Epidemiology of Pain, edited by
I.K. Crombie, IASP Press, Seattle, © 1999.

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Pain in Older People

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According to self-report measures, acute pain probably occurs at much the same rate across all age groups. Chronic pain is experienced more by older people, but this increase does not continue beyond the seventh decade. The elderly often experience chronic pain in the joints, back, legs, and feet; they appear to suffer less visceral pain and headache than younger people. The plateau in overall chronic pain prevalence with age may reflect a balance between age-related impairment of the nociceptive function of the nervous system and an increase in the pathological load that accompanies old age. The contribution of other dimensions of the pain experience to this equation can only be discovered through longitudinal studies that focus primarily on pain rather than addressing pain as an ancillary to other aspects of aging.

PREVALENCE OF PAIN IN OLDER PEOPLE

The population prevalence and characteristics of pain are difficult to ascertain, and comparisons across studies are complex. Moreover, many common pain problems (e.g., the suffering associated with fractures or cancer) may seriously afflict the person involved, but are short-lived because of rapid resolution or mortality and so are not reflected in cross-sectional prevalence studies. Even chronic conditions well known to increase with age, such as central post-stroke pain (Leijon et al. 1989) and postherpetic neuralgia (Portenoy et al. 1986), rarely feature because of their low incidence compared to the overwhelming frequency and chronicity of degenerative joint disease. Most prevalence studies are also unable to incorporate the large number of questions needed to adequately describe the pain experience: where is the site of pain; is it continuous or intermittent; what has been its duration; what is its quality and severity at different times; how is it aggravated and relieved; and how has it been treated? We might also address the effect of pain on quality of life and mood, how pain relates to comorbidity, and its effect on caregivers, and then shift our focus of attention to another pain complaint (Ferrell et al. 1990; Mobily et al. 1994) and repeat this entire battery of questions.

This complexity is compounded by the fact that most epidemiological studies of pain in older people were not designed with the primary object of examining the problem of pain. Pain is either an afterthought or a minor aspect of the study in hand, or the results on pain prevalence were derived later from more general data by a second group of researchers. Presumably the difficulty is the cost of such studies, particularly if a longitudinal element is incorporated into the study design.

Yet the epidemiological study of pain is important as it assists us to define the extent of the problem, which in turn helps determine resource allocation and generates important questions relevant to the pathophysiology, psychopathology, and pathogenesis of pain itself. Such factors are usually hidden in the morass of details that must be interpreted for the typical clinic patient with chronic pain. We must consider several factors in reviewing epidemiological studies of pain prevalence in the elderly. These include the selection of the study population, which may comprise random samples of individuals from the community or convenience samples from pain clinics, general practice groups, or institutions. The method of contact, response rates, age distribution of the sample, and questions asked are also important considerations.

FIELD STUDIES

One of the most quoted studies is that by Crook et al. (1984), who randomly sampled the patients of a group of general practitioners located near Toronto, Canada. Their telephone survey had a gratifying 95% response rate, but there were few participants over the age of 80, a problem common to most community studies that explore issues relevant to the elderly. Questions regarding the temporal nature of pain did not follow the usual pattern of description for acute and chronic pain, and this study's classification of pain as temporary or persistent is not easily compared with classifications used in other studies. Nevertheless, it was one of the first studies to clearly demonstrate increased pain prevalence with increasing age, and it highlighted pain as a frequent problem for a large number of older people. Its finding that temporary pain had the same prevalence at all ages is intriguing, and it remains the only study to have reported age-related prevalence for acute pain of any type.

However, other studies were not necessarily able to replicate Crook's results on persistent or chronic pain. Table I summarizes recent studies that report pain prevalence among older people. Fig. 1 contains prevalence data from 11 studies that contain sufficient detail to allow comparison of overall pain rates across a wide age range. Gibson and Helme (1995) recently reviewed these studies, which collectively suggest a peak or plateau in the prevalence of pain by age 65 (Brattberg et al. 1989, 1996; Andersson et al. 1993) and a decline in reported pain in the old old (75–84 years) and oldest old (85+) (Roy and Thomas 1987; Mobily et al. 1994; Brattberg et al. 1996).

