Opinion

# At the mercy of two crises: displacement and the surge of zoonoses in refugee camps

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## Abstract

Our world faces the worst refugee crisis in modern history.[1,2] Such statements are often repeated but seldom fully understood. This piece aims to explore the global refugee crisis through the lens of literature examining its connection with zoonotic diseases. It will also address future strategies, their limitations and the role of the One Health approach. By analysing research and journals, this work seeks to evaluate solutions to zoonoses while safeguarding vulnerable populations and addressing the complexities of implementation.

## Abbreviations

*HCV – hepatitis C virus*
*IVM – Integrated Vector Management*
*MSF – Médecins Sans Frontières*
*SWOT – Safe Water Optimization Tool*
*UNHCR – United Nations High Commissioner for Refugees*
*UNICEF – United Nations Children's Fund*
*WHO – World Health Organization*
*ZD – zoonotic disease*

## Introduction

***Zoonotic disease and the refugee crisis***

IIn 2022, 108.4 million people were forcibly displaced due to persecution, violence and human violations.[1,2] While statistics can capture the lives lost, they fail to convey the full extent of the additional issues faced by the refugee population. One often overlooked consequence is the burden of zoonotic diseases. These diseases frequently go unaddressed, highlighting the pressing need for this evaluation to explore potential solutions and mitigate their impact.

This discussion begins by examining existing literature on the transmission mechanisms of zoonoses, followed by an exploration of how these mechanisms intersect with refugee populations, particularly in relation to their living conditions. By exploring different demographics, it will assess the real-life impacts of zoonoses on displaced populations and vice versa. Finally, it will evaluate potential future strategies for addressing zoonotic disease risks, emphasising the critical role of the One Health approach in tackling these challenges and its importance in contemporary medicine, particularly for refugee populations.

## Methodology

This study uses a narrative approach, synthesising findings from sources on zoonotic disease (ZD) and their impact on refugee health. While much research exists on ZD, there is limited focus on refugee populations, making this an important area to explore. Populations and sources were selected for their relevance to the global refugee crisis, availability of data and geographical diversity. The populations discussed include both recently displaced and longer-settled groups, offering a varied context for understanding ZD's impact.

## Disease transmission

Zoonoses can spread through direct contact, contaminated food/water, insect bites, inhalation and environmental exposure.[3] Pathogens are often transmitted from animals to humans, with

60% of emerging infections zoonotic, 70% of which from wildlife.[3,4] Population growth and environmental exploitation have increased the likelihood of such spill-over events.[5] The underestimation of zoonotic disease has also contributed to their persistence, as unrecognised cases go unaddressed.[6,7]

ZDs are infections transmissible between animals and humans (over 200 known types), posing public health challenges worldwide. The close relationship between humans and animals, whether in agriculture, as companions, or in shared environments, creates transmission pathways. Symptoms vary depending on the specific illness but commonly include fever, fatigue and body aches. Understanding zoonotic transmission and the conditions that facilitate their spread is crucial in addressing this global health issue.[8,9]

## Discussion

***Exploration of refugee demographics implicated by zoonotic disease***

Refugees are individuals displaced from their country due to persecution, violence or other factors requiring international protection.[10]

With 10.8+ million people internally displaced and a struggling economy, Sudan faces severe hardship. There is a critical shortage of healthcare workers, with only four doctors for every 10,000 people. The healthcare system has now nearly collapsed, leaving the Sudanese people vulnerable to preventable diseases, inadequate medical care and deteriorating health outcomes. Limited access to healthcare, coupled with insufficient aid, heightens their exposure to ZDs as gaps in prevention and treatment fosters conditions that facilitate the spread of these diseases.[11]

With over 140 million livestock in 2009 alone, Sudan has been said to be facing threats on two fronts: both from endemic and transboundary animal disease. These threats harm animal health and livelihoods whilst increasing human ZD risk through close animal contact. The displacement and mixing of animals and humans contribute significantly to ZD transmission[12] with conditions such as yellow fever and Crimean–Congo haemorrhagic fever having a particularly great impact.[13]

The destruction of key laboratories/equipment of Sudan's veterinary serves could also be a critical factor in the increased spread of ZD.[12] The violence has had a ripple effect on veterinary services. Veterinary services have been severely disrupted, with the movement and access of personnel and resources left in ruins – making disease control far more challenging. Coupled with poor sanitation, studies show that ZD from rabies to tuberculosis spread more readily during times of conflict.[11] This emphasises the importance of adopting a multisectoral approach, reinforcing the critical role of the One Health framework, promoting collaboration between human, animal and environmental health sectors to effectively manage ZD.

