

A systematic review of chronic fatigue, its syndromes and ethnicity: prevalence, severity, co-morbidity and coping

Sokratis Dinos,^{1*} Bernadette Khoshaba,¹ Deborah Ashby,² Peter D White,¹ James Nazroo,³ Simon Wessely⁴ and Kamaldeep S Bhui¹

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Background Chronic Fatigue Syndrome (CFS) is characterized by unexplained fatigue that lasts for at least 6 months alongside a constellation of other symptoms. CFS was historically thought to be most common among White women of higher socio-economic status. However, some recent studies in the USA suggest that the prevalence is actually higher in some minority ethnic groups. If there are convincing differences in prevalence and risk factors across all or some ethnic groups, investigating the causes of these can help unravel the pathophysiology of CFS.

Methods A systematic review was conducted to explore the relationship between fatigue, chronic fatigue (CF—fatigue lasting for 6 months), CFS and ethnicity. Studies were population-based and health service-based. Meta-analysis was also conducted to examine the population prevalence of CF and CFS across ethnic groups.

Results Meta-analysis showed that compared with the White American majority, African Americans and Native Americans have a higher risk of CFS [Odds Ratio (OR) 2.95, 95% confidence interval (CI): 0.69–10.4; OR = 11.5, CI: 1.1–56.4, respectively] and CF (OR = 1.56, CI: 1.03–2.24; OR = 3.28, CI: 1.63–5.88, respectively). Minority ethnic groups with CF and CFS experience more severe symptoms and may be more likely to use religion, denial and behavioural disengagement to cope with their condition compared with the White majority.

Conclusions Although available studies and data are limited, it does appear that some ethnic minority groups are more likely to suffer from CF and CFS compared with White people. Ethnic minority status alone is insufficient to explain ethnic variation of prevalence. Psychosocial risk factors found in high-risk groups and ethnicity warrant further investigation to improve our understanding of aetiology and the management of this complex condition.

¹ Centre for Psychiatry, Barts and the London School of Medicine and Dentistry, Queen Mary University of London, London, UK.

² Division of Epidemiology, Public Health and Primary Care, Imperial College London, London, UK.

³ School of Social Sciences, University of Manchester, Manchester, UK.

⁴ Department of Psychological Medicine and Psychiatry, Institute of Psychiatry, King's College London, London, UK.

* Corresponding author. Centre for Psychiatry, Barts and the London School of Medicine and Dentistry, Queen Mary University of London, Charterhouse Square, London EC1M 6BQ, UK. E-mail: s.dinos@qmul.ac.uk

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Chronic fatigue syndrome (CFS) is a debilitating condition characterized by unexplained fatigue that lasts for at least 6 months, accompanied by symptoms including headaches, unrefreshing sleep, muscle pain and cognitive difficulties such as memory and concentration problems.^{1,2} The terms 'CFS' and 'myalgic encephalomyelitis' (ME) are very often used interchangeably. The exact pathogenesis of CFS/ME is unknown. Several aetiological models have been proposed including a role for infection, endocrine dysfunction, autonomic nervous system imbalance, depressed mood and decreased immunity.³ The prevalence of CFS lies between 400 and 2500 adults per 100 000 population.⁴⁻⁶ A secondary analysis of World Health Organisation (WHO) data from 14 countries found the prevalence of disabling fatigue to be 1.69% (95% CI: 1.2–2.03).⁷ There are also significant costs in providing care and lost contributions to the workforce. In the USA, the annual cost to the community for each person with CFS is \$20 000.⁸ In the UK, the estimated costs over a 3-month period were £1906.⁹

The most widely used research definitions of CFS include the International criteria developed by the US Centers for Disease Control and Prevention,¹ and the UK Oxford criteria.⁴ Other fatigue conditions include chronic fatigue (CF: fatigue for 6 months), chronic fatigue-like syndrome (CFS-like: CFS symptoms that lasts for 6 months but without a medical examination), idiopathic chronic fatigue (ICF: CF with fewer than 4 of the accompanying symptoms necessary for a diagnosis of CFS), fatigue or unexplained fatigue.^{5,10} Both US and UK guidelines are similar in terms of duration and constellation of symptoms and in the list of conditions that are incompatible with a diagnosis of CFS.

A number of earlier reports have provided evidence suggesting that individuals with CFS are more likely

to be women (female:male ratio of 3:1), White, and of higher socio-economic status.⁶ However, evidence drawn from population samples suggests that the prevalence of CFS is actually higher for some minority ethnic groups than for White people,¹¹ and higher for individuals of lower socio-economic status than those of higher socio-economic status.² In contrast, the percentage of Non-white patients seen in tertiary care settings is relatively low.^{12,13} These findings raise questions about how people with CFS from diverse ethnic groups negotiate care pathways and why they are not recognized to have CFS or not referred to specialist centres for treatment.

This systematic review is the first to include all available literature on CF, its syndromes and ethnic minority status. Given the complexity of this condition and uncertainties about aetiology and treatment, studies that show higher risks of fatigue, CF and CFS in ethnic minority groups may help to provide knowledge about the balance of biological, social and psychological correlates and aetiological risk factors.

Methods

Search strategy

A computer-assisted systematic literature search was carried out. The bibliographic databases searched were: Embase, Medline, PsychLit, PsychInfo, Cochrane Collaboration database and Web of Science. The search terms used are presented in Table 1 (the complete search strategy is available on request).

All databases were searched from the beginning of their archives until and including January 2008. A further internet search was conducted with the Google search engine using the same search terms. The research team comprised experts on CFS and

Table 1 Literature search terms

CFS related	Ethnicity related
• Fatigue syndrome, Chronic	• Ethnic or racial aspects or exp cultural factor or exp
• Chronic Fatigue Syndrome.tw.	• ethnic difference or exp race difference
• CFS.tw.	• National groups.tw
• Myalgic encephalomyelitis.tw.	• Minority.tw
• Chronic Fatigue Disorder.tw.	• Country.tw
• Postviral Fatigue.tw.	• Country specific.tw
• Unexplained fatigue.tw	• exp ethnic groups/
• Medically unexplained fatigue.tw	• ethnic\$.tw.
• Fatigue.tw	• racial group\$.tw

included the charity 'Action for ME'. The research team were also consulted about additional publications on CFS and ethnicity.

