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DISABILITY IN PATIENTS WITH PROLAPSED INTERVERTEBRAL DISC IN LUMBAR REGION

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ABSTRACT

Lumbar disc herniation is one of the most common spinal degenerative disorders which lead to low back pain (LBP) and radicular leg pain.(Yang H *et al*. 2015) Lumbar disc prolapse is a disease most common between 30 and 50 years of age, with a male preponderance, as well as an association with repeated mechanical forces and smoking. It may occur at any level, but 95% occur at L4/5 or L5/S.Therefore, the present study will be done to find the level of association of disability in PIVD and NON-PIVD subjects in the Indian population.This was a cross sectional study conducted on 300 subjects (150 PIVD/150 Non-PIVD) 25-50 years old. The sociodemographic data was taken and disability was measured by OLBPDQ- Oswestry low back pain disability questionnaire. The disability mean(SD) value of PIVD subjects was 23.93(6.01) and without PIVD 7.61(4.04) on OLBPDQ scale. That shows the level of disability was more within the PIVD subjects and the p-value is <0.001*. We also compared the each component of the OLBPDQ between the PIVD and non-PIVD groups. Components 1,2,3,4,5,6,7,8,9 and 10 represent subjective pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and work, respectively. All components 1,2,3,4,5,6,7,8,9 and 10 were found to have statistically significant difference at p<0.05.On the basis of all 10 components of OLBPDQ we can said that PIVD is affect every aspect of human life. Oswestry Low Back Disability Index (OLBDI) results in PIVD subjects clear an increased risk of physical disability, thereby exposing subjects with PIVD to several other consequences of disability. Therefore, the complete physical health assessment and treatment forsubjects with PIVD should be considered and they should receive proper guidance.

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INTRODUCTION

Prolapsed Intervertebral Disc is one of the common & costly medical problems in india. Heavy lifting, Stwisting and trauma were the most common causes of LBP, in which 52-60% are work related (Biering-Sørensen, F.1983). In India Prasad *et al*. found that the incidence of lumbar disc prolapse was more common in people from rural area, moderate and heavy workers, vehicle drivers on bad roads (Prasad R *et al*. 2006). Lumbar disc herniation is one of the most common spinal degenerative disorders which lead to low back pain (LBP) and radicular leg pain.(Yang H *et al*. 2015) Lumbar disc prolapse is a disease most common between 30 and 50 years of age, with a male preponderance, as well as an association with repeated mechanical forces and smoking. It may occur at any level, but 95% occur at L4/5 or L5/S. In the older population, with chronically degenerative discs, compression of the nerve root is more likely to be due to facet joint or ligamentumflavumhypertrophy. Nerve roots exit the spinal canal, below the pedicle ofthe same numbered vertebrae, but above the disc of the next caudal disc space. Nerve root compression can occur in three locations.

- A central disc prolapse compresses the thecal sac and the roots of the caudaequina that are contained within.
- A lateral disc prolapse or lateral recess stenosis compresses the transiting nerve root just after it has bifurcated from the dural sac. For example a lateral L4/5 disc compresses the L5 nerve root.

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- A far lateral disc prolapse compresses the nerve root that exits the foramen at the level of the involved disc. For example a far lateral L4/5 disc prolapse can compress the L4 root (Haden, N., Whitfield, P., & Moore, A. 2005).

Massive herniation is defined as disc materialoccluding at least 50% or more of the spinal canal on axial MRI scans (Cribb GL *et al* 2007 and Benson RT *et al* 2010). Lumbar spine segmental instability is also one of the important causes of low back pain, but its clinical signsand symptoms are remained poorly defined Instability of the spine has been studied in vivo(Stokes IA, Frymoyer JW. 1987). Since 1944 when Knutsson, using functional radiographs, to study the instability associated with disk degeneration in the lumbar spine (Knutsson F. 1944). White and Panjabi defined clinical instability ofthe spine as the loss of the ability of the spine under physiologic loads to maintain relationshipbetween vertebrae in such a way that there is neither damaged nor subsequent irritation to thespinal cord or nerve roots, and in addition, there is no development of incapacitating deformityor pain due to structural changes (White AA, Panjabi MM. 1990). PIVD is collective term, describing a process in which the rupture of annular fibers allow for a displacement of nucleus pulposus within the intervertebral space, most commonly in posterior or postero-lateral direction (Weber H.1994). The sequences of changes occurring in PIVD are stage of nucleus degeneration, stage of nuclear displacement (Stage of protrusion, extrusion, sequestration) & stage of fibrosis (J Maheshwari: Essential orthopaedics (Revised 2007). The periphery of the disc is nociceptively innervated, the degenerative &/or traumatic process of disc herniation may produce Discogenic pain by the excessive mechanical strain on the outer annular fibers. PIVD can also cause radicular pain. The clinical manifestations following nerve root compression depends on the involvement of nerve root (Robin McKenzie and Stephen May, 1989).

