Sahel Journal of Life Sciences FUDMA (SAJOLS)
March 2026 Vol. 4(1): 375-381
ISSN: 3027-0456 (Print)
ISSN: 1595-5915 (Online)
DOI: *https://doi.org/10.33003/sajols-2026-0401-44*

Review Article

An Overview of Cockroach Infestations in Urban Communities and Their Implications on Public Health: A Systematic Review

***Maigoro, A. M., Ashigar, M. A., Akwashiki, O., and Ahmed, Y. M.**

Zoology Department, Federal University Lafia, Nasarawa State, Nigeria
****Corresponding Author's email*: aliyumagoro1122@gmail.com; Phone number: 09078852299**

ABSTRACT
Cockroaches are among the hardy urban pests that can be found in homes, grocery stores, public areas, and landfills, creating serious problems for the environment and human health. This study's main goal is to present a comprehensive overview of cockroaches as urban pests, with implications for public health, and current management techniques. Findings of this analysis showed that cockroaches are carriers of allergens that exacerbate respiratory ailments as well as disease pathogens like *Salmonella* and *Escherichia coli*. The study also revealed that high infestation rates in dense urban areas have reported that 39% to over 80% of residential units can be infested. Dominant species in urban settings is German cockroach (*Blatella germanica*) as the most prevalent species (often greater than 80% of the trapped cockroaches), especially in apartments, kitchens, and hospitals. Other common species include the American (*Periplaneta americana*) and Brown-banded (*Supella longipalpa*). The study revealed that factors such as structural disrepair- older building (10 years plus have higher infestation rates (74.4%) compared to newer area settings (53.99%). In order to lower health hazards and increase quality of life in urban environments, cockroach infestations necessitate interdisciplinary cooperation, better sanitation, public education, and proactive urban design.

Keywords: Cockroach; Implication; Infestation; Overview; Public Health; Urban Communities

Citation: Maigoro, A.M., Ashigar, M.A., Akwashiki, O., & Ahmed, Y.M. (2026). An Overview of Cockroach Infestations in Urban Communities and their Implication on Public Health: A Systemic Review. *Sahel Journal of Life Sciences FUDMA*, 4(1): 375-381. DOI: *https://doi.org/10.33003/sajols-2026-0401-44*

INTRODUCTION

Cockroach Infestation in Urban Areas: An Overview

With a fossil record spanning over 300 million years, cockroaches are among the oldest insect orders. Only a small number of the 3500–4000 species that are known to exist are problematic to humans (Gottfried, 2003).

With an evolutionary history lasting more than 300 million years, cockroaches, which belong to the order Blattodea, are among the most successful families of insects. These insects are remarkably adaptive, flourishing in a wide variety of habitats, including urban settings and tropical rainforests. Bell (2007) states that whereas most cockroach species serve an important ecological function as decomposers, a few species have become major urban pests that provide serious obstacles to environmental management and public health.

Cockroach species that have successfully adapted to human-modified environments include *Periplaneta americana* (American cockroach), *Blattella germanica* (German cockroach), and *Blatta orientalis* (Oriental cockroach). These species take advantage of the favourable microclimatic conditions, food resources, and shelter that urban settings provide (Bell *et al.,* 2007).

Cockroaches live in groups and are drawn to areas with adequate humidity, warmth, and darkness, such as bathrooms, kitchens, dining rooms, and bedrooms. As a result, their presence should not be undervalued because they grow and multiply quickly (Kang, 1987). They also release a pheromone in their faeces that

attracts other cockroaches as the unsanitary conditions of the areas worsen. As a result, atopic and allergy reactions were significantly influenced by exposure to cockroach populations in residents of infested areas (Kang, 1987).

