**Deanship of Graduate Studies Al-Quds University** 



# Diagnostic Accuracy of Physical Tests for Subacromial Impingement Syndrome among Adults

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**M.Sc Thesis** 

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# Diagnostic Accuracy of Physical Tests for Subacromial Impingement Syndrome among Adults

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A thesis submitted in partial fulfillment of the requirement for the degree of Master of Physiotherapy - Deanship of Graduate Studies - Al-Quds University

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# **Deanship of Graduate Studies Al-Quds University**



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1443/2022

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# Dedication

Firstly, I'd like to thank the Lord and mainly for his wisdom, strength, mind power, and safety and for giving me a healthy life.

My wonderful family, especially my beloved Mother and Father, have always been a source of inspiration for me. They have given me courage when I was about to give up, and they continue to spiritually, and emotionally support me.

My work is dedicated to my friends, families, and coworkers who supported and encouraged me to accomplish this study.

This thesis is dedicated to particular to Dr. Hadeel Halaweh, who encouraged and supported me throughout the writing process. Thank you to the Al-Quds University faculty and staff for always encouraging and motivating me to achieve as a researcher.

# Declaration

I certify that this thesis submitted for the degree of Master is the result of my research, except where otherwise acknowledged, and this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed:

E chmon Jaris Jonine #

Fares Edmon Ishak Janineh

Date: 10/04/2022

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Thanks everyone who has supported me up throughout this critical but exciting period of my career.

# **Diagnostic Accuracy of Physical Tests for Subacromial Impingement Syndrome among Adults**

#### **Prepared by: Fares Edmon Ishak Janineh**

#### Supervisor: Dr. Hadeel Halaweh

#### Abstract

**Background:** Subacromial impingement syndrome (SIS) is one of the most common causes of shoulder pain and is associated with substantial shoulder impairments. SIS is a significant public health problem affecting approximately 7% annually of the population. The purpose of the study is to verify the physical examination tests' results with a golden standard finding for subacromial impingement syndrome diagnosis.

**Methods and Materials:** A prospective, single-blinded study, using a convenient sample included 30 participants, age 20-60 years with shoulder pain. All participants were examined with 5physical examination tests by the first blinded physiotherapist. Within a week, magnetic resonance image (MRI) as "Gold Standard" was applied by experienced musculoskeletal radiologists using a standardized report form. The diagnoses were done by both methods respectively.

**Statistical analysis:** Data captured by SPSS 26, the analysis were performed to evaluate the diagnostic value of the tests compared to MRI results. Associations' analysis through one sample T- test and One-way ANOVA test were conducted.

Sensitivity, specificity, and positive and negative predictive values evaluated for the diagnosis of SIS between physical examination tests and MRI, and computed by 2x2 table.

**Results**: 30 participants were included, all of the physical examination tests were positive in more than half of the patients, and the Hawkins and Kennedy test had a high sensitivity (94.1%) and accuracy (73.3%). However, the sensitivity of resist isometric abduction was modest (47.1%). The MRI results indicated that a number of 17 patients (56.7%) had positive signs of SIS and 13 (43.3%) patients recorded negative signs of SIS.

**Conclusion**: Physical examination tests demonstrated good diagnostic accuracy for identifying SIS. According to our findings, the Hawkins and Kennedy test, as well as the Neer sign test, are effective diagnostic methods for identifying SIS, with the highest sensitivity and accuracy. Accurate and early detection of SIS diagnosis in clinical practice may help to enhance the management of those who have shoulder disorders.

**Keywords**: Rotator cuff, shoulder impingement, supraspinatus tear, sensitivity, physical examination.

الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل الكتف بين البالغين الفلسطينيين.

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ملخص عن الدراسة باللغة العربية

ا**لمقدمة:** تعد متلازمة الاصطدام تحت الأخرمي أحد الأسباب الأكثر شيوعًا لآلام الكتف وتترافق مع ضعف كبير في الكتف. ان متلازمة الاصطدام تحت الأخرمي تعد مشكلة صحية عامة و تؤثر على ما يقارب حوالي 7٪ من السكان سنويا.

**الهدف من هذه الدراسة**: هو التحقق من نتائج اختبارات الفحص الإكلينيكي مقارنة بالرنين المغناطيسي لاكتشاف و تشخيص متلازمة الاصطدام تحت الأخرمي.

**المنهج المتبع للدراسة:** دراسة استطلاعية باستخدام عينة ملائمة تشمل 30 مشاركًا ، تتراوح أعمار هم بين 20- 60 عامًا يعانون من آلام في الكتف. تم إجراء 5 اختبارات إكلينيكيةلجميع المشاركين من قبل أخصائي العلاج الطبيعي. في خلال أسبوع ،و بعد ذلك تم اخذ صورة الرنين المغناطيسي (MRI) باعتبارها "المعيار الذهبي" من قبل أخصائيي أشعة ذوي الخبرة باستخدام نموذج تقرير موحد. ويتم التشخيص بالطريقتين على التوالي.

**التحليل الإحصائي:** البيانات التي تم تحليلها بواسطة SPSS 26 ، التحليل الذي تم إجراؤه لتقييم القيمة التشخيصية للاختبار ات مقارنة بنتائج التصوير بالرنين المغناطيسي. تم تحليل المعلومات من خلال الاختبار عينة واحدة T-TEST و ANOVA .

تم تقييم الحساسية والنوعية والقيم التنبؤية الإيجابية والسلبية لتشخيص الالام الكتف بين اختبارات الفحص البدني والتصوير بالرنين المغناطيسي ، ويتم حسابها بواسطة جدول 2\*2 **نتائجالدراسة**:تضمنت الدراسة 30 مشارحًا ، وكانت جميع اختبارات الفحص الإكلينيكية إيجابية في أكثر من نصف المرضى ، وكان اختبار هوكينز وكينيدي يتمتع بحساسية عالية (94.1٪) ودقة (73.3٪). أشارت نتائج التصوير بالرنين المغناطيسي إلى أن عددًا من 17 مريضًا (56.7٪) لديهم علامات إيجابية لـ SIS

الاستنتاج: أظهرت اختبارات الفحص الإكلينيكي دقة تشخيصية جيدة لتحديد SIS ، وفقًا لنتائجنا. يعد اختبار هوكينز وكينيدي ، بالإضافة إلى اختبار علامة نير ، طريقتين تشخيصيتين فعالتين لتاكيدSIS ، بأعلى حساسية ودقة. قد يساعد الاكتشاف الدقيق والمبكر لتشخيص SIS في الممارسة السريرية في تعزيز علاج أولئك الذين يعانون من آلام الكتف.

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## List of abbreviations:

SIS: Subacromial impingement syndrome RC: Rotator Cuff S: Sensitivity SP: Specificity PPV: Positive Predictive Value NPV: Negative Predictive Value LR: Likelihood Ratio ACJ: Acromioclavicular Joint MRI: Magnetic Resonance Imaging Mra: Magnetic Resonance Arthrography

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#### **Chapter one: Introduction**

#### **1.1 Background**

The human shoulder joint is the most movable joint in the body. The static and dynamic supporting structures offer a wider range of motion in many planes of the body, putting the joint at risk of instability (Chang et al., 2020). Also, tendonopathy and rotator cuff tears typically affect the shoulder joint, which is a complicated anatomic structure (Huegel et al., 2014). Therefore, if this joint is injured or damaged, this will lead to a disorder called subacromial impingement syndrome. Subacromial pain radiates extending from the shoulder joint to the area between the neck and the elbow and worsens with overhead activity (Tangrood et al., 2018).

