SKINFOLD THICKNESSES AND TYPES OF ARTHRITIS: AN ANTHROPOMETRIC ANALYSIS

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Abstract
The present study has been done to see the influence of RA and OA on skinfold thickness. The cross-sectional study comprised female population (45-65) years from urban and rural areas of Punjab. The number of samples were 50 rheumatoid arthritis, 50 osteoarthritis patients and 50 control females.Five skinfold thickness (i.e. biceps skinfold, triceps skinfold, forearm skinfold, thigh skinfold and calf skinfold) measurements of the patients and control group females were taken with the help of skinfold calliper in upper and lower limbs. Comparative picture of skinfold thicknesses in all three groups show that Osteoarthritis group have maximum value of all the skinfold thicknesses thus indicating that they have the greatest subcutaneous fat and lowest skinfold thickness was observed in Rheumatoid arthritis group.

Key Word: Rheumatoid arthritis, Osteoarthritis, Skin fold thickness

Introduction
Arthritis" leads to the inflammation that affects joints and its adjoining connective tissue which is broadly divided into two categories, namely Rheumatoid arthritis (RA) and Osteoarthritis (OA). RA is an autoimmune and acute disorder affecting human adult populationthat leads to defective deterioration of joints with diminished joint motion and distortion prevails at preliminary phase of disease (Alamanos&Drosos, 2005; Begovich et al., 2004;Qin et al., 2015). Itmay affectother organs but its major influence is on hand and wrist joints.Mostly principal cause of affliction in RA is dysfunctioning of hand (Dellhag*et al*., 2001). Global health problem of RA is mainly associated with obesity along with risk of coronary infarction (Finucane *et al*., 2011).Many studies have conflicting reports of how RA is affected by obesity, but positive association is shown by majority of studies (Voigt *et al*., 1994; Pedersen *et al*., 2006; Wesley *et al*., 2013; Crowson *et al*., 2013). Osteoarthritis (OA) is type of arthritis, also named as degenerative arthritis plays a top position role in causing disability among old age people (Guccione*et al*., 1994; McCormick, 1995; Brooks 2002). A significant relationship was observed among body adiposity index and skinfold thickness in body fat estimation in osteoarthritis patients (John et al., 2019). Body fat percentage complete picture can be provided by several anthropometric assessments including skinfold thickness measurements (Ojo &Adetola 2017). Body composition or body fat measurement can be used for understanding risk of OA development in patients across the spectrum of body composition (Davidson *et al*., 2011). Proximal interphalangeal (ICP), metacarpophalangeal (MCP) and wrist joints are primarily involved joints of hand which leads to diminished activity of daily life (Melvin, 1982).Major cause of pain in knees is due to OA which affects its functioning as well. Knee pain leads to physical dysfunctioning and diminished life activities (Ayis& Dieppe, 2009). Prevalence of knee OA is common in western world over 50 years and mostly females are affected by it (Stitik*et al*., 2011).OA affects 18% of women and 9.6% of males above 60 years of age and results in degeneration of cartilage in joint that results in pain and depletion of functioning in hips and knees. Patients suffering from extreme pain undergoes surgery of joint replacement to get comfort (Woolf, &Pfleger, 2003). Since this problem leads to impairment of hip and knee, it results in difficulty with walking and stair climbing (Guccione*et al*., 1994). OA leads to total replacement of hip and knee (Defrances, &Podgornik, 2006). Moreover, advancement in this disorder suggests that OA have influence on health of people in future (Lawrence *et al*., 2008). Present study has been conducted to see the association of arthritis with Skinfold thickness. Aim of the present is to see impact of RA and OA on Skinfold and compare it with normal women.

Material and Methods

The cross-sectional study comprised of female patients of arthritis ranging in age from 45-65years from different areas of Punjab. A total of 100 patients which were categories into three groups i.e Group A (n=50) having rheumatoid arthritis (RA) and Group B (n=50) having osteoarthritis (OA), for comparison control Group C (n=50). The diagnosis of rheumatoid arthritis was confirmed using the classification criteria of the American College of Rheumatology by Five skinfold thickness (i.e. biceps skinfold, triceps skinfold, forearm skinfold, thigh skinfold and calf skinfold) measurements of the patients and control group females were taken with the help of skinfold calliper, on the right side of upper and lower limbs following the standard techniques given by

Lohman et.al., 1988**.**

Study has been approved from the institutional ethical committee of Desh Bhagat University. Subjects were priorly informed about the study and their consent was taken before taking the measurements. Women who were pregnant, not ambulant or taking oral corticosteroids, with bilateral shoulder surgery or severe shoulder disease or knee replacement were excluded.

