

Correlation of Whole Body Fat and Visceral Fat on the Patients Suffering Lower Back Pain with Lumbar Disc Degenerative Diseases- A Pilot Study

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Abstract

Introduction: Lower-back pain (LBP) with lumbar disc degenerative diseases is the major health issue and the best modality in the detection of degenerative disc disease (DDD) is the magnetic Resonance Imaging (MRI).

Objectives: This study was focused on the correlation of body composition on degenerative changes in the lumbar intervertebral disc.

Methods: Low back pain subjects of age 20 -70 years, undergone lumbosacral MRI (1.5T), diagnosed as disc bulging were included. The 40 subjects [19 males (47.5%) and 21 females (52.5%)] were included and body composition of the patients was analyzed by bioelectrical impedance analysis. The relation between whole bodyfat, visceral fat, BMI with age and sex of the subjects were statistically analyzed.

Results and discussions: Statistical analysis showed a positive correlation between whole body fat with age, sex ,BMI (<0.05) but the whole body fat and visceral fat showed an inverse correlation in these subjects.

Conclusions: The whole body (subcutaneous) fat may have influence in lumbar disc degeneration with back pain. So, body composition analysis should be included as a preliminary routine investigation for lower back pain subjects for their better treatment.

Key words: Back pain; Body Composition; Lumbar Disc degeneration; MRI

INTRODUCTION

Lower- back pain (LBP) is noticeable common health issues of people with disc degenerative diseases which affect their routine life. The more than 20.3% in adult population reported the prevalence of back pain and it gradually overshoots in the third decade of life, has highly affected the quality of life of human beings [1]. Over 80% of adults have experienced LBP during their lifetime especially people ages 45 years or younger. 90% of people have herniation occurs between L4/L5 and L5/S1 [2] .

The aetiology of the back pain and disc degeneration include different factors like sedentary lifestyle and

reduced physical activity, stress, overweight, obesity, BMI(Basal metabolic Index) , weakness and atrophy of paraspinal muscles [3].Adiposity tends to correlate directly with intensity of LBP symptoms. Some study reported that the some variation in fat-bone depend on its distribution and deposition of fat on various regions of body [4].

2. LITERATURE REVIEW

The most advanced risk factor for the development of back pain is disc degeneration[5]. Whether the fat distribution of the body has beneficial or prejudicial is still controversy. Body composition has important role in the disc changes and muscular skeletal systems. The skeletal muscle fibres, are replaced by non-contractile tissue due to the fat infiltration [5] as age increases, and seen even in asymptomatic subjects [6]. Visceral fats and subcutaneous fats are the two stored forms of fat. Subcutaneous fats are stored under the skin and the visceral fats around the body organs especially in the trunk region .There are either negative or positive associations occur in subcutaneous and bone mass [7]. As the distribution of stored fat varied in each individual's it can be measured with different methods such as skin-fold callipers and, dual X-ray absorptiometry, bioelectric impedance (BIA), near infrared interactance, computed tomography (CT), magnetic resonance imaging (MRI), underwater weighing and Ultrasonography. Bioelectric impedance analysis measure body fats percentage it works by passing an electric current with low intensity through the body Now BIA has been considered as simple ,reproducible ,least expensive and highly accurate in clinics[8,9].

Therefore, the study conducted to assess the body composition by Tanita -BC analyser and to find out the relation between visceral and subcutaneous fat in subjects having lower- back pain with lumbar disc degeneration.

3. MATERIALS

Study population

This descriptive study was conducted in the period from August to December 2019 from Radiology . This Study was done by the approval of Institutional Ethical Committee. The instrument used for the measurement of body composition analysis was Tanita Bc -601 Manual inner scan Segmental Body Composition Analyzer. Method of total sampling was used in which patients with back pain admitted to the Department of Radiology referred for MRI, were included. Those who were not willing to participate were excluded .

Inclusion and exclusion criteria

Inclusion criteria: Patients with history of Low backache, radiating leg pain.

Exclusion criteria; Patients with history of Trauma, Myeloma, Spinal Surgery Spinal Pathology, Spinal Anomaly. Only eligible subjects as per inclusion criteria were approached for the study. Detailed study procedure was explained to them prior to the participation. Consent forms were obtained from each participants. After obtaining the consent, initially height of the patient was measured using stadiometer.

4. PROPOSED METHODS

40 patients, which include 19 males and 21 females, with low back pain between the age group of 20 to 70 years, who had undergone lumbosacral MRI (1.5T) in the Radiology Department, grouped into five on the basis of age as 20-30,30-40,40-50,50-60 and 60-70.