Ecological and Behavioral Adaptation of Cockroaches in Urban Cities

Cockroaches are extremely difficult to manage due of their ecological and behavioral traits. The main obstacles to population control are their nocturnal habits, high rates of reproduction, and capacity to become resistant to pesticides (Chai *et al.,* 2010). Furthermore, studies of Hamilton *et al*. (1990) revealed that because they prefer to hide in cracks and other difficult-to-reach places, they require alternative and effective management techniques like integrated pest management (IPM) approaches, which combine chemical, biological, and environmental measures. Designing efficient and long-lasting control strategies requires an understanding of the physiology, behavior, and ecological dynamics of these pests (Kassiri, 2020). Additionally, if the consequences of climate change worsen, cockroaches may spread geographically, posing new problems to areas that were previously unaffected by these pests (Cochran *et al.,* 1999). However, despite improvements in pest control, the public's growing worries about the effects of chemical control agents on the environment and human health, as well as the growing resistance to insecticides, highlight the urgent need for sustainable solutions (Chai *et al*., 2010).

Prevalence and Health Risks of Cockroach Infestation in Urban Areas

The prevalence of cockroach infestations has once again soared due to Globalization and urbanization of our former major capitals, raising concerns around the world (Schal *et al*., 2021). In addition to being bothersome, these insects have the ability to spread a variety of illnesses, such as bacteria, viruses, and parasites (Ogunsola, 2016). Research has shown that cockroaches' cuticle surfaces and gastrointestinal tracts are home to bacteria like *Escherichia coli*, *Salmonella* spp., and *Staphylococcus aureus*, which can contaminate surfaces and food (Zhu *et al*., 2016). Furthermore, their secretions, exoskeletons, and faeces are known to function as strong allergens, aggravating respiratory disorders including allergic rhinitis and asthma, especially in crowded urban environments (Brenner *et al*., 2019).

According to research by Bradman *et al.* (2005) and Wang *et al.* (2006), poor hygiene and inappropriate waste storage and disposal lead to a disproportionately high frequency of pest infestation because people are unaware of the conditions that encourage cockroach infestation.

Aim and Boundaries of the Review

This review's main goal is to present a comprehensive overview of cockroaches as urban pests, with an emphasis on their ecological adaptation, implications for public health, and current management techniques.

Significance of the Study Review

The aim to find research gaps and suggest creative ways to lessen the effects of cockroach infestations in urban settings by combining what is already known. It is anticipated that the results of this review will aid in the creation of integrated, empirically supported methods for controlling cockroach populations, guaranteeing a more robust and sustainable urban ecosystem (Kassiri *et al.,* 2020).

MATERIALS AND METHODS

Study Design and Method

The Systematic Reviews of Literatures technique by using a structured, evidence-based approach, typically following PRISMA guidelines in order to ensure comprehensive, unbiased, and reproducible synthesis which is used to find, evaluate, and compile peer-reviewed literature, was examined in this review article. This is to guarantee transparency and methodological rigor. In order to provide a comprehensive understanding of cockroach infestations in urban areas, the evaluation process include classifying literature according to themes, methods, and results.

With a primary focus on urban areas, the study sought to compile the body of information regarding the ecological behavior, public health concerns, and control techniques of cockroaches.

Methodological Approach Used in Study Selection Criteria

Database selection

A thorough search utilizing pre-titled phrases pertaining to cockroaches, urban pests, public health, and management in PubMed, Scopus, Web of Science, and Google Scholar for papers published between 1990 and 2025 using method described by Schneider *et al.* (1997). Once duplicates have been eliminated. At this point, thirty records were eliminated since they did not fit the inclusion requirements.

After evaluating 50 full-text publications for eligibility, we eliminated 20 of them due to a lack of methodological detail, publishing in peer-reviewed sources, or an emphasis on non-urban cockroach

species. Ten studies that satisfied every requirement were included in the final synthesis.

Qualitative inclusion and exclusion criteria

The significant clinical and methodological heterogeneity among the included studies served as justification for the use of qualitative synthesis. These investigations included laboratory bioassays, cross-sectional surveys, environmental monitoring, and management strategy evaluations, and their designs varied greatly. They were carried out in a variety of climatic and socioeconomic environments, including homes, hospitals, food markets, and sewer systems. The effect estimates were not directly comparable or interchangeable due to this heterogeneity.

Data extraction and analysis

The ecology of cockroaches, their involvement in disease transmission, their effects on public health, and current management techniques were the main themes that emerged from the data analysis utilizing thematic synthesis (Cooper *et al.,* 2019). Studies addressing pesticide resistance and the new methods of integrated pest management received a lot of attention.

