Abstract

Chronic widespread pain (CWP) is common and associated with poor general health. There has been no attempt to derive a robust prevalence estimate of CWP, or assess how this is influenced by socio-demographic factors. This study therefore aimed to determine, through a systematic review and meta-analysis, the prevalence of CWP in the adult general population and explore variation in prevalence by age, gender, geographical location and criteria used to define CWP. Medline, Embase, CINAHL and AMED were searched using a search strategy combining keywords and related database-specific subject terms to identify relevant cohort or cross-sectional studies published since 1990. Included papers were assessed for risk of bias. Prevalence figures for CWP (ACR criteria) were stratified according to geographical location, age and sex. Potential sources of variation were investigated using subgroup analyses and meta-regression. Twenty-five papers met the eligibility criteria. Estimates for CWP prevalence ranged from zero to 24%, with the majority of estimates between 10 and 15%. The random-effects pooled prevalence was 10.6% (95% CI 8.6, 12.9). When only studies at low risk of bias were considered pooled prevalence increased to 11.8% (95% CI 10.3, 13.3), with reduced but still high heterogeneity. Prevalence was higher in women and in those aged 40 years plus. There was some limited evidence of geographic variation and cultural differences. One in ten adults in the general population report chronic widespread pain with possible socio-cultural variation. The possibility of cultural differences in pain reporting should be considered in future research and the clinical assessment of painful conditions.

Introduction

Chronic widespread pain (CWP) is a condition characterized by longstanding diffuse musculoskeletal pain and frequently associated with other physical symptoms such as fatigue, psychological distress and concentration problems. In the American College of Rheumatology 1990 (ACR-1990) definition [43], CWP is the fundamental feature of fibromyalgia (FM) and is defined as pain lasting three months or longer, located axially (cervical spine, thoracic spine, anterior chest or low back), above and below the waist, and on the left and right sides of the body.

In 2010, the ACR published an alternative set of criteria (ACR-2010) [41], meant to be used clinically, which emphasized the importance of somatic symptoms (e.g. fatigue, waking unrefreshed) that have been associated with FM. The ACR-2010 criteria dispensed with tender-point examination and instead used a measure of the widespread-ness of pain, and a measure of the number of somatic symptoms experienced, such as fatigue and cognitive impairment. The new criteria place FM at one extreme on a spectrum of polysymptomatic distress that includes CWP.

Whilst studies have reported the prevalence of CWP in different populations, there has been no attempt to consolidate these studies to derive a robust prevalence estimate of CWP or to assess how this is influenced by sociodemographic factors. There have been three systematic reviews and two narrative reviews of the prevalence of 'chronic pain' [12,30,31,34,38], and one study has summarized the reported prevalence of CWP from 16 population studies, but was not a systematic review and did not attempt a meta-analysis [27]. Ascertaining the population prevalence of CWP has important public health implications. It is difficult to justify and plan interventions for conditions with an unknown community burden. Further, clinicians take into account estimates of disease prevalence in different groups of the population (age, sex, ethnicity) when formulating differential diagnoses. Investigating how prevalence varies according to features such as age, sex and geographical location offers insights into possible aetiology.

We aimed to systematically review the existing literature that presents estimates for CWP prevalence in the adult general population. We chose to limit our review to studies using ACR criteria to define CWP in order to ensure that prevalence estimates were comparable. The ACR-1990 criteria were selected as an established and widely used measure of CWP diagnosis. However, we also chose to include the more recent ACR-2010 criteria to investigate variation in prevalence based on the two ACR CWP case definitions. We explored variation in prevalence estimates by age, sex and geographical location.

Methods

Eligibility criteria

All adult population-based (cross-sectional or cohort) studies published since 1990 where prevalence of CWP was presented, or could be calculated from available data, were considered for inclusion. Only studies of CWP determined using either the ACR-1990 [43] or ACR-2010 [41] CWP criteria were included. We excluded studies that presented estimates based on specific subsets of a general population (for example, women, hospital outpatient clinic patients). However, we did not exclude some select populations that were considered to be representative of the general population in a particular geographical locale (for example, Pima Indians, Maori population). Full inclusion and exclusion criteria are presented in supplementary Table A1 (available online as Supplemental Digital Content at http://links.lww.com/PAIN/A138).

Search strategy

Medline, Embase, CINAHL and AMED were searched up to 3rd September 2013 using a search strategy combining keywords and related database-specific subject terms. The search strategy combined terms related to pain (chronic widespread pain, fibromyalgia, chronic pain syndrome, diffuse pain, fibrositis, fibromyositis, myofascial pain), and terms related to study design (epidemiology, cohort study, cohort analysis, cross-sectional study, cross-sectional analysis, observational analysis, prevalence, disease frequency) (supplementary Tables A2 and A3, available online as Supplemental Digital Content at http://links.lww.com/PAIN/A138).

The titles of the papers returned were examined and any that were obviously irrelevant were excluded. Abstracts and then full text of the remaining articles were reviewed to find relevant studies that met the inclusion criteria.

Additional relevant papers were identified by searching the reference lists of full text articles and hand-searching of the *Journal of Rheumatology* (identified as the most frequent contributor of papers in an initial scoping study). Native speakers translated foreign language articles.

Risk of bias assessment

Papers included in the study were assessed for risk of bias using two domains of the Quality in Prognosis Studies (QUIPS) tool [16] that are relevant to observational studies (1. study participation; 2. outcome measurement). Appraisal of each domain provides a subjective assessment of risk of bias (ranked as low, moderate or high). A summary of the areas considered in the assessment of each domain is included in the supplementary Table A4.1(available online as Supplemental Digital Content at http://links.lww.com/PAIN/A138).

Data extraction

A data extraction form was used to extract equivalent information from each paper. Information extracted included population sampled, prevalence estimates, timeframe of prevalence estimate (e.g. point prevalence, annual prevalence), and any prevalence estimates reported stratified by age, sex or location. The form also included fields to capture data relevant to the assessment of risk of bias. Prevalence figures and 95% confidence intervals (CIs) were extracted or calculated from the available data using Wilson's method [29].

