Diagnoses Based on the Research Diagnostic Criteria for Temporomandibular Disorders in a Biracial Population of Young Women

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Aims: *To compare the clinical characteristics of diagnostic subtypes of temporomandibular disorders (TMD) based on the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) in terms of physical findings (Axis I) and psychosocial findings (Axis II) among Caucasian and African American young women. An ancillary goal was to assess the value of using self-reported TMD pain as a screening tool compared to RDC/TMD examinations.* ***Methods:*** *A biracial community sample (n = 830) of young women 19 to 23 years old was screened for facial pain with the Chronic Pain Grade questionnaire. Patients were considered to be putative cases of TMD if they reported facial pain present within the last 6 months; putative controls had no facial pain history or jaw symptoms. Women with facial pain more than 6 months ago and jaw symptoms (jaw symptom-past pain, JSPP group) were added. 129 women were clinically examined for TMD diagnosis for final confirmation of case-control status.* ***Results:*** *41 of 43 Caucasian and 11 of 18 African American putative cases were confirmed as cases; 9 of 27 Caucasians, but 0 of 17 African Americans from the JSPP group were confirmed as cases. All 24 putative controls were confirmed as controls. Based on RDC/TMD Axis I, 80% of 61 cases were muscle-related diagnoses, 33% as disc-related diagnoses, and 48% as arthralgia/arthritis/arthrosis. Based on Axis I, there were no significant differences in diagnoses between African American and Caucasian women. Based on Axis II, cases had significantly greater depression (*P = .002*) and somatization with pain (*P < .001*) than controls as expected. African Americans had significantly greater somatization with pain than Caucasians (*P = .020*). There were no other significant racial differences.* ***Conclusion:*** *Among young women reporting facial pain, clinical TMD subtypes, pain impact, treatment utilization, and additional characteristics other than somatization with pain were similar between races. A high percentage of these young non-clinical cases presented severe depression and somatization.* J OROFAC PAIN 2005;19:65–75

Key words: African Americans, Caucasians, examinations and diagnoses, case-control studies, sensitivity and specificity

There is a paucity of data assessing racial and ethnic differences among patients diagnosed with temporomandibular disorders (TMD).[1] The authors' previous report showed that the prevalence of self-reported orofacial pain and symptoms related to TMD was about twice as high in young Caucasian women as in young African American women of comparable

socioeconomic status.[2] The Caucasian group also reported significantly earlier onset of TMD-related symptoms compared to African American women. Most published studies using validated diagnostic criteria for TMDs refer to Caucasian populations from North America[3–5] or European countries.[6–8] A more racially and ethnically diverse study compared data from an Asian clinical population from Singapore with data from populations from the United States and Sweden.[9] The goal of this report was to compare the clinical characteristics of diagnostic subtypes of TMD based on the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[10] clinical examinations in terms of physical findings (Axis I) and psychosocial findings (Axis II) in Caucasian and African American young women. An ancillary goal was to assess the value of using self-reported TMD pain as a screening tool compared to RDC/TMD examinations and to compare this value between Caucasian and African American young women.

Materials and Methods

Participants

The target sample was an established cohort of 887 young women who were 19 to 23 years old at the time of this investigation (March 1998 to June 2000). They were recruited as children in 1987 for the California center of the longitudinal, multicenter National Heart, Lung and Blood Institute Growth and Health Study (NGHS). NGHS enrolled 9- and 10-year-old African American and Caucasian girls from public and parochial schools of the socioeconomically and racially diverse Richmond Unified School District in west Contra Costa County, California, to investigate growth changes and risks of developing cardiovascular disease in women. The study population included approximately equal numbers of African American and Caucasian girls, with socioeconomic diversity in each racial group. Enrollees resided within racially congruent households self-identified as either non-Hispanic African American or non-Hispanic Caucasian. Parents or guardians consented to subjects' participation; the subjects gave their consent as well. Parents or guardians provided data on socioeconomic status (SES) variables such as education, family structure, and household income. A detailed description of study methodology has been previously published.[11]

Eight hundred thirty of the cohort members participated in this study of TMD. More than 90% of the participants were 20 to 22 years old. Of the 830 women, 411 were Caucasian and 419 were African American. Institutional review boards at the University of California at San Francisco and the University of California at Berkeley approved this study. NGHS personnel contacted the young women via telephone to obtain informed consent and administer the screening questionnaires. One examiner (OP) trained and calibrated according to the RDC/TMD[10] performed all clinical examinations.

