Epidemiology of Pain and relation to Psychiatric Disorders

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Key words: chronic pain, psychiatric disorders, epidemiology, prevalence, anxiety, depression, substance abuse.

Accepted by Prog Neuropsychopharmacol Biol Psychiatry

Abstract

Chronic pain is a common pain condition. Some psychiatric disorders, such as anxiety and depression, are also common in the general population. Epidemiological studies found that some psychiatric disorders are more commonly found among persons with chronic pain (e.g., headache, back pain) than those without chronic pain. Why those psychiatric disorders co-occur with chronic pain, however, is not well understood. Further, studies demonstrated that some psychiatric disorders, such as depression, increase the risk of chronic pain as well as its persistence. It is also recognized that chronic pain has a negative impact on the persistence of psychiatric disorders. The observations from clinical studies suggest that chronic pain is not a common comorbidity among individuals with other psychiatric disorders, such as dementia and schizophrenia. It is not clear if this is a consequence of any specific biological mechanism, or methodology problems in the study. This chapter first provides an overview on the distribution of chronic pain and psychiatric disorders. Secondly, it reviews studies that have demonstrated the association between psychiatric disorders and chronic pain.

1. INTRODUCTION

Chronic pain is a significant health problem. It is common and it affects quality of life, sleep, work, decreases socialization, and increases health care use and costs, as well as mortality (Elliott et al., 1999, Henschke et al., 2015, Smith et al., 2014). Epidemiological studies have also demonstrated that some psychiatric disorders are common in the general population. There is increasing evidence that chronic pain and psychiatric disorders are not only common comorbidities, but psychiatric disorders may modify the risk of chronic pain, as well as pain may contribute to psychiatric disorders (Portenoy et al., 2004, Gureje et al., 1998, de Heer et al., 2014, Bruffaerts et al., 2015). This chapter first provides an overview of the distribution of chronic pain and psychiatric disorders, and then it describes the relationship between psychiatric conditions and chronic pain.

2. EPIDEMIOLOGY OF CHRONIC PAIN

The annual incidence rates of chronic pain range from 2% to 8% (Eriksen et al., 2004, Elliott et al., 2002, Reitsma et al., 2012). The prevalence estimates of chronic pain vary widely: (i) pain lasting 3 months or more, 7% to 51% (Verhaak et al., 1998, Fayaz et al., 2016, Elliott et al., 1999); (ii) pain lasting 6 months or longer, under 1% to 46% (Gureje et al., 1998, Neville et al., 2008, Schopflocher et al., 2011, Moulin et al., 2002); and (iii) pain in previous 12 months, 24% to 60% (Tsang et al., 2008). Further, figure 1 illustrates a few prevalence estimates of chronic pain around the world, ranging from 10% to 76% (Blay et al., 2007, Schopflocher et al., 2011, Reitsma et al., 2012, Tsang et al., 2008, Demyttenaere et al., 2007, Neville et al., 2008, Bhattarai et al., 2007, Elliott et al., 1999, Naidoo et al., 2009, Jakobsson, 2010, Andersson, 1994, Portenoy et al., 2004, Arnow et al., 2006, Gureje et al., 1998). The World Health Organization (WHO) established that chronic pain is common in both developed (37%) and developing (41%) countries (Tsang et al., 2008).

This variation in prevalence estimates is not only due to multiple definitions of chronic pain, or study methodologies, but also due to differences in the study sample (e.g. countries, age, gender), pain characteristics, type of pain (e.g. neuropathic, musculoskeletal), or pain location (e.g. back, head). Chronic pain prevalence is greater in females than males (Elzahaf et al., 2012, Neville et al., 2008, Rustoen et al., 2004, Gureje et al., 1998, Fayaz et al., 2016) and, in general, increases steadily with age (Blyth et al., 2001, Fayaz et al., 2016, Jakobsson, 2010, Schopflocher et al., 2011, Neville et al., 2008).

Restricting the scope by pain severity, it is alarming to find how common moderate chronic pain is, with the prevalence estimates ranging from 10% to 27% (Bhattarai et al., 2007, Elliott et al., 1999, Konig et al., 2009, Schopflocher et al., 2011, Fayaz et al., 2016). The prevalence estimates of severe pain range from 2% and 32% (Bhattarai et al., 2007, Konig et al., 2009, Gureje et al., 1998), and of pain with greater level of disability from 10% to 16% (Elliott et al., 1999, Fayaz et al., 2016).

