Prevalence rate and risk factors associated with health hazards to select the magnitude of health problems among street sweepers in Chiang Rai province, Thailand

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Abstract : Street sweepers exposed to hazards directly and indirectly which can affect their health. This study aimed to determine the prevalence rate of health hazards, to examine the risk factors association with health hazards, and to assess magnitude of health problems among street sweepers. A cross-sectional study was conducted in Chiang Rai province. All volunteered male and female 75 street sweepers were full time workers. Data collection was divided into two phases; the first phase, the hazard questionnaire, was applied for face to face interview. The second phase, focus group discussion, was processed of the prioritization occupational health problems. Majority of prevalence health hazard had 89.3% of street sweepers in ergonomic and 80.0% of physiological hazard respectively. Statistical significance was associated between chemical hazard with educational background and take a short break, biological hazard with working experience, physiological with age group, and ergonomic with gender, age, working experience, educational background, take a short break, BMI, length of broom and weight of broom (Chi-square test, p<0.05). The finding founded that ergonomic was ranked as a major severity of health hazards among street sweepers. Magnitude of health hazards should be raising their concern on health adverse effects and safety in an ergonomic.
Keywords: Prevalence rate, Health hazards, Magnitude, Health problems, Street sweepers

I.   Introduction

Occupational street sweepers are behind the enhancing traffic safety for removing harmful pollutants [1]. In general, street sweepers used brooms and a dustpan for cleaning up waste on the road and footpaths. Street sweepers are exposed to a variety of health risk factors on working environment such as dust volatile organic matter, bio-aerosols and mechanical stress, which caused them to develop certain occupational disease [2][3]. According to Zock, occupational health hazard among street sweepers can be exposed were physical health hazard, chemical health hazard, biological health hazard, psychosocial health hazard and ergonomic [4]. Physical health hazard, physical signs and symptom include rash, sunburn, heat stress, headache, breathlessness, skin cancer and temporary loss of hearing or permanent hearing loss from exposure to noise. Chemical health hazards, risk of health include headaches, dizziness, fatigue and respiratory problem of vehicles on the road such as carbon monoxide, carbon dioxide, sulfur dioxide and particulate matter may serve as a vector for health effect air pollutants. Biological health hazard, street sweepers may be also exposed of biological include bacterial endotoxins, fungal secretions and micro-organisms present in aerosols created during the sweeping and cleaning process. Psychosocial health hazard, involved factors are varied such as requirement to work 8-hour of labor force, individual responsible area and they are monitored daily work by supervisor which lead to adverse effects for street sweepers, such as social isolation, higher risk of being victim of violence, working at unsociable hours, fatigue, disruption of work-life balance and higher exposure to dangerous substances [5]. Ergonomic risk factors involved tasks such as equipment or tool, work station, practice, policy of organization and personal behavior [6]. All of the hazard cannot be resolved as there are complexities and have different health effect. The priority setting of health hazard is an important rule for management in organizations. In Chiang Rai province, there was no campaign to examine the health hazard and to determine health problem among street sweepers. Therefore, the aim of this study was to determine the prevalence of health hazards, to examine the risk factors association with health hazards, and to assess magnitude of health problems among street sweepers in Chiang Rai province, Thailand. The relevant authorities will should consider providing the program to manage and prevent health problem which lead to well-being of street sweepers in the workplace.

II.   Materials and Methods

2.1 Study population

A cross-sectional study was conducted in Chiang Rai province which was located in the northern Thailand. The study setting was in Chiang Rai municipality which encompasses-4 sub-districts including Wiang, Robe Wiang, Rimkok and Sansai. Chiang Rai municipality was selected for two reasons: first, the

municipality is the biggest in size in Chiang Rai province and there are highest numbers of street sweepers who receive income from the municipality. The second reason, it is unreported or undiagnosed health risk among sweepers. Seventy-five eligible target participants were selected to participate by voluntary in the study. Both male and female who participated were full time, aged between 18-60 years old. This study was approved by the Ethics Review Committee for Research involving Human Research Subjects group, Chulalongkorn University, Thailand. The certificate of approval number was COA 135/2557.

