Rodent-Related Zoonotic Pathogens at the Human–Animal–Environment Interface in Qatar: A Systematic Review and Meta-Analysis

Md Mazharul Islam 1,2,* 1, Elmoubashar Farag 3,*, Ahmad Mahmoudi 4, Mohammad Mahmudul Hassan 5,6, Ehsan Mostafavi 6,7, Khalid A. Enan 1,8, Hamad Al-Romaihi 9, Muzzamil Atta 1,9, Abdel Rahim M. El Hussein 8 and Zilungile Mkhize-Kwitshana 10,11

Abstract: Rodents are one of the most diversified terrestrial mammals, and they perform several beneficial activities in nature. These animals are also important as carriers of many pathogens with public health importance. The current systematic review was conducted to formulate a true depiction of rodent-related zoonoses in Qatar. Following systematic searches on PubMed, Scopus, Science Direct, and Web of Science and a screening process, a total of 94 published articles were selected and studied. The studied articles reported 23 rodent-related zoonotic pathogens that include nine bacterial, eleven parasitic, and three viral pathogens, from which the frequently reported pathogens were Mycobacterium tuberculosis (32 reports), Escherichia coli (23), and Salmonella spp. (16). The possible pathway of entry of the rodent-borne pathogens can be the land port, seaports, and airport of Qatar; through carrier humans and animals, contaminated food, and agricultural products. The pathogens can be conserved internally by rodents, pets, and livestock; by agricultural production systems; and by food marketing chains. The overall estimated pooled prevalence of the pathogens among the human population was 4.27% (95% CI: 4.03–4.51%; p < 0.001) with significant heterogeneity (I² = 99.70%). However, there is a knowledge gap about the listed pathogens regarding the occurrence, transmission pathways, and rodent role in transmission dynamics at the human–animal–environment interface in Qatar. Further studies are required to explore the role of rodents in spreading zoonotic pathogens through the One Health framework, consisting of zoologists, ecologists, microbiologists, entomologists, veterinarians, and public health experts in this country.
1. Introduction

Rodentia is one of the most diversified mammalian orders in the world [1]. With 2552 known species, they make up 39.3% of mammals and are the essential components of many terrestrial ecosystems. These animals have several beneficial activities in nature, such as soil aeration and insect control [2–4]. However, rodents are also sources of zoonotic pathogens [4–6]. Almost 10% of the global rodent population are either carriers or reservoirs of pathogens with public health importance [5,6]. Rodents transfer infectious agents to humans by direct contact with humans and animals or through contamination of human or animal food and water with rodent stool, hair, and urine. Arthropod vectors on rodent skin are also able to carry several zoonotic pathogens [5–8]. Rodent-borne diseases and their prevalence are associated with several factors, including the rodent population, human socio-economic lifestyle, human conflict, and war [7,9–11]. Human-related activities such as migration, large-scale traveling, trade, urbanization, and agricultural activities can also be facilitating factors in transferring rodent-borne pathogens from one community to another [12,13].

Qatar is a small desert country located on the coast of the Arabian Peninsula [14]. The country is inhabited by multinational people from around 94 countries around the world [15]. The current population of the country is 2.8 million [16], of whom only 10.5% are Qatari nationals. The people who make up around 80% of the Qatar population are mainly from India, Bangladesh, Nepal, Egypt, the Philippines, Pakistan, Sri Lanka, Sudan, Syria, Jordan, Lebanon, Kenya, and Iran [15]. Approximately 83% of these non-Qatari residents are primarily construction workers, housemaids, drivers, and retail market workers [17]. As a desert country, agriculture is limited [18], and the country imports live animal and food products from nearby countries such as Iran, Turkey, India, Pakistan, and Bangladesh [19,20].

