

## Association of depression and chronic lower-back pain

Sarandha Srivastava, Prerak Yadav, Bharat Navinchandra Panchal, Ashok Ukabhai Vala, Imran Ratnani, Pushpa Khania

### Summary

**Objectives:** To study the prevalence of major depressive disorder, assess sleep quality, permanent functional disability as well as association of major depressive disorder with permanent disability, quality of life and quality of sleep in patients with chronic lower – back pain.

**Method:** One hundred consecutive patients visiting an orthopaedic out patients department (OPD) with chronic lower – back pain in a tertiary hospital were included. They were interviewed for major depressive disorder (MDD) using DSM-5 and assessed for the severity of depression, health-related quality of life and sleep quality using the Hamilton Depression Rating Scale, Health Questionnaire Short Form (SF-36) and Pittsburgh Sleep Quality Index (PSQI), respectively. Proportion was compared using chi-square test, scores of scales were compared using the Mann – Whitney test and Kruskal-Wallis test followed by Dunn's post-hoc multiple comparisons. Statistical data were analyzed by Graph Pad InStat version 3.06. A p value of <0.05 was considered statistically significant.

**Results:** The frequency of major depressive disorder and poor quality of sleep in patients with chronic lower – back pain was 74 % and 81% respectively. Patients with MDD had poorer quality of sleep, lower quality of life and higher functional disability. Severe functional disability due to lower – back pain was associated with severe depressive symptoms poorer quality of sleep and lower quality of life. The severity of depression is positively correlated with functional disability. Patients with a pain lasting more than 1 year had greater chances of depression.

**Conclusions:** Patients with chronic lower – back pain had a high frequency of depression poor quality of sleep and lower quality of life, and higher functional disability.

**depression, lower – back pain, quality of life, chronic backache.**

### INTRODUCTION

Pain is an unpleasant sensory and emotional experience that is always subjective [1]. Backache

is the most commonly reported type of pain, followed by headache then knee pain [2]. It is defined as pain and discomfort, localized below the costal margin and above the inferior gluteal folds [2]. It is one of the most common causes of seeking physician visits, and because of high direct and indirect costs it has great medical, social and economic impact for the individual, their family and society at large [2] the pain can be

---

Sarandha Srivastava<sup>1</sup>, Prerak Yadav<sup>2</sup>, Bharat Navinchandra Panchal<sup>1</sup>, Ashok Ukabhai Vala<sup>1</sup>, Imran Ratnani<sup>1</sup>, Pushpa Khania<sup>1</sup>: <sup>1</sup>Department of Psychiatry, Government Medical College, India  
<sup>2</sup>Department of Orthopaedics, Government Medical College, India  
**Correspondence address:** sarandhas1@gmail.com

localized in upper, middle or lower(back). Low back pain is a common health problem worldwide and a major cause of disability, affecting performance at work and general well-being [2]. Low back pain is classified on the basis of its duration as acute (<6 weeks), sub-acute (6–12 weeks) and chronic(>12 weeks) [4].

Psychological factors are important in people with chronic low back pain. Research has indicated that depression and chronic low back pain could be interrelated [5-9]. Major depressive disorder is a mood disorder that is characterized by depressed mood for most of the day, nearly every day, as indicated either by a subjective report or by observation and/or loss of interest in a previously pleasurable activity, that have been present during the same 2 week period, but there might be other symptoms as well [10].

Both conditions are frequently observed in the general population and have high morbidity rates. Up to 30% of individuals, who report low back pain, have recurrent or persistent symptoms [11]. As a result, chronic low back pain is one of the most common reasons for medical visits. Studies have reported that 55% of chronic low back pain (CLBP) patients experienced sleep disturbance after pain onset [12, 13]. To the best of our knowledge there is paucity of data, on the prevalence of depression in patients suffering from chronic lower – back pain. This study was conducted to assess the frequency of major depressive disorder, quality of sleep, permanent functional disability and the association of MDD with the above mentioned variables in a tertiary care setting.

