

Research Article



A Study on Prevalence of Adhesive Capsulitis in Patients with Diabetes Mellitus

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Abstract:

Frozen shoulder is a self-recovering state of condition. Subjects are generally presented with an idiopathic progressive painful restriction in range of motion of the glenohumeral joint. AC is commonly found to be present in men and women of age 40 years and above. It can have a distinct variable time period of around 2 to 4 years conditions to which if the treatment is not administered, apart from this it may also hamper the quality of life of the patients. There is a lot of variation in the reports of the accumulation of the most commonly occurring musculoskeletal disorder in diabetic patients, that is suspected to be AC or frozen shoulder syndrome (FSS). So, there is a need to understand the exact prevalence of AC in diabetic patients in the population of Moradabad, Uttar Pradesh. The survey based method was conducted in the diabetic population of Moradabad. The responses of the subjects were collected and the data was interpreted. The prevalence was attained from the data obtained and by applying the formula of prevalence which refers to the number of affected individuals in a population with respect to the total number of individuals in a given population.

Keywords: Adhesive capsulitis (AC), Frozen shoulder syndrome, Diabetes mellitus, prevalence



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Introduction:

1.1.0 Background of the study

Adhesive capsulitis (AC) is a self-recovering state of condition. AC accumulates merely around 3% to 6% amongst the general population. Most of the subjects were in the age group of 40 to 50 years.¹ Patients are typically associated with an idiopathic case of persistent and painful limitation in acquiring a range of motion associated with involvement of the glenohumeral joint as per the recent studies conducted it is important to understand that Studies or articles were opted into the consideration only if they justified the prevalence of AC in a diabetic population.² Apart from this subjects who have undergone the surgical intervention for the treatment of AC were monitored and took into consideration.³ AC caused the symptoms of pain and lack of mobility-motility amongst the patients of age group 40 to 60 years of age, apart from this majority were the female population.⁴ They experience a restriction in the capsular region along with the limitation in rotation of the external plane of the scapula. However, the relationship between adhesive capsulitis and diabetes mellitus (DM) states that the incidence of AC is two to four times higher in DM patients than in the general population.⁵ AC is more commonly observed in men and women with an age of onset of 40 to 50 years or above in order to determine this Patients were provided with a questionnaire monitoring the prevalence of shoulder musculoskeletal disorders.⁶ The main purpose of this study was to assess the patients on the basis that was based on age and sex.⁷ In order to reduce

the case of biasness the case of AC and control group were examined and it has been found that majority of subjects who had a history of AC (90.6%) reported a perceived clinical progression and had a pattern of pain and stiffness along with a gradual decrease in range of motion of the glenohumeral joint.⁸ AC can have a distinct variable time period of around 2 to 4 years if the treatment is not administered apart from this it may also hamper the quality of life of the patients. AC or frozen shoulder syndrome (FSS) may lead to the complete or partial limitation of the shoulder mobility. Both cohort studies were taken into consideration and were followed up until there was an accurate incidence of adhesive capsulitis among the subjects.⁹ Patients with diabetes mellitus have higher risk of developing problems in movement of shoulder apart from this the age factor played a vital role in both type 1 and type 2 DM, whereas the autonomic neuropathy was considered in type 2 DM.¹⁰ However, in diabetes only AC is considered in shoulder pain guidelines as a musculoskeletal disorder. It is also important for clinicians to be aware that diabetes is considered to be a specific risk factor especially in the case of idiopathic frozen shoulder considering both males and females.¹¹ Patients with diabetes are at risk of having several other shoulder disorders, including focal neuropathy. There is a threefold increase in prevalence of CSP in diabetic patients as compared to the control group which was associated with the presence of chronic and poorly controlled diabetes, hyperlipidaemia, and hypertriglyceridemia.¹² In some studies, it has been hypothesized that increase in levels of HbA1c and the presence of end stage diabetic manifestations

