The Effects on Health of Indoor Air Quality and Thermal Comfort In Elderly Care Centers

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Background and Objectives: Thermal Comfort (TC) and indoor air quality (IAQ) are indoor environment factors that affect health particularly in susceptible individuals such as elderly. This population is particularly at risk of detrimental effects from pollutants, even at low concentrations, due to reduced immunological defences and multiple underlying chronic diseases. This study explored the impact of environmental health variables and ventilation assessment in 23 elderly care centers (ECCs) in Portugal.

Methods: Indoor environmental parameters were measured twice, during winter and summer in 147 ECCs rooms within dining rooms, drawing rooms, medical offices and bedrooms. These areas were assessed for IAQ chemical (CO_2, CO, formaldehyde, TVOC, PM_{10}, $PM_{2.5}$) and biological contaminants (bacteria and fungi). TC parameters were measured following ISO 7730:2005, included relative humidity, temperature and air velocity in order to determine PMV and PPD indexes. It was also performed a building and ventilation characterization survey and a standardized respiratory health questionnaire (BOLD) to 200 residents. Outdoor samples were also collected for comparison to the indoor measurements.

Findings: Our preliminary results point out that: (i) IAQ parameters are within the reference levels; (ii) Prevalence of indoor sources (P=0.01); (iii) Fungi samples raise concern showing incidence of *Aspergillus fumigatus* that can cause invasive lung infections in susceptible individuals as elderly; (iv) due to poor insulation, the winter season PMV index show results in the ‘slightly cool’ thermal sensation scale which may potentiate respiratory tract infections; (v) PPD (P=0.033) and PMV (P=0.001) indexes show significant differences by season. Ongoing analysis is focusing on the interaction between IAQ and TC variables with building and ventilation characteristics and respiratory health questionnaires.

Conclusions and Practical Implications: Our study suggests that simple measures, such as insulating ceilings, walls and windows, could provide health benefits to ECCs residents and to the building energy efficiency.

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