Screening Questionnaire

The instrument was adapted from the chronic pain grade (CPG) questionnaire previously used by researchers at the University of Washington for prevalence studies of TMD and other chronic pain conditions.[12] The instrument included questions about demographics and SES (employment/student status, marital status, degrees earned, and education level) and identical sets of questions about common pain conditions that lasted a day or more and occurred several times a year in 5 anatomic areas: low back, head, jaw/face, abdomen, and chest. Minor and brief pains were to be excluded. Subjects were asked: "Have you **ever** had a problem with facial pain or pain in the jaw muscles, the joint in front of the ear, or inside the ear? (Do not include pain from ear infections.)" Those with lifetime facial pain were asked if the pain had been present in the last 6 months or more than 6 months ago (past pain). In addition, participants were asked how often (never, rarely, sometimes, often, or always) they experienced the following jaw symptoms: jaw joint sounds such as clicking or popping; jaw ache or stiffness upon waking; jaw pain after chewing or eating; bruxism, ie, tooth grinding or jaw clenching; headaches upon waking; and jaw locking or catching, a symptom often associated with TMD.[10]

The authors identified from the CPG questionnaire putative TMD cases and controls for clinical examination based on the history of facial pain present in the last 6 months. In the screening questionnaires, 52 of the Caucasians (13%) and 25 of the African Americans (6%) reported facial pain in the last 6 months and were considered putative TMD cases. Because of the relatively small number of cases identified and the failure to schedule all such patients for examination, the authors also examined 27 Caucasian and 17 African American women who reported facial pain more than 6 months ago with other jaw symptoms reported as "sometimes," "often," or "always." This group was termed the jaw symptom-past pain (JSPP) group.

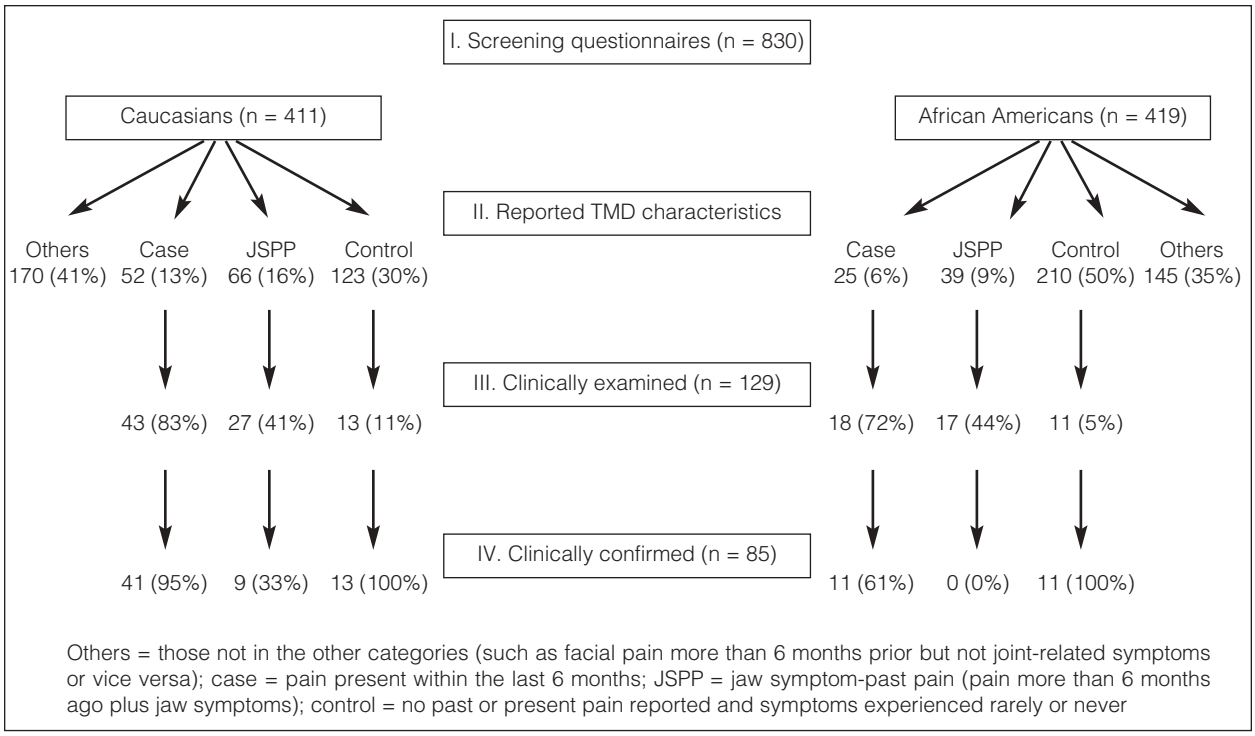

Fig 1 Flowchart for study design and sample size by race.

The initial study protocol required putative controls to have no history of any of the 5 body pains. These stringent criteria were relaxed more than halfway through the study, when the rarity of such individuals was noted. Thus, subjects who reported no past or present facial pain and rarely experienced jaw symptoms, locking, or catching served as putative controls. Twenty-four (13 Caucasian and 11 African American) putative controls were examined. Additional women who had already been screened and met these less stringent criteria could not be scheduled for subsequent clinical examinations.

