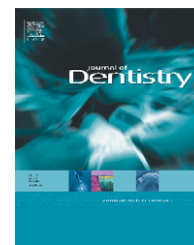


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General dental practitioners and hearing impairment

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ABSTRACT

Objective: Hearing impairment (HI) remains a problem among dentists. Hearing loss at speech frequencies was recently reported among dentists and dental hygienists. This study aimed to investigate prevalence and factors associated with perceived HI among dentists. **Methods:** In 2009–2010, 100 general dental practitioners (GDPs) and 115 general (medical) practitioners (GPs) (mean ages, 43.7 and 44.4 years) from Rome (Italy), who commenced practice ≥ 10 years ago, were interviewed on a series of occupation- and recreation-related HI risk factors and on HI-associated symptoms (tinnitus, sensation of fullness, hypoacusis). Prevalence of presumptive HI (≥ 1 symptom perceived during workdays and weekends) was assessed and factors associated with presumptive HI were investigated.

Results: Prevalence was 30.0% (95% confidence interval, 21.0–39.0%) and 14.8% (95% confidence interval, 8.3–21.3%) among GDPs and GPs, respectively. Occupation (GDP vs. GP), family history of hypoacusis, hypertension, ear diseases and smoking were significantly associated with presumptive HI. Within GDPs alone, significant associations were found for frequent use of ultrasonic scalers, use of dental turbines aged ≥ 1 year and prosthodontics as prevalent specialty.

Conclusions: GDPs experienced HI risk than GPs. Such a risk was not generalized to all dentists, but was specific for those who frequently used noisy equipment (aged turbines, ultrasonic scalers) during their daily practice.

Clinical significance: GDPs with 10 or more years of practice who routinely use potentially noisy equipment, could be at risk of HI. In order to prevent such condition, daily maintenance and periodical replacement of dental instruments is recommended.

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1. Introduction

Environmental noise is responsible for hearing impairment (HI). Daily exposure for 8 hours to noise levels ≥ 85 A-weighted decibels (dB(A)) is associated with permanent hearing loss.^{1,2} The A-weighting system (dB(A)) approximates the frequency response of our hearing system, weighting lower frequencies as less important than mid- and higher frequencies). Within healthcare settings, high environmental noise in hospitals may be responsible for abnormal hearing among healthcare

workers,^{3,4} while the orthopaedic staff experienced the highest prevalence of hearing-associated problems, due to high-powered tools in orthopaedic theatres.^{5–10}

In the 1960s, environmental noise produced in dental healthcare settings was considered responsible for HI in the dental staff.^{11–13} However in almost all previous studies dentists did not experience higher HI risk than the general population.^{14–18} This success was probably due to the technological improvement of dental equipment which considerably reduced the degree of environmental noise.^{19–22} Nowadays, the noise levels generated by suction tubes, turbines, ultrasonic

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scalers and micromotor hand-pieces are generally below the HI threshold of 85 dB(A), irrespectively of brands, type of material cut, type of bur, etc.^{23–25} Thus, excluding peculiar situations, such as occasional peaks during burring²¹ or children's crying episodes,²² the environmental noise during daily practice could be considered reasonably safe.

Nevertheless, the problem of HI among dental healthcare workers became relevant once again in recent years. Indeed, hearing loss at speech frequencies was reported among dental hygienists²⁶ and dentists.^{27,28} In addition, three questionnaire-based surveys reported that 11.3% dentists from Thailand had hearing problems or were not sure about their hearing capacity,²⁹ 19.6% from Belgium had auditory disorders²⁷ and 5% from United Arab Emirates had hearing problems.³⁰ We hypothesized that the revival of this problem was due to the prevalent specialty practiced by general dental practitioners (GDPs) and to the use of aged or worn instruments. Indeed, environmental noise produced by worn or extremely aged instruments is high: levels > 85 dB(A) can be produced during everyday practice and turbines become louder after one year of use-sterilization cycles if they are not properly maintained.^{21,22,31–34} In addition, differences by 10–20% in environmental noise levels are reported between units according to the prevalent specialty.²⁰ Thus, the aim of this study was to investigate prevalence and factors associated with perceived HI among GDPs.