The challenges faced by Sudan are similarly reflected in Syria. Even after a change in leadership, Syria faces a massive task of rebuilding, with the destruction of infrastructure, including hospitals and veterinary services, severely disrupting disease control measures.[17,18]

As of June 2024, Syria remained at the heart of the world's largest displacement crisis, with 13.8 million people forcibly displaced.[14] Civilians face immense hardship, worsened by the February 2023 earthquake affecting Türkiye and Syria.[15] Between March 2011 to March 2020, 595 attacks targeted 350 medical facilities, 90% by the government and allied forces.[16] These attacks devastate medical infrastructure, leaving illnesses untreated and worsening malnutrition in already vulnerable communities. By 2015, 25% of Aleppo's 1.2 million residents remained, with approximately 95% of its doctors displaced or killed.[17] Despite the challenges, Aleppo stands as a testament to the courage of its healthcare workers, who continued providing care despite constant danger and resource shortages. In violation of international humanitarian law,[17] hospitals and medical personnel were deliberately targeted, highlighting the need for stronger enforcement of humanitarian protections and a revaluation of strategies aimed at safeguarding healthcare workers and facilities in conflict zones.

Syrians have endured some of the worst atrocities of this century, marked with immense hardship with 23 million+ internally displaced and refugees across Syria and neighbouring countries requiring aid.[18] Many livelihoods in this region rely on agriculture, facilitating trade between refugees and host countries. However, ownership and registration restrictions for non-Jordanians create institutional and political barriers to health and veterinary services, compounding the risk of ZD outbreaks.[19] Both of these reasons act as reminders of how legislation can both mitigate or exacerbate health risks. In this context, policies on livestock ownership and trade may not only hinder economic stability but also could undermine efforts to control ZD.

Moreover, the collapse of veterinary services may lead to the re-emergence of brucellosis in cattle and sheep,[18] while rising rabies circulation in animals in Syria increases the risk of human transmission.[19] Hence part of this reconstruction management of infectious disease is paramount across all stages of life, from prenatal care to geriatrics, in order to provide comprehensive health coverage and reduce long-term public health risks.

Syria's long-standing conflict and Myanmar's recent circumstance presents contrast as while Syria's crisis highlights the protracted effects of war on public health, Myanmar's more recent upheaval shows how swiftly healthcare services can deteriorate.[17,20]

From February 2021–24, Myanmar saw 75,000 homes destroyed and 4600 civilians and activists killed. Since 2021, Myanmar has endured 1257+ attacks on health infrastructure with 104 healthcare workers being killed.[20] This huge impact on the healthcare system severely hinders healthcare capacity and medical care for many, potentially obstructing future efforts to improve public health.[20]

In 1982, the Rohingya were stripped of their citizenship,[21] with Rohingya children continuing to be excluded from immunisation campaigns, heightening their vulnerability to zoonoses such as rabies and leptospirosis. This exclusion creates pathogen reservoirs, aiding their spread in displaced and host communities. Fearing deportation, many refugees avoid seeking help. As of December 2023, 971,904 Rohingya refugees were issued identification through the Bangladesh government and the United Nations High Commissioner for Refugees (UNHCR), with 52% being children.[22] This complicates disease surveillance, as children are less likely to report symptoms, requiring additional resources for detection and management.[22] An estimated 40% of children in camps suffer from diarrheal diseases, with significant gaps in antenatal and postnatal care.[23] These challenges underline the importance of prioritising antenatal and postnatal care and highlight the difficulty of conducting disease surveillance in refugee camps.

In Cox's Bazar, 20% of Rohingya adults have active HCV (hepatitis C) infections, reflecting inadequate healthcare.[24] This worsens vulnerability to zoonoses, as poor sanitation, overcrowding and weakened immune systems increase disease risks. Rohingya areas have shown high rates of tuberculosis and brucellosis, and in 2009 Bangladesh reported 2000 rabies deaths, the highest per capita rate globally.[25] The death toll among animals likely exceeds human cases, emphasising the need for better animal vaccination programmes[25] with Bangladesh aiming for zero dog-mediated rabies deaths by 2030.[26] Additionally, cases of dengue rise during the monsoon season, and poor slaughterhouse inspections increase foodborne illness risks.[25] This dangerous combination threatens to turn the region into a disease outbreak epicentre.[27] These factors increase the likelihood of ZD but also hinders containment efforts.