Reliability

A second reviewer (KJ) blinded to the primary reviewer's (KM) decisions checked the paper selection, data extraction and risk of bias assessment stages of the review. In each instance the number of papers checked was the larger of either 10 studies or 10% of the studies to be appraised. Any differences of opinion were discussed and a third reviewer (JS) was available to arbitrate any issues that remained unresolved.

Analysis

We undertook an initial descriptive analysis of the studies. Heterogeneity between estimates was assessed using the I^2 statistic, which describes the percentage of variation not due to sampling error across studies. An I^2 value above 75% indicates high heterogeneity [18]. We limited the papers included in the meta-analysis to those using the ACR-1990 criteria to define CWP. Meta-analysis was undertaken using a random-effects model (to account for heterogeneity) conducted using the MetaXL (www.epigear.com) add-in for Microsoft Excel. A pooled prevalence figure was calculated with 95% CI.

In a meta-analysis of prevalence, when the estimate for a study tends towards either 0% or 100%, the variance for that study moves towards zero and as a result its weight is overestimated in the meta-analysis [5]. Therefore, we conducted the meta-analysis with prevalence estimates that had been transformed using the double arcsine method [5]. The final pooled result and 95% CIs were back-transformed for ease of interpretation.

Potential influences on prevalence estimates were investigated using subgroup analyses and meta-regression. Where studies allowed, we descriptively compared prevalence estimates by age, gender and location within studies. We then assessed the influence on estimates of the following study-level variables identified a priori as potential sources of variation in the estimates of prevalence: i) risk of bias; ii) geographical location; and iii) data collection method. We classified studies as being either at low risk of bias (low risk of both participation and outcome measurement bias) or at moderate-to-high risk of bias (moderate or high risk of either participation or outcome measurement bias). We also

compared European studies with North American studies. Data collection method was assessed by comparing studies where data were collected by a self-completed questionnaire versus a data collection method that required some form of human interaction (e.g. interview or telephone questionnaire). We ran three meta-regression models including these covariates separately using Stata version 13.1.

Results

Search results

The search returned a total of 4,051 publications, leading to 111 papers selected for full-text review. An additional fifteen studies were identified from the citation lists, and one further paper [28], published after the formal database search had been completed, was identified by an electronic citation alert for the ACR-1990 case definition criteria [1]. Hence, a total of 127 papers had their full text reviewed for inclusion. The screening process is detailed in Figure 1.

One hundred and two papers were excluded after full text review. Twenty-five studies (reported in 28 papers) [1–4,6–11,13–15,19,20,22–26,28,32,33,35,37,39,40,42] were therefore selected for inclusion in the review (Table 1), representing 37 CWP prevalence estimates.

Included studies

All studies included had a cross-sectional design and estimated point prevalence. Twenty-four studies used ACR-1990 criteria and the remaining study defined CWP using the ACR-2010 criteria of a widespread pain index of greater than or equal to six for a minimum of three months [15]. One study used an unstructured clinical interview [23], the other 24 used a structured questionnaire. Of the studies using a questionnaire, ten [2,6,10,13,19,25,28,32,37,42] used a postal questionnaire, five [1,3,8,35,39] used a telephone questionnaire, three [9,20,22] used a face-to-face interview, two [15,33] used a self-completed questionnaire with help available from an interviewer if required, and four [11,14,24,40] used a mixture of self-completed questionnaires, face-to-face interviews and telephone questionnaires.

Risk of bias

A summary of the risk of bias of the included papers is provided in Table 1; a justification of each rating is provided in the supplementary appendix (Table A4.2, available online as Supplemental Digital Content at http://links.lww.com/PAIN/A138). Seven studies (29%) were considered to be at low risk of bias for both study participation and outcome measurement, and two studies (8%) were considered to be at high risk of bias for both domains.

Study participation

Twenty-four percent (n=6) of studies were considered to be at high risk of study participation bias, 44% (n=11) were at moderate risk, and 28% (n=7) at low risk (Table 1). One study [40] scored low risk of participation bias for one population (Amish) under investigation and moderate risk for another (non-Amish).

The main failings in sample selection were poor response rates [1,23], non-random sampling of respondents [3,22,23], or recruitment from a non-representative sampling frame [11].

The seven studies at low risk of participation bias either selected their study sample randomly or demonstrated that the sample was representative of the study population. Response rates in the low-risk studies were good or these studies were able to demonstrate that the sample was representative of the population or that non-responders were not significantly different from responders.

Outcome measurement

Sixteen percent (n=4) of the papers included were considered to be at high risk of outcome measurement bias, 24% (n=6) at moderate risk, and 60% (n=15) at low risk.

Four studies [1,8,24,33] used non-robust methods to establish prevalence estimates. These prevalence figures were calculated from data extrapolated from a sub-sample or from a non-related population (e.g. rheumatology outpatients) rather than from the whole sample or the target population. Specifically, i) two studies [1,8] calculated a positive predictive value for a screening questionnaire using data obtained from rheumatology outpatients (number of confirmed ACR-1990-positive cases in those identified as cases by the questionnaire) and used this to calculate prevalence figures using the questionnaire responses from the general population; ii) one study [33] assumed an equal frequency of CWP in responders and non-responders and extrapolated prevalence within responders to non-responders to calculate overall prevalence; and iii) one study [24] calculated prevalence based on examination of a stratified sample of positive responders a year after their initial questionnaire response. One paper [33] also failed to provide sufficient evidence of validity of their data-collection instrument.

The 15 studies at low risk of outcome measurement bias used clearly defined diagnostic criteria, reliable and validated instruments and a similar method and setting of outcome measurement for all participants.

Prevalence

Prevalence estimates ranged from 0% observed in a sample of Pima Indians [20] to 24% for low socioeconomic status populations in Brazil [3]. The majority of estimates were between 10% and 15% of the population, and all the low-risk studies using ACR-1990 criteria gave estimates between these two levels. There was greater variation in studies with a high risk of bias.

Low estimates (less than 6%) were found in seven studies [1,14,15,20,23,24,35]. One study [15] used the widespread pain index from the ACR-2010 criteria to estimate a CWP prevalence of 5.8%. The remaining six low estimates came from studies using the ACE-1990 criteria. One study [24] used a slightly different application of the case definition by using data from two different time points a year apart; those with possible widespread pain were identified by an initial postal questionnaire and followed up a year later to identify CWP cases. Another [20] estimated prevalence in a particularly select population (Pima Indians). Three low estimates [1,23,35] were from studies at high risk of bias. The other low estimate [14] may be explained by data collection methods.

