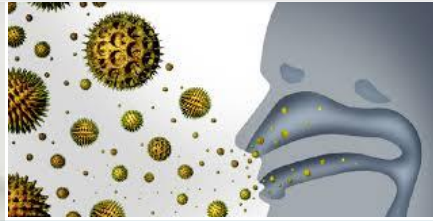


# The sick building syndrome in hospital workers: A cross-sectional study of personal and environment-related risk indicators



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# Introduction

- ✿ Indoor air in the workplace is a great concern to employers, workers, and health professionals
- ✿ People spend 80% to 90% of their time indoor (Wylie *et al.*, 2017). Health care staffs spend > 8 hours a day in an office environment
- ✿ Poor indoor air quality - Sick Building Syndrome (SBS), occupational related diseases, nosocomial infection (Leung and Chan, 2006), and reduce productivity & absenteeism (Rashid & Zimring, 2008; Singh 2005; Soleimanipirmorad & Vural, 2018)
- ✿ SBS - building occupants or workers experience acute health effects or discomfort when spent time in the building, with no specific illness or cause identified (DOSH, 2010)

## Objective

## Rationale

- ✿ The environment in hospital needs special attention to make sure healthful and good IAQ to prevent occupants in the hospital building against hospital-acquired (nosocomial) infections and occupational diseases
- ✿ Not a mandatory procedure to monitor IEQ in Malaysian healthcare centers

To determine the prevalence of SBS and assess the personal and environment-related risk indicators for SBS

# Research population & Tool

- ✿ **Design:** A cross-sectional design conducted in October to December, 2011
- ✿ **SSC:** 265 nurses (+15% missing data)
- ✿ **Criteria:**  $\geq 6$  months service and excluded nurses on long leave/out station
- ✿ Multistage (11/33 wards) & Simple random sampling (265/355 nurses)
- ✿ Indoor Air Questionnaire (MM-40)

(Lahtinen et al., 2004), translated into Malay & validated by Valentine @ Japulee Gantul in 2010.

Sociodemography

Characteristic of working environment during the last three months (12 items)

Past or present diseases and symptoms (3 items)

Symptoms related to the work environment (12 items)

Diagnosis of SBS = combination of at least two symptoms, occurred at least once or twice weekly in the last week, and its work related

*(Norhidayah, et. al 2012)*

# Statistical analysis

- ✿ SPSS version 19.0
- ✿ A descriptive analysis- Baseline characteristics
- ✿ Pearson chi-square test / Fishers exact test, Simple & Multiple logistic regression – factors associated with the presence of SBS

**Results 1**

**Sociodemographic and atopy history of the respondents (n=263)**

Variables	Frequency (%)
Age (years)	30.4 (9.54) <sup>∅</sup>
Gender: Female/Male	234 (89.0) / 29 (11.0)
Years of working at present work area	5.0 (7.00) <sup>¥</sup>
Tobacco smoking, Yes	6 (2.3)
History of asthma, Yes	9 (3.4)
History of hay fever, Yes	129 (49.0)
History of skin eczema, Yes	23 (8.7)

<sup>∅</sup>Mean (standard deviation)

