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REVIEW ARTICLES

Chronic pain epidemiology and its clinical relevance

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Editor's key points

- Identifying risk factors allows development of healthcare strategies to reduce the burden of chronic pain.
- Around 20% of the population may be affected, with a huge impact on the wider society.
- Some risk factors cannot be changed (e.g. gender, age); others can be modified (e.g. pain severity, mood).
- Further epidemiological studies are an essential part of a chronic pain research strategy.

Summary. Chronic pain affects ~20% of the European population and is commoner in women, older people, and with relative deprivation. Its management in the community remains generally unsatisfactory, partly because of lack of evidence for effective interventions. Epidemiological study of chronic pain, through an understanding of its distribution and determinants, can inform the development, targeting, and evaluation of interventions in the general population. This paper reviews current knowledge of risk markers associated with chronic pain and considers how these might inform management and prevention. Risk factors include socio-demographic, clinical, psychological, and biological factors. These are relevant to our understanding of chronic pain mechanisms and the nature of, and responses to, current and future treatments.

Keywords: chronic pain; pain, psychological variables; risk; statistics, epidemiology

Epidemiology is the 'study of the distribution and determinants of health-related states or events in specified populations and the applications of this study to control health problems'.[1] Good epidemiological research on chronic pain provides important information on prevalence and factors associated with its onset and persistence. Improving our understanding of associated factors will inform our clinical management, limiting severity, and minimizing disability.

There is a strong argument that the most recent estimations of global burden of disease have underestimated the contribution of chronic pain.[2] By 2030, the WHO predicts that the four leading contributors of global burden of disease will be unipolar depression, coronary heart disease, cerebrovascular disease, and road traffic accidents.[3] Chronic pain is an important co-morbidity associated with all of these. But chronic pain is more than just a co-morbidity of other identifiable disease or injury. Chronic pain is now acknowledged as a condition in its own right, underpinned by an agreed set of definitions and taxonomy.[4 5]

Approximately 20% of the adult European population have chronic pain[6] and, in addition to the physical and emotional burden it brings, the financial cost to society is huge, currently estimated at more than €200 billion per annum in Europe and $150 billion per annum in the USA.[5] Fewer than 2% of sufferers ever attend a pain clinic[6] with the remainder managed mainly in primary care, if anywhere.[7]

While important recent advances in understanding pain mechanisms bring the possibility of new treatments, management of chronic pain is nonetheless generally unsatisfactory; two-thirds of sufferers report dissatisfaction with current treatment and most chronic pain persists for many years.[8] We need to understand the reasons for this, with a view to improving treatment.

In addition to research on the pathophysiology of pain mechanisms, it is important to understand the risk factors associated with the presence and development of chronic pain, as this will allow the design and targeting of preventive and management strategies. Risk factors include socio-demographic, clinical, psychological, and biological factors, and recent research has elucidated many of these, with potential clinical relevance. One important aspect is the translation of research on risk factors from animal or small human samples to the general population.[9] This paper will review our current understanding of risk markers associated with chronic pain, considering how this might be applied to the prevention and management of chronic pain.

Socio-demographic factors associated with chronic pain

The socio-demographic factors associated with chronic pain are well described across different pain conditions[10] (Box 1).

Box 1. Socio-demographic factors associated with chronic pain

- Female gender
- Older age
- Lower socio-economic status
- Geographical and cultural background
- Employment status and occupational factors
- History of abuse or interpersonal violence

In addition to a female preponderance for chronic pain, women consistently report lower pain thresholds, lower pain tolerance, and greater unpleasantness (or intensity) with pain with different analgesic sensitivity.[11] There is some evidence for a biological basis for apparent sex differences in pain experiences involving oestrogens.[12] However, the greatest gender differences are seen in the prevalence of chronic pain syndromes.[13] Recent evidence suggests that the occurrence of *disabling* chronic pain continues to rise with old age. Although the onset of pain *per se* does not have a clear relationship with age,[14 15] there is generally a higher prevalence of chronic pain in older age.[16] Given that the world's population aged >65 is likely to double in the next 40 years, treatment needs to take cognisance of pain-related co-morbidities and polypharmacy. Population-based studies of chronic pain have consistently shown that chronic pain occurrence is inversely related to socio-economic status[17 18] with evidence that people living in adverse socio-economic circumstances experience more chronic pain and greater pain severity,[19 20] independent of other demographic, and clinical factors. There is also evidence of both geographical and cultural variation in occurrence of chronic pain.[6]

