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REVIEW

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The prevalence of neck pain in the world population: a systematic critical review of the literature

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Abstract The objective of this study was to determine the prevalence of neck pain (NP) in the world population and to identify areas of methodological variation between studies. A systematic search was conducted in five databases (MEDLINE, EMBASE, CINAHL, OSHROM, and PsycINFO), followed by a screening of reference lists of relevant papers. Included papers were extracted for information and each paper was given a quality score. Mean prevalence estimates were calculated for six prevalence periods (point, week, month, 6 months, year, and lifetime), and considered separately for age, gender, quality score, response rate, sample size, anatomical definition, geography, and publication year. Fifty-six papers were included. The six most commonly reported types of prevalence were point, week, month, 6 months, year, and lifetime. Except for lifetime prevalence, women reported more NP than men. For 1-year prevalence, Scandinavian countries reported more NP than the rest of Europe and Asia. Prevalence estimates were not affected by age, quality score, sample size, response rate, and different anatomical definitions of NP. NP is a common symptom in the population. As expected, the prevalence increases with longer prevalence periods and generally women have more NP than men. At least for 1-year prevalence Scandinavian countries report higher mean estimates than the rest of Europe and Asia. The quality of studies varies greatly but is not correlated with the prevalence estimates. Design varies considerably and standardisation is needed in future studies.

Keywords Neck pain · Prevalence · Systematic review

Introduction

Neck pain (NP) is a major public health problem, both in terms of personal health and overall well-being [22, 25, 61] as well as indirect expense [5, 10, 22]. For instance the total cost of NP in the Netherlands in 1996 was estimated to about 1% of the total health care expenditure or 0.1% of the Dutch gross domestic product [10].

Accurate prevalence estimates are desirable to serve as a basis for etiological studies and health care evaluation, and to assess the effect of NP in general populations [10, 22]. Unfortunately, prevalence studies on NP show great variation in both quality and results. For instance, the point prevalence varies between 6% [4] and 22% [21] and 1-year prevalence between 1.5% [31] and 75% [55].

Different results of observational studies may be due to varying definitions, for example, the neck region, NP, and the duration of pain. Methodological differences, such as non-comparable population samples, differing

response rates, and the overall quality of the studies, may also cause bias and explain the discrepancies [43].

Although a few authors have tried to incorporate small reviews of NP prevalence in their papers [3, 21], this literature has never been systematically and critically reviewed. We, therefore, conducted a systematic and critical literature review in order to determine the prevalence of NP in the world population and to identify areas of methodological variation between studies.

Methods

Search design

A systematic search was conducted in the MEDLINE (Silverplatter, 1966–2002), EMBASE (Science Direct, 1975–2002), CINAHL (Silverplatter, 1967–2002), PsycINFO (Silverplatter 1967–2002), and OSH-ROM databases (RILOSH, NIOSHTIC2, MHIDAS, HSELINE, CISDOC all completed 2002/12). The search terms were: 'neck', 'cervical', 'spinal', 'back', 'musculoskeletal', 'pain', 'ache', 'problem', 'complaint', 'prevalence', 'incidence', 'survey', and 'epidemiology' (truncated when appropriate) (the full search strategy can be requested from the corresponding author). The search on MESH/EMTREE terms were equivalent to the free text search. Due to the different databases in the OSH-ROM databases only a free text search was possible. The bibliographic databases were searched, focusing on titles and abstracts, and relevant papers were retrieved. Reference lists of all the included and excluded papers were systematically screened for additional papers.

Inclusion criteria

The following criteria were endorsed:

- Papers in English and printed in peer-reviewed journals
- Any type of NP prevalence reported
- Study samples representative of the general population (i.e. specific working populations or patient samples were excluded)
- If more than one article was published based on the same study, only the most relevant was included.

Evaluation of completeness of the search strategy

To illustrate our completeness of the search strategy, the numbers of retrieved and included papers from each database were tabulated. Capture–recapture analysis has previously been used in a systematic literature review [44], but is not considered appropriate in literature reviews due to the non-independency between the bibliographic databases [58].

Extraction of information

Information on core items were extracted from each paper independently by two reviewers (R.F., J.H.) (Table 1). Any discordance or disagreement was resolved by discussion or by majority (K.O.K.). The crude response rate (numbers of responders out of the total number of subjects contacted) for each study is presented. The total and the gender prevalence estimates are presented or calculated if not provided.

Assessment of quality scores

A scoring system was developed, based on two quality scoring systems previously used for assessing prevalence studies on low-back pain [39, 44] (Table 2). The quality criteria focused on representative population samples, valid and reliable outcome measures, and precision of the prevalence estimates. Quality scores were assigned to each paper independently by two reviewers (R.F., J.H.) and subsequently compared. Any disagreement was resolved by discussion, and if still unsolved a third reviewer was included (K.O.K.). No attempt at blinding the reviewers was made. Each criterion was weighted equally, as we could not differentiate which criterion is more important for the overall quality assessment. The quality criteria were clearly defined a priori to avoid any bias. Studies with a score of 1 or 2 points were considered to be of poor quality, between 3 and 5 points of medium quality, and 6 or 7 points of higher quality.