In prolapsed intervertebral disc thepart or all of the soft gelatinous central portion of an intervertebral disc (the nucleus pulposus) is forced through a weakened part of its retaining ring, resulting in back pain and possibly nerve root irritation.Usually herniation takes place in the lumbar area of the spine. Lumbar disc herniation occurs 15 times more often than cervical (neck) disc herniation, and it is one of the most common causes of lower back and leg pain. The cervical discs are affected 8% of the time and the upper-to-mid-back (thoracic) discs only 1% to 2% of the time. Nerve roots (large nerves that branch out from the spinal cord) may become compressed resulting in symptoms such as pain or changes to muscle power or skin sensation. Abnormal function of a nerve from the neck or back is known as "radiculopathy". Disc herniation occurs more frequently in middle aged and older men, especially those involved in strenuous physical activity. Other risk factors include any congenital conditions that affect the size of the lumbar spinal canal.Pain or loss of sensation or weakness in the leg which results from a herniation of disc material may give rise to different findings depending on a number of factors including the size of the disc prolapse and the degree to which the spinal nerve is compressed by it. A disc protrusion occurs when the nucleus pulposus extends into the retaining ring of the disc without actually rupturing through it. A lump of this material is still able to compress the nerve, however, and symptoms in the back or leg may result. A disc extrusion occurs when the material of the nucleus pulposus ruptures through the retaining ring entirely so that this material is situated in the spinal canal adjacent to a nerve root. Disc prolapses are often larger than the previous variety and may cause a greater degree of nerve compression.Disc herniation is one of the common musculoskeletal disorders & is closely related to functional disability of trunk muscle, such as back extensors & abdominal muscles. The spinal column is vital in maintenance of spinal stability. Any postures they are not physiological, puts extra strain on structures such as disc ligaments, bones, muscles & posterior facet joints of vertebral column, Nygaard, Ø. P., Kloster, R., & Solberg, T. (2000). Symptom severity also varies and, in many patients, pain and loss of function may lead to disability and long periods of sick leave. The posture becomes pathological due to obesity, poor musculature, osteoporosis etc. the commonest cause of backache is abrupt unbalanced or unexpected movement of spine, lifting heavy weights, vertical jerking while traveling, bending to strain stretching or tearing of various muscles & ligaments of vertebral column or prolepses of intervertebral disc. This produces inflammation & edema leading to pain & compression of nerves or spinal cord and because of all these, there is imbalance between damage due to routine work & repetitive process, which is a key factor in herniated disc.Disc herniation is rupture of fibro cartilaginous material (annulus fibers). That surrounds the intervertebral disc. This rupture involves release of disc's centre containing a gelatinous substance known as nucleus palposus to force outward, placing pressure on spinal nerve & causing considerable pain & damage to nerve (Marchand F, *et al*. (1990). When radial fissures allow gross migration of nucleus relative to annulus, to the extent that the disc periphery is affected then disc can be said to be herniated or prolapsed. Depending on the extent of nucleus migration, disc hernia ion may result in protrusion, extrusion or sequestration of nuclear material. (Nakamura SI, Takahashi K, Takahashi Y, *et al*.1996). Among 180 patients 65.6% were male and 34.4% were female. The most common age of presentation was 31-40 yrs (33.3%) followed by 21-30 yrs (23.3%) with the highest percentage of patients (89.4%) were between age of 21-60 yrs. In this study 71.7% patients were from rural area and 59.4% patients were moderate workers. Similarly the percentage of rural moderate workers were 47.22%. Even among the female patients, most of them (72.58%) were rural moderate workers **(**Nakamura SI *et al* 1996, Bogduk N, *et al* 1981 and WS, Shim JC *et al* 2004).

