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Special Article

Chronic pain: a review of its epidemiology and associated factors in population-based studies

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Summary

Chronic pain is a common, complex, and distressing problem that has a profound impact on individuals and society. It frequently presents as a result of a disease or an injury; however, it is not merely an accompanying symptom, but rather a separate condition in its own right, with its own medical definition and taxonomy. Studying the distribution and determinants of chronic pain allows us to understand and manage the problem at the individual and population levels. Targeted and appropriate prevention and management strategies need to take into account the biological, psychological, socio-demographic, and lifestyle determinants and outcomes of pain. We present a narrative review of the current understanding of these factors.

Keywords: chronic pain; epidemiology; genetics; incidence; prevalence; risk factors

Chronic pain is a common, complex, and distressing problem, which has a significant impact on society and individuals.[1] It commonly presents as a result of an injury or a disease; however, it is a separate condition in its own right, not merely an accompanying symptom of other ailments. Chronic pain, therefore, has both its own taxonomy and medical definition.[2–4]

The Global Burden of Disease Study 2016 reaffirmed that the high prominence of pain and pain-related diseases is the leading cause of disability and disease burden globally.[5] Worldwide, the burden caused by chronic pain is escalating: 1.9 billion people were found to be affected by recurrent tension-type headaches, which were the most common symptomatic chronic condition.[5] Measuring years lived with disability, low back and neck pain have consistently been the leading causes of disability internationally, with other chronic pain conditions featuring prominently in the top 10 causes of disability.[5]

In order to develop treatment plans and prevention strategies, chronic pain needs to be understood in the context of social, biological, psychological, and physical factors. This is a narrative synthesis of the epidemiology, particularly the risk factors and demographic associations, of chronic pain.

Importance of epidemiology in chronic pain

Epidemiology, 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',[6] is vital to understanding chronic pain. According to the International Association for the Study of Pain, chronic pain is 'pain which has persisted beyond normal tissue healing time',[7] which, in the absence of other factors, is generally taken to be 3 months.[7] There are many risk factors for chronic pain, including socio-demographic, psychological, clinical, and

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biological factors.[8] Insight into these risk factors will allow the identification of specific prevention and management approaches that take into account these predisposing factors and the impact of pain on those affected.

Chronic pain, like most diseases, often arises from a series or combination of multiple events. Even when there is a solitary precipitating event in the genesis of chronic pain (e.g. injury), there remains a series of factors that affect the duration, intensity, and effects (physical, psychological, social, and emotional) of chronic pain.[9] Health-related behaviours and their outcomes are the most important modifiable risk factors in the genesis, duration, and impact of chronic pain.[10]

Methods

For this narrative review, we were informed by studies that investigated or demonstrated an association between any biological, psychological, socio-economic, cultural, or other risk factor for the development, persistence, or severity of chronic pain. In our search for these, we applied no limits for date of publication, country of origin, or study design. Articles published in languages other than English and abstracts for which no full text was available were excluded.

We searched six electronic databases (Medline, Embase, Cochrane Central Register of Controlled Trials, PubMed, Cochrane Database of Systematic Reviews, and Web of Science) using the following terms:

(i) Chronic pain or persistent pain AND
(ii) Epidemiology OR demography OR demographics OR incidence OR prevalence OR frequency OR pattern OR determinants OR causes OR risk factors OR public health

Databases were searched up to September 1, 2018. Through this search, we identified the main themes and important studies that have contributed to them. Under each of these themes, we further searched for systematic reviews. Additional records were identified through searching references of included articles and through literature searches of publications by leading academics working in the field of chronic pain research. Factors identified through this search were then search for specifically in order to identify further relevant publications.