2.1 Prevalence of specific type and chronic pain location

Headaches and musculoskeletal pain are the leading types of chronic pain (Elzahaf et al., 2012, van der Windt, 2010, Parsons et al., 2007, de Heer et al., 2014, Fayaz et al., 2016). Headaches prevalence estimates ranges from 6% to 77%: (i) one year prevalence: 29% to 77% (Stovner et al., 2007 Lipton, 2007 #136); and (ii) 6 months or longer prevalence: 6% to 45% (Gureje et al., 1998, Neville et al., 2008, Schopflocher et al., 2011). Tension-type headache (TTH) and migraine are the most common headaches with the prevalence estimates ranging from 16% to 78% (Stovner et al., 2007, Vos et al., 2012), and 9% to 17% (Stovner et al., 2007, Vos et al., 2012, Wang et al., 2016), respectively. Chronic daily headache appears to be less prevalent (0.5% to 5%) (Stovner et al., 2007).

Within the musculoskeletal pain category, the most common types are back/neck pain and temporomandibular disorders. Back/neck pain prevalence estimates ranges from 16% to 48%; (i) 3 months or more: 16% to 40% (Elliott et al., 1999, Portenoy et al., 2004); (ii) 6 months or longer: 32% to 48% (Elzahaf et al., 2012, Neville et al., 2008, Schopflocher et al., 2011, Gureje et al., 1998); and (iii) 12 months or more: 10% to 42% (Demyttenaere et al., 2007). Prevalence estimates for painful temporomandibular disorders lasting for 6 months range from 5% to 12% (National Institute of Dental and Craniofacial Research, 2014, Von Korff et al., 1988).

Arthritis is a term that describes numerous rheumatic conditions affecting joints and their surrounding tissue. Its prevalence is estimated at 23% and it is expected to increase to 26% in 2040 (Barbour et al., 2016, Hootman et al., 2016). Fibromyalgia is a type of chronic widespread pain, which has a prevalence ranging from 2% to 5%, depending on the criteria used for the diagnosis; American College of Rheumatology 1990 (2%), and modified 2010 classification criteria (5%) (Jones et al., 2015, Fayaz et al., 2016).

The prevalence of neuropathic pain is estimated to be between 1% and 23% (Smith and Torrance, 2010, Torrance et al., 2013, Fayaz et al., 2016, Yawn et al., 2009). The prevalence of chronic abdominal pain ranges from 0.5% to 25% (Drossman et al., 1993, Bommelaer et al., 2004, Clouse et al., 2006, Gureje et al., 1998, Schopflocher et al., 2011). Further, the prevalence of chronic pelvic pain among women ranges from 11% to 25% (Mathias et al., 1996, Coelho et al., 2014, Grace and Zondervan, 2004), and among men from 2% to 10% (Clemens et al., 2006, Nickel et al., 2001, Suskind et al., 2013, Kunishima et al., 2006, Liang et al., 2009). This pain is most often associated with endometriosis and pelvic inflammatory disease among women (Zondervan and Barlow, 2000), and with chronic prostatitis or interstitial cystitis/bladder pain syndrome among men (Suskind et al., 2013).

3. PSYCHOLOGICAL DISORDERS

Similarly to chronic pain, some psychiatric disorders, such as anxiety and depression, are also common. A meta-analysis including 174 surveys across 63 countries estimated the 12-month period and lifetime prevalence estimates of a set of common mental disorders (i.e., anxiety, depression and substance use disorders) as 18% and 29%, respectively (Steel et al., 2014).

Chronic pain is frequently accompanied by psychological disorders; anxiety and depression. Gureje *et al*. found that individuals with chronic pain were 4 times as likely to have anxiety or depression disorders than those without chronic pain (Odds ratio [OR] = 4.1) (Gureje et al., 1998). Further, chronic pain was found to be a frequent symptom among individuals with anxiety or depression disorders (Chaturvedi, 1987, Birgenheir et al., 2013). This co-occurrence is defined as comorbidity; “concurrent existence and occurrence of two or more medically diagnosed diseases in the same individual” (Nardi et al., 2007).

