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Research Article

ASSESSMENT OF STATIC SCAPULAR ELEVATION AND ABDUCTION USING T8 METHOD AND SCAPULAR ABDUCTION RATIO IN POPULATION WITH AND WITHOUT TYPE 2 DIABETES MELLITUS AGED 40-60 YEARS: AN ANALYTICAL CROSS-SECTIONAL STUDY

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A B S T R A C T

Diabetes mellitus is fast emerging as a global epidemic of this century with increased risk of developing number of serious life-threatening health problems. **Materials and methodology**: Permission was obtained and total 180 (75 Type 2 diabetics and 75 age, sex, BMI matched non diabetics) between age 40-60 years were included in study. Participants were assessed for scapular elevation and scapular abduction using Right angled protractor and measuring tape respectively. **Data analysis and results**: Independent sample't' test was used for data analysis. Results shows significantly higher mean scapula abduction ratio and scapular elevation in type 2 diabetics than non diabetics. **Conclusion**: Static scapular positions differ in type 2 diabetics and non diabetics.

INTRODUCTION

Diabetes, correctly termed as diabetes mellitus is fast emerging as a global epidemic of this century which has increased in incidence by 50% over past 10 years (DeFronzo RA *et al*, 2015). People with diabetes have an increased risk of developing a number of serious life-threatening health problems (Forbes JM *et al*, 2013). In addition to micro and macroangiopathic complications, diabetes is also associated with wide variety of musculoskeletal complications involving bones, joints and periarticular structure with the prevalence of shoulder joint involvement 50% among patients with type 2 Diabetes mellitus in India (Deepti P. Deshmukh *et al*, 2017). A study done by W Ben Kibler *et al* in 2013 explaining kinematic patterns in normal and degenerative shoulders concluded that shoulder pathologies are biomechanically associated with altered scapular motion or position such as increase or decrease scapular protraction and scapular elevation(W Ben Kibler *et al*, 2013). Higher prevalence of shoulder dysfunction in diabetics and occurance of future shoulder dysfunction in healthy individuals with scapular dyskinesis is an alarming sign for clinical practitioners for early detection of risk factors in patients with Type 2 diabetes mellitus and plan management accordingly to achieve better shoulder function and enhance quality of life.(Panagiotopoulos AC,2019) In order to provide comprehensive rehabilitation for these patients clinician must be able to reliably and accurately measure factors related to shoulder dysfunction such as resting scapular position, which is considered as an important factor in the assessment (W. Ben Kibler 2003).

In such scenario this study will help to find the measured alteration in static scapular position in diabetic patients as compared to the non diabetic individuals.

MATERIALS AND METHODOLOGY

Permission was obtained from ethical committee and head of institution for conduction of study. A cross sectional study was performed at tertiary care hospital on total 170 participants (85 Type 2 diabetics and 85 age, sex and BMI matched non diabetics) of age group 40-60 years. Convenience sampling was done to recruit the participants who were confirmed diagnosed cases of Type 2 Diabetes Mellitus for more than 3 years while age-sex-BMI matched non-diabetic participants, relatives or attendee of the same age group from hospital campus were included by simple random sampling. Participants willing to participate were included and consent was taken. Participants with Type 1 diabetes mellitus, with history of any recent injury/ surgery/ inflammatory condition in dominant upper extremity or history of any vascular or neurological problem were excluded from study.

PROCEDURE

Permission was obtained from ethical committee and head of institution. Participants who meet the inclusion criteria were briefed about the study in the language best understood by them and informed written consent was taken. Demographic date like age, weight, height and BMI was taken. A metal right-angle protractor with 150*300 millimeter side length a carpenter tool of HISTAN INCORPORATION was used to

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assess scapular elevation. It is a valid and reliable tool for measurement of scapular elevation (Aidan O Shea *et al*, 2016). Participant was seated on a stool in a normal relaxed sitting position with their arms by their side while looking forward at a mark on the wall fixed at eye level. Therapist was in sitting position and facing towards back of the participant. The most inferior aspect of eighth thoracic (T8) spinous process was identified. Then inferior angle of the scapula was identified. Landmarks were palpated, soft tissue was released and horizontal line with a black pen was placed. Next vertical line was drawn through the most central point of the landmark creating crosshatch. Intersection of these two lines was used as a single point for measurement. The protractor was placed horizontally, aligning between the inferior angle of scapula and eighth thoracic spinous process. The vertical distance was read from the bottom of protractor to T8 spinous process in millimeter and documented. Next scapular abduction was measured using measuring tape (Mark H. Gibson *et al*,1995). Total scapular distance was measured as the distance from third thoracic vertebrae to inferior angle acromion. Length of the scapula was measured as the distance from inferior angle of acromion to root of scapula. Both the measures were recorded in centimeters and ratio of total scapular distance and length of scapula was calculated.

RESULTS

Statistical software STATA. Version 10.1,2011 was used for data analysis. Independent sample 't' test was used to compare mean static scapular elevation and scapular abduction between participants with and without type 2 diabetes mellitus. P value less than 0.05 was level of significance. Mean scapular length was found almost similar in participants with diabetes (14.88 ± 1.07 cm) and without diabetes (14.91± 0.88) (shown in table 1). Mean scapular distance was found significantly higher in participants with Type 2 diabetes mellitus(21.88 ± 1.74 cm) than non diabetics(20.52 ± 1.74cm)(shown in table 2). Mean scapular abduction ratio was found significantly higher in Type 2 diabetes mellitus individuals(1.48 ±0.10) than non diabetics(1.37 ±0.10)(shown in table 3). In type 2 diabetes mellitus individuals (2.21 ±1.22 mm)highly significant increased mean scapular elevation was found than non diabetics(1.32 ±1.34 mm)(shown in table 4).