The MR protocol includes: Sagittal TSET2-and T1-weighted images, axial TSE T2-weighted images were reviewed and reported as disc degeneration on the basis of presence of anterior compartment disc degenerative diseases such as disk bulging, disk herniations, protrusion, and prolapse and posterior compartment degenerative disease such as: facet arthropathy, lumbar canal stenosis. From this report, the patients belonged in the disc bulging group. The whole body fat, visceral fat and body mass index (BMI) as the body composition, was done in the same subjects. On the basis of degree of adiposity, body composition analyser indicated and reported the subjects as underweight, normal weight, overweight and

obese among study subjects

Body composition Analysis

Questionnaires concerning the occurrence of present lower back pain prolonging for 1 month or more than month were completed by participants. With regard to the analysis of body composition, Tanita Bc-601 Segmental Body Composition Analyzer manual internal scan, by Bioelectrical Impedance Analysis (BIA) technology, BIA will use a constant current with a high-frequency current (50 kHz, 90 μ A) to determine the difference of impedance (resistance) of the body parts, consisting muscle and lean tissue. Both tests were conducted with an empty stomach during the morning hours (830-1200) or 3 hours after meals, and subjects had no physical exercise for the past 3 hours. The patients stood on the foot platform containing electrodes and held both hands on the handgrip with electrodes. Parameters of body composition, including whole body fat mass (kg), visceral fat, body mass index (BMI), were determined automatically. In the meantime the system reported all body impedance from the standard equation. Previous studies reported that BIA as the most reliable and valid technology [10, 11, and 12]

Result

Among the 40 participants, 19 (47.5%) were males and the remaining 21 were females (52.5%) and were categorized on the basis of age and degenerative changes in the lumbar intervertebral discs. As per the age they were categorized into 20-30 yrs, 30-40yrs, 40-50yrs, 50-60yrs and 60-70yrs. based on the MRI findings they were grouped under disc bulging group. The relationship between whole body fat, visceral fat, BMI with age and sex were performed and statistically analysed by Pearson correlation.

Table 1: Demographic characteristics

General characteristics	Frequency (N (%))
Gender	
Male	19
Female	21
Age	20-70
Weight	
Height	
BMI	
Whole body fat percentage	
Visceral fat percentage	

Demographic data of the patients were summarized in table1. As per the results obtained, females had higher proportion (21 females (52.5%)) as compared to males (47.5%) and back pain with disc bulging subjects were categorized. On the basis of body composition analysis, disc bulging subjects were again grouped as normal weight, overweight, obese. The results showed that, 31-40, 41-50 ages of both sexes were come under over fat and obese on the basis of their whole body fat and visceral fat. As age increased almost disc bulging subjects were come under obese group in both whole body fat and visceral fat.

Table 2: Distribution of both male and female disc bulging patients on the basis of whole body fat

Whole body fat category	Male (19)	Female(21)	Total(40)
Normal	3(16%)	1(4.8%)	4
Overfat	4(21%)	10(47.6%)	14
Obese	12(63%)	10(47.6%)	22

Table 2.showed that whole body fat of male disc bulging subjects were 63 %(12) obese and 21 %(4) had over fat. Of the 21 disc bulging females, the whole body fat category, 47.6 %(10) were over fat and 47.6 %(10) were obese and only 1(4.8%) was under normal category.

Table 3: Distribution of male and female disc bulging patients on the basis of visceral fat

Visceral fat Category	Male (19)	Female (21)	Total (40)
normal	5(26%)	16(76.2%)	21
Overfat	2(11%)	2(9.5%)	4
Obese	12(63%)	3(14.3%)	15

Table 3 showed about the visceral fat category male and female. Total of 19 males, 12(63%) were under obese, 2(11%) were overfat, 5males (26%) are normal .But in females, 76.2% females had normal visceral fat, 14.3% were under obese and 9.5% were in over fat category.

Table 4: Distribution of disc bulging patients according Body Mass Index

BMI Category	N(40)		Percentage(%)	
	Female N(21)	Male N(19)	Female	Male
Normal	8	7	38	36
Overweight	6	6	29	32
Obese	7	6	33	32

BMI =Body Mass Index

Table 4 mentioned that out of the 21 disc bulging females 7(33%) are obese and 6(29%) were in over fat category 8(38%) females come under normal BMI. Out of 19 males 32% of males shown overweight and 32% belongs obese category.