We recently completed a study of a community sample from Melbourne, Australia (Health Status Of Older People [HSOP]; Kendig et al. 1996). A sample of 1000 English-speaking persons aged 65 years and over was randomly selected from electoral rolls (voting is compulsory for all Australian citizens between the ages of 18 and 70, and the names of all adults are maintained on the rolls, regardless of age). Only 12% of residents over age 70 were not Australian citizens, and most of this group were of non-English-speaking background and were beyond the scope of the study. The response rate among participants was 70%, which is common for this type of study. Trained researchers interviewed subjects and obtained answers to a wide

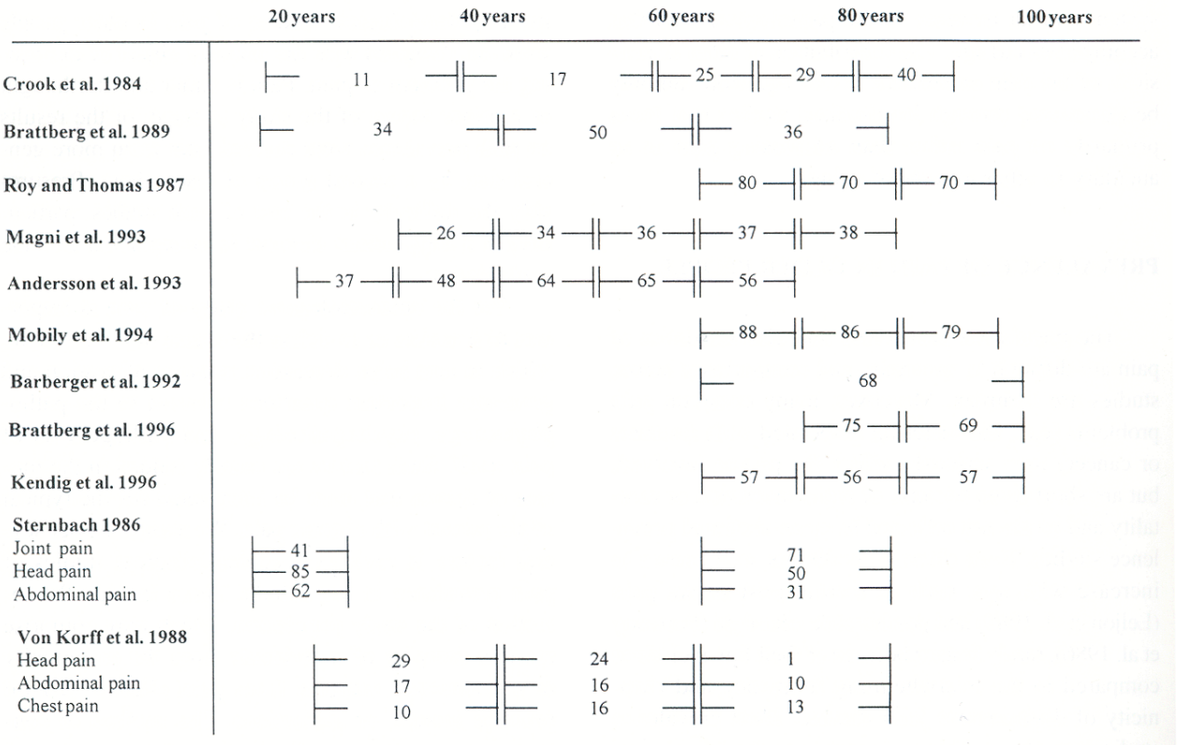

Fig. 1. Pain prevalence (%) across the adult lifespan.