The occurrence of pain, or the extent to which pain interferes with life, can be influenced by demands, expectations, control and fear of re-injury at work, specific occupational factors, employer and co-worker reactions to pain, or even by broader issues such as the job market.[21] There is a growing body of literature from large-scale national surveys that pain is more common among people who report a history of abuse and violence at any age, in both domestic and public settings.[22 23] This effect appears to be additional to the risk caused by physical injuries and pain, and highlights the need to elicit any history of domestic, sexual, or criminal violence in assessing the propensity to chronic pain and in managing its impact. A prospective population-based study in the North of England (EpifunD study) concluded that there was a strong relationship between lack of sunshine, lower temperatures, and pain reporting, postulating climate as a possible risk factor.[24] However, this relationship may be, at least in part, mediated through lifestyle factors associated with cooler and duller days (less exercise, poorer sleep, and higher reported boredom). Similarly, a seasonal effect suggests the potential role of vitamin D, low levels of which in some (but not all) studies have been shown to be related to the report of pain.[25]

Although many of these risk factors are un-modifiable or not amenable to medical intervention, it is important to recognize them, as they inform a targeted approach to chronic pain assessment and management. Dedicated coding and inclusion within routinely collected data sources and disease registries will enable routine population and health system surveillance of chronic pain. This will also aid visibility, linking chronic pain to existing (better-funded) health priority areas such as cancer, injury, obesity, and healthy ageing.[26] The existence of both individual-level risk factors and population-level risk factors for the onset or persistence of pain suggests that opportunities for intervention exist at more than one level.[17] Ignoring population-level factors and intervening exclusively on high-risk individuals (such as in specialist pain clinics) could limit options for reducing the overall community burden of chronic pain.

Clinical and psychological factors associated with chronic pain

Chronic pain

Perhaps the most important clinical factor for chronic pain at a specific site is pain (acute pain, or chronic pain at a different site). The more severe the pain and the greater number of pain sites, the more likely severe chronic pain.[8 27 28] This highlights the importance of pain management, not just in the relief of suffering, but also as a preventive activity. As Bingel and colleagues[29] highlighted, neuroimaging of pain has evolved from providing evidence that pain is processed in the brain at all to a sophisticated, mechanism-orientated research tool that can address a plethora of specific aspects related to the processing, perception, and modulation of pain. Functional brain imaging has provided objective proof of pain perception both in experimentally-induced and in disease-related pain.[30 31] From this, we now know that chronic pain patients display an altered brain activation in response to acute pain stimuli.[32] There is also some evidence to suggest that brain changes associated with chronic pain may be reversible after effective treatment.[33 34] In healthy individuals, neuroimaging studies have found that grey matter plasticity can be induced by repetitive experimental noxious stimuli as early as 8 days (after daily pain stimulus for 8 consecutive days), and that this receded between 22 days and 12 months later.[35] That these anatomical changes within the brain occur in the early stages of pain (before pain is labelled as chronic) further suggests that early intervention will be important in preventing chronicity, though this remains to be tested clinically.

It is uncertain whether there is pre-existing brain vulnerability to chronic pain, or whether these changes arise as a result of chronic pain. Even if brain responses are found to be tracking pain, these could conceivably represent co-located non-nociceptive functions.[36 37] Mindful of these caveats, future neuroimaging has the potential to optimize treatment or even offer personalized therapy, improve pain diagnostics in those who cannot communicate this and indicate targets for drug development.[37]