Gender variation

Fourteen papers presented prevalence figures by gender (Table 2). Prevalence was higher for women in all studies; female-to-male prevalence ratios ranged from 1.06 to 4.80, with the majority of estimates showing CWP prevalence in women to be around double that observed in men.

Age variation

The minimum age for the study population was 18 years or over in all but three of the included studies [8,15,23]. In these studies the minimum age was between 12 and 15 years, but estimates from these three studies were within the range of those from studies with minimum age of 18 years or over. Six studies presented age-banded data (Figure 2). These demonstrate an increase in CWP prevalence to around age 40–50 and then either continually increasing prevalence or a plateauing of prevalence estimates in older age groups. Data from Croft et al. [13] demonstrate two peaks: one in middle age and another in old age.

Geographical variation

Figures for CWP in Europe were generally between 10% and 14% (Table 3). One UK study [25] observed higher prevalence in South Asians than Europeans.

In North America, prevalence among the Amish was high at 14.5%, compared to 8.9% among rural Ontarians [40], and 7.3% among urban Ontarians [39]. Pima Indians in Phoenix, Arizona had no observed CWP [20]. The general population in the USA was found to have a prevalence of 3.6% in a 2008 study [14] and 10.6% in a 1995 study [42].

Four [11,23,25,40] studies made comparisons between different ethnic or cultural groups resident in the same regions; all four studies revealed appreciable differences in CWP prevalence.

Meta-analysis

Thirty-two prevalence estimates (from 23 papers) were included in the meta-analysis. The 24 papers (36 prevalence estimates) using ACR-1990 criteria to estimate CWP prevalence were considered for entry and four estimates (from two papers) were excluded. One estimate [24] was excluded because the study population was a subsample of those studied in another paper [6]. A further three estimates (from one paper) were excluded to avoid problems with overweighting a population; Choudhury et al. [11] presented seven prevalence estimates representing figures for different ethnic groups from both a short postal survey and a long questionnaire. Participants were recruited from the same sampling frame, which could lead to overlap of study populations; we therefore only included the estimates from the short postal survey as the sample was more likely to be representative of the general population.

The overall random-effects pooled prevalence of CWP was 10.6% (95% CI 8.6, 12.9) with a high level of heterogeneity (I^2 = 98.7%) (Figure 3). When only studies at low risk of bias (on both domains of the QUIPS tool) were considered, the pooled prevalence increased to 11.8 (95% CI 10.3, 13.3), with reduced, but still high, heterogeneity (I^2 = 85.1%). A sensitivity analysis using untransformed prevalence estimates showed similar results.

The results of three meta-regression analyses including pooled estimates for subgroups based on geographical location, risk of bias, and data collection method are included in Table 4. There was little evidence of an effect of data collection method (p=0.181) or risk of bias (p=0.744) on prevalence. However there was an apparent higher prevalence in Europe than North America (12.8% vs. 7.1%, p=0.008).

Discussion

Twenty-five papers (37 prevalence estimates) were included in this systematic review and meta-analysis of the prevalence of CWP. Prevalence estimates of studies at low risk of bias were between 10% and 15%. Pooled prevalence for studies at low risk of bias was 11.8%. Prevalence was higher in women and in those over 40 years of age. There

was some evidence of geographic variation in prevalence between Europe and North America. Some papers included in the review suggest that there may be sociocultural variation in CWP.

The review searched four major bibliographic databases, using a search strategy that had been tested in a pilot study, and we translated all relevant foreign language articles. In addition, we searched the citation lists of all papers selected for full text review and hand searched the *Journal of Rheumatology* for relevant papers published after 1990. Moreover, at each step of the identification and review process a reliability exercise was undertaken. However, we did not undertake a search of grey literature, so there may be unpublished research that was not included. Nonetheless, with such a large review of a topic, where we could argue that any publication bias is unlikely to be systematic, it seems reasonable to conclude that the included studies present a reasonable reflection of the true general population prevalence of CWP.

A systematic review of tools to assess the quality of observational studies examining incidence or prevalence [36] concluded that no consensus exists as to which individual criteria should be assessed to establish methodological quality. The Cochrane Collaboration [17] advise assessing risk of bias on a subjective basis using domain-based evaluation. This advice is also relevant to observational studies. Therefore, based on an evaluation of different tools in a pilot study, we chose to use a tool based on a subjective assessment of risk of bias in separate domains [16]. However, even guided by a tool, methodological appraisal remains a subjective exercise. For this reason, to minimize bias in the review process, for a random sample of 10% of the included papers two reviewers assessed risk of bias independently, with minimal disagreement between reviewers.

No effort was made to contact study authors for raw data. This meant that, in some instances, 95% CIs for prevalence estimates had to be calculated from information given in the paper. It also restricted the ability to assess the variability in prevalence according to age. Of the papers that presented prevalence figures according to age, the age groups used varied. Only one study reported prevalence based on the ACR-2010 criteria; hence, we were unable to assess variation between the two ACR criteria definitions.

Given the varied methodological approaches of the studies included in the review, the appropriateness of calculating pooled prevalence estimates could be questioned. Given high heterogeneity between studies, the pooled prevalence estimate should therefore be interpreted with caution. However, only studies using the ACR-1990 case definition criteria were entered into the meta-analysis, and these criteria were selected as an established and widely used standard for CWP/FM diagnosis. Including studies using the same diagnostic criteria in similar populations (male and

female adults) ensured some comparability. The heterogeneity in pooled prevalence estimates may have been due to data collection method, the geographical location of the study, or bias introduced by study methods. The impact of study quality on pooled prevalence was assessed by systematically excluding low-quality studies and studies examining particularly select populations from the meta-analysis, and by conducting a meta-regression comparing studies at low risk of bias with those at moderate-to-high risk. Meta-regression demonstrated little evidence of data collection method or higher risk of bias giving a consistently higher or lower level of prevalence.

The prevalence estimates of low-risk studies were consistently between 10% and 15%. Prevalence estimates in females were around double those for males, whilst prevalence estimates generally plateaued in middle age (40–60 years). This matches the patterns of prevalence of primary care-recorded widespread pain consultation [21] and non-specific chronic pain [38].

