Studies on Research Trends in Construction Sites Infectious Diseases: A Systematic Literature Review

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Abstract: The construction industry has longstanding issues with infectious disease prevalence among on-site workers, particularly during the COVID-19 pandemic. However, academic literature lacks sufficient empirical evidence about the prevalence and impact of infectious diseases in the setting of construction sites. This study intended to identify the prevalence of infectious diseases at construction sites by formulating systematic data on the study of infectious diseases in this context. In this study, data on prevalent infectious diseases on construction sites were obtained from a secondary source based on a systematic literature review (SLR) following the Preferred Reporting Items for Systematic Review (PRISMA) standards and by utilising thematic analysis. The related studies for each selected infectious disease were identified through this process. The findings, based on academic databases such as Scopus, PubMed, ScienceDirect and Emerald Insight, revealed eight prevalent infectious diseases on construction sites: dengue, tuberculosis (TB), leptospirosis, Hepatitis B, HIV, Hepatitis C, malaria and syphilis. This study contributes to theoretical understanding and practical insights into this crucial area, addressing methodological constraints and suggesting future research and initiatives. At the same time, this study is applicable to encourage further empirical research and the development of preventive and treatment strategies for prevalent diseases in construction settings.

Keywords: Infectious diseases, Construction workers, Construction sites, PRISMA, Systematic literature review

INTRODUCTION

Infectious diseases may manifest in several forms that can significantly affect human health and well-being. They can afflict people and animals and sometimes lead to mortality. The aetiology of this condition may be attributed to a specific microbe that flourishes and multiplies within the environment, including bacteria, viruses, protozoa, or fungi (World Health Organization [WHO]-Eastern Mediterranean Region, 2021). Infectious diseases can spread through people by direct contact with creatures, food, water or the climate, and they are called zoonotic sicknesses (McArthur, 2019).

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According to Ministry of Health (2022), Malaysia is affected by seven groups of infectious diseases. Thus, preventing infectious disease outbreaks is a formidable challenge for the human population, specifically for Malaysian construction workers. However, because the researchers focused on the top 10 diseases in Malaysia based on data from the WHO-Representative Office for Malaysia, Brunei Darussalam and Singapore (2019), only five genera were included in this analysis (as shown in Table 1).

Table 1. The genus of infectious diseases in Malaysia is based on Ministry of Health (2022)

Genus	Infectious Diseases
Vaccine-preventable diseases	Hepatitis B
Vector-borne disease	1. Dengue 2. Malaria
Tuberculosis	1. Tuberculosis (TB)
Leprosy	
Sexually transmitted infection	1. HIV 2. Gonorrhoea 3. Syphilis 4. Hepatitis C
Zoonosis	1. Hand, foot and mouth disease (HFMD) 2. Leptospirosis

Vaccine-preventable diseases are illnesses caused by infections that can be forestalled with antibodies, such as Hepatitis B. Vector-borne illnesses, such as dengue fever and malaria, are transmitted through being bitten by infected arthropods. Furthermore, *Mycobacterium tuberculosis* is the bacteria that causes TB, which mostly affects the lungs but may also harm the kidneys, spinal cord and brain. TB can be fatal if not adequately treated (Khatri, 2020). Next, sexually transmitted infections, such as HIV, gonorrhoea, syphilis and Hepatitis C, are illnesses that are spread through sexual contact from an infected person to an uninfected one. Also, zoonotic diseases are caused by bacteria, fungi, parasites and viruses, which may cause minor to severe illnesses and death in humans and animals (Ornithological Council, 2021).

According to Awolusi, Marks and Hallowell (2018), construction employees face various health risks and are susceptible to various diseases. Hence, it is important to get precise data to substantiate the assertion that infectious illnesses have a more pronounced influence on construction sites. However, there is a lack of data regarding infectious diseases on construction sites.

Therefore, this research presented a summary of the data pertaining to ten infectious illnesses that are often seen on construction sites based on the top 10 infectious diseases in Malaysia according to the WHO-Representative Office for Malaysia, Brunei Darussalam and Singapore (2019).

The Need for a Systematic Review

A systematic review is an objective, repeatable method for answering a specific research question by obtaining all relevant studies and reviewing and analysing their findings (Ahn and Kang, 2018). It involves a comprehensive and in-depth plan and search strategy to develop a priori and reduce bias by recognising, evaluating and synthesising all relevant studies on a specific topic (Patterson and Morshed, 2021).