Selection criteria

All publications on fatigue, CF and CFS including data on ethnicity were included in the review. The following inclusion criteria were applied.

- The article includes data on the following fatigue syndromes: CFS, CFS-like illness, ICF, CF, fatigue or unexplained fatigue.
- Studies were included if they presented data on at least two ethnic groups.

An ethnic group was defined in this review as a minority group or any group within any one country from which its cultural, racial, ethnic or national identity is different to the 'dominant' identity (or to the one shared by the majority) in their country of residence. We aimed to identify all studies comparing ethnic minorities; we did not exclude studies comparing racial groups as in some countries these are preferred as classifications of ethnic group. The only 'exclusion criterion' was to exclude any studies that compared fatigue syndromes in populations of different countries or different national cultures (e.g. France vs Germany).

Assessment of study quality

A quality scoring system was adapted from previous systematic reviews¹⁴⁻¹⁶ supplemented by new items related to the present review (Table 2). The important determinants of quality were clearly stated hypotheses, sample sizes, the use of operational definitions of ethnicity and fatigue syndromes, managing confounding and appropriate statistical handling and interpretation. Quality scores ranged from 0 to 23 and were summarized into three categories: low quality (0-7); medium quality (8-15); and high quality (16-23). Quality indicators of greatest importance for this review were appropriate and explicit classification of ethnic group and a valid measurement of CFS or fatigue syndromes. Therefore these were given additional weight in the quality scoring.

Data extraction, analysis and meta-analysis

Information was extracted from the identified papers by one reviewer. Extraction sheets were used and involved information on methods, design and statistical tests used in the study as well as results. All extracted information was then verified by a second reviewer using the original publication.

Prevalence data and meta-analysis

We extracted information on the overall number of participants from each ethnic group in each of the studies. We also identified the number of participants

from ethnic groups identified as having CF, CFS and/or CFS-like illness.

We completed two meta-analyses of prevalence data on CF and CFS by ethnic group. All studies in the meta-analysis were population-based with similar sampling strategies (e.g. population-based samples with and without CF and CFS) and with a similar design (e.g. all data extracted were cross-sectional). Therefore, homogeneity in terms of design and sampling strategy was a necessary condition before pooling studies for meta-analysis. Furthermore, as there is no evidence to suggest that CFS and CFS-like illness have different correlates, and there were too few studies of CFS-like illness for separate analysis, data for CFS and CFS-like illnesses were grouped together, under the CFS category. Studies included for comparisons between White people and specific ethnic groups were all based in the USA, further minimizing geographical bias and further improving homogeneity of the studies. Different studies contained different combinations of ethnic groups, but all contained a White group. In order to make best use of these data in meta-analysis with different ethnic groups in each study, a Bayesian 'mixed-treatments-comparison' approach was used with White people as the common baseline.¹⁷ This was fitted using WinBUGS software.¹⁸ The analysis was carried out on the logistic scale, but results have been transformed for presentation into Odds Ratios (ORs) with 95% confidence interval (CIs).

Observational data

The remaining evidence was brought together using narrative synthesis^{16,19} and is presented in tables using accepted conventions for reporting systematic reviews of observational data.²⁰ In addition to prevalence, three other themes by which the data are organized emerged from the studies: severity, coping with illness and co-morbidity.

Population and health service studies

Population studies provide more appropriate evidence of the true relationship between fatigue, CF, CFS and ethnicity because ethnic minorities are under-represented in health service studies.¹² Therefore, in this review, samples from health service studies were not included in the meta-analyses. Health service studies also received a lower quality scoring so even if these were included in the narrative synthesis they received less weight in drawing overall conclusions.

Results

Literature searches and quality assessment

The literature searches identified 535 publications (Figure 1). Titles and abstracts were assessed against the inclusion and exclusion criteria. In cases where the abstract was vague or unclear the full text was read.

Table 2 Scoring system for quality of paper**Hypotheses (maximum possible = 1)**

- The hypothesis/research question of the study not clearly described = 0
- The hypothesis/research question of the study clearly described = 1

Sampling (maximum possible = 6)^a

- Sample source and size (2)
 - Routine data = 0
 - Sample size: less than 50 per at least two ethnic groups = 1
 - Sample size: more than 50 per at least two ethnic groups = 2
- Type of sampling (2)
 - Consecutive patients or opportunistic = 0
 - Random representative of populations studied = 2
- Ethnicity categorization (2)
 - Third-party reports = 0
 - Self-reported = 1
 - Theoretical basis of ethnic categories = 2

Methodology (maximum possible = 13)

- Operationalization of CF (3)
 - No standardized measures (e.g. self-reported diagnosis) = 0
 - Operationalized criteria (e.g. Fukuda 1994) = 2
 - Standardized measures = 3
 - *If no standardized measures used or operationalized criteria applied what was the duration of symptoms*
 - <6 months = 0
 - ≥6 months = 1
- Coding of ethnicity (4)^b
 - Inappropriate ethnic groups combined (e.g. White vs all Asians) = 0
 - Reasonable combinations of groups (e.g. White Caucasian vs South Asians) = 3
 - Analysis performed without amalgamation (e.g. based on data as collected from census/self-reports/credible/authentic definitions of ethnic group) = 4
- Other explanatory variables in the analysis (e.g. confounders) (6)^c
 - No explanatory variables involved = 0
 - Age and/or gender and/or SES = 2
 - Age, gender, SES and risk factors (employment, household size, marital status) = 4
 - Age, gender, risk factors and other psychiatric conditions = 6

Statistical analyses and results (maximum possible = 3)

- Statistical analysis (1)
 - Statistical methods not described = 0
 - Statistical methods clearly described = 1
- Statistical outcomes (1)
 - Statistical outcome not clearly reported = 0
 - Statistical outcomes clearly reported (e.g. *P*- and *F*-values, CIs) = 1
- Results (1)
 - Research questions/hypotheses not clearly answered/tested = 0
 - Research questions/hypotheses clearly answered/tested = 1

^aSample size values. The sample size value of 50 participants per group has been chosen as this permits reasonable estimates of rates of CF.