Table I
Studies of pain prevalence that include older persons

Reference	Type of Study	Type of Pain	Source of Sample	Sample Size (>65 y)	Pain Severity	Duration of Symptoms	Type of Prevalence Estimate
Crook et al. 1984	Telephone survey	All types	GP practice	827 (107*)	Often troubled by pain	Previous 2 wk	Period
Sternbach 1986	Telephone survey	Headache, backache, muscle, joint, stomach, premenstrual, dental	Random population sample	1254 (179)	Any pain	Previous 12 mo	Period
Roy and Thomas 1987	Telephone survey	All types	Convenience sample	205 (205)	Not stated	Not stated	Point
Von Korff et al. 1988	Postal survey	Back, head, abdomen, face, chest	Stratified random population sample	1016 (77)	Mild to severe of >1 d duration	Previous 6 mo	Period
Brattberg 1989	Postal survey	All types	Random population sample	1009 (183)	Affected to severe degree	<1 mo to >6 mo	Period
Magni et al. 1993 †	Interview	Musculo-skeletal	Stratified random population sample	3023 (333)	Not asked	Previous 12 mo	Period
Andersson et al. 1993	Postal survey	All types	Random population sample	1806 (285)	Weak to intense	>3 mo	Period
Mobily et al. 1994‡	Interview	Legs, joints, back, chest	Random rural population sample	3097 (3097)	Been troubled, persistent, bothersome	Previous 12 mo	Period
Barberger et al. 1996	Interview	Joint pain	Random population sample	2792 (2792)	Not stated	Not stated	Period
Brattberg et al. 1996	Telephone interview	All types	Stratified random population sample	537 (537)	Mild to severe	Previous 12 mo	Period
Kendig et al. 1997	Interview	All types	Random population sample	1000 (1000*)	Weak to severe	Previous 12 mo	Period

* Persons >60 years old.
† See also Magni et al. 1990, 1992.
‡ See also Herr et al. 1991, Lavsky-Shulan et al. 1985.

range of demographic and social questions as well as details about active disease states, functional ability, and attitudes to health. A brief physical examination completed the interview. The interview included a brief series of questions on pain, its expectation, frequency, site, severity, presumed cause, and treatment. Representative data are shown in Table II (adapted from Helme and Gibson 1997). The prevalence of pain considered to be "persistent, or bothersome, or limiting activities" over the preceding 12 months was essentially the same at all ages above 65. The stability of pain prevalence with increasing age is best shown for the group who did not report pain at all over this time interval; 44% of subjects within each of the three age cohorts had no pain. These figures are in general agreement with the studies shown in Fig. 1, and include a reasonable sample of persons over the age of 85. The sociodemographic factors that were associated with increased pain report were low educational status (odds ratio [OR] = 1.6) and a history of unpaid em-

Table II
Health status of older people

	Young Old	Old Old	Oldest Old
Pain Prevalence	*n* = 638	*n* = 310	*n* = 42
Frequent	32	36	34
Occasional	25	20	23
Never	43	44	43
Pain Duration			
Acute	6	7	6
Chronic	51	48	55
No Pain	51	45	43
Pain Site	*n* = 364	*n* = 172	*n* = 24
Joints	49	50	50
Back	45	40	42
Legs/feet	38	37	50
Abdomen	7	9	0
Chest	8	10	0
Head	5	3	8
Other	7	4	0

Source: Adapted from Helme and Gibson (1997).
Note: "Young old" represents persons aged 65–74 years, "old old" 75–84 years, and "oldest old" 85+ years. Pain prevalence figures are percentage of positive responses in three categories (frequent = once or twice a week to daily, occasional = a few times a year to once or twice a month, never) to the question: "In the past 12 months how often have you felt pain that is persistent or bothersome or limits your activities?" Pain duration figures are percentage of responses in three categories (acute = less than 3 months, chronic = more than 3 months, or no pain) to the question: "About how long ago did you start having (your most severe) pain?" Pain site figures are percentage of positive responses to the question: "In the past 12 months, where is your pain?" (respondents were restricted to a maximum of three sites).

ployment, such as household duties (OR = 1.5). The prevalence of acute pain in the HSOP sample, defined as pain with onset within the previous 3 months, was stable at 6% across the entire age range. This finding adds support to the notion that the prevalence of temporary pain is remarkably constant across the age spectrum (Crook et al. 1984).