Correspondingly, Ministry of Health has conducted a significant number of previous studies on infectious diseases worldwide to investigate the likelihood of these diseases occurring on construction sites. These studies provide a local context for researchers and policymakers to comprehend the prevalence, incidence and trends of diseases directly affecting the Malaysian population (WHO-Representative Office for Malaysia, Brunei Darussalam and Singapore, 2019). Moreover, using local data ensures that interventions and policies are tailored to the unique challenges and characteristics of the country. Nevertheless, there is a lack of research and established standards on infectious diseases in the Malaysian construction industry because most studies focus on specific diseases (Adnan et al., 2018).

The study of this systematic literature review aimed to answer the research question: Which infectious illnesses have occurred at construction sites? The principal focus of the investigation was on collecting the results of the previous study of the top 10 infectious diseases that were analysed by Ministry of Health to prove that these illnesses had also been outbreaks within construction sites. The present study was vital because it provided information based on the top 10 infectious diseases according to the Ministry of Health statistics. This information can aid future researchers in investigating these top 10 infectious diseases on-site and focusing future attention on infectious diseases at construction sites.

METHODOLOGY

The Preferred Reporting Items for Systematic Review (PRISMA) methodology was utilised to carry out a systematic literature review (SLR) to analyse and identify infectious diseases on construction sites. The SLR process for this

study followed the prescribed phases of preliminary, identification, screening, eligibility and data abstraction and analysis (Shahruddin, Zairul and Haron, 2021).

Preliminary

The research topic for this SLR study was formulated in a concise, understandable and logical manner to facilitate the discovery, screening and retrieval of relevant publications related to the subject being investigated. Hence, this study topic was formulated by adapting the population, intervention, comparison and outcome measurements (PICO) concept from Cochrane (Patterson and Morshed, 2021) to answer the study's research question: Which infectious illnesses have occurred at construction sites?

Despite the significance of construction sites as potential drivers of infectious disease transmission, there is a lack of statistics focusing on construction sites (Liang et al., 2018). Hence, the question encompasses four PICO concepts: (1) construction party on-site (Population), (2) Malaysia's ranking of the most prevalent infectious diseases (Intervention), (3) infectious diseases study-related sectors (Comparison) and (4) the number of relevant studies pertaining to the top 10 infectious diseases in the construction industry (Outcome). The keywords gathered from the titles and abstracts of the obtained articles were subsequently examined using a thesaurus and methodically organised in a logic grid table (as shown in Table 2).

Table 2. Logic grid with recognised keywords table

Population	Intervention	Comparison	Outcome
Construction party who is on-site	Malaysia's ranking of the most prevalent infectious diseases (Ministry of Health)	Related study on construction site	The number of related studies based on the top 10 infectious diseases related studies on construction sectors
1. Main contractor 2. Subcontractors 3. Clerk of works 4. Construction workers 5. Designers 6. Project manager 7. Quantity Surveyor 8. Principal Designer 9. Other consultants	1. Dengue 2. HFMD 3. Tuberculosis 4. Leptospirosis 5. Hepatitis B 6. HIV 7. Gonorrhoea 8. Hepatitis C 9. Malaria 10. Syphilis	1. Proven evidence of site workers with diseases 2. Transmission strategy 3. Methods to prevent	1. Dengue 2. Tuberculosis 3. Leptospirosis 4. Hepatitis B 5. HIV 6. Hepatitis C 7. Malaria 8. Syphilis

Identification

The first phase of the SLR procedure, which involved identification, was conducted in July 2023. By using relevant keywords, the researchers may enhance the dataset's capacity to retrieve a broader range of potential articles (Shaffril et al., 2021). Thus, this study utilised the identification technique to identify the previous study for selected infectious diseases reported or confirmed on-site from 2013 to 2023 from four databases: Scopus, PubMed, ScienceDirect and Emerald Insight. Finally, a total of 10,563 articles were retrieved.

Screening

The subsequent step involves the screening procedure. Researchers examined the titles and abstracts of the studies to remove irrelevant materials using an abstract screening tool consisting of clear and concise questions based on the study's inclusion criteria. The abstract screening examined the titles and abstracts identified as potentially relevant. Once the screeners deem an abstract eligible, the full-text document of the study is obtained for further screening. Then, the researchers examined the full text of the articles to ensure compliance with the eligibility criteria. At this stage, the researchers try to find the keywords and eligible data regarding this study (as shown in Table 3).