show a significant correlation with the increased prevalence of AC there is an evidence, supporting throughout the literature that certain systemic disorders, such as DM are associated with a higher incidence of primary FSS.¹³ AC is associated with symptoms like pain, stiffness reduced mobility-motility and/or functional impairment of the glenohumeral joint or shoulder capsule. It is one of the most commonly occurring musculoskeletal disorder in patients with DM that can be particularly weakening hence it is of utmost importance to figure out a prevalence of AC particularly in the DM patients. The aim of this study is to estimate the prevalence of adhesive capsulitis in a population with DM.¹⁴ Apart from this some previous studies states that the aim is to monitor and evaluate the demographic information of subjects with adhesive capsulitis and to deeply evaluate the evidence providing the information by comparing the level of pain and disability due to FSS between diabetic and non-diabetic subjects. Various fibrosis conditions of shoulder and upper extremity have been determined which led to the concerns of prevalence of AC.¹⁵ Based on the previous studies, it has also been estimated that the prevalence of AC is slightly greater in the diabetic population as compared to the general population the entire analyses were based upon the evidence based health reports and consented questionnaires filled by the patients to figure out the comorbidities and other associated risk factors.¹⁶ It affects about 20 to 30% of people with diabetes and has been considered to be the most disabling occurrence of disease of the common musculoskeletal manifestations of diabetes and it had accounted that women of age group 40 to 50

years who had a history of smoking and drinking along with the DM were more prone to get the adhesive capsulitis.¹⁷

1.1.1 Epidemiology

Adhesive capsulitis is a leading musculoskeletal condition of diabetes mellitus that affects subjects of age group 40 years or above around 500+ subjects completed the SF-36 health survey and had various musculoskeletal disorder in common which were adhesive capsulitis, limited joint mobility, rotator cuff injury, glenohumeral impairment and osteoarthritis.¹⁸ Out of 100+ subjects it has been found that the majority of cases were associated with the prevalence of adhesive capsulitis and Dupuytren's contractures, followed by limited joint mobility and carpal tunnel syndrome.¹⁹ The incidence of frozen shoulder syndrome or adhesive capsulitis has not yet been precisely known, also there is no evidence of prepossession for race yet FSS is a pathological disorder with a prevalence of 2-5% in the general population, the condition of the syndrome is idiopathic however, there is an evidence, supporting throughout the literature that certain systemic disorders, such as DM are associated with a higher incidence of primary FSS.²⁰ It has also been evident that the prevalence of frozen shoulder syndrome has been 15% to 25% in subjects with DM as compared to that of general population which is around 2% to 3%. Therefore, the question arises that whether the patients with DM are more prone to AC, or is it mandatory for the subjects to screen for DM Nevertheless, there has been no significant definition and classification found for this musculoskeletal manifestation. However, the

study evaluated the association of adhesive capsulitis with type 2 DM.²¹

1.2 Presentation

A past medication history should be performed before monitoring the condition of the patient. Following outcomes should be gathered regarding the condition:

- Persistent occurrence of pain
- Case of accident or surgical intervention
- Triggered shoulder area
- Time period of symptoms

It has to be taken care that whether the patient has any past medical history or not, especially the ones who have dealt with DM, or any chronic heart condition like myocardial infarction. since these conditions may lead to the hampered shoulder injury.²² Since adhesive capsulitis is strongly associated with diabetes, it is extremely important to diagnose patients dealing with AC or FSS for DM or prediabetic condition.²³ It has also been found that AC has been also associated with the conditions of hyperthyroidism, hypothyroidism and ischemic heart disease.²⁴

1.3 Anatomy

It is of utmost importance to understand that the glenohumeral joint and scapula-thoracic articulation are vital criteria to manipulate the proper functioning of shoulder. It is important for the physicians or clinicians to figure out the importance of the scapula in providing the movement of the glenohumeral joint.²⁵ There is a simultaneous motion of Scapulothoracic and glenohumeral joint following the abduction or

lateral movement of arm. Approximately 1/3rd of forceful elevation of arm is related to scapulothoracic motion, whereas 2/3rd is due to motion in glenohumeral.²⁶