2.2 Procedures

The data collection was face to face interviewed by questionnaire constructed. The socio-demographic characteristics included gender, age, educational background, working years, marital status, take a short break, cigarette smoking, alcohol drinking, BMI, street sweeping distance, length of broom and weight of broom.

The hazard questionnaire was applied to appropriate type of occupational health among street sweepers including 5 parts: 1) physiological hazard; 2) chemical hazard; 3) biological hazard; 4) psychological hazard; and 5) ergonomic. The questionnaire was validated with pilot testing for clarity and reliability on 30 street sweepers showed a Cronbach alpha coefficient of 0.84 in physiological hazard, 0.86 in chemical hazard, 0.88 in biological hazard, 0.93 in psychological hazard and 0.88 in ergonomic.

Focus group discussion was processed of the prioritization occupational health problems followed by the Sanpasithiprasong (SPS) model [7]. This study applied the Sanpasithiprasong (SPS) model to assess the priority setting for the analysis of magnitude of occupational health hazard among street sweepers. The participants were staff of environmental and public health department and street sweepers who can be sharing common attitudes and suggestions on occupational health problem, after that they were ranking scores in each process include 1.) Size of problem or prevalence refers to the all-new proportion of a population having exposed to occupational health problem during a period of time. The data obtained as a result of hazard questionnaire. Then continue to compare the scoring criteria as follows; no prevalence = 0 score, > 25% = 1 score, 26-50%= 2 score, 51-75%= 3 score and 76-100%= 4 score. 2.) Severity of problem refers to the participants who were exposed to health hazard; there was danger of disability or death. The problem which does not prevent may affect health, family, community and economic. The score of problem are as follows; no effect = 0 score, rarely = 1 score, few = 2 score, very = 3 score and most = 4 score. 3.) Feasibility of management refers to the process of work to resolve the problem were easily or difficult. The problems can be solved by themselves or organizations through period of time, budget. This problem-solving considers number of people who support the idea that problems are not difficult to solve, scoring criteria as follows: incorrigible= 0 score, very difficult= 1 score, difficult = 2 score, be easy= 3 score and very easy= 4 score. 4.) Community concern refers to street sweepers who were willing to help in solving problems. This problem-solving considers number of people who support in solving problem, scoring criteria as follows; no problem= 0 score, rarely= 1 score, few= 2 score, very= 3 score and most= 4 score. The conclusion combined the data scoring in four elements above filled in the table and scores. The summary total scores result were reported by multiply four element score (element 1*2*3*4). The magnitude of data was shown by sorting priority.

2.3 Statistical analysis

A descriptive statistic was used to analyze data by using SPSS v.17 (Chulalongkorn University license). Analysis of data was descriptive statistic such as frequencies and percentage, mean and standard deviation, it explained socio-demographic characteristic; inferential statistic such as, odds ratios (OR), 95% confidence intervals (CI). Chi-square test was used to explore associations between health hazards and socio-demographic factors. Magnitude of health hazards were used multiplication method to set priority of health problem in street sweepers.

III.   Results

The prevalence rate of health hazard among street sweepers indicated 89.3% of ergonomic, 80.0 % of psychological hazard, 76% of chemical hazard, 58.7 % of biological hazard and 57.3 % of physiological hazard respectively as shown in the figure 1.

Association between the risk factors with health hazards in street sweepers showed physiological hazard was not significantly associated, chemical hazard was significantly associated with educational background and take a short break, biological hazard was significantly associated with working experience, physiological was significantly associated with age group, and ergonomic was significantly associated with gender, age, working experience, educational background, take a short break, BMI, length of broom and weight of broom (Chi-square test, $p<0.05$) as shown in table1.