European estimates of prevalence were slightly higher than those from North America. However, the number of North American studies was low and only two of these six studies were not in more specific populations. Smaller numbers of studies from other locations and diverse methodological approaches make comparisons between other regions difficult. There were some apparent cultural and socioeconomic differences in CWP prevalence. The two most extreme outliers for CWP prevalence included in the review represent select populations (considered to be representative of the general population in the geographical locale from which they were selected) rather than the wider general population. The highest estimate for prevalence is for a low socioeconomic population [3], while the lowest estimate is in a North American Indian trial population [20].

Four [11,23,25,40] studies found differences in CWP prevalence between ethnic or cultural groups. Although observed differences in prevalence in two of these studies may also be due to different approaches to data collection [40], and recruitment [23], this finding may offer some support for ethnic or cultural variation in CWP. Whether any differences in the experience of CWP are attributable to lifestyle, genetics or sociocultural influences is unclear and it is difficult to draw convincing conclusions based on evidence from only four studies. However, potential cultural differences in pain reporting should be considered during clinical history taking, and further research should investigate the extent and nature of ethnic, cultural and regional variation in CWP prevalence, as this may offer insights into the aetiology or management of this condition.

Conclusions

CWP is a common problem, reported by one in ten adults, with prevalence twice as high in women as in men, and with those aged over 40 having a higher prevalence. Heterogeneity between studies made assessment of geographical variation difficult. However, there may be cultural differences in CWP prevalence and the possibility of such differences in pain reporting should be considered in future research and the clinical assessment of painful conditions.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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Figures

Figure 1. Flow chart to illustrate the process by which papers were selected or rejected for inclusion in the study.

Figure 2. Variation in CWP prevalence (%) population by age.
Note that the horizontal axes differ between graphs depending on the information supplied in the corresponding reports.

Figure 3. Forest plot of prevalence (%) of ACR-1990 CWP of studies. Sub-grouped by risk of bias. Random effects analysis.
a. Low-risk studies are those at low risk of bias on both domains of QUIPS tool.
b. Intermediate-risk studies are those at either moderate risk of bias on both domains or moderate risk in one and low in the other.
c. High-risk studies are those at high risk of bias on either domain of the QUIPS tool.
d. Select populations: Pima Indians [20]; Amish population [40]; white European and South Asian [25].
SQ: short postal questionnaire
LQ: long questionnaire

Tables

Table 1. Summary of studies included, and their risk of participation and outcome measurement bias.

Table 2. Prevalence of CWP in the adult general population stratified by gender.

Table 3. Prevalence of CWP in the adult general population (%) stratified by geographical location.

Table 4. Results of subgroup analyses and three separate meta-regression analyses based on: data collection method, geographical location, and risk of bias.

Table 1. Summary of studies included, and their risk of participation and outcome measurement bias.

Study	Sample size	Sample age	Location / Population	Prevalence % (95% CI)	Risk of study participation bias	Risk of outcome measurement bias
Ablin et al. 2012 [1]	1,019	18+	Israel	5.1 (3.9, 6.6)*	High	High
Aggarwal et al. 2006 [2]	2,299	18–75	Manchester, UK	15.0 (12.3, 16.5)*	Low	Low
Assumpção et al. 2009 [3]	768	35–60	São Paulo, Brazil (low socioeconomic status)	24.0 (11.0, 25.0)	High	Moderate
Bergman et al 2001 [6,7]	2,425	20–74	Sweden	11.4 (10.1, 12.6)	Low	Low
Branco et al. 2010 [4,8]	4,517	15+	Five European countries	13.0 (12.0, 14.0)*	Moderate	High
France	1,014		France	10.0 (8.3, 12.0)*		
Italy	1,000		Italy	10.0 (8.3, 12.0)*		
Germany	1,002		Germany	11.0 (9.2, 13.1)*		
Portugal	500		Portugal	13.0 (10.3, 16.2)*		
Spain	1,001		Spain	23.0 (20.5, 25.7)*		
Buskila et al. 2000 [9]	2,210	18+	Israel	10.2 (8.7, 11.1)	Low	Low
Carnes et al. 2007 [10]	2,445	18+	South East, UK	12.0 (10.8, 13.3)*	Moderate	Low
Choudhury et al. 2013 [11]		18+	Tower Hamlets, London, UK		High	Moderate
Short postal survey	1,223		*Short postal survey*			
White British/Irish	571		White British/Irish	10.0 (2.0, 18.0)		
British Bangladeshi	141		British Bangladeshi	9.0 (0, 25.0)		
Bangladeshi	201		Bangladeshi	16.0 (3.0, 28.0)		
Other ethnic groups	310		Other ethnic groups	9.0 (0, 20.0)		
Long questionnaire	600		*Long questionnaire*			
White British/Irish	294		White British/Irish	6.0 (0, 18.0)		
British Bangladeshi	158		British Bangladeshi	9.0 (0, 24.0)		
Bangladeshi	141		Bangladeshi	18.0 (3.0, 33.0)		
Croft et al. 1993 [13]	1,340	18–85	Cheshire, UK	11.2 (9.6, 13.0)*	Low	Low
Hardt et al. 2008 [14]	10,271	20+	USA	3.6 (3.1, 4.2)	Moderate	Moderate
Häuser et al. 2013** [15]	2,510	14+	Germany	5.8 (5.0, 6.8)*	Low	Low
Hunt et al. 1999 [19,26]	1,953	18–65	Manchester, UK (suburban)	12.9 (11.5, 14.5)	Low	Low
Jacobsson et al. 1996 [20]	105	35–70	Pima Indians, Gila River Indian Community, Phoenix, Arizona, USA	0 (0, 3.5)	Moderate	Moderate
Kim et al. 2006 [22]	1,028	not stated	Gyeongsangbook-Do, South Korea	14.0 (12.0, 16.2)*	High	Moderate
Klemp et al. 2002 [23]	689	12+	New Zealand	2.8 (1.6, 4.3)	High	Moderate