<sup>¥</sup>Median (interquartile range), data skewed to the right

# Results 2

## Characteristic of working environment reported by respondents (n=263)

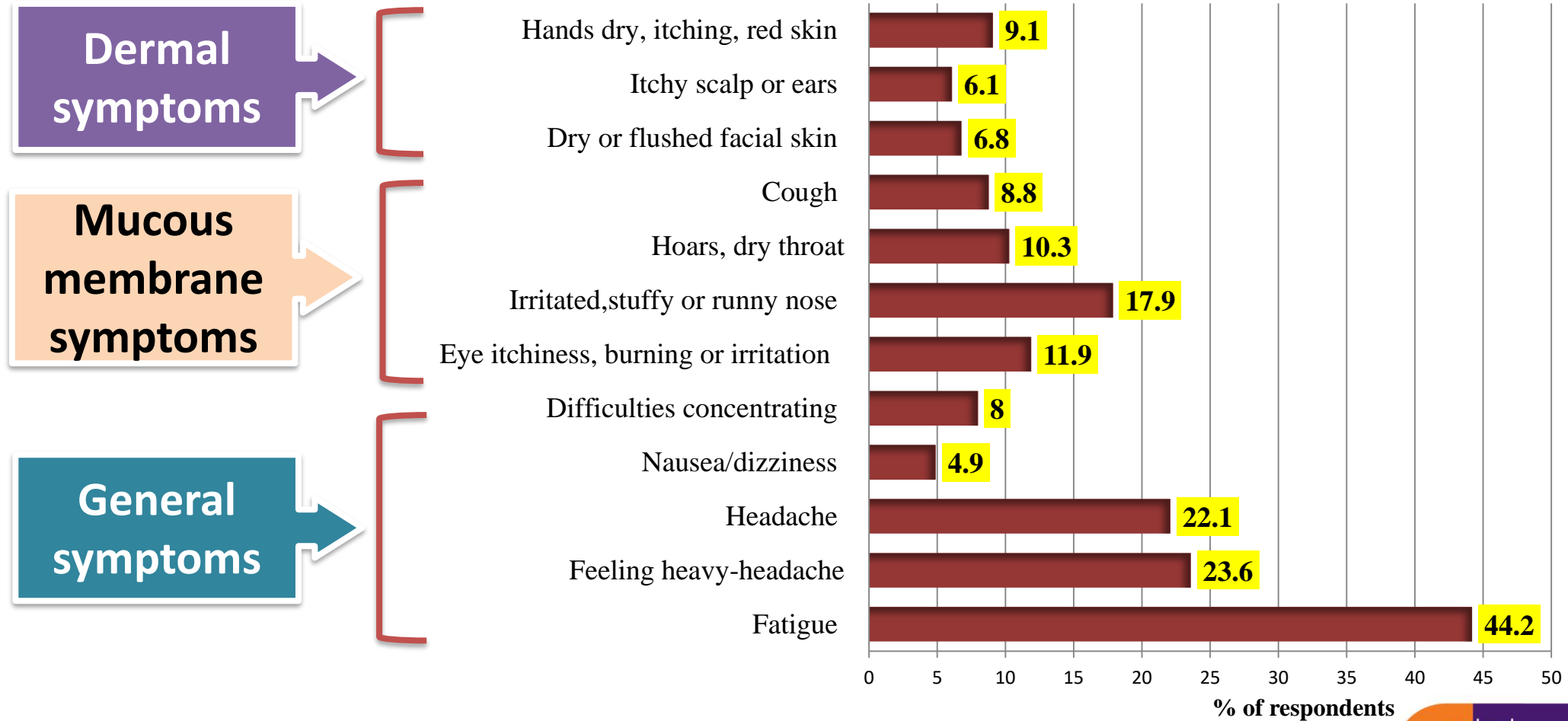
Working environments	Frequency (%)		
	Often	Sometimes	Never
Unpleasant odour	75 (28.5%)	161 (61.2%)	27 (10.3%)
Varying of temperature	115 (43.7%)	141 (53.6%)	7 (2.7%)
Stuffy bad air <sup>Ø</sup>	43 (16.4%)	124 (47.3%)	95 (36.3%)
Dry air	48 (18.3%)	127 (48.3%)	88 (33.5%)
Room temperature very high	108 (41.1%)	139 (52.9%)	16 (6.1%)
Room temperature very low	18 (6.8%)	141 (53.6%)	104 (39.5%)
Static electricity	22 (8.4%)	113 (43.0%)	128 (48.7%)
Noisy	97 (36.9%)	144 (54.8%)	22 (8.4%)
Poor lighting	33 (12.5%)	179 (68.1%)	51 (19.4%)
Dust and dirt	53 ( 20.2%)	156 (59.3%)	54 (20.5%)
Draught	53 (21.0%)	117 (46.4%)	82 (32.5%)
Passive smoking	16 (6.1%)	77 (29.3%)	170 (64.6%)