MATERIALS AND METHODS

This was a cross sectional study. All subjects were women 25-50 years old (men and women). The PIVD subjects were recruited from the Hakim Abdul Hamid Centenary hospital, Deptt. Of rehabilitation sciences, Physiotherapy and orthopedic department, JamiaHamdard, New Delhi and near byarea.Diagnosed patients by the orthopaedicsconsultant, were included in the study after due informed consent.

Sample Size: Convenience sampling was used. The sample size was 150 for PIVD subjects and 150 NON-PIVD subjects. Therefore, 93 women and 57 men were included in the PIVD group and 104 women and 46 men were included in the NON-PIVD group are from the local community and universities were included in the control group.

Inclusion Criteria

- Age: 25-50 years
- Gender: both males and females

- Grade-2 and 3 PIVD patients
- Patients willing to give informed consent.

Exclusion Criteria

- Person who had underwent any kind of musculoskeletal surgical procedure which might affect his/her normal upper or lower limb function.
- With no known neurological, musculoskeletal, cardiopulmonary, medical or psychological condition other than PIVD condition.

Equipment

- Sociodemographic Information
- Oswestry low back disability index(OLBDI)
- OswestryLow Back Disability Index (OLBDI)-Thesource of this scale was Fairbank JCT &Pynsent, PB (2000).

The Oswestry Disability Index (also known as the Oswestry Low Back Pain Disability Questionnaire) is an extremely important tool that researchers and disability evaluators use to measure a patient's permanent functional disability. The test is considered the 'gold standard' of low back functional outcome tools[1]. In this scale there are 10 section, for each section the total possible score is 5: if the first statement is marked the section score = 0; if the last statement is marked, it = 5. If all 10 sections are completed the score is calculated and then percentage of total score will be calculated as0% to 20%: minimal disability, 21%-40%: moderate disability, 41%-60%: severe disability, 61%-80%: crippled, 81%-100%: These patients are either bed-bound or exaggerating their symptoms (Fairbank JCT &Pynsent, PB. 2000)

Table 1. Comparison of demographic data and subject characteristics between PIVD and non-PIVDgroups ;PIVD- Prolapsed Intervertebral Disc; BMI- body mass index; *significant difference at p<0.05

Variable	PIVD Mean(SD) N=150	Non-PIVD Mean(SD) N=150	t-value	p-value
Age (years)	41.24 (5.56)	39.81 (7.95)	1.79	0.073
BMI (kg/m^2)	26.17 (1.51)	23.24 (1.97)	14.39	<0.001*
Occupation Status(%)			-	0.090
Unemployed	-	-		
Homemaker	59 (39.3)	45 (30.0)		
Employed	91 (60.7)	105 (70.0)		
Type of Work (%)			-	0.163
Intellectual	72 (48.0)	60 (40.0)		
Physical	78 (52.0)	90 (60.0)		
Character of Work (%)			-	0.041
Sedentary	57 (38.0)	37 (24.7)		
Dynamic	72 (48.0)	90 (60.0)		
Standing	21 (14.0)	23 (15.3)		

Table II. Comparison of disability scores between PIVD and non-PIVDgroups; PIVD- Prolapsed Intervertebral Disc; OLBPDQ-Oswestry low back pain disabilityquestionnaire. *Significant difference at p<0.05

GP		N	Mean	Std. Deviation	t-value	p-value
OLBPDQ	PIVD	150	23.93	6.01	27.560	<0.001*
	NON-PIVD	150	7.61	4.04		

Operational Definition

PROLAPSED INTERVERTEBRAL DISC (PIVD) -PIVD is collective term, describing a process in which the rupture of annular fibers allow for a displacement of nucleus pulposus within the intervertebral space, most commonly in posterior or postero-lateral direction (Weber H.1994). DISABILITY- A disability is any continuing condition that restricts everyday activities. The WESTERN AUSTRALIA – LEGISLATION Disability Services Act 1993 (Act no. 36 of 1993) defines 'disability' as meaning a disability:which is attributable to an intellectual, psychiatric, cognitive, neurological, sensory or physical impairment or a combination of those impairments.
DISABILITY by WHO- Disabilities is an umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations.