Prevalence and incidence

Prevalence is the proportion of the at-risk population affected by a condition. Population estimates for the prevalence of chronic pain vary widely according to case definition and ascertainment methods, and time place and population. Research suggests that chronic pain affects 13–50% of adults in the UK.[1,11] Of those who live with chronic pain, 10.4–14.3% were found to have moderate-to-severe disabling chronic pain.[1]

Incidence is the number of new cases of a disease developing during a particular time period in a population at risk of developing the disease. Although difficult to accurately determine because of a lack of longitudinal studies, the incidence of chronic pain in one region of the UK has been estimated at 8% per year.[12]

Factors associated with chronic pain

Chronic pain has multiple associated physical, psychological, and social factors (Table 1). Historically, risk factors have been classified as 'modifiable' and 'non-modifiable'; however, this bio-medico-centric approach to epidemiology does not always take into account the complex interplay between both modifiable and non-modifiable elements of each risk factor. For example, the experience of violence or abuse in the past is often considered 'non-modifiable' because the event or events have already occurred, and the patient's history cannot be changed. However, the individual's interpretation of these events and their impact on their life and health is constantly evolving and will affect the impact that this has on their future health and life. Furthermore, interventions that improve the biopsychosocial determinants of health can prevent or reduce the future population exposure to risk factors implicated in the genesis of chronic pain.

Table 1 Factors associated with the development of chronic pain

Factor	
Demographic	Age
	Gender
	Ethnicity and cultural background
	Socio-economic background
	Employment status and occupational factors
Lifestyle and behaviour	Smoking
	Alcohol
	Physical activity
	Nutrition
	Sunshine and vitamin D
Clinical	Pain
	Multi-morbidity and mortality
	Mental health
	Surgical and medical interventions
	Weight
	Sleep disorders
	Genetics
Other	Attitudes and beliefs about pain
	History of violent injury, abuse, or interpersonal violence

Ascertaining and managing those risk factors and elements of risk factors that are modifiable may allow the prevention of chronic pain, or the reduction of its duration and severity. Factors that are not amenable to medical interventions are still important to discuss in the clinical context. Many are relevant to chronic pain predictions, assessments, management, and prognoses, and others will be important in the attempt to identify new targets for therapeutic intervention.[8] An epidemiologically informed multidisciplinary and patient-centred approach is key to the successful management of chronic pain.[13,14]

Demographic

Age

Whilst there is a paucity of evidence examining chronic pain in children and adolescents,[15] the available literature suggests that older patients have a higher prevalence of chronic pain than younger groups of patients.[1] Advanced age and chronic pain (and its reporting) have a complex interrelationship,[16–18] whereby multi-morbidity is independently associated with chronic pain.[19] With increasing age comes increasing multi-

morbidity; the more advanced a patient's age, the more he or she is likely to have experienced noxious stimuli or injury that can trigger chronic pain. For example, in people with shingles, those aged 50–54 yr have an 8% chance of developing post-herpetic neuralgia, whereas those aged 80–84 yr have a 21% chance of its development.[20] Assessing pain in older patients can be complex, particularly because older adults are often reticent to discuss or disclose the level of their pain.[21] Age-related disease processes, such as cognitive decline and dementia, can make identifying and managing chronic pain more difficult.[21] Characteristics of pain, including duration and severity, area of body affected, and number of sites of pain, were found to be indicators for ongoing pain in older women, but these were less relevant in older men.[22] Chronic pain is not limited to older age groups, however. A study from across 42 countries identified that self-reported chronic pain amongst adolescent populations was common: 20.6% of young people experienced pain in at least two sites of headache, stomach, and backache.[23] Chronic pain affects up to 30% of those aged 18–39 yr. Younger age seems to be a risk factor for chronic post-surgical pain.[24]

