

## Background

- Shift work among nurses often leads to sleep disorders and mental health concerns.
- Modifying environmental factors might help alleviate these issues.
- This study explores the relationships between environmental factors, sleep and mental well-being in nurses.

## Objective

- To characterize individual environmental exposures (light, noise and green/blue spaces, air pollution) and the associations with sleep and mental problems.

## Methods

- This study plans to recruit 364 nurses.
- A standard questionnaire was used to collect information on environmental features.
- Sleep pattern was assessed using the Pittsburgh Sleep Quality Index and Insomnia Severity Index.
- Depression and anxiety were measured by the Hospital Anxiety and Depression Scale. Higher scores on the scale indicates worse situation.
- Multiple linear regression analyses to investigate the associations between environmental factors, sleep quality, and psychological health issues.

| Table 1. General characteristics of the study population |                   |                   |                   |         |
|----------------------------------------------------------|-------------------|-------------------|-------------------|---------|
| Variables                                                | Overall           | Daytime nurses    | Shiftwork nurses  | P-value |
|                                                          | N=81              | N=9               | N=72              |         |
| Age(years)                                               | 33.6 (7.23)       | 40.6 (11.31)      | 32.7 (6.13)       | 0.022*  |
| BMI (kg/m²)                                              | 22.8 (3.54)       | 23.3 (2.47)       | 22.7 (3.66)       | 0.344   |
| Gender (Female), n (%)                                   | 73 (90.1%)        | 9 (100%)          | 64 (88.9%)        | 0.588   |
| Income (over 60000 HKD), n (%)                           | 21 (25.9%)        | 4 (44.4%)         | 17 (23.6%)        | 0.228   |
| Master/Doctorate degree, n (%)                           | 24 (29.6%)        | 4 (44.4%)         | 20 (27.8%)        | 0.439   |
| Tobacco exposure, n (%)                                  | 19 (23.5%)        | 1 (11.1%)         | 18 (25.0%)        | 0.678   |
| Alcohol drinkers, n (%)                                  | 11 (13.6%)        | 2 (22.2%)         | 9 (12.5%)         | 0.602   |
| Poor sleep quality, n (%)                                | 59 (72.8%)        | 5 (55.6%)         | 54 (75.0%)        | 0.245   |
| Insomnia symptoms, n (%)                                 | 48 (59.3%)        | 3 (33.3%)         | 45 (62.5%)        | 0.149   |
| Anxiety symptoms, n (%)                                  | 36 (44.4%)        | 2 (22.2%)         | 34 (47.2%)        | 0.286   |
| Depressive symptoms, n (%)                               | 36 (44.4%)        | 3 (33.3%)         | 33 (45.8%)        | 0.724   |
| Scores of Scales (points), Median (Min, Max)             |                   |                   |                   |         |
| Pittsburgh Sleep Quality Index                           | 8.00 [1.00, 15.0] | 6.00 [4.00, 12.0] | 8.00 [1.00, 15.0] | 0.167   |
| Insomnia Severity Index                                  | 8.00 [0, 23.0]    | 7.00 [1.00, 13.0] | 8.50 [0, 23.0]    | 0.132   |
| Hospital Anxiety and Depression Scale-anxiety            | 7.00 [0, 20.0]    | 5.00 [1.00, 9.00] | 7.00 [0, 20.0]    | 0.072   |
| Hospital Anxiety and Depression Scale-depression         | 7.00 [0, 19.0]    | 6.00 [1.00, 12.0] | 7.00 [0, 19.0]    | 0.356   |
| Perceived positive greenness                             | 37.0 [10.0, 50.0] | 35.0 [12.0, 50.0] | 37.0 [10.0, 50.0] | 0.827   |
| Perceived positive blue space                            | 10.0 [3.00, 19.0] | 9.00 [5.00, 12.0] | 10.0 [3.00, 19.0] | 0.469   |
| Perceived less air pollution                             | 2.00 [0, 4.00]    | 2.00 [0, 3.00]    | 2.00 [0, 4.00]    | 0.420   |
| Satisfaction on light quality                            | 20.0 [4.00, 28.0] | 20.0 [4.00, 24.0] | 20.0 [4.00, 28.0] | 0.565   |
| Satisfaction on noise level                              | 20.0 [4.00, 28.0] | 21.0 [14.0, 28.0] | 20.0 [4.00, 28.0] | 0.531   |

| Exposure                                  | B (95%CI) |                         | P     |
|-------------------------------------------|-----------|-------------------------|-------|
| PSQI                                      |           |                         |       |
| Perceived positive impacts from greenness |           | -0.002 (-0.082, 0.078)  | 0.968 |
| Perceived positive image of blue space    |           | -0.056 (-0.323, 0.212)  | 0.679 |
| Perceived less air pollution              |           | 0.138 (-0.583, 0.858)   | 0.705 |
| Satisfaction on light quality             |           | -0.162 (-0.269, -0.055) | 0.003 |
| Satisfaction on noise level               |           | -0.196 (-0.338, -0.054) | 0.008 |
| ISI                                       |           |                         |       |
| Perceived positive impacts from greenness |           | 0.038 (-0.096, 0.173)   | 0.572 |
| Perceived positive image of blue space    |           | -0.049 (-0.500, 0.402)  | 0.831 |
| Perceived less air pollution at workplace |           | 0.590 (-0.617, 1.798)   | 0.333 |
| Satisfaction on light quality             |           | -0.209 (-0.394, -0.025) | 0.027 |
| Satisfaction on noise level               |           | -0.252 (-0.497, -0.008) | 0.043 |
| HADS_anxiety                              |           |                         |       |
| Perceived positive impacts from greenness |           | 0.034 (-0.064, 0.132)   | 0.491 |
| Perceived positive image of blue space    |           | 0.274 (-0.049, 0.597)   | 0.095 |
| Perceived less air pollution              |           | 0.593 (-2.341, 3.527)   | 0.688 |
| Satisfaction on light quality             |           | -0.057 (-0.196, 0.081)  | 0.414 |
| Satisfaction on noise level               |           | -0.227 (-0.402, -0.052) | 0.012 |
| HADS_depression                           |           |                         |       |
| Perceived positive impacts from greenness |           | -0.019 (-0.113, 0.075)  | 0.686 |
| Perceived positive image of blue space    |           | 0.127 (-0.186, 0.440)   | 0.421 |
| Perceived less air pollution              |           | 0.275 (-0.569, 1.118)   | 0.518 |
| Satisfaction on light quality             |           | -0.039 (-0.171, 0.094)  | 0.563 |
| Satisfaction on noise level               |           | -0.123 (-0.296, 0.050)  | 0.159 |

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**Conclusion:** These preliminary findings suggest that environmental factors, particularly lighting and noise, may be related to sleep quality and mental health among nurses. Future publications will include real-time environmental tracking, circadian rhythm metrics, and biomarker data.