ORIGINAL ARTICLE

Risk factors for the occurrence and prevention of temporomandibular joint and muscle disorders: Lessons from 2 recent studies

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Introduction: Our objectives were to demonstrate how standard epidemiologic measurements can assist in evaluating the risk factors for tempormandibular joint and muscle disorders (TMJMD) and to determine whether prevention is feasible. **Methods:** We reviewed 2 recent studies that examined third-molar extractions and severe mandibular retrognathia as risk factors for TMJMD. Cumulative incidences were available from these studies. By using these values, standard epidemiologic measurements of risk, including population attributable risk (PAR), attributable risk (AR), population attributable risk percent (PAR%), and attributable risk percent (AR%), were calculated. (PAR and AR are reported as the numbers of cases per 10,000 per year.) **Results:** In the third-molar extraction study, PAR, AR, PAR%, and AR% were 5, 10, 25%, and 40%; in the severe mandibular retrognathia study, they were 0.5, 17.5, 10%, and 80%, respectively. **Conclusions:** This review supports the current consensus that most risk factors explain only a small portion of TMJMD in the population. However, some factors might explain a significant portion of TMJMD in persons exposed to particular risk factors. This review supports the current consensus that prevention, by screening the population for risk factors and intervening, is probably not justified. Modification of certain risk factors among exposed persons to prevent TMJMD might be warranted. Incidence data and epidemiologic measurements of risk are needed to evaluate the importance of risk factors for the occurrence and prevention of TMJMD, in both the population and exposed persons. (Am J Orthod Dentofacial Orthop 2008; 134:537-42)

The current consensus is that most tempormandibular joint and muscle disorders (TMJMD) have several risk factors, and, in general, no one risk factor is of overwhelming importance.[1-4] For many risk factors, such as dental and skeletal malocclusions, when the factors explain only a small portion of the TMJMD in the population, the risk factors are considered unimportant.[5-9] However, for some people, dental and skeletal malocclusions appear to be associated with, and a risk factor for, the development of TMJMD.[10-16] The relationships between other risk factors and TMJMD are more widely accepted, such as acute trauma that causes TMJMD.[17-22] Still, many people with trauma do not develop a disorder.[18,20,22] These examples illustrate the difficulty of understanding the importance of risk factors for TMJMD. These difficulties, and the fact that successful treatment strategies have been developed without a complete understanding of etiology, have led some to question whether further research on clinical risk factors would be productive.[4,23] Because of this current de-emphasis of the importance of individual risk factors, it is not surprising that most authors discourage attempts to prevent TMJMD in the general population.[24-26] However, some well-established epidemiologic measurements for evaluating the importance of risk factors for the disease and the feasibility of prevention have not been widely used in the study of TMJMD.[27,28] These might extend our understanding of clinical risk factors. To calculate these measurements, incidence data for the occurrence of disease associated with specific risk factors are required.

Fortunately, 2 recent studies determined incidence data for TMJMD associated with 2 risk factors: third-molar extraction in adolescents and severe mandibular retrognathia in women, respectively.[29-31] The first was a large retrospective cohort study of adolescents that examined third-molar extraction as a risk factor for the examination or treatment of TMJMD. All participants had records available through a common dental insurance company (Washington Dental Service, Seattle, Wash) and at least 5 consecutive years of enrollment.

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More than 34,000 adolescents were included in the study. The second was part of a large case-control study of women that examined mandibular retrognathia as a risk factor for temporomandibular joint disorders (with or without muscle pain). This study was conducted in a large health maintenance organization (Kaiser Permanente, Portland, Ore). Cases and controls were recruited from 190,000 eligible enrollees. By using the incidence data from these 2 studies, it was possible to calculate several epidemiological measurements of risk.[27] These include population attributable risk (PAR), attributable risk (AR), population attributable risk percent (PAR%), and attributable risk percent (AR%). PAR and AR estimate the number of cases that might be prevented by mitigating a purported risk factor in the population and in people with the risk factor, respectively. PAR% and AR% estimate the proportion of cases that might be prevented by mitigating a purported risk factor in the population and in people with the risk factor, respectively.

The purpose of this review was to use incidence data, derived from these studies, to calculate epidemiologic measurements of risk, including PAR, AR, PAR%, and AR%. The usefulness of these measurements to evaluate the risk factors for TMJMD is demonstrated.

MATERIAL AND METHODS

We obtained incidence data from 2 recent studies, each investigating a purported risk factor for TMJMD. The first was a large retrospective cohort study that examined at least 1 third-molar extraction as a risk factor for the examination or treatment for TMJMD in adolescents.[29,30] The relative risk associated with that as a dichotomous risk factor was moderate (RR = 1.6; 95% CI, 1.3, 2.0). The participants all had records available through a dental insurance company with at least 5 consecutive years of enrollment. More than 34,000 adolescents were included in the study, and the prevalence of third-molar extraction was 50%. Whether a participant had third-molar extraction or received a dental code consistent with examination or treatment for TMJMD was determined from the insurance data. This study provided a clear-cut temporal relationship, with third-molar extraction preceding the examination or treatment for TMJMD in the participants; this allowed the authors to determine the incidence.

The second study was a large case-control study that examined mandibular retrognathia as a risk factor for temporomandibular joint disorders in women seeking treatment for TMJMD.[31] The odds ratio associated with severe mandibular retrognathia as a dichotomous risk factor was strong (OR = 4.7; 95% CI 1.2, 18.2). This study was conducted in a large health maintenance organization. The participants were recruited from among 190,000 eligible enrollees, whose prevalence of severe mandibular retrognathia was 3%. Facial photographs determined the presence or absence of severe mandibular retrognathia, and questionnaires determined whether a participant probably had a temporomandiular joint disorder (with or without muscle pain). Patients reporting signs and symptoms compatible with arthralgia, internal derangement, or degenerative joint disease were recruited as cases. Experienced clinicians provided clinical diagnoses for them, using a validated clinical classification system.[32-34] Patients being seen for routine dental cleaning at the same health maintenance organization, but with no history of previous TMJMD, were recruited as controls. This study was designed to provide a clear-cut temporal relationship, with severe mandibular retrognathia preceding the development of TMJMD; this allowed the authors to determine the incidence.

Values for population incidence (It), incidence among the exposed (Ie), and incidence among the nonexposed (Io) were available from each study. Using these data, we calculated epidemiologic measurements of risk, including PAR, AR, PAR%, and AR% from each study.[27] PAR was calculated by subtracting the incidence among the nonexposed from the population incidence (PAR = It − Io). AR was calculated by subtracting the incidence among the nonexposed from the incidence among the exposed (AR = Ie − Io). PAR% was calculated by subtracting the incidence among the nonexposed from the population incidence and dividing this value by the population incidence, and then multiplying by 100 (PAR% = [(It − Io)/It] × 100). AR% was calculated by subtracting the incidence among the nonexposed from the incidence among the exposed and dividing this value by the incidence among the exposed, and then multiplying by 100 (AR% = [(Ie − Io)/Ie] × 100). To illustrate the usefulness of these epidemiologic measurements for determining whether preventive intervention is appropriate, we calculated the number and proportion of preventable cases in 2 hypothetical populations. The hypothetical populations consisted of 100,000 adolescents and 100,000 women, all at risk for developing new TMJMD.

RESULTS

Values for It, Ie, and Io were available from each study and are reported as the number of cases per 10,000 per year. In the third-molar extraction study, It, Ie, and Io were about 20, 25, and 15, respectively, and, in the severe mandibular retrognathia study, about 5, 22, and 4.5, respectively. The relative risk associated