^bUse of ethnicity categorization. Because we were interested in studies that explored the relationship between ethnicity and CF, CFS and fatigue the maximum points were given to those papers that conducted the analysis based on the census categories for definition of ethnic group without amalgamation.

^cAdjustment for confounding variables. From an overview of studies on CFS and ethnicity it became apparent that fatigue symptoms and CFS-like illness were significantly related to age, gender, SES and other psychiatric conditions (e.g. depression). Therefore, studies that tested the relationship between ethnicity and CF adjusting for these explanatory variables were given the maximum points.

At this stage 454 articles were eliminated as they did not meet our inclusion criteria. After reading the full text of the remaining 81 publications, 54 were further excluded as they did not meet the inclusion criteria.

The 27 papers that met all the inclusion criteria were subjected to backward citation (i.e. reference lists used in the papers) and forward citation (i.e. papers that had cited the included article) tracking. Backward citation tracking returned two further

publications that met the inclusion criteria. Forward citation resulted in two further publications that met the inclusion criteria. A list of the 31 papers to be included was sent to a panel of experts in order to identify any omissions; this provided two more publications, making a total of 33 papers entering the review.

Quality scores (Table 3) assigned to the papers ranged from 4 to 19. Cohen's kappa for inter-rater

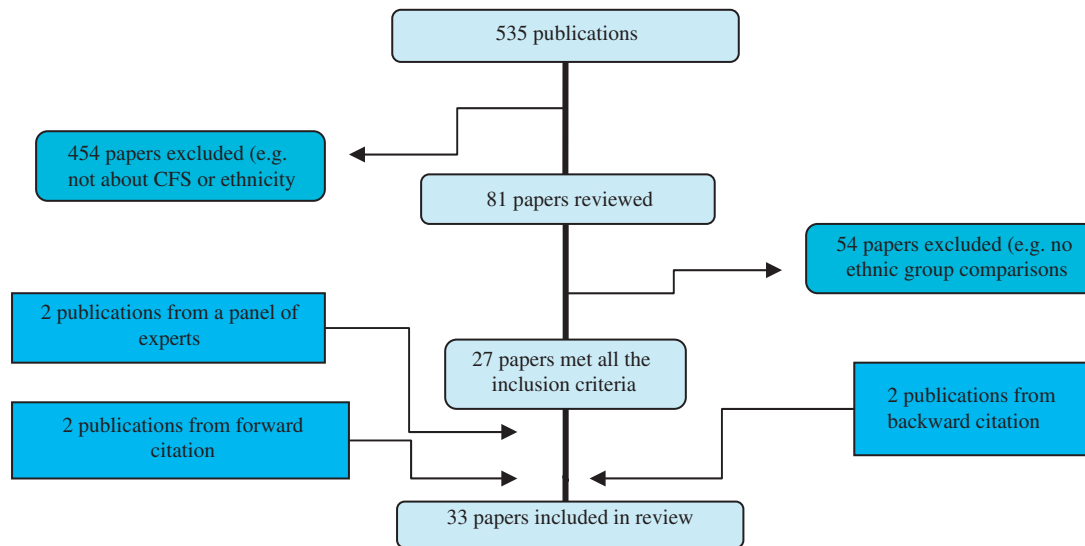


Figure 1 Flow diagram of the systematic review

agreement for scoring items in any one paper was very good ($\kappa = 0.7\text{--}0.8$); in 15 of the papers agreement was excellent (100% agreement).²¹

Methodological findings

Studies and papers

Seven papers recruited participants from health services (five from tertiary and two from primary care services) and 26 papers recruited participants from population settings (study design in Table 3); 13 papers were part of two large population-based surveys (i.e. Chicago Study^{11,12,22–29} and Wichita Study^{30–32}). Results from these 13 papers (i.e. Chicago and Wichita study) will be summarized and presented as two studies to avoid overlapping information from the same study. Similarly, the Chicago and Wichita studies were included in the meta-analysis as two studies and therefore there were no multiple entries of the same study. Therefore, although 33 papers entered the review, these included data from 23 studies (Table 3 describes all 33 papers; Table 4 describes all 23 studies).

Sample source (see Table 3)

Nineteen studies were conducted in the USA, two in the UK, one in Sweden and one in Brazil. Out of 23 studies, 15 involved a random sample of the population, whereas the remaining eight recruited their participants from service settings (two primary care and six tertiary care).

Ethnic groups

Table 3 summarizes the ethnic backgrounds of all the participants. All studies included White as an ethnic group for comparison. More often than not ethnic groupings were arbitrary. For example, in most

cases, ethnic group definitions were general overarching groups that included a number of subgroups. In particular, six studies used Asian as an ethnic category without making further distinctions between groups (e.g. Indian, Pakistani, Bangladeshi, Chinese, etc).^{11,33–37} Five studies used 'Blacks' as an ethnic group without making distinctions between different Black sub-groups.^{35–39} One study conducted in Brazil used a 'colour classification' (i.e. Yellow, Brown, Black).³⁹ Finally, seven studies compared White with Non-white groups.^{30,40–45} The small number of participants in some of the studies necessitated the aggregation of ethnic groups in the reported analyses.

