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Evaluation of Obesity Association with Severity of Symptoms of the Degenerative Lumbar Scoliosis

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Abstract

Background: *More than 90% of all people will be affected by debilitating low back pain sooner or later in their lives. Degenerative scoliosis of the lumbar spine is one of the causes of low back pain in people older than 45 years. Body mass index (B.M.I.) and other factors may be directly related to the pathogenesis of degenerative lumbar scoliosis, exercise, severity of side effects experienced and response to treatment.*

Objective: *The aim of this study was to determine the associations between BMI and the severity of side effects of degenerative lumbar scoliosis in elderly patients.*

Methodology: *All elderly patients with signs and side effects of degenerative lumbar scoliosis presenting to the center were consecutively enrolled and studied. Weight, height and symptomatology were collected for each patient. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 24.0. Measurable significance was set at $P < 0.05$. Chi-square tests were used to determine the association between each item and the severity of side effects in the patients studied.*

Results: *Patients with increased B.M.I. accounted for 100%. The review found that 73% of the members had extreme types of disability, while 27% of them had mild to direct disability. The range of side effects was from 2 to 13 years, with an average duration of 5.63 years. Sensory hypoesthesia was noted in 99.4% of patients. The affected levels of the lumbar spine on radiographs were L5/S1 (40.4%), T12/L1 (18.6%), L4/L5 (21.3%), L1/L2 (11.2%), L2/L3 (3.3%), L3/L4 (2.7%) and T12/L1 to L5/S1 (2.5%). There was a large association between the clinical adverse events and the patients' BMI in the chi-square test ($p < 0.05$). The B.M.I. also showed a large association with the patients' pain score.*

Conclusion: *This study showed that there was a really large ($P < 0.05$) association between BMI and clinical severity of degenerative lumbar scoliosis including severity of pain score with worsened side effects in people with increased B.M.I.*

Keywords: *obesity, lumbar degenerative scoliosis, low back pain.*

Introduction

Adult scoliosis includes both adult idiopathic scoliosis and degenerative lumbar scoliosis (DLS). DLS is a renewed scoliosis. It is characterized by a parallel shape of the spine with a Cobb angle greater than 10° and sagittal vertical deviation (SVA) greater than 5 mm in an adult over 50 years of age. (1) Clinically, displacement is evident, with deformity usually associated with loss of lordosis, vertebral rotation, lateral listhesis (Figs. 1,2), and with/without spondylolisthesis (Fig. 3). Although the etiology is unclear, degenerative scoliosis is associated with degenerative circulatory disease, dysfunction, and hypertrophy of the ligamentum flava, which usually results in neurogenic claudication and back pain (Fig. 4). Occasionally, sagittal or coronal irregularities may also occur. Signs of treatment include pain, moderate distortion, radiculopathy or myelopathy, and corrective disfigurement. Nonsurgical treatment focuses on tolerant teaching, exercise, and nonnarcotic medications. Careful administration should be considered carefully, weighing the benefits and hazards to the patient. The sagittal vertical pivot is the shallow separation from the vertical central sacral line that runs from the center of gravity of C7 to the predominant corner of the sacral endplate. (Fig.1-2)

Fig.1-2 different varies of degenerative scoliosis in plain AP X-ray where the A-Vertical Sacral Central Line. B- Apical Rotation of Vertebra. C- Lateral Listhesis of Vertebra. D- Intercrest Line.

The dominance of the DLS varies in different studies. The detailed rate ranges from 8.3-68% (2, 3, 4, 5) The undeniable diversity in dominance may be a result of differences in the viewing dimensions of the various studies. (6, 7) Increasing body mass index (B.M.I.), which can lead to obesity, is a growing problem for general wellbeing worldwide, and the number of overweight or obese people is increasing significantly worldwide (5, 6). High BMI can negatively impact muscle supply in virtually all musculoskeletal disorders (MSDs), particularly DLS. Both elevated