Table 3. The search criteria employed in the systematic review

Databases	Keywords Used
Scopus	"dengue" OR "hand, foot and mouth diseases" OR "tuberculosis" OR "leptospirosis" OR "hepatitis B" OR "HIV" OR "gonorrhoea" OR "hepatitis C" OR "malaria" OR "syphilis" AND "construction workers" OR "construction sites"
PubMed	"dengue" OR "hand, foot and mouth diseases" OR "tuberculosis" OR "leptospirosis" OR "hepatitis B" OR "HIV" OR "gonorrhoea" OR "hepatitis C" OR "malaria" OR "syphilis" AND "construction workers" OR "construction sites"
Emerald Insight	"dengue" OR "hand, foot and mouth diseases" OR "tuberculosis" OR "leptospirosis" OR "hepatitis B" OR "HIV" OR "gonorrhoea" OR "hepatitis C" OR "malaria" OR "syphilis" AND "construction workers" OR "construction sites"
Science Direct	"dengue" OR "hand, foot and mouth diseases" OR "tuberculosis" OR "leptospirosis" OR "hepatitis B" OR "HIV" OR "gonorrhoea" OR "hepatitis C" OR "malaria" OR "syphilis" AND "construction workers" OR "construction sites"

For this study, 70 articles solely focused on specific infectious diseases on construction sites between 2013 and 2023 were found relevant. Journals containing review papers, conference papers, books or types of infectious diseases were not included (as shown in Table 4). This aimed to concentrate on the actual research, such as listing infectious disease related to previous studies on-site.

Table 4. Inclusion and exclusion criteria of this study

Inclusion Criteria	Exclusion Criteria
Publication range 2013–2023	Publication before 2013
Journal (articles with specific infectious diseases on construction sites or related to construction workers)	Review paper, conference paper, book, types of infectious diseases not under the listing
English language	Other languages; Other than English language
Availability of full text	Non-availability of full text

Eligibility

The third step was the eligibility process. In this step, articles were included or excluded according to the authors' specific criteria (Shaffril, Samsuddin and Samah, 2020). For this study, during the eligibility process, 70 articles were manually screened for literature related to selected infectious diseases on-site based on inclusion and exclusion criteria.

Data Abstraction and Analysis

For this stage, the implemented articles underwent thorough analysis and the result of the research concentrated on precise studies on the defined research questions (Shaffril, Samsuddin and Samah, 2020). Figure 1 shows the PRISMA procedures for the SLR of this study.

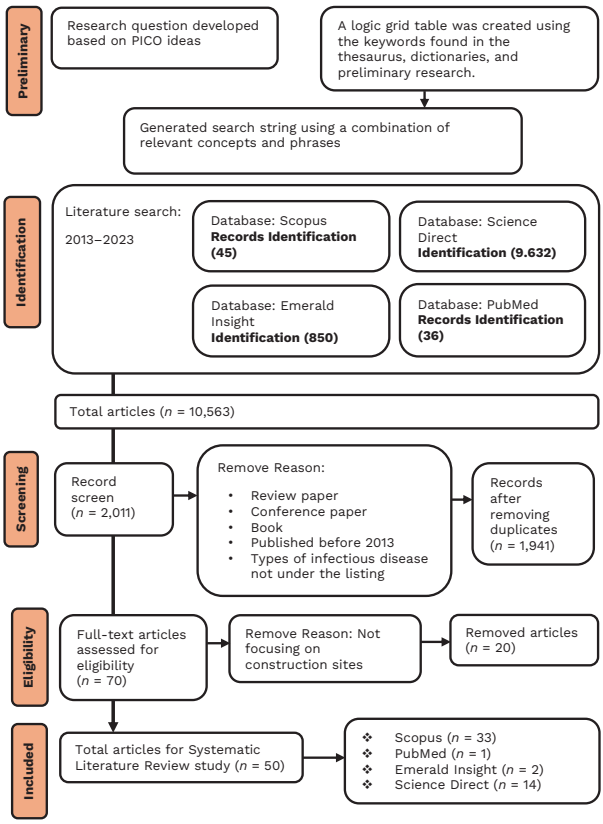

Figure 1. PRISMA procedures for SLR

Thematic Analysis

The remaining articles were evaluated, reviewed and analysed using a thematic analysis approach (as shown in Figure 2). This process generated the themes for this study. The total number of materials selected for thematic evaluation was 50 articles. Using ATLAS.ti 9, a qualitative data analysis software, the initial coding of research on infectious diseases at construction sites was generated by directly quoting the empirical data. Subsequently, all the initial coding with comparable characteristics was classified into distinct code clusters. Every code group corresponds to a confirmed contagious illness seen at construction sites. For this study, themes were generated by the researchers (inductively generated themes) based on patterns and relationships within the data without being constrained by a specific theoretical perspective. The article quotation was coded into the group, and finally, the final theme was classified.