The rodent fauna of the country is limited to four species, which include three commensal species (Mus musculus, Rattus norvegicus, and Rattus rattus) and a single wild rodent species (Jaculus loftusi, previously known as Jaculus jaculus) [21–24]. M. musculus, R. norvegicus, and R. rattus are reported to spread rodent-borne zoonoses among the human population throughout the world [8,25]. The countries from where most of the Qatari residents originated and some of the countries from where food and agricultural products are imported are endemic with several rodent-borne diseases, including leishmaniasis, enteric fever, echinococcosis, and hepatitis E virus [26–28]. For effective prevention and control measures of such diseases, it is essential to know the status of these pathogens in Qatar. However, to the authors’ knowledge, no studies have been performed to understand the rodent-borne diseases in this country at the human–animal–environment interface. Therefore, the current study aimed to identify the rodent-related zoonotic pathogens detected in humans, animals, and environmental sources in Qatar and possible transmission pathways and to estimate the pooled prevalence of these pathogens among humans in this country.

2. Materials and Methods

We conducted a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [29]: (1) We conducted a database search to find relevant articles, (2) we assessed the relevance of the searched articles, and (3) we extracted data from the included articles (Figure 1, and Supplementary Table S1).
2.1. Data Search

In the beginning, we conducted a mini-review to determine the list of rodent-borne diseases. We found a total of 88 diseases that can have public health importance (Supplementary Table S2). Among these, 26 were bacterial diseases, 2 fungal, 27 parasitic, and 33 viral diseases. Then, we conducted a systematic literature search from 20 to 26 March 2020 through four databases: PubMed, Scopus, Science Direct, and Web of Science. The search included all the original field reports for each of the 88 rodent-borne diseases individually in Qatar with no time limit of publication. The search terms included ((disease name OR synonym OR causal agent[s]) AND Qatar). We screened the searches as “Title/Abstract” in PubMed, “Find articles with these terms” in Science Direct, “TITLE-ABS-KEY” in Scopus, and “Topic” in Web of Science.

2.2. Assessing the Searched Articles

We compiled the searched document on the EndNote X9 system (Clarivate Analytics, Philadelph, PA, USA). Using EndNote X9, we identified and removed the duplicate articles. After that, two authors assessed the title and abstract of the articles. The articles that had unknown relevance based on the title and abstract study were subjected to full-text screening. We included only original research studies published in English. We excluded articles that did not fulfill the objective, were reviews/editorials, were outside the selective diseases, were from outside Qatar, or were books/chapters.

2.3. Data Extraction

The extracted data included the study type and season, the pathogen, target population, total sample tested and total positives, and associating factors of a disease prevalence and dynamics (Supplementary Table S3).

2.4. Data Analysis

We collected the relevant data in a Microsoft Excel spreadsheet and analyzed them using the statistical software STATA/IC-13.0 (Stata Corp, 4905 Lakeway Drive, College
Station, TX 77845, USA). Descriptive statistics of the selected articles were calculated and expressed as percentage (%) and 95% confidence interval (CI). Then, the crude prevalence estimation was calculated by dividing the total number of individual positive pathogens with the total number of sampled and expressed percentages (%). The crude estimate of prevalence was used for the 95% confidence interval (CI), the p-value, and heterogeneity ($I^2$).

A random-effect meta-analysis model was applied using the “mean” command specifying random due to the study’s high degree of heterogeneity ($I^2 > 80\%$) [30]. The output was illustrated using a forest plot.