Table 1 List of items extracted from each paper

1.	Name of authors
2.	Country
3.	Title of paper
4.	Source
5.	Objective of study (and if NP was the primary objective)
6.	Study design (cross-sectional or longitudinal)
7.	Method of data collection (questionnaire, interview, or examination)
8.	Sampling method and sample data (age, sex, target and final sample, and response rate)
9.	Description of NP (definition, type and validation of questionnaire)
10.	Outcome data (type of prevalence, gender, age, prevalence, 95% CI)
11.	Quality score (based on seven equally weighted quality criteria)
12.	Own remarks or conclusion

Table 2 Description of quality criteria

Unbiased randomised population sample (either from census list, or patient registers)
Adequate sample size (> 1,000) (adapted from Loney and Stratford)[45]
Adequate response rate (> 70%) (adapted from Loney and Stratford) [45]
Precise definition of NP provided (either written or drawing)
NP definition validated (either own validation or a reference)
Prevalence estimates with 95% CI provided (to estimate precision of data)
Analysis of non-responders (any comparison between responders and non-responders)

Each item was weighted equally and was given either 0 (criterion not fulfilled) or 1 (criterion fulfilled) point. Maximum score was seven points

Data analysis and presentation

For each prevalence period, the mean prevalence estimates from homogeneous study samples based on adult populations were calculated (the total number of subjects with NP divided by the total number of participants) and visualised graphically. Prevalence was considered separately for age, gender, quality score, response rate, sample size, anatomical definition, geography, and publication year, where applicable. The average gender ratio was calculated for each prevalence period (i.e. the total number of females with NP divided by the total number of males with NP).

Results

Search results

In total, 56 original papers were included (Table 3) [1, 2, 4, 6–9, 11–21, 23, 24, 26–36, 38, 41–43, 46–48, 51, 52, 54–57, 59, 60, 62–71]. Fifty-five papers were found by search in electronic databases and one paper was found via reference lists. All electronically retrieved papers could be retrieved in MEDLINE or EMBASE. No additional papers were added after searching other databases.

Thirty-five papers fulfilling the inclusion criteria were subsequently excluded, mainly because data had already been presented in another paper (16 papers), the type of prevalence was not stated (11 papers), or too broad anatomical definition was used (i.e. neck–shoulder–upper-limb) (eight papers). The full list of excluded papers is available from the corresponding author.

Extraction of information

Table 4 lists all the included studies. Almost half the studies (46%) were from Scandinavia, 23% from the rest of Europe, 16% from Asia, and 11% from North America. Two papers were from Australia and one from Israel.

Most studies (79%) had unbiased, randomized population samples. The sample sizes varied from 300 [57] to 51,050 [31] participants. Thirty-seven (66%) of the studies had sample sizes of more than 1,000 subjects. The crude response rates varied between 15% [2] and 100% [14, 41, 42, 57]. Twenty had inadequate (< 70%) response rates [2, 6, 7, 9, 16, 19, 21, 23, 27, 28, 30–32, 36, 42, 43, 48, 53, 56, 71]. In four studies the response rate was not reported [15, 26, 47, 59].

The six most commonly reported types of prevalence were 1-year (39%), point (13%), lifetime (13%), 6-months (11%), 1-month (10%), and 1-week (10%). In many studies, extra criteria were added to the prevalence definitions (e.g. 'Pain lasting for more than 3 months'). The definition of NP (i.e. pain, ache, troublesome, soreness) and the anatomical definition of the neck region also varied between studies.

Table 3 Search results (number) for each database

	MEDLINE	EMBASE	CINAHL	PsycINFO	OSH-ROM	Reference search
Paper						
In search strategy	7,120	8,706	6,799	548	720	1,436
Obtained	257	273	232	70	34	277
Reviewed	84	78	22	15	4	42
Excluded	31	27	7	10	2	5
Total number included	53	51	15	5	2	37
Included papers						
Found in other databases	43	43	14	6	0	36
Found in three databases	17	17	10	5	0	11
Found in two databases	34	33	5	0	0	25
Found only in this database	2	1	0	0	0	1

Table 4 Description of all included papers (*Q* questionnaire, *I* interview, *E* examination, *n* final sample size, *R* response rate)