The prior joint is enclosed within the muscles sleeves. The shoulder capsule is generally a flaccid structure with a much larger surface area as that of the bicep.²⁷ The capsule thickens anteriorly, posteriorly, and superiorly as the rotator cuff tendons thicken it, while the glenohumeral ligaments thicken it even more.²⁸

The impaired anatomy correction of AC is based upon the first line therapies that are commonly non operative, however there is no such evidence that states the complete effectiveness of the intervention.²⁹

Histologically, the entire shoulder capsule (made of bundles of type I collagen), the inner surface of the joint capsule and the bicep tendon are lined up by the synovial cells which particularly have an extravagant importance.³⁰

1.4 Pathophysiology

Pathophysiology of AC primarily involves Immune, inflammatory and fibrotic stimulation. The evidence has shown to possess a pain or loss of abduction in the capsule region followed by persistent adhesive fibrosis.³¹ Biomarkers in synovial fluid suggests a mark of chronic inflammation in the shoulder. These have been identified in FSS as-

- ICAM-1; CD54
- TGF- β
- TNF- α
- IL-1(alpha and beta)

- IL-6
- PDGF

1.5 Differential Diagnosis

- Calcifying tendinitis
- Polymyositis
- Sub acromial bursitis
- Fracture
- Malignancy
- Shoulder impingement
- Cervical radiculopathy
- Glenohumeral osteoarthritis
- Glenohumeral synovitis
- Polymyalgia rheumatica
- Rotator cuff tendinopathy

1.6 Management

A total of 32 subjects presented with FSS were provided with anonymous questionnaires which was designed to extract the demographic information as well as medical information of the subjects the management or interventions were entirely based upon the MUA technique along with glycosaminoglycan content of the capsule and the metabolism of local bone.³²⁻³⁴ The minor subjects' headings were also based upon the age, bone density, gender, particularly female and history of DM amongst the subjects.³⁵ In order to reduce the biasness the case of AC and control group were examined and it has been found that majority of subjects who had a history of AC (91.6%) had a clinical progression along with pattern of pain and stiffness as well as gradual decrease in range of motion of the glenohumeral

joint.³⁶ In a survey conducted on upper limb of the shoulder proximity by the orthopaedic surgeons in London, patients who are preferring nonsurgical management have been relieved by physiotherapy, whereas those preferring surgical care favoured arthroscopic arthrolysis³⁷. Experience and training of surgeons have played a vital role as opposed to strong scientific evidence.³⁸ However, the most effective treatment or intervention of AC is quite uncertain. NSAIDs, oral corticosteroids, intra-articular corticosteroid injections and physiotherapy exercises were the key interventions to bring the condition under the curb.³⁹ The study also carried out the management by using intervention techniques of administration of injection of hydrocortisone into the shoulder joint or capsule and the manipulation was carried out under anaesthesia during the painful and stiffening phase was thus preferred over the surgical treatment options apart from this the introduction of stemless anatomic shoulder arthroplasty has led to the publication of few mid-term functional and radiographic results.⁴⁰ The study shows the results of the Arthrex Eclipse prosthesis which resulted in the follow up of around 70 months which was considered to be the average.⁴¹ It is also been proven that the physiotherapy exercises along with the corticosteroid injections have been proven in relieving the pain or the improvement in loss of abduction.⁴² Whereas surgical treatment options for patients who have not been improved or have shown minimal improvement after two to three months of nonsurgical treatment, include monitoring under the administration of anaesthesia and arthroscopic capsule release surgical process.⁴³

However, the surgical interventions are not frequently considered since majority of the patients who are in their 30s to 40s of age show improvement by prescribed medications.⁴⁴ The subjects were also monitored in order to figure out the background and assessment based on the retinopathy, proliferative and peripheral symmetrical somatic polyneuropathy.⁴⁵

Need of the Study:

There is lot of change in the reported prevalence of the most commonly occurring musculoskeletal disorder in DM, that is suspected to be AC. So, there is a need to understand the exact prevalence of AC in DM in the population of Moradabad, Uttar Pradesh. 244001

3.1 Aim

To find out the prevalence of AC in patients with DM.