One of the most main sources of shoulder pain is subacromial impingement syndrome, which is linked to significant shoulder limitations (Witten et al., 2019). In the pathogenesis of rotator cuff injury, the link between subacromial impingement and rotator cuff illness is a contentious issue(Umer et al., 2012). Subacromial impingement can be caused by both extrinsic joint compression and intrinsic soft tissue deterioration (Harrison & Flatow, 2011). In terms of an individual's capacity to do daily tasks at home and at work, signs and symptoms can be chronic and severe.

Shoulder pain is a frequent reason for people to visit their doctor or an orthopedic clinic all around the world. Shoulder disorders affect 7% to 34% of the population, according to SIS(Chu et al., 2021), and it is described as the third most common musculoskeletal condition (after chronic low back pain) resulting in pain and disability(Tangrood et al., 2018). Subacromial shoulder painrepresenting 89% of total shoulder complaints referred to orthopedic doctors and physiotherapists(Virta et al., 2012).

Recently, there is a debate among many techniques and methods to diagnose patients with subacromial impingement such as magnetic resonance imaging, ultrasonography, and physical examination. However, Physical examination, range of motion and endurance, and provocative shoulder testing are some of the diagnostic test procedures used on the shoulder joint to aid in the diagnosis of shoulder pain(Çalış et al., 2000). Also, can be confirming the findings from the physical assessment and providing an accurate diagnosis(Magee, 2014). Although globally there are many studies about diagnostic accuracy for subacromial impingement syndrome, to our knowledge, the evidence is still limited in Palestine. Therefore, this study aims to assess the accuracy of clinical tests compared to MRI findings among adult Palestinians.

#### **1.2 Problem statement**

Physical examination tests are efficient tools to provide an accurate diagnosis for patients with subacromial impingement(Silva-Fernández et al., 2008). In general, most patients go for diagnosis such as MRI and US, and these techniques are expensive and time costly; however, physical examinations might be used as a simple practical diagnostic method and with less cost.

There is a lack of studies on SIS in Palestine, to our knowledge, this would be the first study in Palestine addressing the accuracy of physical examination tests among SIS patients. Therefore, the aim of this study is to investigate the diagnostic accuracy of physical tests for subacromial impingement syndrome among adults Palestinians.

#### **1.3 Justification of the study**

The study may contribute to give credibility to available tests with less time and cost for patients with SIS, and will reduce the complications related to SIS dysfunction. The findings of this study are expected to improve early diagnosis and treatment. Furthermore, the applications of the studied

physical examinations tests might be developed to be used by orthopedic doctors and physiotherapists in Palestine as a valid diagnostic tool of SIS.

## **1.4 Study objectives**

- To assess the diagnostic accuracy of physical examination tests for subacromial impingement syndrome among adult patients.
- To verify the physical examination tests' results with a golden standard (MRI) finding for subacromial impingement syndrome diagnosis.
- Is there a significant association between pain severity, shoulder range of motion and muscle strength (Oxford scale) among patients with SIS.

# **1.5 Study hypothesis**

#### Null hypothesis:

- There is no diagnostic accuracy of physical examination tests for subacromial impingement syndrome among adults.
- There is no significant association between pain severity, shoulder range of motion and muscle strength (Oxford scale) among patients with SIS.

#### Alternative hypothesis:

- There is a diagnostic accuracy of physical tests for subacromial impingement syndrome among adults.
- There is a significant association between pain severity, shoulder range of motion and muscle strength (Oxford scale) among patients with SIS.

## **1.6 Terminology**

- SIS: Subacromial impingement syndrome: It spreads from the shoulder joint to the area between the neck and the elbow, and it gets worse with overhead motion(Tangrood et al., 2018).
- SI: Subacromial impingement
- ACJ: Acromioclavecal joint
- RC: Rotator cuff
- VAS: Visual analog scale
- ROM: range of motion
- MMT: manual muscle test
- Cyriax functional examination: a set of tests for determining the severity of a shoulder dysfunction include : 3 arm elevations tests, 3 glenohumeral joint tests, and 6 resisted tests are included(Ombregt, 2013).
- Sensitivity: the ability of a test to correctly identify patients with a disease =TP / (TP+FN)(Parikh et al., 2008).
- Specificity: the ability of a test to correctly identify people without the disease =TN / (FP+TN)(Parikh et al., 2008).
- True positive (TP): the person has the disease and the test is positive.
- True negative (TN): the person does not have the disease and the test is negative.
- False positive (FP): the person does not have the disease and the test is positive.
- False negative (FN): the person has the disease and the test is negative.

• Positive predictive value (PPV): the chance that people who have a positive screening test actually have the disease=TP / (TP+FP)

Negative predictive value (NPV): the possibility that people who receive a negative diagnostic test do not actually have the disease =TN/(TN+FN).

- Accuracy: how precisely the measured value or findings reflect the real or the original values. = (TP+TN)/(TP+TN+FP+FN)
- Positive likelihood ratio (+LR): The likelihood of a positive test in a patient divided by the probability of a positive test in a patient without a disease= sensitivity / (100 specificity)(Shreffler & Huecker, 2022)
- Negative likelihood ratio(-LR): the likelihood of a patient testing negative who has a disease divided by the possibility of a patient testing negative who doesn't have a disease = (100 sensitivity) / specificity.

#### **Chapter Two: Literature Review**

#### 2.1 Theoretical studies

#### **Definition**:

The shoulder joint is structurally a ball-and-socket joint and functionally a multiaxial joint and diarthrodial joint. This term is divided into two terms: di, which refers to a type of articulation that allows for maximum motion, and arthrodial, which refers to a sliding joint that allows for surface gliding motion (Whiting & Rugg, 2006). The AC joint and the glenohumeral joint make up the shoulder joint, which is a three-dimensional plane joint with flexion-extension, abductionadduction, and internal-external rotation (Miniato MA, Anand P, 2020).

In a healthy shoulder, the passive tissues (labrum, joint capsule, and ligaments) work together with the active structures (muscles and related tendons) to maintain dynamic stability throughout movements.(Põldoja et al., 2017).The acromion, the coracoid process, the AC joint, and the coracoacromial ligament are all located beneath the subacromial canal(Dal Maso et al., 2015) (See figure 2.1).



Figure 2.1 anatomical overview of the shoulder

#### **Pathology**:

Anatomical factors, rotator cuff disease, aging, arthritis, acromial shape, and anomalies such as subacromial and acromioclavicular joint spurs are among the intrinsic variables that cause SIS. Extrinsic factors include glenohumeral instability and restrictive processes of the glenohumeral joint, as well as misalignment of the shoulder joint caused by an imbalance of the muscles controlling the scapula or improper trunk postures, altered scapular kinematics, and mechanical factors, glenohumeral instability, and mechanical factors(Seitz et al., 2011).Other pathological factors that contribute to the narrowing of the subacromial area include repetitive overhead movement in athletes, degeneration, and tearing of the rotator cuff tendons(Julie A. Creech; Sabrina Silver., 2020).