Although attempts were made to examine all putative cases, only 83% (n = 43) of Caucasians and 72% (n = 18) of African Americans were successfully scheduled for examination (Fig 1). The JSPP group comprised 44 subjects (27 Caucasians and 17 African Americans). Putative controls, a total of 24 women (13 Caucasians and 11 African Americans) who met the aforementioned criteria, were also clinically examined to verify control status. The amount of time between administration of the screening questionnaire and the examination ranged from 1 day to 2 years because of logistics and travel schedules. However, time between screening and examination did not appear to differ by race (means ± standard deviations, 113 ± 181 days for Caucasians and 108 ± 177 days for African Americans; median, 24 days for Caucasians and 21 days for African Americans). Nor did it appear to be related to case-control status confirmation, as kappa (κ) statistics assessing agreement between screening and examination for time quartiles showed no consistent pattern of decreasing confirmation over time (0.72, 0.45, 1.00, 0.69; stratified κ: 0.68).

Clinical Examination for TMD (Axis I)

The RDC/TMD present a dual-axis system: Axis I to record clinical physical findings and Axis II to record psychological findings (depression, somatization), psychosocial status (CPG for assessing pain severity and life interference), and functional findings (eg, mandibular functional disability). The RDC/TMD Axis I examination assesses the ranges of motion of the jaw, joint sounds, and tenderness to palpation of the jaw joints and muscles. Based on the RDC/TMD Axis I criteria, cases are classified into 3 groups: masticatory muscle disorders (group I), disc displacements (group II), and arthralgia, arthritis, or arthrosis (inflammatory or degenerative joint disease) (group III). These diagnoses are not mutually exclusive; 2 or 3 diagnoses can coexist. Group I has 2 subcategories: myofascial pain (Ia) and myofascial pain with limited opening (Ib). Group II has 3 subcategories: disc displacement with

reduction (IIa), disc displacement without reduction and with limited opening (IIb), or disc displacement without reduction and without limited opening (IIc). Group III has 3 subcategories: arthralgia (IIIa), osteoarthritis of the temporomandibular joint (TMJ) (IIIb), or osteoarthrosis of the TMJ (IIIc).

TMD Questionnaire (Axis II)

The RDC/TMD Axis II questionnaire[10] assesses pain intensity, pain-related disability, depression, and somatization. Based on pain intensity and pain-related interference with daily activity, the participant's condition was classified as grade 0 (no TMD pain in the last 6 months); grade I (low disability; low-intensity pain); grade II (low disability; high-intensity pain); grade III (high disability; moderately limiting pain); or grade IV (high disability; severely limiting pain). Depression and somatization were scored as normal, moderate, or severe with the modified Symptom Check List-90 (SCL-90-R, Depression and Vegetative Symptom Scales). Somatization was scored with and without the pain items. Additional questionnaires assessed jaw disability, self-rated health (excellent, very good, good, fair, or poor), and treatment-seeking behavior. All these parameters were determined at the clinical examination visit.

Data Analysis

Diagnoses between races were compared with chi-square tests, (extended) Mantel-Haenszel chi-square tests with standardized midranks adjusting for factors (eg, SES) 1 at a time, and logistic regression adjusting for multiple factors simultaneously. Differences between races in vertical ranges of motion (unassisted without pain, maximum unassisted, and maximum assisted) were assessed overall with multivariate analysis of variance (MANOVA), and following MANOVA significance, each range of motion was compared between races with linear regression, adjusting for case-control status. Regression diagnostics were performed to assess model fit. Multiplicity-adjusted stepdown bootstrap Fisher exact tests, which are more efficient than Bonferroni adjustment,[13] were used to compare jaw symptom checklist items between races. Relationships between ordinal self-rated health and ordinal Axis I and Axis II diagnoses were assessed with Spearman correlations (r_s) and partial Spearman correlations adjusting for SES ($r_s|$SES) or race ($r_s|$race).

Results

Case-Control Status

Based on the clinical examination of putative cases, 41 of 43 Caucasians (95%) and 11 of 18 African Americans (61%) fulfilled the RDC/TMD criteria, a statistically significant difference (P = .002) (Fig 1). In addition, 9 of the 27 Caucasians in the JSPP group were confirmed as cases, versus 0 of 17 African Americans, a statistically significant difference (P = .008). Of the 24 putative controls, none (0%) was found to have TMD; all (100%) were confirmed as controls.

The above percentages relate to predictive values, which are influenced by prevalence. Overall, 61 of 61 (50 Caucasian and 11 African American) were identified as cases or placed in the JSPP group, for a sensitivity (Sn) of 100% (95% CI: 93%–100%); only 24 of 68 noncases were correctly identified as controls at screening, for a specificity (Sp) of 35% (95% CI: 25%–47%), since there were 0 false negatives but 44 false positives. However, Sn and Sp do not differ by race as predictive values do: For Caucasians, Sn was 100% (95% CI: 91%–100%) and Sp was 39% (95% CI: 25%–56%); for African Americans, Sn was 100% (95 CI: 70%–100%) while Sp was 31% (95% CI: 19%–48%). Therefore, based on RDC/TMD clinical examinations, a total of 61 cases (50 Caucasians and 11 African Americans) and 24 controls (13 Caucasians and 11 African Americans) met final case-control status definitions. The remainder of this report concerns only these 85 confirmed participants.