Results

Table.1,2 & Fig.1 describes trends in Mean, SD and SEm of skinfold thickness of upper limb in RA and OA patients.It has been observed that Osteoarthritis patients possess maximum mean value of forearm skin fold (25.6 mm) whereas mean values of triceps skinfold and biceps skin fold thickness is found to be almost similar for OA and control subjects i.e. 34.3mm and 33.3mm. Minimum values of all the skin fold thicknesses of upper limb i.e.triceps skinfold (28.0mm), biceps skinfold (30.5mm), forearm skinfold (20.9mm) were observed in RA patients

In terms of statistics

Inter group statistical differences **(Table 2)** are highly significant for triceps skin fold in CNT *vs* RA and OA *vs* RA. Data observed is significant for forearm skin fold inCNT *vs* RA and OA *vs* RA.

In case of skin fold thicknesses of lower limb, Osteoarthritis patients possess maximum mean value of thigh skinfolds (53.1mm) followed by medial calf skin fold (44.9mm) and lateral calf skin fold (43.6mm) whereas minimum mean values of all skin fold thicknesses of lower limb i.e. thigh skinfold (49.8mm), medial calf skinfold (39.2mm) &lateral calf skinfold (40.9mm) were observed in RA patients **(Table 1 & Fig 1)**.

In terms of statistics

Inter group statistical differences **(Table 2)** are significant for medial calf skin fold and non-significant for thigh and lateral calf skinfold in CNT *vs* OA group. In CNT *vs* RA data is non-significant. Data observed is significant for medial calf skin fold and non-significant for thigh and lateral calf skinfold in OA *vs* RA group.

Table 1. Mean, SD and SE$_m$ of skinfold measurements (mm) in the subjects of osteoarthritis (OA), rheumatoid arthritis (RA) and control (CNT) groups

Body region	Parameter# (mm)	Group								
		OA			RA			CNT		
		Mean	SD	SE$_m$	Mean	SD	SE$_m$	Mean	SD	SE$_m$
Upper limb	TRSK	34.3	8.12	1.15	28.0	7.45	1.05	34.3	5.76	0.81
	BISK	33.3	8.42	1.19	30.5	7.02	0.99	33.3	7.53	1.07
	FASK	25.6	7.23	1.02	20.9	6.70	0.95	24.5	6.60	0.93
Lower limb	THSK	53.1	8.94	1.26	49.8	7.92	1.12	51.6	8.40	1.19
	MCSK	44.9	8.61	1.22	39.2	8.13	1.15	41.2	8.18	1.16
	LCSK	43.6	7.85	1.11	40.9	7.94	1.12	41.5	8.84	1.25

TRSK: Triceps Skf.; BISK: Biceps Skf.; FASK: Forearm Skf.; THSK: Thigh Skf.; MCSK: Medial calf Skf.; LCSK: Lateral calf Skf.

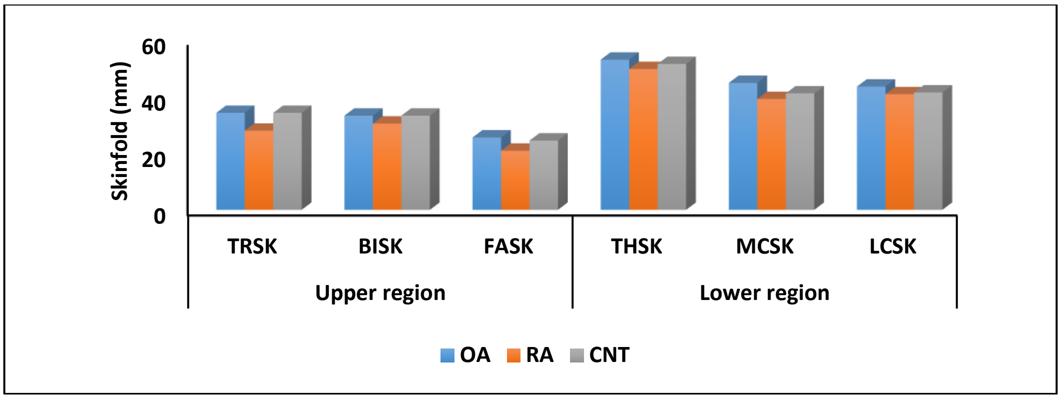

Fig:1 Trend in mean values of skinfold (mm) at different locations in upper Limb and lower limb in the three groups

Table: 2. Significant differences for sample mean of skinfold (mm) of upper and lower body regions in the three groups