#### **Risk factors of SIS:**

- Demographics: Age above 60 years old, female sex and previous shoulder injury.
- Systematic diseases: Diabetes, cardiovascular disease and Osteoarthritis.
- Occupation status and mechanical factors: Work with the shoulder above 90°, repetitive and sustained arm abduction, heavy manual work, repetitive work, high frequency of work, high force exposure of work and vibration work.
- Acromion shape: anatomical variations of the scapula such as hooked acromion.
- Sleeping position.
- Smoking status.
- Shoulder instability
- Anthropometrics: Increased body mass index.
- Psychological factors: High psychological demand, low co-worker support, and poor safety measures (Leong et al., 2019).

#### **Physical examinations tests**

Many physical examination tests are used to aid the assessment of joint dysfunction and are used by clinicians in physical therapy, and orthopedics during clinical tests. Also, these tests are used to identify specific musculoskeletal problems. They help in the differential diagnosis of orthopedic conditions and injuries(Gismervik et al., 2017).

The accuracy of physical examination tests is significantly related to specific terminologies; Sensitivity: the ability of a test to correctly identify patients with a disease.

Specificity: the ability of a test to correctly identify people without the disease.

Positive predictive value (PPV): the chance that people who have a positive screening test have the disease.

Negative predictive value (NPV): the possibility that people who receive a negative diagnostic test do not have the disease (Parikh et al., 2008).

Accuracy: how precisely the measured value or findings reflect the real or the original values. Positive likelihood ratio (+LR): The likelihood of a positive test in a patient divided by the probability of a positive test in a patient without a disease.

Negative likelihood ratio (-LR): the likelihood of a patient testing negative who has a disease divided by the possibility of a patient testing negative who doesn't have a disease (Shreffler & Huecker, 2022).

#### 2.2 Similar Studies

In a study evaluating the incidence of symptomatic and asymptomatic rotator cuff tears in the general population, they discovered that in the 1950s and 1960s, the prevalence of tears was substantially higher in men than in women. In contrast, there was a statistically significant gender difference in injury incidence (p 0.001) in a comparison study of men and women in sports injuries. As a result, more shoulder injuries were reported by females. This could be linked to a higher rate of shoulder injury among females, which is most likely due to the intensive training(Sallis et al., 2001).

In a cross-sectional study conducted by Hira et al, between the ages of 22 and 41 for 100 office receptionists of both genders. The highest prevalence of work-related neck and shoulder

pain was identified, with 72 and 62 cases respectively. Many studies have shown that those who spend more than 3-4 hours sitting in a slouched position, such as secretaries, receptionists, and teachers, suffer from shoulder impingement as a result of poor ergonomic and biomechanical positioning (Rajput, 2019).

According to an MRI study published in 2018, 93 percent of the patients had signs of rotator cuff impingement, including 13 full-thickness tears. The majority of patients with full-thickness supraspinatus tendon tears reported rotator cuff disease, which was found to be related to long head biceps tendon rupture (Vestermark et al., 2018).

In a study conducted in 2019, a blinded practitioner performed a physical examination with Cyriax functional evaluation, while another blinded radiologist performed ultrasonography. They discovered that the examination had a high sensitivity (90.4 %) for subacromial-subdeltoid bursitis, as well as moderate to high specificity (70.3 %). Cyriax's functional examination demonstrated a high sensitivity in diagnosing subacromial-subdeltoid bursitis and a high specificity in rotator cuff injuries, according to the findings (Kuo & Hsieh, 2019).

Also, in a study of 55 patients, five physical examination tests for SIS were used. They observed that the painful arc, empty can, and external rotation resistance tests had moderate to substantial agreement, whereas the Neer and Hawkins-Kennedy tests had fair agreement. (Michener et al., 2009).

According to a study conducted in Singapore General Hospital in 2014, shoulder impingement syndrome (SIS) is one of the most common pathologies. The study found that 44–65 percent of all shoulder pain complaints in adults had this disorder, which was attributed to the shoulder joint's heavy physical demands (Tien & Tan, 2014).

Another study was conducted in Birmingham, United Kingdom. The physical examination tests were administered to the subjects shortly afterward, and it was discovered that the Hawkins and Kennedy tests were the most accurate for identifying SIS (71.0 percent).Besides that, pain on resisted external rotation and weakness during the full can test (63.6 percent) for the presence of subdeltoid fluid, pain on resisted external rotation (58.8 percent) for incomplete tears, and the painful arc test (62.1 percent) for complete tears were the most accurate tests for diagnosing subcategories of impingement(Kelly et al., 2010).

Many studies discussed the effectiveness of diagnostic tests for shoulder pain due to soft tissue disorder. In individuals who may have had tissue shoulder disorders, ultrasonography, MRI, or MRA may be used. Each study assessed sensitivity, specificity, and positive and negative probability ratios with 95% confidence intervals for each test. The study shows 10 cohort studies of clinical examination that reported a high sensitivity at ruling out rotator cuff tears when negative and high specificity at ruling in such disorders when positive. In 38 cohort studies, ultrasound was found to be most accurate when used to detect full-thickness tears; sensitivity was reduced when used to detect partial-thickness tears. In a systematic review conducted by Dinnes et. al. A total of 29 cohort studies were included in the MRI study. Overall averaged sensitivities and specificities for full-thickness tears were rather high. MRI or ultrasound can both be used to detect full-thickness rotator cuff injuries. They conclude the clinical examination by specialists can rule out the occurrence of a rotator cuff tear (Dinnes et al., 2003).

Also, in a prospective study that was conducted by Mirco et. al in 2018. The goal of this study was to look at the diagnostic accuracy of seven clinical tests for diagnosing supraspinatus tendon injuries. In order to see if a combination of tests can help enhance diagnosis accuracy. When compared to pain or employing both criteria, they discovered that muscular weakening had the

definitive diagnostic precision. There was no one clinical diagnostic that could distinguish between partial and full-thickness tears. The diagnostic value was improved by combining at least three or more tests(Sgroi et al., 2018).

A cross-sectional study of 59 participants with chronic shoulder pain was done by Susan et al. Reported the value of the physical test for subacromial impingement syndrome. For diagnosing SIS, the Hawkins and Kennedy test was the most accurate (71.0 %). The full can test (63.6%), pain on resisted external rotation (58.8%), and the painful arc test (62.1%) were the most accurate tests for diagnosing subcategories of impingement (Kelly et al., 2010).

Furthermore, a prospective, single-blinded study was done by Silva et al. 2008. The goal of the study was to see how accurate physical tests were in diagnosing SIS, which was confirmed by MRI. The results of clinical testing and MRI findings are correlated. According to the authors, All of the clinical tests have reasonable sensitivity (all above 58%), but low specificity around10% - 60%. Yocum was the most sensitive and accurate maneuver (65.5%), followed by Hawkins and Jobe tests (Silva et al., 2008).

The goal of a prospective cohort study was to see how effective nine different clinical tests were at diagnosing rotator cuff tears. Magnetic resonance arthrography was the gold standard (MRA). The empty can test was shown to be the most sensitive (68.4%), the drop arm and lift-off tests to have the highest specificity (100%), and the Neer test to have the best overall accuracy (75 percent ) (van Kampen et al., 2014).