Fatigue definitions

In all papers, CFS and CF were operationalized using validated instruments with good psychometric properties (Table 3). In the Chicago study, the CFS Screening Questionnaire was administered;⁴⁶ this was based on the international criteria of CFS.⁴⁷ Studies that recruited participants from tertiary care settings tended to rely on physician examination. CFS diagnoses from physician examination were based on DSM-III-R, or CDC 1988/94, or the international criteria. The criteria applied in all studies were unexplained, persistent or relapsing CF and the concurrent occurrence of four or more symptoms, all of which must have persisted or recurred during 6 or more consecutive months of illness and must not have predated the fatigue. Symptoms included memory and concentration problems, sore throat, tender lymph nodes, muscle and/or joint pain, headaches, sleep problems and post-exertional malaise lasting for >24 h. Seven studies examined fatigue only (e.g. daytime fatigue, recurrent fatigue) in relation to ethnicity.^{40,48–52,53}

Table 3 Descriptive table of included studies

References, sample size and response rate N (%)	Groups N (%)	Diagnosis and Study measure design	Results/Findings				Coping and illness behaviour	Co-morbidity	QS, kappa
			Prevalence	Severity	Prevalence	Severity			
Jason <i>et al.</i> ²³ N = 18 675 (65.1%), Chicago study, Stage 1	White, 9716 (percentage of NR) African American, 3692 Native American, 93 Asian, 1020 Multiracial, 263 Latino, 3450 Other, 240	CFS-like, CF, prolonged fatigue XS PB SS	CF: African American (+), Native American (+), Latino (++), multiracial (+++), CFS-like: Latino (++), Native American (+++), Multiracial (++), African American (+), Other (++)	CFS-like: African American (++) American (++) Native American (++) Latino (++) Multiracial (+++)	CF and current PTSD: Latino (+)*, Multiracial/other (+)* CF and lifetime PTSD: African American (+)*, Latino (+)*	19 (1.00)			
Song <i>et al.</i> ²⁵ N = 18 675 (65.1%), Chicago study, Stage 1	Caucasian (Ns and percentage of NR) African American Latino Asian American	CFS-like, CF, prolonged fatigue XS PB SS	CFS-like by gender, age, SES: African American (++) Latino (++)			19 (0.87)			
Song <i>et al.</i> ²⁶ N = 18 675 (65.1%), Chicago study, Stage 1	Caucasian, 9717 (percentage of NR) African American, 3692 Latino, 3450 Other, 1614	CFS-like, CF, prolonged fatigue XS PB SS	CFS-like by gender, age: African American (++) Latino (0), White (++)			19 (1.00)			
Jason <i>et al.</i> ¹¹ N = 213 (percentage of NR) African American Latino Other	White (Ns and percentage of NR) African American Latino Other	CFS OC CFS	CFS: African Americans (+), Latinos (+), Other (+)			12 (0.86)			
Jason <i>et al.</i> ²² N = 780, Chicago study, Stage 2	Caucasian, 301 (percentage of NR) African American, 185 Latino, 188 Other, 56	CFS OC CFS	Physical exertion: African American (++) Latino (++) Cognitive problems: Latino (++)			19 (1.00)			
Taylor <i>et al.</i> ²⁶ N = 301, Chicago study, Stage 2	White, 123 (percentage of NR) African American, 72 Latin American, 84 Multiracial/other, 21	CF SS PB	CF: Latino (+)			15 (1.00)			

(continued)

Table 3 Continued

References, sample size and response rate N (%)	Results/Findings					Co-morbidity	QS, kappa
	Groups N (%)	Diagnosis and study design	Prevalence	Severity	Coping and illness behaviour		
Torres-Harding <i>et al.</i> ²⁸ N = 780, Chicago study, Stage 2	White, 315 (percentage of NR) African American, 190 Latino, 197 Asian American, 23 Other, 55	CF OC	XS PB	CF: Non-white (0)	CF attributions: White (++), African American (++) than Latino		17 (0.86)
Jason <i>et al.</i> ²⁴ N = 166 (of 408), Chicago study, Stage 3	Caucasian, 15 (percentage of NR) African American, 5 Latino, 9 Asian American, 1 Native American, 1 Multiracial, 1	CFS-like SS and OC	XS PB	Throat pain: Non-white (+) Fatigue: Non-white (+) Headache: Non-white (+) Sleep: Non-white (+)	CFS-like, religious coping, denial, behavioural disengagement: Non-white (+) CFS-like, optimism: Non-white (0)		11 (1.00)
Jason <i>et al.</i> ¹² N = 32 (percentage of NR), Chicago study, Stage 3	White (Ns and percentage of NR) Black Latino Other	CFS OC	XS PB	CFS: Non-white in community (++) in comparison to tertiary care			14 (0.87)
Njoku <i>et al.</i> ²⁹ N = 70 (percentage of NR), Chicago study, Stage 3	European American, 33 (47%) African American, 16 (23%) Latino, 21 (30%)	CFS-like SS	XS PB				14 (0.81)
Addington <i>et al.</i> ⁴⁰ N = 1741, USA	White, 1059 (percentage of NR) Non-white, 682	Fatigue GFS	XS PB	Fatigue: Non-white (0)	CFS-like, denial: Non-white (+)		15 (0.74)
Alisky <i>et al.</i> ³⁸ N = 1544 (percentage of NR), USA	White, 1224 (79.3%) Black, 298 (19.3%) Hispanic, 13 (0.8%) Other, 9 (0.6%)	CFS Measure*	XS TCB	CFS: Black (+)			5 (0.81)
Bardwell <i>et al.</i> ⁴⁹ N = 104, USA	African American, 40 (percentage of NR) Caucasian American, 64	Fatigue GFS	XS PB	Fatigue by SES: White (0), African American (+)	Fatigue and depressive symptoms: African Americans (++)		15 (0.72)
Bardwell <i>et al.</i> ⁴⁸ N = 72, USA	African American, 30 (percentage of NR) Caucasian American, 42	Fatigue GFS	XS PB	Fatigue: African American (+)			15 (0.86)

(continued)