Study Limitations

Common effect estimates that were not comparable and appropriate for pooling could not be derived due to the heterogeneity endpoint measures. The inadequate statistical reporting in numerous studies was another significant drawback.

RESULTS

Key data and findings regarding urban cockroach infestations include:

The findings of numerous earlier studies on cockroaches as urban pests were compiled in the systematic review, which highlighted major themes that centered on the insects' ecology and adaptive traits, role in disease transmission, effects on public health, and management techniques.

Ecological and Behavioral Adaptation of Cockroaches in Urban Cities

Cockroaches are extremely difficult to manage due of their ecological and behavioral traits. The main obstacles to population control are their nocturnal habits, high rates of reproduction, and capacity to become resistant to pesticides (Kattan *et al*., 2025). Additionally, because they prefer to hide in cracks and other difficult-to-reach places, they require alternative and effective control techniques like integrated pest management (IPM) approaches, which combine chemical, biological, and environmental measures. Designing efficient and long-lasting control strategies requires an understanding of the physiology, behavior, and ecological dynamics of these pests. Additionally, as the consequences of climate change worsen, cockroaches may spread geographically, posing new problems to areas that were previously unaffected by these pests (Cochran *et al.,* 1999).

Cockroach species, especially *B. germ*anica, *P. americana*, and *B. orientalis*, flourish in settings where food and water are easily accessible, frequently in close proximity to human settlement, according to the reviewed studies. Cockroaches' exceptional capacity to adapt to urban settings is a major factor in their effectiveness as pests in human settlements, according to Creutzfeldt (2020). Because of their nocturnal lifestyle and tendency to hide during the day in cracks, crevices, and other concealed areas, cockroaches are able to coexist with humans while simultaneously avoiding predators. Cockroaches have evolved to a range of environmental niches within man-made structures, such as kitchens, basements, sewers, and waste disposal sites, according to numerous studies (Bradman *et al.,* 2005). Their persistence in urban areas is largely due to their ability to adapt to different levels of sanitation and to penetrate nearly any habitat, including those with little food availability (Creutzfeldt *et al*., 2020).

Health Risks Associated with Cockroach Infestation

The severe threats to public health posed by cockroach infestations are highlighted by a large number of reviewed research articles. Their function as infection vectors is one of the main issues. Cockroaches can carry a variety of germs, such as bacteria, viruses, and parasites, which can infect humans through contaminated food, surfaces, and utensils, according to studies reviewed in this article. Cockroach faeces, saliva, and body surfaces have repeatedly been found to contain pathogens such *E. coli*, *Salmonella spp.,* and *S. aureus* (Ogunsola, 2010). These infections present a serious risk, especially in unsanitary settings where cockroaches can readily come into contact with food and water sources. Cockroaches are also recognized to play a significant role in indoor allergies and asthma flare-ups.

Chang (1985) asserts that allergens from cockroaches, such as their excrement, saliva, and lost exoskeletons, can cause allergic reactions in those who are susceptible. Similarly, studies like Gottfried *et al*. (2003) and Kaffari (2015) show a high correlation between children's development of asthma and exposure to cockroach allergens, especially in metropolitan regions where cockroach infestations are more common. In densely populated

places, where the close proximity to high quantities of allergens increases the strain on public health systems, allergic reactions to cockroaches are a developing issue (Kaffari, 2015). In urban areas with inadequate hygiene and sanitation facilities, cockroaches play a major role in the spread of diseases like gastroenteritis, foodborne infections, and respiratory disorders (Ogunsola, 2016). According to the reviewed literature, cockroach infestations may be a factor in the persistence and spread of diseases in households, businesses, and hospitals. These results highlight the critical need for efficient pest management techniques to reduce the hazards these hardy pests represent to public health (Brenner, 2019).

Prevalence of Cockroach Infestation and Species Composition

High infestation rates- In dense urban areas, studies have reported that 39% to over 80% of residential units can be infested.