Study	Sample size	Sample age	Location / Population	Prevalence % (95% CI)	Risk of study participation bias	Risk of outcome measurement bias
Lindell et al. 2000 [24]	147	18–74	Sweden	4.2 (3.4, 5.0)	High	High
Macfarlane et al. 2005 [25]		18–75	UK		Moderate	Low
South Asian	1,945		South Asian	13.8 (12.4, 15.5)*		
White European	932		White European	11.8 (9.9, 14.0)*		
Mundal et al. 2014 [28]	28,367	20+	Norway	17.4 (16.9, 17.8)*	Moderate	Low
Papageorgiou et al. 2002 [32]	1,386	27–90	Handforth, UK	10.0 (8.6, 11.7)*	Low	Low
Raspe & Baumgartner 1993 [33]	438	25–74	Bad Sackingen, Germany	12.0 (9.4, 15.5)	Moderate	High
Scudds et al. 2006 [35]	1,467	18–65	Hong Kong	4.4 (3.4, 5.5)*	Moderate	Low
Storozhenko et al. 2004 [37]	120	27–75	Yekaterinburg, Russia	13.3 (8.38, 20.56)*	Moderate	Low
White et al. 1999 [39]	3,395	18+	London, Ontario, Canada (urban)	7.3 (6.5, 8.2)*		
White et al. 2003 [40]		18+	Aylmer, Ontario, Canada			
Amish	179		Amish	14.5 (10.1, 20.4)*	Low	Low
non-Amish (rural)	494		non-Amish (rural)	8.9 (6.7, 11.8)*	Moderate	Low
Wolfe et al. 1995 [42]	3,006	18+	Wichita, USA (urban)	10.6 (9.5, 11.7)	Moderate	Low

*95% CI not presented in papers but calculated from sample size and prevalence estimate.
**Uses ACR-2010 criteria of widespread pain index ≥ 6 for 3 months.
Risk of bias assessed using Quality in Prognosis Studies (QUIPS) tool [16].

Table 2. Prevalence of CWP in the adult general population, stratified by gender

	Prevalence % (95% CI)		female:male
Study	**female**	**male**	**ratio**
Kim et al. 2006 [22]	19.2 (16.4, 22.4)*	4.0 (2.4, 6.6)*	4.80
Buskila et al. 2000 [9]	14.0 (12.3, 16.0)	3.0 (2.1, 4.4)	4.67
Ablin et al. 2012 [1]	7.1 (5.2, 9.7)*	3.0 (1.8, 4.9)*	2.37
Bergman et al. 2001 [6,7]	15.3 (13.2, 17.4)	7.5 (6.0, 9.1)	1.76
Klemp et al. 2002 [23]	3.5 (1.9, 5.8)	1.8 (1.0, 4.1)	1.94
White et al. 1999 [39]	9.0 (7.8, 10.2)	4.7 (3.5, 5.8)	1.91
Carnes et al. 2007 [10]	14.4 (12.6, 16.4)*	8.2 (6.7, 10.0)*	1.76
Croft et al. 1993 [13]	15.6 (13.2, 18.4)*	9.4 (7.3, 12.1)*	1.66
Mundal et al. 2014 [28]	20.7 (20.1, 21.4)*	12.8 (12.3, 13.5)*	1.62
Aggarwal et al. 2006 [2]	16.0 (14.2, 18.0)*	10.7 (8.9, 12.6)*	1.50
Hardt et al. 2008 [14]	4.3 (3.5, 5.3)	2.9 (2.3, 3.7)	1.48
Storozhenko et al. 2004 [37]	14.6 (8.6, 23.9)*	10.5 (4.2, 24.1)	1.39
Häuser et al. 2013** [15]	6.3 (5.1, 7.7)*	5.3 (4.2, 6.7)*	1.19
White et al. 2003 (Amish) [40]	14.9 (9.2, 23.1)*	14.0 (8.1, 23.5)*	1.06

*95% CI not presented in papers but calculated from sample size and prevalence estimate.
**Uses ACR-2010 criterion of widespread pain index ≥ 6 for 3 months.

Table 3. Prevalence of CWP in the adult general population (%), stratified by geographical location

Geographical region		Study	Population	Prevalence % (95% CI)
Asia		Scudds et al. 2006 [35]	Hong Kong (Chinese population)	4.4 (3.4, 5.5)*
		Kim et al. 2006 [22]	Gyeongsangbook-Do, South Korea	14.0 (12.0, 16.2)*
Australasia		Klemp et al. 2002 [23]	New Zealand	2.8 (1.6, 4.3)
Middle East		Buskila et al. 2000 [9]	Israel	10.2 (8.7, 11.1)
		Ablin et al. 2012 [1]	Israel	5.1 (3.9, 6.6)*
South America		Assumpção et al. 2009 [3]	Sao Paulo, Brazil (low socioeconomic status)	24.0 (21.0, 27.0)
North America	Canada	White et al. 2003 [40]		
		Amish	Ontario, Canada (Amish)	14.5 (10.1, 20.4)*
		Non-Amish (rural)	Ontario, Canada (rural, non-Amish)	8.9 (6.7, 11.8)*
		White et al. 1999 [39]	London, Ontario, Canada (urban)	7.3 (6.5, 8.2)*
	USA	Jacobsson et al. 1996 [20]	Pima Indians, Gila River, Arizona	0 (0, 3.5)
		Hardt et al. 2008 [14]	USA	3.6 (3.1, 4.2)
		Wolfe et al. 1995 [42]	USA	10.6 (9.5, 11.7)
Europe	Central/ Western Europe	Papageorgiou et al. 2002 [32]	Handforth, UK	10.0 (8.6, 11.7)*
		Croft et al. 1993 [13]	Cheshire, UK	11.2 (9.6, 13.0)*
		Carnes et al. 2007 [10]	South East, UK	12.0 (10.8, 13.3)*
		Choudhury et al. 2013 [11]	East London, UK	
		Short postal survey	White British/Irish	10.0 (2.0, 18.0)
			British Bangladeshi	9.0 (0, 25.0)
			Bangladeshi	16.0 (3.0, 28.0)
			Other ethnic groups	9.0 (0, 20.0)
		Long questionnaire	White British/Irish	6.0 (0, 18.0)
			British Bangladeshi	9.0 (0, 24.0)
			Bangladeshi	18.0 (3.0, 33.0)
		Hunt et al. 1999 [19,26]	Manchester, UK	12.9 (11.5, 14.5)
		Macfarlane et al. 2005 [25]	Bolton, Oldham, Aston, Tameside and Birmingham, UK	
		White European		11.8 (9.9, 14.0)*
		South Asian		13.8 (12.4, 15.5)*
		Aggarwal et al. 2006 [2]	Manchester, UK	15.0 (12.3, 15.1)*
		Raspe & Baumgartner 1993 [33]	Bad Sackingen, Germany	12.0 (9.4, 15.5)
		Häuser et al. 2013** [15]	Germany	5.8 (5.0, 6.8)*
		Branco et al. 2010 [4,8]	Europe	13.0 (12.0, 14.0)*
			France	10.0 (8.3, 12.0)*
			Italy	10.0 (8.3, 12.0)*
			Germany	11.0 (9.2, 13.1)*
			Portugal	13.0 (10.3, 16.2)*
			Spain	23.0 (20.5, 25.7)*
	Scandinavia	Lindell et al. 2000 [24]	Halmstad & Laholm, Sweden	4.2 (3.4, 5.0)
		Bergman et al. 2001 [6,7]	Halmstad & Laholm, Sweden	11.4 (10.1, 12.6)
		Mundal et al. 2014 [28]	Norway	17.4 (16.9, 17.8)*
	Russia	Storozhenko et al. 2004 [37]	Yekaterinburg, Russia	13.3 (8.38, 2.56)*

