Depression in patients with chronic low back pain
Nassar Na, Assaf Na, Farrag Da, Ibrahim Db, Al-Sheekh Aa

Background
Low back pain is a common health issue affecting at least 80% of individuals during their lifetime. It is usually recurrent and develops into chronic low back pain (CLBP). In chronic pain, psychosocial risk factors become relevant, and may explain how individuals respond to pain. CLBP is often comorbid with depression.

Aim
The aim of this study was to detect if there is an association between depression and functional disability in patients with CLBP.

Patients and methods
This cross-sectional, descriptive preliminary study included 50 patients with CLBP. Pain intensity was measured using visual analogue scale (VAS), functional disability was measured using the Oswestry Disability Index (ODI), and depression assessment was done using Beck depression inventory (BDI) questionnaire II.

Results
The mean age of the patients was 43.66±13.96 years. Mean scores for VAS, ODI, and BDI were 5.38±2.42, 18.66±7.26, and 22.40±9.20, respectively. A strong positive correlation was found between VAS and each of ODI and BDI ($r=0.797$ and $0.515$, respectively; $P=0.000$). Similarly, a positive significant linear relation was detected between degree of disability by ODI and severity of depression by BDI ($P=0.039$).

Conclusion
Depression strongly influences pain intensity and degree of disability in patients with CLBP. Screening and early management of depression is essential for reducing pain and disability associated with CLBP.

Keywords:
depression, functional disability, low back pain

Introduction
Low back pain (LBP) is one of the most common medical problems involving any age worldwide. It is a leading cause of disability and interferes with quality of life and work performance [1]. The incidence of chronic low back pain (CLBP) has been reported to be 9–21% in the general population and has been increasing steadily [2]. As a result, disability associated with CLBP has been studied extensively, and psychosocial factors that may contribute to pain and disabilities have also been studied systematically [3].

CLBP and depression are two common problems that present in health facilities. LBP is a physical condition that usually presents with physical symptoms, whereas depression is a psychiatric condition [4]. The physical and psychological distress of chronic pain in association with individual and social vulnerability may precipitate an episode of major depression [5].

Pain and depression share biological pathways and nerve transmitters with treatment implications for both conditions. Assessment and treatment of CLBP and depression simultaneously are necessary for better outcomes [6]. The explanation for this is that pessimistic thoughts activate some specific areas in the brain that cause the person to give more attention to the pain and increase the amplitude of pain felt [7].

Aim
The aim of this study was to detect if there was an association between depression and functional disability in patients with CLBP.

Patients and methods
This is a cross-sectional, descriptive and preliminary study, including 50 patients presenting with pain of at least 6-month duration and aged 20 years and above. A total of 25 patients were recruited for this study from
Physical Medicine, Rheumatology and Rehabilitation outpatient clinic in Ain Shams University. All of the participants were informed about the nature of the study and its objectives, and those who agreed to take part signed the informed consent form. The study was approved by local ethical committee.

Exclusion criteria included patients with LBP of less than 6-month duration, those with back deformity, individuals who had previous back surgery, and those with systemic illnesses such as cancer, cardiac disease, chronic renal failure, and autoimmune diseases. Patients with primary psychiatric disorders such as depression, anxiety, or insomnia were also excluded. Moreover, patients with cognitive disability who are incapable of understanding and answering the questionnaire were excluded as well.

All patients were subjected to full history taking and clinical examination including back and neurological examination followed by plain radiography: lumbo-sacral spine, anterior–posterior view, and lateral view. Pain intensity measurement was assessed by the visual analogue scale (VAS).

Functional disability was assessed by the Oswestry Disability Index (ODI) [8]. Depression was assessed by the Beck depression inventory (BDI) questionnaire II [9]. The Arabic version was used for the study [10].

**Statistical analysis**

Data were entered and analyzed using the statistical package for the social sciences (version 15.0) (SPSS Inc., Chicago, Ill, USA). Qualitative data were presented as number and percent. The mean and SD were used as suitable statistical parameters to summarize the data. Tests of significance used for data analysis were the $\chi^2$ test, which was for association or difference between categorical variables; independent t test, which was used for difference between two independent samples means; one-way analysis of variance, which was used for difference between more than two independent samples means; and Pearson’s correlation coefficient ($r$), which was used for the association between two continuous variables. Results were statistically significant as follows: $P$ value less than 0.05, significant and less than 0.01, highly significant.