Clinical Examination (Axis I)

Table 1 shows the RDC/TMD Axis I classification of clinical subtypes overall and by race. Overall, the highest percentage of cases (n = 49, 80%) was diagnosed with masticatory muscle-related disorders (group I), 29 without limited opening (group Ia) and 20 with limited opening (group Ib). For each diagnosis, the majority of those diagnosed were Caucasian (Table 1). Thirty-three percent of cases were diagnosed with disc-related diagnoses (group II); an even higher percentage of them (95%) were Caucasians. Forty-eight percent of cases were diagnosed with arthralgia/arthritis/arthrosis (group III); again, the majority (83%) were Caucasian. The 3 diagnostic groups are not mutually exclusive; multiple diagnoses were possible. As Fig 2 shows, 12 case subjects presented with both a masticatory muscle disorder and

Table 1 Subtypes of TMD Diagnoses Based on RDC/TMD Axis I by Race

RDC/TMD Diagnosis*	Caucasian (n = 50)	African American (n = 11)	Total (n = 61)
I. Muscle	41 (82%)	8 (73%)	49 (80%)
Ia. Myofascial pain without limited opening	23 (56%)	6 (75%)	29 (59%)
Ib. Myofascial pain with limited opening	18 (44%)	2 (25%)	20 (41%)
II. Disc Displacements	19 (38%)	1 (9%)	20 (33%)
IIa. Disc displacements with reduction	19 (100%)	1 (100%)	20 (100%)
IIb. Disc displacements without reduction with limited opening	0 (0%)	0 (0%)	0 (0%)
IIc. Disc displacements without reduction or limited opening	0 (0%)	0 (0%)	0 (0%)
III. Arthralgia, Arthritis, Arthrosis†	24 (48%)	5 (45%)	29 (48%)
IIIa. Arthralgia	20 (83%)	5 (100%)	25 (86%)
IIIb. Osteoarthritis	5 (21%)	0 (0%)	5 (17%)
IIIc. Osteoarthrosis	0 (0%)	0 (0%)	0 (0%)

*Categories are not mutually exclusive, as shown in Fig 2.
†Subcategories may not add to category, as left and right sides may have different subcategories.

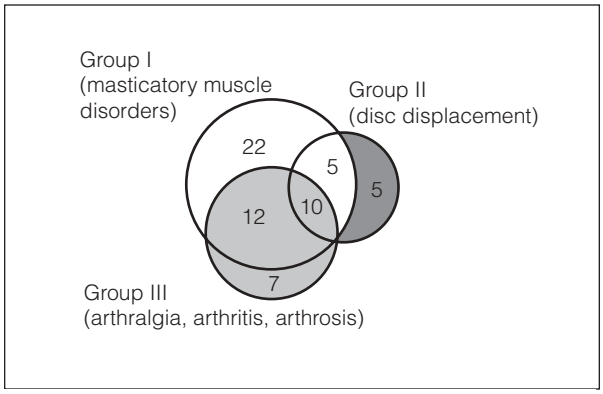

Fig 2 Venn diagram showing the overlap of RDC/TMD diagnoses (n = 61 cases). Of the 11 African American cases, 5 had group I diagnoses only, 1 had a group II diagnosis only, 2 had group III diagnoses only, and 3 had both group I and group III diagnoses.

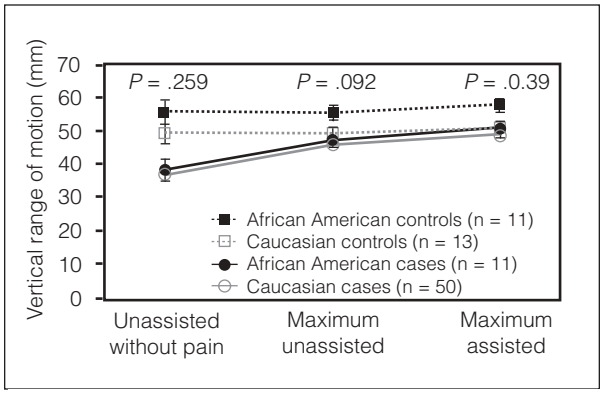

Fig 3 Vertical range of motion by case-control status and race (mean ± standard error). Race effect tested from linear regression adjusting for case-control status (n = 85).

arthralgia/arthritis/arthrosis; 5 presented with both a masticatory muscle disorder and disc displacement; and 10 presented with all 3. The majority of people in group III had multiple diagnoses. Among the 61 cases, there were no racial differences regarding the distribution of clinical subtypes (2 degrees of freedom [df], chi-square $P = .678$).