Gender

Men are less likely to report or experience chronic pain than women,[25] and girls are more likely to report pain in multiple sites than boys.[23] Several reviews have studied how gender (role) and sex (biological) differences are related to the way men and women experience pain.[26–29] One recent systematic review found that women who experience pain are more likely to use maladaptive coping strategies, which predispose them to chronic pain and poorer functional ability.[26] Women have been shown to have lower pain thresholds and tolerance, and are more likely to experience greater intensity and unpleasantness with pain.[30] The evidence also suggests that women have different sensitivities to analgesia.[27] When corrections are made for the prevalence of pain in the different genders, women are more likely to seek treatment for their pain. In a recent study from one specialist pain clinic, there were twice as many women as men.[31] Women reported a higher level of pain intensity and higher pain-related disability than men.[32] Although there is insufficient information on the mechanisms behind these sex-specific differences in pain perception and pain prevalence,[26] there is some evidence for the role of oestrogens[33] and genetics, including sex-specific differences in the contribution of pain-related genes.[34]

Ethnicity and cultural background

There are substantial and complex ethnic variations in prevalence and outcomes of pain-related conditions, although the mechanisms behind these remain poorly understood.[11,35] Caucasian patients have been found to experience less pain and less pain-related disability than black patients.[35,36] A survey of 500 000 people in the UK showed that those who self-identified as white were less likely to report chronic pain than those reporting black, Asian, or mixed ethnicity.[37] However, once adjusted for income employment and adverse life events, the association between self-reported ethnicity and chronic pain was significantly attenuated. The prevalence of chronic pain and its associated disability has been found to be greater in developing countries than in developed countries.[5]

Socio-economic background

Population studies reliably show that the prevalence of chronic pain is inversely related to socio-economic factors.[36,38–40] Those who are socio-economically deprived are not only more likely to experience chronic pain than people from more affluent areas, but they are also more likely to experience more severe pain and a greater level of pain-related disability.[36,41,42] People who have low levels of education, perceived income inequalities, and high levels of neighbourhood deprivation are more likely to experience chronic pain than those who have higher levels of education, less perceived income inequality, and who live in more affluent neighbourhoods.[43] The economic impact of chronic pain compounds the cycle of pain's complex interrelationship with socio-economic deprivation.[40] Although an individual's socio-economic and educational background are non-modifiable, it is clear that political attention to these factors can have a great influence on the future prevalence and severity of chronic pain at a societal level.

Employment status and occupational factors

People who are not in employment because of ill health or disability are more likely to have chronic pain than those who are employed. Occupational risk factors for chronic pain include poor job control, expectations of return to work (including fear around a recurring injury),[44] lack of work autonomy or the ability to modify work, job satisfaction, and higher perceived level of difficulty of job requirements.[44,45] Chronic neck and shoulder pain was found to be an independent predictor of chronic pain and related to work stress.[46] Non-manual workers were less likely to report chronic pain than people who hold manual occupations.[47] A recent study found that, amongst those who earned less than £18,000 yr^{-1}, the prevalence of chronic pain was 52.5%, whilst amongst those with incomes greater that £100,000 yr^{-1} the prevalence was 33.5%.[37] The same study also demonstrated that chronic pain relates to working status: chronic pain was present in 78.9% of those who were unemployed, but only in 39.8% of those in paid employment and 42.4% of those in voluntary or unpaid work.[37] This relationship, however, may be bidirectional in that people with chronic pain may be less likely to be in work because of their pain. The extent of the burden on healthcare from chronic pain has also been related to education level and socio-economic level of patients.[30] A score to assess work disability from pain leading to absent days demonstrated that, in both genders, more locations of pain, smoking, less education, and obesity were related to higher risk of time off work as a result of pain.[48]

Lifestyle and behaviour

Smoking

People with chronic pain are more likely to smoke than those with no pain.[49–51] Patients who are heavy smokers report higher pain intensity scores than non-smokers, and report a higher number of painful sites.[52–54] Smoking is involved in the aetiology of several conditions that cause chronic pain,[55] and the relationship between smoking and chronic pain appears to be dose related.[53] Smokers affected by chronic pain are more likely to be dependent on tobacco, smoke more cigarettes a day, and have more difficulty in quitting smoking than those who do not have the condition.[52,56]