## METHOD

### *Subjects*

One hundred consecutive patients visiting orthopedic outpatient department in a tertiary care hospital during October 2015 to March 2016 were included in the study. Patients were of both genders, aged more than 30 years and had lower – back pain as a primary complaint, for a period of more than 12 weeks. Pregnant and lactating females along with severely ill, bedridden patients those with a history of psychiatric illness, patients suffering from severe mental illnesses

including schizophrenia, bipolar mood disorder, cognitive impairment, chronic disabling illnesses, negative symptoms, dementia, and poor attention as well as those unable to give verbal replies were excluded from the study.

Patients were interviewed by the principal investigator on various demographic variables such as age, gender, religion, residence, education, socioeconomic status, height, weight and body mass index, treatment for lower back pain, its duration and mode, and the duration of backache. Personal and family history of any psychiatric illness was recorded as well.

All patients were interviewed for a diagnosis of major depressive disorder (MDD) using DSM-5 [2] criteria. The diagnosis was confirmed by a consultant psychiatrist with more than 25 years of experience in the subject. Every patient was assessed for the severity of depressive symptoms, health-related quality of life, sleep quality, lower-back pain severity and permanent functional disability on the Hamilton Depression Rating Scale [14, 15] which is a 17-item observer-rated scale for assessing the severity of depression; and by the Short Form 36 Health questionnaire [16] that is a multi-purpose short-form health survey with 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically based physical and mental health summary measures and a preference-based health utility index. They were also assessed with the Pittsburgh Sleep Quality Index (PSQI) [17], a self-rated sleep quality questionnaire and by the Oswestry Low Back Disability Questionnaire [18], which is an important tool that researchers and disability evaluators use to measure permanent functional disability in a patient.

Qualitative data were expressed as percentages and quantitative data as median  $\pm$  interquartile range. Statistical analysis was performed using Graph Pad in Stat version 3.06 (San Diego, California, US). The proportion of participants was compared by using chi-square test the while scores on HAM D, SF 36, PSQI and Oswestry index were compared using the Mann–Whitney U-test and Kruskal-Wallis test followed by Dunn's post-hoc multiple comparisons. The Statistical correlation between the severity of depressive symptoms and permanent functional disability

due to back pain were assessed by Spearman's rank correlation.

A p value of <0.05 was considered statistically significant.

Written informed consent was obtained from every patient. Prior approval for the study had been obtained from the local ethics committee.

## AIMS AND OBJECTIVES

To study the frequency of major depressive disorder, assess sleep quality, permanent functional disability; association of major depressive disorder

with permanent functional disability; quality of life and quality of sleep in patients with chronic lower-back pain; also to study the correlation between permanent functional disability due to lower-back pain and the severity of depressive symptoms.

## RESULTS

On recruiting 100 consecutive patients we assessed their socio-demographic and other historical characteristics (Table1).

**Table 1.** Socio-demographic characteristic and other factors related to patients with chronic lower-back pain

Variables		Frequency(%)
Age N=100	30-40	26
	41-50	25
	51-60	28
	61-70	16
	>70	5
Gender N=100	Male	36
	Female	64
Residence N=100	Rural	16
	Urban	59
	Town	25
Socio-economic status (BG Prasad classification) [57] N=100	Lower class	28
	Lower middle class	39 (%)
	Middle class	16 (%)
	Upper middle class	12 (%)
Education N=100	Illiterate	36 (%)
	Primary	49 (%)
	Secondary	13 (%)
	Graduate	2 (%)
Religion N=100	Hindu	73 (%)
	Muslim	25 (%)
	Others	2 (%)
Patient history of psychiatric illness ,n=100	Yes	0 (%)
	No	100 (%)
Family history of psychiatric illness ,n=100	Yes	6 (%)
	No	94 (%)
Etiology N=100	Trauma	44(%)
	Idiopathic	44(%)
	Tumor	1 (%)
	Others	11 (%)