Table 3 Continued

References, sample size and response rate N (%)	Groups N (%)	Diagnosis and study measure design	Results/Findings				Qs, kappa
			Prevalence	Severity	Coping and illness behaviour	Co-morbidity	
Bierl <i>et al.</i> ⁴¹ N = 1055, USA	White, (Ns and percentage NR) Non-white	CFS-like, CF OC	CF: Non-white (0) CFS-like: Non-white (0)			11 (1.00)	
Buchwald <i>et al.</i> ³³ N = 690, USA	Caucasian, 651 (94.3%) African American, 15 (2.2%) Asian, 12 (1.7%) American Indian, 8 (1.2%) OC Hispanic, 4 (0.6%)	CF OC	CF: Non-white (0) CF: Non-white (0)	CF: Non-white (0)*	CF, emotional functioning, social support: Non-white (-) CF, attributions: Non-white (0)	8 (1.00)	
Buchwald <i>et al.</i> ⁴² N = 74 (NR%), USA	White, 125 (percentage of NR) Non-white, 13	CFS, CF OC	CF: Non-white (0)			4 (0.85)	
Gunn <i>et al.</i> ⁴³ N = 590 (percentage of NR), USA	White (Ns and percentage of NR) Non-white	CFS OC	CFS: Non-white (0) CFS: Non-white (-)			8 (1.00)	
Cho <i>et al.</i> ³⁹ N = 304, Brazil	White, 154 Yellow, 8 Brown, 90 Black, 52	CF SS	CF: Non-white (0)			15 (0.81)	
Kroenke <i>et al.</i> ⁵⁰ N = 13 538, USA	White, Ns NR (73%) Other, (27%)	Fatigue SS	Fatigue: white (+)*			11 (0.74)	
Mears <i>et al.</i> ³⁴ N = 901, USA	White, Ns NR (83%) Latino (10%) African American (4%) Asian (2%) Multiracial/other (1%)	Prolonged fatigue fatigue OC	Prolonged fatigue: Non-white (0)			18 (0.75)	
Reeves <i>et al.</i> ⁶⁰ N = 5623, USA	White (Ns and percentage of NR) Non-white	CFS OC	CFS: Non-white (0)			15 (1.00)	
Reyes-Gibby <i>et al.</i> ⁵¹ N = 274, USA	Caucasian, 235 (86%) African American, 15 (5%) Hispanic, 13 (5%) Other, 11 (4%)	Fatigue SS	Fatigue: Non-white (+)			15 (0.71)	

(continued)

Table 3 Continued

References, sample size and response rate N (%)	Results/Findings					Coping and illness behaviour	Co-morbidity	QS, kappa
	Groups N (%)	Diagnosis and Study measure design	Prevalence	Severity	Prevalence			
Rhee ³⁷ N = 20 000, USA	White, 10 009 (53.2%) Black, 4060 (21.6%) Hispanic, 3230 (17.2%) Native American, 156 (0.8%) Asian/Pacific Islander, 1369 (7.3%)	Recurrent Fatigue (12 months) GFS	XS PB	Recurrent fatigue: Non-white (0)			18 (1.00)	
Rimes <i>et al.</i> ⁴⁴ N = 842, UK	White (Ns and percentage of NR) Non-white	CFS, CF, prolonged fatigue (1 month) OC	P PB	Prolonged fatigue: Non-white (0) CF: Non-white (0) CFS: Non-white (0)			15 (0.87)	
Shefer <i>et al.</i> ³⁵ N = 3312 (82%), USA	White, Ns and NR (66.1%) Hispanic (12.7%) Asian (12.8%) Black (6.8%) Native American (1%) Other (0.5%)	CFS, CF, prolonged fatigue (1 month) Measure NR	XS PB	CF: Native American (++) Hispanic (+) Asian (-) CFS: All groups (0)			15 (1.00)	
Steele <i>et al.</i> ³⁶ N = 635 (68%), USA	White, 306 (4.5%) Asian, 77 (2%) Black, 73 (7%) Native American, 7 (9%) Hispanic, 118 (5.5%) Other, 29 (6%)	CFS-like OC	XS PB	CFS-like: Native American (++) Black (+++) Asian (-)			13 (1.00)	
Sundquist ² N = 2892 (68%), Sweden	Iranian, 293 (percentage of NR) Chilean, 571 Turkish, 351 Kurdish, 197 Polish, 568	Fatigue GFS	XS PB	Fatigue adjusted for age and gender: Iranian men (+), Iranian women (++), Chilean men (++) than Polish men Fatigue adjusted for exposure to violence and sense of coherence and acculturation and sense of control and economic difficulties and education: Non-Polish (0)			17 (0.76)	
Thomas <i>et al.</i> ⁵⁹ N = 93, USA	African American, 37 (percentage of NR) Caucasian American, 56	Fatigue GFS	XS TCB	Fatigue: African American (++)			13 (0.85)	

(continued)

Table 3 Continued

References, sample size and response rate N (%)	Results/Findings						
	Groups N (%)	Diagnosis and Study measure design	Prevalence	Severity	Coping and illness behaviour	Co-morbidity	QS, kappa
Viner <i>et al.</i> ⁴⁵ N = 11 261, UK	White (Ns and percentage of NR) Non-white	CFS PB	CFS: Non-white (0)				13 (0.71)
Reyes <i>et al.</i> ³⁰ N = 7,162, USA, Wichita study, baseline	White (Ns and percentage of NR) Non-white	CFS PB	CFS: Non-white (0)				11 (1.00)
Jones <i>et al.</i> ³¹ N = 153, USA, Wichita study, anytime	White (Ns and percentage of NR) African American American Indian Hispanic Other	CFS PB	CFS: Non-white (0)				10 (1.00)
Solomon <i>et al.</i> ³² N = 153, USA, Wichita study, anytime	White, 83 (percentage of NR) Non-white, 7	CFS PB	CFS: Non-white (0)				10 (1.00)

Study design: XS = cross sectional; P = prospective. Study type: PB = population-based; TCB = tertiary care based; PCB = primary care based. Measure: SS = standardized scale; OC = operationalized criteria; GFS = general fatigue scale. Key to results: (all comparisons are made with Whites, unless specified): ++ = strong positive association between CF, CFS, fatigue and ethnicity significant at $P < 0.05$ or OR between >1.50 and <2.00 ; + = moderate positive association between CF, CFS, fatigue and ethnicity significant at $P < 0.05$ or OR between >1.50 and <2.00 ; 0 = no association between CF, CFS, fatigue and ethnicity, $P > 0.05$ or odds ratio <0.75 and >1.50 ; - = moderate inverse association between CF, CFS and ethnicity (i.e. lower prevalence in minorities) significant at $P < 0.05$ or OR between >1.50 and <2.00 ; - = strong inverse association between CF, CFS and ethnicity significant at $P < 0.001$ or OR ≥ 2.00 ; *Statistically significant relationship but P -values not specified in the study. NR = Not Reported, Ns = Number of participants.