Alcohol

The analgesic properties of alcohol are short lived; however, it is commonly used by patients to 'self-medicate' for chronic pain.[57,58] When alcohol is used to excess, people with chronic pain can develop resistance to its limited analgesic effects. Additionally, alcohol withdrawal can increase pain sensitivity, which can promote a cycle of escalating alcohol abuse in order to seek analgesia effects at higher doses as tolerance builds, and to avoid alcohol withdrawal-related pain.[59,60] There is evidence that alcohol dependence may be caused by the same dysregulation of pain neurocircuitry and neurochemistry that causes chronic pain.[60]

Physical activity

Systematic reviews conclude that exercise and physical activity have positive effects in chronic pain, with improved quality of life and physical function, reducing pain severity, and few adverse effects, although the quality of evidence is variable.[61,62] Compliance with exercise interventions is key to their success; interventions with a measured high compliance yielded significantly larger reduction in pain than those with uncertain or unmonitored compliance.[63] The specific effects of physical activity on chronic pain are hard to determine because of the heterogeneity of chronic pain and exercise regimes, and study limitations, including limited follow-up periods and small sample sizes.[61,64] However, there is evidence of benefit for some types of physical activity in particular chronic pain conditions: aquatic exercise can improve chronic back pain and improve physical function,[65] supervised aerobic and strength training has been shown to reduce pain in patients with fibromyalgia,[66] and t'ai chi had a beneficial effect in reducing arthritis pain.[67] Yoga has also been shown to have a beneficial impact on those with chronic pain.[68] Recommendations for including physical activity in treatment plans for the management of chronic pain have started to feature in national and international care guidelines.[14,69]

Nutrition

The role of nutrition in the development and prevention of chronic pain is unclear. Nutrition management plans may be of benefit to patients with chronic pain by improving pain management and reducing cardiovascular risk factors that are related to chronic pain. There have been calls for patients with chronic pain to be offered personalised nutrition assessment and counselling targeted at improving diet and supplement use, and emerging evidence that this may improve the quality of life and clinical outcomes in patients with chronic pain.[70] Omega-3 as a diet supplement in preclinical trials did show an improvement in inflammatory pain,[71] whilst garlic has been suggested to reduce pain severity in overweight women with knee arthritis.[72] A recent systematic review and meta-analysis of 23 papers found that interventions based on nutrition, particularly those testing an altered overall diet or a single nutrient, had a significant effect on reducing participants' reported pain severity and intensity.[73] However, the studies in the field of nutrition and chronic pain, including those included in the meta-analysis, were of low quality,[73–76] and there is insufficient evidence to make specific dietary recommendations. More rigorous studies examining nutrition with chronic pain as a primary outcome are needed in order to determine the role of nutrition in chronic pain.[73]

Sunshine and vitamin D

Colder climates and lack of sunshine correlate with chronic pain; a study showed less pain was experienced on longer, sunnier days. A relationship between high levels of reported pain and low levels of vitamin D has been demonstrated, with the suggestion that low vitamin D levels cause anatomic, endocrine, neurological, and immunological changes, which predispose to onset and perpetuation of chronic pain.[77,78] However, the effect is not replicated across all studies with only 25% of studies concluding that there is a correlation between low levels of vitamin D and chronic pain.[79,80]

Clinical

Pain

The most important clinical risk factor for the development of chronic pain is the presence of another site of acute or chronic pain within the body.[12] The greater the severity and the greater number of sites, the more likely chronic pain is to develop.[12,81] The presence of painful stimuli alters brain chemistry in such a way as to predispose individuals to develop chronic pain.[82] This increased susceptibility to pain can develop within days of exposure to continuous painful stimuli and can persist for up to a year after the pain has resolved.[83] Having more than one cause of chronic pain and pain of longer duration are both associated with poorer quality of life.[84] Effective analgesia for acute pain is protective against the development of chronic pain.[85] One of the most important ways to reduce the incidence of chronic pain is to prevent acute pain from occurring and managing it well when it does occur.