3. Results

3.1. Characteristics of the Studied Articles

The literature search resulted in a total of 94 articles published from 1991 to 2020 (Table 1). Many of the articles ($n = 42, 44.68\%, 95\%CI: 34.41–55.29\%$) were published by last five years (2016–2020), and only one ($n = 1, 1.06\%; 0.027–5.79\%$) was published between 1991–1995. The studies were mostly conducted in human hosts ($n = 80, 85.11\%, 95\%CI: 76.28–91.61$), followed by animals ($n = 10, 10.64\%; 5.22–18.70$), and the environment ($n = 1, 1.06\%, 95\%CI: 0.027–5.79$), with some studies on the human–animal–environment interface. The majority of the studies assessed rodent-related bacteria ($n = 62, 65.96\%, 95\%CI: 55.46–75.42$), followed by helminths ($n = 10, 10.64\%, 95\%CI: 5.22–18.70$), protozoa ($n = 9, 9.57\%, 95\%CI: 4.47–17.40$), and viruses ($n = 5, 5.32\%, 95\%CI: 1.75–11.98$). However, some articles described mixed infections.

| Characteristics | Number of Articles (%; 95%CI) | References |
|-----------------|-------------------------------|------------|
| Publication Year|                               |            |
| 1991–1995       | 1 (1.06; 0.027–5.79)          | [31]       |
| 1996–2000       | 3 (3.19; 0.66–9.04)           | [32–34]    |
| 2001–2005       | 12 (12.77; 6.77–21.24)        | [21,35–45] |
| 2006–2010       | 13 (13.83; 7.57–22.49)        | [46–58]    |
| 2011–2015       | 23 (24.47; 16.19–34.42)       | [22,59–80] |
| 2016–2020       | 42 (44.68; 34.41–55.29)       | [81–122]   |
| Host            |                               |            |
| Humans          | 80 (85.11; 76.28–91.61)       | [31–45,49–54,56–75,77–81,83–92,94–99,101,103,104,107–118,120,121] |
| Animals         | 10 (10.64; 5.22–18.70)        | [21,22,46–48,55,82,93,105,106] |
| Environment     | 1 (1.06; 0.027–5.79)          | [36]       |
| Humans + Animals| 1 (1.06; 0.027–5.79)          | [119]      |
| Animals + Environment | 1 (1.06; 0.027–5.79) | [76] |
| Humans + Environment | 1 (1.06; 0.027–5.79) | [104] |
| Pathogen        |                               |            |
| Bacteria        | 62 (65.96; 55.46–75.42)       | [31–45,53,54,57,58,62–67,69–82,87,88,92,94–98,102,103,105–111,114–117,120,121] |
| Helminth        | 10 (10.64; 5.22–18.70)        | [21,22,46–48,60,63,68,86,122] |
| Protozoa        | 9 (9.57; 4.47–17.40)          | [49,50,55,83,84,88,99–101] |
| Virus           | 5 (5.32; 1.75–11.98)          | [45,56,90,113,119] |
| Helminth + Protozoa | 4 (4.25; 1.17–10.54) | [51,52,61,85] |
| Bacteria + Protozoa | 4 (4.25; 1.17–10.54) | [59,91,93,112] |

CI: Confidence Interval.
3.2. Possible Transmission Pathways of the Pathogens in Qatar

The current review shows that besides humans, rodent-related zoonotic pathogens are available among livestock, stray (free on-street) and domesticated cats and dogs, big cats (cheetah), and environmental samples. In addition, rodents are usually available in every facility of an ecosystem, such as animal farms, agricultural farms, residential areas, desert ecosystems, restaurants, and sewage facilities in Qatar. Therefore, rodents can contribute to zoonotic pathogen transmission within and between these facilities. The possible transmission pathways of rodent-borne zoonotic pathogens in Qatar are illustrated in Figure 2. Moreover, the land port at the Qatar–Saudi Arabia border, the international airport, and the two seaports can also contribute to rodent-associated zoonoses transmission into Qatar by the human migration and transmission of live animals, rodents, and agricultural products from different parts of the world.