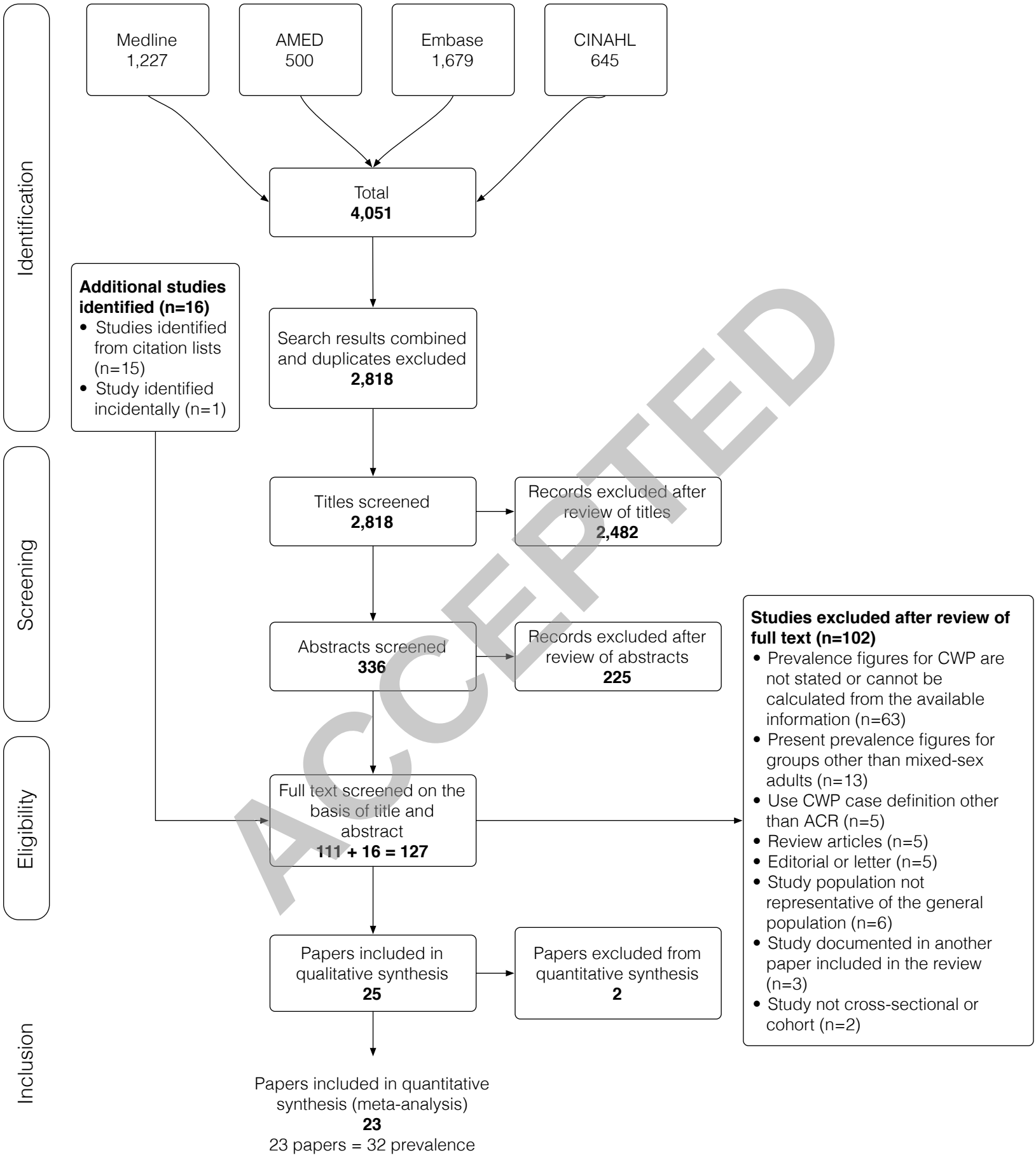
*95% CI not presented in papers but calculated from sample size and prevalence estimate.