**Results**

The present study was performed on 50 patients experiencing CLBP, which persisted for more than 6 months. Demographic data and clinical findings of the patients are shown in Tables 1 and 2, respectively.

Radiological findings are seen in Table 3, and mean pain scores, disability scores, and depression scores are shown in Table 4.

Figure 1 shows the pain intensity measurements using VAS 30% of patients had mild pain, 46% had moderate pain intensity, and 24% had severe intensity.

The results of simple linear correlations between different quantitative variables revealed VAS significantly correlated with the BMI ($r=0.309$, $P=0.029$). Similar finding was found between the age and VAS ($r=0.442$, $P=0.001$). A weaker positive correlation was found between the age and ODI ($r=0.321$, $P=0.023$), whereas a positive nonsignificant correlation was found between the age and BDI. A strong positive correlation was found between VAS and ODI ($r=0.797$, $P=0.000$). Finally, a positive moderate correlation was found between BDI and each of VAS and ODI ($r=0.515$ and $r=0.538$, respectively; $P=0.000$), as seen in Fig. 2.

As seen in Fig. 3, as disability scores increase, the depression scores increase as well. This correlation is highly significant ($r=0.538$, $P=0.000$).

A similar finding is present in Table 5, where most of the patients with severe disability had moderate to severe depression, 46.15 and 38.46%, respectively ($P=0.039$).

On comparing disability with BMI categories of obesity, obese patients had higher disability (23.09 $\pm$5.19); however, this difference was not significant ($P=0.853$) (Table 6).

**Table 1 Descriptive data of patients with chronic low back pain**

| Parameters                  | Mean±SD     | Minimum | Maximum |
|-----------------------------|-------------|---------|---------|
| Age (years)                 | 43.66±13.96 | 20.0    | 71.0    |
| Duration of back pain (years)| 5.27±6.20  | 0.5     | 30.0    |
| BMI (kg/m²)                 | 27.12±3.69  | 19.0    | 33.1    |
| Sex [n (%)]                 |             |         |         |
| Male                        | 25 (50.00)  | –       | –       |
| Female                      | 25 (50.00)  | –       | –       |
Regarding the effect of occupation on disability, the manual worker got lowest disability score (15.42±5.93) and highest was seen office workers (22.83±8.11); in spite of this, the difference was not significant, as evident from Table 7.

**Discussion**

CLBP and depression are the main causes of disability worldwide [11]. Thus, in chronic pain, psychosocial risk factors become relevant and are important to explain how individuals respond to back pain.

Recent studies have demonstrated that psychosocial factors are important risk factors for LBP [12].

The comorbidity between chronic pain and depression is clinically well established, but the underlying mechanisms are not well understood, though a potential explanation is disruption of the mesolimbic dopamine system [13]. Data from animal models indicate that regulation of dopamine activity in the ventral tegmental area mediates depressive response, suggesting a neurological link between depression and chronic pain [14].

Because of the increased prevalence of psychological disturbance in patients with LBP, Carley et al. [15] reported that screening for depression should be routine in older adults with LBP. In spite of that, the mental state of most patients with CLBP is not routinely assessed.

The present study aimed to assess if there is an association between depression and functional disability in patients with CLBP. It included 50 patients with CLBP lasting for more than 6 months. Overall, 50% of our patients were males and 50% were females, and their mean age was 43.66±13.96 years.

Most of the patients (46%) presented with pain of moderate intensity. This is in accordance with a previous work by Stefane et al. [16] where most of the patients with CLBP presented with moderate intensity pain. However, Frost et al. [17] in their study of patients with LBP found that most of the patients presented with mild to moderate LBP score.

The mean disability score of the studied patients was 18.66±7.26 by ODI, where most of them had moderate intensity pain.

