

THE RELATIONSHIP BETWEEN BUILDING DESIGN AND BUILDING OPERATION WITH INDOOR AIR QUALITY IN MALAYSIAN HOSPITAL OUTPATIENT DEPARTMENTS: A MULTICENTRE CROSS-SECTIONAL STUDY

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ABSTRACT

INTRODUCTION: Poor indoor air quality (IAQ) in healthcare settings may adversely impact occupants' well-being and promote the transmission of infectious respiratory disease. However, evidence on IAQ in hospital outpatient departments (OPDs) and its building-related factors remains scarce. OBJECTIVE: This study aims to determine the relationship between building design and building operation with IAQ in Malaysian public hospital OPDs. METHODOLOGY: A multicentered cross-sectional study of six randomly selected Malaysian public hospital OPDs was conducted. First stage involved measurement of IAQ parameters including temperature, relative humidity (RH), air velocity (AV), carbon dioxide (CO₂), total bacterial count (TBC), and total fungal count (TFC). Second stage involved examination of hospital records on building design and building operation of selected hospital OPDs. Simple correlation, partial correlation, and linear regression analyses were then performed to examine the relationship of building design and building operation with IAQ parameters. RESULTS: The study results indicated that the IAQ of selected hospital OPDs complied with established standards, except for temperature and AV. In terms of building design, ventilation system design was negatively correlated with temperature, RH, AV, CO₂, TBC, and TFC, whereas the total number of appliances was positively correlated with AV, while the size of OPD was positively correlated with TBC and TFC. Meanwhile, none of building operation variable were significantly correlated with IAQ. CONCLUSION: On the whole, ventilation system design contributed the most to variation in IAQ parameters. The study findings suggest that the IAQ of hospital OPDs are significantly related to building design including ventilation system design, number of appliances, and the size of OPD. Consequently, multidisciplinary and multipronged strategies considering these important building-related determinants are deemed viable for the future control and improvement of hospital IAQ.

Keywords: Indoor air quality, building design, building operation, occupant behaviour, occupant factor, healthcare, hospital
