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WORK-RELATED ASTHMA ASSOCIATED WITH ENDOTOXIN EXPOSURE IN DENTAL WORKERS IN SOUTH AFRICA

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ABSTRACT

Background: Dental procedures associated with dental unit waterlines (DUWLs) in dental health care settings generate aerosolised droplets that have the potential to cause adverse health effects in exposed workers. **Aim:** The aim of this study was to evaluate the risk of work-related asthma associated with endotoxin exposure in dental health care workers. **Materials and methods:** The study population included dental personnel (n = 454) from 5 academic dental institutions in South Africa. Personal air samples (n = 413) in various dental jobs as well as airborne area and water samples from dental handpieces and basin taps were collected. A self-administered modified European Community Respiratory Health Survey questionnaire was used to obtain information on respiratory symptoms and the occupational history. Serum samples were collected to determine atopic status, specific IgE to composite latex (k82) extract and 8 recombinant latex proteins, myeloperoxidase (MPO), eosinophilic cationic protein (ECP), inflammatory cytokines, and endotoxin levels. Spirometry including pre- and post-bronchodilator testing was conducted according to ATS/ERS guidelines. Multivariate linear and logistic regression and factor analysis was used in the data analysis. **Results:** Airborne endotoxin levels were variable across departments with administration having the lowest and laboratories the highest mean exposures (geometric mean: 2.38 versus 5.63 EU/m^3). Job status as a student (compared to staff member) and dental unit characteristics (age, model type, number of units) were important predictors of airborne endotoxin. The most common asthma phenotypes were atopic asthma (6.9%), non-atopic asthma (5.9%) and work-aggravated asthma (4%). Four inflammatory groups related to eosinophilic versus neutrophilic inflammation and chronicity of the response were identified. Acute neutrophilic response was associated with work-related chest symptoms (OR = 4.99, 95% CI: 1.32 - 18.92). Cumulative endotoxin exposures (>51.12 EU/m^3-year) was an important predictor of work-related ocular-nasal symptoms (OR = 3.82, 95% CI: 1.01 – 14.41) in non-atopic workers. Borderline significant associations were also observed between current airborne endotoxin concentrations (>5.83 EU/m^3) and asthma-related symptoms (OR = 2.24, 95% CI: 0.97 – 5.17) as well as suboptimal lung function (FEV_1<80% predicted) (OR = 8.02, 95% CI: 0.94 – 68.35) in non-atopic workers. Dental workers using latex gloves and concurrently exposed to low-grade (> 5.83 EU/m^3) elevated endotoxin levels were at increased risk (OR = 2.59, 95% CI: 1.20 – 5.60) of presenting with latex sensitisation. **Conclusion:** This study demonstrated that endotoxin exposures from DUWLs play an important role in the manifestation of non-atopic asthma through the neutrophilic-response mechanism. Neutrophilic inflammatory cell asthma phenotypes coexist with eosinophilic inflammatory cell asthma phenotypes in this group of workers. Furthermore, low-grade elevated endotoxin levels increase the risk of sensitisation to latex among dental workers using latex gloves. This is the first study to demonstrate airway effects associated with low-grade elevated endotoxin exposures in dental settings.