3.2 Objective

- To figure out the percentage of male and female population who are suffering from adhesive capsulitis
- To figure out the extent of idiopathic FSS among the individuals with diabetes mellitus
- To explore the severity of adhesive capsulitis, affecting the quality of life of the individuals

Materials and Methods:

4.1 type of study

A survey based study was conducted after conducting a literature study using PubMed NCBI (National Centre of Biotechnology Information) out of 100 articles, 20 articles were selected that

explored the prevalence of FSS in DM patients. Studies or articles were opted into the consideration only if they justified the prevalence of AC in a diabetic population. A questionnaire was prepared and study on 271 subjects was carried out after the completion of pilot study on 30 subjects.

4.2 Need and site

There is lot of variation in the reported prevalence of the most commonly musculoskeletal disorder in diabetic patients that is adhesive capsulitis. So, there is need to know exact prevalence of adhesive capsulitis in diabetes patients in Moradabad, Uttar Pradesh.

4.3 Sample size formula

$$x = Z(c/100)^2 r(100-r)$$

$$n = N x / ((N-1)E^2 + x)$$

$$E = \text{Sqrt}[(N-n)x / n(N-1)]$$

Where,

- n=sample size
- E=margin of error
- N=population size
- r= fraction of response of interest
- $Z(c/100)$ =critical value for the confidence level C

4.4 Study population

271 subjects on the basis of 90% confidence level and a population proportion of 900000

4.5 Study period

The study was conducted for 6 months.

4.6 Study site

Moradabad, Uttar Pradesh.

4.7 Materials

- Validated Questionnaire (Hindi and English)
- Patient Information Sheet (Hindi and English)
- Informed Consent Form (Hindi and English)

4.8.0 Criteria

4.8.1 Inclusion criteria:

- Adult DM patients (≥ 18 years)
- Patients willing to participate

4.8.2 Exclusion criteria:

- Pediatric subjects
- Patients not willing to participate in the study

4.9 Data collection method

Prior to our study the subjects were given Patient Information Leaflet along with an Informed Consent Form who fulfilled the inclusion criteria. The data was collected from the subjects using a well-structured Questionnaire which includes patient demographics, contact, past history of shoulder pain and severity.

Results:

5.1 Background

The observations and results were carried out by conducting a survey via online and offline medium amongst the subjects with a history of DM in the population of Moradabad, U.P. The survey consisted of questionnaires, both in Hindi and English which highlighted the questions, that subjects commonly face during their monotonous routine, nevertheless, the sample size was

determined and the responses of individuals were noted based on their demographic information and their routinely monotonous activity.

271 diabetic subjects. were assessed with a confidence interval of (CI=90%), on the basis of a survey based questionnaire with an age distribution of 18yrs to 60+ yrs. Most subjects were married (74.2%) with over (75.3%) male population and (24.7%) female population, the severity was found to be mild in (50.1%) subjects, moderate in (31.4%) subjects and highly severe in (18.5%) subjects. It has also been found that (51.2%) population have previously experienced shoulder pain during the course of condition. The mean percentage was calculated by identifying the overall percentage of the factors prevailing during night, severity, mobility-motility and frequency which resulted to be 54.47%. i.e. 147 out of 271 subjects with DM were affected from AC. Since, prevalence refers to the number of affected individuals in a population with respect to the total number of individuals in a given population, and hence the prevalence was found to be 54.24%.