First author [ref], country, year	Study population	Mode of collection	Final sample size, crude response rate[a]	Definition of neck pain and duration	Prevalence period	Prevalence (95% CI)[b]	Quality score
Mäkelä [46], Finland, 1991	Two-stage cluster sample, population register, Finland 30 + years	Q + I + E	$n = 7{,}217$ $R = 90\%$	Lifetime experience of pain in the neck or shoulder [Neck] pain during the month preceding the examination	Lifetime Month	♂ + ♀: 71 ♂ + ♀: 41.1	4
Cote [21], Canada, 1998	Stratified sample, Saskatchewan, Canada 20–69 years	Postal Q	$n = 1{,}133$ $R = 52\%$[c]	'In your lifetime have you ever experienced neck pain?' (6-month. Probably derived from chronic pain questionnaire) 'Do you have neck pain at the present time, that is right now?'	Lifetime 6 months Point	♂ + ♀: 66.7 (63.8–69.5) ♂: 47.2 (42.2–51.5) ♀: 58.8 (54.8–62.7) ♂ + ♀: 54.2 (51.4–56.5) ♂ + ♀: 22.2 (19.7–24.7)	6
Aoyagi [2], Japan, 1999	All community dwelling people 40–85 years (The MBJ study) Mitsugi, Japan 60–79 years	E + Q	$n = 2{,}600$ $R = 15\%$[c]	'Which of your joints have ever been painful, swollen, aching, or tender on most days for at least one month (currently of in the past)?' + response box [Neck]	Lifetime	60–69 years ♀: 17[c] 70–79 years ♀: 35[c] 60–79 years ♀: 17[c]	2
Lau [38], Hong Kong, 1996	Door to door in two housing blocks. All adults in every household. Hong Kong > 30 years	I	$n = 800$ $R = 70\%$	Neck pain lasting for a day or more... preceding year + mark on a drawing	Lifetime Year	♂: 31 ♀: 27 ♂ + ♀: 29[c] ♂: 15 ♀: 17 ♂ + ♀: 16[c]	3
Brattberg [12], Sweden, 1989	'Randomly selected' Sweden 18–84 years	Postasl Q + Telephone I/Q	$n = 827$[c] $R = 82\%$[c]	'Do you have/have you ever had any pain or discomfort in any part of your body?'	Lifetime	♂ + ♀: 26.2[c]	4
Reyes-Llerena [57], Cuba, 2000	Door to door interviews, Santa Catalina, Cuba 'Adults'	I + E	$n = 300$ $R = 100\%$	Musculoskeletal pain with no trauma, either present or past	Lifetime	♂ + ♀: 14.2	2
van der Donk [63], Holland, 1991	Population survey 1975–78, Dutch town of Zoetemer, Holland 20–65 years	Postal Q + E	$n = 5{,}440$ $R = 78\%$[c]	Ever had neck pain Currently suffering from pain in the neck	Lifetime Point	♂: 9.6[c] ♀: 17.7[c] ♂ + ♀: 13.8[c]	3
Wigley [68], Tokelau Islands, 1987	All migrants (exclusively pregnant women), Tokelau/New Zealand 15 + years	I + E	$n = 1381$ $R = 100\%$	'Have you ever had pain or swelling in your joints, neck, or back?'	Lifetime	♂: 2.5 ♀: 1.6 ♂ + ♀: 2.1[c]	4
Wigley [69], Tokelau Islands, 1987	All non-migrants (exclusively pregnant women), Tokelau islands 15 + years	I + E	$n = 811$ $R = 100\%$	'Have you ever had pain or swelling in your joints, neck, or back?'	Lifetime	♂: 0.3 ♀: 0.2 ♂ + ♀: 0.2	3

Table 4 (contd.)

First author [ref], country, year	Study population	Mode of collection	Final sample size, crude response rate[a]	Definition of neck pain and duration	Prevalence period	Prevalence (95% CI)[b]	Quality score
Rauhala [56], Finland, 2000	All people born in 1966 living in Northern Finland or in the capital area Finland (age not known—max 33 years)	I/Q or postal Q	$n=5{,}696$ $R=67\%$	'Have you had pain or ache during the last year in the following regions?'...[neck and occiput]	Year	♂: 68.1 ♀: 82.2 ♂ + ♀: 75.1	3
Linton [42], Sweden, 2000	Randomly selected via private company, Eskiltuna and Nykoping, Sweden 35–45 years	Postal Q	$n=1{,}914$ $R=64\%$[c]	'Have you suffered from back or neck pain during the past 12 months?'	Year	♂: 35 [c] ♀: 48 [c] ♂ + ♀: 44 [c]	5
Linton [41], Sweden, 1998	Randomly selected via private company, 3 communities, central Sweden 35–45 years	Postal Q	$n=2{,}305$ $R=77\%$[c]	'Have you suffered from back or neck pain during the past 12 months?'	Year	♂ + ♀: 44	6
Rajala [55], Finland, 1995	All persons born in 1935 living in the city of Oulu, Finland 55 years	Postal Q + I/E	$n=780$ $R=77\%$	'Have you had ache, pain or discomfort in the following joints or muscles during the past 12 months?'	Year	♂: 36.5[c] ♀: 47.8[c] ♂ + ♀: 42.8[c]	4
Viikari-Juntura [64], Finland, 1991	A subsample from a previous study ('Healthy child' study) Helsinki, Finland mean age 36.9 years	Q + E	$n=154$ $R=86\%$	'On how many days during the last 12 months they had had pain, ache, stiffness, or numbness in their neck-shoulder'...[more than 7 days]	Year	♂: 30.5[c] ♀: 55.6[c] ♂ + ♀: 42.2[c]	4
Ciancaglini [20], Italy, 1999	Random selected from census list Segrate municipality, Italy 18–75 years	I	$n=520$ $R=93\%$	Troublesome neck pain within the last year	Year	♂ + ♀: 38.9 [c]	3
Bovim [11], Norway, 1994	Random sample, National Register of Norway, Norway 18–67 years	Postal Q	$n=7{,}648$ $R=77\%$	'Did you within the last year have troublesome neck pain?'	Year	♂: 29 (28–31) ♀: 40 (38–41) ♂ + ♀: 34.4 (33–35)	4
Palmer [54], England, 2001	Random sample from 34 general practices and central pay records for serving members of British armed services. (England, Scotland, Wales) 16–64 years	Postal Q	$n=12{,}907$ $R=58\%$	Pain lasting a day or longer during the past 7 days or the past 12 months	Year Week	♂ + ♀: 33.7[c] ♂ + ♀: 19.5[c]	5
Garcia [29], Spain, 1994	Proportional, polystaged, stratified random sample, Asturias, Spain >18 years	I + E	$n=702$ $R=76\%$	Pain in any area of the locomotor system, with a minimum duration of one week during the 12 months prior to the interview	Year	♂ + ♀: 24.1 (21.0–27.3)	3

