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THE OCCURRENCE OF COMMON COLD AND THE NUMBER OF PERSONS IN THE OFFICE ROOM

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The effect of the presence of one or more room mates on the occurrence of common cold was studied in a modern, mechanically ventilated, 8 story office building with 2150 workers, located in the center of Helsinki. The occurrence of respiratory infections and relevant individual and environmental data was collected in a self-administered questionnaire (response rate 71.0%). The study population, one person from each room in floors 3 to 8, consisted of 893 workers, 439 males (49.2%) and 454 females (50.8%). In the logistic regression analysis the adjusted odds ratio (OR) for more than two episodes of common cold during the past 12 months in subjects with one or more room mates vs. no room mates was 1.35 (95% CI 1.00-1.82). Also subjects with young children (OR 1.46, 1.05-2.04) and with a history of hay fever (OR 2.07 1.47-2.92) had a higher risk for common cold. Females (OR 1.25, 0.95-1.66) and subjects under 40 years of age (OR 1.15, 0.86-1.55) had slightly, but nonsignificantly increased risk while the risk in the smokers did not differ essentially from the nonsmokers (OR 1.05, 0.76-1.42). The results suggest that the presence of other persons in the office room increases the risk for common cold possibly due to indoor air transmission.

INTRODUCTION

There is controversy on the principal mode of transmission of the common cold. Some common cold viruses are transmitted primarily by direct and/or large droplet contact and others probably primarily airborne (3). Some other viruses have been shown to spread in the indoor air. Measles epidemics have been transmitted in the air. Viable virus can even pass from one space to another through ventilation system (1).

Statistical Methods

The outcome was operationalized to be the frequency of common cold during the past 12 months, which was inquired (structured 0, 1, 2, 3 or more, very frequently) using self-diagnosis without verifying or specifying the infectious agent. The exposure was estimated indirectly by assuming that subjects with one or more roommates are exposed, in the average, more to viable viruses via indoor air than those in a single room. The study population was divided into those considered to be exposed (index group) and nonexposed (reference group).

First the potential determinants of the outcome were compared in the index and reference group in order to elaborate the comparability of the two groups. The frequency of the episode of common cold during the past 12 months were then compared in the index and reference group. Finally, the adjusted odds ratio for having experienced more than two episodes of common cold in index vs. reference group was calculated in the logistic regression analysis. The following confounders were dichtomized and included in the model: gender (female = 1, male = 0), allergic rhinitis (1 = past or current allergic rhinitis, 0 = no), smoking (1 = current, 0 = ex or never) and children under the age of 8 at home (yes = 1, no = 1). Exposure to environmental tobacco smoke in the office was recorded, but it was not meaningful in the model due to lack of exposure among subjects in the single rooms (reference group).

RESULTS

Indoor Air

The relative humidity during the study, in February, was very low (10-20%) which reflects the cold winter season. The ventilation rates were in the average great (mean 26 L/s/person) but varied considerably (SD 10 L/s/person, range 7-70 L/s/person). The mean room temperature was high and the variation large (mean 23.3°C, SD 0.9°C, range 21-26°C).

The concentrations of measured indoor air pollutants were far below the values known to cause adverse health effects. The mean carbon dioxide concentration was 420 ppm and did not exceed 950 ppm. The concentration of formaldehyde was 47 ug/m^3 in a room with typical furniture, textiles and ventilation rate. The maximum concentrations of organic gases were: ethanol 98 ug/m^3 (mean 73 ug/m^3), hexasone 10 ug/m^3 (9 ug/m^3), acetone 33 ug/m^3 (32 ug/m^3) and toluene 165 ug/m^3 (107 ug/m^3). The maximum concentration of radon (160 Bq/m^3) was measured when ventilation was stopped after office hours, the mean concentration was 87 Bq/m^3. The concentrations of positive and negative ions followed the concentrations of radon and ranged from 150 to 3200 No/m^3.

Occurrence of Common Cold

In the study population 133 workers (14.9%) did not have any episodes of common cold during the past 12 months, 153 (17.1%) reported one, 268 (30.0%) two, 304 (34.1%) three or more and 35 (3.9%) very frequently (Table 2.). The crude comparison demonstrated more episodes of common cold in those with one or more room mates (index group) both in males and in females.

Table 2. Occurrence of common cold during the past 12 months in the index and reference group.

Episodes of common cold	Males				Females			
	Index		Reference		Index		Reference	
	n	%	n	%	n	%	n	%
No	13	15.5	67	18.9	20	9.2	33	13.9
One	16	19.1	64	18.0	35	16.2	38	16.0
Two	20	23.8	112	31.6	65	30.1	71	29.8
Three or more	26	31.0	104	29.3	87	40.3	87	36.5
Very frequently	9	10.7	8	2.2	9	4.2	9	3.8

Workers with one or more room mates had 1.35 (95 % CI 1.00-1.82) times greater risk for having more than the average number of common cold episodes (over 2 episodes) compared to those in a single room (Table 3.). Also subjects with young children were significantly more likely to catch a cold than those without (OR 1.56 1.05-2.04). Presence or history of hay fever also a significant determinant of common cold (OR 2.07 1.47-2.92). The risk was slightly, but not significantly increased among females and smokers.

Table 3. Adjusted odds ratios (OR) and 95 % confidence interval (95% CI) for experiencing more than two episodes of common cold during the past 12 months.

Determinant	OR	95% CI
Room mates		
No	1.00	
One or more	1.35	1.00 - 1.82
Young children (< 8 yrs)		
No	1.00	
One or more	1.46	1.05 - 2.04
Age		
40-	1.00	
< 40	1.15	0.86 - 1.55
Gender		
Male	1.00	
Female	1.25	0.95 - 1.66
Allergic rhinitis		
No	1.00	
Yes	2.07	1.47 - 2.92
Smoking		
Never or ex	1.00	
Current	1.05	0.76 - 1.42

DISCUSSION

Workers with one or more room mates in the office were found to have a higher risk for common cold than those in single rooms. This findings support the hypothesis that some of the viruses causing common cold are transmitted via indoor air. Even a modest relative increase (35% in our study) in common cold has a major public health impact due to high frequency of the disease in the population.

It is very difficult, if not impossible, to measure the direct exposure to viable viruses. Theoretically the exposure to the viruses depends on the strenght of the source, i.e., the emission of viable viruses by the infected person, the indoor air conditions affecting the viability of the infectious agent. In our study the exposure in the office was measured by the presence of other persons in the office and workers in single rooms provided a reference group. The exposed and the reference group differed in some potential determinants of common cold and thus direct comparison of the occurrence of the two groups could be confounded. The measured potential confounders, including age, gender, occurrence of hay fever, current smoking and the number of young children were taken into account in the logistic regression analysis.

Also subjects with children under the age of 8 had a higher risk for common cold than those without. This provides further evidence on the importance of human contacts in the air transmission of common cold. However, the transmission via other routes than indoor air is also likely to be increased in subjects with young children.

The results suggest that the presence of other persons in the office room increases the risk for common cold possibly due to indoor air transmission. However, the practise of early sick leaves could possibly prevent from spreading the infections and as a whole might lead to less disease.

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