Similar challenges are evident in Gaza, where restricted access to medical care heightens the risk of zoonotic disease outbreaks.[29] The destruction of healthcare infrastructure, overcrowding in shelters, and limited access to clean water and sanitation create conditions that facilitate disease spread. By 29 February 2024, the UN estimated 35% of Gaza's buildings had been destroyed, with thousands of lives lost beneath the rubble,[28] representing both a profound human tragedy and a further strain on healthcare and disease surveillance. On 26 January, 2024, the International Court of Justice ruled that Israel must allow humanitarian aid into Gaza, emphasising the urgent need for medical and public health interventions.[27] Researchers estimate the death toll could reach 186,000 (8% of the population), highlighting the severe humanitarian crisis and the long-term impact on public health.[28] Coupled with the destruction of critical infrastructure, the risk of ZD transmission worsens as the breakdown of sanitation, healthcare, and disease control measures leaves populations more vulnerable. In the face of such human rights violations, there is a moral imperative to protect civilians, humanitarians, and health workers from military harm.[29] The #NotATarget campaign seeks to ensure their safety by emphasising the need for their protection in conflict zones.[30] This conveys how even when situated away from areas of active violence, raising awareness for the protection of healthcare workers and facilities may help combat ZD indirectly.

Following a confirmed case of paralytic polio in a child in Gaza, a vaccination campaign for children under 10 began on 16 September 2024.[31] However, low vaccination rates continue to fuel concerns about the resurgence of preventable diseases like measles.[31] Similarly, in Palestine, brucellosis remains a public health concern, with the Palestinian Brucellosis Control Program working to reduce its prevalence through animal vaccination.[32] These efforts highlight the crucial role of immunisation in controlling both human and zoonotic diseases. Meanwhile, in neighbouring Jordan, long a refuge for displaced populations from Palestine and Iraq, limited resources, water shortages, and underdevelopment pose further challenges to disease control.[33] Strengthening public health infrastructure and ZD prevention in both Palestine and Jordan could help mitigate health risks, reduce strain on vulnerable communities, and promote broader stability in the region.[33]

## Limitations

A major limitation in ZD research for refugees is the lack of studies linking these diseases to displacement-related challenges. While ZDs are well-studied, little is known about their spread in refugee settings. Factors like overcrowding and limited healthcare is often overlooked, hindering tailored interventions. Additionally, challenges in data collection, lack of formal documentation, and destroyed healthcare infrastructure complicates accurate disease monitoring. Political barriers and fear of persecution also discourages refugees from seeking care, leaving ZD transmission unreported. Focused studies and improved surveillance can help address these gaps and reduce ZD risks.

## Future steps

This section explores future steps that can be taken to enhance disease prevention and improve health outcomes in these communities.

### *Vector control*

Vector-borne diseases cause 17% of the global burden of infectious diseases, with increased movement of people and livestock raising the risk of transmission.[34] Integrated Vector Management (IVM), using methods like insecticidal nets, larvicides and environmental management, can combat diseases like malaria and dengue.[35] Challenges include resource delivery and funding however if it is rolled out the promise is great. E.g. from 2001–2015, insecticide-treated bed nets and indoor spraying prevented an estimated 663 million malaria cases in sub-Saharan Africa[36] Maintaining political commitment is essential for prioritising vector control.[35,36] Insecticide-treated nets have notably reduced Plasmodium falciparum incidence (RR 0·55 [95% CI 0·37–0·79]; high certainty), reinforcing WHO's recommendation for their use in humanitarian crises.[37]

### *Vaccinations*

Since 1974, vaccinations have prevented over 154 million deaths, showcasing their efficacy.[38] Vaccines reduce individual risk and community transmission.[38] Various vaccines, such as inactivated pathogen, subunit and live attenuated vaccines, are used or in development, each requiring selective application.[39] UNHCR–UNICEF (United Nations Children's Fund) guidelines stress equal vaccine access regardless of legal status for refugees, however, engagement remains low due to barriers like fear, language, finances and discrimination.[40]

In low- and middle-income countries and humanitarian settings, vaccine availability can be scarce. A 2019 study across 16 countries found conflict, damaged infrastructure and resource shortages have caused low coverage and outbreaks.[40] In Syria, prolonged disruption since 2014 have left many children under 5 under-immunised, leaving potential long-term ramifications for future generations.[40,41,42]