#### 2.3 Summary

Through literature review, many studies support that MRI has high sensitivity in the diagnosis of subacromial impingement syndrome, while other studies concluded that ultrasound scanning had good examination results for patients who complain of rotator cuff injuries. A growing literature supports the use of physical examination tests in the diagnosis of subacromial impingement syndrome, accuracy and sensitivity of specific diagnostic tests are vital factors to be considered in the diagnosis of SIS according to recommendations of several studies. Also, many studies discussed the high cost-effectiveness of medical imaging for MRI and waiting time. Besides these two diagnostic tools, the physical examination had good findings in the diagnosis of SIS patients with high accuracy of special tests.

#### **Chapter three: Methods and materials**

#### **3.1Study design**

A prospective single blinded study with a diagnostic validity design; the results of clinical examination tests to be compared with diagnostic imaging tests (MRI). The study was designed according to existing guidelines of diagnostic accuracy studies(Diercks et al., 2014; N. C. A. (Nigel) Hanchard, J. (Janis) Cummins, 2004). The therapists performing the physical tests do not know the result of MRI until the study is completed.

#### **3.2Study sample**

#### **3.2.1 Sampling method**

A convenient sampling method was used, which is defined as a non-probability sample method, this form of sampling means that to select the participants from the people who are available in orthopedic clinics and physiotherapy centers at the time of this study period (Etikan, 2016). The researcher got a collaboration with orthopedic physicians and other therapists in Bethlehem and Hebron to recruit the participants.

#### **3.2.2 Inclusion Criteria**

- Patients with rotator cuff syndromes
- Patients over the age of 18 years, and less than 60 years.
- Conscious, able to follow verbal instructions
- No history of traumatic injury to the shoulder
- Sign a consent form

## 3.2.3 Exclusion criteria

- Fractures or dislocations around the shoulder complex.
- Referred pain from the cervical spine.
- Sensory or motor deficit involving the upper limb.
- Previous surgery to the shoulder or cervical spine.
- Red flags: osteoporosis, abnormal joint shape, local mass or swelling, tender joint and severe restriction of movement.
- Refused to sign a consent form.
- Phobia from close area (MRI)

#### 3.2.4 Sample size

Every potential participant that could be identified during May-2021- January2022was invited to participate in this study. A number of 30 patients was recruited



**Figure 3.1 Sampling Method** 

## **3.3 Settings of the study**

The study was conducted at Janineh center for physiotherapy and rehabilitation, Vanda medical center and Herbawi medical imagining in Bethlehem and Hebron /West Bank.



Figure 3.2 Map of Palestine (Map of world, 2014)

#### **3.4Study tools**

For the purpose of collecting data related to the study questions, the researchers used several data collection tools that included:

#### **1-** Data collection sheet For Patients

The patient's questionnaire contains information related to people who have SIS disorder, it contains demographic and clinical characteristics of the patients including, height, weight, gender, address, phone number, city, work, education, socioeconomic status, past medical history, medications, easing and aggravating factors, and the pain onset. Also, easing and aggravating factors were recorded.

#### **2-** Functional tests for shoulder joint.

Tests that are related to functional examination of the SIS were included, composed of:

- Test for active range of motion for shoulder joint by goniometer to measure shoulder flexion, extension, abduction, internal and external rotation with 30-seconds rest intervals between consecutive measurements(Kolber & Hanney, 2012).
- Tests to measure the muscles strength during shoulder joint movements by oxford scale for manual muscle test, scoring from 0-5, which 0 means no visible or palpable contraction while 5 means muscle activation against examiner's full resistance, full range of motion(Naqvi U, 2020).
- Tests related to the pain intensity in different activities and the participant should answer by giving a scoring from 0 to 10 which 10 means severe pain while 0 means no pain. According to the visual analog scale (Delgado et al., 2018).

#### **3-** Physical examination:

The physical examination consisted of the following tests that are used in the clinical diagnosis of subacromial conditions:

#### A. Hawkins and Kennedy test:

Places the patient's arm at 90 degrees of shoulder flexion with the elbow bent to 90 degrees while sitting, and then internally rotates the arm (see figure 3.1). If the patient complains of pain during internal rotation, the test is considered positive (Flynn et al., 2008). This test has high sensitivity 0.62 - 0.92 with moderate specificity 0.25-1.00 (Dutton, 2008).



Figure 3.3 Hawkins and Kennedy test.

#### **B.** Painful arc of abduction:

The patient should be instructed to abduct the arm in the scapular plane whether the patient is seated or standing. If the patient feels any pain in or around the glenohumeral joint while abducting the arm, they must tell the physiotherapist. When discomfort starts, the physiotherapist will tell the patient to keep abducting their arm as high as they can.

When the patient reaches about 120 degrees of abduction, the level of pain they are experiencing should decrease. After completing the abduction action, the patient should progressively reverse the motion, bringing the arm back to its neutral position through the adduction movement (see figure 3.2). If the patient has pain between 60 and 120 degrees of abduction, which decreases once passing 120 degrees of abduction, this test is considered positive (Flynn et al., 2008). The Diagnostic Test Properties for painful arc abduction sign include low sensitivity(0.33)0.30 and high specificity (0.81)(Caliş et al., 2000).



Figure 3.4 Painful arc of abduction test

#### C. Neer's sign test:

With one hand, the examiner should support the patient's scapula while passively flexing the arm while internally rotating it (see figure 3.3). If the patient complains of pain while in this position, the test is considered positive(Caliş et al., 2000). The sensitivity of Neer's sign test was 79% and specificity was 60%, PPV was 1.35 and NPV was 0.82 (Dutton, 2008; Hegedus et al., 2012).



Figure 3.5 Neer's sign test.

#### **D.** Resisted isometric abduction:

The patient abducted his arm to 90 degrees in a standing position with his elbow extended and his arm in neutral rotation. The examiner delivered a downward push to the lateral aspect of the arm, proximal to the elbow, and the patient was requested to maintain this position (see figure 3.4). A positive test resulted in pain or weakness(Clarkson H. Baltimore, 2000).



Figure 3.6 Resisted isometric abduction

#### E. Resisted isometric external rotation:

The patient is asked to externally rotate the shoulder by moving the hand away from the side of the body while standing with the shoulder in neutral rotation and the elbow flexed to 90 degrees. As the examiner applied internal tension to the posterior portion of the forearm, proximal to the wrist, the patient will stay in this position (see figure 3.5). A positive test resulted in pain or weakness(Clarkson H. Baltimore, 2000).The sensitivity of resisted isometric external rotation test was moderate 0.56 and high specificity was 0.87 (Michener et al., 2009).



Figure 3.7 Resisted isometric external rotation

If any patient does not complete any of these examinations, the patient was excluded from the study.

#### 4- Magnetic resonance imaging (MRI) evaluation:

Magnetic resonance imaging (MRI) was our golden standard diagnostic examination, it becomes a frequently used diagnostic tool for the evaluation of structural abnormalities in the shoulder (Ashir et al., 2020; Shahabpour et al., 2008)

MRI was performed by a consultant radiologist, with extensive experience in musculoskeletal, particularly of the shoulder. The examinations were performed by (Siemens Magnetom Sempra 1.5 Tesla model, Germany 2019).