Table 4 Summary of positive, negative and no associations with ethnic group (studies not mutually exclusive)

	Positive association		No association		Negative association		Total studies with unique data	Total studies for each theme
	Population studies	Service studies	Population studies	Service studies	Population studies	Service studies		
Prevalence								17
CFS	2	1	6	1		1	11	
CF	2		3	2			7	
Fatigue			2		1		3	
Severity								7
CFS	1						1	
CF			1	1			2	
Fatigue	5						5	
Coping AND illness behaviour								2
CFS	1						1	
CF		1					1	
Co-morbidity								3
CF	1					1	2	
Fatigue	1						1	

Positive association: observed in the ethnic minority sample; no association: not observed in a particular ethnic minority; negative association: observed in the majority (White) group

The data are presented by: (i) prevalence of CFS, CF and fatigue, including meta-analysis of CFS and CF data; (ii) severity of CFS-related symptoms; (iii) coping and illness behaviour (e.g. locus of control, attribution styles) in patients with CFS; and (iv) co-morbidity of psychiatric disorders in CFS, CF and fatigue (Table 4).

Prevalence of CFS, CF and fatigue according to ethnicity

Seventeen studies explored the prevalence of CFS, CF and fatigue in different ethnic groups (see Table 3 for summary and Supplementary Table 6 in online version for details) (Supplementary data are available at *Int J Epidemiol* online). A distinction in the narrative is made between service- and population-based studies as only results from the latter can give a true picture of the relationship between fatigue syndromes in population samples including ethnic groups.

CFS prevalence

Eleven studies in total explored the relationship between CFS and ethnicity. Eight of the studies were population-based and three were service (tertiary care) based. Two population-based studies^{11,36} found a higher prevalence of CFS in ethnic minorities when compared with the White majority, whereas six found no association.^{30–32,41,42,44,45,54}

Looking at service studies, one³⁸ found a higher prevalence of CFS in ethnic minorities than in Whites, one³³ found no association between CFS and ethnicity and one⁴³ found Non-whites to have a lower likelihood of having CFS compared with Whites.

There were no observable differences of overall quality scores between studies that found a relationship between CFS and ethnicity and studies that did not. However, studies that found a higher prevalence of CFS in ethnic minority groups conducted analyses without aggregation of ethnic sub-groups, whereas studies that found either no relationship or a negative relationship conducted analyses between Whites and an aggregated category of Non-whites.

CF prevalence

Seven studies in total explored CF and ethnicity of which five were population-based.^{11,35,41,42,44} Two population studies^{23,35} found that ethnic minorities such as Native Americans, Latinos and African Americans were more likely to report CF, whereas the other three found no association.

One study included a sample from tertiary care³³ and one included a sample from primary care.³⁹ These service-based studies found no association between CF and ethnicity.

The population studies that found a relationship between CF and ethnicity received higher quality scores than service studies that found no associations.

Fatigue prevalence

Four studies reported on fatigue, three of which were population-based. Out of the three population studies, one study found a higher prevalence of fatigue in White people compared with others (unspecified ethnicities⁵⁰), whereas the other two found no

Table 5 Meta-analysis results

Ethnic group	CF		CFS	
	OR (No of studies)	95% CI	OR (No of studies)	95% CI
White	1 (n5)		1 (n7)	
Asian (unspecified)	0.69 (n2)	0.44–1.04	0.097 (n1)	0.004–0.65
African American	1.51 (n2)	1.03–2.24	2.95 (n1)	0.69–10.4
Hispanic	1.68 (n2)	1.12–2.38	1.06 (n1)	0.25–4.04
Native American	3.28 (n2)	1.63–5.88	11.5 (n1)	1.08–56.4
Non-white (aggregated)	0.69 (n3)	0.42–1.22	0.8 (n6)	0.47–1.52
Other (unspecified) than non-white	1.46 (n2)	0.84–2.55	1.66 (n1)	0.20–8.31
Mixed ethnicity	1.76 (n1)	0.88–3.35	NA	NA

Meta-analysis was based on eight population-based studies that provided data on number of participants with and without CF, and CFS or CFS-like illness by ethnic group, by Whites and non-whites. NA = Not Applicable.

associations between ethnicity in fatigue in adolescents³⁷ and adults.⁴⁰

The remaining study was primary care based and found no association between ethnicity and fatigue in adolescents.³⁴

Meta-analyses

CFS prevalence

Data for meta-analyses of prevalence of CFS by ethnic group came from 7^{23,30,36,41,42,45,53} out of the 11 population-based studies.

Findings were of a higher prevalence of CFS amongst some ethnic minority groups (Table 5). In particular, Native Americans (OR = 11.5, 95% CI: 1.08–56.4) were more likely to have CFS. However, the small sample of Native Americans with CFS may have led to an imprecise estimate of risk (wide CIs).

The results of the meta-analyses were in accord with the findings of the narrative synthesis, which indicated that statistical analysis using aggregated Non-white people as a group often found no relationship between ethnic group and prevalence of CFS. Therefore, not all ethnic groups have a higher prevalence of CFS; however, specific ethnic groups may be at higher risk of CFS (e.g. Native Americans and possibly African Americans).

CF prevalence

Meta-analysis was conducted for the four population studies that explored the prevalence of CF in relation to ethnicity.^{23,41,42,44} Ethnic minority groups were more likely to report CF than White people (Table 5). In particular, African Americans (OR = 1.56, 95% CI: 1.03–2.24), Hispanics (OR = 1.68, 95% CI: 1.12–2.38) and Native Americans (OR = 3.28, 95% CI: 1.63–5.88) were more likely to report CF than White people.

Severity of symptoms

Seven studies, six of which were population-based, presented evidence on ethnicity and the severity of

CFS symptoms (one study), CF (two studies) and fatigue without a time frame (five studies); (see Table 3 for summary and Supplementary Table 7 for online version) (Supplementary data are available at *Int J Epidemiol* online).

CFS

The Chicago population study found that ethnic minorities with CFS were more likely to report more severe symptoms such as more severe fatigue than White people.^{22–24} There were interactions between ethnicity and other demographic variables in the severity of CFS symptoms. For example, Latino females and Latinos of higher socio-economic status experienced more severe CFS symptoms than their African American and White counterparts.²³

CF

The Chicago population study²⁸ and one tertiary-care-based study³³ yielded no associations between fatigue severity and ethnicity in CF patients.