### *Clean water*

Contaminated water spreads diseases like cholera and typhoid, causing 505,000 deaths annually from diarrhoeal diseases.[43] Fleeing refugees often lack access to clean water and sanitation, exposing them to these diseases.[44] Water, sanitation and hygiene services are essential to safeguarding health. UNHCR provides these during emergencies to protect dignity, prevent disease and reduce gender-based violence.[45] This places the onus on aid agencies to manage trauma, disease and the rebuild. Safe water, waste disposal and clean food have become vital components of said rebuild. Tools like Safe Water Optimization Tool (SWOT) (a low-bandwidth web platform) used in Cox's Bazar is an example whereby screening has improved the quality of water safety compared to standard chlorination guidelines, reducing the public health risks.[46]

### *One Health*

The One Health approach emphasises the interconnectedness of human, animal and environmental health.[47] By integrating expertise from the veterinary, medical and environmental sectors, it strengthens disease surveillance, prevention and response efforts.[47] Successful examples such as rabies vaccinations have significantly reduced human fatalities.[48] Zoonoses emerge faster due to globalisation and population movement, with unhealthy practices and limited healthcare access contributing to epidemics.[49] Anthropogenic changes increasingly drive animal pathogens into human populations. While efforts focus on detecting and containing emerging diseases, prevention to reduce pathogen spillover risk are often disregarded.[50] Around 60% of emerging infectious diseases and the major pandemics, originate from zoonotic spillover, primarily from wildlife reservoirs.[51] Thus, to prevent future pandemics these factors need to be addressed upstream.

The G7 Carbis Bay Health Declaration acknowledged the upstream drivers of ZD but lacked clear prevention strategies or funding plans.50 Prevention protects vulnerable populations, while detection often shields more privileged groups. Jordan's use of the "One Health zoonotic disease prioritisation" tool demonstrated the value of a One Health approach by prioritising rabies, brucellosis and zoonotic tuberculosis, enabling targeted mitigation efforts such as animal vaccination and public awareness campaigns to reduce rabies transmission.[52,53]

## Conclusion

Refugees are a vulnerable community within our society, often

overlooked and bearing the brunt of systemic crises. This article has explored the impact of zoonotic diseases on refugee populations, highlighted some challenges faced, and observed preventative measures to better protect them. It underlines the importance of targeted research and a One Health approach in addressing these issues. As future doctors, it is not just our medical knowledge, but our ability to respond to such challenges that will define our practice.