5.2 Summary of Percentage Identifying Demographic Information of the Subjects

Questions	Response		
What is your gender?	Male- 75.3%	Female- 24.7%	
What is your marital status?	Married- 74.2%	Unmarried- 25.8%	
What is the severity of your shoulder pain?	Mild- 50.1%	Moderate- 31.4%	Severe- 18.5%

Table-2

Age group	No. of subjects
20-27	79
27-34	20
34-41	38
41-48	50
48-55	49
55-62	30
62-69	05

5.3 Summary of Percentage Identifying the Responses of the Subjects

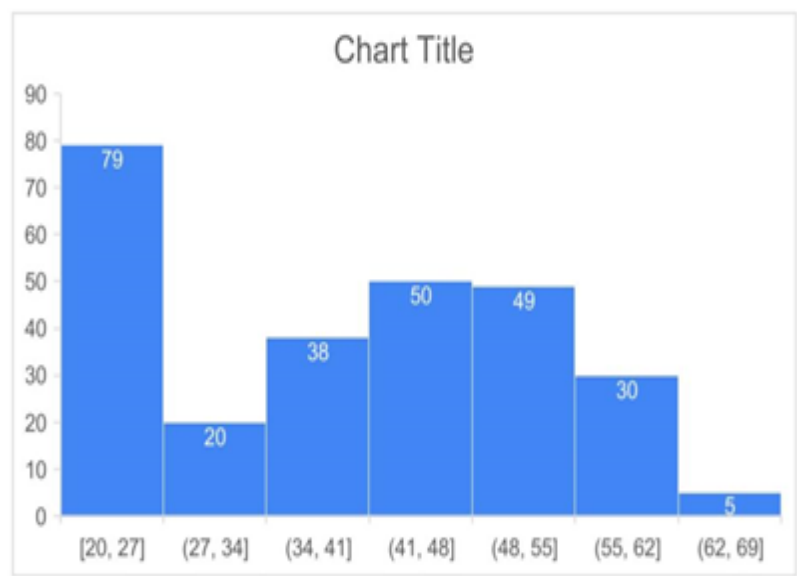
Have you ever experienced shoulder pain?	51.2 %	48.8 %				
Do you have any trouble while rotating your arm?			25.1%	7.3%	16.0%	51.6%
How frequent is your shoulder pain?			44.3%	8.4%	47.3%	
Have you consulted the doctor regarding your shoulder pain?	34.8%	65.2 %				
Do you feel any shoulder pain during night?			25.1%	5.6%	21.9%	47.4%
Do you need help from others while dressing because of your shoulder pain?			22.3%	7.3%	10.8%	59.6%
Does your shoulder allow you to do your regular work?			22.6%	40.5%	8.0%	28.9%
Can you lift heavy weight above your shoulder?			29.6%	29.3%	11.8%	29.3%
Can you sleep comfortably over your shoulder?			23.3%	39.7%	11.8%	25.2%

5.4 Summary of Overall Percentage Identifying the Prevalence of Adhesive Capsulitis in Diabetes Mellitus Patients

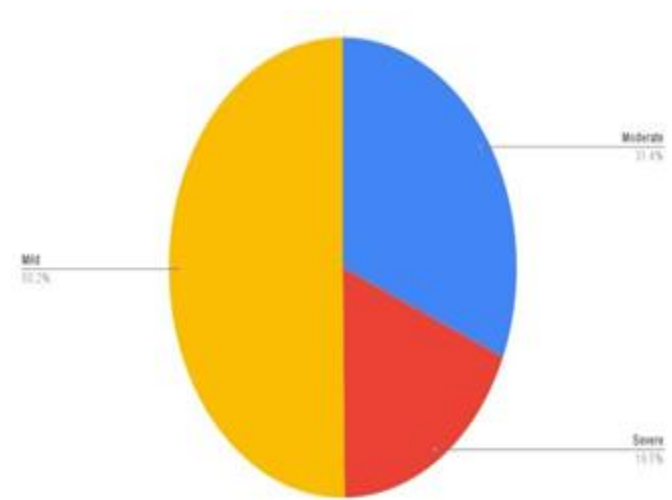
Questions	Percentage of population affected by adhesive capsulitis	Percentage of population not affected by adhesive capsulitis
Have you ever experienced shoulder pain?	51.2 %	48.8%
	52.7%	47.3%
Do you have any trouble while rotating your arm?	48.4%	51.6%
Do you feel any shoulder pain during night?	52.6%	47.4%
Do you need any help from others while dressing because of your shoulder pain?	40.4%	59.6%
Does your shoulder allow you to do your regular work?	59.5%	40.5%
Can you lift heavy weight above your shoulder?	70.7%	29.3%
Can you sleep comfortably over your shoulder?	60.3%	39.7%