3.1 Anxiety

3.1.1 Prevalence and association with chronic pain

The prevalence of anxiety disorders ranges from 4% to 38% among adults worldwide (Steel et al., 2014, Bandelow and Michaelis, 2015, Remes et al., 2016, Vos et al., 2012, Kessler et al., 2007).

Table 1 shows a large variation in the prevalence of anxiety disorders according to pain types and sites; musculoskeletal pain (de Heer et al., 2014), neck or back pain (Demyttenaere et al., 2007, Dersh et al., 2006, Ciaramella and Poli, 2015, McWilliams et al., 2004, Reme et al., 2011, Von Korff et al., 2005), headache (McWilliams et al., 2004, Oedegaard et al., 2006, Saunders et al., 2008, Zwart et al., 2003), orofacial pain (Bertoli and de Leeuw, 2016, Velly et al., 2003), rheumatoid arthritis (Arnold et al., 2006), fibromyalgia (Arnold et al., 2006, Raphael et al.,

2006, Thieme et al., 2004, Uguz et al., 2010), arthritis (McWilliams et al., 2004, Murphy et al., 2012, Stang et al., 2006), as well as chronic abdominal pain (de Heer et al., 2014), chronic pelvic pain (CARVALHO et al., 2015), and neuropathic pain (Berger et al., 2012, Gore et al., 2007, Yawn et al., 2009, Zhao et al., 2012). Anxiety disorder appears to be also frequent among chronic pain patients receiving opioid therapy (37%) (Saffier et al., 2007).

A substantial body of studies shows that individuals with chronic pain are more likely to present anxiety disorders than individuals without pain (Von Korff et al., 2005, Demyttenaere et al., 2007). These higher likelihoods were noted among individuals with chronic back or neck pain (OR = 1.5 to 2.5) (McWilliams et al., 2004, Aggarwal et al., 2006, Aggarwal et al., 2010, Demyttenaere et al., 2007), arthritis (OR = 1.4 to 1.8) (McWilliams et al., 2004) headache (OR = 2.0 to 10.4) (Zwart et al., 2003, McWilliams et al., 2004, Baskin et al., 2006), chronic orofacial pain (OR = 1.5 to 5.1) (Aggarwal et al., 2006, Aggarwal et al., 2010, Velly et al., 2003, Fillingim et al., 2011), chronic widespread pain (OR = 2.9) (Aggarwal et al., 2006), fibromyalgia (OR = 6.7) (Arnold et al., 2006), and irritable bowel syndrome (OR = 3.5) (Aggarwal et al., 2006).

The association between anxiety and chronic pain is modified not only by the type of pain, but also by its characteristics. For example, individuals with more severe pain are more likely to have higher anxiety than those with less severe pain (OR = 2.2 and 5.2) (Murphy et al., 2012, de Heer et al., 2014).

Additionally, cohort studies demonstrated that individuals who are exposed to higher levels of anxiety disorders have an increased risk of developing chronic pain (e.g. temporomandibular disorders, a type of orofacial chronic pain; risk ratio [RR] = 2.8, and Hazard ratio [HR] = 1.3) than individuals with lower anxiety (Aggarwal et al., 2010, Fillingim et al., 2013). Finally, it is important to recognize that this relationship between anxiety disorders and pain is bidirectional: pain may contribute to anxiety disorders and anxiety contributes to chronic pain (de Heer et al., 2014, Bruffaerts et al., 2015).

3.2 Depression

3.2.1 Prevalence and association with chronic pain

The prevalence estimates of depression range from 0.8% to 21% (Weissman et al., 1996, Kessler et al., 2007, Steel et al., 2014). More recently, the overall prevalence estimate of depression among 60 countries in the World Health Survey was found to be 3% (Moussavi et al., 2007), while the Global Burden of Disease Study 2010 estimates a prevalence of 4% (Vos et al., 2012). The lifetime prevalence of bipolar disorder ranges from 0.3% to 4% (Weissman et al., 1996, Merikangas et al., 2007).