Multi-morbidity and mortality

Patients with co-morbid physical and mental chronic diseases are more liable to suffer chronic pain than those without.[19,86] Up to 88% of those with chronic pain have additional chronic diagnoses.[11,19,87] Even after adjusting for known socio-economic and environmental confounders (e.g. age, gender, smoking, deprivation, and education), there is an increased co-occurrence of chronic pain with depression and cardiovascular disease.[88] Approximately a third of patients with chronic pulmonary disease and coronary heart disease report experiencing chronic pain.[19] The presence of co-morbidities also complicates the clinical management of people with chronic pain by limiting the applicability of disease-specific clinical guidelines and reducing the treatment options available for optimal pain control.[89] In people with other medical co-morbidities, chronic pain is an independent risk factor for all-cause mortality.[90,91] Patients diagnosed with severe chronic pain are twice as likely to have died 10 yr later from ischaemic heart disease or respiratory disease than those who report mild chronic pain or were pain free.[92–95] Those who were 'resilient to pain'—people who experienced a high pain intensity, but documented a low pain disability—had an improved 10 yr survival rate compared with people who were not resilient to pain.[96]

Improvements in cancer treatments and care have led to improved survival rates, meaning that chronic pain is becoming more prevalent in those who have had cancer. A French study discovered that a third of patients with cancer had chronic pain; within this group, approximately a fifth had pain with neuropathic characteristics.[97] In patients with chronic obstructive pulmonary disease (COPD), chronic pain is

common, and those with COPD and chronic pain were found to have more depression, do less physical exercise, and have higher breathlessness scores than those without COPD.[98] For those living with neurological conditions, the prevalence of chronic pain is double that of the general population, and those with spinal cord injury have the highest levels of pain.[99] Chronic pain is also more prevalent in adolescents with physical disabilities; however, other mental health concerns, such as insomnia, low mood, and anxiety associated with chronic pain, were as prevalent in those without any physical disability who had chronic pain.[100]

Mental health

Chronic pain is linked with depression, and the combination of these conditions can cluster in families.[101] Depression, anxiety, and negative beliefs about pain are all related not only to developing chronic pain, but also to having worse outcomes from chronic pain.[102–105] Depression is strongly linked with chronic pain: 20–50% of patients with chronic pain have co-morbid depression,[11,19] and patients with severe pain are more likely to be depressed.[106] Depression often goes unrecognised, and therefore, untreated in patients with chronic pain.[107] Even once depression has improved, people with a history of depression remain at higher risk of chronic pain.[108] It is likely that the aetiology is bidirectional with chronic pain both causing and resulting from poor mental health.[109] Neuroimaging studies on patients with depression showed abnormal prefrontal brain activity and dysfunctional emotional regulation when exposed to experimentally induced painful stimuli.[110,111] Anxiety and fear about pain are linked to a higher likelihood of developing chronic pain and a poorer prognosis of recovery from chronic pain.[102] Fear avoidance behaviours and associated lack of movement are independent risk factors for developing chronic pain.[112] A large population study demonstrated that patients who had consulted their general practitioner (GP) for 'nerves, anxiety, tension, or depression' had a higher risk of consulting about chronic pain than those who had not consulted their GP in this way (52.2% *vs* 38.0%).[37] In post-traumatic stress disorder (PTSD), chronic pain is common,[113,114] although the strength of the relationship varies depending on the cause of the PTSD and the type of chronic pain.[115] The resolution of anxiety and depression may need to be achieved, and effective analgesia, in order to enable effective pain control in chronic pain.[116] Because of the bidirectional relationship between chronic pain and mental health conditions, screening for mental health issues in people with chronic pain, and for chronic pain in people with mental health issues, should be considered.[117]