The patient was positioned in a supine position, with his or her head facing the scanner bore. The patient's arm should be in a neutral or slightly externally rotated position. Surface coils, also known as flexible coils, wrap around and conform to the anatomical area of interest. In the axial, coronal, and sagittal planes, preliminary scout localizers.



Figure 3.8 MRI Left Shoulder Scanning

#### 3.5 Study procedures

Firstly, recruitment procedures were arranged with physiotherapy and orthopedics clinics in Bethlehem and Hebron to identify and interview patients with SIS. Patients were invited to participate in this study for those who met the inclusion criteria. The purpose and procedures of the study were explained to the participants and they were asked to give a written informed consent before being recruited.

After signing the consent form, the participants were subjected to the relevant data collection sheet, which was filled with the help of the researcher, then the relevant tests were performed. The researcher is a well-qualified licensed therapist, and he has advanced knowledge and skills to perform the applied tests competently. In some cases, the tests were applied by the orthopedic doctors who were well- oriented about the study procedures.

The tests were applied as follows:

- 1- Hawkins and kennedy test,
- 2- Neer's sign test
- 3- Painful arc test
- 4- Resist isometric abduction test
- 5- Resist isometric external rotation test

Between each test, 2 minutes rest was given for the patients or sometimes more to release the provocation symptoms that may happen from the previous test. The applied tests do not pose any harm.

Upon completing the physical examination and within one week, all patients underwent MRI examinations.

#### **3.6Statistical analysis**

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) package, version 26. The analysis was performed to evaluate the diagnostic value of the tests compared to MRI results. Descriptive statistics (frequency and percentages) to exhibit the main characteristics of the sample. T-tests and ANOVA were used to determine the mean differences according to pain severity, ROM, oxford scale, and MRI.

Sensitivity, specificity, positive predictive value and negative predictive values were computed by 2x2 cross tabulation.

#### **3.7 Ethical consideration**

Ethical approval for the study was obtained from AL-Quds Research Ethics Committee (Appendix 4). Approval was also obtained from the orthopedic clinics and radiology centers who approved to participate in the study. The participants were fully informed about the study's objectives and procedures, and they had the right to refuse or withdraw from the study at any time. A signed written consent form was obtained. Data were processed confidentially, and the researcher was responsible of ensuring the participants' rights and safety.

#### **3.8Study Funding**

All patients were referred to MRI by the orthopedic doctors. Most of the patients were insured and the cost of MRI was covered.

# **Chapter Four**

## 4.1 Results presentation and analysis

#### 4.1.1 Recruitment and follow-up process

Patients were recruited from 5 centers and 2 hospitals in Bethlehem and Hebron, were 30 patients

assessed two times at the admission by physiotherapist (physical examination tests) and by MRI.

#### 4.1.2 Descriptive statistics of demographic variables

#### • Age of the participants.

Table 4.1 shows the 30 patients enrolled; the average age of the whole patients' group was found

to be  $40.40 \pm 10.01$  (range: 22–53).

#### Table 4.1. The Mean age, height, weight and body mass index of the participants (n=30).

	Minimum	Maximum	Mean	Std. Deviation
Participant's Age	22.0	53.00	40.40	10.01
Height	158.0	188.0	174.9	8.05
Weight	67.0	110.0	83.3	11.6
Body Mass Index	22.5	33.52	27.1	2.81

#### • Gender of the participants.



The study sample consisted of both females and males as shown in (Figure 4.1).

Figure 4.1: Gender of the Participants

#### • BMI of participants

Regarding BMI categorization of the participants, the distribution was: 7 (23.3%) participants had normal BMI, 16(53.4%) were overweight, and 7(23.3%) were obese, (Figure 4.2).



**Figure 4.2: BMI categories of the Participants** 

#### • Occupation of the participants.

Regarding the occupation of the participants, the distribution was: 10(33.3%) participants were working on office, 12(40%) workers, and 8(26.7%) don't work currently, (Figure 4.3).



Figure 4.3: The Participants Occupation

#### • Pain Severity &affected Side

Pain severity categorized by mild, moderate and severe. Also, there were 17(56.7%) of the affected right side as shown in table (4.2).

Pain severity	Frequency	Percent	
Mild	10	33.3	
Moderate	11	36.7	
Severe	9	30.0	
Affected side			
Right	17	56.7	
Left	13	43.3	

Table	4.2 Pain	Severity	&affected	Side	(n=30)
labic	<b>7.</b> 2 1 am	Bevenuy	Ganceicu	blue	(n-30)

#### 4.1.3 Descriptive statistics of MRI and clinical results

• MRI findings

Results of MRI indicated that a number of 17 patients (56.7%) had positive signs of SIS and 13 (43.3%) patients recorded negative signs of SIS.

#### • Clinical Results

Results of the applied tests in this study are listed as clinical findings in Table (4.3). No single test was positive in all the cases. Whereas Hawkins was positive among 76.7% of the participants. The resist isometric abduction and external rotation were negative in 50% of the sample. All the tests were positive in more than a half of the patients. A higher percentage of positive cases was recorded for the three tests (painful arc test, Neer impingement sign and Hawkins test).

Tests	Percentage positive	<b>N.</b>	
Hawkins and kennedy test	76.7	23	
Painful arc test	70.0	21	
Neer's sign test	66.7	20	
<b>Resist isometric Abduction</b>	50	15	
Resist isometric external rotation	50	15	

Table 4.3 clinical findings of the applied tests (n=30)

#### • Correlation between physical examination tests and MRI findings

Table 4.4 shows the sensitivity, specificity, PPV, NPV, accuracy and LR of the 5 physical test maneuvers in the detection of SIS. Sensitivity was reasonably good for 3 physical tests: Hawkins, Neer's and painful clinical tests (all of them recorded results above 70%), but the specificity was moderate, with values between 30% and 55%. The Hawkins was the most sensitive, followed by the Neer's and Painful arc maneuvers. Also, Hawkin's maneuver had the best PPV (69.5%) and was the most accurate (73.3%).

		M	RI	S	SP	PPV	NPV	Accuracy	+LR	ΙD	
		+	-	(%)	(%)	(%)	(%)	(%)		-LK	
Hawkins	+	16	7	94.1	46.2	69.5	85.7	73.3	1.75	0.13	
	-	1	6								
Neer's	+	12	8	70.6	38.5	60.0	50.0	56.7	1.15	0.76	
	-	5	5								
Painful	+	12	9	70.6	30.8	57.1	44.4	53.3	1.02	0.95	
arc	-	5	4								
Res, Abd	+	8	7	47.1	46.2	53.3	40.0	46.7	0.88	1.145	
	-	9	6								
Res, Ext	+	9	6	52.9	53.8	60.0	46.7	53.3	1.15	0.88	
·	-	8	7								

 Table 4.4. Physical examination tests' findings in MRI-confirmed SIS

S: Sensitivity, SP: specificity, positive and negative predictive values (PPV & NPV).

#### • Correlation between VAS and ROM (Shoulder)

Our results indicated that there was a significant association between VAS scale and shoulder range of motion, p<.001, as shown in table (4.5).

Shoulder ROM	VAS scale n=30			
variables	R <sub>s</sub>	P value		
Shoulder flexion	773**	<.001**		
Shoulder abduction	640**	<.001**		

Table 4.5 correlation between VAS scale and shoulder flexion and abduction

\*\*.Correlation is significant at the 0.01 level (2-tailed).