Vertical Range of Motion. Mean vertical ranges of motion for controls and cases for each race are presented in Fig 3. Patterns are consistent for opening without pain, maximum unassisted opening, and maximum assisted opening. The overall MANOVA for a race effect, adjusting for case-control status, was suggestive of significance ($P = .084$). The MANOVA for race × case-control status interaction was nonsignificant ($P = .186$), perhaps because of low power, while the MANOVA for the race effect in the interaction model (which corresponds to a race effect only in controls) was statistically significant ($P = .049$). Results from univariate linear regression model tests of the race effect that adjusted for case-control status are shown in Fig 3 for each range of motion measurement (regression diagnostics showed normally distributed residuals and adequate model fit). African Americans, particularly controls, had a significantly

Table 2 Chronic Pain Disability Grade by Race

Pain grade	Caucasian (n = 50)	African American (n = 11)	Total (n = 61)
0	7 (14%)	1 (9%)	8 (13%)
I	32 (64%)	5 (45%)	37 (61%)
II	10 (20%)	3 (27%)	13 (21%)
III	1 (2%)	2 (18%)	3 (5%)
IV	0 (0%)	0 (0%)	0 (0%)

1 df Mantel-Haenszel chi-square $P = .110$, $r_s = 0.21$.

larger mean range of assisted maximum opening than Caucasians ($P = .039$) when the analysis was adjusted for case-control status (mean difference 3.7 mm; 95% CI: 0.2–7.1 mm).

Psychosocial Assessment (RDC/TMD Axis II)

Chronic Pain Grade. Pain-related disability grades, which are considered relatively independent of Axis I, are based not only on the intensity of TMD pain but also on the impact of TMD pain on daily activity: grade I indicates low pain and disability, grade II indicates high pain but low disability, and grades III and IV indicate high pain and disability. The majority of these community cases (74%) presented with low pain and disability (grades 0 or 1); 21% presented with high pain but low disability (grade II), and 5% presented with high pain and disability (grade III) (Table 2). Racial distributions among cases were similar (1 df chi-square $P = .110$; $r_s = 0.21$).

Depression. Table 3 presents the racial and case-control distribution of depression score categories: normal, moderate, or severe. As expected, overall, cases had more depression than controls (adjusting for race, $P = .002$; $r_s|\text{race} = 0.34$), but racial groups were similar (adjusting for case-control status, $P = .544$; $r_s|\text{case} = 0.07$). More than twice as many controls (71%) had normal depression scores compared to cases (35%). Furthermore, more than 4 times as many cases (40%) had severe depression scores compared to controls (8%).

Nonspecific Physical Symptoms. Axis II also assesses somatization items related to pain, fatigue, cardiopulmonary, and nonspecific symptoms. Total somatization scores with and without pain can be classified as normal, moderate, or severe. Table 3 shows that more than 70% of cases had moderate to severe somatization scores with pain. As with depression, cases had more somatization than controls (adjusting for race, $P < .001$; $r_s|\text{race} = 0.58$). In addition, African Americans had higher levels of somatization than Caucasians (adjusting for case-control status, $P = .020$; $r_s|\text{case} = 0.26$). No controls of either race had severe somatization scores. Of African American cases, however, 0% had normal somatization scores, 30% had moderate somatization, and 70% had severe somatization, while in Caucasians, 18% had normal scores, 50% had moderate scores, and 32% had severe scores. Somatization without pain scores by race and case-control status were very similar to the depression findings (rather than to the somatization with pain results) (Table 3).

Jaw Symptoms. An Axis II checklist is used to assess jaw symptoms related to 12 mandibular activities. These items, which were not fully validated in a previously published study[7] shed light on the number of limitations rather than their extent or severity. The most frequently reported limitations among the 61 cases were pain on chewing (52%), eating hard foods (51%), and yawning (48%) (all others < 18%). Responses were similar between races (all stepdown bootstrap multiplicity adjusted $P > .315$).

Treatment-Seeking Behavior

Participants reported past jaw or face pain treatment-seeking behavior such as the number of treatments, types of treatment, and provider (physician, dentist, chiropractor, or other health professional). More than half of the 61 women (58%) in this community sample who met the RDC/TMD criteria for cases had never sought professional care; 42% had sought care. More than a quarter (28%) of cases reported seeking care more than 6 months prior to the clinical examination, while 14% of cases reported seeking care within the 6 months prior to the examination. No controls reported ever seeking care. Lifetime treatment-seeking behavior was reported by similar percentages of Caucasian and African American women diagnosed with TMD (41% vs 45%; chi-square $P = .704$). Among those reporting seeking care, the number of lifetime health-care visits for facial pain ranged from 1 to 20 (median = 2) and was similar for the 2 races. Types of care reported included night guards and splints as well as jaw, TMJ, and facial pain treatment (20 items). The number of different types of treatment received by those reporting care ranged from 1 to 6 (median = 2); this value was similar for the 2 races.