## References

1. Statistics and Demographics Section, UNHCR. Global trends: forced displacement in 2022. Copenhagen: UNHCR Global Data Service; 2023. Available from: https://www.unhcr.org/sites/default/files/2023-06/global-trends-report-2022.pdf
2. Oakley R, Hedrich N, Walker A, Dinkita HM, Tschopp R, Abongomera C, et al. Status of zoonotic disease research in refugees, asylum seekers and internally displaced people, globally: A scoping review of forty clinically important zoonotic pathogens. PLoS Negl Trop Dis. 2024;18(5): e0012164
3. Rahman MT, Sobur MA, Islam MS, Ievy S, Hossain MJ, El Zowalaty ME, et al. Zoonotic Diseases: Etiology, Impact, and Control. Microorganisms. 2020;8(9).
4. Roberts M, Dobson A, Restif O, Wells K. Challenges in modelling the dynamics of infectious diseases at the wildlife-human interface. Epidemics. 2021; 37:100523.
5. The Lancet Infectious Diseases. Supporting healthcare access for refugees and migrants. The Lancet Infectious Diseases. 2023;23(3):261.
6. de Oliveira RC, Fernandes J, Gonçalves-Oliveira J, Guterres A, de Lemos ERS. Out of the shadows, into the spotlight: Invisible zoonotic diseases in Brazil. The Lancet Regional Health – Americas. 2022;8.
7. Wilson RT. Livestock in the Republic of the Sudan: policies, production, problems and possibilities. Animal Husbandry, Dairy and Veterinary Science. 2018;2(3)
8. Zoonotic Diseases [Internet]. Cleveland Clinic. 2024. Available from: https://my.clevelandclinic.org/health/diseases/zoonotic-diseases
9. World Health Organization. Zoonoses [Internet]. World Health Organization. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/zoonoses
10. United Nations. Definitions [Internet]. Refugees and migrants. United Nations; 2024. Available from: https://refugeesmigrants.un.org/definitions
11. Saleh E, Dousa KM, Babiker A. et al. Health and humanitarian toll of Sudan's forgotten war. The Lancet, doi: 10.1016/S0140-6736(24)01939-1
12. Mohammed AAA, Ahmed M. Veterinary services under siege: how the armed conflict in Sudan threatens animal and human health and how to respond. Infect Ecol Epidemiol. 2023;13(1):2281054.
13. Dafallah MA. The current status of monkeypox in Sudan. Ann Med Surg (Lond). 2023;85(6):3202-3.
14. Reid K. Syrian refugee crisis: Facts, FAQs, and how to help [Internet]. World Vision. 2023. Available from: https://www.worldvision.org/refugees-news-stories/syrian-refugee-crisis-facts#:~:text=Displacement%3A%20Millions%20of%20Syrians%20have
15. Kaloti R, Diab JL, Alkhalil M, Rayes D, Abbara A. Compounding challenges for Syrian refugees in Türkiye in the wake of the earthquake. The Lancet Global Health. 2024;12(4):e557-e8.
16. World Vision International, Matei A, Nepesova N, Economics F, Breckenridge A, Baily T. Too high a price to pay [Internet]. World Vision International; 2021 [cited 2024 Sep 15]. p. 1–35. Available from: https://www.wvi.org/sites/default/files/2021-04/Syria%2010th%20Anniversary%20Global%20Policy%20Report_Revised_0.pdf
17. Heisler M, Baker E, McKay D. Attacks on health care in Syria — normalizing violations of medical neutrality? New England Journal of Medicine. 2015 Dec 24;373(26):2489–91.
18. Gwida M, Al Dahouk S, Melzer F, Rösler U, Neubauer H, Tomaso H. Brucellosis — regionally emerging zoonotic disease? Croat Med J. 2010;51(4):289-95
19. Petersen E, Baekeland S, Memish ZA, Leblebicioglu H. Infectious disease risk from the Syrian conflict. International Journal of Infectious Diseases. 2013;17(9):e666-e7.
20. Htet AS, Soe ZW, Aye WT, Maung C, Lien L, Ottersen OP, et al. 3 years after the Myanmar military coup—the people are suffering. The Lancet. 2024;403(10440):1966-9.
21. Mahmood SS, Wroe E, Fuller A, Leaning J. The Rohingya people of Myanmar: health, human rights, and identity. The Lancet. 2017;389(10081):1841-50.
22. Bangladesh [Internet]. Global focus. Available from: https://reporting.unhcr.org/operational/operations/bangladesh#:~:text=As%20of%2031%20December%202023%2C%20971%2C904%20Rohingya%20refugees%20have%20been
23. Burki T. Life in limbo for millions of stateless people worldwide. The Lancet. 2017;389(10077):1384-5.
24. Samarasekera U. Hepatitis C epidemic among Rohingya refugees in Cox's Bazar: a public health emergency. The Lancet Gastroenterology & Hepatology. 2024;9(9):789.
25. Samad M. Public health threat caused by zoonotic diseases in Bangladesh. Bangladesh Journal of Veterinary Medicine. 2013 Jan 22;9(2):95–120.
26. Ghosh S, Hasan MN, Nath ND, Haider N, Jones DH, Islam MK, et al. Rabies control in Bangladesh and prediction of human rabies cases by 2030: a One Health approach. The Lancet Regional Health - Southeast Asia. 2024;27.