#### • T-Tests values according to pain severity and ROM

A comparison between the mean values among groups according to pain severity (mild, moderate and severe). Our results indicated that there were significant differences among groups according to oxford scale of shoulder abduction (P<0.05), as shown in table 4.6.

Table 4.6 Pain severi	ty according to	oxford scale	for shoulder abduction
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(I)Pain	(J)Pain	Mean	Std.	Sig.	95%	Confidence
Severity	Severity	Difference (I-	Error		Interval	
		<b>J</b> )			Lower	Upper
					Bound	Bound
Mild	Moderate	.690*	.282	.021	.110	1.27
	Severe	$1.60^{*}$	.297	.000	.989	2.21
Moderate	Mild	690*	.282	.021	-1.27	110
	Severe	.909*	.290	.004	.312	1.50
Severe	Mild	-1.60*	.297	.000	-2.21	989
	Moderate	909*	.290	.004	-1.50	312

Our results indicate that there were significant differences among groups according to Oxford scale for shoulder abduction were the results recorded significant difference among the mild and severe group and between the moderate and severe group (P<0.05). However, no significant differences were recorded between the mild and the moderate group (P>0.05). As shown in table (4.7)

The 4.7 Pain severity according to Range of motions for shoulder abduction

Pain	Pain Severity	Mean	Std.	Sig.	95% Confide	ence Interval
Severity I-J	I-J	Difference	Error		Lower	Upper
		( <b>I-J</b> )			Bound	Bound
Mild	Moderate	20.9	11.2	.074	-2.13	43.9
	Severe	57.7*	11.8	.000	33.5	82.0
Moderate	Mild	-20.9	11.2	.074	-43.9	2.13
	Severe	36.8*	11.5	.004	13.1	60.5
Severe	Mild	-57.7*	11.8	.000	-82.0	-33.5
	Moderate	-36.8*	11.5	.004	-60.5	-13.1

The mean value of oxford scale for shoulder flexion between mild and moderate indicated that there were no significant differences among groups according to oxford scale for shoulder flexion(P=.144). However, there were significant differences between mild and severe pain (P=0.00). As shown in table (4.8).

Pain	Pain	Mean	Std.	Sig.	95% Confi	idence Interval
severity-I	Severity-J	Difference	Error		Lower	Upper
		( <b>I-J</b> )			Bound	Bound
mild	Moderate	.263	.175	.144	095	.622
	Sever	1.011*	.184	.000	.633	1.38
moderate	Mild	263	.175	.144	622	.095
	Severe	.747*	.180	.000	.378	1.11
sever	Mild	-1.011*	.184	.000	-1.38	633
	Moderate	747*	.180	.000	-1.11	378

Table 4.8 Pain severity according to oxford scale for shoulder flexion

\*. The mean difference is significant at the 0.05 level.

Table 4.9 illustrates a comparison between the mean values among groups according to pain severity (mild, moderate and severe). Our results indicated that the ROM for shoulder flexion were significantly difference (P<0.05) according to pain severity.

Pain Severity-I	Pain Severity-J	Mean Difference	Std. Error	Sig.	95% Interval	Confidence
		( <b>I-J</b> )			Lower Bound	Upper Bound
mild	Moderate	37.1*	11.5	.003	13.4	60.8
	Sever	77.9*	12.1	.000	52.9	102.8
moderate	Mild	-37.1*	11.5	.003	-60.8	-13.4
	Sever	$40.7^{*}$	11.8	.002	16.3	65.1
sever	Mild	-77.8*	12.1	.000	-102.8	-52.9
	Moderate	-40.7*	11.8	.002	-65.1	-16.3

 Table 4.9 Pain severity according to Range of motions for shoulder flexion

\*. The mean difference is significant at the 0.05 level.

• T-test value according to oxford scale and painful arc test.

A significant difference on the mean values of oxford scale according to the painful arc test (p<0.001) was recorded, where patients with positive painful arc test recorded lower scores on the oxford scale. As shown in table 4.11 and figure 4.5.

Table 4.10 the mean values (oxford scale) according to the painful arc test

Painful arc		Ν	Mean	Sig.
	test			
<b>Oxford scale</b> Positive		21	3.57	001
of abduction Negative		9	4.55	.001



Figure 4.4 comparison between painful arc test and MMT ABD

#### **4.2 Discussion**

Shoulder pain is very common in orthopedic clinics, as patients complain of similar symptoms due to the etiology of the shoulder complex, which makes a specific diagnosis difficult. Physical examination tests played an important role in differentiating and evaluating the diagnostic value of individual clinical shoulder tests for SIS in our study. We hypothesize that physical tests (Hawkins, painful arc, Neer's sign, resist isometric abduction, and resist isometric external rotation) can detect the diagnostic accuracy of SIS in adults. In clinical practice, an accurate diagnosis of SIS may help to enhance the treatment and management of people who have shoulder problems(Sgroi et al., 2018).

Occupation-related SIS, the shoulder has evolved to be able to tolerate extreme physical demands while moving through an extraordinarily wide range of motion. Because of its complexity and the demands placed on it (high demands, low control, negatively impacting musculoskeletal health), the shoulder is prone to a variety of articular and peri-articular diseases (Linaker & Walker-Bone, 2015). According to a study of work-related and personal factors (ergonomic and physical hazards) in SIS among electronics workers, that they found 19% of those with shoulder symptoms had SIS. (Chu, Wang, & Guo, 2021). Type of occupation had the influence of shoulder pain, 40% of our sample was workers and 33.3% was office workers, who are complaining of SIS. Through many similar studies related to work offices such as secretaries, receptionists, and teachers who spend more than 3-4 hours sitting in a slouched position, they suffer from SIS due to bad ergonomic and biomechanical position (Rajput, 2019).

In terms of gender, evidence suggests that the prevalence of SIS is higher among males. The risk varied by gender, with force having a greater impact on men's SIS. As a result, men workers were

probably more likely than women to be exposed to the possibility of being forced to work. (Chu et al., 2021). In the present study, we investigated 30 participants from Hebron and Bethlehem – Palestine with an average age of 40.40 of 76.6% males. Previous studies showed the prevalence of tears was significantly greater in males than in females in the 50s and 60s (Sallis, Jones, Sunshine, Smith, & Simon, 2001).

Regarding patient weight, BMI revealed that 53.4 percent of the participants were slightly overweight, 23.3 percent were in the normal range, and 23.3 percent were obese, indicating that obesity is a significant problem in overweight people, which can negatively impact the quality of life and function, according to BMI and Musculoskeletal Pain (Rosa et al., 2021).