<sup>Ø</sup>Missing=1

# Results 3

## Prevalence of SBS symptoms among nurses (n=263)

The prevalence of SBS among nurses was 39.9%





Results

4

# Personal risk indicators for SBS in nurses (n=263)

Factors	Sick building syndrome, n (%)		p-value
	Absent (n=158)	Present (n=105)	
Age	29.8 (7.61)∅	30.1 (6.98)∅	0.783¥
Gender			0.568δ
Male	16 (10.1)	13 (12.4)	
Female	142 (89.9)	92 (87.6)	
Years of working at present work area	5.81 (4.70)∅	6.20 (4.65)∅	0.958¥
Tobacco smoking			1.00β
Yes	4 (2.5)	2 (1.9)	
No	153 (97.5)	104 (97.1)	

∅Mean (standard deviation)

¥Independant t-test

δPearson chi-square test

βFishers exact test

Results

5

# Relationship of work environmental factors with SBS in nurses (n-263)

Factors	Simple logistic regression			Multiple logistic regression		
	Wald-stat.	Crude OR (95% CI)	p-value	Adj OR (95% CI)	Wald-stat.	p-value
Unpleasant odour (yes)	6.172	2.51 (1.21-5.17)	0.013	3.79 (2.08-6.90)	18.875	<0.001
Varying of temperature (yes)	5.051	2.35 (1.12-4.95)	0.025	2.15 (1.24-3.73)	7.387	0.007
Stuffy bad air (yes)	2.451	2.13 (0.83-5.49)	0.117			
Dry air (yes)	1.277	1.71 (0.67-4.37)	0.258			
Room Temp. very high (yes)	2.542	0.53 (0.24-1.16)	0.111			
Static electricity (yes)	0.011	1.07 (0.31-3.63)	0.917			
Noisy (yes)	0.057	0.92 (0.48-1.78)	0.811			
Light (poor)	2.347	2.09 (0.81-5.39)	0.126			
Dust and dirt (yes)	1.671	1.74 (0.75-4.03)	0.196			
Drought	1.542	0.99 (0.31-5.11)	0.670			
Room Temp. very low (yes)	2.346	2.04 (1.17-6.52)	0.161			
Passive smoking	0.015	1.05 (0.24-3.910)	0.169			

OR = Odds ratio; CI = Confidence interval; The model reasonably fits, assumptions are met, and no interaction and multicollinearity found; Hosmer Lemeshow test, *p*-value=0.439; Classification table 69.6% correctly classified; Area under ROC curve was 77.1%

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# Discussion

- ✿ High prevalence of SBS in nurses (39.9%) vs. 12-23% (Lee et al, 2015)
- ✿ Unacceptable indoor air = a building is “sick” = >20% occupants complain of suffering from discomfort symptoms for periods more than two weeks (ASHRAE, 2003; Nur Fadilah & Juliana 2012)
- ✿ None of personal characteristics found to be risk indicators for SBS in nurses
- ✿ Unpleasant odor and varying room temperature are significant risk indicators for the occurrence of SBS in nurses with the odds of 3.79 (95% CI: 2.077,6.904;  $p<0.001$ ) and 2.15 (95% CI: 1.238,3.726;  $p=0.00$ ) respectively

# Conclusions

- ✿ The study confirmed the high prevalence of SBS and significant environment-related risks in hospital nurses.
- ✿ Regular indoor air monitoring in the hospital and medical surveillance among healthcare workers is recommended
- ✿ Further study to determine other predictors of SBS - multifactorial etiologies such as staff psychology, work ergonomics, job stress and satisfaction, staff position in the organization and other environmental conditions including ventilation and indoor air contaminants

# Acknowledgements

- A sincere appreciation to
  - Universiti Sains Malaysia for funding through the short-term grant
  - Hospital Universiti Sains Malaysia

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