Duration of low back pain N=100	<12 months	59 (%)
	12-24 months	8 (%)
	24-60 months	18 (%)
	>60 months	15 (%)
Treatment (n=100) Treatment modalities N=53	Yes	53 (%)
	No	47 (%)
	Ibuprofen	19 (35%)
	Diclofenac	33 (62.26%)
	Paracetamol	0 (0%)
	Others	1 (1.82%)
Frequency N=53	Once a day	6 (11.3%)
	Twice a day	46 (86.7%)
	Thrice a Day	1 (1.8%)
Substance use N=100	Yes	22 (%)
	No	78 (%)
Body mass index N=100	Underweight	8
	Healthy	53
	Overweight	30
	Obese	9

Data were presented as No.(%) .In the present study 36(%) were males and 64 (%) were females among 100 patients. The mean age of

the patients was 51.02 +/-13.5 years, mean duration of backache was 31.12 months.

**Table 2.** Frequency of major depressive disorder and poor quality of sleep in patients with chronic lower-back pain according to DSM-5 criteria and on the basis of PQSI scores(global score >5) respectively

Variables	No. of chronic lower-back pain patients(N=100)(%)
Major depressive disorder ,n=100	74 (%)
Poor quality of sleep ,n=100	81 (%)

Data were presented as No.(%). Diagnosis of major depressive disorder was made by clinical interview as per the DSM-5 criteria [2].

**Table 3.** Demographic variables according to the presence or absence of major depressive disorder

Variables	Major depressive disorder, n=100		P value
	Present N =74 (%)	Not present N =26(%)	
Age	51.54±12.8	49.54±14.1	P=0.50
Gender			
Male	23 (%)	13 (%)	P=0.08
Female	51 (%)	13 (%)	
Residence			
Rural	11 (%)	5 (%)	P=0.204
town	16 (%)	9 (%)	
urban	47 (%)	12 (%)	

Education			
illiterate	28 (%)	8 (%)	P=0.7
primary	36 (%)	13 (%)	
above primary	10 (%)	5 (%)	
Socio-economic status			
Class 1	20 (%)	8 (%)	P=0.8
Class 2	27 (%)	12 (%)	
Class 3	13 (%)	3 (%)	
Class 4	10 (%)	2 (%)	
Class 5	4 (%)	1 (5)	
Religion			
Hindu	51 (%)	22 (%)	P=0.26
Muslim	21 (%)	4 (%)	
Others	2 (%)	0 (%)	
Duration of lower-back pain	37.04 ± 51.0	14.23 ±13.07	P=0.226
Etiology			
Trauma	35	9	P=0.35
Tumor	1	0	
Idiopathic	32	12	
Others	6	5	
Treatment			
Yes	42	11	P=0.20
No	32	15	
Substance use			
Yes	15	7	P=0.49
No	59	19	
BODY MASS INDEX	24.07±4.1	24.37±3.4	P=0.60

Data were represented in numbers (%) or mean ± S.D, groups were compared by Chi-square test & Mann Whitney U test,  $p < 0.05$  is considered to be statistically significant. Patients with chronic lower-back pain were grouped; (1) With MDD and (2) without MDD as shown in Table 3.

There were no statistically significant differences in variables of age ( $p=0.5$ ), gender ( $p=0.08$ ), residence ( $p=0.204$ ), education ( $p=0.7$ ), socio-economic status ( $p=0.8$ ), religion ( $p=0.26$ ), duration of pain ( $p=0.226$ ), etiology ( $p=0.35$ ), treatment ( $p=0.2$ ), substance use ( $p=0.49$ ) and body mass index ( $p=0.6$ ) among the two groups.

