Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2014, 5 (2):47-50
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW

Correlations of hip and knee range of motion with selected anthropometric variables in Indian obese individuals

Shyamal Koley and Jaspreet Kaur Sodhi

Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, Punjab, India

ABSTRACT

The purpose of the present study was to estimate the hip and knee range of motion in Indian obese individuals and their correlations with selected anthropometric variables. To solve this problem, three anthropometric variables viz. height, weight and percent body fat, six hip range of motion, viz, flexion, extension, abduction, adduction, internal and external rotation and knee flexion were measured on randomly selected 299 Indian obese individuals (152 male having mean age 46.19 ±7.76 years and 147 female having mean age 46.18 ±7.76 years) aged 26–59 years from Delhi, India. The results indicated statistically significant differences (p<0.001) between Indian obese males and females in height, weight and percent body fat. Significant positive correlation (p<0.05) of hip internal rotation was found with weight and significant negative correlation (p<0.05) of hip flexion was noted with height only. In conclusion, it may be stated that there was no significant association of hip and knee range of motion with anthropometric variables studied (except two cases).

Keywords: Hip and knee range of motion, Anthropometric variables, Indian obese individuals.

INTRODUCTION

Obesity has become the epidemic globally [30, 26]. It was reported that obese individuals had functional limitations in activities of daily living, particularly for tasks requiring increased flexibility [20]. Obesity is also reported as a factor in reduced motion magnitude at the hip joint, probably owing to a mechanical effect of interposing adipose tissue restricting the joint range of motion [3,9]. Mechanical obstruction may also lead to altered posture. The musculoskeletal load on the trunk muscles during standing work tasks hence may be increased as a consequence of altered posture, increased load or combined [24]. However, the effects of obesity on musculoskeletal load on trunk and hip is less known [11].

As anthropometric data are strong predictors of functional impairment, morbidity, and mortality, anthropometric measurements are valuable for health status assessment. These are easily applied and non-invasive components [7,10,12,17,18,29]. Thus, in the present study, an attempt has been made to search any correlations of hip and knee range of motion with selected anthropometric variables.

MATERIALS AND METHODS

Participants

The present cross-sectional study was based on randomly selected 299 Indian obese individuals (152 male having mean age 46.19 ±7.76 years and 147 female having mean age 46.18 ±7.76 years) aged 26–59 years from Delhi, India. The age of the subjects were recorded from the date of birth registered in their birth certificates. A written consent was obtained from the subjects. The data were collected under natural environmental conditions in morning (between 8 AM. to 12 noon). The study was approved by the institutional ethics committee.

Anthropometric measurements

Three anthropometric variables, viz. height (HT), weight (WT) and percent body fat (%BF) were taken on each subject. Anthropometric variables of the subjects were measured using the appropriate techniques [22]. The height was recorded during inspiration using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the nearest 0.1 cm, and weight was measured by digital standing scales (Model DS-410, Seiko, Tokyo, Japan) to the nearest 0.1 kg. Percent body fat (%BF) was assessed with standard formula [8] using the four skinfold measurements (biceps, triceps, subscapular and suprailiac) measured by Harpenden Skinfold caliper.

Hip and knee range of motion

A total of six hip ranges of motion, viz. flexion, extension, abduction, adduction, internal rotation and external rotation, and knee flexion were measured by standard techniques using goniometer in degree.

Statistical Analysis

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. Independent t test was applied for the comparisons of data among Indian obese males and females. Pearson's correlation coefficients were applied to establish the relationships between hip and knee range of motion and selected anthropometric variables. Data were analyzed using SPSS (Statistical Package for Social Science) version 17.0. A 5% level of probability was used to indicate statistical significance.

RESULTS

Table 1 showed the descriptive statistics of hip and knee range of motion and anthropometric variables of Indian obese individuals. Obese males had higher mean values in height, weight, hip flexion and knee flexion and lesser mean values in hip extension, abduction, adduction, internal and external rotation than their female counterparts, however, statistically significant differences ($p<0.001$) were found only in height, weight and percent body fat between these two sets of data.