Individuals with depression frequently reported chronic pain (Fornaro and Stubbs, 2015, Birgenheir et al., 2013, Chaturvedi, 1987). Table 2 shows that depression is also common among individuals with specific chronic pain, such as musculoskeletal pain (de Heer et al., 2014), neck or back pain (Demyttenaere et al., 2007, Dersh et al., 2006, Ciaramella and Poli, 2015, McWilliams et al., 2004, Reme et al., 2011, Von Korff et al., 2005), headache (McWilliams et al., 2004, Oedegaard et al., 2006, Saunders et al., 2008, Zwart et al., 2003), orofacial pain (Manfredini et al., 2010, Bertoli and de Leeuw, 2016, Velly et al., 2003), rheumatoid Arthritis (Arnold et al., 2006), fibromyalgia (Aguglia et al., 2011, Arnold et al., 2006, Raphael et al., 2006, Thieme et al., 2004, Uguz et al., 2010), arthritis (McWilliams et al., 2004, Murphy et al., 2012, Stang et al., 2006), chronic abdominal pain (de Heer et al., 2014) and pelvic pain (CARVALHO et al., 2015, Clemens et al., 2008, Masheb et al., 2005, Riegel et al., 2014), and neuropathic pain (Berger et al., 2004, Berger et al., 2012, Gore et al., 2007, Yawn et al., 2009). Finally, more than one out of three patients (34%) receiving opioid therapy reported depression (Saffier et al., 2007).

Observational studies have demonstrated that individuals with chronic pain were also more likely to present depression in comparison to those without chronic pain: chronic back/neck pain (OR = 1.4, 2.3) (McWilliams et al., 2004, Demyttenaere et al., 2007); arthritis (OR = 1.4) (McWilliams et al., 2004); headache (OR = 1.7 to 4.0) (Zwart et al., 2003, McWilliams et al., 2004,

Baskin et al., 2006); chronic orofacial pain (OR = 1.6 to 4.6) (Aggarwal et al., 2006, Aggarwal et al., 2010, Velly et al., 2003, Fillingim et al., 2011), chronic widespread pain (OR = 3.3) (Aggarwal et al., 2010); fibromyalgia (OR = 2.7) (Arnold et al., 2006); and irritable bowel syndrome (OR = 3.9) (Aggarwal et al., 2006).

It has been well demonstrated that depression is not only a comorbidity of chronic pain, but also increases its risk. A cohort study, for example, estimated that depression is a predictor for a type of orofacial chronic pain; temporomandibular disorder (HR = 1.31) (Fillingim et al., 2013).

3.3. Substance use disorder and Suicide

3.3.1 Prevalence and association with chronic pain

Substance use disorder

The prevalence estimates of substance use disorder are in the range from 1% to 15% (Demyttenaere et al., 2007, Kessler et al., 2007, Whiteford et al., 2013, Grant et al., 2016). The prevalence estimate of opioid-use disorder is 35% (Boscarino et al., 2011). A systematic review in 2015 found the estimates of opioid addiction ranging from 8% to 12% (Vowles et al., 2015) and opioid misuse 21% to 29% (Boscarino et al., 2015). Current opioid dependence is associated with age (<65 years-old, OR = 2.33), opioid abuse history (OR = 3.81), high dependence severity (OR = 1.85), major depression (OR = 1.29) and psychotropic medication use (OR = 1.73) (Boscarino et al., 2010).

A few studies found a wide range of prevalence estimates of substance use disorder, from 0.4% to 14%, among individuals with back pain (Ciaramella and Poli, 2015, Reme et al., 2011, Von Korff et al., 2005, Dersh et al., 2006, Demyttenaere et al., 2007). In 2007, Martell *et al*. systematic review found a higher lifetime prevalence estimates of opioids addiction among individuals with back pain (36% to 56%) (Martell et al., 2007). This large variation in the estimated

prevalence of opioid use disorders likely reflects differences in the study methodology, study populations, and variances in definitions of opioid use disorders; abuse, addiction and misuse.

Substance use disorder appears to be more prevalent among individuals with migraine (1.3%, OR = 4.0) or non-migraine headache (1.4% OR = 3.8) than those without headache (Saunders et al., 2008). Individuals with back or neck pain were also more likely to present alcohol abuse/dependence disorders (OR = 1.6) than those without back or neck pain (Demyttenaere et al., 2007). Substance use disorder was also more common among fibromyalgia patients (26%, OR = 3.3 (Arnold et al., 2006); 10% OR = 2.7 (Raphael et al., 2006)), than those without fibromyalgia.