**Table 4.** Association of major depressive disorder with severity of depressive symptoms (HAM D), Oswestry low backache functional disability score, quality of sleep (PSQI) and quality of life (SF 36) in patients with chronic lower-back pain

Variables	Major depressive disorder ,n=100		P value
	Present N =74 (%)	Not present N =26(%)	
Oswestry low backache disability questionnaire(ODI SCORE)	39.08 ±16.6	28±12.9	0.0048
Pittsburgh Sleep Quality Index	10.21±4.3	5.73±4.5	<0.0001
HAM D	16.2±5.2	4.8±5.1	<0.0001
Physical functioning	37.63±25.5	55.96±29.8	0.007
Role limitations due to physical health	18.91±30.0	36.53±38.2	0.0407

Role limitations due to emotional problems	11.71±26.1	41.02±41.4	0.0040
Energy /fatigue	33.31±13.30	50.19±21.0	0.0002
Emotional well-being	34.75±12.7	51.23±21.4	0.0004
Social functioning	45.94±12.6	50.96±12.2	0.1437
Pain	34.42±10.9	44.32±12.0	0.0004
General health	35.87±13.4	50±19.6	0.0016

Data were represented as Mean ± S.D, groups were compared with a Mann Whitney U test. P value  $p < 0.05$  was considered statistically significant.

We divided the patients into groups with and without MDD. Patients with chronic lower-back pain with MDD scored significantly higher (0.048) on Oswestry low backache disability questionnaire as compared to patients without MDD, which suggests that patients with MDD

had higher permanent functional disability than patients without MDD. Similarly, patients with MDD scored significantly higher on the Pittsburgh Sleep Quality Index ( $< 0.0001$ ) and on, HAM D ( $< 0.0001$ ). There were statistically significant differences in the all domains of the quality of life, except social functioning, which suggests that patients with MDD had lower quality of life as compared with patients without MDD.

**Table 5.** Association of duration of lower-back pain with depression, severity of depressive symptoms (HAM D), Oswestry low backache functional disability score, quality of sleep (PSQI) and quality of life (SF 36 score ).

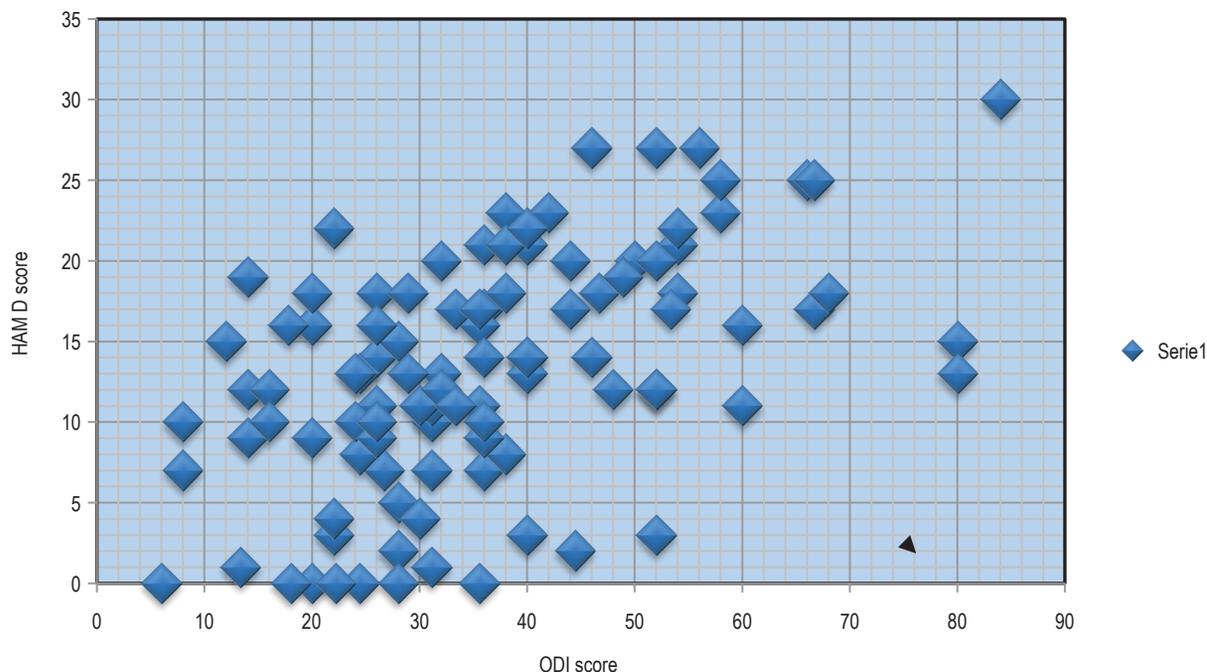
Variables	Duration of lower-back pain $\leq 1$ year N =59	Duration of lower-back pain $> 1$ year N=41	P value
Depression			
Present	38	36	P=0.008
Absent	21	5	
HAM D	12.66±7.7	14.21±6.5	P=0.25
Oswestry low backache disability questionnaire	33.75 ±16.2	40.08±15.9	P=0.052
Pittsburgh Sleep Quality Index	8.33±4.9	10.07±4.4	P=0.06
Physical functioning	43.8±29.2	40.24±24.9	P=0.9
Role limitations due to physical health	23.72±33.61	23.17±32.7	P=0.95
Role limitations due to emotional problems	22.59±34.1	14.63±31.6	P=0.30
Energy /fatigue	39.40±18.7	35.24±14.7	P=0.409
Emotional well-being	40.34±18.3	36.87±14.7	P=0.42
Social functioning	47.88±12.0	46.34±13.4	P=0.81
Pain	37.66±12.2	36.03±11.7	P=0.65
General health	39.74±16.5	39.26±16.3	P=0.9