Dominant Species: According to Creutzfeldt (2020), German cockroach (*Blatella germanica*) is the most prevalent species (often greater than 80% of the trapped cockroaches), especially in apartments, kitchens, and hospitals, due to its ability to thrive in warm, humid, and crowded environments. Other common species include the American (*Periplaneta americana*) and Brown-banded (*Supella longipalpa*).

Local Trends: In 2025 survey, kitchen and bathrooms were common areas of cockroach, and dormitories. In another study, 37%-59% of hospital units were found to be infested (Molewa & Mapula 2023).

Factors Contributing to High Infestation

• Structural disrepair- older building (10 years plus have higher infestation rates (74.4%) compared to newer area settings (53.99%) partly due to cracks, crevices and leaking roofs (Molewa *et al*., 2023).

• Poor sanitation, inadequate waste disposal and unsealed food storage are the primary causes of high infestation levels.

Control Challenges of Cockroach Infestation

According to research by Bradman (2005), the behavioral traits of cockroaches, their resilience to chemical treatments, and the complexity of their habitats make controlling infestations in urban areas more difficult. The development of resistance mechanisms is the main reason why cockroach populations have persisted despite the extensive use of chemical insecticides, according to numerous research (Ajayi, 2018). Ameya (2021) reports that a number of cockroach species have been shown to be resistant to widely used insecticides like pyrethroids and organophosphates, especially in regions with heavy pesticide use. Because of this resilience, IPM—an alternate control strategy that combines chemical, biological, and mechanical means to lower cockroach populations—is now required.

Wang and Bremer (2019) study highlighted the effectiveness of employing baiting devices in conjunction with environmental changes, like blocking access holes and limiting food sources. Additionally, the use of biological control agents—such as parasitic nematodes and pathogens unique to cockroaches—has been investigated as a possible way to manage cockroach populations in an eco-friendly way (Wang, 2006). In addition to lowering dependency on chemical pesticides, these integrated approaches would help to reduce the possibility of resistance development. In order to track infestations and evaluate the efficacy of control measures, the reviewed paper recommends that cockroach control strategies be strengthened in urban settings and should involve routine monitoring and surveillance.

Cockroach management is expected to become more difficult as urbanization and population growth continue to accelerate. According to Chang (1985), a number of studies indicate that the distribution and abundance of cockroaches may vary as a result of climate change, eventually extending their range into new geographic areas. Cockroach populations may flourish in unhygienic areas due to warmer temperatures and higher humidity levels. This could put more strain on public health systems and urban environments, necessitating the development of innovative early detection and control methods. The review studies also show that urban dwellers are frequently unaware of the dangers associated with cockroach infestations, underscoring the necessity of public health initiatives to increase knowledge of the significance of appropriate waste disposal and insect protection strategies.

DISCUSSION

The results of this systematic analysis offer a thorough grasp of cockroaches' ecological adaptation, consequences for public health, and management techniques in urban settings. Given their involvement in spreading diseases and aggravating allergy symptoms, cockroaches are not only a persistent urban annoyance but also a serious public health risk (Cochran, 1999). Discussion incorporates the review's thematic findings, emphasizes their ramifications, and points out knowledge gaps that need more investigation. The success of cockroaches as pests is based on their capacity to flourish in a variety of urban settings. They

can adapt to a variety of environmental situations, from heavily urbanized locations to weakly sanitized ones, because to their omnivorous diet, fast reproductive cycles, and behavioral flexibility (Egger, 1997).

These results are consistent with earlier research by Bell *et al.* (2007), which highlights cockroaches as one of the most resilient urban pests, able to endure harsh environments.

Even in well-maintained urban environments, *B. germanica* and *P. americana* can persist due to their quick reproductive rates and capacity for resource exploitation (Adeleke, 2019). This flexibility is a double-edged sword; although it enables them to endure difficult circumstances, it also makes it more difficult to forecast and manage their dispersal. Future studies should concentrate on how interspecific competition and microhabitats influence cockroach populations in urban environments (Bell, 2007).