#### Table 2 The clinical finding of the study sampled patients

| Parameters                        | n (%) (N=50) |
|-----------------------------------|--------------|
| Tender spine                      | 42 (84.00)   |
| Motor affection                   | 11 (22.00)   |
| Sensory loss                      | 28 (56.00)   |
| Para-spinal spasm                 | 42 (84.00)   |
| Back movements                    |              |
| Limited flexion                   | 24 (48.00)   |
| Limited side bending              | 4 (8.00)     |
| Limited side bending and flexion  | 15 (30.00)   |
| Straight leg raising test          |              |
| Negative                          | 16 (32.00)   |
| Positive unilateral               | 26 (52.00)   |
| Positive bilateral                | 8 (16.00)    |
| Femoral stretch test              |              |
| Negative                          | 25 (50.00)   |
| Positive unilateral               | 23 (46.00)   |
| Positive bilateral                | 2 (4.00)     |
| Medication                        |              |
| No                                | 15 (30.00)   |
| NSAID                             | 11 (22.00)   |
| NSAID and muscle relaxant         | 24 (48.00)   |

#### Table 3 Lumbosacral radiological finding of the study sample patients

| Radiographic finding                          | n (%) (N=50) |
|-----------------------------------------------|--------------|
| One level disc space narrowing                | 22 (44.00)   |
| More than one level disc space narrowing       | 10 (20.00)   |
| More than one level disc space narrowing and spondylosis | 8 (16.00)   |
| Spondylosis                                   | 5 (10.00)    |
| Spondylolisthesis                             | 5 (10.00)    |

#### Table 4 Mean results of visual analogue scale, Oswestry Disability Index, and Beck depression index for patients with chronic low back pain (N=50)

| Parameters            | Mean±SD | Minimum | Maximum |
|-----------------------|---------|---------|---------|
| VAS                   | 5.38±2.42| 2.0     | 9.0     |
| ODI                   | 18.66±7.26| 5.0     | 32.0    |
| BDI                   | 22.40±9.20| 4.0     | 45.0    |

BDI, Beck depression inventory; ODI, Oswestry Disability Index; VAS, visual analogue scale.

The distribution of the study sample patients according to VAS for pain intensity (n=50). VAS, visual analogue scale.

Regarding the effect of occupation on disability, the manual worker got lowest disability score (15.42±5.93) and highest was seen office workers (22.83±8.11); in spite of this, the difference was not significant, as evident from Table 7.
(40%) disability and only 26% had severe disability. This finding is in accordance with previous works by other authors [18,19]. On the contrary, in the study by Stefane et al. [16], with the help of the Roland–Morris questionnaire, most of the patients with CLBP had severe disability. In this study, patients with highest disabilities were office workers compared with manual workers, which could be explained by the fact that active manual workers have better core stabilizing muscles and they exercise more often than those who are desk bound. A previous work on patients with fibromyalgia has shown that exercise decreases both pain scores and depression scores [20].

The present study revealed a significant positive correlation between pain intensity measured by VAS and disability by ODI. This is in agreement with the work of Hung et al. [21]. Similarly, Ferrari et al. [22] found higher pain scores among patients with higher disability scores. This could be because of the fact that LBP chronicity is associated with changes in attitudes and body composition and in the way people move, load their backs, and respond to variety of motor and stable challenges [23].

In present work, we found a significant positive relationship between pain score by VAS and age. This agrees with the study by Robertson et al. [24] who found a significant association between older age and current LBP.

In this study, total disability score (ODI) significantly correlated with patient’s age. This might be owing to aging process in addition to LBP intensity. This agrees with the work of Pinheiro et al. [5] who found an association between greater age and disability among patients with LBP.

Our study showed no association between age and depression in patients with CLBP. Similar findings were reported by Namgwa et al. [4]. However, in a Canadian general population study, age was found to have a significant effect on depression in patients with CLBP [24].

In this study, there was no relation between disease duration and pain intensity or disability. Similarly, Probst et al. [25] in their work on patients with chronic pain found no relation between disease duration and pain intensity, but they also observed...
that depressed mood significantly increased the effect pain exerts on disability in patients with chronic pain of long duration.