Data are represented as mean ± S.D ,groups were compared using a Chi Square test and, Mann Whitney U test,  $p < 0.05$  is considered to be statistically significant – HAM D Hamilton depression rating scale, SF 36 short form 36.

Participants were divided in two groups on the basis of duration of lower-back pain: (1) with 1 year or less (n=59), (2) and more than 1 year (n=41). Significant difference

was observed in both groups on depression ( $p=0.008$ ). No statistically significant difference was observed in both groups on HAM-D score ( $p=0.25$ ), Oswestry lower-back pain disability questionnaire score ( $p=0.052$ ), PSQI score ( $p=0.06$ ) and all domains of SF 36 score as shown in Table. 5.

Spearman's  $r = 0.5220$ . The two tailed p value is  $< 0.0001$ .



**Figure 1.** Correlation of severity of functional disability due to lower-back pain with severity of depression

Data were analyzed using Graph Pad in Stat. Correlation was assessed using Spearman’s rank

correlation. X axis the Oswestry low backache disability, scorey axis HAM D score.

**Table 6.** Association of lower back pain functional disability with major depressive disorder, severity of depressive symptoms (HAM D), quality of sleep(PSQI) and, quality of life (SF 36 score ) in patients with chronic lower back pain

Variables	Minimal disability N=16 (ODI score: 0 to 20)	Moderate disability N=53 (ODI score:21-40)	Severe disability bedridden N=31 ODI score(40-100)	P value
Depression				
Present	9	38	27	P=0.06
Absent	7	15	4	
HAM D	9.62±6.5	11.45±6.4	18.35±6.616†	P<0.0001
Pittsburgh sleep quality index	6±3.8	7.92±4.4	12.5±3.7†	P<0.0001
Physical functioning	60.62±27.3†	39.90±26.4	37.25±26.51	P=0.012
Role limitations due to physical health	39.06±41.8†	24.5±33.0	13.70±24.8	P=0.107
Role limitations due to emotional Problems	35.41±35.4†	23.27±37.8	4.3±11.3	P=0.0057
Energy /fatigue	46.25±21.8	38.30±18.0	32.25±10.6	P=0.10
Emotional well being	48.75±21.0	38.56±17.7	34.83	P=0.07
Social functioning	49.21±11.6	49.76±11.0†	41.93±14.27	P=0.02
Pain	36.71±12.8	38.82±12.0	34.03±11.15	P=0.21
General health	51.25±20.3†	38.39±15.5	35.48±12.9	P=0.02

Data are shown in mean  $\pm$  S.D. All the groups were compared by Kruskal-Wallis test followed by Dunn's post-hoc multiple comparisons.  $^{\dagger}P < 0.05$  in comparison with other groups.