Self-rated Health

Participants rated their overall and oral health on commonly used 5-point scales ranging from

Table 3 Distribution of Depression (SCL-90-R) and Somatization (With and Without Pain) Scores in Cases and Controls by Race (n = 84)

	Case		Control			
					P	
Axis II measure	African American (n = 10)*	Caucasian (n = 50)	African American (n = 11)	Caucasian (n = 13)	Case vs control	Race
Depression						
Normal	3 (30%)	18 (36%)	8 (73%)	9 (69%)		
Moderate	1 (10%)	14 (28%)	3 (27%)	2 (15%)	.002	.544
Severe	6 (60%)	18 (36%)	0 (0%)	2 (15%)		
Somatization with pain						
Normal	0 (0%)	9 (18%)	7 (64%)	10 (77%)		
Moderate	3 (30%)	25 (50%)	4 (36%)	3 (23%)	< .001	.020
Severe	7 (70%)	16 (32%)	0 (0%)	0 (0%)		
Somatization without pain						
Normal	3 (30%)	21 (42%)	10 (91%)	11 (85%)		
Moderate	2 (20%)	17 (34%)	1 (9%)	2 (15%)	< .001	.346
Severe	5 (50%)	12 (24%)	0 (0%)	0 (0%)		

*One African American case did not provide Axis II information.

excellent to poor. Overall health was reported as slightly better than oral health: 38% reported overall health and 26% reported oral health as very good or excellent; 22% reported overall health and 31% reported oral health as fair or poor. Cases and controls differed significantly in self-reported overall health ($P = .002$; $r_s = 0.33$) but were similar in oral health self-ratings ($P = .455$; $r_s = 0.08$); significance was evident even after adjusting for SES factors (parental education, baseline household income, or participant education: $P < .008$; $r_s|SES > 0.29$). Self-rated overall health was similar between races (whether assessed as ordinal or fair/poor dichotomy) when the analysis was adjusted for SES. Overall health was significantly related to Axis I diagnosis type ($r_s = 0.38$). Interestingly, most cases reporting poor health were diagnosed with group III disorders (Axis I); group I cases reported poor health the least often. Note that most of the group III cases presented multiple diagnoses (Fig 2). Overall health was also significantly associated with depression trichotomy (normal, moderate, severe; $r_s = 0.44$); somatization with pain trichotomy ($r_s = 0.40$); and somatization without pain ($r_s = 0.35$). Those scoring *severe* on these scales also tended to report poor overall health. Overall health was significantly but only marginally related to pain intensity and disability classification ($r_s = 0.22$). However, self-rated oral health was not significantly related to any of the Axis I or Axis II diagnoses ($-0.02 \le r_s \le 0.13$).

Discussion

To the authors' knowledge, this is the first paper to compare clinical characteristics of Caucasian and African American cases confirmed with an RDC/TMD diagnosis. The authors also report on the utility of a telephone questionnaire to screen for potential TMD cases and controls.

One finding of this study relates to the ability to screen for TMD cases. Based on validated clinical examination of putative cases using the RDC/TMD, a significantly higher percentage of young Caucasian women (95%) than African American women (61%) fulfilled the criteria for TMD. Furthermore, when the JSPP group was clinically examined, one third of Caucasians (33%) unexpectedly fulfilled the criteria for TMD compared to none of the African Americans. Since this was part of a case-control study and not designed as a diagnostic study, the examined group is from 2 extremes. Thus, spectrum bias may have resulted and skewed Sn and Sp estimates. Still, the racial comparisons should be valid. Additional JSPP cases were included for examination, since fewer women fulfilling criteria for putative cases (facial pain reported within the last 6 months) were successfully appointed for clinical examination than planned. The elapsed time between screening and clinical examination ranged widely from 1 day to 2 years. The logistics of scheduling, particularly for women who had moved out of the immediate area, may have reduced case confirmation. Since fluctuation in TMD pain and symptoms has been

previously reported,[14–16] it was decided to clinically examine women who reported facial pain more than 6 months prior to the screening examination. However, difference in the amount of time elapsed between the screening and clinical examinations did not explain the racial difference, since the distribution of time elapsed did not differ between the 2 racial groups (a median of 24 days for Caucasians versus a median of 21 days for African Americans). Moreover, time between screening and examination did not appear to be related to case-control status, since all putative controls were confirmed as controls upon clinical examination and there was no decreasing pattern of confirmation (κ statistics) as the time difference increased. Therefore, based on clinical examination of both putative and JSPP cases, significantly fewer African Americans were confirmed as TMD cases compared to Caucasians.