Body region	Parameter# (mm)	Paired Comparisons					
		CNT *vs* OA		CNT *vs* RA		OA *vs* RA	
		t-ratio$	p-value	t-ratio	p-value	t-ratio	p-value
Upper limb	TRSK	-0.028NS	0.9774	4.714***	< 0.0001	4.055***	0.0001
	BISK	-0.038NS	0.9701	1.910NS	0.0591	1.832NS	0.0700
	FASK	-0.766NS	0.4457	2.721**	0.0077	3.357**	0.0011
Lower limb	THSK	-0.887NS	0.3771	1.102NS	0.2730	1.977NS	0.0509
	MCSK	-2.227*	0.0282	1.214NS	0.2278	3.416**	0.0009
	LCSK	-1.256NS	0.2120	0.393NS	0.6954	1.749NS	0.0835

TRSK: Triceps Skf.; BISK: Biceps Skf.; FASK: Forearm Skf.; THSK: Thigh Skf.; MCSK: Medial calf Skf.; LCSK: Lateral calf Skf. $Each t-ratio is associated with 98 *degrees of freedom*;
Significant at 5% probability level; **: Significant at 1% probability level;
Significant at 0.1% probability level; NS: Non-Significant. **et al., 1995).** Skinfold thickness average is used for prediction of adiposity. Distribution of subcutaneous fat is also affected by dietary factors, sex, weight, habitual physical activity patterns and upbringing of individual respectively **(Allen et al., 1956; Garn et al., 1987; evill et al., 2004; Nevill et al., 2006; Ross et al., 1988;).**

Table 3: Comparative analysis of Biceps and Triceps skinfold of OA group

Group	Source	Number of Subjects	Age group (In Years)	Biceps Skinfold (mm)	Triceps skinfold (mm)
OA	Present Study	50	45-65	33.3±8.42	34.3±8.12
	Cimen et al., 2004	33	42-77	22.56±7.56	31.19±7.28

Comparing the results of present study with previously done researches (Table 3) on OA. It has been observed that mean values of biceps and triceps skin fold are greater in comparison to **(**Cimen et al., 2004**)** findings

Discussion

Present study has been conducted to see the association of arthritis with Skinfold thickness. Subcutaneous tissue thicknesses provide information of total fat deposited and body energy reserves. It was already reported that RA patients receiving steroid therapy observe reduction of skin-fold thickness, frequent occurrence of purpura, and transparency in skin due to changes in structure of the dermal connective tissue (Greenwood B.M., 1966). In addition, RA patients in old age observed atrophic skin with loss of collagen (Shuster and Bottoms, 1963). Subscapular and triceps skinfold thicknesses provide an provides muscle mass measurement andindex of body fat and midarm muscle circumference (Khursheed, 2004). Cross- sectional analysis of the relationship between risk of disease and obesity can be determined by anthropometric measurements such as skin fold thickness and mid upper arm circumferences (Sanghi et al., 2011). Progression and development of Osteoarthritis is strongly linked with obesity. To explain this association, two major theories i.e., biomechanical and systemic/metabolic mechanisms have been proposed. The biomechanical theory explains that axial loading along with articular cartilage degeneration increases with obesity, whereas metabolic theory suggests that cartilage is adversely affected by various metabolic factors and osteoarthritis risk is indirectly increased withobesity (Felson *et al.*, 1988; Gelber*et al*., 1999; Cooper *et al*., 2000; Felson *et al*., 2004; Grotle*et al*., 2008). Adipose fat storage is related to positive energy balance, depletion of fat stored in bodyreflects reduced skinfold thicknesses **(Cameron, 1998)**. In present study comparative picture of skinfold thicknesses in all three groups showed that osteoarthritis group have maximum value of all the skinfold thicknesses and Rheumatoid arthritis group have least value**(Table 1 & Fig 1)**. Maximum skin fold thickness in OA group thus indicate that they have the greatest subcutaneous fat followed by Control and then RA group. Findings suggested that with respect to body mass, increase occurs at greater rate in skinfold.Consumption of fatty products and less habitual physical activity leads to greater deposition of subcutaneous fat whereas strenuous physical life results in burning of calories, results in lesser deposition of fat. Increase in amount of fat especially in upper and lower extremity impairs physical functioning and intervenes range of motion hindering its muscular function

Conclusion

This study validates the contention that skin foldprovides measurement of body fat index and have a significant association with Osteoarthritis and Rheumatoid arthritis. In this present study, Osteoarthritis group have maximum value of all the skinfold thicknesses thus indicating that they have the greatest subcutaneous fatand adiposity and lowest skinfold thickness was observed in Rheumatoid arthritis group.

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