Fatigue

Five of eleven population studies found that ethnic minority groups reported greater levels of general fatigue,^{48,51} greater physical (as opposed to mental) fatigue⁵⁵ and greater daytime fatigue.⁵² Socio-economic status was found to moderate the relationship between fatigue and ethnicity in that African Americans of any socio-economic status were more likely to experience more severe fatigue when compared with middle and upper-class Caucasian Americans.⁴⁹

Coping and illness behaviour

There were two studies that explored coping and illness behaviour, one of which involved people with CFS in the population (i.e. Chicago study^{24,28,29}) and one included people with CF in a specialist tertiary service³³ (see Table 3 for summary and Supplementary Table 8 for online version) (Supplementary data are available at *Int J Epidemiol* online).

CFS

The Chicago population study found that ethnic minorities were more likely to 'use' religion and denial to cope with their illness and were also more likely to appear less optimistic about life than White people.^{24,29} Looking at the attribution styles, White and African American people with CFS were more likely to report physical attributions than Latino people.²⁸

CF

The one service-based study³³ that reported on CF found that ethnic minority groups with CF exhibited poorer emotional functioning and reported less social support from friends and families than White people with CF. With regards to attribution styles, there was no association between attributions and ethnicity.

Chronic fatigue and co-morbid psychiatric disorders

Three studies, two of which were population-based, explored the relationship between CF, fatigue and co-morbid psychiatric disorders in ethnic minorities (see Table 3 for summary and Supplementary Table 9 for online details) (Supplementary data are available at *Int J Epidemiol* online).

CF

The Chicago population study²⁷ found that minorities with CF were more likely to report higher rates of current (i.e. Latin Americans, Multiracial/other) and lifetime (i.e. African Americans, Latin Americans, other) post-traumatic stress disorder (PTSD) than White people. In contrast, a specialist service-based study found that White people with CF were more likely to report lifetime major depression and lifetime alcohol abuse than individuals from ethnic minority groups.³³

Fatigue

One population study showed that depressive symptoms were more likely to accompany fatigue in African Americans than in White Americans.⁴⁸

These three studies received a medium quality score and although they showed associations between fatigue, CF and co-morbidity, the co-morbid diagnostic categories were not consistent across studies, making it hard to reach broader conclusions.

Discussion**Is there a higher risk of CFS and CF in ethnic minorities?**

The narrative synthesis and the meta-analyses of population studies in the USA demonstrate a higher prevalence of CF and CFS in some ethnic minority groups compared with White people. The higher risk of CF and CFS may be specific to certain ethnic groups, such as Native Americans and African

Americans in the USA. However, this result needs to be replicated in future research as there were only two studies for CF and only one study for CFS that compared Native American and African American with White people and all three studies found a higher prevalence of CF and CFS in ethnic minority groups.

Studies that found a higher risk of CFS in ethnic minority groups were more likely to be population-based, perhaps exposing a selection bias in service-based studies, or that ethnic minorities with CFS are not referred to specialist centres. Future research should investigate reasons for, and the extent of, ethnic variations of care pathways from the community through to specialist services.

In contrast to the findings for CF and CFS, studies that explored fatigue symptoms without a time-frame did not find any associations with ethnicity. Therefore, fatigue symptoms cannot simply be seen as a precursor of CF and CFS, and they may have a different origin to fatigue complaints in CF or CFS.

CF and CFS prevalence: social or ethnic disadvantage

Studies that adjusted for individual characteristics other than ethnicity, found that socio-demographic factors were important explanatory variables and partially accounted for the relationship between CFS, CF, fatigue and ethnic minority status. Although men were less likely than women to experience CFS, Latino females and Latinos of higher socio-economic status had higher levels than African American and White females.²⁴ Age was also of particular importance. CFS tended to be more prevalent in the older ethnic minority people.²⁵ Age, gender and socio-economic status were also found to interact with ethnicity in people who reported fatigue.⁵²

The higher risk of CFS among Native Americans and African Americans needs to be discussed in the light of the reported health status disparities between White people and other racial groups in the USA. For example, the Office of Minority Health & Health Disparities (OMHD) reported that both Native Americans and African Americans have poorer health, whereas Native Americans have a disproportionately high prevalence of substance abuse problems (i.e. alcohol and illegal drugs) compared with White people.⁵⁶ Although the studies included in the systematic review did not provide data on physical health and/or substance misuse, such disparities in prevalence may help to explain the higher prevalence of CFS in these ethnic groups.

Data from the systematic review are too limited to draw conclusions about psychiatric co-morbidity with CFS, CF, and fatigue and any patterns of co-morbidity across ethnic groups. Previous studies show a higher prevalence of some mental health problems in some ethnic groups in the USA.^{57,58} The higher prevalence of mental health problems and physical illness in

ethnic minority groups in the USA may explain the higher prevalence of CFS (which may be co-morbid with psychiatric disorder) in some ethnic minority groups. A number of factors may be implicated in these ethnic disparities in physical and mental health. In particular, the US literature reviewed shows that ethnic minority groups tend to have lower socio-economic status than White people, poorer educational achievement, and lower job skills alongside language barriers, conflict between ethnic sub-groups (e.g. Latinos), and other forms of social deprivation.^{24,29} Mexican Americans and Puerto Rican Americans, for example, are among the most socially and economically deprived groups in Chicago.¹¹ Such social factors associated with ethnic minority groups may be risks for CFS and may operate in some groups more than others. These factors operating through ethnic minority status may place individuals in specific ethnic minority groups at higher risk of CFS. However, ethnic minority status does not appear to be an inevitable risk factor. Comparison of the prevalence rates of unexplained fatigue among primary care attenders in 14 countries suggested that unexplained fatigue did not differ between countries with distinct national cultures and at different stages of economic development.⁵⁹ Therefore, the role of culturally and ethnically specific risk factors along with ethnic minority status as a cause of health inequalities needs further elucidation. This will help to develop appropriate and effective clinical and public health interventions, and improve our understanding of aetiology and the relative importance of psychosocial, biological and cultural factors.