Holmen [34], Norway, 2000	YOUNG-HUNT study Norway 13–18 years	Q	$n=8{,}771$ $R=90\%$	'Have you ever had any of these problems in the last 12 months?'...[neck–shoulder pain]	Year	♂: 15.9[c] ♀: 28.6[c] ♂ + ♀: 22.1[c]	3
Lock [43], England, 1999	Randomly selected from 4 general practices, Newcastle, England. >17 years	Postal Q	$n=1{,}546$ $R=64\%$	Substantial back, neck or shoulder problem...in the previous year (restricted their normal activities for more than one week)	Year	♂: 18 ♀: 23 ♂ + ♀: 21 (16.5–25.5)	4
Fredriksson [28], Sweden, 1999	All subjects from previous study (REBUS) with no known musculoskeletal disorder, County of Stockholm, Sweden 42–59 years[c]	Q + E	Year 1993 presented:, $n=783$ $R=62\%$	Pain, ache or stiffness in the neck during the past12 months, leading to medical consultation or treatment	Year	Year 1993 presented: ♂: 11 ♀: 23 ♂+♀: 17[c]	3
Takala [60], Finland, 1982	'Research sample' Two municipalities, Southwestern Finland 40–64 years	Postal Q + E	$n=2{,}268$ $R=93\%$	Any ache, stiffness, soreness in moving, numbness, or pain during the preceding year...[fairly often, often, or continuously] + mark on drawing [neck, cervical spine, occiput]	Year	♂: 16 ♀: 18 ♂ + ♀: 17[c]	3
Bergman [8], Sweden, 2001	Representative sample population register. Halmstad + Laholm, Sweden 20–74 years	Postal Q	$n=2{,}755$ $R=70\%$[c]	'Have you experienced pain lasting more than 3 months during the last 12 months?' (chronic = persistent or regularly recurrent)	Year	♂: 14.5 ♀: 22.9 ♂ + ♀: 16.7[c]	6
Niemi [52], Finland, 1997	Five out of 11 high schools randomly chosen (grade 1 to 3) Oulu, Finland	Q	$n=714$ $R=86\%$[c]	Neck or shoulder symptoms at least once a week over the past 12 months (disturbing symptoms)	Year	♂: 10.0[c] ♀: 21.4[c] ♂ + ♀: 15.8[c]	4
Brochet [14], France, 1998	Subgroup from another study (PAQUID, random selected electoral registers) Gironde, France >65 years	I	$n=761$ $R=100\%$	'During the previous year, did you feel pain anywhere?'...'If yes, where?'...[neck]	Year	♂ + ♀: 11.6 (9.2–14)	2
Woo [71], China, 1994	Stratified random sample registered list of all recipients of old age and disability allowance, China 70+ yessars	Q + I	$n=2{,}029$ $R=60\%$	Indicate the sites of musculoskeletal pain, if any, within the past 12 months from the time of the interview	Year	♂: 5.9[c] ♀: 11.8[c] ♂ + ♀: 8.9[c]	3
Isacsson [35], Sweden, 1995	All men born in 1914 and living in Malmö, Malmö, Sweden 68 years	Q	$n=500$ $R=81\%$	Daily aches, pain and discomfort in the neck during the last 12 months	Year	♂ + ♀: 8.8[c]	5

Table 4 (contd.)

First author [ref], country, year	Study population	Mode of collection	Final sample size, crude response rate[a]	Definition of neck pain and duration	Prevalence period	Prevalence (95% CI)[b]	Quality score
Jacobsson [36], Sweden, 1989	A subsample from a previous survey, Malmö, Sweden 50–70 years	E + Q	$n=445$ $R=49\%$	Pain or stiffness...continuously or intermittent for more than 6 weeks during the preceding 12 months	Year	♂: 3.0 ♀: 10.2 ♂ + ♀: 6.5 (4.2–8.8)	3
Hagen [31], Norway, 2002	All inhabitants (HUNT study), North-Trondelag, Norway >20 years	Postal Q	$n=51,050$ $R=55\%$[c]	'Have you during the last year continuously for at least three months suffered from pain and/or stiffness in muscles and joints?' + mark the location	Year	♂ + ♀: 1.5[c]	5
Vikat [65], Finland, 2000	Nationally representative sample, Population register, Finland 12, 14, 16, and 18 years	Postal Q	$n=11,095$ $R=76\%$s[c]	'Have you had neck or shoulder pain during the past half year?'...[about once a month or more]	6 months	♂: 33 [c] ♀: 52 [c] ♂ + ♀: 40 [c]	3
Chrubasik [19], Germany, 1998	Every 71st citizen, population register of Heidelberg, Germany 18–80 years	Postal Q	$n=1,420$ $R=61\%$[c]	Experienced one or more episodes of prolonged pain in previous 6 months in neck and/or shoulder	6 months	♂ + ♀: 39[c]	3
Feldman [27], Canada, 2002	3 high schools (7th–9th grade), Montreal, Canada	Q	$n=502$ $R=53\%$[c]	Neck and upper limb pain occurring at least once a week within the preceding 6 months	6 months	♂ + ♀: 32.2[c]	4
Birse [9], Canada, 1998	'Population Laboratory' random digit numbers Edmonton, Canada >18 years	Telephone I/Q	$n=410$ $R=56\%$[c]	Recurrent or persistent pain of six months duration or longer [=chronic pain] in the previous 6 months...If more than one site then the most troublesome site	6 months	♂ + ♀: 13.7[c]	2
Bassols [6], Spain, 1999	Stratified sample electoral census Catalonia, Spain >18 years	I	$n=1,964$, $R=69\%$[c]	Any pain complaint in the last 6 months...if more than one then the most troublesome site	6 months	♂: 7.2[c] ♀: 6.7[c] ♂ + ♀: 6.9[c]	2
Hakala [33], Finland, 2002	Nationwide adolescent health and lifestyle survey + annual classroom survey, Finland 12, 14, 16, 18 years	Postal Q	Year 2001 presented:, $n=28556$, $R=83\%$ [c]	'Have you ever had neck or shoulder pain during the past half year?'...[at least weekly]	6 months	Year 2001 presented: 12 years ♂: 6 ♀: 15 14 years ♂: 12 ♀: 25 16 years ♂: 15 ♀: 36 18 years ♂: 19 ♀: 45	4
Mikkelson [51], Finland, 1997	Nineteen out of 21 primary schools, Lahti, Finland Mean age 9.8 years and 11.8 years	Q	$n=1,756$ $R=83\%$	Pain or aches [at least once a week] during the last three months in the neck + mark on a picture	3 months	♂: 13.7 (11.5–16.1) ♀: 16.2 (14.0–19.0) ♂ + ♀: 15.0[c]	6