A recent report examining the relationship between the self-reported pain (putative TMD cases) and confirmed TMD cases based on RDC/TMD examination showed that time, gender, and type of questionnaire administration (in person versus by telephone) may explain the difference.[17] However, time, gender, and type of questionnaire administration did not explain the racial difference in the present study. There is little explanation for the racial difference. One possible explanation for lower prevalence of self-reported facial or TMD pain in African Americans is that the instrument is not valid in this group or not as valid with telephone administration as with face-to-face administration. However, there were no differences in 4 other types of pain (headaches, back, chest, and abdomen).[2] Moreover, if Caucasians overreported and African Americans underreported TMD pain on the telephone, then fewer Caucasians and more African Americans would be expected to be confirmed clinically. However, the results of the present study contradict this explanation. Neither group underreported TMD pain in the screening. Finally, in the present study, there were no differences in confirming controls in face-to-face administration of the instrument. This suggests the instrument screens out noncases equally well in both races. The instrument used for this study was similar to that used by researchers in a previous epidemiologic TMD study to determine 6-month and lifetime prevalences in primarily Caucasian samples.[12] Furthermore, for Caucasians, the results of the present study confirm similar findings regarding facial pain prevalences.[2] No study has reported racial comparisons in TMD pain other than reports from the National Health Interview Survey, suggesting that Caucasians may report higher facial pain.[18] However, that report did not adjust for SES. Therefore, the present study is the first to report racial comparisons based on standardized validated criteria for clinical examinations (RDC/TMD) in a non–care-seeking, community-dwelling sample. Another possible explanation for the difference in findings for the races might be partially related to progression of TMD. Gender differences in the progression of TMD signs and symptoms have been reported in a 10-year follow-up study.[19] In that study, men seemed to recover from TMD pain and symptoms to a greater extent than women. The conclusion drawn from that study was that the gender difference in TMD prevalence could be partly explained by the recovery rate. A racial difference in time-course, with African Americans recovering more quickly and to a greater extent than Caucasians, may explain why no African Americans in the JSPP group could be confirmed as cases on clinical examination. This could also partially explain the initial difference between the races in the prevalence of reported facial pain and TMD signs and symptoms. Prevalence is known to be a function of incidence, episode duration, and number of episodes over the course of illness.[20] None of these parameters is presently known. Therefore, longitudinal studies are greatly needed to evaluate the racial difference related to the incidence, progression, and recovery of this condition.

Most other US studies of TMD relate to Caucasian populations. This paper is the first to compare the clinical characteristics of Caucasian and African American cases of TMD confirmed with the RDC/TMD. This study reports the TMD subtypes of community-dwelling Caucasians and African Americans based on the RDC/TMD, which have been recognized as the best validated criteria for conducting standardized clinical examination and classifications of TMD subtypes (Axis I).[7,9,10] Axis I criteria were reported to demonstrate acceptable reliability for examinations performed to specifications.[7,21] The examiner in this study (OP) has demonstrated excellent reliability and validity during multicenter RDC/TMD training sessions.[22] Based on RDC Axis I clinical subtypes, the highest percentage of TMD were muscle-related diagnoses (group I), followed by disc-related diagnoses (group II), and arthralgia/arthritis/arthrosis diagnoses (group III), with arthralgia being the main type. Multiple diagnoses were found in 44% of cases (Fig 2). Note that of groups I, II, and III, group III had the highest percentage of cases with multiple diagnoses.

However, there were no statistically significant differences between races in the distribution of the 3 diagnostic types (Table 1). The distribution of clinical TMD subtypes seen in this study was comparable to studies of primarily Caucasian samples of community cases.[4]

The only racial difference based on clinical findings was related to the vertical ranges of jaw motion, with African Americans, most significantly controls, presenting larger jaw openings (Fig 3). However, because of the limited number of subjects, this finding should be interpreted with care. The jaw hypermobility theory as a cause of TMD has never been substantiated.[23,24] The present data do not support such a relationship, since African Americans tended to have wider jaw openings but less prevalent TMD. However, more data will be necessary in order to investigate whether structural physiological differences exist between racial groups. Moreover, race in the United States is considered more of a sociocultural construct than a biologic or genetic measure.

The reliability, validity, and clinical utility of Axis II measures have recently been reported.[25] Based on the reported level of pain and the pain impact on activities of daily living, this community sample presented a low grade of chronic pain. A high percentage of participants (74%) presented no or low pain disability (grades of 0 or I), which means that they rated their pain intensity as 4 or less on a 10-point scale, with no or little pain-related interference with daily activity; 21% presented high pain but low disability (grade II), meaning that they rated their pain intensity as 5 or more on a 10-point scale with low interference with daily activity; and 5% presented high pain and high disability (grade III), meaning that they experienced increasing levels of pain-related psychosocial disability regardless of pain level.[10] However, the racial groups were similar regarding pain dysfunction (Table 2). Comparing these results with a previous report of Asian, Swedish, and American clinical cases shows that these young female community cases presented lower pain-related psychosocial disability than the American clinical cases in the other report (Grade II: 21% versus 40%, Grade III: 5% versus 15%, and Grade IV: 0% versus 6%).[9] These differences may be related to ascertainment status (clinic versus community) as well as gender and age differences.