METHODOLOGICAL CONSIDERATIONS

The question remains as to why the studies in Fig. 1 demonstrate such widely disparate prevalence figures for chronic pain. Many reasons can be put forward, most notably methodological variations such as whether the means of data acquisition is by personal or proxy interview, telephone interview, or postal survey (postal surveys have a selection bias toward healthier older persons; Von Korff et al. 1990). Other considerations include the number of subjects in each age group and response rates, especially for the oldest old. The unreliability of memory of previous pain may be particularly important in older samples, where the effects of age-associated memory impairment and incipient dementia are frequent enough to seriously affect data acquisition in large-scale prevalence surveys. However, the most likely reason for the variation in absolute prevalence figures is the nature of the questions. Questions may involve the pain "window" (the time period over which pain is sampled), the time in pain within this window, the severity of pain, or the level of its interference with daily life (often recorded as whether the pain is "troubling" or "bothersome"), and the effect of cueing.

Most epidemiological studies differ on several of these points, making direct comparison difficult. For example, Roy and Thomas conducted their 1987 study on a convenience sample using telephone survey methods; the numbers of oldest old were small, and the measure of pain poorly specified. In contrast, Mobily et al. (1994) examined a randomly selected rural sample using direct interview techniques and limited questions regarding pain to the back, chest, legs, and joints. Given such fundamental differences, it is not surprising that absolute prevalence figures vary.

As might be expected, studies with a longer time frame tend to report higher pain prevalence (compare Crook et al. 1984 with Andersson et al. 1993). However, more subtle influences on the way the pain is defined are also important. Brattberg et al. (1989) examined the prevalence of pain in response to different questions in the same population. Positive answers to the question "any" pain were reported by 66% of respondents, pain "to a high degree" by 51%, "obvious" pain over one month by 44%, "obvious" pain over 6 months by 40%, and "continuous or nearly continuous" pain by 23%. The HSOP study (Kendig 1996) reported a slight increase in pain with age in females of 4.6% per decade if it occurred daily, but a decrease if the pain occurred from once or twice a month to a few times a year. Thus, it appears that both an age-related increase and a decrease in pain prevalence can be supported from the same database, depending on the stringency of the criteria used for describing pain as "bothersome."

Cueing is more difficult to recognize because the nature and sequencing of the questions asked are rarely reported with the data. Nonetheless, the prevalence of pain in studies that ask for "any" pain before asking where that pain is located (Crook et al. 1984; Roy and

Thomas 1987; Andersson et al. 1993) is often strikingly different to that reported in studies that ask about pain in each anatomical location and then request specific details (Sternbach 1986; Von Korff et al. 1988; Brattberg et al. 1989, 1996; Mobily et al. 1994). For example, Mobily et al. asked respondents if they had experienced any pain in their legs at night or while walking, and then asked similar questions about joint pain, back pain, and chest pain prior to asking about any other pain condition. This type of rich contextual information is likely to provide a more salient prompt to the recollection of pain symptoms than studies like that of Crook et al. (1984) that simply ask whether the subject is often troubled by pain.