3.3. Estimated Pooled Prevalence of Pathogens

The overall estimated pooled prevalence of the rodent-related zoonotic pathogens within the human population in Qatar was 4.27% (95%CI: 4.03–4.51%; \( p < 0.001 \)) with significant heterogeneity (\( I^2 = 99.50\% \)) and \( p \)-value (\( p = 0.00 \)) (Figure 3). Among the individual pathogens, the estimated pooled prevalence of Mycobacterium tuberculosis was the highest (30.90%; 22.75–39.04%; \( p < 0.001 \); \( I^2 = 99.70\% \)) followed by Toxoplasma gondii (21.93%; 6.23–37.61%; \( p < 0.001 \); \( I^2 = 99.30\% \)), hepatitis E virus (18.29%; 11.72–24.86%; \( p < 0.001 \); \( I^2 = 96.70\% \)), Escherichia coli (16.34%; 13.08–19.59%; \( p < 0.001 \); \( I^2 = 98.60\% \)), Campylobacter spp. (8.09%; 3.48–12.70%; \( p < 0.001 \); \( I^2 = 97.00\% \)), Salmonella spp. (7.77%; 4.74–10.79%; \( p < 0.001 \); \( I^2 = 94.10\% \)), Cryptosporidium spp. (6.61%; 2.26–12.97%; \( p < 0.001 \); \( I^2 = 98.60\% \)), Giardia duodenalis (2.88%; 2.26–3.50%; \( p < 0.001 \); \( I^2 = 95.10\% \)), Schistosoma sp. (2.05%; 0.83–3.27%; \( p < 0.001 \); \( I^2 = 99.00\% \)), Trichuris trichiura (1.48%; 1.05–1.92%; \( p < 0.001 \); \( I^2 = 97.50\% \)), Entamoeba histolytica/dispar (0.62%; 0.366–0.87%; \( p < 0.001 \); \( I^2 = 88.20\% \)), Hymenolepis nana (0.21%; 0.12–0.31%; \( p < 0.001 \); \( I^2 = 82.10\% \)), and Taenia spp. (0.10%; −0.03–0.24%; \( p = 0.02 \); \( I^2 = 74.30\% \)). The overall prevalence by meta-analysis showed that bacterial organisms were the major group of pathogens followed by parasitic and viral pathogens.

3.4. The Pathogens at the Human—Animal—Environmental Interface

Of the 88 rodent-borne disease pathogens listed by mini-review at the beginning of the current systematic review, we identified 23 disease pathogens in Qatar. We described the interface of these pathogens in terms of humans, animals, and environmental hosts to determine the relationship with the One Health process in Qatar (Figure 4): we found 12 parasitic, 8 bacterial, and 3 viral pathogens. Our review revealed that Campylobacter spp. (including Campylobacter coli and Campylobacter jejuni) and E. coli are common in humans, animals, and the environment. Salmonella spp. (mainly Salmonella enterica), Babesia spp., Taenia spp., T. gondii, and rabies virus were reported from humans and animals. Cryptosporidium spp. was the only pathogen reported from both humans and the environment.
Figure 2. Possible transmission pathways of the rodent-related zoonotic pathogens at the human–animal–environmental interface in Qatar. The stars indicate the plausible routes of entry of rodent-related pathogens in Qatar via carrier immigrants and the importing of contaminated food and agricultural products. “A” indicates that rodents can be a source of transmission of pathogens among livestock animals and humans inside Qatar. Similarly, the figure illustrates how rodents can facilitate zoonotic pathogens transmission among agricultural products and humans “B”, residential areas between humans and pet animal “C”, in the environment between stray cats and dogs, wildlife, and humans “D”, fresh food in households, restaurants, markets, and humans “E”, and through the sewage system “F”. Rodents can interlink zoonotic pathogens “G” between A, B, C, D, E, and F.
Figure 3. Forest plot of the pooled overall prevalence of rodent-related pathogens in Qatar. The central square represents point estimates, whereas the square size represents the weight of each study in the meta-analysis.
Figure 4. Rodent-related zoonotic pathogens identified at the human–animal–environmental interface in Qatar.

