

Perception of disease transmission risks associated with domestic rats in Kinshasa households

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Domestic rats, also known as black rats (*Rattus rattus*), coexist with humans in various ecological settings, thereby facilitating the transmission of pathogens through multiple routes. In low- and middle-income countries, several anthropogenic factors exacerbate this risk. In the Democratic Republic of Congo (DRC), few studies have examined community perceptions of this threat. The present study aimed to assess household perceptions of disease transmission risks associated with domestic rats in four neighborhoods of Ngaliema Commune, Kinshasa. This was a cross-sectional and descriptive study conducted among randomly selected households located near waste disposal sites, following oral consent from household heads or their representatives. Findings showed that the presence of rats was reported in 98% of households, mainly due to garbage accumulation (47%) and kitchen waste (44%). Moreover, 89% of respondents were aware of the potential for disease transmission. Although 98% of households reported practicing rat control, only 12% did so specifically to prevent disease risks. In conclusion, while knowledge of rat-borne disease transmission was relatively high among respondents, their attitudes and practices toward effective prevention remained limited.

Keywords: Perception, risk, transmission, disease, domestic rat, DRC

INTRODUCTION

Urban rats, commonly referred to as black rats (*Rattus rattus*), inhabit environments alongside humans in urban, suburban, and rural areas. While they play important ecological roles, such as decomposing waste, these rodents also pose significant public health risks as potential vectors for various pathogens that can be transmitted to humans both directly and indirectly. Their proximity to human dwellings, frequent contact with food waste, and ability to reproduce rapidly contribute to the swift spread of associated diseases (Ndombasi, 2019; Desvars-Larrive et al., 2019). Rats can transmit zoonotic pathogens through their urine, feces, or bites, resulting in infections such as leptospirosis, salmonellosis, and hantavirus, as well as other viral or bacterial diseases (Tshimanga, 2021; Easterbrook et al., 2007; Himsworth et al., 2013).

In low- and middle-income countries, several human behaviors contribute to the spread of diseases carried by rats. These include poor waste management, easy access for rats to food storage areas,

and the absence of clear public policies regarding rat population control. Additionally, insufficient prevention programs in schools, communities, and hospitals, along with inadequate sanitation infrastructure, are significant risk factors associated with the transmission of diseases by rats (Kalonda, 2022; Mbuyi, 2020).

In the Democratic Republic of the Congo (DRC), the prevalence of domestic rats in both urban and rural households has not been extensively studied, and existing research is poorly documented. Studies conducted in urban areas like Kinshasa indicate that rats are frequently found in homes (Nyembo, 2017). This presence can increase the risk of disease transmission, as highlighted in previous studies. Currently, the knowledge, attitudes, and practices of the Congolese population—particularly those of residents in Kinshasa and Ngaliema—are not well understood. This study aims to assess the knowledge, attitudes, and practices of households in four neighborhoods of the Ngaliema municipality regarding the health risks associated with the presence of domestic rats.

MATERIAL AND METHODS

Study Site

The study was conducted in the neighborhoods of Jolie Parc, Kinsuka, Ngomba Kinkusa, and Punda, all located in the Ngaliema municipality within the Lukunga district of Kinshasa.

Materials

For data collection, a semi-structured questionnaire was administered using smartphones equipped with the KoboCollect software. To ensure trust and transparency, a paper version of the questionnaire was also provided to the respondents.

Type of study

This study was cross-sectional and descriptive. The data obtained focused on assessing the risk of pathogen transmission by domestic rats across the four neighborhoods in Ngaliema municipality.

Study population

The study population comprised residents of households in the neighborhoods of Ngaliema mentioned earlier. In each household, the head or a representative aged over 18 voluntarily agreed to participate in the questionnaire. Before participation, verbal consent was obtained from the head of the household or their representative, after explaining the importance of the study. Participants' anonymity was ensured throughout the entire process, from data collection to data analysis.

Sampling

Random sampling was employed to select households in each neighborhood according to pre-established inclusion criteria. A convenience sample of 100 households was utilized across the four neighborhoods participating in the study.

Inclusion criteria

The first inclusion criterion consisted of all randomly selected households located within one kilometer of waste disposal sites. After explaining the study's objectives to the respondents, they were asked if they had at least 30 minutes available to answer the questionnaire. Only household heads or their representatives who voluntarily agreed to participate were included in the study.

Exclusion criteria

Households located more than one kilometer away from waste disposal sites, as well as those whose heads or representatives were unwilling or unavailable to fully participate in the study, were excluded. Additionally, households without a responsible person over the age of 18 present were also excluded and subsequently replaced.

Interview procedure

For data collection, electronic devices using ODK were employed, allowing for detailed programming of «skip patterns» and internal checks to ensure the collection of comprehensive and consistent data. The KoboCollect software facilitated data gathering and enabled local data storage even in offline mode until the enumerator had internet access. Using this questionnaire, the following indicators were assessed to evaluate respondents' perceptions of the risk of disease transmission by domestic rats:

- Socio-demographic characteristics of respondents;
- Information on the presence of rats in households;
- Consumption of domestic rats and products or by-products contaminated by rats;
- Knowledge about diseases transmitted by rats;
- Methods used to control rats in households and the reasons for using them.