Eriksen [26], Scandinavia, 1998	Two cluster sample from Population registers Denmark, Finland, Norway, Sweden >15 years	I	$n=4{,}046$ $R=$not known by the authors	Experienced any pain in the neck in the previous 30 days	Month	♂+ ♀: 32	4
Croft [23], England, 2001	All adults registered at two family practices, South Manchester, England 18–75 years	Postal Q	$n=4{,}393$, $R=57\%$[c]	'Thinking back over the past month, have you had any neck pain in the areas shown which lasted for more than 1 day?'	Month	♂+ ♀: 30.9[c]	4
Urwin [62], England, 1998	Stratified sample from three general practices, North-West England 16+ years	Postal Q	$n=4{,}515$ $R=75\%$	Experienced pain in the neck for more than one week in the past month + indicate area of maximum pain if more than one area	Month	♂: 15[c] ♀: 19[c] ♂+ ♀: 17[c]	4
Hagen [32], Norway, 1997	Randomly selected by 'Statistics Norway', Oslo + Nordland, Norway 20–79 years	Postal Q	$ns=11{,}780$ $R=59\%$	Presence of pain in joints, back or muscles during the previous month [Neck pain=neck/shoulders]	Month	♂: 12.9 ♀: 18.4 ♂+ ♀: 15.4 (14.7–16.1)	4
Wedderkopp [66], Denmark, 2001	Stratified two-stage cluster sample of 28 state schools (primary and high schools) Odense, Denmark 8–10 years and 14–16 years	Q	$n=1{,}020$ $R=75\%$	Any neck pain at the moment, within the past week, and within the past month	Month	♂: 4.9[c] ♀: 8.8[c] ♂+ ♀: 6.9[c]	5
Bredkjaer [13], Denmark, 1991	'Random sample' Denmark >16 years	Telephone I/Q	$n=4{,}753$ $R=80\%$	Pain or complaints of shoulder or neck...during the past 2 weeks	2 weeks	♂: 18 ♀: 29	4
Crook [24], Canada, 1984	Randomly selected households from group family practice unit Burlington, Canada 18–91 years	Tel. I/Q	$n=500$ (households) $R=74.4$[c]	'Are you or any member of your family over 18 years of age *often* troubled with pain?' + 'Have you or any family member experienced any noteworthy pain within the past 2 weeks?' [=persistent pain in neck shoulder]	2 weeks	♂+ ♀: 1.7[c]	3
Wigley [70], China, 1994	Subjects selected from village registers and invited to health center, North and South China 20+ years	Q + I	$n=9{,}249$ $R=88\%$[c]	Neck pain in past 2 weeks	2 weeks	♂: 1.2[c] ♀: 1.8[c] ♂+ ♀: 1.5[c]	3
Gordon [30], Australia, 2002	Every third household, Telephone directory, Port Lincoln community, Australia >18 years	Telephone I/Q	$n=812$ $R=50\%$[c]	Waking pain and/or stiffness in the week preceding the survey completion	week	♂+ ♀: 36[c]	2

Table 4 (contd.)

First author [ref], country, year	Study population	Mode of collection	Final sample size, crude response rate[a]	Definition of neck pain and duration	Prevalence period	Prevalence (95% CI)[b]	Quality score
Chopra [18], India, 2002	Door to door interviews, Bhigwan village, India >15 years	I	$n=4{,}092$ $R=89\%$	Mark on a manikin 'pain/swelling/stiffness/tenderness' experienced during 7 days prior to the survey	Week	♂: 3.4 ♀: 8.4 ♂+ ♀: 6(5.3–6.7)	7
Catala [16], Spain, 2002	Stratified sample, Spanish National Telephone Company, Spain Age not known	Telephone I/Q	$n=5{,}000$ $R=48\%$[c]	Any physical pain complaints during the previous day or week + site of pain	week	♂: 5.0 ♀: 4.2 ♂+ ♀: 4.5	3
Chaiamnuay [17], Thailand, 1998	Door to door interviews, three villages, Thailand 15–90 years	I + E	$n=2{,}455$ $R=99.7\%$	Current musculoskeletal pain within the last 7 days	Week	♂: 3.0 ♀: 3.7 ♂+ ♀: 3.4	4
Cardiel [15], Mexico, 2002	Stratified sample, census, San Pedro, Mexico >18 years	I/Q	$n=2{,}500$ $R=$ not stated	pain in the last 7 days + location on a manikin	week	♂+ ♀: 1.4	6
March [48], Australia, 1998	Random sample from electoral rolls, Northern Sydney area, Australia 65+ years	Postal Q	$n=1{,}527$ $R=38\%$[c]	Any long term illnesses, injuries or conditions (musculoskeletal symptoms included pain, swelling, or stiffness)	point	♂: 36.1 ♀: 40.5 ♂+ ♀: 38.7[c]	3
Andersson [1], Sweden, 1993	Random sample population register two communities Bromölla and Simrishamn, Sweden 25–74 years	Postal Q	$n=1{,}609$ $R=89\%$	'Do you feel pain lasting for more than three months?'	Point	♂: 14.5 (12.1–16.9) ♀: 19.1 (16.4–21.8) ♂+ ♀: 16.8[c]	7
Stendig-Lindberg [59], Israel, 1998	Sample of Israeli urban households, one adult per household, Israel 20+ years	I	$n=773$ $R=$ not stated	Suffered from chronic back pain, and/or neck pain	Point	♂+ ♀: 15.9	0
Manahan [47], The Philippines, 1985	Door to door interviews, Southern Luzon, The Philippines 15+ years	I	$n=1{,}685$ $R=$ not known by the authors	Pain felt at present + indicated on a diagram [Neck and upper dorsal]	Point	♂: 7.5 ♀: 6.2 ♂+ ♀: 6.6[c]	2
Bergenudd [7], Sweden, 1994	Subsample from another study (Malmö Longitudinal Study), Malmö, Sweden 55 years	E	$n=575$ $R=69\%$	Indicate on a pain drawing	Point	♂: 4 ♀: 9 ♂+ ♀: 6.2[c]	4
Badley [4], England, 1992	Random sample, domestic rating list, Calderdale, England >16 years	Postal Q	$n=21{,}889$ $R=87\%$	'Does anyone in your household suffer from pain, swelling or stiffness?' + site recorded on a chart [Neck]	Point	♂+ ♀: 5.9 (5.7–6.1)	5