In this work, BMI significantly correlated with pain on VAS, whereas it showed a positive though nonsignificant correlation with disability by ODI. A previous work by Abou El-Soud et al. [26] has confirmed the highly significant association between LBP and BMI. Obesity was found to be a risk factor for disability, whereas obese patients have a higher disability, with mean of 23.09±5.19. This could be explained by the fact that excess weight produces greater pressure on structures (intervertebral discs, nerve roots, interapophyseal joint, and interspinous ligaments) and cause pain. Other factors contributing to LBP in obese patients are flaccidity and abdominal wall distention, which prevents proper spinal support [27]. Moreover, lowered self-esteem owing to how different societies perceive patients with increased weight can add to disability.

In this work, more than half of the patients had moderate depression and 75% of them presented with moderate to severe depression. Our data are in agreement with Pawlowska et al. [28] who reported the presence of depressive symptoms in 78% of their patients with LBP. In the recent work by Park et al. [29], depression was reported in 20.3% of Koreans experiencing LBP compared with 4.5% without LBP. The prevalence of depression observed in the present work is somewhat higher than the average for other recent studies, and this could be owing to several factors, including methodological differences and socioeconomic factors.

In this work, BMI significantly correlated with pain on VAS, whereas it showed a positive though nonsignificant correlation with disability by ODI. A previous work by Abou El-Soud et al. [26] has confirmed the highly significant association between LBP and BMI.

Obesity was found to be a risk factor for disability, whereas obese patients have a higher disability, with mean of 23.09±5.19. This could be explained by the fact that excess weight produces greater pressure on structures (intervertebral discs, nerve roots, interapophyseal joint, and interspinous ligaments) and cause pain. Other factors contributing to LBP in obese patients are flaccidity and abdominal wall distention, which prevents proper spinal support [27]. Moreover, lowered self-esteem owing to how different societies perceive patients with increased weight can add to disability.

In this work, more than half of the patients had moderate depression and 75% of them presented with moderate to severe depression. Our data are in agreement with Pawlowska et al. [28] who reported the presence of depressive symptoms in 78% of their patients with LBP. In the recent work by Park et al. [29], depression was reported in 20.3% of Koreans experiencing LBP compared with 4.5% without LBP. The prevalence of depression observed in the present work is somewhat higher than the average for other recent studies, and this could be owing to several factors, including methodological differences and socioeconomic factors.

In this work, a significant association was noticed between depression, pain, and disability in patients with CLBP. BDI significantly correlated with VAS and ODI. Moreover, it was found that as the degree of disability increased, the severity of depression is significantly increased.

Persistent LBP increases the risk of developing depressive symptoms [30] which has a negative effect on the course of recovery of LBP [31]. In the present study, none of our patients with mild disability had severe depression. At the same time, most of the patients with severe disability had moderate to severe depression. Hung et al. [21] found that depression was an important factor associated with disability among patients with CLBP.

Our results are supported by previous works of Kakpovi et al. [32] and Hiyama et al. [33] who observed depressive symptoms were significantly associated with LBP. On the contrary, Hülsbusch et al. [7] did not find a link between depression and pain intensity.

Depression may be a precursor to pain. Pain tolerance is decreased in major depression, and somatic
preoccupation can be a prominent symptom, especially in older people [33]. Another proposed mechanism is that chronic pain is a subtype of depression. Patients with LBP have a cycle of excessive fear of movement leading to deconditioning, further worsening pain, and further fear, termed fear avoidance, has been found to be more predictive of disability than pain intensity [34].

Serotonergic and nor-adrenergic neurotransmitters have been implicated in both pain and depression, and they share clinical pattern of persistence beyond the precipitant. Chronic pain and major depression may be associated when both arise out of a common underlying process [35].

Furthermore, patient’s attitude and beliefs (especially fear avoidance) and passive coping strategies are considered as predisposing factors for disability and depression in CLBP [36]. As most of our patients presented with CLBP of mechanical origin and none of them presented with depressive symptoms before the start of LBP as observed in history and examination, we could hypothesize that CLBP could be a major precipitative factor for disability and depressive symptoms in our patients.