Data analysis

Thanks to the electronic data collection system, the software's statistical module automatically generated the results.

RESULTS

General characteristics of respondents in the Ngaliema Commune

The socio-professional characteristics of the respondents provide valuable insights. Among them, male respondents made up the majority at 52%. Most respondents fell within the age group of 26 to 35 years, closely followed by those aged 36 to 45 years. In terms of education, a significant portion had attained a university level (66%), while 16% had completed secondary education, 10% had primary education, and 8% had not attended school at all. When it comes to occupation, 39% identified as entrepreneurs, 28% were employees, and 25% were students.

The respondents' standard of living varied, with 66% reporting an average standard of living, 31% indicating a low standard of living, and only 3% assessing their standard of living as high (Table 1).

Information on the presence of rats in households across four neighborhoods of Ngaliema commune in 2024

Respondents reported a significant presence of small rodents in their household yards, with 98% indicating that these rodents were indeed domestic rats. Among the 98 respondents, the justification for the presence of these rats was primarily linked to several factors: 47% attributed it to the existence of garbage or rubbish bins located next to the household, while 44% pointed to the presence of kitchen waste. Additionally, 9% of respondents could not provide a specific reason for the rodents' presence (Table 2).

Knowledge, attitudes, and practices of respondents from the four neighborhoods of Ngaliema commune

Respondents expressed concern about the health risks associated with rats, with 89% acknowledging that rats can transmit diseases. Various modes of disease transmission were highlighted, with respondents citing multiple reasons: 72% believed food could be contaminated by rat excrement, while 68.5% pointed to contamination through saliva. Additionally, 64% noted that food could be tainted by urine, and 51% identified bites as a potential transmission method. Other transmission modes included contact with urine (26%), contact with excrement (25%), and direct contact with rats (18%) (Table 3).

Almost all respondents (99%) indicated that they do not consume rats, mainly due to their inedibility (49.5%), dirtiness (21.2%), and their role as vectors transmitting diseases (12.1%). Furthermore, 11% of respondents reported having consumed food previously eaten by rats, compared to 89% who never consumed such food. The main reasons given by those who avoid consumption were to prevent contamination (77.5%), avoid spoiled food (8%), avoid unfit food (7%), and disgust (4.5%) (Table 4).

Despite their presence, 98% of respondents nonetheless engage in rat control in their households. This control is carried out using food containing toxic products (59.2%), traps (18.4%), cats (15.3%), and sticky mats (6.1%). The reasons for this rat control were: destruction of clothes and materials (37%), maintaining house cleanliness (25.5%), food consumption (23.5%), disease transmission (12%), as well as disturbance and disgust each at 1% (Table 5).

DISCUSSION

The role of rats in households as vectors for disease transmission has been little studied. This study was conducted as a preliminary survey to assess the perception of the risk of disease transmission related to the presence of rats in households by the population of four neighborhoods in the Ngaliema commune.

In low- and middle-income countries such as the DRC, some anthropogenic factors—such as pollution from human waste, sewage, and garbage—are likely to create environments conducive to rat habitation in urban areas and facilitate the transmission of certain pathogenic agents (Bonell et al., 2017; Huijbers et al., 2019), including zoonotic potentials like *Leptospira* spp., *Salmonella* enterica, Shiga toxin-producing *E. coli*, *Campylobacter* spp., as well as many other bacterial infections (Meerburg et al., 2009; Guenther et al., 2012; Himsworth et al., 2013).

Through this study, the socio-professional characteristics show that 42% of respondents were aged between 26 and 35 years, with a majority being men (52%). This can be explained by the fact that from age 26, maturity within the African community increases, and the respondents' level of understanding of the survey topics is better. Men tend to participate more willingly in surveys and discussions, which explains their higher participation rate compared to women, who are often more occupied with household chores and thus feel unavailable during the survey visits. The educational level of the respondents was predominantly university-level (66%). This is not surprising given that over the past 30 years, access to higher education has become more accessible throughout the country, allowing better comprehension of the study objectives by the respondents.

Furthermore, 39% of respondents were engaged in entrepreneurship and 28% were employees, while 25% were pursuing university studies. The entrepreneurship described by our respondents can be likened to a form of semi-resourcefulness; it involves setting up small activities to ensure household survival. The high number in this category may influence the social status of the respondents. Regarding social living standards, 66% of respondents reported a medium level, 31% a low level, and 3% a high social level. This is likely related to the monthly family income, which is

generally insufficient across the country for both public and private sector employees. According to the World Bank, the DRC is among the five poorest countries in the world, with 73.5% of the population living on \$2.15 per day in 2024 (World Bank, 2025).