Symptom severity: social or ethnic disadvantage

More severe specific symptoms among ethnic groups included sore throats, headaches and sleep problems; poorer general health was also reported more often in ethnic minority groups compared with White people. Symptom severity may be greater among ethnic groups because:

- More social disadvantage among ethnic minorities is known to be associated with poorer health in general and inequalities of access to appropriate services.¹¹
- Historically, ethnic groups have been found to report unexplained somatic symptoms to a doctor with greater frequency than White people.^{60,61} It is possible that physical symptoms are emphasized when seeking help from doctors, and social and other complaints are selectively under-reported. Consequently, CFS may not be considered if numerous somatic complaints are presented to clinicians; and so CFS may again go untreated or undetected.
- Ethnic minorities are more likely to experience ethnic specific adverse life events such as

discrimination and traumatic events;⁵⁴ these may lead to poorer physical and mental health. Symptoms of both mental illnesses and other medical conditions are the same as CFS symptoms. Therefore, adjustment for physical and mental health is important in future analyses.

Coping and care pathways

Care pathways and coping behaviours are known to vary by ethnic group for a number of medical conditions, including diabetes,⁶² cardiac conditions⁶³ and mental health problems.^{54,64–70} Different ways of coping with fatigue and fatigue syndromes may explain the lower prevalence and under-representation in secondary and tertiary healthcare services. Two studies reported that minorities were more likely to use religion, denial and behavioural disengagement to cope with their illness, and there is some suggestion that physical attributions are more common among some ethnic minority groups. The impact of such variations in coping on outcome should be part of future research efforts.

Limitations and future directions

The majority of the studies reviewed were conducted in the USA. This may limit the extent to which these findings may be generalized to other countries. The two studies conducted in the UK^{44,45} undertook analysis comparing White people with aggregated non-white people and therefore are less useful in explaining ethnic and cultural influences.

The conclusion that both CF and CFS were more prevalent in some ethnic minority groups compared with White people was from population studies. However, service-based studies were also considered in the narrative synthesis of this review. Samples drawn from service-based studies may be indicative of racial-ethnic differences in the use of services, coping and help-seeking behaviour for CF and CFS.^{12,70}

On the whole the ethnic groupings used in the studies reviewed were not conceptually consistent across studies. For example, all studies that recruited Asian participants did not differentiate between ethnic sub-groups (e.g. Indian, Pakistani, Bangladeshi, Chinese, Korean, Japanese, etc.), which makes results difficult to disentangle. Two of the studies that involved aggregated Asians found that being Asian was a protective factor against CFS^{35,36}—a trend supported by the meta-analysis. A similar argument can be made for the Latino and the Black groups as the former included Mexicans and Puerto Ricans, whereas the latter involved African Americans and Caribbean Americans. Both groupings comprise two distinct sub-groups. Furthermore, studies that conducted analyses without aggregation of ethnic sub-groups were more likely to demonstrate a relationship between CFS, CF and specific ethnic groups. This argues for research on more specific and well-defined

ethnic sub-groups to avoid confounding due to ill-defined ethnic group definitions.

The main reason that studies combined different ethnic groups was to overcome small numbers of subjects from a specific ethnic minority group for statistical analyses. Small sample sizes limited the between and within group analyses and also had limited statistical power to demonstrate ethnic differences. A limitation of small sample sizes in specific ethnic groups also applies to the meta-analysis for CFS in the present study. Although Native Americans were more likely to have CFS than White people (suggesting that power was sufficient to detect associations), the small sample size suggests that the result should not be overstated. Although there were multiple between-group comparisons in the meta-analyses, results were interpreted cautiously and only results with sufficient effect sizes were underlined.

There is some evidence that self-report measures perform differently across different racial-ethnic groups.⁷¹ For example, a relationship has been found between choosing extreme response categories in self-report measures and ethnicity.⁷² Furthermore, many epidemiological studies in the USA and the UK use outcome measures that were validated with White samples or were directly translated to a different language without further cross-cultural and/or local validation.⁷³ Along these lines, studies that utilized self-report instruments to measure CF and CFS did not provide evidence on the cross-cultural validity of the instruments used, which could have impacted on the prevalence rates reported. However, in all but one of the studies used in the meta-analyses, CF and CFS diagnoses were based on physician examination, which minimizes the possibility that higher prevalence of CF and CFS in some ethnic groups was due to the use of self-report measures.

Conclusion

CF and CFS are more common in some ethnic minority groups, but ethnic minority status does not always confer a risk. Although CF and CFS show an association with ethnicity, fatigue does not. Specific factors related to higher risk in these ethnic groups warrant further research, which should distinguish between fatigue, CF and CFS syndromes more precisely. Studies should also investigate coping, co-morbidity and pathways into care.

At this stage it is not clear which cultural factors explain ethnic variations in prevalence. For example, ethnic minority groups have to manage the social stresses of acculturation, discrimination and economic inequalities. In addition, preliminary work implicates genetic influences on immune response⁷⁴ and exercise tolerance⁷⁵ both of which are important in CFS aetiology. Similar work is needed with diverse ethnic minority groups.

Studies of CFS, CF and ethnicity may improve our knowledge about the relative contribution of psychosocial and biological risk factors for this complex illness. Future studies should investigate care pathways, and outcomes, and how these are influenced by ethnic variations of illness perceptions and ways of coping with this chronic and poorly understood illness.

Supplementary Data

Supplementary data are available at *IJE* online.

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KEY MESSAGES

- CF and CFS are more common in some ethnic minority groups, but ethnic minority status does not always confer a risk.
- The higher risk of CF and CFS may be specific to certain ethnic groups, such as Native Americans and African Americans in the USA.
- Fatigue is not associated with ethnicity and cannot be seen as a precursor of CF and CFS, as it may have a different origin to fatigue complaints in CF or CFS.
- Ethnic minority groups reported more severe CFS specific symptoms including sore throats, headaches and sleep problems compared with Whites.
- Studies that found a higher risk of CFS in ethnic minority groups were more likely to be population-based, perhaps exposing a selection bias in service-based studies, or that ethnic minorities with CFS are not referred to specialist centres.

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