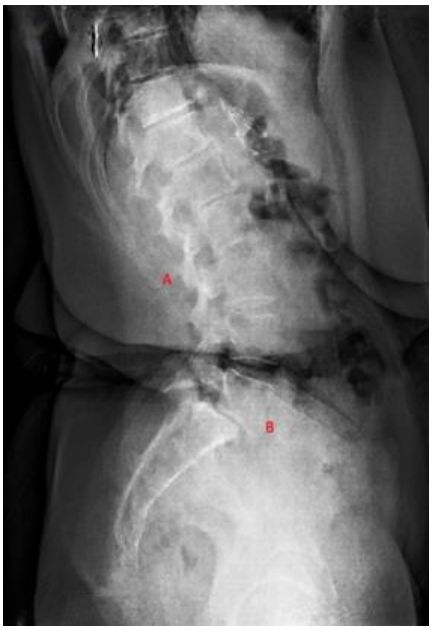

Fig. 3 degenerative scoliosis with Spondylolisthesis where A- posterior listhesis Of Th-12 and B- Spondylolisthesis L5 over S1 Grade II

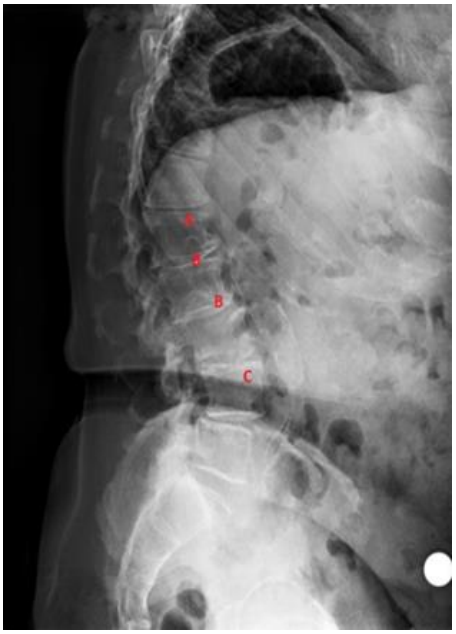

Fig. 4 degenerative scoliosis with A-posterior listhesis B- degenerative disc disease with facet incompetence C- spondylolisthesis grade I

BMI and DLS have been broadly regarded as problems of Western countries and are, in any case, widespread in industrialized countries. (5,6) Increased body weight increases the mechanical demands on the external muscles, particularly the intervertebral disks (IVDs) and joints, and causes a number of immediate and circumstantial muscular difficulties due to the expanded mechanical demands on the spine in people with increased BMI. Increased body weight may be associated with the pathogenesis of DLS, but direct evidence is insufficient. (7) Elevated BMI also leads to elevated strain, and it has additionally been recommended that metabolic elements related to body weight could be a hindrance to a solid spinal segment. (7, 8) Therefore, higher BMI could be a direct or hidden risk factor for the pathogenesis of DLS. The severity of side effects of DLS could be influenced by the patient's BMI both before treatment and in response to any type of treatment. The worldwide pandemic of overweight and obesity-"globosity"-is rapidly becoming a significant overall health condition in many regions of

the world. Overweight and obesity are referred to as a strange or extreme fat accumulation that poses a risk to health. (9) The World Health Organization (WHO) estimates that the prevalence of obesity has more than doubled since 1980 (Table 1), with over 10% of the total population classified as obese. (10)

In England, up to 25% of the population is corpulent, with higher prevalence in women than men. (11) In European Union countries, up to half of adults are overweight or obese; in the United States and China, comparatively 33% of adults are corpulent. (11) In the Arab world, the percentage of overweight was 20.3%-30% of men and 32-55% of women. (12) BMI order: body mass index (BMI) is a basic record of weight in relation to height that is helpful in classifying weight into underweight, overweight, and obese in adults. (9) It is characterized as weight in kilograms divided by the square of height in meters (kg/m2). (9) BMI = weight (kg)/height2 (m2) BMI values are independent of age and the same for both sexes. Be that as it may, BMI is not necessarily similarly related to consanguinity, to some degree because of differences in body size.