Conclusion
In conclusion, depression strongly influences pain intensity and degree of disability in patients with CLBP. Preventing and treating depression is essential in patients with CLBP to reduce the effect of pain and disability. The use of antidepressant, such as selective serotonin release inhibitors, could be used as a part of integrated therapy of CLBP in patients with depression and functional disability.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Tsang S, Szeto G, Li L, Wong D, Yip M, Lee R. The effects of bending speed on the lumbo-pelvic kinematics and movement pattern during forward bending in people with and without low back pain. BMC Musculoskelet Disord 2017; 18:157.
2. Sions JM, Coyle P, Velasco T, Elliott J, Hicks G. Multifidi muscle characteristics and physical function among older adults with and without chronic low back pain. Arch Phys Med Rehabil 2017; 98:51–57.
3. Guclu DG, Guclu O, Ozaner A, Senor manci O, Konkan R. The relationship between disability, quality of life and fear – avoidance beliefs in patients with chronic low back pain. Turk Neurosurg 2012; 22:724–731.
4. Namgwa KJ, Terkura A, William Y, Daniel MD, Cornillius EI. Depression in patients with chronic low back pain: a hospital-based study. Niger J Surg Res 2016; 17:1–4.
5. Pinheiro MB, Ferreira ML, Refshauge K, Ordoñana JR, Machado GC, Prado LR. Symptoms of depression and risk of new episodes of low back pain: a systematic review and meta-analysis. Arthritis Care Res (Hoboken) 2015; 67:1591–1603.
6. Søndergård S, Vaegter H, Erlangsen A. Ten-year prevalence of mental disorders in patients presenting with chronic pain in secondary care: a register linkage cohort study. Eur J Pain 2017; 22:346–354.
7. Hülsebusch J, Hasenbring M, Rusu A. Understanding pain and depression in back pain: the role of catastrophizing, helplessness, and thoughts suppression as potential mediators. Int J Behav Med 2016; 23:251–259.
8. Grotle M, Foster NE, Dunn KM, Croft P. Are prognostic indicators for poor outcome different for acute and chronic low back pain consultants in primary care? Pain 2010; 151:790–797.
9. Beck AT, Steer RA, Ball R, Ranieri WF. Comparison of Beck Depression Inventories-IA and –II in psychiatric outpatients. J Pers Assess 1996; 67:588–597.
10. Ghareeb AG. Manual of the Arabic BDII-H. Cairo: Egypt: Angel Press; 2000.
11. Vos T, Barber RM, Bell B, Bertozzi-Villa A, Biryukov S, Bolliger I, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2015; 386:743–800.
12. Kawaguchi M, Matsuda-Ka K, Isomura T, Inuzuka K, Koga T, Miyoshi K, et al. Assessment of psychosocial risk factors for the development of specific chronic disabling low back pain in Japanese workers-findings from the Japan Epidemiological Research of Occupation-related Back Pain (JOB) study. Ind Health 2015; 53:368–377.
13. Taylor AMW, Castonguay A, Taylor AJ, Murphy NP, Ghogha A, Cook C, et al. Microglia disrupt mesolimbic reward circuitry in chronic pain. J Neurosci 2015; 35:8442–8450.
14. Small KM, Nunes E, Hughley S, Addy NA. Ventral tegmental area muscarinic receptors modulate depression and anxiety-related behaviors in rats. Neurosci Lett 2016; 616:80–85.
15. Carley JA, Karp JF, Gentilli A, Marcum ZA, Reid MC, Rodríguez E, et al. Deconstructing chronic low back pain in the older adult: step by step evidence and expert-based recommendations for evaluation and treatment. Part IV: depression. Pain Med 2015; 16:2098–2108.
16. Stefane T, Santos AM, Marinovic A, Hörtenste P. Chronic low back pain: pain intensity, disability and quality of life. Acta Paediatr Enferm 2013; 26:14–20.
17. Frost H, Lamb SE, Doll AH, Carver PT, Brown SS. Randomized controlled trial of physiotherapy compared with advice for low back pain. BMJ 2004; 329:708.
18. Huijnen IP, Verbunt JA, Peters ML, Delespaul P, Kindermans HP, Roelofs J, et al. Do depression and pain interference interfere with physical activity in daily life in patients with chronic low back pain? Pain 2010; 150:161–166.
19. Klemenc-Ketis Z. Predictors of health-related quality of life in patients with chronic non-specific low back pain. Zdrav Vestn 2011; 80:379–385.
20. Soliman Amal F, El-Olemy Gehan G, Hassan Waleed A, Shaker Raneyah HM, Abdullah Omrninex A. Impact of an intensive dynamic exercise program on oxidative stress and on the outcome in patients with fibromyalgia. Egypt Rheumatol Rehabil 2016; 43:117–123.
21. Hung C, Liu C, Fu T. Depression: an important factor associated with disability among patients with chronic low back pain. Int J Psychiatry Med 2015; 49:187–198.
22. Ferrari S, Chiarotto A, Pellizzera M, Nanti C. Pain self-efficacy and fear of movement are similarly associated with pain intensity and disability in Italian patients with chronic low back pain. Pain Pract 2016; 16:1040–1047.
23. McGill S, Grenier S, Bluhm M, Preuss R, Brown S, Russell C. Previous history of LBP with work loss is related to lingering deficits in biomechanical, physiological, personal, psychosocial and motor control characteristics. Ergonomics 2003; 46:731–746.
24. Robertson D, Kumbhare D, Nolet P, Srbely J, Newton G. Associations between low back pain and depression and somatization in a Canadian emerging adult population. J Can Chiropr Assoc 2017; 61:96–105.
25. Probst T, Neumeier S, Almeppen J, Angerer M, Loew T, Pich C. Depressed mood differentially mediates the relationship between pain intensity and pain disability depending on pain duration: a moderated mediation analysis in chronic pain patients. Pain Res Manag 2016; 2016:3204914.
Abou El-Soud AA, El-Najjara A, El-Fattah AN, Hassan A. Prevalence of low back pain in working nurses in Zagazig University Hospitals: an epidemiological study. Egypt Rheumatol Rehabil 2014; 41:109–115.

