

THE PROBLEM OF THE DISTRIBUTION OF BEDBUGS IN THE WORLD AND IN VITEBSK REGION (BELARUS) IN PARTICULAR

D. P. Prathapasinghe¹⁾, Yu. Yu. Masalkova¹⁾

¹⁾ Vitebsk State Order of Peoples' Friendship Medical University, Frunze Avenue, 23/1, 210009, Vitebsk, Belarus, dulmini.pr1@gmail.com masalkovayulia@mail.ru

This paper focuses on data on the spread of bedbugs in some countries around the world, including the Republic of Belarus, the reasons for the increase in the spread of these insects, and other existing problems in relation to them. 1/3 (34.83% and higher) of all requests from the population of Vitebsk for dwellings disinfection in 2019–2024 are for homes infested with bedbugs. In 10.53 % – 41.67 % during the study period, people requested help from entomologists in identifying bedbugs. The article also contains information on the results of a survey of students of the Vitebsk State Medical University regarding bedbugs, according to which 61.7 % of respondents had never had experience interacting with bedbugs in their lives, but had heard of their existence.

Keywords: bedbugs; distribution; *Cimex hemipterus*; *C. lectularius*; disinsection

ПРОБЛЕМА РАСПРОСТРАНЕНИЯ ПОСТЕЛЬНЫХ КЛОПОВ В МИРЕ И В ВИТЕБСКОМ РЕГИОНЕ В ЧАСТНОСТИ

Д. Пратасингхе¹⁾, Ю. Ю. Масалкова¹⁾

¹⁾ Витебский государственный медицинский университет, пр-т Фрунзе, 23/1, 210009, Витебск, Беларусь, dulmini.pr1@gmail.com, masalkovayulia@mail.ru

В статье приведены данные о распространении постельных клопов в ряде стран мира, в том числе в Республике Беларусь, причины роста распространения этих насекомых и другие существующие проблемы. 1/3 (34,83 % и более) всех обращений населения г. Витебска за дезинсекцией жилых помещений в 2019–2024 гг. приходится на квартиры, зараженные клопами. При этом в 10,53 % – 41,67 % случаев люди обращались за помощью к энтомологам в определении постельных клопов. По результатам опроса студентов Витебского государственного медицинского университета в отношении клопов, согласно которым 61,7 % опрошенных в жизни никогда не сталкивались с клопами, но слышали об их существовании.

Ключевые слова: постельные клопы; распространение; *Cimex hemipterus*; *C. lectularius*; disinsection

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Introduction. Bed bugs of the *Cimicidae* family are blood-sucking wingless insects that are classified as house (nesting) parasites of the ambush type. Among the great variety of bedbug species, only two are capable of permanently living in human dwellings and affect humans: *Cimex lectularius* (Common Bed bug) found in temperate regions and *Cimex hemipterus* (Tropical Bed bug) found in the tropical and subtropical regions of the world. While bed bugs are not confirmed vectors of disease, they are a growing global issue, affecting both developed and developing nations due to increased travel and insecticide resistance.

Their presence may lead to nervous illnesses in sensitive people and the wound caused by bed bug bites may lead to secondary infections. Significant skin irritations, sleep disruption and psychological impacts such as anxiety, stress are other public health impacts of bed bugs [1]. More than 40 pathogens have been found in bed bugs however, there is not enough evidence to show that

they transmit disease causing pathogens to humans. If the bed bugs are numerous the patients may suffer from anemia [2]. Research has provided evidence of presence of Hepatitis C virus in common bed bug (*C. lectularius*) nymphs [3].

Even though *C. lectularius* is known to be the bed bug species that spread across Europe, recent cases of *C. hemipterus* are being reported from European countries such as Czech Republic, Slovakia and Switzerland, and also in the countries of North Australia, Middle East, the United States, Russia etc. [4, 5]. Numerous Russian cities have reported sightings of tropical bed bugs, a new species that spread across the European portion of Russia [6].

Since the 2000s, bed bug infestations have been steadily rising globally. These infestations pose a significant health threat, ranging from minor skin irritations to severe psychological distress. Public awareness of this public health issue is increasing. Analyses of Google trends data reveal a consistent rise in search volume related to bed bugs since 2004, with noticeable seasonal fluctuations and recurring peaks observed during summer months [7].

High population density, increased travel, resistance to traditional insecticides attribute the increased infestations. Business, travel, educational etc. movement of people between different countries, including Belarus, significantly contributes to the spread of these pests, increases the risk of transporting bed bugs via luggage, public transport, and clothing, allowing infestations to spread rapidly across different regions, making eradication challenging. The problem is compounded by the fact that bed bugs can survive up to a year without feeding, allowing infestations to persist unnoticed [3]. It is important to understand their biology and how they spread in order to implement effective control measures.

