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Resurgence of Tropical bed bug, *Cimex hemipterus* (Hemiptera: Cimicidae) Infestation in Malaysia: Control strategies and challenges faced by Urban Pest Control Operator (PCO)

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Abstract

Bed bugs cases have been at alarming rate in Malaysia. An online survey was conducted among Pest Control Operators in Malaysia to investigate the often used technique in treating bed bugs infestation. The forms were distributed via online. Other preferences such as type of premises, number of cases, number of successful treatment and resistance in bed bugs after residual treatment were also included in the questionnaires. From the survey, Pest Control Operators preferred chemical and spray method for treatment (66.7%) especially in Kuala Lumpur and Selangor which also had the highest infestation of bed bugs in their premises. Most companies prefer MYR 500-1000 (USD 100 – 300) as service cost per treatment site. Although professionals hardly find resistance bed bugs in their treatment cases (75%), but number of complete eradication per site is very low (41.7%). Improvements of bed bugs treatment required to prevent widespread of bed bugs infestation in Malaysia.

Keywords: tropical bed bugs, *Cimex hemipterus*, Pest Control Operator, treatment, Malaysia

1. Introduction

Generally, bed bugs infestation is known to be a nuisance to humans as they have been battling the insect pests for millennia. Bed bugs are ectoparasites that live closely to people that requires blood meal to complete its life cycle and reproduce^[1-3]. They are not known to transmit disease such as body lice but are a significance treated pest for public health importance^[4]. After blood meal, they will seek shelter in cracks and crevices. The flattened oval body shaped, makes things easier for them to hide in cracks and crevices in walls, in wooden furniture, seams of mattresses, in box springs and other places during daylight^[1]. Their bites cause cutaneous reactions such as itchiness and redness on the skin surface while secondary infection may occur if severe^[5]. The reactions may occur due to hypersensitivity of victim towards pests.

The issue started when the infestation problems get much more serious in order to control the population. Although the pest managers and professionals have come up with various types of chemical and non-chemical insecticides, the digits of this pest population still have not shown negative results^[4]. The exact cause of the population that dropped dramatically during mid-20th century is not known but the bed bugs resurgence is related to globalization that requires people to travel to and fro from their country, socio-economic condition (disposal and second-hand furniture in most rental houses) and lack of knowledge among the professionals and pest control operator on managing this insect^[5]. *Cimex lectularius* is widely spread in United States and some parts of other country like Thailand (Chiangmai only) as they prefer more temperate region, whereas *C. hemipterus* is prevalent mostly in Southeast Asia such as Malaysia and Singapore^[6-7]. Therefore, the purpose of this study was to identify the preferred methods and findings related to treatment by Pest Control Operator in Malaysia via online survey forms in controlling bed bugs infestation.

2. Materials and Methods

The study was conducted for the period of 4 months from December 2014 until March 2015. Survey forms for the pest control operator (PCO) were distributed to study the control methods provided by each company and effectiveness of treatment used in the affected area. For instance, type of premises that each company have treated before, number of cases and

presence of resistance in bed bugs after treatment also included in the form. The questionnaire was sent through emails to each pest control company in several states of Malaysia. Forty eight respondents involved in this research. Questionnaires for PCO were analyzed using Chi-squared test goodness of fit (χ^2 test) for each of the variables to study treatment methods used in each company according to states in Malaysia. For example, the variables tested include the knowledge level on bed bugs and control method used to treat infestation in affected among the pest company operator (PCO) in states of Pulau Pinang, Kuala Lumpur, Selangor, Kedah, Johor, Perak, Kelantan, Negeri Sembilan and Sarawak.

3. Results and discussion

The preferences in the questionnaire were tabulated as follows in Table 1. A total of 48 pest companies from nine states in Malaysia involved in the online survey. Questionnaires were distributed to all pest companies via online and the results were analyzed using Chi-square Goodness-of-fit test (χ^2 test) to investigate the most preferable method used by pest companies in Malaysia. The nine states include Selangor, Kuala Lumpur, Pulau Pinang, Kedah, Perak, Kelantan, Negeri Sembilan, Johor and Sarawak. Pest companies from each state were tabulated in Figure 1.

Table 1: Preference and frequency mode from the online survey for Pest companies in Malaysia.

Items	Preference	χ^2 (df)	Mode frequency
Treatment methods	Chemical and spray	26.000 (2)	32
Premises	Hotel/motel and residential houses	9.375 (2)	26
Infestation sites	Walls and floors, sofa and cushion and wooden furniture	15.833 (3)	23
Number of cases per year	1-20 cases	8.000 (3)	16
Severity level	3(21-30)	5.958 (4)	14
Succession in bed bugs treatment	2 times	34.083 (4)	20
Resistance in bed bugs	No	12.000 (1)	36
Cost of expenditure	RM500-RM1000	58.625 (2)	41

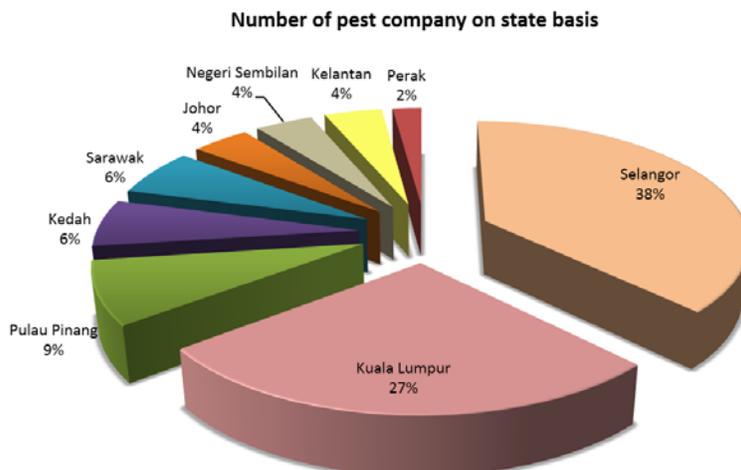


Fig 1: Pest companies from nine states in Malaysia

The study also involves types of premises that most of the pest company used to treat bed bugs infestation (Figure 2). For example, premises were categorized into hotel and low-budget motel, residential houses and apartments, and schools and dorms. Preferred treatment methods to eradicate infestation of bed bugs applied by pest companies were simplified in the