We divided the patients into three groups: (1) With mild permanent functional disability due

to lower-back pain; (2) with moderate permanent functional disability due to lower-back pain; (3) severe and very severe permanent functional disability due to lower-back pain lower-back pain, as shown in Table 6.

**Table 7.** Association of treatment with major depressive disorder lower-back pain, severity of depressive symptoms (HAM D), functional disability due to lower-back pain, quality of sleep (PSQI) and, quality of life (SF 36 score).

Variables	Treatment taken N=53	Treatment not taken N=47	P value
Duration of illness	38.77 $\pm$ 57.16	22.47 $\pm$ 24.65	P=0.333
Depression Present	42	32	P=0.204
Not present	11	15	
HAM D score	15.16 $\pm$ 7.6	11.191 $\pm$ 6.3	P=0.0067
Oswestry low backache disability questionnaire score	36.59 $\pm$ 16.4	36.07 $\pm$ 16.35	P=0.94
Pittsburgh Sleep Quality Index	9.09 $\pm$ 4.9	9 $\pm$ 4.60	P=0.7168
Physical functioning	38.39 $\pm$ 27.6	46.914 $\pm$ 26.95	P=0.1176
Role limitations due to physical health	16.03 $\pm$ 29.45	31.91 $\pm$ 35.24	P=0.0148
Role limitations due to emotional problems	19.49 $\pm$ 34.241	19.14 $\pm$ 32.41	P=0.9577
Energy /fatigue	37.540 $\pm$ 17.50	37.87 $\pm$ 17.17	P=0.8955
Emotional well-being	39.16 $\pm$ 16.95	38.89 $\pm$ 17.22	P=0.8764
Social functioning	45.28 $\pm$ 12.310	46.34 $\pm$ 13.4	P=0.1029
Pain	35.33 $\pm$ 11.266	38.88 $\pm$ 12.62	P=0.08
General health	38.30 $\pm$ 15.96	40.957 $\pm$ 16.9	P=0.6236

Data is represented in Mean  $\pm$  S.D ,groups were compared by Chi Square test ,Mann Whitney U test,  $p < 0.05$  is considered to be statistically significant, HAM D Hamilton depression rating scale, SF 36 short form 36.

Participants were divided in two groups: ((1) with treatment received (n=53), and( 2)with no treatment (n=47). A significant difference was observed in both groups on severity of depression (HAM D score) ( $p=0.0067$ ), and physical health (0.0148). No significant statistical difference was observed in both groups on depression ( $p=0.205$ ), Oswestry low backache disability questionnaire score ( $p=0.94$ ),PSQI score ( $p=0.716$ ) and all domains of SF 36 as shown in Table7.

## DISCUSSION

It was observed in the present study that 74 patients with chronic lower-back pain who vis-

ited orthopedic, out-patients department suffered from MDD on the basis of DSM-5 diagnostic criteria. Many previous studies have shown depression to be prevalent among people with chronic back pain [4, 5, 7, 16, 19, 20]. In clinical samples of previous studies rates of major depression in such patients ranged from 30% to 62.8 %, which is significantly higher than the rate found in the general population [21, 22].

Out of 100 patients recruited to the study, 81 had significantly poor sleep quality. This is consistent with other studies :Graine et al. [23] recorded a frequency of 86.6%on the basis of Pittsburgh Sleep Quality Index, and Morin et al. [24] and Gráinne et al. [25] have also found high prevalence of poor quality of sleep in patients with lower-back pain.

It must be noted that comparing these studies was a difficult task because of differences in

study populations, applied tools, cut-off points and differences in social and cultural contexts.

The present study noted that there was no significant difference in the frequency of depression with demographic variables; similar results were noted in other studies [10, 26]. In a study conducted on the Korean population patients with chronic lower-back pain with depression had a poorer quality of life compared with those who did not have depression, which is consistent with the results of our study. Other studies reported similar findings [10, 27].