Similarly to anxiety and depression, a bidirectional association appears to exist between substance use disorder and chronic pain, since individuals with chronic pain frequently present substance use disorders and individuals with substance use disorders appear to have an increased risk of chronic pain (Scott et al., 2016).

Suicide

Suicidal ideation is not uncommon among patients seeking treatment for chronic pain (Fishbain et al., 2014, Tang and Crane, 2006). A systematic review estimated that the prevalence of suicidal ideation among patients with chronic pain ranges from 5% to 50% (Tang and Crane, 2006). The range of suicidal attempts is smaller, but remains relevant (5 to 14%) (Tang and Crane, 2006).

Suicide risk is modified by pain characteristics. Studies demonstrated that veterans with severe pain were more likely to die by suicide than those without severe pain (HR = 1.3), regardless of their demographic and psychiatric characteristics (Ilgen et al., 2010) and individuals with chronic pain were more likely to express a desire to die than those with acute pain (Fishbain et al., 2009). Tang *et al*. found that individuals with more severe pain, longer duration, sleep-onset

insomnia co-occurring with pain, helplessness and hopelessness about pain, the desire to escape from pain, pain catastrophizing and avoidance, or problem-solving deficits had an increased risk of death by suicide than individuals with chronic pain, but not exposed to these risk factors (Tang and Crane, 2006).

A significant suicide risk was observed among individuals exposed to back pain (HR = 1.1), migraine (HR = 1.3), and psychogenic pain (HR = 1.6) regardless of their demographic and psychological disorders (Ilgen et al., 2013).

3.5 SCHIZOPHRENIA

3.5.1 Prevalence and association with pain

A World Health Survey across 48 low and middle income countries found a prevalence of schizophrenia or psychosis of 1.1% (Stubbs et al., 2016). Birgenheir *et al*. found that 1.8% of individuals in the Veterans Health Administration System (USA) had schizophrenia (Birgenheir et al., 2013), while - according to systematic reviews - the mean prevalence estimate of schizophrenia in the general population was 5.5 per 1000 (McGrath et al., 2008), and ranged from 3.1 per 1000 in least developed countries to 5.8 per 1000 in developed countries (Saha et al., 2005).

Few studies have assessed the prevalence of schizophrenia among patients with chronic pain. In 1986, Fishbain *et al*. reported that, among 281 individuals with chronic pain, and predominantly back pain, schizoid personality disorder was present in 2% of the sample (Fishbain et al., 1986). This estimate is close to that found among patients with fibromyalgia (1%) (Arnold et al., 2006).

For instance, both Birgenheir *et al*. (Birgenheir et al., 2013) and Chaturvedi *et al*. (Chaturvedi, 1987) found that 2% of schizophrenia patients presented chronic pain. In 2013, a cross-sectional study using the Veterans Health Administration (VHA) system records of all

individuals receiving services found that schizophrenia patients were twice more likely to report chronic pain in comparison to those without schizophrenia (Birgenheir et al., 2013). A 2014 systematic review, however, concluded that the prevalence of chronic pain (e.g. headache and back pain) and intensity of pain were both lower among schizophrenia patients than among those without schizophrenia (Engels et al., 2014). A meta-analysis including 11 studies put in evidence that: (i) patients with schizophrenia present a decreased response to induced pain, and (ii) higher sensory thresholds (Potvin and Marchand, 2008). A review of the literature on pain sensitivity in subjects with schizophrenia indicates that the higher pain threshold observed in schizophrenia is poorly understood and suggest that pain insensitivity might serve as a prodromal predictor of susceptibility for schizophrenia (Singh et al., 2006).

3.6 DEMENTIA

3.6.1 Prevalence and association with pain

Dementia prevalence estimates among individuals aged 65 years and over varies from 6.3% to 21% (Mehta and Yeo, 2017). WHO estimated that the total number of dementia cases worldwide will be 65.7 million in 2030 and 115.4 million in 2050 ((WHO), 2012). Additionally, 2% to 10% of dementia cases initiate before the age of 65 years and its prevalence increases significantly with advanced aging ((WHO), 2012). The most frequent subtype of dementia is Alzheimer's (44%), followed by vascular (15%), Lewy body (5%), frontotemporal (1%), and alcohol induced (1%) (Goodman et al., 2017). Langa *et al*., however, described that the dementia prevalence in the USA, among those 65 years or older, decreased from 12% in 2000 to 9% in 2012. They indicated that years of education was associated with this decline (Langa et al., 2017).