Table 1 Scapular length (cm) in Type 2 diabetics and non diabetics

Scapular length (cm)	With Diabetes (n=85)	Without Diabetes (n=85)
Mean	14.88	14.91
SD	1.07	0.88
t= 0.24, df= 168, P= 0.8139		

Table 2 Scapular distance (cm) in Type 2 diabetics and non diabetics

Scapular distance (cm)	With Diabetes (n=85)	Without Diabetes (n=85)
Mean	21.88	20.52
SD	1.74	1.74
t= 5.09, df= 168, P= 0.0001		

Table 3 Scapular abduction ratio in Type 2 diabetics and non diabetics

Scapular abduction Ratio	With Diabetes (n=85)	Without Diabetes (n=85)
Mean	1.48	1.37
SD	0.10	0.10
t= 6.56, df= 168, P= 0.0001		

Table 4 scapular elevation (mm) in Type 2 diabetics and Non diabetics

Scapular elevation (mm)	With Diabetes (n=85)	Without Diabetes (n=85)
Mean	2.21	1.32
SD	1.22	1.34
t= 4.56, df= 168, P= 0.0001		

DISCUSSION

In current study when matched pair analysis was done between type 2 diabetics and non-diabetics results were statistically significant suggesting increased scapular elevation and scapular abduction in asymptomatic type 2 diabetics.

It has been suggested that possible contributor to altered scapular position is dysfunction of muscles supporting shoulder complex. There are many other previous studies which shows the prevalence of scapular dyskinesis in asymptomatic individuals like young elite swimmers (Jacopo *et al*., 2018), rugby players (Takayuki *et al*., 2012), rock climbers (Aimee R. *et al*., 2007). Mitchell in (2000) investigated the effect of repetitive fatiguing exercise on the scapular stabilizers in the proprioceptive neuromuscular facilitation (PNF) D2 pattern. (Mitchell *et al*, 2000) Their results suggested that a fatigue induced strength deficit of the shoulder musculature can have an adverse effect on scapular positioning by allowing the scapula to glide more laterally. Type 2 diabetes mellitus independent of its complications increases muscle fatigability in both lower and upper body muscles (Orlando G *et al*, 2017). Decline in activity of muscles in asymptomatic normal functioning shoulder is probably because of onset of pathophysiological changes and abnormal skeletal muscle capillary recruitment due to micro-vascular complications in shoulder muscles of diagnosed type 2 diabetics (Article O *et al*, 2019). Sonographic evaluation of shoulder in asymptomatic elderly subjects with type 2 diabetes was done by Michele Abate in (2010) in which they found early degenerative age related rotator cuff tendon changes. They have also added that increased thickness of supraspinatus and biceps tendon due to abnormal storage of collagen layers in tissue surrounding shoulder complex is more evident in asymptomatic diabetic patients (Abate M *et al*, 2010). Moreover, it is also well known that diabetes is a strong risk factor for rotator cuff pathologies, as shown by studies performed in symptomatic subjects (Burne G *et al*,2019). Rotator cuff muscle functions through synergistic co-contraction to anchor the scapula. Rotator cuff arthropathy promotes increased action from rotator cuff muscles and upper trapezius. As rotator cuff dysfunction and scapular dyskinesis are interrelated, changes in rotator cuff can also contribute to the scapular dyskinesis (Kibler W Ben.2012). This fact is supported by the finding of scapular dyskinesis in as many as 68% of patients with rotator cuff abnormalities (Warner JJ *et al*, 1992). Supporting these Arjen K., in (2016) have also found that in shoulder diseases such as rotator cuff related pathologies, an increased scapular lateral position is common scapular dyskinesis sign (Kolk A *et al*,2015).

Study done by kibler in (2003) on scapular dyskinesis and its relation to shoulder pain represented a causative factor of scapular dyskinesis (W Ben Kibler *et al*, 2003). In which they

have suggested that muscle inhibition or weakness is quite common in shoulder pathology(Moseley JB Jr *et al*,1992). Of all the muscles supporting shoulder complex, serratus anterior and lower trapezius muscles are most susceptible to the effect of inhibition and they are more frequently involved in early phases of shoulder pathology like rotator cuff dysfunctions(Warner JJ *et al*,1992). Inhibition is seen as a decreased ability of muscles to exert torque and stabilize scapula as well as disorganization of the normal muscle firing patterns of muscles around shoulder (Glousman R *et al*,1988). They have also added that imbalance in muscular forces of serratus anterior and lower trapezius could result in altered scapular position of elevation (Bagg SD *et al*, 1986). Provided most of the diabetic individuals in present study were in the age group of 56-60 years this can be one of the reason for such findings of altered scapular positions in present study.

CONCLUSION

The study concludes that static scapular position changes in the form of increased scapular elevation and abduction in type 2 diabetics compared to non diabetics can be the alarming sign for future shoulder dysfunction in diabetics.

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