*M. tuberculosis* was detected within various forms in humans of Qatar, such as abdominal tuberculosis (TB), mastitis pulmonary TB, pleural TB, peritoneal TB, ocular TB, pancreatic TB, spinal TB, tuberculous adenitis, tuberculous arthritis, tuberculous meningitis, tuberculous peritonitis, military TB, latent TB, and multi-drug resistant TB. Moreover, childhood TB with many of the above forms has been detected in children in Qatar.

Supplementary Table S2 shows that the pathogenic *E. coli*, *Salmonella* spp., and *Campylobacter* spp. are three frequently reported causes of human gastroenteritis in this country. *E. coli*, including EAEC (enteroaggregative *E. coli*), EIEC (enteroinvasive *E. coli*), EPEC (enteropathogenic *E. coli*: EPEC 2, EPEC 3, and EPEC 4), ETEC (enterotoxigenic *E. coli*), STEC (Shiga-like toxin-producing *E. coli*), and *E. coli* O157: H7 were detected among humans. Besides human gastroenteritis, *E. coli* was found to cause surgical wound infection, arthritis, genital tract infection, meningitis, peritonitis, pneumonia, sepsisemia, skin infection, and urinary tract infection. *E. coli* O (O157: H7, O26, O45, O103, and O111) was identified from animal sources, such as camel, cattle, and sheep. *E. coli* was isolated in human food, such as fresh fruit juice; fresh vegetables; cattle and camel milk; meat animal carcasses, such as camel, cattle, chicken, and sheep carcasses; hand swabs of fresh product market workers; market environments; animal bedding; feed and water troughs; and abattoir environments.
S. enterica (type B, C1, C2, D, E), S. enterica paratyphi A, S. enterica Typhi were detected in humans. Among the non-human sources, S. enterica was isolated from animal bedding, camel carcasses, and cattle faeces. In addition, Campylobacter spp., such as C. coli, C. fetus, C. jejuni, C. lari, and C. upsaliensis, were confirmed from human diarrheagenic samples. Moreover, C. coli and C. jejuni were isolated from non-human sources, via camel and cattle milk; camel, cattle, and sheep faeces; camel, cattle, chicken, and sheep carcasses; cattle udders; chicken abattoirs; feed water troughs; and bedding of animals in livestock farms.

Corynebacterium spp. was isolated from a fresh product market. Listeria monocytogenes was confirmed in children (<1 year), causing meningitis. In addition, soldiers at the US army base in Qatar were positive for Coxiella burnetii antibodies, and non-specific Yersinia was detected in faecal samples of humans with gastroenteritis.

The parasites that were detected in Qatar included 5 protozoa, 3 cestodes, 2 nematodes, and one trematode. T. gondii was reported to have vertically transmitted from mother to baby. Diarrheagenic protozoa, such as Cryptosporidium parvum, Cryptosporidium hominis, Cryptosporidium meleagris, G. duodenalis, and pathogenic amoebae (Entamoeba histolytica/dispar), were reported among humans in Qatar. Besides gastroenteritis, E. histolytica was detected to cause a liver abscess. There was a case of non-specific human babesiosis in Qatar. However, Babesia gibsoni and Babesia vogeli are present among pet dogs in this country. Among the cestodes, Hymenolepis diminuta is a common parasite among rodents. H. nana and Echinococcus granulosus were reported in humans. Non-specific Taenia and Taenia taeniaeformis were identified in humans and cats, respectively. Among the nematodes, Toxascaris leonina was identified in cats, and T. trichuria was identified in humans. However, only the trematode Schistosoma mansoni was reported among humans in this country. The review found three viruses in Qatar, including chikungunya, hepatitis E, and rabies, of which rabies was reported in humans, camels, and foxes.