We observed that patients with chronic lower-back pain with depression had higher functional disability than patients who did not suffer from depression, similar to other studies [28, 29] (Table 6). It has also been found that depression in patients with chronic lower-back pain is associated with poorer quality of sleep [13, 29].

We observed that patients who had lower-back pain for more than 1 year had higher frequency of depression than patients who had pain for lesser than 1 year, which is consistent with the results noted in a study conducted by Kimney et al. [30], but inconsistent with a study conducted by Michael et al. [6].

A strong correlation (Spearman  $r = 0.5220$ ,  $P < 0.0001$ ) was established between functional disability and severity of depressive symptoms (see Figure 1). The correlation between disability and depression has been well demonstrated by previous studies [7, 8] which showed positive but weak correlation. It should be noted that it is difficult to establish the cause and effect relationship on the basis of correlation. Depression itself is a debilitating condition and disability caused due to lower-back pain may in itself lead to depression, which further increases the disability.

Similar to other studies [6, 7], patients with severe functional disability had poorer quality of sleep, severe depressive symptoms, poorer quality of life in all domains except role limitations due to physical health, less energy and greater fatigue, worse emotional well-being and greater pain.

It was also observed that patients who were on treatment for backache had severe depression and poorer quality of life in role limitations due to physical health compared with patients who were not on any treatment, which can be due to multiple reasons such as severity of ill-

ness, cost of treatment, accessibility and availability of treatment. Similar results were found in a study conducted by Ritzwoller et al. [31].

This study has several limitations – it was a single-centered study, with small sample size. Participants were recruited from a tertiary care hospital and they do not represent the general population. A further larger-scale randomized study is needed. A longitudinal study is required to study the cause effect relationship of depression and lower-back pain.

## REFERENCES

1. International Association for the Study of Pain. IASP terminology; [Updated 2017 Dec 14; Cited 2018 Jul 26]. Available from: <http://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1698>.
2. Vrbanić TS. [Low back pain—from definition to diagnosis]. *Reumatizam (journal)* 2011;58(2):105-7.
3. Andersson GB et al. Epidemiological features of chronic low-back pain. *Lancet*.199; 354 (9178): 581-585.
4. Sagheer MA, Khan MF, Sharif S. Association between chronic low back pain, anxiety and depression in patients at a tertiary care centre. *Journal of Pakistan medical association*. 2013; 63(6): 688-690.
5. Shah SH, Kataria LR, Joshi D. Incidence of depression in chronic low-back pain – A hospital based study. *Healthline*. 2011; 2(2): 35-40.
6. Michael O, Egwu and Afolabi O. Olakunle. Relationship of Duration and Intensity of Pain with Depression and Functional Disability Among Patients with Low-Back Pain, Low Back Pain Pathogenesis and Treatment, Yoshihito Sakai, IntechOpen, Intechopen. 2012. p. 69-78.
7. Garbi Mde O, Hortense P, Gomez RR, da Silva Tde C, Castanho AC, Sousa FA et al. Pain intensity, disability and depression in individuals with chronic back pain. *Revista Latino Americana Enfermagem*. 2014; 22(4): 569-75.
8. Guclu DG, Guclu O, Ozaner A, Senormanci O, Konkan R et al. The Relationship Between Disability, Quality of Life and Fear-Avoidance Beliefs in Patients with Chronic Low Back Pain. *Turkish Neurosurgery*.2012;22(6):724-31
9. Arlington VA. Diagnostic And Statistical Manual of Mental Disorders (DSM-5). 5<sup>th</sup> Ed. Washington DC: American Psychiatric Association. 2013. p.160-8.
10. Antunes RS, Macedo BG, Amaral TS, Gomes HA, Pereira LSM, Rocha FL et al. Pain, kinesiophobia and quality of life in chronic low back pain and depression. *Acta Ortopedica Brasileira*. 2013; 21(1):27-9.
11. Marin R, Cyhan T, Miklos W et al. Sleep Disturbance in Patients with Chronic Low Back Pain. *American Journal of Physical Medicine & Rehabilitation*. 2006;85: 430-5.

