagnosis was shown regarding strangulated inguinal hernia (kappa=0.79), haematocele (kappa=0.77), pyocele (kappa=0.64) and varicocele (kappa=0.58), while lowest agreement was shown regarding hydrocele (kappa=0.48), epididymo-orchitis (kappa=0.39) and no agreement was shown regarding torsion of appendix testes, spermatocele and tumors. These findings are close to results of previous cross sectional study conducted in Cameroon which reported higher agreement between clinical diagnosis and ultrasound in cases of varicocele and testicular torsion with no agreement was shown regarding orchitis and tumors [23].

In conclusion, the ultrasound is a highly accurate and cost-effective imaging tool in differential diagnosis of scrotal pain and swelling. Scrotal pathologies detected by ultrasound examination are variable in regard to different age groups. This study recommended use of ultrasound in diagnosis of scrotal diseases.

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CONFLICT OF INTEREST

Declared none.

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