Classification	BMI (kg/m2) Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99 23.00 - 24.9
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49 27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49 32.50 - 34.99
Obese class II	35.00 - 39.99 35.00 - 37.49 37.50 - 39.99	
Obese class III	≥40.00 ≥40.00	
Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004		

Table 1

The wellbeing chances associated with rising BMI are unwavering, and understanding of BMI assessment in relation to dangers may vary for different populations. (9) In our study, we found that despite the high prevalence of low back pain (LBP) due to DLS in the population, the methods of analysis and treatment options are variable and often contradictory, due to fewer spine experts who are not trained in spine and numerous investigations, leading to increasing costs and variations in management around the world. Managers of patients with DLS could be tested and costly. Assessing the severity of side effects using BMI is relevant to the degree of impairment in activities of daily living (ADL) and its impact on satisfaction. There are many assessment tools for assessing DLS side effects at presentation and follow-up of treatment, but in this study many variables "pain score, type of gait, sensory hypoesthesia, overall spinal posture, apical rotation, lateral listhesis, line of interest" were used in terms of their clinical relevance to the intricacies of the exercises of daily living.

Materials and Methods

26 patients aged 56-78 years with suggestive DLS who fulfilled the criteria for the study were continuously selected and treated at our center. Informed consent was obtained from each patient before enrolment in the study. Each individual patient was recorded, analyzed in detail and examined. Body weight and height were estimated and X-ray findings were noted. The B.M.I. of each patient was determined. Bio-information, symptomatology and agony score were recorded. Interdiction measures included patients with previous spinal medical procedures, persistent low back pain from a cause other than DLS, patients with previous spinal pathologies (such as infections, tumors, congenital or deformities) or patients with a history of mental health problems. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 24.0. Factual significance was set at $P < 0.05$. Chi-square tests were used to determine the relationship between BMI and severity of adverse events in the concentrated patients. (Table 2)

	Age	Sex	BMI	Initial factor	Gait	Pain Score	Patellar Reflex		Ankle Reflex		Total Spine Posture	Apical Rotation	Lateral Listhesis	Intercrest Line
							Right	Left	Right	Left				
1	58	F	40.9	R.T.A	Antalgic	9.5	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 right	L3 left	L4
2	67	M	55.4	Fall Down	Stepage	9.6	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 right	L3 left	L4-L5
3	69	F	33.1	Lifting	Stepage	9.5	Decreased	Exaggerated	Decreased	Exaggerated	kyphosis	L3 left	L4 left	L4
4	59	F	41.4	Sitting	Antalgic	9	Decreased	Decreased	Decreased	Decreased	Kyphosis	L3+L4 right	L3 + L4 right	L4-L5
5	56	F	34.2	Lifting	Antalgic	9.3	Exaggerated	Exaggerated	Exaggerated	Exaggerated	Lumbar Lordosis	L3 right	L3 left	L4
6	58	F	52.5	Lifting	Stepage	8.7	Decreased	Exaggerated	Exaggerated	Exaggerated	Lumbar Lordosis	L2 left	L2 right	L4
7	77	M	32	Fall Down	Stepage	8.9	Decreased	Absent	Decreased	Decreased	Kyphosis	L2 left	L2 left	L4
8	78	F	36	Sitting	Stepage	8.5	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 right	L4 left	L4-L5
9	62	F	36.2	Fall Down	Antalgic	9.7	Exaggerated	Exaggerated	Exaggerated	Exaggerated	Lumbar Lordosis	L3 left	L4 right	L5
10	68	M	39	Fall Down	Antalgic	8.4	Exaggerated	Exaggerated	Exaggerated	Exaggerated	Kyphosis	L2 left	L4 right	L4
11	63	M	35.9	Fall Down	Antalgic	9.6	Decreased	Decreased	Decreased	Decreased	Kyphosis	L2 right	L4 right	L4
12	75	M	31.5	Sitting	Stepage	8.4	Decreased	Decreased	Decreased	Decreased	Kyphosis	L2 right	L2 left	L4-L5
13	70	F	49.7	Fall Down	Stepage	8.6	Decreased	Exaggerated	Decreased	Exaggerated	Lumbar Lordosis	L3 left	L3 left	L4-L5
14	65	F	39.5	Fall Down	Antalgic	8.8	Exaggerated	Decreased	Exaggerated	Decreased	Lumbar Lordosis	L2 left	L3 left	L4-L5
15	71	F	34.9	R.T.A	Stepage	9.3	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 left	L3 right	L4-L5
16	56	M	31.1	Fall Down	Stepage	8.7	Decreased	Absent	Decreased	Decreased	Lumbar Lordosis	L2 left	L3 right	L4-L5
17	72	F	38.2	sitting	Stepage	9.3	Exaggerated	Decreased	Exaggerated	Decreased	Lumbar Lordosis	L3 left	L4 left	L4
18	67	F	37.8	Fall Down	Stepage	9.6	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 left	L3 right	L4-L5
19	64	F	38.7	Fall Down	Antalgic	7.9	Exaggerated	Exaggerated	Exaggerated	Exaggerated	Kyphosis	L3 left	L3 left	L4-L5
20	54	M	42.7	Fall Down	Antalgic	8.2	Decreased	Decreased	Decreased	Decreased	Kyphosis	L3 left	L3 left	L4