Instruments

- The sociodemographic variables were collected using a specially designed semi-structured proforma.

HYPOTHESIS

ALTERNATE HYPOTHESIS

H_1: There is a significant difference between PIVD and NON-PIVD subjects with disability.

Null Hypothesis

H_0: There is no significant difference between PIVD and NON-PIVD subjects with disability.

Statistical Analysis

The data were pooled and statistically analyzed using IBM SPSS 23software. The sociodemographicdata and the prevalence of low back disability are reported in terms of frequency, percentages, mean and standard deviation wherever required. The Chi-square test was used to analyze categorical data. Comparison between the two groups was done using independent t- test. Level of significance was set at $p<0.05$.

RESULTS

Sociodemographic Information: Data from 300 subjects (150 with PIVD and 150NON-PIVD subjects) were analyzed. No significant difference between the meanage, mean OS and mean TOW were identified between the groups (Table I). Table II compares disability in PIVD and non-PIVD groups. Values are represented as mean (SD) for all the variables. The values for OLBPDQ showed statistically significant difference between the two groups at $p<0.001$. The mean (SD) were 23.93 (6.01) and 7.61 (4.04) for PIVD and non-PIVD groups, respectively. Table III compares each component of the OLBPDQ between the PIVD and non-PIVD groups.

Components 1,2,3,4,5,6,7,8,9 and 10 represent subjective pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and work, respectively.All components 1,2,3,4,5,6,7,8,9 and 10 were found to have statistically significant difference at $p<0.05$. Around 60% subjects had fairly severe pain intensity at that moment in the PIVD group compared to around 34% subjects had mild pain intensity in the non-PIVD group. In personal care, 52.7% subjects are feeling painful to look after his/her self and slow/ careful in the PIVD group compared to around 3.3% subjects are feeling same in the non-PIVD group.44.7% subjects are pain prevent from lifting heavy weights, but they can manage light to medium weights if they are conveniently positioned in

Table III. Comparison of OLBPDQ components between PIVD and non-PIVDgroups ;PIVD- Prolapsed Intervertebral Disc;OLBPDQ-Oswestry low back pain disability questionnaire.. *Significant difference at p<0.05

OLBPDQ Components		PIVD (n=150)		Non-PIVSD (n=150)		p-value
		N	%	N	%	
1. Pain intensity	0	-	-	60	40.0	<0.001*
	1	7	4.7	51	34.0	
	2	39	26.0	39	26.0	
	3	90	60.0	-	-	
	4	9	6.0	-	-	
	5	5	3.3	-	-	
2. Personal care (washing, dressing etc)	0	-	-	127	84.7	<0.001*
	1	16	10.7	18	12.0	
	2	79	52.7	5	3.3	
	3	42	28.0	-	-	
	4	10	6.7	-	-	
	5	3	2.0	-	-	
3. Lifting	0	3	2.0	56	37.3	<0.001*
	1	11	7.3	67	44.7	
	2	40	26.7	17	11.3	
	3	67	44.7	10	6.7	
	4	24	16.0	-	-	
	5	5	3.3	-	-	
4. Walking*	0	3	2.0	85	56.7	<0.001*
	1	22	14.7	42	28.0	
	2	88	58.7	23	15.3	
	3	25	16.	-	-	
	4	7	4.7	-	-	
	5	5	3.3	-	-	
5. Sitting	0	-	-	68	45.3	<0.001*
	1	4	2.7	38	25.3	
	2	55	36.7	44	29.3	
	3	66	44.0	-	-	
	4	21	14.0	-	-	
	5	4	2.7	-	-	
6. Standing	0	-	-	63	42.0	0.228
	1	10	6.7	47	31.3	
	2	91	60.7	39	26.0	
	3	37	24.7	1	0.7	
	4	5	3.3	-	-	
	5	7	4.7	-	-	
7. Sleeping	0	-	-	64	42.7	<0.001*
	1	49	32.7	56	37.3	
	2	69	46.0	30	20.0	
	3	22	14.7	-	-	
	4	10	6.7	-	-	
	5	-	-	-	-	
8.Social life	0	3	2.0	97	64.7	<0.001*
	1	55	36.7	21	14.0	
	2	59	39.3	32	21.3	
	3	24	16.0	-	-	
	4	4	2.7	-	-	
	5	5	3.3	-	-	
9. Travelling	0	-	-	53	35.3	<0.001*
	1	30	20.0	60	40.0	
	2	56	37.3	13	8.7	
	3	51	34.0	24	16.0	
	4	10	6.7	-	-	
	5	3	2.0	-	-	
10. Work	0	-	-	71	47.3	<0.001*
	1	24	16.0	25	16.7	
	2	36	24.0	31	20.7	
	3	55	36.7	23	15.3	
	4	30	20.0	-	-	
	5	5	3.3	-	-	