27. Khan MS, Tinua AT. Israel—Palestine: dehumanisation and silencing. The Lancet. 2024;403(10429):805-6.
28. Khatib R, McKee M, Yusuf S. Counting the dead in Gaza: difficult but essential. The Lancet. 2024;404(10449):237-8.
29. Dehghan R, Smith J, Shahid HJ, Hadley D, Hopkinshaw B. Medical duty and advocacy for Palestine. The Lancet. 2024;403(10424):349.
30. Alser O, Alser M. Urgent call for protecting health-care workers in Palestine. The Lancet. 2023;402(10414):1746-7.
31. Waldman R, Steinglass R, Nieburg P. An urgent case for measles vaccination in Gaza. The Lancet.
32. Amro A, Mansoor B, Hamarsheh O, Hjaija D. Recent trends in human brucellosis in the West Bank, Palestine. International Journal of Infectious Diseases. 2021;106:308-13.
33. McAlester J, Kanazawa Y. Situating zoonotic diseases in peacebuilding and development theories: Prioritizing zoonoses in Jordan. PLoS One. 2022;17(3):e0265508.
34. CropLife International. Vector control fact sheet [Internet]. [cited 2024 Sep 24]. Available from: https://croplife.org/wp-content/uploads/pdf_files/Vector-Control-fact-sheet.pdf
35. Alonso P, Engels D, Reeder J. Renewed push to strengthen vector control globally. The Lancet. 2017;389(10086):2270-1.
36. Wilson AL, Courtenay O, Kelly-Hope LA, Scott TW, Takken W, Torr SJ, et al. The importance of vector control for the control and elimination of vector-borne diseases. PLoS Negl Trop Dis. 2020;14(1):e0007831.
37. Messenger LA, Furnival-Adams J, Chan K, Pelloquin B, Paris L, Rowland M. Vector control for malaria prevention during humanitarian emergencies: a systematic review and meta-analysis. The Lancet Global Health. 2023;11(4):e534-e45.
38. Shattock AJ, Johnson HC, Sim SY, Carter A, Lambach P, Hutubessy RCW, et al. Contribution of vaccination to improved survival and health: modelling 50 years of the Expanded Programme on Immunization. The Lancet. 2024;403(10441):2307-16.
39. Iqbal M, Sealy J. Why vaccines matter in the fight against zoonotic diseases [Internet]. The Pirbright Institute. 2021. Available from: https://www.pirbright.ac.uk/news/2021/07/why-vaccines-matter-fight-against-zoonotic-diseases
40. Hargreaves S, Crawshaw A, Deal A. Ensuring the integration of refugees and migrants in immunization policies, planning and service delivery globally [Internet]. Available from: https://iris.who.int/bitstream/handle/10665/359108/9789240051843-eng.pdf?sequence=1
41. Giambi C, Del Manso M, Marchetti G, Olsson K, Adel Ali K, Declich S. Immunisation of migrants in EU/EEA countries: Policies and practices. Vaccine. 2019;37(36):5439-51.
42. Harmsen IA, Bos H, Ruiter RAC, Paulussen TGW, Kok G, de Melker HE, et al. Vaccination decision-making of immigrant parents in the Netherlands; a focus group study. BMC Public Health. 2015;15(1):1229
43. World Health Organization. Drinking Water [Internet]. World Health Organization. World Health Organization; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/drinking-water
44. Water and sanitation - United Kingdom for UNHCR [Internet]. United Kingdom for UNHCR. 2021 [cited 2024 Sep 26]. Available from: https://www.unrefugees.org.uk/how-we-help/water-and-sanitation/
45. UNHCR. Water, sanitation and hygiene [Internet]. [cited 2024 Sep 24]. Available from: https://www.unhcr.org/uk/what-we-do/respond-emergencies/water-sanitation-and-hygiene
46. Elrha. Safe Water for Refugees [Internet]. Available from: https://www.elrha.org/project/msf-safe-water-for-refugees/
47. Sutradhar I, Zaman MH. One Health approaches to improve refugee health. The Lancet Global Health. 2021;9(12):e1646-e7.
48. Cleaveland S, Sharp J, Abela-Ridder B, Allan KJ, Buza J, Crump JA, et al. One Health contributions towards more effective and equitable approaches to health in low- and middle-income countries. Philos Trans R Soc Lond B Biol Sci. 2017;372(1725).
49. Horefti E. The importance of the One Health concept in combating zoonoses. pathogens. 2023;12(8).
50. Shanks S, van Schalkwyk MCI, Cunningham AA. A call to prioritise prevention: action is needed to reduce the risk of zoonotic disease emergence. The Lancet Regional Health – Europe. 2022;23.
51. Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, Gittleman JL, et al. Global trends in emerging infectious diseases. Nature. 2008;451(7181):990-3.
52. Kheirallah KA, Al-Mistarehi A-H, Alsawalha L, Hijazeen Z, Mahrous H, Sheikali S, et al. Prioritizing zoonotic diseases utilizing the One Health approach:

53. Jordan's experience. One Health. 2021; 13:100262.
Flowra MT, Asaduzzaman M. Resurgence of infectious diseases due to forced migration: is planetary health and One Health action synergistic? The Lancet Planetary Health. 2018;2(10):e419-e20.

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