Correlation matrix of hip and knee range of motion and selected anthropometric variables in Indian obese individuals were given in table 2. Significant positive correlation ($p<0.05$) of hip internal rotation was found with weight and significant negative correlation ($p<0.05$) of hip flexion was noted with height and hip external rotation with percent body fat. In fact, anthropometric variables had significant ($p<0.05$) correlations among them and knee flexion had significant ($p<0.05$) correlations with hip flexion and extension and negative correlations with hip internal rotation. Hip extension had significant negative correlation ($p<0.05$) with hip internal rotation, and hip external rotation had significant negative correlations ($p<0.01$) with hip adduction and knee flexion.

Table 1. Descriptive statistics of hip and knee range of motion and anthropometric variables of Indian obese individuals

Variables	Males (n=152)		Females (n=147)		t-value	p-value
	Mean	SD	Mean	SD		
Height (cm)	172.23	7.07	158.24	6.38	17.935	<0.001
Weight (kg)	99.26	5.89	90.91	8.74	10.889	<0.001
Percent body fat (%)	33.83	1.95	36.08	4.01	6.222	<0.001
Hip flexion (degree)	115.62	3.89	115.03	4.53	1.211	0.227
Hip extension (degree)	17.63	2.55	17.67	2.91	0.132	0.895
Hip abduction (degree)	35.06	3.75	35.22	2.89	0.409	0.683
Hip adduction (degree)	16.80	2.61	16.86	2.35	0.212	0.832
Hip internal rotation (degree)	25.76	2.36	25.84	2.53	0.284	0.777
Hip external rotation (degree)	17.50	2.94	17.67	2.47	0.551	0.582
Knee flexion (degree)	76.08	3.93	76.05	3.82	0.070	0.944

Table 2. Correlation matrix of hip and knee range of motion and selected anthropometric variables in Indian obese individuals

Variables	HT	WT	%BF	HFL	HEX	HABD	HADD	HINR	HEXR	KFL
HT	1	.721**	-.693**	.012	-.112	.034	.013	.007	.013	.008
WT	.580**	1	-.010	.005	-.159	-.049	-.064	.083	-.148	.045
%BF	-.245**	.468**	1	-.007	-.003	-.094	-.078	.084	-.179*	.034
HFL	-.168*	-.023	.109	1	.105	.079	.024	-.076	.025	.232**
HEX	-.005	-.129	-.097	.096	1	-.094	.059	-.060	.023	.301**
HABD	-.042	-.083	-.020	.025	-.154	1	-.014	-.011	-.063	-.008
HADD	.081	.008	-.116	-.051	.074	-.037	1	-.140	.214**	-.058
HINR	.150	.170*	.042	-.094	-.196*	.034	-.024	1	-.045	-.188*
HEXR	.030	.015	.048	.136	-.025	.125	.053	.067	1	-.050
KFL	-.045	.040	-.011	0.114	-.021	-.157	-.040	.103	-.236**	1

Upper triangle correlations for males and lower triangle correlations for females;
** Significant at 0.05 level (2-tailed); ** Significant at .01 level (2-tailed).*

DISCUSSION

Joint range of motion is the measure of motion available at a body joint for a certain inter-segmental rotational movement. Joint range of motion at body joints greatly affects individuals' physical capabilities to perform work and daily-life activities [2,15,28]. Joint range of motion is primary limited by the skeletal and muscle structures and functions and also the physiological characteristics of connective tissues surrounding a body joint [1,27].

In the present study, significant positive correlation of hip internal rotation was found with weight and significant negative correlation of hip flexion with height, and hip external rotation with percent body fat. The findings of the present study followed the findings of Gilleard and Smith [11] where they also failed to observe any association of trunk range of motion with anthropometric variables. Though Park et al. [23] found reduction of range of motion in obese individuals. Obese individuals have more musculoskeletal pain and physical dysfunction than people of normal weight [4,25]. The reductions of range of motion were reported mainly due to the excess fat in the obese body. Such fat would interpose and mechanically obstruct inter-segmental rotations at body joints [21,9,6,11]. Aside from excess fat, reduced physical activity might also be a possible contributor to the reduced range of motion, as obesity is generally associated with a lower level of physical activity during daily life [13,14,19] and physical inactivity can decrease body flexibility [16,5]. However, the present study did not found any significant association of hip and knee ranges of motion with anthropometric variables studied.

CONCLUSION

It may be concluded from the present study that though hip and knee ranges of motion have significant correlations with themselves (in some cases), but no significant correlations were found with anthropometric variables studied (except two cases). Further studies are required considering range of motion of more joints with greater sample size to validate the data.