[a]Crude response rate presented or calculated (rounded to the nearest whole number)
[b]Presented with one decimal (if possible)
[c]Estimated, determined or calculated from data provided

Prevalence estimates

The prevalence estimates and confidence intervals for all included studies are presented in Fig. 1. Generally and as expected, the ranges increase with longer prevalence periods. Thus, the mean prevalence estimates for the adult populations show a steady increase with increased prevalence periods.

Point prevalence

In eight studies [1, 4, 7, 21, 47, 48, 59, 63], the point prevalence was presented ranging from 5.9% [4] to 38.7% [48]. For the adult population (15–74 years), the prevalence ranged from 5.9% [4] to 22.2% [21], with a mean prevalence of 7.6%. One study [48] focused specifically on an elderly population (65+ years) with 38.7% point prevalence.

One-week prevalence

The 1-week prevalence was presented in six studies [15–17, 19, 30, 54], ranging from 1.4% [15] to 36% [30]. The NP definition in the latter study was 'waking pain and/or stiffness', which to our knowledge is the only study using this kind of definition. The mean 1-week prevalence for the remaining of the studies (15–90 years) was 12.5%, ranging from 1.4% [15] to 19.5% [54].

One-month prevalence

In six studies [23, 26, 32, 46, 62, 66], the 1-month prevalence was presented. The range for the adult population (16–79 years) was between 15.4% [32] and 41.1% [46], with a mean of 23.3%. One study [66] focused specifically on children, with a prevalence of 6.9%.

Six-month prevalence

The 6-month prevalence was reported in seven studies [5, 9, 19, 21, 27, 33, 65]. For the entire adult population (18–80 years), the prevalence was between 6.9% [6] and 54.2% [21], with a mean prevalence of 29.8%. The prevalence for the three studies on children/adolescents ranged between 6% (12-year-old males) and 45% (18-year-old females) [33].

One-year prevalence

The 1-year prevalence was estimated in 22 studies [8, 11, 14, 20, 28, 29, 31, 34–36, 38, 41–43, 52, 54–56, 60, 64, 67, 71]. Based on fairly homogeneous definitions of NP, the prevalence ranged from 16.7% [8] to 75.1% [56] for the entire adult population (17–70 years), with a mean of 37.2%. In two studies on adolescents, prevalences of 15.8% [52] and 22.1% [34] were reported. Three studies focused specifically on elderly populations, with a prevalence range between 8.8% [35] and 11.6% [14].

Lifetime prevalence

Eight studies presented the lifetime prevalence [2, 12, 21, 38, 46, 57, 68, 69]. In two studies on lifetime, NP among natives from small islands in the South Pacific Ocean was reported (0.2% and 2.1%) [68, 69]. The lifetime prevalence for the rest of the adult population (18–84 years) ranged from 14.2% [57] to 71% [46], with a mean of 48.5%. One study focused specifically on elderly women, with a prevalence of 17% [2].

Pain definition and duration

In studies dealing with pain of longer duration (e.g. pain lasting for more than 3 months), lower prevalence estimates were presented, except for the point prevalence [1, 48, 59]. Studies where NP was reported as the most painful site also generally showed low prevalence estimates [6, 9, 62]. Otherwise, the various definitions of NP (e.g. pain, ache, soreness, etc.), different type of questions, or difference in response format (i.e. yes/no, graded pain, etc.) did not systematically affect the prevalence estimates (data not shown).

Age and gender

Children reported less pain than the adults for the 1-month [66] and 1-year prevalences [34, 52], but more pain for the 6-months prevalence [27, 33, 65].

In studies on elderly populations, low estimates were reported in 1-year prevalences [14, 35, 71]. However, in the point prevalence elderly people reported more NP than for the remaining adult populations [48].

Women reported more NP than men in 25 (83%) out of 30 studies [1, 6–8, 11, 16–18, 20, 21, 28, 32, 34, 36, 38, 42, 43, 47, 48, 52, 55, 56, 60, 62, 64–66, 68, 69, 71].