21	62	M	51	Sitting	Antalgic	9	Decreased	Decreased	Decreased	Decreased	Lumbar Lordosis	L3 left	L3 left	L4
22	69	M	49	Fall down	Stepage	8.6	Absent	Absent	Absent	Absent	Kyphosis	L3+L4 right	L3+L4 right	L4-L5
23	59	F	38.5	Fall down	Stepage	8.1	Exaggerated	Exaggerated	Exaggerated	Exaggerated	Lumbar Lordosis	L3+L4 right	L3+L4 right	L4-L5
24	63	F	32.7	Sitting	Antalgic	7.9	Exaggerated	Decreased	Exaggerated	Decreased	Lumbar Lordosis	L3 right	L3 right	L4
25	78	F	40.1	R.T.A	Stepage	9.2	Absent	Absent	Absent	Absent	Kyphosis	L2 right	L2 right	L4-L5
26	69	M	41	Sitting	Antalgic	8.5	Decreased	Decreased	Decreased	Decreased	Kyphosis	L3 left	L3 left	L4-L5

Table 2: Patient data summary

Results

26 patients from the outpatient confidential facility at our center were studied, of whom 38.5% were male and 61.5% were female (16 patients were female and 10 were male) (Fig. 5). The average age ranged from 56 to 78 years (Fig. 6). Each of the patients had an elevated B.M.I. (obesity class I, II, III), with a mean of 39.7 (with a minimum of 31.1 and a maximum of 55.4) and a mean of 38.6 in females and 41.4 in males (Fig.7). The review revealed that the agony score (0 no agony and 10 extreme agony) was elevated, the mean of the agony score was 8.8 (with a minimum of 7.9 and a maximum of 9.7), in males the mean was 8.7 and in females it was 8.8 (Fig.8). The side effect duration of the patients ranged from 2 to 13 years, with a mean side effect duration of 6.63 years. Each of the patients reported numerous side effects of shifted severity, while 99.40% of them had altered sensations (paresthesia) on presentation. 53.8% of the patients had a stepper gait and 46.2% had an antalgic gait. For the underlying element from the history of the patients, we traced the fall in the significant cause (half), followed by prolonged sitting during the lifestyle of the patients (26.9%) and the last two variables lifting heavy objects and road traffic accident with the same rate of (11.5%) for each of them. The overall spinal posture of (57.7%) was lumbar hyper-lordosis detected by actual assessment and radiography and (42.3%) was undeniable kyphosis. The affected anatomical levels of apical rotation of the lumbar spine were L3 left (38.5%), L2 left (19.2%), L2 right (19.2%), L2 right (11.5%), L3-L4 right (11.5%). The most important lateral gliding vertebra of the lumbar spine was L3 left (26.9%), followed by L3 right (19.2%), L4 right and L4 left (15.4%) and (7.7%) for lateral gliding vertebra of L2 right, L2 left and L3-L4 right. There was a critical association between clinical side effects and the patient's B.M.I. with chi-square tests (p-values) of < 0.05. The B.M.I. also showed a

critical association with clinical side effects and signs (p-value < 0.05). In 99.40% of the members, the sensation in the lower limbs changed in different variants. The recurrence of the respective radiculopathy (radiating pain) increased with each extension of B.M.I. Moreover, 86.3% of the members had reciprocal radiculopathy of the lower limbs. The incidence of distal limb weakness increases with each expansion of the B.M.I. group.