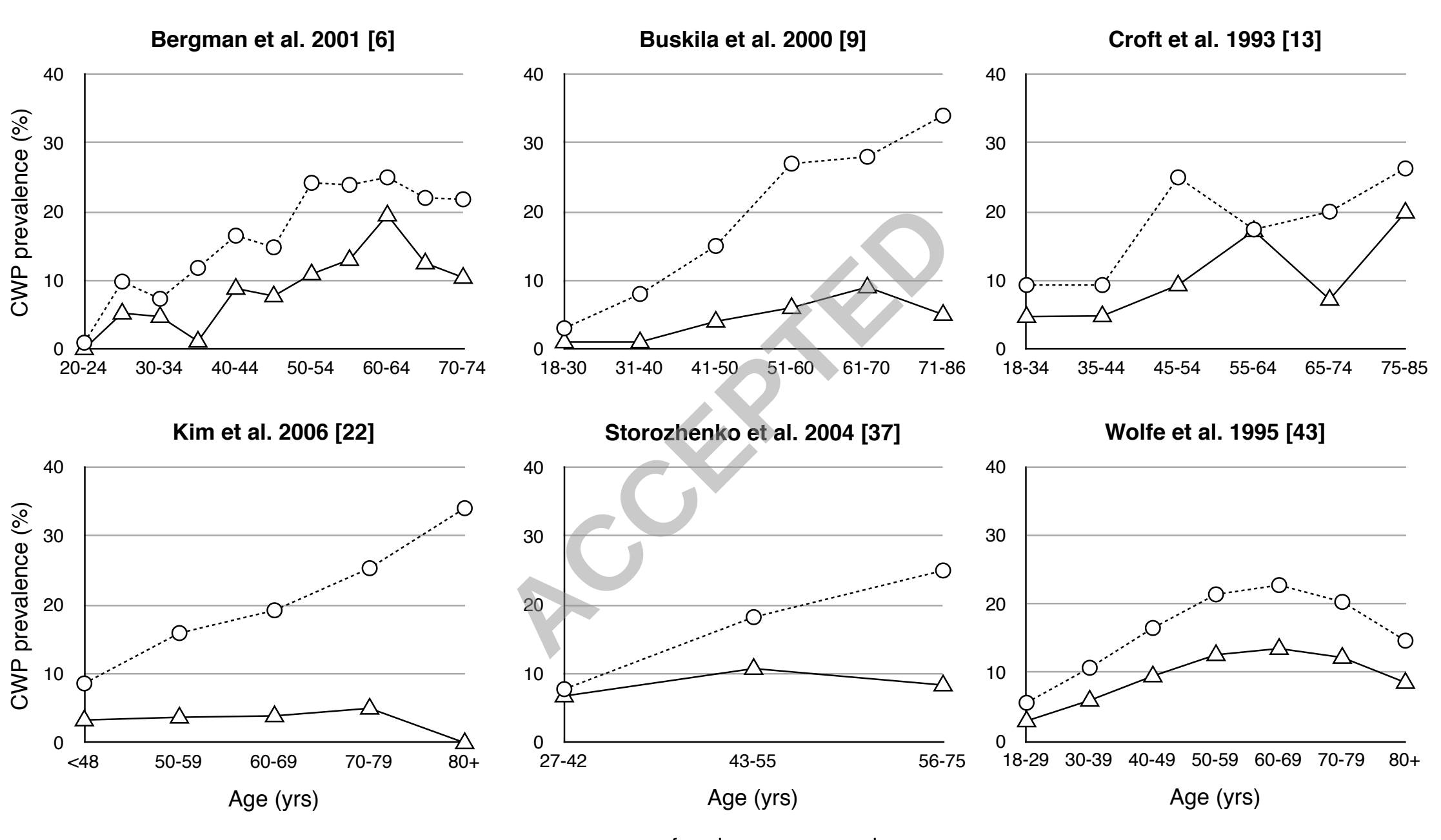
**Uses ACR-2010 criterion of widespread pain index ≥ 6 for 3 months.

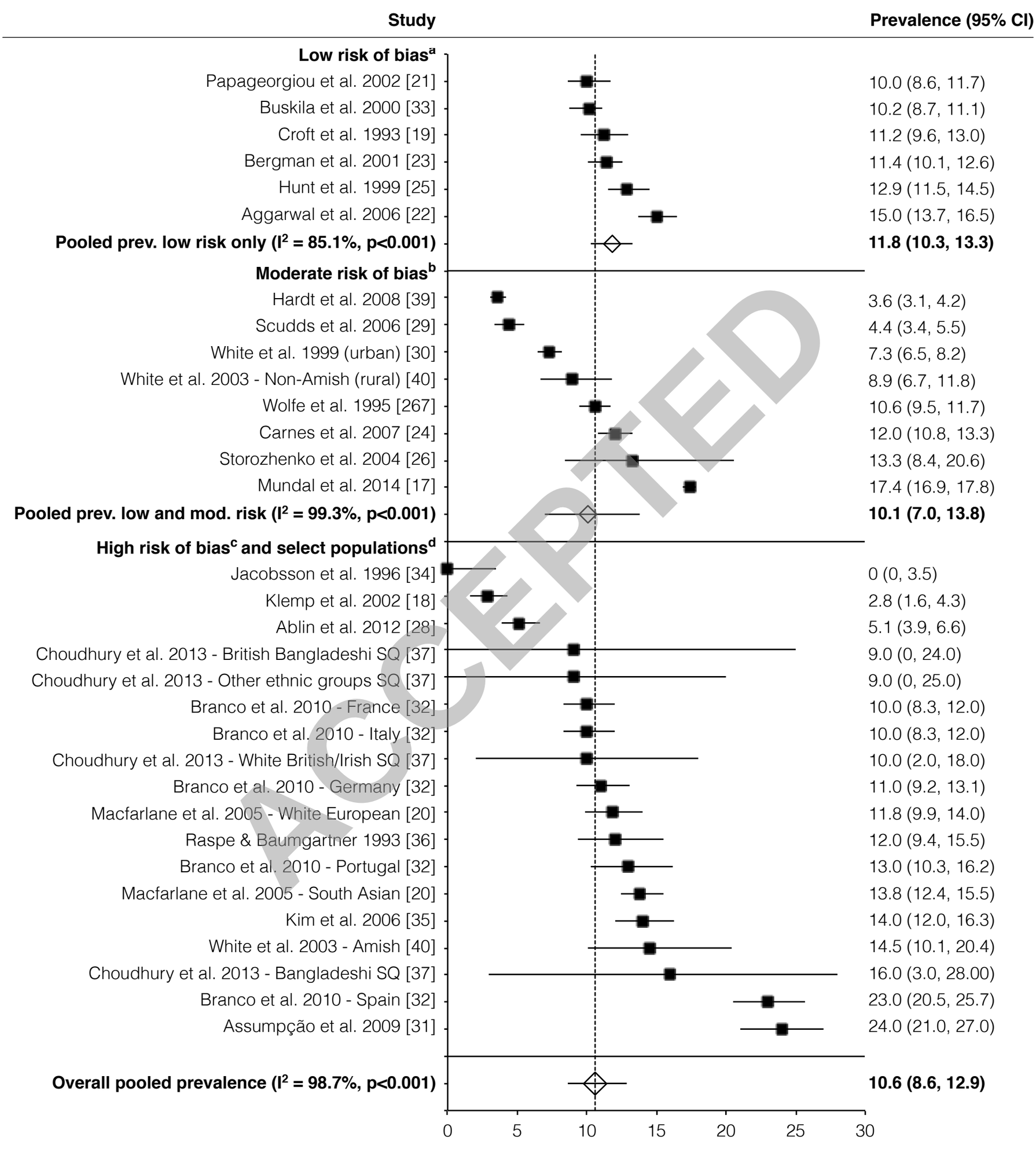
Table 4. Results of subgroup analyses and three separate meta-regression analyses based on: data collection method, geographical location, and risk of bias.