Regardless of socioeconomic backgrounds, bedbug infestations can be very costly. Inspections, quarantines, treatments, and replacing infected items are all part of the expensive process of disinfection. Both people and economies are impacted by this. Studies reveal large financial losses, especially in the tourism and hotel industries. The costs vary greatly [4]: according to US surveys, each infestation costs between \$800 and \$1200, while Australia estimated \$100 million in 2006. The government of Ghana has spent millions of cedis. The anticipated cost of developing new insecticides is more than \$180 million.

In light of global trends in the growth of bed bugs, Belarus is no exception, which confirms the importance of studying this problem in our country. In addition, bed bugs are a novel experience for the foreign students who encounter them for the first time in Belarus from one side but also can take part in their distribution from the other side.

The purpose of the article is to study the general distribution of bed bugs around the world including The Republic of Belarus and Vitebsk region particularly.

Materials and methods. The research material was literary sources containing data on the spread of bed bugs in different countries of the world, including the Republic of Belarus, statistical data from the Vitebsk Zonal Center of Hygiene and Epidemiology. In addition, an online survey (using a Google form) was conducted among students of the Vitebsk State Medical University to determine their level of awareness of bed bugs and methods of combating them.

81 students participated in the survey: from Republic of Belarus (12.3 %), India (2.5 %), Sri Lanka (76.5 %), Nigeria (4.9 %), Egypt (1.2 %), Turkmenistan (1.2 %), others countries (1.2 %) took part in the Statistical processing, data analysis, and charting were carried out using Google sheets and MS Excel 2021.

Research results. Specific Belarus-focused statistics are limited by the data of Centers of Hygiene and General Health. One method to assess the spread and increase in bed bug population in the country is to observe the disinsection requests received by exterminating organizations. As an example, the Pinsk Zonal Center for Hygiene and Epidemiology has received more citizen requests in recent years for bedbug elimination in private residences and apartments. Thus, if in 2011 the extermination measures against bedbugs in the city and district amounted to 2.5% of all those carried

out, in 2014 – 8.5%, then already in 2020 – 25 % [9]. Having displaced cockroaches and ants in the name of harmful domestic insects, bedbugs in apartments have recently become the number one problem. Studies also indicate that the majority of pest control efforts in urban settings focus on hotels, dormitories, and low-income housing – common sites of infestations have been reported.

This uptick reflects the broader global trend, where bed bugs are now three times more prevalent in urban centers compared to rural areas due to densely packed living conditions and high turnover rates in accommodations like hostels and low-cost apartments.

Although a visual inspection can confirm the presence of bed bugs, these pests are often misidentified. Not all residents are aware of what bed bugs look like and as a rule, awareness of bed bugs among the population increases with age. For example, in a study of 358 people in England [10], only 10 % recognized a bed bug when shown one in a test tube. In the US, 50 % of the people did not realize it even though they had an active infestation [11]. In four main German cities [12] out of a sample of 391 people, 13 % recognized a bed bug and 15% of total respondents would call an exterminator in case of a bed bug outbreak. This results in the pessimistic estimate that 97 % of all early-stage infestations could go undesinsected.

Even health professionals including residents and consultants can have many misconceptions regarding bedbugs clinical significance, spread, control, and their general appearance. This reflects a lack of knowledge about these insects in the wider community.

France was mentioned as the Epicenter of bed bug resurgence in Europe. This issue has drawn considerable attention, particularly as Paris hosted the 2024 summer Olympics. Jean-Michel Berenger an entomologist at Marseille's main hospital and France's leading expert on *les punaises* states that every summer an increase in bed bug population is seen is bigger than at the last one [13]. According to the press release from the French National Academy of Medicine issued on (April 2024) in France, the percentage of bed bug infected households increased from 7% in 2014 to 11 % in 2023 [13]. Furthermore moderate-to-severe repercussions on everyday life were reported by 39 % of the patients in France applied to the doctors of general practice related to bed bugs from March 2019 to April 2020. Cases were reported in all regions of mainland France [5]. In London, United Kingdom, complaints to councils about bedbugs have risen 23 % in 2023 to 14,587. Of the callouts made last year, 8,864 were homes in London, with research showing infestations in hotels were up by 278 % since 2021 [14].

As mentioned earlier, the most common bed bug in tropical regions is *C. hemipterus*, which has also seen a significant increase in numbers recently. Study results of the Chinese scientists Lei Wang, Yijuan Xu, Ling Zeng [15] shows 67 instances of bed bugs in 2012, a sharp rise from the 4 in 2007 discovered in 23 provinces of China with the most severe infestations occurring in Guangdong Province.