Rats were reported in 98 out of 100 surveyed households, and their presence is primarily due to the existence of garbage waste nearby (47%) as well as kitchen waste inside the home (44%). These findings align with hypotheses indicating that anthropogenic factors create a suitable environment for rat habitation (Bonell et al., 2017; Huijbers et al., 2019). Overall, waste management poses a serious problem in the Kinshasa city-province, thereby making effective rat control in households difficult.

The respondents were aware that rats could transmit diseases (89%) through various means, including contamination of food via contact with feces (72%), saliva (68.5%), or urine (64%). These results indicate that the respondents possess a good level of knowledge regarding disease transmission by rats. Several studies have discussed the possibility of pathogen transmission by rats (Meerburg et al., 2009); Guenther et al., 2012; Himsworth et al., 2013).

The attitudes and practices of the respondents revealed that 49.5% do not consume rats due to their inedibility, and 21% consider them as unclean food. Furthermore, 11% stated that they have consumed food that had been eaten by rats in the household. Among those who have never consumed such food (89%), the majority avoid it to prevent contamination (77.5%). These results reflect the respondents' positive attitudes toward preventing diseases transmitted by rats through food.

Furthermore, regarding rat management and control to prevent diseases, almost all respondents (98%) implement control measures. However, these measures are largely carried out for reasons other than health prophylaxis, such as the destruction of clothes and household items by rats (37%), maintaining cleanliness in the home (25.5%), and the habit of rats consuming food in the household (23.5%). Very few respondents (12%) reported controlling rats due to concerns about disease transmission. These attitudes and practices demonstrate that the population underestimates the risk of disease transmission by rats in households. Consequently, it is crucial to develop appropriate strategies not only to control rat populations but also to raise public awareness about the risks associated with these animals and to promote sanitary practices that can limit their presence and reduce the risk of disease transmission (Kalonda, 2022).

CONCLUSION

This study highlighted the perception of the risk of disease transmission by domestic rats among residents of four neighborhoods in the Ngaliema commune of Kinshasa, DRC. It emerged that the participants are well aware of the risks associated with the presence of rats in households, as well as the related transmission routes and factors. However, rat control practices do not fully reflect these perceived risks. Therefore, it is crucial to strengthen the population's attitudes and practices regarding integrated rat control management in households.

REFERENCES

- Bonell A., Lubell Y., Newton P.N., Crump J.A., Paris D.H. (2017). Estimating the burden of scrub typhus: A systematic review. *PLOS Neglected Tropical Diseases*, 11: e0005838.
- Desvars-Larrive A., Ruppitsch W., Lepuschitz S., Szostak M. P., Spargser J., Feßler A.T., Schwarz S., Monecke S., Ehricht R., Walzer C., Loncaric I. (2019). Urban brown rats (*Rattus norvegicus*) as possible source of multidrug-resistant Enterobacteriaceae and meticillin-resistant *Staphylococcus* spp., Vienna, Austria, 2016 and 2017. *Eurosurveillance*, 24(32).

Easterbrook J.D., Kaplan J.B., Vanasco N.B., Reeves W.K., Purcell R.H., Kosoy M.Y., Glass G.E., Watson J., Klein S.L. (2007). A survey of zoonotic pathogens carried by Norway rats in Baltimore, Maryland, USA. *Epidemiology and Infection*, 135: 1192-1199.

Guenther S., Bethe A., Fruth A., Semmler T., Ulrich R.G., Wieler L.H., Ewers C. (2012). Frequent combination of antimicrobial multiresistance and extraintestinal pathogenicity in *Escherichia coli* isolates from urban rats (*Rattus norvegicus*) in Berlin, Germany. *PLoS ONE*, 7: e50331.

Himsworth C.G., Parsons K.L., Jardine C., Patrick D.M. (2013). Rats, cities, people, and pathogens: a systematic review and narrative synthesis of literature regarding the ecology of rat-associated zoonoses in urban centers. *Vector-Borne and Zoonotic Diseases*, 13: 349-359.

Huijbers P.M.C., Flach C.-F., Larsson D.G.J. (2019). A conceptual framework for the environmental surveillance of antibiotics and antibiotic resistance. *Environment International*, 130: 104880.

Meerburg B.G., Singleton G.R., Kijlstra A. (2009). Rodent-borne diseases and their risks for public health. *Critical Reviews in Microbiology*, 35: 221-270.

World Bank (2025). République Démocratique du Congo-Vue d'ensemble.

Kalonda, J. (2022). Le rôle des rats dans la transmission des pathogènes et les stratégies de contrôle en RDC. *Revue de la Santé et de l'Environnement*, 38: 89-94.

Mbuyi T. (2020). Les défis de la gestion des nuisibles dans les villes congolaises. Presse Universitaire de Kinshasa.

Nyembo A. (2017). Etude de la prévalence de la leptospirose chez les rats à Kinshasa. *Journal de la santé publique*, 29: 145-151.

Ndombasi M. (2019). Les nuisibles urbains et les risques sanitaires en Afrique centrale. Éditions de la Santé Publique.

Tshimanga S. (2021). Impact des rongeurs sur la santé publique en République Démocratique du Congo. *Journal de la Santé Tropicale*, 45: 205-210.

References