	Subgroup analyses			Meta-regression	
	Number of estimates	**Pooled estimate (95% CI)**	**I^2 (%)**	**Mean difference (95% CI)**	**p-value**
All estimates	32	10.6 (8.6, 12.9)	98.7		
Data collection method				-2.4 (-6.0, 1.19)	0.181
Self-complete	16	12.6 (10.7, 14.5)	95.1		
Human interaction (interview/questionnaire)	16	9.8 (7.5, 12.1)	97.7		
Location				5.1 (1.5, 8.7)	0.008
North America (USA, Canada)	6	7.1 (4.0, 10.2)	97.5		
Europe	20	12.8 (11.1, 14.5)	94.7		
Risk of bias*				0.8 (-4.0, 5.5)	0.744
Moderate/high risk	26	10.9 (8.3, 13.6)	98.9		
Low risk	6	11.8 (10.3, 13.3)	85.7		

* Low risk of bias: low risk on both participation bias and outcome measurement bias domains of the QUIPS tool; Moderate/high risk of bias: moderate or high risk of bias on a either participation bias or outcomecome measurement bias domains of the QUIPS tool.


Identification
Screening
Eligibility
Inclusion
Medline
1,227
AMED
500
Embase
1,679
CINAHL
645
Total
4,051
Additional studies identified (n=16)
• Studies identified from citation lists (n=15)
• Study identified incidentally (n=1)
Search results combined and duplicates excluded
2,818
Titles screened
2,818
Records excluded after review of titles
2,482
Abstracts screened
336
Records excluded after review of abstracts
225
Full text screened on the basis of title and abstract
111 + 16 = 127
Studies excluded after review of full text (n=102)
• Prevalence figures for CWP are not stated or cannot be calculated from the available information (n=63)
• Present prevalence figures for groups other than mixed-sex adults (n=13)
• Use CWP case definition other than ACR (n=5)
• Review articles (n=5)
• Editorial or letter (n=5)
• Study population not representative of the general population (n=6)
• Study documented in another paper included in the review (n=3)
• Study not cross-sectional or cohort (n=2)
Papers included in qualitative synthesis
25
Papers excluded from quantitative synthesis
2
Papers included in quantitative synthesis (meta-analysis)
23
23 papers = 32 prevalence




Study
Prevalence (95% CI)
Low risk of bias[a]
Papageorgiou et al. 2002 [21]
10.0 (8.6, 11.7)
Buskila et al. 2000 [33]
10.2 (8.7, 11.1)
Croft et al. 1993 [19]
11.2 (9.6, 13.0)
Bergman et al. 2001 [23]
11.4 (10.1, 12.6)
Hunt et al. 1999 [25]
12.9 (11.5, 14.5)
Aggarwal et al. 2006 [22]
15.0 (13.7, 16.5)
Pooled prev. low risk only (I² = 85.1%, p<0.001)
11.8 (10.3, 13.3)
Moderate risk of bias[b]
Hardt et al. 2008 [39]
3.6 (3.1, 4.2)
Scudds et al. 2006 [29]
4.4 (3.4, 5.5)
White et al. 1999 (urban) [30]
7.3 (6.5, 8.2)
White et al. 2003 - Non-Amish (rural) [40]
8.9 (6.7, 11.8)
Wolfe et al. 1995 [267]
10.6 (9.5, 11.7)
Carnes et al. 2007 [24]
12.0 (10.8, 13.3)
Storozhenko et al. 2004 [26]
13.3 (8.4, 20.6)
Mundal et al. 2014 [17]
17.4 (16.9, 17.8)
Pooled prev. low and mod. risk (I² = 99.3%, p<0.001)
10.1 (7.0, 13.8)
High risk of bias[c] and select populations[d]
Jacobsson et al. 1996 [34]
0 (0, 3.5)
Klemp et al. 2002 [18]
2.8 (1.6, 4.3)
Ablin et al. 2012 [28]
5.1 (3.9, 6.6)
Choudhury et al. 2013 - British Bangladeshi SQ [37]
9.0 (0, 24.0)
Choudhury et al. 2013 - Other ethnic groups SQ [37]
9.0 (0, 25.0)
Branco et al. 2010 - France [32]
10.0 (8.3, 12.0)
Branco et al. 2010 - Italy [32]
10.0 (8.3, 12.0)
Choudhury et al. 2013 - White British/Irish SQ [37]
10.0 (2.0, 18.0)
Branco et al. 2010 - Germany [32]
11.0 (9.2, 13.1)
Macfarlane et al. 2005 - White European [20]
11.8 (9.9, 14.0)
Raspe & Baumgartner 1993 [36]
12.0 (9.4, 15.5)
Branco et al. 2010 - Portugal [32]
13.0 (10.3, 16.2)
Macfarlane et al. 2005 - South Asian [20]
13.8 (12.4, 15.5)
Kim et al. 2006 [35]
14.0 (12.0, 16.3)
White et al. 2003 - Amish [40]
14.5 (10.1, 20.4)
Choudhury et al. 2013 - Bangladeshi SQ [37]
16.0 (3.0, 28.00)
Branco et al. 2010 - Spain [32]
23.0 (20.5, 25.7)
Assumpção et al. 2009 [31]
24.0 (21.0, 27.0)
Overall pooled prevalence (I² = 98.7%, p<0.001)
10.6 (8.6, 12.9)
0
5
10
15
20
25
30