2. Methods

We decided to select only GDPs exposed to occupational environmental noise for at least 10 years, a period generally considered sufficient to generate HI.^{1,2} GDPs were compared to general practitioners (GPs). We chose GPs because in Italy they are MDs with the Diploma of Special Training in General Medicine and have no exposure to other medical specialties (e.g. orthopaedics), and are a homogenous group according to type and duration of medical studies and practice. This choice to select subjects with 10 or more years of practice decreased the external validity of the study, namely, the chance to extend the results to all dental healthcare workers, but increased the internal validity, because virtually all the individuals who resulted exposed to high levels of occupational environmental noise had enough time to perceive HI in the event that exposure and perceived HI were associated.³⁵

GDPs and GPs with the abovementioned characteristics, were consecutively invited to participate in the survey by one of the authors (G.A.M.) present at the registration desk of various congresses and courses. More specifically, GDPs were recruited among those participating at the Italian National Congress of the College of Dentists during the year 2009 in Rome (Italy). Such a choice was justified by the fact that every year, 2000–3500 dentists participate to this congress, a representative number of the Italian dental healthcare workforce corresponding to 6.5–11.3% of all dentists (estimated at 31,000 in the year 2012 according to World Health Statistics released by the World Health Organization). GPs were recruited among those participating in CME courses organized by the Professional Association of Physicians and Dentists of Rome (“Ordine dei Medici Chirurghi e Odontoiatri

di Roma”) during the years 2009–2010. Attendance at CME courses is mandatory for Italian healthcare workers to renew the annual working license. Courses organized by the Professional Association are cheaper than other courses for GPs and, therefore, they generally reach the maximum number of participants.

The subject selection continued until 100 GDPs and a similar number of GPs were enrolled. The sample size was calculated using the aforementioned questionnaire-based surveys on HI prevalence among dentists.^{27,29} Pre-estimated presumptive HI prevalence was set at 10% among GDPs and at 1% among GPs. With α and β errors set at 0.05 and 0.20, respectively, the estimated sample size was $N = 100$ per group.

GDPs and GPs provided their consent to questionnaire administration. Data protection and anonymity were guaranteed. There were no incentives for participants.

One of the authors (G.A.M.) administered the questionnaires to the volunteers. The questionnaire included two sections. The first section was directed to all participants and was divided into three parts: (1) general characteristics of the subjects; (2) exposure to the most important HI-associated risk factors, such as use of firearms, familiars with hypoacusis or otosclerosis, use of quinine or aminoglycosides, etc.; (3) perceived HI-associated symptoms. The second section was specific for GDPs and focused on potential sources of environmental noise typical of dental practice (Fig. 1). This questionnaire was previously validated as it was used for a survey commissioned by the Italian Ministry of Health to investigate the occupational health hazards among Italian dentists.

Subjects who perceived at least one of the three HI-associated symptoms (Fig. 1) permanently, that is, in all three situations (“ever”, “during/at the end of working days”, “during weekends”) were classified as presumptively affected by HI.¹ Prevalence of presumptive HI among GDPs and GPs was statistically compared with χ^2 test with Yates' correction.

In order to investigate whether the two groups were homogeneous with respect to exposure to important HI risk factors, the differences between GDPs and GPs in the investigated generic HI-associated risk factors were assessed. Ordinal variables and some continuous variables were dichotomised giving score “1” to the potentially HI-associated value (exposure) and “0” to the reference value (Fig. 1). Means and proportions in the two groups were statistically compared (Student's *t* for unpaired samples – means; χ^2 with Yates' correction – proportions). If GDPs and GPs differed with respect to one or more important HI risk factors it could be possible that the differences between GDPs and GPs in presumptive HI, potentially observed, were not due to the type of occupation but to these factors.

The effect of occupation on presumptive HI accounting for other important risk factors was assessed. The outcome variable was presumptive HI presence/absence. The independent variable under investigation was the occupation (GPs reference group; GDPs exposed group). In addition, all the potential confounders were included in the analysis as independent variables. Potential confounders were located through 2×2 contingency tables, which were made splitting the observations according to presence/absence of presumptive HI and exposure/non-exposure to the generic HI-associated risk factor. The χ^2 test with Yates' correction was applied.

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