Quality score

The criteria scores for all included studies are shown in Table 4. Seven studies (13%) [1, 8, 15, 18, 21, 41, 51] were of higher quality, 42 studies (75%) were of medium quality, and seven studies (13%) [2, 6, 9, 30, 47, 57, 60] were of poor quality. Only two studies were assigned maximum points [1, 18], whereas one paper did not score any points at all [59].

No pattern between quality scores and prevalence estimates was seen in any of the prevalence periods (i.e.

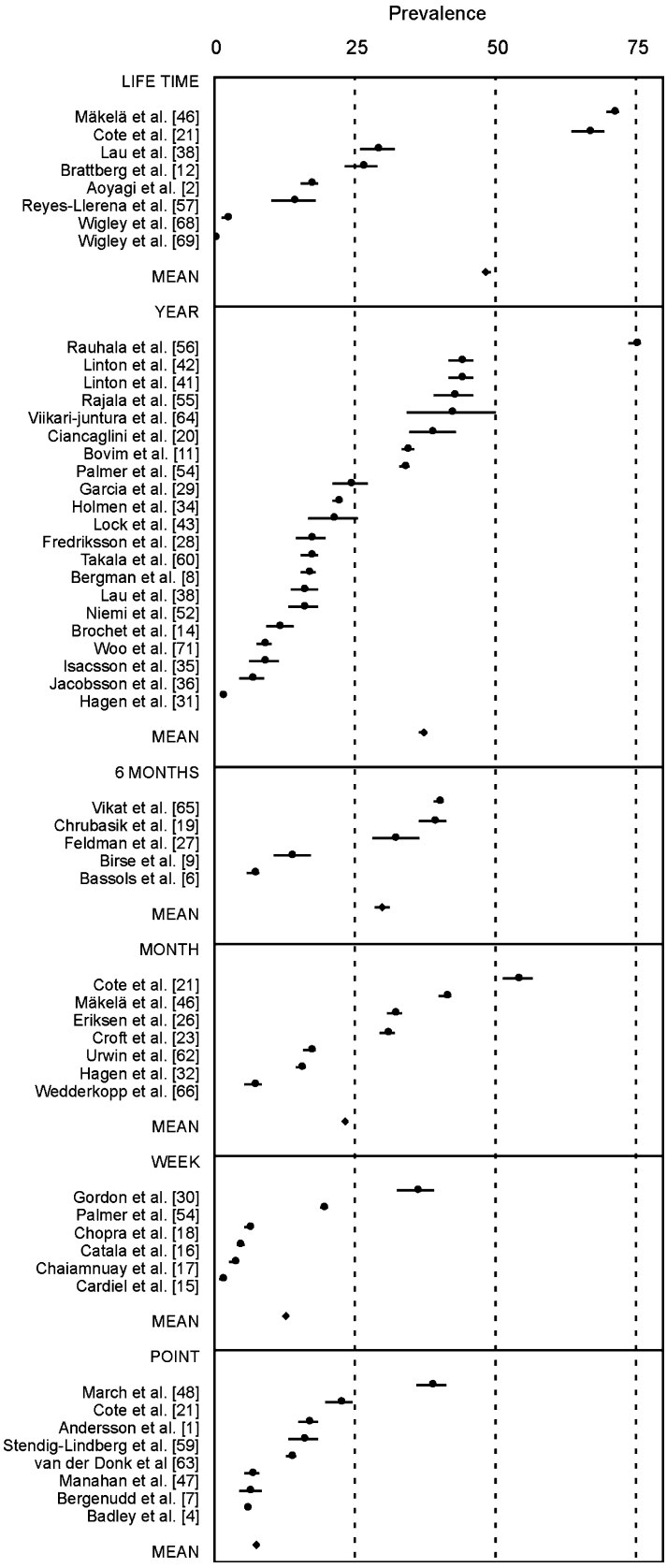

Fig. 1 The prevalence estimates and 95% confidence intervals of all studies for the six most commonly reported prevalence periods. The 95% confidence intervals were calculated when not provided. One study is not included [33] in the figure, as it was impossible to estimate the total prevalence for the population. The mean prevalence estimates are calculated from homogeneous study samples based on adult populations (i.e. the total number of subjects with neck pain divided by the total number of participants)

studies with low quality scores did not show greater differences in prevalence estimates compared to studies with high scores). In fact, in the study obtaining zero point [59] and the study assigned maximum points [1] nearly identical point prevalence estimates were reported.

Response rate

No consistent pattern of the effect of inadequate (< 70%) response rate on the prevalence estimate was found (Table 4). Some studies with low response rates reported high prevalence estimates (point [21, 48], 1-week [30, 54], 6-months [21], and 1-year prevalence [42, 56]), whereas other studies reported low prevalence estimates (1-week [16] and 1-year prevalence [31, 36, 71]).

Sample size

Studies with inadequate sample sizes (less than 1,000 participants) did not differ from studies with higher sample sizes in relation to the prevalence estimates (Table 4).

Anatomical definition

The anatomical definition varied between studies, typically either including or excluding the shoulder region. Twelve studies included the shoulder in the anatomical definition of the neck region (Table 4). However, there were no differences between studies including or excluding shoulders in any of the prevalence estimates.

Geography and prevalence

The mean 1-year prevalence estimates from different geographical regions based on comparable studies are presented in Table 5. The 1-year prevalence was higher in Scandinavian countries than in the rest of Europe and Asia. However, this was not statistically significant. The lifetime prevalence estimates found in two studies from the Tokelau Islands (small islands in the South Pacific Ocean) were very low and close to zero [68, 69]. However, in the remaining studies geographical/regional differences did not affect prevalence estimates.