12. Tang NKY, Wright KJ, Salkovskis PM et al. Prevalence and correlates of clinical insomnia co-occurring with chronic back pain. *Journal of sleep research*. 2007, 16:85-101.
13. Marty M, Rozenberg S, Duplan B, Thomas P, Duquesnoy B, Allaert F et al. Quality of sleep in patients with chronic low back pain: a case-control study. *European Spine Journal*. 2008;17(6):839-44.
14. Hamilton M. A Rating Scale for Depression. *Journal of Neurology Neurosurgery and Psychiatry*. 1960.23:56-62.
15. Strik JJ, Honig A, Lousberg R, Denollet J. Sensitivity and specificity of observer and self-report questionnaires in major and minor depression following myocardial infarction. *Psychosomatics*. 2001; 42(5):423-8.
16. Magni G, Caldieron C, Rigatti-Luchini S, Merskey H. Chronic musculoskeletal pain and depressive symptoms in the general population. An analysis of the 1st National Health and Nutrition Examination Survey data. *Pain*. 1990; 43(3):299-307.
17. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research*. 1989; 28: 193–213.
18. Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine (Phila Pa 1976)*. 2000; 25 (22): 2940-52.
19. Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine (Phila Pa 1976)*. 2000; 25(22): 2940-2952.
20. Sullivan MJ, Reesor K, Mikail S, Fisher R. The treatment of depression in chronic low back pain: review and recommendations. *Pain*. 1992; 50(1):5-13.
21. Banks Sara M., Kerns, Robert D. Explaining high rates of depression in chronic pain: A diathesis-stress framework. *Psychological Bulletin*. 1996; 119(1):95-110.
22. Castro Martha M. C, Quarantini Lucas C, Daltro Carla, Pires-Caldas Milke, Koenen Karestan C, Kraychete Durval Campos et al. Comorbid depression and anxiety symptoms in chronic pain patients and their impact on health-related quality of life. *Revista de psiquiatria clinica*. 2011; 38(4):126-9.
23. O'Donoghue GM, Fox N, Heneghan C, Hurley DA. Objective and subjective assessment of sleep in chronic low back pain patients compared with healthy age and gender matched controls: a pilot study. *BMC Musculoskeletal Disorders*. 2009; 10: 122
24. Morin CM, Gibson D, Wade J. Self-Reported sleep and mood disturbance in chronic pain patients. *The clinical journal of pain*. 1998; 14(4):311-4.
25. Kelly GA1, Blake C, Power CK, O'keeffe D, Fullen BM. The Association between Chronic Low Back Pain and Sleep: A Systematic review. *The Clinical Journal of Pain*. 2011; 27(2):169-181.
26. Kelly GA1, Blake C, Power CK, O'keeffe D, Fullen BM. The Association between Chronic Low Back Pain and Sleep: A Systematic review. *The Clinical Journal of Pain*. 2011; 27(2):169-81.
27. SF-36 Health Survey, Manual and Interpretation Guide. [Cited 2018 Jul 26]. Available from: [http://czresearch.com/info/SF36\\_healthsurvey\\_ch6.pdf](http://czresearch.com/info/SF36_healthsurvey_ch6.pdf)
28. Woolf DA, Bruce Pflieger et al. Burden of major musculoskeletal conditions. *Bulletin of the World Health Organisation*. 2003; 81(9): 646–56.
29. Hong JH, Kim HD, Shin HH, Huh B. Assessment of depression, anxiety, sleep-disturbance, and quality of life in patients with chronic low back pain in Korea. *Korean Journal of Anesthesiology*. 2014; 66 (6): 444-450.
30. Kinney RK, Gatchel RJ, Polatin PB, Fogarty WT, Mayer TG. Prevalence of psychopathology in acute and chronic, low back pain patients. *Journal of Occupational Rehabilitation*. 1993;3(2):95-103.
31. Ritzwoller DP, Crounse L, Shetterly S, Rublee D. The association of comorbidities, utilization and costs for patients identified with low back pain. *BMC Musculoskeletal Disorders*. 2006;7:72.