Figure 3 according to their states respectively. According to the analysis survey data, residential houses, apartments, hotels and motels have the highest infestation of bed bugs especially in Kuala Lumpur and Selangor. Treatment method preferred by most pest companies in Malaysia was chemical and spray rather than clean up and combination (Figure 3).



Fig.2: Premises types treated by pest control companies in Malaysia

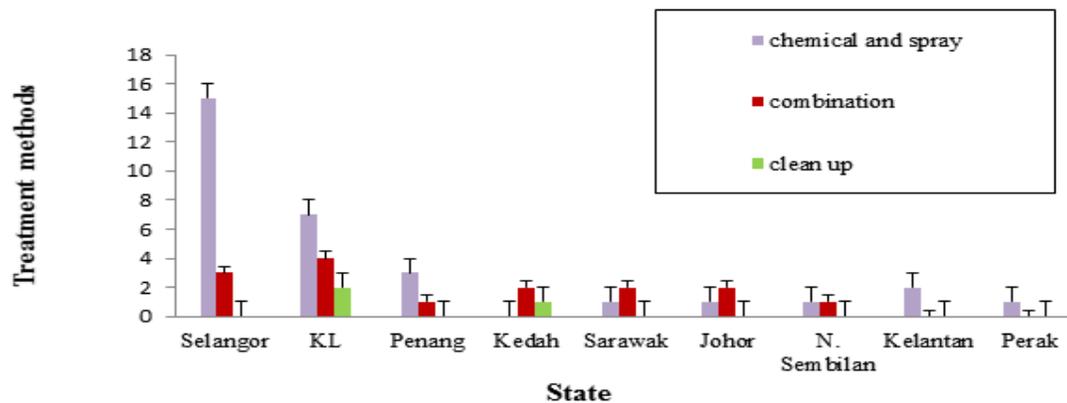


Fig. 3: Treatment methods used by each pest control company from respective state.

Based on statistical analysis, there were significant difference for both treatment methods and the most treated premises by pest companies in each state. For instance, in treatment methods, there was a significant difference in the preference of distinct methods where most pest companies prefer chemical and spray used to treat bed bugs with a total percentage of 66.7%. Chemical treatment is easier to implement and alternate mode of insecticides has been widely used to prevent the insect from developing resistance. A total of 54.2% of pest companies often treated premises such as hotel or motels and residential houses or apartments. Common infestations also occur in the particular premises based on the survey among the professionals of pest control in Israel [8]. Low-cost flats and apartments and multi-tenanted houses causes high distribution of bed bugs to other premises or public places [9].

Most sites of infestation occurred along walls and floors, sofa and cushion and wooden furniture when less than 50% (47.9%) of them reported in the survey form. Treatment using chemical insecticides can be applied along their harborage sites but the remaining that survives will produce more generations if the small sites left untreated [10]. In Malaysia, the highest reported cases received would be in ranges of 1-10 and 11-20 equally voted by 33.3% of pest companies for both ranges. However, the severity level of infested sites within premises showed a medium scale of bed bugs found in each treatment area which is around 21-30 insects. At least 29.2% of them agreed the number level. The reason for this outcome is because cases of bed bugs infestations are very rare nowadays as they were considered to be eliminated after being lost for quite some time and made a comeback in later years [11].

Majority of the pest companies (41.7%) took twice per week to completely eradicate the bugs. Successful treatment is due to bed bugs may escape from the treated surface and flee to other area in the house [12]. It is also reported that about 75% did not find any resistance in bed bugs their previous treatment were able to control the pest population. In contrast, only 12 pest companies found resistance in bed bugs. Insecticides from pyrethroid family like deltamethrin and alpha-cypermethrin, increases dispersal of bed bugs that can lasts for few generations as the insect become resistance against those insecticides [12-14]. Malaysia is still capable in controlling the insect pest due to low tolerance level but consistent treatment is required to wipe out the entire colony. Approximately, 85.4% of pest control companies usually charged at a standard price around MYR500-MYR1000 (USD 100 – 300) per treatment site. However, due to the treatment cost per house is very expensive among the residents, most of them prefer to find other methods rather than calling professionals [15].

Besides, lacking of cooperation from some of the residents that never reported bed bugs cases as the pest is known not to carry such harmful diseases had cause difficulties for the pest control companies in treating heavy infestation [14-15].

4. Conclusion

Based on the survey conducted among 48 pest control companies in Malaysia, the pest population still can be controlled as less complaints received among the residents. Although spraying chemical insecticide was highly in used for treatment purpose, the severity of infestations was below threshold level. Nevertheless, improvement in treating bed bugs should be implemented to prevent widespread of the pest throughout the country. Introduction of methods such as exposing bed bugs to extreme temperatures (freezing or heating) and sanitary campaign may help in outnumbering the pest population. Talks on bed bugs issue among the Pest Control Operators (PCO) also should be executed as a part of their studies on urban entomological pest.

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