Graphical and PIE Chart Representation of the Data

5.5.1 Age group:



5.5.2 Severity

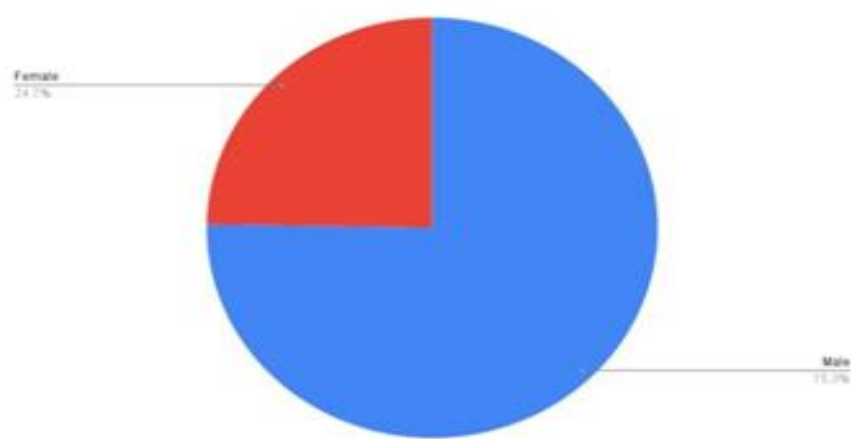


5.5.3Gender-

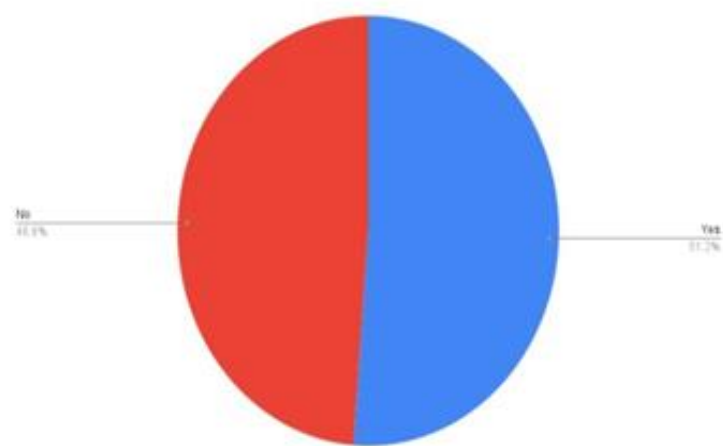


5.5.4

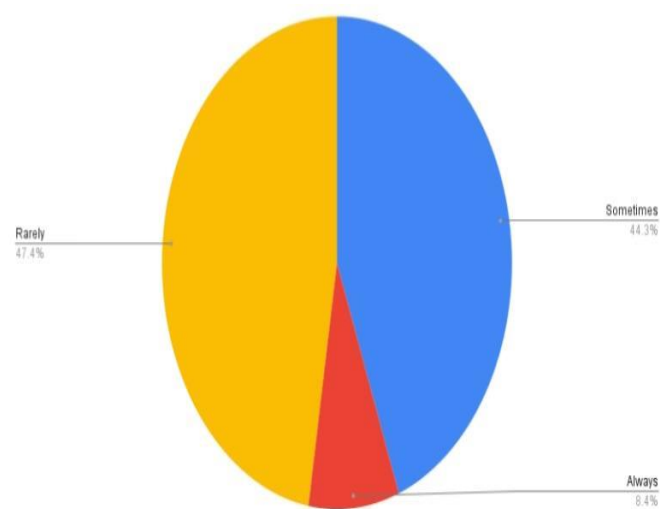
Marital status