Table 5: Correlation between Age, BMI, Whole body fat and visceral fat with disc bulging patients

		Age	BMI	Whole body fat	Visceral fat
Age	Pearson Correlation	1	.337 [*]	0.174	.507 ^{**}
	(2-tailed)		0.034	0.283	0.001
		40	40	40	40
BMI	Pearson Correlation	.337 [*]	1	.496 ^{**}	.760 ^{**}
	(2-tailed)	0.034		0.001	0.000
		40	40	40	40
Whole body fat	Pearson Correlation	0.174	.496 ^{**}	1	-0.078
	(2-tailed)	0.283	0.001		0.634
		40	40	40	40
Visceral fat	Pearson Correlation	.507 ^{**}	.760 ^{**}	-0.078	1
	(2-tailed)	0.001	0.000	0.634	
		40	40	40	40
*significant P< 0.05					
**significant P< 0.01					

5. DISCUSSION

Whether the fat distribution changes are influence or not on bone is still unknown. As the adipose tissue increases, metabolic changes increases it can trigger back problems in addition to weight gain [13]. The bone suffered varying effects on the basis of types of body fat and its mechanical loading on the bone

also influence due to excess increase in the fat which links to higher bone mineral density (BMD, g/cm²)[14,15]

This study, focussed about the correlation of whole body fat (subcutaneous fat) and fat in viscera in the subjects were undergone MRI, whose suffering back pain for more than 1months. Patient's degree of degeneration was diagnosed on the basis of MRI as disc bulging group. As age increases, low back pain increases and severity of degree of degeneration also increases [16]. The study mentioned that there was a positive relation with BMI and lumbar back pain [17]. Several factors align and augment the occurrence of this significant result. Some studies revealed that obesity has correlation with overweight and in pain in the lower-back [18]. Obesity has a leading role to increased body weight, metabolic disorders and cardiac problems [19].

Our data has shown a strong positive correlation between BMI and disc degenerative diseases with back pain ($p < 0.05$) [20, 21]. Their body weight has positive correlation with BMI also. Obesity can lead to herniated disc and spine osteoarthritis[22,23] and can trigger to joint misalignment and firmly supported that truncal adiposity can affect spinal degeneration and grade of changes in the spine by making sustained, localized oedema and inflammation in and around the damaged area[24,25]. Furthermore, the protein glycation in connective tissues or atherogenesis is the striking feature of the obesity also leads to decreased blood circulation to the spine. Consequently, some of the overweight people have difficulties in doing their life routine activities such as walking, climbing steps, driving and can also leads to physical inactivity, pain and discomfort, however, in this study, on the basis of BMI, out of the 21 disc bulging females 7 are obese and 6 were in over fat category 8 females come under normal BMI.

Studied proved that increased BMI has also a factor in the disability in chronic low back pain patients [26]. Besides, this study depicted that the whole bodyfat has a positive correlation with disc bulging subjects and low back pain ($p < 0.05$) [27, 28]. Urquhart et al have noted a significant independent relationship between lower back pain and body fat of the extremities [29]. The majority of the disc bulging females (76.2%) belonged to normal visceral fat but they came to obese and overfat category when focused on subcutaneous fat. The collected data after analysis proved that there is a relation between fat and degenerative disc diseases. . Meanwhile, in this study correlation analysis also shown an opposite correlation between whole body fat and visceral fat in the lumbar disc degenerated patients. Increase in the percentage of visceral fat is a predictor or individuals prone to cardio metabolic complications and mineral density of lower limbs has positive correlation with subcutaneous fat but that visceral fat was a negative predictor of spine and total bone mineral density only in boys [30]. So this study revealing that increase in the subcutaneous fat have positively correlate with patients suffering lower- back pain with lumbar disc degeneration. Consequently, measuring body composition [31, 32] however, provide specific information on percentage of fat but BMI only does not give exact details.

The strength of the present study included novelty, important correlation between subcutaneous fat and lumbar disc degeneration, opposite correlation between visceral fat and lumbar disc degeneration. However, there are some limitations pointed out research period was short duration of data collection may affect the result of study. So continuation of the study should be needed more strength of subjects support the study. When a person is obese or weight, due to attaining excess of fat, it exerts abnormal load on back muscles that are forced to carry the weight of the fat. Lower abdominal muscle exercise can empower abdominal muscles which can help to balance hyperlordosis[33] and bring the pelvis go back into a neutral position. Apart from this, gradual weight management will have reducing the stress and

strain on the back and spine. Consequently, lower- back pain patients must to reduce their body weight and follow routine specific exercise with a nutritional diet chart as per the guidelines from the physicians can augment the bone strength and weight management [34].

6.CONCLUSION

There was a positive correlation in whole body fat with age, sex and BMI of disc degenerative patients and statistically significant correlation was found in visceral fat with age, sex and BMI. However there was an opposite correlation between whole body fat and visceral fat in the lumbar disc degenerated subjects. So it revealed that increase in the subcutaneous fat may have influence in patients suffering low back pain with lumbar disc degeneration . Therefore, body composition analysis should be included as a routine investigation in the diagnosis and appreciate course of treatment of low back pain.

Conflict of interest: The authors have no conflict of interest to declare.

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