SITE OF PAIN

The site of reported pain is a major source of variation in prevalence figures between different studies. Several studies have examined pain at particular body sites, and while the absolute prevalence figures vary according to the temporal definition of pain, some consistent trends have emerged. The prevalence of articular joint pain more than doubles in adults over 65 years old compared to young adults (Sternbach 1986; Von Korff et al. 1990; Barberger-Gateau et al. 1992; Andersson et al. 1993; Harkins et al. 1994). The frequency of foot and leg pain also increases markedly with advancing age (Herr et al. 1991; Mobily et al. 1994; Benvenuti et al. 1995; Helme and Gibson 1997). Conversely, the prevalence of headache shows a progressive decrease with increasing age after a peak prevalence at 45–50 years of age (Sternbach 1986; D'Allesandro et al. 1988; Kay et al. 1992; Andersson et al. 1993; Harkins et al. 1994). The frequency of facial/dental pain and abdominal/stomach pain also appears to decline during old age (Kay et al. 1992). Chest pain probably is most prevalent during late middle age at the peak of ischemic heart disease, but declines thereafter despite the continuing high mortality from this disease (Sternbach 1986; Korff et al. 1988; Tibblin et al. 1990; Andersson et al. 1993). The findings are more equivocal with respect to back pain. Harkins et al. (1994) and Von Korff et al. (1988) report a small but significant increase in back pain with advancing age, whereas other studies have shown the reverse (Sternbach 1986; Tibblin et al. 1990; Andersson et al. 1993). A summary view would be that head, abdominal, and chest pain frequency are reduced in older people and that joint pain is increased. Age-related back pain prevalence varies among studies, so no definite opinion can be provided on how age affects that condition (Gibson and Helme 1995).

GENDER AND PAIN

Almost 60% of persons more than 65 years old are women, and by the year 2020, 73% of those aged 85 and above will be women (Ruda 1993). Given this disproportionate representation within older segments of the population, any gender differences in pain complaint could greatly affect age-specific pain prevalence estimates. Most epidemiological studies have indicated that women have a significantly higher prevalence of pain when compared to men of similar age (Crook et al. 1984; Lavsky-Shulan et al. 1985; Sternbach 1986; Von Korff et al. 1988; Magni et al. 1990, 1993), although there have been some exceptions (Brattberg et al. 1989; Anderssen et al. 1993). The magnitude of gender differences in pain prevalence may depend upon the type of disease. Rheumatoid arthritis, osteoarthritis, headache, and fibromyalgia are more common in women, whereas gout, ankylosing spondylitis, and coronary heart disease are more common in men (Berkeley 1993). Biological factors probably contribute to some of these differences, and there are documented changes in pain report during pregnancy and during the different stages of the menstrual cycle (Ryan and Maier 1988; Polleri 1992). Socialization and lifestyle factors in self-report of pain must also be considered, and at least some of these influences are unlikely to change across the adult lifespan. Biological factors may be less important in persons of advanced age, but unfortunately little systematic research has focused on gender differences beyond the reproductive years. The prevalence of headache is 15% higher in middle-aged women than middle-aged men, but this apparent gender difference disappears in persons over the age of 70 years (D'Allesandro et al. 1988; Von Korff et al. 1988). Abdominal and visceral pain complaints are more common in women aged 18–40 years than in men of the same age, but are approximately equal in older men and women (Von Korff et al. 1988; Tibblin et al. 1990; Brattberg et al. 1996). Conversely, gender differences in backache, joint and leg pain, and multiple pain complaints may be preserved with advancing age (Lavsky-Shulan et al. 1985; Tibblin et al. 1990; Mobily et al. 1994). Gender

differences in pain report may diminish during the later years of life, at least for certain types of pain, but further research is needed in order to fully clarify this issue.

REASONS FOR AGE-RELATED CHANGES IN PAIN PREVALENCE

Gerontologists would most likely agree that pathological load is the overriding factor contributing to increased pain complaint with advancing age. Most illnesses increase in prevalence with advancing age, and the interplay of multiple diseases in an individual case is the hallmark of geriatric medicine. The HSOP study (Helme and Gibson 1997) detected a modest association between age and number of self-reported diseases, despite the truncated age range of subjects ($r = 0.12$, $P = 0.0001$). One of the burdens of disease is an increased risk of pain, although not all diseases are painful. Older patients with occasional or regular pain are likely to suffer from a circumscribed list of complaints including osteoarthritis in its numerous clinical manifestations, osteoporosis with crush fractures, other fractures of the spine or limbs, headache, and postherpetic neuralgia (Farrell et al. 1996).