Table 5 Mean 1-year prevalence estimates for Scandinavia, Europe, and Asia

Region	Number of studies	One-year prevalence (95% CI)
Scandinavia	9	36 (22–52)
Europe	5	26 (13–39)
Asia	2	13 (0–58)

Year of publication

All studies were published between 1980 and 2002, with the majority (87.5%) of publications from 1991 and onwards. None of the prevalence estimates showed any distinct pattern of change over time (data not shown).

Discussion

This is the first comprehensive systematic and critical review on NP prevalence and we therefore provide reference data for future studies on NP. Although considerable heterogeneity in prevalence estimates was found, two trends are evident: first, the average NP prevalence estimates increase with longer prevalence periods; second, in nearly all studies women reported more NP than men.

Differences in prevalence estimates could be a result of several factors. First, wording of the questions and use of different manikins may affect the results [37, 49, 50]. In the majority of studies self-developed questionnaires were used and this may explain some of the observed variation in the prevalence estimates. Second, the anatomical definition varies between studies (i.e. including or excluding the shoulder region). Interestingly, no general differences between studies including or excluding the shoulder region were seen, and it has been questioned whether neck and neck/shoulder pain can actually be clearly distinguished from each other [53, 61]. Finally, methodological quality of a study may affect the outcome. Surprisingly, this was not the case in our review. In fact, two studies with very different quality scores showed roughly the same prevalence estimates [1, 59], indicating that estimates of NP prevalence could be regarded as independent of the quality of individual studies.

This lack of correlation between study–quality and outcome estimates may, however, be true for our scoring system only, but, since no evaluation of the appropriateness of quality criteria for epidemiological studies on the prevalence of musculoskeletal disorders such as NP exists, this remains unknown. Lebeouf-Yde and Lauritsen [39] developed a comprehensive set of quality criteria for studies assessing low-back pain prevalence, whereas Loney and Stratford [45] developed a less detailed scoring system for this purpose. However, no consensus exists as to what quality scoring system should be used when evaluating prevalence studies. It is our opinion that scoring systems should be kept as simple as possible and be easy to use. Our quality criteria

cover basic issues that should be considered in any epidemiological study. Nevertheless, more work is needed in this area.

Previous attempts at reviewing the literature on NP prevalence also showed wide prevalence ranges [3, 21]. However, these reviews included very few papers. We included 56 papers due to a more comprehensive search strategy and different inclusion/exclusion criteria. More than one database should be included in a comprehensive search and one paper was not retrieved in any database. Therefore, screening of reference lists must be performed for complete retrieval of all relevant literature.

The results of this review should be interpreted in the light of several limitations. Our search strategy was broad and resulted in many potentially relevant papers. However, since most of the included studies had other primary objectives than to study NP prevalence, the broad search strategy was necessary in order to retrieve all relevant studies. We did not conduct a search of journals by hand, as prevalence studies are reported in many different journals. For example, the 56 included papers in our review were retrieved from 29 different journals.

Although no prior training with regards to applying the quality assessment was conducted, no substantial disagreements between the raters were seen for any of the papers. Any initial divergence was based merely on interpretations of the papers, and in fact the third reviewer was never involved in the quality assessment.

The mean prevalence estimates should be regarded with caution, as our review showed a great heterogeneity among the included studies. For example, the pain definition and duration of pain varied, typically by including the shoulder region or extending the duration of pain (i.e. pain lasting more than 3 months). Also, upper and lower age ranges were not identical between studies. For instance, some studies included 15-year-olds in the adult group, whereas others defined adulthood from 20 years of age and onward.

Reviewer bias cannot be ruled out, as we did not attempt to blind reviewers. This was because some studies were already known to the reviewers, hence making a fully blinded assessment was impossible.

We found that women consistently report more NP than men and this is in agreement with other reviews dealing with NP [3, 21]. In fact, women appear to report more musculoskeletal pain than men, and it has been suggested that this is based on different physiological mechanism for pain perception between the sexes [40]. No other review has included studies specifically on children or elderly populations.

Homogeneity is a key issue when comparing results from different studies. Some of the requirements in studies on prevalence are: sufficiently large and unbiased study samples with non-responder analysis, uniform and valid anatomical definitions, and precise outcome measures. Our systematic review clearly indicates a lack of homogeneity in prevalence studies on NP. This is also apparent in other smaller reviews on NP prevalence where the variation in the definitions and the durations of NP [3, 21], as well as the sample source and age distribution have been emphasised as explanations for the large variation in the NP prevalence estimates [3].

Knowledge about prevalence does not in itself inform about the impact of NP on individuals and on society at large. To assess the impact on individuals, information such as pain intensity, influence on daily performance, general health status, care seeking, and co-morbidities should be available. To assess the impact of NP on society at large, both direct costs (e.g. use of medication and/or health care providers) and indirect costs (e.g. number of sick days, decreased daily performance) should be provided. Such clinically and sociologically relevant information is difficult to obtain, and this may in part explain the diversity in questionnaires used.

Time has come to reach a consensus on these issues and develop new standardised instruments that entail more relevant outcome measures based on our present knowledge. This would facilitate comparisons between different countries and cultures, and, most importantly, provide clinicians, researchers, and politicians with a relevant and detailed picture of both occurrence and impact of NP in the population.

Conclusions

NP is a common symptom in the population. The prevalence increases with longer prevalence periods and generally women have more NP than men. At least for 1-year prevalence, Scandinavian countries report higher mean estimates than in the rest of Europe and Asia. The quality of studies varies greatly but is not correlated with the prevalence estimates. Design varies considerably between studies and standardization is needed in future studies.

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