REFERENCES

[1] Alter, M.J. *Science of Human Flexibility*. Champaign, IL: Human Kinetics, **1996**.
[2] Badley, E.M., Wagstaff, S. And Wood, P.H.N. *Annuls of Rheumatic Diseases*, **1984**, 43:563-569.
[3] Battl'e, M.C., Bigos, S.L., Sheehy, A . and Wortley, M.D. *Physical Therapy*, **1987**, 67: 653:658.
[4] Bingfors, K. and Isacson, D. *European Journal of Pain*, **2004**, 8: 435-450.
[5] Buckwalter, J.A. *Physical and Sports Medicine*, **1997**, 25: 126-133.
[6] Chaffin, D.B., Anderson, G.B.T. and Martin, B.J. *Occupational Biomechanics*. 4th ed. New York, John Wiley and Sons, Inc. **2006**.
[7] De-Groot, C.P. Perdigao, A.I. and Deurenberg, P. *European Journal of Clinical Nutrition*, **1996**, 50: S9-S15.
[8] Durnin, J.V.G.A. and Womersley, J. *British Journal of Nutrition*, **1974**, 32: 77-97.
[9] Escalante, A., Lichtenstein, M.J., Dhanda, R., Cornell, J.E. and Hazuda, H.P. *Arthritis Care Research*, **1999**, 12: 8-18.
[10] Galanos, A.N.,Pieper, C.F., Cornoni-Huntley, J.C., Bales, C.W. and Fillenbaum, G.G. *Journal of American Geriatric Sociaty*, **1994**, 42: 368-373.
[11] Gilleard, W. and Smith, T. *International Journal of Obesity*, **2007**, 31: 267-271.
[12] Hemenway, D., Feskanich, D. and Colditz, G.A. *International Journal of Epidemiology*, **1995**, 24: 783-786.
[13] Jebb, S.A. and Moore, M.S. *Medicine and Science in Sports and Exercise*, **1999**, 31: S534-S541.
[14] Kaplan, M.S. *Journal of Gerontology. Serises A. Biological Sciences and Medical Sciences*, **2003**, 58: 1018-1030.
[15] Kee, D. And Karwowski, W. Human Factors, **2002**, 44: 430-544.
[16] Kottke, F.J. *Public Health Reports*, **1965**, 80: 437-451.
[17] Kuben, K.S., McIntosh, W.A., Georghiades, M.B. and Landmann, W.A. *Journal of American Dietic Association*, **1991**, 91: 1402-1407.
[18] Kuczmarski, M.F., Robert,Kuczmarski, R.J. and Najjar, M. *Journal of American Dietic Association*, **2001**, 101(1): 28-34.
[19] Kvaaik, E., Tell, G.S. and Klepp, K.I. *Archieves of Pediatrics and Adolescent Medicine*, **2003**, 157:1212-1218.
[20] Larsson, U. and Mattsson, E. *International Journal Obesity Related Metabolic Disorder*s, **2001**, 25: 893-899.
[21] Laubuch, L.L. *Sports Medicine and Physical Fitness*, **1969**, 9(5): 89-97.
[22] Lohmann, T.G., Roche, A.F. and Martorell, R. *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics Books, **1988**.
[23] Park, W., Ramachandran, J., Weisman, P. and Jung, E. *Ergonomics*, **2010**, 53(1): 102-108.
[24] Paul, J.A., Salle, H. and Frings-Dresen, M.H.W. *Clinical Biomechanics*, **1996**, 11:111-115.
[25] Peltonen, M., Lindrooms, A.K. and Torgerson, J.S. *Pain*, **2003**, 104: 549-557.

[26] Proletto, J. *Asia Pacific Journal of Clinical Nutrition*, **2005**, 14: S32.
[27] Reese, N.B. and Bandy, W.D. *Joint Range of Motion and Muscle Length Testing*. Philadelphia, P.A.: W.B. Sanders Company, **2002**.
[28] Verbrugge, L.M. and Jette, A.M. *Social Science and Medicine*, **1994**, 38:1-14.
[29] Wardlaw, G.M. *American Journal of Clinical Nutrition*, **1996**. 63: 433S-436S.
[30] World Health Organisation. *Technical Report Serises*, **2000**, 894.