Leaving aside the increase in pain-associated diseases in older people, it is easier to postulate reasons for decline in pain report than for any increase. First, there are issues related to selection bias. For instance, older persons with painful disease may be sequestered into institutional care, thereby reducing pain prevalence estimates among older persons in the community. The response rates among the very old in community surveys may be poor, especially for those who are disabled by disease and hence more likely to suffer from pain. The very oldest (85+) also represent a select sample of survivors, and these individuals may experience less pain-causing disease. Second, there may be an age-specific response bias. The elderly may de-emphasize pain due to other significant life events such as death of a spouse, loss of independence, and high levels of morbidity and disability. There is a general perception that older persons are more stoic (Foley 1994) and more likely to misattribute pain symptoms to the aging process. Furthermore, pain may not be present at the time of questioning, especially if it is arthritic in nature (subjects are normally seated during an interview, and arthritic pain "right now" is often relieved in this posture). Lastly, age-related changes in the function of nociceptive pathways could lead to reduced pain sensitivity during senescence.

ISSUES RELATED TO SELECTION BIAS

The sequestration of elderly pain sufferers into nursing home care appears an unlikely explanation of reduced pain prevalence in older persons in the community. Studies of pain prevalence in institutional settings have largely been conducted in North American nursing homes and independent but supervised living accommodations for the frail elderly (Roy and Thomas 1986; Ferrell et al. 1990; Parmelee et al. 1991, 1993; Sengstaken and King 1993). Although the methods of pain measurement are not always clear and vary among studies, all such studies showed pain prevalence to be high, ranging between 70% and 83%, with severity ranging from mild to severe. Most reported pain was in the back and joints. Ferrell et al. (1990) used a measure of present pain intensity from the McGill Pain Questionnaire (MPQ) and found that 66% of subjects had no pain at the time of interview. These prevalence figures are approximately commensurate with those from community samples (Roy and Thomas 1986; Mobily et al. 1994). Depression, a common problem among institutionalized patients, is also likely to influence the prevalence of pain (Parmelee et al. 1991; Casten et al. 1995). Magni et al. (1985) found that 96% of the depressed and 80% of others reported pain in a geriatric hospital setting. Thus, institutionalized persons appear to be a cohort of the very old with high rates of pain, although they seem to have the same disorders at the same prevalence rates as people of similar age who reside in the community. No large-scale study has compared the same measures of pain in community and institutionalized samples, although a small study by Roy and Thomas (1986) directly supports the view that pain is equally prevalent in elderly persons in the community and in institutions. Given the relatively similar pain prevalence figures between institutionalized and community-dwelling persons over the age of 80, even high rates of institutionalization approaching 30% would be expected to have little overall effect on community prevalence rates. Moreover, most of the reported decrease in pain occurs at an age when institutionalization rates are less than 1%.

The high response rates in most large-scale epidemiological surveys suggests that the prospect of an age-specific drop-out of older persons with pain should

not be viewed as a major concern. However, response rates may depend upon the method of data acquisition, as personal interview appears to result in a higher yield of older persons when compared to postal surveys, and response rates vary across different age groups when postal survey methods are used (Von Korff et al. 1990). Recent epidemiological investigations in which the study population was restricted to persons aged 65 and older have generally noted a higher overall prevalence of pain than has been found in cross-sectional studies that cover the entire age range of the adult population (Lavsky-Shulan et al. 1985; Barberger-Gateau et al. 1992; Mobily et al. 1994). These restricted sample studies have used methods tailored specifically to recruit older individuals, and they usually contain a much larger sample of adults in the seventh, eighth, and ninth decades of life. The findings of higher pain prevalence in restricted elderly samples are of concern; however, the difference between these and cross-sectional population studies is not large, and both types of investigation support a decline in pain prevalence from younger elderly adults (aged 65–75 years) to those of more advanced age (85+ years).