Priority settings of health hazard, the total score from 4 criteria were 192 scores of ergonomic, 81 scores of psychological hazard, 32 scores of chemical hazard, 12 scores of biological hazard and 12 score of physiological hazard. Majority of magnitude of health hazard founded that as shown in table 2.

IV.   Figures and Tables
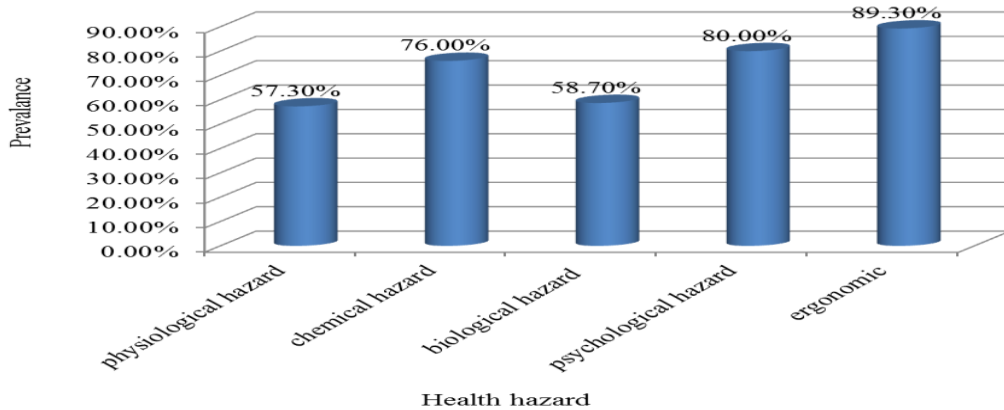
Figure1 Prevalence of health hazards (n=75)

Table 1 Associated between health hazards and socio-demographic characteristics (n=75)

Characteristics	Physiological hazard OR	95%CI	Chemical hazard OR	95%CI	Biological hazard OR	95%CI	Psychological hazard OR	95%CI	Ergonomic OR	95%CI
Gender (Male, Female)	2.41	0.76-7.67	2.66	0.79-8.95	1.84	0.59-5.75	0.56	0.11-2.78	5.09	1.10-23.49
p-value		0.129		0.105		0.291		0.470		0.025*
Age(years) (<46, ≥46)	0.63	0.25-1.59	0.39	0.13-1.26	0.87	0.34-2.19	3.22	0.98-10.61	11.03	1.28-94.96
p-value		0.328		0.112		0.762		0.048*		0.009*
Educational background (Primary, Secondary school)	2.12	0.59-7.51	0.22	0.06-0.76	0.93	0.29-2.99	1.63	0.32-8.19	0.18	0.04-0.82
p-value		0.237		0.012*		0.898		0.553		0.016*
Working years (<14, ≥14)	0.62	0.24-1.59	0.50	0.17-1.47	0.27	0.10-0.73	1.83	0.52-6.43	0.07	0.01-0.56
p-value		0.322		0.203		0.009*		0.340		0.002*
Marital status (single, married)	2.34	0.74-7.43	0.77	0.23-2.56	2.18	0.69-6.93	5.53	0.67-45.42	0.48	0.10-2.25
p-value		0.143		0.667		0.180		0.079		0.344
Take a short break (No, Yes)	1.23	0.36-4.20	0.28	0.08-0.99	2.74	0.69-10.95	1.46	0.29-7.42	0.08	0.02-0.41
p-value		0.736		0.040*		0.142		0.647		0.001*
Cigarette (smoker, nonsmoker)	1.60	0.44-5.86	0.94	0.22-3.92	0.66	0.19-2.27	3.14	0.37-26.48	1.37	0.15-12.32
p-value		0.476		0.929		0.506		0.270		0.775

Note. OR-odds ratio, 95% CI - 95% confidence intervals (CI), Chi-square test(χ2), *Significant at p-value < 0.05