During our research, we discovered that shoulder pain affects the range of motion and muscle power of patients with SIS, which affects daily activities, particularly in young people and productive ages. According to a study related to ROM, changing posture influenced all components of posture measured (P<.001), and these changes were associated with a substantial change (P<.001) in the range of motion in shoulder flexion and abduction in the plane of the scapula. The outcomes of this study imply that altering one or more aspects of posture may have a positive impact on shoulder range of motion and the point at which discomfort occurs (Lewis, Wright, & Green, 2005). A prior study of the relationship between muscle strength and pain in SIS, found that muscles strength of the shoulder with positive impingement signs were significantly lower than the healthy opposite side (p<0.05), and the mean of the VAS scale was significantly higher on the affected sides (p<0.05) (Garving, Jakob, Bauer, Nadjar, & Brunner, 2017). This can be attributed that shoulder muscle weakness and pain are being linked. Based on these findings, the involved muscles should be assessed and strengthened as needed during the rehabilitation process. Our results indicated that there were significant differences among groups according to the range of motion and muscle power (P<0.05), the results of shoulder pain were vary due to the severity of SIS (mild, moderate, and severe). Through our results, we found significant differences between mild and severe pain (P<0.05), according to ROM and oxford scale in painful arc test and shoulder flexion. That's can be attributed logically to severe pain with a minimal range of motion or muscle power and mild pain with a higher range of motion.

In a study conducted by Apostolopoulos et al., despite the high expense of MRI, the accuracy of MRI (83 percent) was shown to be significantly higher than that of ultrasound (73 percent). The ultrasound, on the other hand, is a dynamic scan that is better taken by the patient and can be employed as the first-line examination for rotator cuff injury to reduce the investigation's waiting time and expense. In general, an MRI or MRA should be performed in clinical settings where shoulder problems such as articular cartilage injuries or labral tears are suspected. (Apostolopoulos et al., 2019).

Shoulder MRI examination is a valuable method of assessment of rotator cuff pathologies. In a study of shoulder rotator cuff tears they found, full thickness tears were seen in (66.7%), and partial thickness tears were less common than full thickness tears, and were seen in (33.3%), using MRI diagnosis as the reference(Sharma et al., 2017). In other words, studies demonstrate that partial-thickness tears are more common than complete tears (Stoller, 2007), with partial supraspinatus tendon tears found in 86 (81%) of patients with rotator cuff abnormalities, whereas complete tears were found in 11 (10%) of patients. The same could be said for the infraspinatus and subscapularis muscle tendons (34 patients had full tears, while three others had partial tears) (Freygant et al., 2014). Our findings show that 90% of the sample had partial-thickness tears, with the means of 86.6 percent and 103.3 percent in shoulder ROM flexion and abduction, respectively.

To our knowledge, this is the first study in Palestine to address the accuracy of diagnostic tests in SIS; however, there have been many studies around the world about the diagnostic accuracy of SIS, such as a study that found that either MRI or ultrasound could be used equally well for SIS detection (Brockmeyer et al., 2017; Dinnes et al., 2003). In summary, these investigations indicate the role of physical examination test accuracy for SIS. For example, in a study that was conducted by Silva et al (Silva et al., 2008). MRI evidence of SIS were found in 65.5% of the subject. Furthermore, according to a study, MRIs correctly diagnosed 60% of SIS with a sensitivity of 0.91(Naqvi et al., 2009). In this study, the results of MRI revealed that 56.7 percent of the subjects had clinically verified positive SIS.

We investigated the accuracy of a variety of clinical tests as SIS diagnostic techniques in this study. Our results of physical tests indicated that the highest percentage of the physical test (positive) was Hawkins and Kennedy test (76.7%), and the lowest score was resisted isometric abduction and external rotation (50%). Findings that are consistent with similar study results, which reported that Hawkins and Kennedy's test was the most accurate test for diagnosing SIS (71.0%). However, the most accurate tests for diagnosing subcategories of impingement were pain on resisted external rotation (58.8%) for partial-thickness tears, and the painful arc test (62.1%) for full-thickness tears(Kelly, Brittle, & Allen, 2010). Also, in a study of the specificity of Hawkins and Kennedy test by physical examination was 40% in patients with shoulder pain and diagnosed by MRI (Silva-Fernández et al., 2008).

Results that are comparable with our study where the specificity of the Hawkins and Kennedy test was 46.2%. Regarding the Neer signs test in our findings, the sensitivity was 70.6, SP was 38.5, PPV was 60% and NPV was 50%. Findings that are consistent with similar study results, which

reported that Neer signs test, they found the sensitivity was 68.4%, SP was 30%, PPV was 65%, NPV was 33.3% (Silva et al. 2008), findings that are close to our results.

Additionally, a study conducted by Macdonald et.al revealed that the Neer sign test recorded a sensitivity of 85% for rotator cuff tearing and 88 percent sensitivity was recorded for the Hawkins sign. The two tests had low SP and PPV for rotator cuff injury, however, the two tests showed a high NPV of 90%. (MacDonald, Clark, & Sutherland, 2000). This is most likely attributable to the fact that many of these physical examination movements might be positive even if there are additional shoulder problems present.

#### 4.3 Study limitations

There were several limitations to the present study that the researcher recommend that they may be taken into consideration in any further research:

- Due to the coincidence of sample enrollment with the current COVID-19, there were certain restrictions during sample recruitment, which contributed to some patients' worries about attending clinics or medical centers for imaging.
- Limited sources of articles related to our study.
- The findings of the present study cannot be generalized to all patients with shoulder pain.

# **Chapter five**

#### **5.1 Conclusions**

- As a result of Hawkins and Kennedy test of sensitivity and accuracy, it was usable in the diagnosis SIS.
- As a result of Neer's sign test of sensitivity and accuracy, it was usable in the diagnosis SIS
- According to the results and discussion, we can rely on three physical tests (Hawkins, Neer's sign, and painful arch) to detect SIS. This does not rule out the possibility of MRI dispensing.
- This study provides evidence for the high sensitivity and specificity of the Hawkins and Kennedy and Neer's sign for SIS.
- These findings may help clinicians identify clinically significant SIS more quickly and accurately, as well as inform referral decisions for future investigations.

# **5.2 Recommendations**

- Physical examinations can be utilized as a valid and reliable SIS diagnostic technique by orthopedic doctors and physiotherapists in Palestine.
- In clinical practice, a proper diagnosis of SIS may contribute to efficient diagnosis and treatment of patients with shoulder disorders.
- Further studies are needed with a larger sample size.

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Appendixes

**Appendix 1: Data collection sheet** 



Al – Quds University

Faculty of Health Professions Physiotherapy department

# Diagnostic accuracy of physical tests for subacromial impingement syndrome among Palestinian adults

الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل الكتف بين البالغين الدقة التشخيصية

الدراسة تخص رسالة ماجستير للطالب فارس جعنيني من دائرة العلاج الطبيعي في جامعة القدس.

Participant Name:
Participant Code:
Date of Signature:

#### **Section I: Personal Data**

1.	Name of participant:				
2.	Phone number:				
3.	Address:				
4.	Gender: ■ Female ■ Male				
5.	Date of birth:				
6.	Age:				
7.	Height:KgBMI (Body Mass Index):				
8.	Education				
	• None				
	• Special education				
	Primary education     Others:				
9.	Occupation:				
10.	Socioeconomic status:				
Section	on II: Medical History				
1.	Other Diseases:				
2.	Current Medications :				
3.	Previous Surgery:				

4.	Previous injuries :
5.	Previous investigation(s):
6.	Easing factors:
7.	Aggravating factors:
8.	When the pain start:
9.	Activities increase pain:
10.	Dominant hand:
11.	Other symptoms:

## Section III: Physical examinations tests

Functional tests	Positive	Negative	Date of assessment
1. Hawkins and kennedy test			
2.Neer's sign test			
3.Painful arc test			
4.Resist isometric abduction test			
5.Resist isometric external rotation test			

# Range of motion (Active shoulder motions):

Flexion: \_\_\_\_\_\_(0-180)

Extension: \_\_\_\_\_\_(0-40)

Internal rotation: \_\_\_\_\_(0-80)

External rotation: \_\_\_\_\_\_(0-90)
Abduction: \_\_\_\_\_\_(0-180)

Visual analog scale: /10		
Monual muscle tests /5	OXFORD SCALE	EXPLANATION
Manual muscle test: 75	0	No contraction is present
Flexion:/5	1	There is Flickering contraction
Extension: /5	2	Full Range of Motion with gravity counter balance *(Eliminated)
Laternal rotation: /5	3	Full Range of Motion with Against gravity
Internal rotation:/3	4	Full Range of Motion with Against gravity
External rotation:/5		+ added Resistance
Abduction:/5	5	Muscle function normally.