These insects are widely spread even in hospitals. According to the study conducted in 86 wards of 2 tertiary public sector care hospitals in Lahore, Pakistan during autumn 2019 in 72.1 % of the wards infestation was found. The incidence of infestation was significantly lower in wards that took control measures (25.8 % vs 74.2%) [16].

In Southeast Asia over the past years, pest management professionals have reported bed bug management to be increasingly important. A study examining 54 infested sites across Malaysia and Singapore found that the majority (74.1 %) of infestations occurred in hotels, while 25.9% were detected in residential properties [17]. *C. hemipterus* was the only species of bedbug found in Malaysia and Singapore the three most common locations of infestation within an infested premise were the bedding (31.1 %), the headboard (30.3 %), and cracks and crevices surrounding the baseboard, wall, or floor (23.5 %).

One species of bed bugs, *C. hemipterus* has been discovered according to recent research in major cities across eight governorates of Iraq [18]. The worker dormitories (71.12 %) were the most common places with bed bugs infestation, followed by family housing (25.07 %) and local hotels (3.81 %). Bed bugs have dominantly infested the bedding area (87.5 %), wooden furniture (91.6 %),

cracks and crevices (83 %). It further established that 70% carpets, low cost hotels and housings had been infested by bugs. The discovery of bed bugs in 3% of Bahraini households in 2004 prompted the government to launch a national control campaign involving education and pesticides [19].

There is an underreporting of bed bug infestations in health care settings, as evidenced by the sparse medical literature. Bed bug outbreak was observed in the neonatal intensive care unit attached to the state-run Lady Hardinge Medical College, New Delhi, India. A total of 39 individuals (newborns, their mothers, the health professionals and their families) were affected by a wide variety of rashes and inducing sleeplessness [20]. In hospitals in the United States the bed bug infestations have increased by over 50 % in 2012 compared to 2011. In nursing homes, it has increased from 25 % to 46% in the same year. Hamilton Health Sciences hospitals in Canada reported 10 cases of bed bugs between January and July, 2012 [21].

In light of the above, the results of a survey of students of the Vitebsk State Medical University regarding bedbugs are presented below. 53.1 % of study participants had experience interacting with bed bugs and 39.3 % found them daily. In 22.7 % cases bedbugs were found in beds. Furniture (5.5 %), walls (7.3 %), kitchen (10.9 %), bathroom (5.5 %) were also the places they were found. 59.3 % of respondents said they had seen live insects, while 31.5 % had bite marks and 9.3 % saw bloodstains. Paying attention to the discomfort caused by bedbugs, it must be said that 50 % of respondents complained about skin irritation, 25.9 % suffered from sleep disorders, and 17.3 % of students felt anxiety and stress. In the context of the existing problem, 46.4% of the surveyed students used insecticides to control insects, 14.3 % contacted organizations that deal with the treatment of bedbug infestations, 10.7 % of participants even were forced to change living places. Generally 61.7 % of respondents did not see or have not contact with bedbugs earlier but have heard about them, 13.6 % have seen them in their country before, 24.7 % were not aware about these insects at all.

According to the data of the State Institution “Vitebsk Zonal Center for Hygiene and Epidemiology”, the number of people’s requests for treatment of premises against bedbugs from the total number of requests for disinfestations over the years changed as follows.

It was in the range between 34,83 % and 58,82 % from general requests. The minimum number of requests for treatment of premises against bedbugs was observed in 2020 with a subsequent increase in the number of requests to 56.18 % of the total cases number in 2023. Absolute data of requests was also changed in a similar tendency. Most likely, this pattern is related to the beginning of the Covid-19 pandemic, when the main attention was focused on this disease. Less attention was paid to other problems including bedbugs. The cases of secondary requests for bedbugs control varied within the range 3 – 7 cases per year with the minimum range in 2020 as for general one.

The records of citizens’ requests to the Vitebsk Zonal Center for Hygiene and Epidemiology for species identification of insects are presented in table 2. In 10.53 % – 41.67 % of general requests cases in the period 2019 – 2024 people would know did they meet bedbug or any other insects in the dwelling. Moreover, people mainly decided to seek pest control as a result of insect bites at night and scratching the bite area.

Conclusion. All of the above highlight the need for research and dissemination of information about *Cimex spp.* to the public to address infestation levels, public awareness, and to develop effective control strategies to mitigate its impact on public health and welfare. Further research is needed to develop innovative control strategies for the current problem and to study the impact of climate change on bed bugs.

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