Table 1 Associated between health hazards and socio-demographic characteristics (n=75) (continue)

Characteristics	Physiological hazard OR	95%CI	Chemical hazard OR	95%CI	Biological hazard OR	95%CI	Psychological hazard OR	95%CI	Ergonomic OR	95%CI
Alcohol drinking (never, sometime)	0.72	0.16-3.12	0.26	0.06-1.19	2.29	0.43-12.18	0.72	0.13-3.99	0.88	0.86-0.96
p-value		0.657		0.068		0.321		0.708		0.301
BMI(kg/m2) (<23, ≥23)	1.01	0.39-2.61	2.00	0.68-5.86	1.39	0.54-3.60	0.35	0.09-1.37	6.14	1.14-32.91
p-value		0.979		0.203		0.489		0.121		0.020*
Street sweeping distance (kilometers/day) (<2, ≥2)	0.76	0.27-2.09	2.31	0.59-8.99	2.97	0.95-9.26	0.50	0.15-1.64	0.34	0.08-1.51
p-value		0.589		0.219		0.055		0.247		0.143
Length of broom (centimeter) (<160, ≥160)	0.74	0.29-1.87	0.68	0.23-1.96	1.32	0.52-3.36	0.58	0.18-1.82	0.81	0.71-0.94
p-value		0.525		0.471		0.561		0.350		0.010*
Weight of broom (gram) (<800, ≥800)	1.43	0.57-3.59	1.49	0.51-4.33	1.59	0.63-4.03	1.83	0.58-5.79	9.17	1.07-78.76
p-value		0.443		0.462		0.320		0.298		0.018*

Note. OR-odds ratio, 95% CI - 95% confidence intervals (CI), Chi-square test (χ2), *Significant at p-value < 0.05

Table 2 Prioritization criteria and magnitude of health hazards

Health hazards	Criteria				Multiplication	Magnitude
	Size of Problem or prevalence	Severity of Problem	Feasibility of Management	Community concern		
Physiological hazard	4(57.30%)	1(Rarely)	1(Very difficult)	1(Rarely)	4	5
Chemical hazard	4(76.00%)	2(Few)	2(Difficult)	2(Few)	32	3
Biological hazard	3(58.70%)	2(Few)	2(Difficult)	1(Rarely)	12	4
Psychological hazards	3(80.00%)	3(Very)	3(Be easy)	3(Very)	81	2
Ergonomic	4(89.30%)	3(Very)	4(Very easy)	4(Most)	192	1

V. Conclusion

Most of the occupational health hazards were ergonomic problem 89.30 % of street sweepers. As reported Losakul, the major occupational related to work hazard was 79.00% of ergonomic among street sweepers in Hatyai municipal, Songkhla province [8]. Majority of risk factors was associated with ergonomic, it involved personal factors and working factors in street sweepers. Ergonomics risk factors related to perceived physical demand of task, behavioral of personal and policy of organization. The workers can learn to anticipate what might go wrong and modified tools and the work environment to make tasks safer for their workers [9], [10].

In conclusion, the results indicated that ergonomic was ranked as a major hazard and followed by psychological hazard, chemical hazard, biological hazard and physiological hazard respectively. The scoring of criteria was concerned to ranking score in each process by street sweeper, staff of environmental and public health of municipality. Magnitudes of setting that focus upon the primary level are considered in the guidelines for resolve a variety of problems and show latency to develop health hazard of street sweepers. All of the health hazard cannot resolve the problems due to there are the complexity and different health effect. The priority setting of health hazard is important for management in organization.7 Hence, Street sweepers are exposed to a variety of occupational health hazard should be raising their concern on safety work practice and health risk-especially, both an ergonomic and psychological hazard. However, the organization should be aware occupational process and environmental health among street sweepers in municipality, to provide the appropriate program for health risk prevention among street sweepers followed by score magnitude of health hazards.

Acknowledgements

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