4. Discussion
4.1. Characteristics of Rodent-Borne Pathogens

The current review studied 94 research articles to understand the rodent-related zoonotic pathogens in Qatar. About 25% (23/88) of the rodent-related pathogens have been reported in this country. Most of the pathogens (20/23) were from humans, whereas only H. diminuta was from rodents. However, all these 23 infectious agents are important as they are zoonotic and can cross the species barrier at any time. In addition, some infectious agents have higher importance for public health in Qatar, such as T. gondii, S. enterica, which were reported multiple times or from multiple sources.

4.2. Bacterial Pathogens

We detected different types of bacterial pathogens in the current review. M. tuberculosis was the most studied pathogen, followed by E. coli, Salmonella spp., and Campylobacter spp. The overall estimated pooled prevalence (30.89%) suggests that tuberculosis is a high-risk disease in this country. However, the reviewed studies tested tuberculosis mostly among the suspected cases, which may not represent the population of Qatar. Rodents act as a reservoir of Mycobacterium microti, a member of the M. tuberculosis complex [123–125]. M. microti was not detected in rodents or humans in Qatar. Therefore, the rodent role in TB prevalence in Qatar remains to be confirmed. Previous studies suggested that immigrant workers can be a source of TB in Qatar [53], as TB is more prevalent among immigrants, especially newly arrived persons [37,40,43,65]. The review showed that E. coli, Salmonella spp., and Campylobacter spp. are the leading causes of human gastroenteritis in Qatar [121]. Pathogenic E. coli, S. enterica, C. coli/jejuni were reported from non-human samples [76,82,121]. Rodent can mediate these food-borne pathogens to humans and animals by contaminating the foods and water [5,126–128]. Enteric fever by S. enterica serovar Typhi was considered a border disease in Qatar, imported from the endemic countries, such as Bangladesh, India, Pakistan, and Nepal by immigrant workers [31,78]. R. norvegicus from the wholesale market of Doha was found to carry the oriental rat flea.
Xenopsylla astia [21,22]. Xenopsylla astia is a carrier of Bartonella spp., Coxiella burnetti, and Yersinia pestis [129–131].

4.3. Parasitic Pathogens

The largest group of rodent-related pathogens in the current review was parasites, of which *T. gondii* was the most prevalent among humans in Qatar. *T. gondii* was reported with a vertical transmission from mother to fetus [50]. Besides free-living cats, *T. gondii* was detected in cheetahs [55]. Rodents might be involved with the transmission of *T. gondii* in Qatar, which needs to be confirmed. Qatar residents from Africa showed higher infection indices with *T. gondii, H. nana,* and *Taenia* spp. than did the residents from Asia [49,85]. *Cryptosporidium* spp., *H. nana,* and *Taenia* spp. are more prevalent in newly arrived residents [60,85,101]. Pathogenic amoebiasis are more prevalent among the immigrants from Asia than in those from Africa and other Arab countries [83–85]. Trichuriasis is mostly prevalent among residents from Asia [61,86], particularly from Eastern Asian countries [85], such as the Philippines and Indonesia [52]. Furthermore, cerebral schistosomiasis was reported in Filipino residents living in Qatar [122]. However, there is an information gap regarding rodent-borne diseases in humans, rodents, other animals, and the environmental interface in Qatar. *H. diminuta* was reported in *R. norvegicus* [21,22] with no report among humans. On the other hand, *H. nana* was reported from humans but not from rodents or other animals. In addition, the studies that identified rodent-related pathogens in animals and environmental sources may not represent the overall scenario at the non-human facilities in Qatar.

4.4. Viral Pathogens

Out of the three viruses identified in the current review, Hepatitis E showed high prevalence. Studies showed that hepatitis E in Qatar is imported by expatriates [56,90,118]. One study showed that Nepal could be a significant source of hepatitis E in Qatar [56]. Nepal is a hyperendemic country for the hepatitis E virus, where commensal rodents were found positive with hepatitis E virus [132]. Human cases of rabies in Qatar were confirmed in immigrants from Nepal [119]. Previous reports showed that rodents could be infected with rabies [133], with a low risk for transmitting the virus [134].