Detection of dementia, however, maybe the root for the controversy. A systematic search including 23 studies found that undetected dementia is common (62%). The rate of under

detection appears to be lower in studies that used the Mini-Mental State Examination (MMSE) diagnosis criteria, and in residential/nursing care vs community settings (Langa et al., 2017).

Knowing that chronic pain is common among the elderly, it is expected that chronic pain be common among individuals with dementia. Shega *et al*. found that 54% of patients reported pain “on an average day" and 46% had potentially insufficient analgesia (Shega et al., 2006). Mantyselka *et al*. however, found that individuals with dementia were less likely to report any pain, any daily pain, pain every day interfering with routine activities, daily pain at rest, and use of analgesics than those without dementia (case/control = 43%/69%, 23%/40%, 19%/36% and 4%/13%, 33%/47% respectively) (Mantyselka et al., 2004). Flo *et al*. described that “Pain is, in general, under-recognized and undertreated in people with dementia” (Flo et al., 2014).

There are many difficulties related to pain assessment among individuals with dementia such as appropriateness of the instruments used, difficulties for the individuals with dementia to report their pain due to cognitive impairment, and difficulty of communication between healthy professionals and patients with dementia (Achterberg et al., 2013, Kelley et al., 2008, Flo et al., 2014, Lichtner et al., 2015, Rantala et al., 2014).

4. Conclusion

The present chapter adds to a growing knowledge of prevalence of chronic pain, and the relation between chronic pain and psychiatric disorders. We have used the best available data to demonstrate that, for some types of chronic pain and psychiatric conditions, they are common comorbidities. Moreover, either condition modifies the risk of the other.

It is therefore essential that health professionals identify psychiatric disorders comorbidities in patients with any kind of chronic pain early on, in order to provide proper therapy. Also, it is extremely important to recognize the increased risk of substance use disorder and suicide among patients with chronic pain.

ACKNOWLEDGEMENTS

The authors declare no conflict of interest.