Finally, the issue of survivorship as an explanation for decreased pain report among the very oldest also appears unlikely. In general, studies that report prevalence rates of asymptomatic pathology, such as that of the spine (Wiesel et al. 1984; Jensen et al. 1994), show a progressive increase with increasing age. Rates of disability also increase into the very extremes of old age. A retrospective investigation showed pain report to be even more frequent during the last years of life (Moss et al. 1991).

AGE-SPECIFIC RESPONSE BIAS AND MISATTRIBUTION

The context in which painful symptoms ar e processed and the meaning attributed to them are recognized as important factors in shaping the pain experience (Melzack 1973). Older adults may attribute pain symptoms to the normal aging process rather than perceiving them as a warning sign of injury or disease (Stoller et al. 1993). Several studies have demonstrated that mild pain symptoms do not affect self-rated perceptions of health in older adults as they do in the young (Tornstam 1975; Ebrahim et al. 1991). Mis-attribution of mild aches and pains to the normal aging process greatly reduces the importance attached to thissymptom and may even alter the fundamental meaning of pain. Pain may also be judged as a relatively minor problem when compared to other concurrent life circumstances such as the loss of a lifetime partner or increasing levels of morbidity and disability that threaten loss of functional independence. One important consequence of such life events and the misattribution of pain symptoms is that older adults will be less likely to endorse questions pertaining to the presence of "bothersome pain" or "being often troubled by pain." However, severe pain symptoms are always interpreted as signs of serious illness, irrespective of age (Leventhal et al. 1993), and the elderly are more likely to seek medical attention than are younger persons when faced with severe pain (Stoller et al. 1993).

Another form of age-specific response bias that could affect pain report relates to stoicism, or alternatively, a decreased willingness to label a sensation as painful. There is a commonly held view that older adults are more stoic in reporting clinical pain sensations (Portenoy and Farkash 1988; Hofland 1992; Foley 1994), although empirical studies have yet to substantiate this view. In an extensive series of studies, Botwinick (1984) has shown an age-related increase in the tendency toward cautious response patterns for most tasks involving sensory threshold processing. Psychophysical studies of pain perception are consistent with this view and suggest that elderly persons adopt a more stringent response criterion for the threshold report of pain when faced with low-intensity noxious stimulation (Clark and Mehl 1971; Harkins and Chapman 1976, 1977). It is difficult to estimate the extent to which stoicism, misattribution, or cautiousness might influence pain prevalence figures in older persons. The effect of response bias (either stoicism or cautiousness) and misattribution appears to be most pervasive at lower intensities of noxious sensation. This could result in the under-reporting of mild or weak pain symptoms by older persons, but would be unlikely to affect reports of moderate to severe pain.

AGE-RELATED CHANGES IN NOCICEPTIVE FUNCTION

One of the reasons for a decline in pain complaint after the age of 65 years despite increasing morbidity from pain-associated disease may be reduced function

in nociceptive pathways. The results from psychophysical studies using experimentally controlled levels of noxious stimulation are somewhat equivocal with regard to age differences in pain perception. Many studies have shown a progressive decrease in pain sensitivity with advancing age, but there have also been numerous reports of no age difference, particularly when using electrical stimulation (for review see Gibson and Helme 1995; Harkins et al. 1996). A recent study using differential nerve fiber blockade has shown that older persons rely on C-fiber activation before reporting the presence of pain, whereas younger adults utilize the additional information from A-delta nociceptive fibers (Chakour et al. 1996). Moreover, when A-delta-fiber input was blocked in young adults, the observed age differences in pain threshold and subjective ratings of pain intensity disappeared. Age differences in the temporal summation of nociceptive input also varies as a function of nociceptive fiber type (Harkins et al. 1996), and such differential age effects on A-delta and C-fiber function may help explain some of the disparity in psychophysical findings.