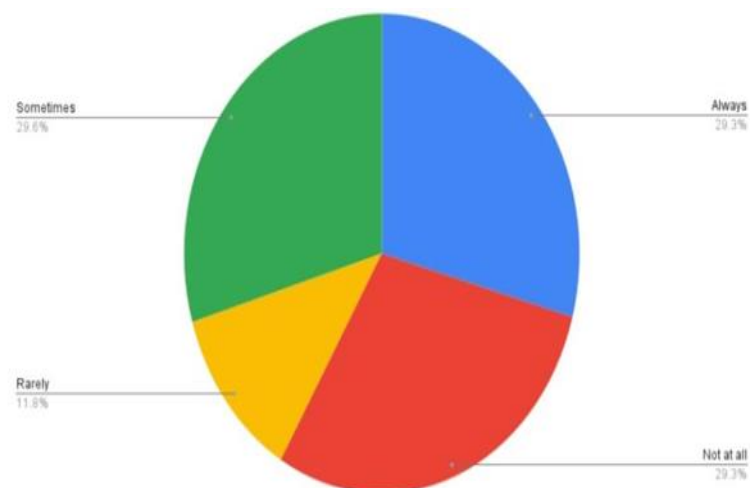
5.5.5 Have you ever experienced shoulder pain?



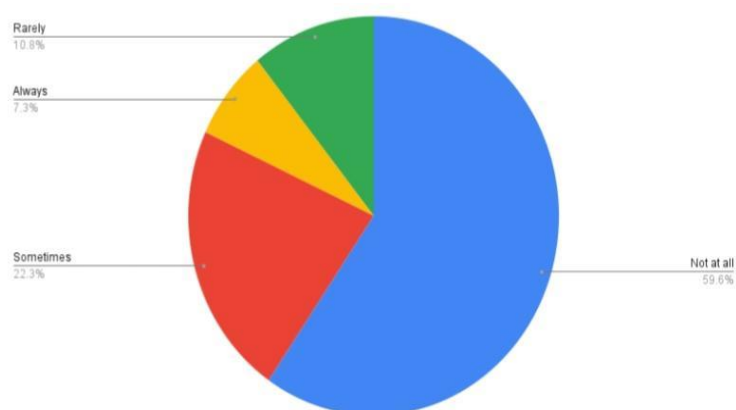
5.5.6 How frequent is your shoulder pain?



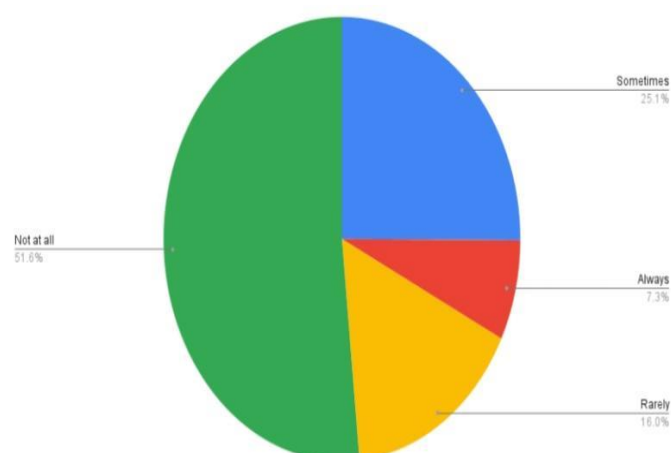
5.5.7 Can you lift heavy weight above your shoulder?