Bell (2007) states that whereas most cockroach species are important ecological decomposers, a small number of them have become major urban pests that pose serious problems for environmental management and human health. According to some research, acknowledging such ecological contributions offers a more nuanced view of their location within urban ecosystems, even while these functions do not lessen their detrimental effects on public health (Abbasi *et al.,* 2021).

Beyond their capacity to spread infections, cockroaches play a significant role in public health. Exposure to cockroach populations is a major factor in atopic and allergic reactions, even if the review confirmed their link to foodborne illnesses and respiratory diseases (Kang, 1987). These results highlight the necessity of focused treatments in urban settings where cockroach allergen exposure is a serious issue.

Cockroaches' widespread resistance to traditional insecticides continues to pose a serious problem for pest control initiatives. This research supports previous findings by Gottfried (2003) that some species of cockroaches have been found to be resistant to conventional insecticides like pyrethroids and organophosphates, especially in regions with high pesticide use. The need for creative pest management strategies is highlighted by the quick development of resistance mechanisms such metabolic detoxification and target-site insensitivity.

In order to track infestations and evaluate the efficacy of control measures, the reviewed paper recommends that cockroach control strategies be strengthened in urban settings and involve routine monitoring and surveillance.

Large-scale IPM implementation, however, necessitates overcoming a number of obstacles, such as low public awareness, inadequate training for pest management professionals, and the high expense of ecologically benign substitutes.

The analysis also reveals a crucial knowledge vacuum about the indirect health effects of cockroach infestations, such as their role in mental health problems resulting from the stigma attached to inadequate cleanliness (Kaffari *et al.,* 2015).

This emphasizes how crucial it is to handle pests holistically, taking into account both mental and physical health. To measure the socioeconomic cost of cockroach infestations and create solutions that address these wider health consequences, more study is required (Kaffari *et al.,* 2015).

This review's methodical methodology guarantees a comprehensive synthesis of the body of research, offering insightful information about cockroach biology and management. However, a number of drawbacks should be noted, such as the dependence on published research, which could lead to publication bias because studies with unfavorable or ambiguous findings are less likely to be published. Furthermore, the generalizability of some findings is limited by the variation in study designs and techniques. Notwithstanding these drawbacks, this evaluation indicates important areas for intervention and provides a solid basis for further study.

It will take interdisciplinary cooperation between entomologists, public health professionals, and urban planners to fill in the identified knowledge gaps and create long-term solutions for controlling cockroach numbers.

CONCLUSION

This study highlights the complicated problems that cockroaches pose as urban pests and the urgent need for innovative, sustainable, and interdisciplinary approaches to their management.

Based on previous research, it was found that internal settings such as hospital conditions such as temperature, humidity, adequate food seemed to create an ideal environment for cockroach, with higher infestation rates (74.4%) compared to newer area settings (53.99%) partly due to cracks, crevices and leaking roofs.

Based on previous research, it was found that sanitation facilities that do not meet the requirements both in very dense residential areas, hospitals, and residential houses. Unqualified

kitchens with leftovers are a favorite place for cockroaches.

Combining ecological knowledge, public health concerns, and emerging technologies can improve urban living circumstances and lessen the risks of cockroach infestation. Future efforts should prioritize public education, preventative measures, and the development of environmentally friendly pest management techniques in order to address this persistent urban issue.

Larger urban planning initiatives, such as improved home design, waste management infrastructure, and sanitation services, will need to include cockroach control. To guarantee the widespread adoption of sustainable techniques, policymakers should also give community education initiatives and pest control operator training top priority. Policies pertaining to urban development and public health that incorporate pest management will increase resistance to infestations in the future.

REFERENCES

Abbasi, E., Alipour, H., Vahedi, M. & Mosashoar, M. (2021). Halal certification for edible insects. *Journal of Halal Research*, 7, 58-67.

Adebayo, A.S. & Ogunmide, A. (2020). Prevalence of Cockroach-borne pathogens in hospital environments in Nigeria. *African Journal of Clinical and Experimental Microbiology*, *12* (2), 123-130.

Adeleke, S.I. (2019). Cockroach Species Diversity and Abundance in Selected Hospital in Ilorin, Nigeria. *Nigerian Journal of Parasitology*, *40*(2), 153-158.