Corona L, da Silva Alexandre T, Duarte Y. Abdominal obesity as a risk factor for disability in Brazilian older adults. Public Health Nutr 2017; 20:1046–1053.

Pawlowska B, Tarczynska M, Gaweda K, Kukula B, Pic J, Szwarc B. Symptoms of anxiety and depression in patients with chronic low back pain syndrome. Zdr Publ 2013; 123:148–152.

Park SM, Kim HJ, Jang S, Kim H, Chang BS, Lee CK, et al. Depression is closely associated with chronic low back pain in patients over 50 years of age: a cross-sectional study using the sixth Korea National Health and Nutrition Examination Survey (KNHANES VI-2). Spine 2018; 43:1281–1288.

Elfering A, Käser A, Melloh M. Relationship between depressive symptoms and acute low back pain at first medical consultation, three and six weeks of primary care. Psychol Health Med 2014; 19:235–246.

Melloh M, Elfering A, Käser A, Salathé CR, Barz T, Aghayev E, Theis JC. Depression impacts the course of recovery in patients with acute low-back pain. J Behav Med 2013; 39;80–89.

Kakpovi K, Soedje K, Koffi-Tessio V, Ahoble K. Anxiety and depression disorders in chronic non-specific low back pain in Lomé (Togo). Open J Rheumatol Autoimmune Dis 2017; 7:1–15.

Hiyama A, Watanabe M, Kotoh H, Sato M. Effect of depression and neuropathic pain using questionnaires on quality of life in patients with low back pain; cross-sectional retrospective study. Eur Spine J 2016; 25:2750–2760.

Cuijpers P, Donker T, Weissman MM, Ravitz P, Cristea IA. Interpersonal psychotherapy for mental health problems: a comprehensive meta-analysis. Am J Psychiatry 2016; 173:680–687.

Han C, Pae C. Pain and depression: a neuro-biological perspective of their relationship. Psychiatry Investig 2015; 12:1–8.

Romond A, Bouton C, Richard I, Roquelaure Y, Baufreton C, Legrand E, Huez JF. Psychosocial risk factors for chronic low back pain in primary care – a systemic review. Fam Pract 2011; 28:12–21.