4.5. Possible Transmission of Rodent-Borne Pathogens at the Human–Animal–Environment Interface

The records of the Qatar Pest Control Company and the pest control unit of the Ministry of Municipality and Environments show that commensal rodents are more prevalent in livestock and agricultural farms than they are in residential, commercial, or industrial areas [135,136]. Most of the workers in these agriculture and livestock facilities are from South Asia [136]. The traditional livestock farms in Qatar are multi-species animal farms with poor biosecurity management [136,137]. A previous study showed that over 70% of the livestock farms are infested with rodents, such as *M. musculus, R. norvegicus,* and *R. rattus* [24]. In the residential area, rodents are more prevalent in bachelor accommodations [135]. It is plausible that immense ongoing efforts in urbanization and agricultural projects, in addition to climate change [138–140], may be conducive to a species-jump of rodent-borne pathogens from immigrant workers to livestock animals and rodents. Further, the introduction and establishment of new rodent species and their associated vectors in Qatar can increase such potential risks. However, the reports of *E. coli, Salmonella* spp., *M. tuberculosis, Cryptosporidium* spp., *T. gondii, Giardia* spp., and *Entamoeba* spp. among the residents from different nationalities, including native Qatari and children, means that there might be an autochthonous internal and dynamic transmission of these pathogens among the community.

The seaports and maritime shipping routes of Qatar are immensely linked to many countries to import foodstuffs, animals, crops, and animal feed and fodder. As the rodents, such as *R. norvegicus* and *R. rattus,* usually live in ships used for traveling and trades of agricultural food products [141], these rodents can move between the terminus countries
and Qatar and possibly can introduce unknown pathogens to Qatar. In this respect, international seaports may play a significant role in zoonotic disease spread [141,142]. The plague outbreak in Australia in 1900 [143] and Hong Kong in 1894 [144] was linked to rodent entry through the ports. Several rodent-borne disease agents reported from the central fresh product market in Qatar may indicate that pathogens are introduced into the country when fresh market products are imported from abroad. Further studies are required to find the link between the cross-border import of rodent-related pathogens through humans, animals, or agro-products spillover in Qatar.

4.6. Limitations

Our study is not without limitations. Some of the limitations were identified during our work. We only conducted a mini-review (at the beginning of the systematic review) to understand rodent-related zoonotic pathogens in general. In there, we emphasized only the descriptive articles [3,5,6] and 35 additional reports to list rodent-borne zoonotic diseases [123,124,127,128,133,145–174]. Therefore, there is a chance we missed pathogens that were not described by these studied articles. There has been limited rodent-related research done at the animal–environment interface in Qatar. Finally, some related information may be out of the scope of our current systematic review and meta-analysis.

5. Conclusions

This review showed pathogens at the human–animal–environment interface in Qatar for which rodents can become potential mediators in transmission. A total of 23 pathogens were listed, which were mostly reported from humans. *M. tuberculosis*, *E. coli*, *T. gondii*, and hepatitis E virus were the most prevalent pathogens among humans. Besides rodents, other animals such as dogs, cats, and livestock animals can be involved in the transmission cycle. However, as there is a lack of research on rodents and other animals in this country, the transmission cycle of the stated infectious agents remains unclear. Therefore, extensive studies are required to investigate rodents and rodent-borne zoonotic pathogens among the diverse human population, livestock and pet animals, rodents, and environments in various ecosystems in Qatar. Furthermore, these studies should pursue a multidisciplinary One Health approach with contributions from zoologists, ecologists, microbiologists, entomologists, veterinarians, and public health experts to understand rodent-related zoonoses in Qatar.

**Supplementary Materials:** The following are available online at https://www.mdpi.com/article/10.3390/ijerph18115928/s1, Table S1: Prima checklist, Table S2: List of the rodent-borne zoonotic diseases; mini-review, Table S3: Extracted data from the selected 94 studies.

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