the PIVD group compared to around 6.7% subjects having same issue in the non-PIVD group.58.7% subjects are pain prevent from walking more than ½ mile in the PIVD group compared to around 15.3% in the non-PIVD group.44% subjects are pain prevent them from sitting more than 30 minutes in the PIVD group compared to around 29.3% subjects are pain prevent them sitting more than one hour in the non-PIVD group.24.7% subjects are pain prevent them from standing more than 30 minutes in the PIVD group compared to around 0.7% subjects in the non-PCOS group.46% decreased subjective sleep quality because of pain patient have less than 6 hours of sleep in the PIVD group compared to around 20 % in the non-PIVD group.39.3% subjects has no significant effect of pain on my social life apart from limiting them more energetic interests eg, sport in the PIVD group compared to around 21.3% subjects in the non-PIVD group.34% subjects are restricted by the pain to journeys of less than one hour in the PIVD group compared to around 16% subjects in the non-PIVD group.36.7% subjects are having moderate problem during the working hour in the PIVD group compared to around 15.3% subjects in the non-PIVD group.

DISCUSSION

The objective of this study was to find out differences between subjects of PIVD and Non-PIVD with disability. When comparing disability by using OLBPDQ scale, we found a significant difference between subjects with PIVD and non-PIVD. These findings are in line with other studies,Crichlow, R. J., Andres, P. L.,Morrison, S. M., Haley, S. M., &Vrahas, M. S. (2006) There is a known connection between physical injury and disability. In this study disability is one of the major point of research and we compaired level of disability between subjects with PIVD and without PIVD.The disability mean(SD) value of PIVD subjects was 23.93(6.01) and 7.61(4.04) on OLBPDQ scale. That shows the level of disability was more within the PIVD subjects and the p-value is <0.001*.We also compared the each component of the OLBPDQ between the PIVD and non-PIVD groups. Components 1,2,3,4,5,6,7,8,9 and 10 represent subjective pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and work, respectively. All components 1,2,3,4,5,6,7,8,9 and 10 were found to have statistically significant difference at $p<0.05$.On the basis of all 10 components of OLBPDQ we can said that PIVD is affect every aspect of human life.Nakamura SI et al 1996, Bogduk N, et al 1981 and WS, Shim JC et al 2004, in this artcles**,**among 180 patients 65.6% were male and 34.4% were female. The most common age of presentation was 31-40 yrs (33.3%) followed by 21-30 yrs (23.3%) with the highest percentage of patients (89.4%) were between age of 21-60 yrs. In this study 71.7% patients were from rural area and 59.4% patients were moderate workers. Similarly the percentage of rural moderate workers were 47.22%. Even among the female patients, most of them (72.58%) were rural moderate workers. So because of the disability in that cases, patients are facing so many other related or secondary problem which will including effect over physical, psychological and medical condition.

Limitations

This study has some limitations. Patients were recruited from few hospital only, which is a limitation in our study. The sample size can be more in future research. A large sample study is required from different hospitals with different variables.

Conclusion

In conclusion, disability is affected in subjects with PIVD and they experience severe disability. Treatment strategies should focus on the patient level of disability in day to day life activity and plane rehabilitation treatment protocol according to that and giving more importance to ergonomic as well.

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