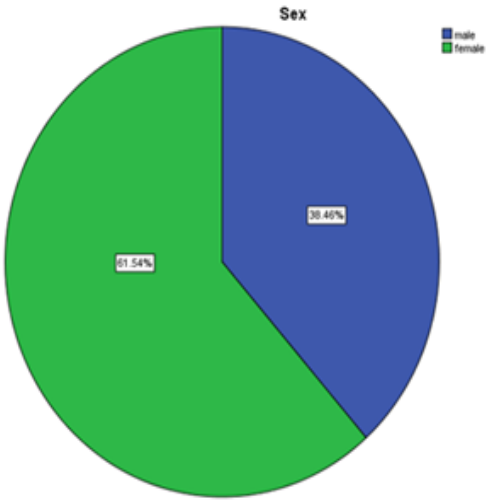

Fig. 5 relation the gender of patients

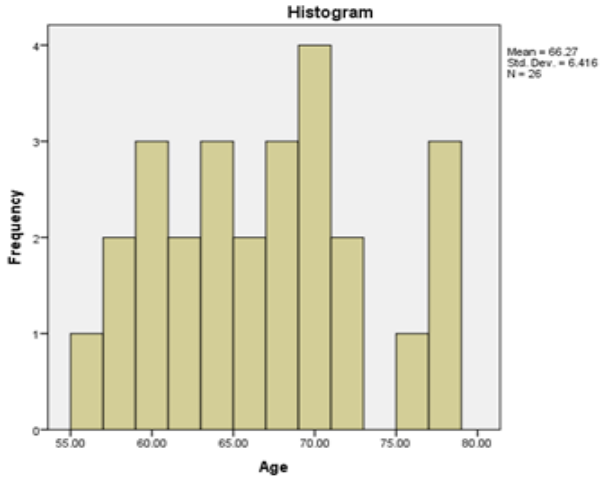

Fig. 6 histogram of the Age of patients

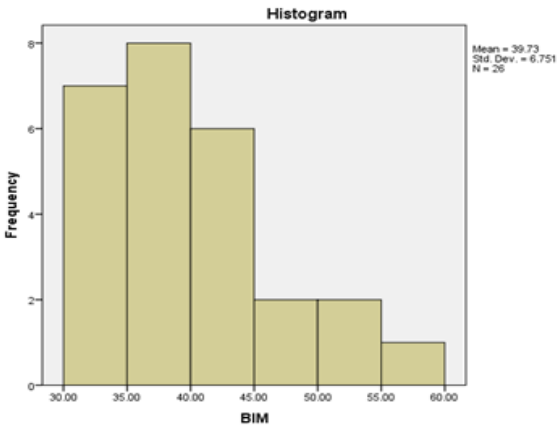

Fig. 7 histogram of the B.M.I. of the patients

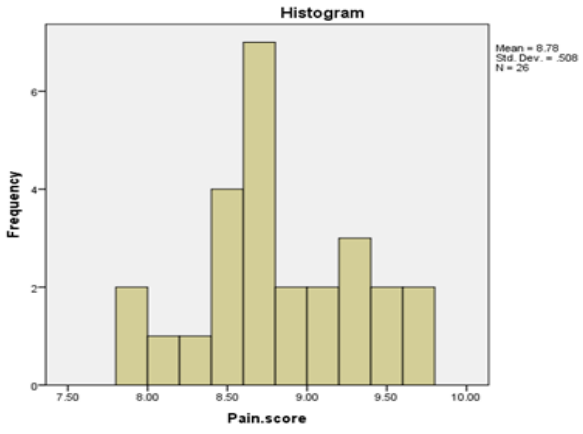

Fig. 8 histogram of the Pain Score of the patients

Discussion

Lumbar degenerative scoliosis (DLS) is the most common cause of low back pain (LBP) in adults internationally and the leading cause of incapacity, grimness and psychological problems with high financial weight. (1-4) The rate is increasing even in our city "Jeddah" and more and more people are affected by the clinical circumstances. The study was conducted on 26 patients with a male to female ratio of 1:1.6. In our study, 100% of the members presented at the outpatient clinic. 85% of the patients presented to the outpatient department with acute LBP as a chronic case. This difference could be due to the fact that the study was targeted at a population where there was a combination of government employees as opposed to this study which was conducted in urban communities among a population of government employees and merchants in general. The patients with elevated BMI constituted 100 per cent (26 patients) of the members. This could mean that BMI plays a role as a risk factor for improving lumbar DLS, as an indication of the side effects of lumbar DLS, or both. The review found that a total of 26 patients (100 per cent) of the members had moderate to severe to limited ability scores. These pain scores were high because the study was conducted in reference communities where numerous patients were referred for specialized care after treatment failure. The severity of the pain scores in this study may also be due to the late presentation of patients, which may have exacerbated pathology and affected ability, according to the reviews by Ajiboye et al. (13)