Surgical and medical interventions

Postoperative chronic pain is a significant complication of many surgical procedures.[118] Whilst rates of post-surgical pain vary, it has been suggested that up to 80% of patients experience some degree of significant postoperative pain.[119] Chronic post-surgical pain affects up to 10% of patients,[120] and is particularly common after amputations (50–85%), thoracotomies (5–65%), cardiac surgery (30–55%), and breast surgery (20–50%).[121] In spite of it becoming a more widely recognised pathophysiology, rates of diagnosis of post-surgical pain have remained unchanged.[122] In foot surgery patients, the risk of developing chronic postoperative pain was not correlated with the severity of surgery.[123] Those with pre-existing severe chronic pain were more likely to develop chronic post-operative pain.[118,123] The presence of moderate-to-severe pain before the operation and acute post-surgical pain are both independent predictors of whether patients develop chronic post-surgical pain.[24] Patients who were anxious about their operation, younger patients, and those who developed post-operative infections were also more likely to suffer from chronic post-surgical pain.[24,123] Chronic post-surgical pain can have significant negative effects on patients' quality of life, particularly in conditions, such as breast cancer, where survivors are living longer, but living with chronic pain as a result of their treatment.[124]

Weight

Obesity, defined as a BMI of greater than 30, is related to multi-morbidity and is an independent predictor of chronic pain. Obesity increases chronic pain in several ways, including placing strain on weight-bearing joints, reducing physical activity, and contributing to overall body deconditioning.[125] One study suggests that nearly 40% of people who are obese experience chronic pain, and that the pain they report is more likely to be moderate to severe than chronic pain in those who are not obese.[126] A large-scale population study found that the likelihood of reporting chronic pain increased proportionately with BMI: compared with groups of people with a healthy BMI, in people with a BMI of 30–34, the rates of pain were 68%; the relative rates of chronic pain were 136% in those with a BMI of 35–39, and 254% in those with BMI >40.[127] This increased prevalence of chronic pain is seen even after adjusting for the impact of obesity on other medical conditions, which contribute to multi-morbidity and which are independently associated with pain.[128] There are both environmental and genetic elements to the relationship between pain and obesity.[129] There is, however, limited evidence that weight loss improves chronic pain.[130] However, there is evidence that being underweight is a consideration when managing patients with chronic pain: one study showed a higher chronic pain prevalence in men over 50 who had a BMI of less than 18.5; they also had higher rates of severe depression.[131]

Sleep disorders

Sleep disorders have been shown to affect nearly half of people reporting chronic pain, with a quarter of chronic pain patients suffering from clinical insomnia.[132] The association is bidirectional, with chronic pain causing poor sleep, and poor sleep increasing the intensity and duration of chronic pain.[132] Sleep deprivation was found to be a risk factor for chronic pain in a prospective survey of women over a 17 yr period.[133] Another study showed that having chronic pain made people more likely to suffer from sleep problems and depression, and suggested that treating sleep disorders should be considered as part of chronic pain management.[134] Severe chronic pain after concussion was significantly related to insomnia.[135] There is a high prevalence of sleep apnoea in patients who take opioid medications long term, but patients with chronic pain are at higher risk of developing sleep apnoea irrespective of opioid medication.[136]

Genetics

The relationship between chronic pain and genes is complex. Genes act at many levels to shape the experience of chronic

pain, influencing emotional, behavioural, and biological processes.[137] Sensitivity to painful stimuli and pain tolerance are partly genetically determined.[138,139] Chronic pain is a heritable phenotype, and the presence of chronic pain clusters in family groups[140,141] through genetic and 'maternal' effects. It also may be as a result of important genetic contributions to underlying diseases, which will include chronic pain.[63,140,141]

One of the current challenges in chronic pain epidemiology is to determine which genes contribute to chronic pain and what their individual roles are. Currently, there are known to be at least 150 genes associated with chronic pain in humans, and this number is ever expanding.[137,142] Amongst others, they include genes from immune, inflammatory, and stress-related pathways, including *COMT* and *OPRM*.[143] Specific genetic variants have been identified with rare chronic pain conditions, such as *SNC9A* with erythromelalgia.[144] A recent systematic review of genetic factors associated with chronic neuropathic pain found that variants in HLA genes, *COMT*, *OPRM1*, *TNFA*, *IL6*, and *GCH1*, were identified in more than one study.[145]