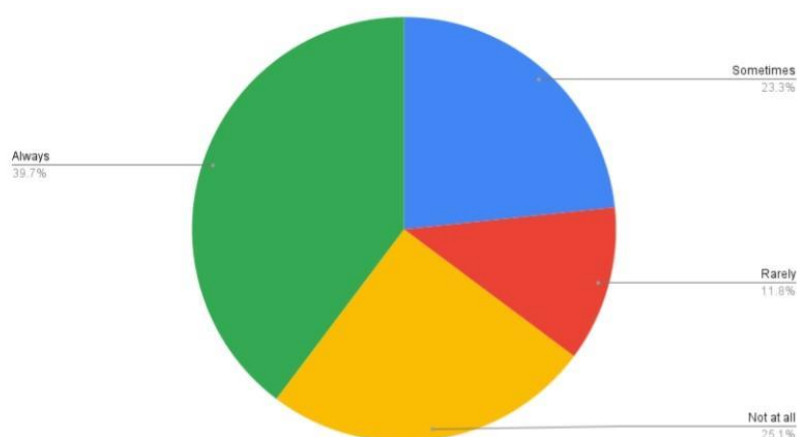
5.5.8 Do you need help from others while dressing because of your shoulder pain?



5.5.9 Do you have any trouble while rotating your arm?



5.5.10 Can you sleep comfortably over your shoulder?



Discussion

Adhesive Capsulitis is common disorder in diabetic subjects. The presence of adhesive capsulitis was primarily dependent on the factors like age, gender, mobility-motility, frequency of the pain, past experience, adversity and quality of life found in the subjects. The study also demonstrates that majority of the subjects were married and were male. Since DM is a chronic disease that requires regular follow-up, it might be interpreted that DM patients tend to utilize more health care resources and undergo more intense medical treatment. This raises the concern of whether the excess risk of AC in the DM could be related to the treatment prescribed for the patients with DM because AC may be more readily diagnosed in this particular scenario.

Conclusion:

Summary

This chapter presents the summary and conclusion derived by conducting the study which based to figure out the prevalence of AC or FSS in patients with DM.

271 diabetic subjects were assessed with a confidence interval of (CI=90%), on the basis of a survey based questionnaire with an age distribution of 18yrs to 60+ yrs. Most subjects were married (74.2%) with over (75.3%) male population and (24.7%) female population, the severity was found to be mild in (50.1%) subjects, moderate in (31.4%) subjects and highly severe in (18.5%) subjects. It has also been found that (51.2%) population have previously experienced shoulder pain during the course of condition. The mean percentage was calculated by identifying the overall percentage of the factors prevailing during night, severity, mobility-motility and frequency which resulted to be 54.47%. i.e. 147 out of 271 subjects with DM were affected from AC.

Since, prevalence refers to the number of affected individuals in a population w.r.t the total number of individuals in a given population, therefore the percentage prevalence was found to be 54.24%.

Conclusion

Based on the indicated findings, the following conclusion was drawn:

- The majority of subjects who were affected with AC were male population with over 75% occurrence.
- Based on the results, it has been concluded that the prevalence of FSS in patients with DM was found to be 54.24% in Moradabad, Uttar Pradesh.

Limitations of the Study:

When a survey based study is conducted, certain limitation usually occurs. Our study also underwent those limitations such as difficulty in analysing the results due to lack of appropriate or false responses of certain questions by the subjects in the questionnaire. The study would not have faced such limitation if it was not conducted through online spectrum, nevertheless due to the Covid time period there was no any other choice. Another important limitation of our study was the inappropriate generation of graphical representation of certain results due to the irrelevant or false responses provided by the subjects in the questionnaire. It has also been difficult to monitor the medications used by the diabetic subjects which would have provided information regarding its relationship with the occurrence of frozen shoulder amongst the subjects.

Ethical Consideration:

Initially every participant was fully informed on how the study would be carried out and how the collected data would be handled to ensure confidentiality and privacy by providing them with patient information sheet. Later an informed consent was required from each study participant. Each prospective participant had a right to refuse

to participate without negative consequences. Informed consent was obtained from patients, confidentiality and privacy was assured. Names and addresses of patients were collected only for the purpose of follow up.

Conflict of Interest: None declared.

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