**Appendix 2: consent form** 



نموذج الموافقة على المشاركة في البحث

# **Consent Form**

اسم البحث: الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في

مفصل الكتف بين البالغين الفلسطينيين

اسم الباحث : فارس ادمون اسحق جعنيني.

Patient code:

Evaluator name: \_\_\_\_\_

Date of evaluation and signature: \_\_\_\_\_

عزيزى المشارك /المشاركة

نشكر لكم استعدادكم للمشاركة بهذا البحث، الذي هو جزء من در اسة الماجستير في العلاج الطبيعي في جامعة القدس. هذا البحث يهدف إلى التعرف على الدقة التشخيصية للإختبار ات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل الكتف بين البالغين الفلسطينيين.

ان البحث عبارة عن 5 فحوصات سريرية امنة، إضافة الى المدى الحركي لمفصل الكتف و القوة العضلية لتشخيص المرضى الذين يعانون من متلازمة الإصطدام تحت الآخرمي في مفصل الكتف و جمع النتائج الخاصة بالمريض، و من ثم سيتم التشخيص من خلال التصوير الرنين المغناطيسي بدون مادة ملونة، وذلك من خلال طبيب مختص بالتصوير الاشعاعي.

جميع الفحوصات سيتم إجرائها بواسطة معالجين أكفاء ولديهم المهارات اللازمة للقيام بهذه الفحوصات.

توقيعك ادناه على نموذج الموافقة هذا هو بموجب موافقة مكتوبة وموقعة على المشاركة في دراسة بحثية التي يقوم بها الباحث فارس جعنيني في ا**لدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل** الكتف بين البالغين الفلسطينيين ". و هو إقرار بإنه قد تم شرح أهداف البحث و طريقة الفحص للبحث، وانه قد تم شرح حقوقك المتضمنة: شرح حقوقك المتضمنة:

- سرية المعلومات التي تصرح بها وعدم إطلاع اي شخص عليها و تخزينها في مكان امن لا يصل اليه سوى الباحث.
  - إخفاء هوية المشارك في تحليل البحث والنتائج.
    - استخدام المعلومات للاغراض العلمية فقط.
- حرية إنسحابك في اي وقت من الدراسة ومن دون الحاجة لإبداء الأسباب ودون اية عواقب شخصية او مالية.
  - حقك في الإطلاع على نتيجة فحوصاتك ونتائج البحث النهائية.

وأنه في حال كان لديك أسئلة حول الدراسة او حول اي معلومة متعلقة بها, يرجى الاتصال بالباحث: فارس جعنيني على رقم التلفون 0595317860

#### موافقة المشارك

لقد تم وصف الدراسة البحثية لي شفهيا، وبما فيه المعلومات المدرجة أعلاه، وأوافق على المشاركة بهذه الدراسة البحثية.

اسم المشارك/ة الرباعي:

توقيع المشارك/ة: \_\_\_\_\_ التاريخ:

**Appendix 3: Information sheet** 



# نموذج تعريف ومعلومات عن البحث

اسم البحث الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل الكتف

## بين البالغين الفلسطينيين.

اسم الباحث إفارس ادمون اسحق جعنيني.

تحية طيبة وبعد

نشكر لكم استعدادكم للمشاركة بهذا البحث، الذي هو جزء من دراسة الماجستير في العلاج الطبيعي في جامعة القدس. هذا البحث يهدف إلى التعرف على الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الأخرمي في مفصل الكتف بين البالغين الفلسطينيين.

# معلومات عن الدقة التشخيصية للإختبارات الإكلينيكية لمتلازمة الإصطدام تحت الآخرمي في مفصل الكتف بين البالغين الفلسطينيين

ان البحث عبارة عن 5 فحوصات سريرية امنة، والمدى الحركي لمفصل الكتف و القوة العضلية لتشخيص المرضى الذين يعانون من متلازمة الإصطدام تحت الأخرمي في مفصل الكتف و جمع النتائج الخاصة بالمريض، و من ثم سيتم التشخيص من خلال التصوير الرنين المغناطيسي بدون مادة ملونة، وذلك من خلال طبيب مختص بالتصوير الاشعاعي. تم تدريب المعالج الخاص بك على وجه التحديد في مختلف التقنيات الخاصة في تقييم الحالة. وسيقوم المعالج بدوره عل اكمل وجه.

إذا كنت سعيدًا بمتابعة التشخيص على النحو الذي اقترحه اخصائي العلاج الطبيعي ، واجابك على الأسئلة التي ترغب في معرفة اجابتها ، و موافقا على المشاركة في الدراسة يرجى التوقيع على نموذج الموافقة المرفق وتسليمها إلى أخصائي العلاج الطبيعي. والاحتفاظ بهذه النشرة بسجلاتك الخاصة

- طبيعة الفحوصات التي سوف تستخدم في هذا البحث هي فحوصات أمنة ولا يوجد منها اي ضرر على المريض.
- تحدث إلى عائلتك وأصدقائك حول هذا الموضوع وخذ وقتك لاتخاذ القرار. إذا قررت المشاركة ، يجب عليك توقيع هذا النموذج لإظهار رغبتك في المشاركة.
   إن قرار عدم المشاركة أو قرار مغادرة الدراسة لاحقًا لن يؤدي إلى أي عقوبة أو يؤثر على الرعاية الصحية الحالية أو المستقبلية .
   إن الرعاية الصحية الحالية أو المستقبلية .
   إن الشتراككم في هذا البحث هو طوعي و مرتبط بتوقيعكم على نموذج موافقة بالمشاركة و اي المشاركة و تصريح بفهمكم لطبيعة البحث، فحوصاته. وفي حال وجود اي استفسار عن البحث او اي شيء متعلق بهذه الدراسة، يرجى التواصل مباشرة مع الباحث (فارس ادمون اسحق جعنيني ) على الرقم التالي المونانية التواصل مباشرة مع الباحث (فارس ادمون المحق جعنيني ) على الرقم التالي 0595317860

شاكرين لكم حسن تعاونكم

فارس جعنيني اخصائي علاج طبيعي طالب ماجستير علاج طبيعي جامعة القدس

#### **Appendix 4: Ethical Committee Approval.**



Cc. Prof. Imad Abu Kishek - President Cc. Members of the committee Cc. file

Abu-Dies, Jerusalem P.O.Box 20002 Tel-Fax: #970-02-2791293

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