At a human population level, research has failed to identify any single genetic variant that contributes substantially to the population risk of developing chronic pain; there is no 'chronic pain gene'. It is more likely that a combination of genetic variants increases the risk of developing chronic pain. However, identifying relevant genes may help to understand underlying biological mechanisms and the search for therapeutic targets. Gene identification from genome-wide association studies (GWAS) may offer hope, particularly as genetic data from large numbers of samples, such as the UK Biobank,[146] are accessible. In one GWAS, a genetic variant on Chromosome 5 was found to be associated with chronic widespread pain in both human genome- and animal-wide association study meta-analyses.[147] A more recent GWAS and meta-analysis of 158 000 individuals identified three novel genetic variants associated with chronic back pain.[148]

Other

Attitudes and beliefs about pain

Personal beliefs and attitudes can affect a person's likelihood of developing long-term pain or pain-related disability.[149,150] Patients who adopted passive coping strategies, such as 'resting and taking medications', were found to use three times the amount of healthcare appointments and have double the level of disability from pain in comparison with those who adopted active strategies (e.g. exercise).[151] Changing patients' attitudes to their pain can reduce their level of pain and the impact of their quality of life.[152]

History of violent injury, abuse, or interpersonal violence

The severity and development of chronic pain experience are affected by early life factors: people who experience adversity or emotional trauma (e.g. death of parent and being raised in the care system) or physical trauma (e.g. substantial hospitalisation and preterm birth) in childhood have a higher risk of chronic pain in their adult lives.[153] Early stress in life can alter the function of the hypothalamic pituitary adrenal axis, affecting the stress response.[153] Young people who have experienced traumatic adverse childhood experiences (ACEs) have a greater chance of developing chronic pain than those who have not. A study of children and 9-19 years with chronic pain found that the most common ACE in children with chronic pain was having family members with mental health illnesses; 55% of children with multiple ACEs experience chronic pain.[154] The more ACEs, the greater the level of chronic widespread pain and psychological distress, such as anxiety and depression (which have been noted previously to be related to the development and severity of chronic pain).[154]

People who have experienced personal violence or abusive relationships are more likely to experience subsequent chronic pain.[43,155] This has been found to be true regardless of the age at which the violence or abuse was experienced, or whether it was domestic or public violence or abuse.[155,156]

Limitations

It is challenging to draw conclusions on chronic pain epidemiology given the heterogeneity of the research in this field, whose sources include variations in how chronic pain is defined in each study and of the populations studied. The latter may impact on the generalisability of study findings in other populations, regions, or countries. Differences in study design also limit the applicability of individual research findings. These differences make robust data synthesis, including meta-analysis, particularly challenging in this field. In particular, it is generally impossible to determine causality from cross-sectional studies, and therefore, to distinguish risk factors from outcomes of chronic pain.

Conclusion

The significant global disease burden of chronic pain needs to be addressed by managing the causes and effects of chronic pain, targeted at both individual and population levels. To prevent and reduce the impact of chronic pain, modifiable risk factors (e.g. acute pain, lifestyle, and behaviour) need to be addressed, with the patient at the centre of the management. In the longer term, attention to the local and global distributions of wealth and access to education are likely to be more important. Employing modern techniques in further epidemiological research, such as neuroimaging and genetics, is important in identifying underlying biological mechanisms and potential therapeutic targets.

Authors' contributions

Literature search: SEEM, KPN.
Identifying factors used in the thematic synthesis: all authors.
Drafting paper: SEEM, KPN.
Critically revised the article for important intellectual content and had final approval of the version to be published: BHS.

Declaration of interest

The authors declare that they have no conflicts of interest.

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