Ajayi, A.O. & Bala, T. (2018). Cockroach infestations in residential areas of Lagos metropolis, Nigeria. Prevalence and Public Health Implications. *Journal of Public Health Africa*. *9*(1), 816.

Ameya, D.G., Arthur, G.A., & Gretchen, M.T. (2021). A Review of Alternative Management Tactics Employed for the Control of Various Cockroach Species (Order: Blattodea) in USA. *Insects*, *12*(6), 550.

Bell, W.J., Roth, L.M. & Nalepa, C.A. (2007). Cockroaches: ecology, behavior, and natural history. Baltimore: Bohns Hopkins University Press. P. 163-170.

Bell, W.J. (2007). The laboratory cockroach: experiments in cockroach anatomy, physiology and behavior. Berlin: Springer Science & Business Media. p. 541-543.

Brenner, R.J. & Kramer, R. D. (2019). Cockroaches (Blattaria). Medical and veterinary entomology. Amsterdam: Elsevier. p. 61–77.

Chai, R.Y. & Lee, C.Y. (2010). Insecticide resistance profiles and synergism in field populations of the German cockroach (Dictyoptera: Blattellidae) from Singapore. *Journal of Economic Entomology,* 103, 460. https://doi.org/10.1603/ec09284.

Cochran, D. G. (1999). Cockroaches. Their biology, distribution and control. WHO/CDS/CPC/
WHOPES/99 3. Geneva: World Health Organization. p. 93-96.

Cooper, R., Changlu, W. & Amanda, E. (2019). Effectiveness of Building-wide Integrated Pest Management Programs for German cockroach and Bed Bug in a High-Rise Apartment Building. *Journal of Integrated Pest Management, 10*(1), 33.

Cooper, H., Hedges, L.V, & Valentine, J.C. (2019). The Handbook of research synthesis and meta-analysis, Russel Sage Foundation, New York. p. 527-528.

Creutzfeldt, N., Mason, M., McConnachie, K. (2020). Book of socio-legal theory and methods. New York. p. 408.

Egger, M. D. Smith, G.D., Schneider, M. & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal, 315*, 629–34. https://doi.org/10.1136/bmj.315.7109.629.

Gottfried, J., Kattan, M. & Eggleston, P.A. (2003). Cockroach allergen exposure and asthma morbidity in inner-city children. *Journal of Allergy Clinical Immunology,* 112, 755–62. https://doi.org/10.1016/S0091-6749(03)02002-4.

Hamilton, R. L., & Schal, C. (1990). Integrated suppression of synantropic cockroaches. *Annual Review of Entomology, 35*, pp. 521-551.

Kattan, M. (2025). Inner city asthma: strategies to reduce mortality and morbidity. *Pediatric of Allergy Immunology,* 26, 299–305. https://doi.org/10.1111/pai.12383.

Kassiri, H., Dehghani, R., Doostifar, K., Rabbani, D., Limoee, M. & Chaharbaghi, N. (2020). Insecticide resistance in urban pests with emphasis on urban pest resistance in Iran: a review. *Entomology of Applied Scientific Letters,* 7, 32–54.

Molewa, M. L. & Bernard, T. N. (2023). Control Strategies for Domestic Cockroach (*B. germanica, B. orientalis and P. Americana*) Pest: A Scoping Review. *International Journal of Advanced Multidisciplinary Research (*IJAMR), *10*(3), 20-40.

Schal, C. & Devries, Z. C. Public Health and Vet. Importance. CABI Publishing, Boston (2021). p. 17-52.

Schneider, M. & Egger, M. (1997). Bias in Meta-analysis, detected by a simple graphical test. *British Medical Journal,* 315, 629-634.

Wang, C., & Bennett, G.W. (2006). Comparative study of integrated pest management and baiting for German Cokroach control in public housing. *Journal*

of Economic Entomology, 99, 879–85. https://doi.org/10.1093/jee/99.3.879.

Zhu, F., Lavine, L. (2016). Insecticides resistance and management strategies in urban ecosystems. *Insects, 7* (2), 212-218.