Figure 1: Prevalence of chronic pain

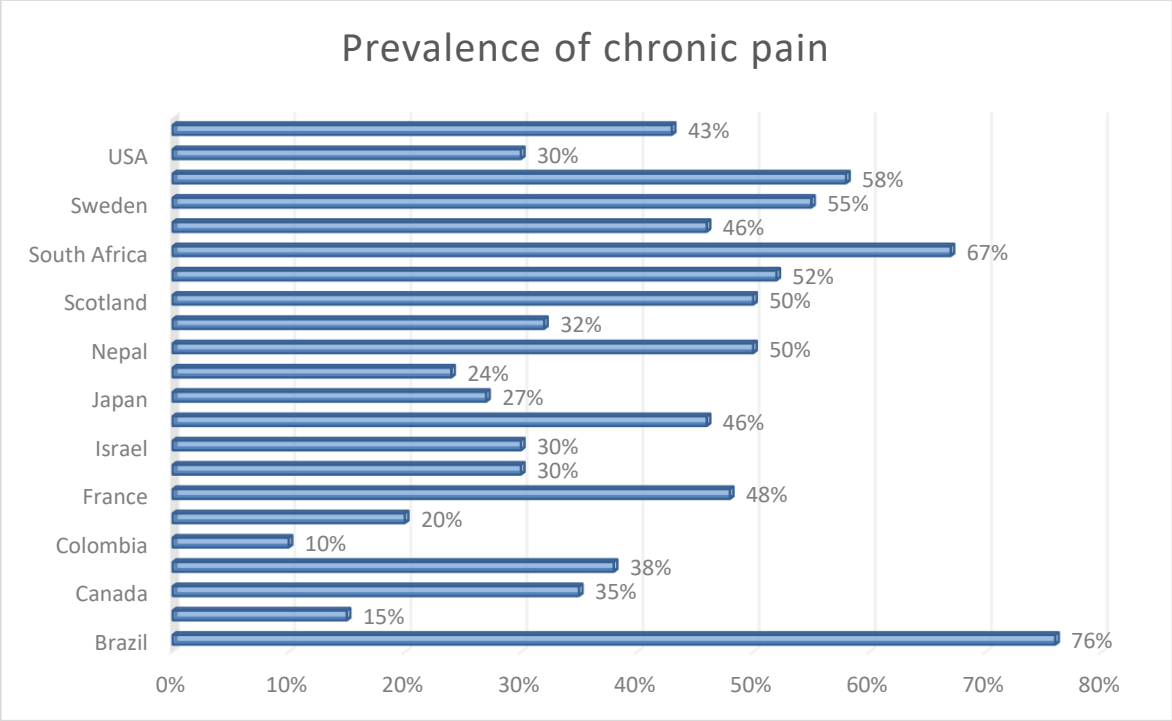

Table 1. Prevalence of anxiety among chronic pain conditions			
Authors	**Pain**	**Number of subjects with pain condition**	**Prevalence (%)**
De Heer et al. (2014) (de Heer et al., 2014)	Musculoskeletal pain	2753	93
Demyttenaere et al. 2007 (Demyttenaere et al., 2007)	Neck and back pain	9817	3[1]
Dersh et al. 2006 (Dersh et al., 2006)	Neck and back pain	1323	11
Ciaramella & Poli, 2015 (Ciaramella and Poli, 2015)	Back pain	416	17[2], 4[3], 16[4],10[5]
McWilliams et al. (2004) (McWilliams et al., 2004)	Back pain	640	6[2] and 13[4]
Reme et al. 2011 (Reme et al., 2011)	Back pain	565	12, 4[2], 1[4]
Von Korff et al. (Von Korff et al., 2005)	Spinal pain	5692	27, 6[2], 8[3], 5[4],1[5]
McWilliams et al. (2004) (McWilliams et al., 2004)	Headache	340	9[2] and 17[4]
Oedegaard et al 2006 (Oedegaard et al., 2006)	Migraine headache[6]	6045	15
Saunders et al. 2008 (Saunders et al., 2008)	Migraine headache	317	45[1], 7[2], 18[3], 11[4], 1[5]
Saunders et al. 2008 (Saunders et al., 2008)	Nonmigraine headache	400	31[1], 5[2], 10[3], 7[4], 3[5]
Zwart et al. (2003) (Zwart et al., 2003)	Non migrainous headache	11801	8
Zwart et al. (2003) (Zwart et al., 2003)	Migraine headache	5478	9
Bertoli et al. (Bertoli and de Leeuw, 2016)	Orofacial pain (TMD)	1,241	29
Velly et al. 2003 (Velly et al., 2003)	Orofacial pain (TMD)	83	36, 20[4]
Arnold et al. (2006) (Arnold et al., 2006)	Fibromyalgia	78	60, 5[2], 21[3], 28[4], 1[5]
Arnold et al. (2006) (Arnold et al., 2006)	Rheumatoid Arthritis (no fibromyalgia)	40	25, 8[2], 5[3], 8[4]
Raphael et al. (2006) (Raphael et al., 2006)	Fibromyalgia	129	36, 5[2], 11[4]
Thieme et al. 2004 (Thieme et al., 2004)	Fibromyalgia	115	32[1]
Uguz et al. 2010 (Uguz et al., 2010)	Fibromyalgia	103	32[1], 10[2], 5[3], 7[4]
McWilliams et al. (2004) (McWilliams et al., 2004)	Arthritis	588	6[2] and 11[4]
Murphy et al. (2012) (Murphy et al., 2012)	Arthritis	1793	31

Stang et al. 2006 (Stang et al., 2006)	Arthritis	5692	5[2], 6[3], 4[4]
De Heer et al. (2014) (de Heer et al., 2014)	Abdominal pain	1432	51
Carvalho et al. 2015 (CARVALHO et al., 2015)	Pelvic pain	-	39
Clemens et al. 2008 (Clemens et al., 2008)	Pelvic pain	174 males	6[4]
		111 females	14[4]
Berger et al. 2012 (Berger et al., 2012)	Neuropathic pain	31,688	3
Gore et al. 2007 (Gore et al., 2007)	Neuropathic pain	16,690	5
Yawn et al. 2009 (Yawn et al., 2009)	Neuropathic pain	71[7]	27
Yawn et al. 2009 (Yawn et al., 2009)	Neuropathic pain	315[8]	23
Zhao et al. 2012 (Zhao et al., 2012)	Neuropathic pain	2694	16
Saffier et al 2007 (Saffier et al., 2007)	Chronic pain receiving opioid therapy	908	37
Note: [1]anxiety includes: generalized anxiety disorder, panic disorder/agoraphobia, posttraumatic stress disorder, and social anxiety disorder, [2]generalized anxiety disorder, [3]social phobia, [4] panic disorder, [5]agoraphobia, [6]migraine with aura vs without aura, [7]clinical examination positive, [8] S-LANSS positive			