Studies of clinical pain states have also indicated that older persons exhibit a relative absence of pain in the presentation of certain visceral disease states such as ischemic heart pain and abdominal pain associated with acute infection (Albano et al. 1975; MacDonald et al. 1983; Norman and Yoshikawa 1983; Clinch et al. 1984; Solomon et al. 1989; Muller et al. 1990). Unfortunately, most of the clinical studies are difficult to interpret because the severity of pathology is seldom reported. Nonetheless, controlled investigations of myocardial pain during exercise-induced ischemia provide support for the view of a clinically significant decrease in ischemic pain perception with advancing age (Miller et al. 1990; Ambepitiya et al. 1993, 1994).

There is limited evidence of age-related changes in the physiological functioning of peripheral and central nervous system (CNS) nociceptive pathways. For instance, a marked decrease in the density of myelinated and unmyelinated nerve fibers has been noted in older adults (Ochoa and Mair 1969), and nerve conduction studies indicate prolonged latencies in peripheral sensory nerves in apparently healthy older persons (Desmedt and Cheron 1980). Stimulation of cutaneous nociceptors on some finely myelinated A-delta and unmyelinated C-fibers produces impulses that travel both to the CNS to signal pain and along axon collaterals to initiate a neurogenic vasodilatation or flare around the site of stimulation. Older personsshow a significant reduction in the neurogenic flare size, which provides further indirect evidence of altered primary afferent nociceptive function (Helme and McKernan 1985; Parkhouse and Le Quesne 1988;Ardron et al. 1991). Under certain conditions, the size of axon flare is highly correlated with the perception of pain (Helme and McKernan 1985; Gibson et al. 1994), and these responses are thought to play an important role in primary hyperalgesia and wound healing.

With regard to CNS processing, the Cerebral Event Related Potential (CERP) in response to noxious thermal CO_2 laser stimulation is also altered with advancing age (Gibson et al. 1990, 1994). This electroencephalographic response to a noxious stimulus shows a strong relationship between peak amplitude and subjective ratings of pain in response to increasing strength of stimulation. The CERP is a sensitive measure of analgesic efficiency and is affected by levels of arousal and attention. It is therefore thought to represent integrated CNS processing of afferent noxious input. A recent study has shown an age-related increase in the latency of CERP components and a reduction in peak amplitude in older people (Gibson et al. 1990). These findings suggest an age-related slowing in the cognitive processing of noxious information and a reduced cortical activation in response to noxious input.

In summary, limited evidence from physiological studies and psychophysical investigations suggest age-related alterations in the function of peripheral and CNS nociceptive pathways. These changes are likely to influence sensitivity to painful sensation and would be expected to contribute to a decline in pain report in persons of advanced age. However, most of the evidence of age differences in nociceptive function is indirect, and the clinical relevance of reduced pain sensitivity to experimental pain stimuli is still the subject of considerable debate (see Harkins et al. 1994). It seems likely that pain report does decline as a consequence of age-related changes in nociceptive function, but more definitive studies on physiological changes in nociceptive pathways are needed in order to fully resolve this issue.

CONCLUSIONS

Most cross-sectional epidemiological studies have shown that the overall prevalence of pain increases with advancing age. Absolute prevalence rates vary considerably among different investigations, which

probably reflects the nature of questions asked, including the time window for pain assessment, the time in pain within this window, and the severity and site of pain included within the prevalence estimate. The welldocumented increase in pathological load, particularly degenerative joint and spine disease and leg and foot disorders, may help explain the increased frequency of pain report in surveys of older persons. However, it is also apparent that the age-related increase in overall pain prevalence does not continue beyond the seventh decade of life. The reasons for maintaining a steady frequency of pain report beyond that time remain largely unknown. Issues relating to selection bias, response bias, or misattribution of pain symptoms and possible age-related changes in the function of nociceptive pathways may play some role in explaining this trend. Future studies will need to focus on the development of pain over the life-span of the individual and on the influence on pain report of losses in independence brought about by diminished functional capacity, death of spouse, and altered socioeconomic status as well as the effects of dementia and depression. There remains the more difficult task of accurately determining the effects of pain from uncommon or short-lived disease states such as cancer, fractures, and infections on health outcomes and costs.

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