As anticipated, TMD cases presented with higher depression scores than controls, but Axis II depression scores were similar for the 2 racial groups. This is in contrast to a study of male and female chronic pain patients in a clinical setting (18 to 85 years old) that showed significantly more depression in African Americans compared to Caucasians.[26] Surprisingly, a high percentage (40%) of the cases in the present study reported severe depression. Despite their relatively low CPGs, a higher percentage of this community sample than of Asian, Swedish, and American clinical cases reported severe depression (40% of community cases versus 15% to 20% of clinic cases). There is little explanation as to why these young women are more depressed than older clinical populations (mean age = 35 years) who also had higher pain-related psychosocial disability.

Somatization without pain, characterized by a high tendency to report nonspecific physical symptoms (such as hot and cold spells, numbness or tingling, and a lump in the throat) and somatization with pain, characterized by pain-related complaints such as headaches, low back pain, and sore muscles, were also higher in TMD cases compared to controls, as expected. Somatization scores without pain were similar between the racial groups. However, somatization with pain was significantly higher in African Americans than Caucasians. Most somatization with pain items were closely related to common chronic pains such as headache, back, and chest pain. Although the prevalence of these types of chronic pains was high, there were no racial differences in 4 of the 5 common types of pain, excluding face/jaw pain (face/jaw pain was significantly less prevalent among African Americans).[2] Therefore, it is hard to explain why African Americans reported higher scores of somatization with pain. Does TMD pain, when present, affect African Americans differently? Because of the relatively small number of cases in the present study, it is hard to assess this proposition.

The jaw disability checklist assessed a number of activities related to jaw function. The most frequently reported functional activities impaired by the TMD were chewing, eating hard food, and yawning. Although this scale has not been validated, the present results are similar to those reported for a Swedish clinical population.[7]

Almost half (42%) of these community TMD cases reported seeking some type of treatment either in the past or present. The data recorded regarding treatment-seeking behavior included the number of treatments (1 to 20), type of treatment (eg, splint, medications, physical therapy and biofeedback), and providers (physician, dentist, chiropractor, or other health professional). Many types of treatments and providers have been reported for clinical populations.[26,27] Previous reports also showed that treatment need for the general population ranged

from 3% to 9%.[28] Therefore, it is not surprising that almost half of these African American (prevalence = 6%) and Caucasian cases (prevalence = 13%) reported seeking TMD treatment. Another study reported that elevated stress level and a combination of muscle and arthralgia/arthritis/arthrosis diagnoses are causal factors for treatment need.[27] Similarly, the majority of the arthralgia/arthritis/arthrosis cases in the present study presented with multiple diagnoses, poor overall health, and high treatment need. However, interestingly enough, the results show similar patterns between African Americans and Caucasians regarding treatment-seeking behaviors.

The self-reported overall health in this community sample was better than self-reported oral health. Also, as expected, overall health, but not oral health, was significantly related to the case or control status. This is not surprising, since TMD pain greatly affects the overall well-being, while a direct relationship between oral health (eg, dentition, occlusion) and TMD has never been established. Also, there was a significant association between Axis I diagnosis and reported overall health, with a majority of the arthralgia/arthritis/arthrosis group (group III) and a minority of the myalgia group (group I) reporting poor health. However, the majority of arthralgia/arthritis/arthrosis cases presented multiple diagnoses that often included myalgia, which may contribute to the perception of poor overall health.

Limitations of this study relate to the somewhat small sample size, as well as imbalances in case-control status and race, and the use of a case-control design to examine diagnostic utility of screening. While the most efficient designs are balanced, the authors preferred to have a "pure" control group, without any other pain, including facial pain or jaw symptoms, for comparison. However, relatively few individuals were completely pain-free, therefore fewer controls were identified. The imbalance in race is related to the difference in prevalence of self-reports,[2] but compounded by the differing confirmation of putative cases upon examination. The study originally planned to examine between 42 and 85 cases and have twice as many controls as cases to provide up to 96% power. However, the number of confirmed cases (61) was on-target to provide 80% power to detect large odds ratios. Thus, small or moderate effects may not have been detected. This study was designed as a case-control study, not a diagnostic study. By sampling from extremes, the study may have shown biases in measures such as Sn and Sp.

In conclusion, the findings of this study demonstrate a racial difference in that fewer African Americans than Caucasians could be confirmed as cases based on the RDC/TMD clinical examination. With the exception of vertical range of motion and somatization with pain (more African Americans reported severe scores than Caucasians), measures were similar between races. The results also showed that TMD pain had little interference with daily activities in this community sample. However, depression—often severe—and somatization characterized these young female community cases, regardless of race, to a much higher extent than previous reports of clinical cases.

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