Table 2. Prevalence of depression among chronic pain conditions			
Authors	**Population**	**Number of subjects with pain condition**	**Prevalence (%)**
De Heer et al. (2014) (de Heer et al., 2014)	Musculoskeletal	2753	94
Demyttenaere et al. 2007 (Demyttenaere et al., 2007)	Neck and back pain	9817	3 to 16[1]
Dersh et al. 2006 (Dersh et al., 2006)	Neck and back pain	1323	56[1]
Ciaramella & Poli, 2015 (Ciaramella and Poli, 2015)	Back pain	416	33 [1]
McWilliams et al. (2004) (McWilliams et al., 2004)	Back pain	614	21
Reme et al. 2011 (Reme et al., 2011)	Back pain	565	4
Von Korff et al. (Von Korff et al., 2005)	Spinal pain	5692	13[1], 4[2]
McWilliams et al. (2004) (McWilliams et al., 2004)	Headache	340	29
Oedegaard et al. 2006 (Oedegaard et al., 2006)	Migraine headache[3]	6045	4
Saunders et al. 2008 (Saunders et al., 2008)	Migraine headache	317	19[1], 5[2]
Saunders et al. 2008 (Saunders et al., 2008)	Nonmigraine headache	400	13[1], 5[2]
Zwart et al. (2003) (Zwart et al., 2003)	Non migrainous headache	12733	4
Zwart et al. (2003) (Zwart et al., 2003)	Migraine headache	5844	4
Bertoli et al. (Bertoli and de Leeuw, 2016)	Orofacial pain (TMD)	1,241	30
Manfredini et al. 2010 (Manfredini et al., 2010)	Orofacial pain (TMD)	111	Severe: 40
Velly et al. 2003 (Velly et al., 2003)	Orofacial pain (TMD)	83	36
Arnold et al. (2006) (Arnold et al., 2006)	Rheumatoid Arthritis (no fibromyalgia)	40	28[1], 0[2]
Raphael et al. (2006) (Raphael et al., 2006)	Fibromyalgia	129	10
Thieme et al. 2004 (Thieme et al., 2004)	Fibromyalgia	115	29[1]
Aguglia et al. (2011) (Aguglia et al., 2011)	Fibromyalgia	30	83
Uguz et al. 2010 (Uguz et al., 2010)	Fibromyalgia	103	15[1], 1[2]
McWilliams et al. (2004) (McWilliams et al., 2004)	Arthritis	588	18

Murphy et al. (2012) (Murphy et al., 2012)	Arthritis	1793	18
Stang et al. 2006 (Stang et al., 2006)	Arthritis	5692	7[1], 3[2]
De Heer et al. (2014) (de Heer et al., 2014)	Abdominal pain	1432	55
Carvalho et al. 2015 (CARVALHO et al., 2015)	Chronic Pelvic pain	-	30
Clemens et al. 2008 (Clemens et al., 2008)	Pelvic pain	174 males	12, 7[1]
		111 females	16, 5[1]
Masheb et al. 2005 (Masheb et al., 2005)	Vulvodynia	53 females	17
Riegel et al. 2014 (Riegel et al., 2014)	Pelvic pain	-	6.5 – 24
Berger et al. 2012 (Berger et al., 2012)	Neuropathic pain	31,688	4
Gore et al. 2007 (Gore et al., 2007)	Neuropathic pain	16,690	7
Yawn et al. 2009 (Yawn et al., 2009)	Neuropathic pain	71[4]	12
		315[5]	16
Saffier et al. 2007 (Saffier et al., 2007)	Chronic pain receiving opioid therapy	908	34
Note : [1]major depression, [2] bipolar I or II, [3]migraine with aura vs without aura, [4]clinical examination positive, [5]S-LANSS positive			

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