The radiological levels of lumbar spine involvement were L5/S1 40.4%), T12/L1 (18.6%), L4/L5 (21.3%), L1/L2 (11.2%), L2/L3 (3.3%), L3/L4 (2.7%) and T12/L1 to L5/S1 (2.5%). These levels are in line with the findings of Ajiboye et al (14) and Eyichukwu et al (15) in Lagos and Enugu, where L4/L5 and L5/S1 were found to be the most elaborated spinal segments. Physically, the L4/L5 and L5/S1 spinal segments are a cross between an exceptionally mobile lumbar and a non-mobile sacral region, and the joints at L4/L5 are more sagittal located and can easily be hit by a slipped vertebra. These could be the explanations for the increased recurrence of this pathology in these areas. Each of the patients studied had numerous side effects of varying severity. The altered sensation side effects were the most frequently and found in 99.4% of members. This is followed by hub and mechanical back pain in 95% of members. Disabled or complete loss of urinary or potential sphincter control was noted in 8.3% of members. It is noted that the higher the BMI, the more common the various side effects/symptoms in the groups. Chi-square tests showed a huge association between BMI and clinical side effects with p-upsides of < 0.05 for each of the side effects. Weiler et al (16) showed a serious association between histological changes in IVD degeneration and BMI in a study of 854 patients. Weiler et al (16) also found that increased BMI was recognized as a positive risk factor for improving suggestive, clinically significant disc degeneration. These findings are similar to the findings in our

study. The association between adverse events and BMI in our study is also similar to the report by Fanuele et al. (17), who found a decrease in the severity of adverse events with higher weight. Samartzis et al (18) also found a critical relationship between the presence, grade and global severity of disc degeneration and clinical severity with increased BMI in a large local study of methodological assessment of lumbar disc degeneration on MRI ($P < 0.001$). This critical relationship could be due to the expanded mechanical demands as the expanded load moves down the lumbar spine; as a result, the lumbar spine (muscles, tendons, joints, vertebral bodies and IVD) is capable of more compressive force as BMI increases. Most (95.6%) members have reciprocal radiculopathy (radiating agony) as a side effect. It is also noticeable that radiculopathy side effects increase with BMI and all members with BMI ≥40.00kg/m2 had reciprocal radiculopathy side effects. This could be due to the fact that focal canal stenosis occurs more rapidly in patients with a higher BMI. This could significantly affect the nerves (cauda equina) in the lumbar fossa before they leave the canal. There is a really big correlation between BMI and ODI (P-value = 0.001). This could be explained by the greater mechanical stress on the unhealthy lumbar section during daily routine exercises and, surprisingly, still with a huge stress on the affected part of the spine in patients with a higher BMI. This finding is also in line with the report by Fanuele et al. (19) from a study with an enormous range, in which ODI was found to be much worse in patients with a higher BMI. Kara et al (20) announced in their forthcoming review that BMI was one of the most important risk factors for poor practical and financial circumstances in patients who had treated at least one degenerative lumbar scoliosis. In another concentrate in India, in which Ha et al (21) investigated the risk of postoperative degeneration of the adjacent fragments, it was found that the presence of circular degeneration, age older than 65 years and increased BMI were major risk factors for both adjacent fragment degeneration and worsening ODI. These previously mentioned discoveries from the studies, as well as in our concentrate, showed that increased BMI is one of the elements responsible for the clinical and utilitarian severity of adverse events in patients with lumbar LDS.

Conclusion

this study shows that B.M.I. is one of the elements responsible for the unfortunate performance and extreme clinical side effects in elderly patients with lumbar degenerative scoliosis.

Weight gain should be overtly addressed through general well-being training to prevent the worsening side effects of LDS.

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