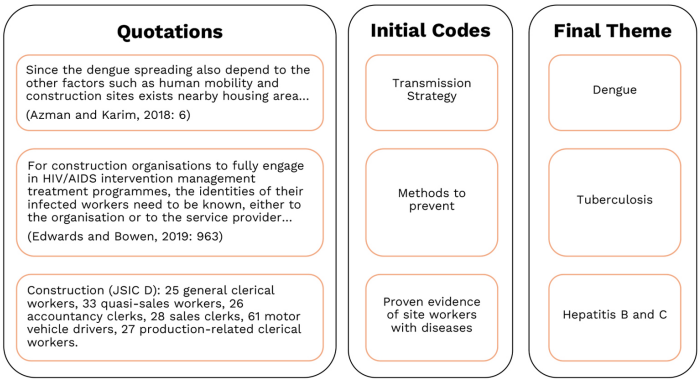

Figure 2. Example of thematic analysis

RESULTS

Descriptive Analysis

The current study reviewed 50 articles from 21 countries, as shown in Figure 3. A total of eight out of 10 were about the types of infectious diseases found on construction sites. HFMD and gonorrhoea were excluded from this study due to the absence of relevant citations in prior publications pertaining to these diseases on-site from 2013 to 2023.

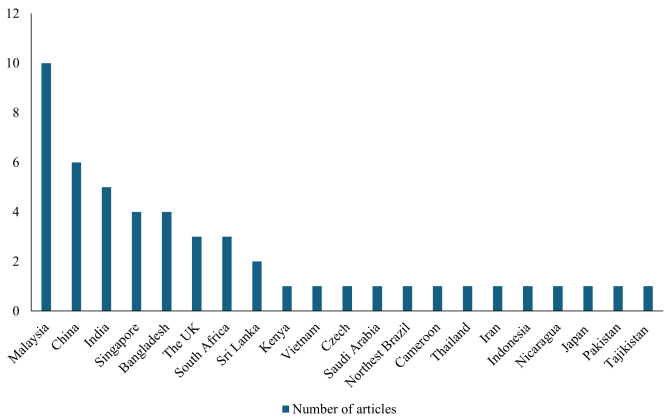

Figure 3. Publications of articles by nation

Table 5 shows the number of prior related studies for infectious diseases on-site from 2013 to 2023, together with additional information such as study design, database and country collected using the PRISMA approach.

Table 5. List of previous studies of eight infectious diseases on construction sites from 2013 to 2022

Authors	Study Design	Database	Country	Infectious Diseases							
				Dengue	TB	Leptospirosis	Hepatitis B	HIV	Hepatitis C	Malaria	Syphilis
Azman and Karim (2018)	QNS	ScienceDirect	Malaysia	●							
Adnan et al. (2021)	QNS	ScienceDirect	Malaysia	●							
Nazni et al. (2019)	CS	ScienceDirect	Malaysia	●							
Jebrail and Dawood (2020)	QNS	PubMed	Malaysia	●						●	
Majid et al. (2021)	CS	Scopus	Malaysia	●							
Hamidun et al. (2021)	CS	Scopus	Malaysia	●							
Zamzuri et al. (2022)	QLS	Scopus	Malaysia	●							
Liang et al. (2018)	CS	Scopus	Singapore	●							
Liu et al. (2021)	CS	Scopus	China	●							
Sim et al. (2020)	CS	Scopus	Singapore	●							
Salami, Ajayi and Oyegoke (2022)	CS	Scopus	Sri Lanka	●							
Lutomiah et al. (2016)	CS	Scopus	Kenya	●							
Nguyen-Tien, Probandari and Ahmad (2019)	QLS	Scopus	Vietnam	●							
Dickin, Schuster-Wallace and Elliott (2014)	CS	ScienceDirect	Malaysia	●							
Yung et al. (2016)	CS	Scopus	Singapore	●							
Trojánek et al. (2016)	EX	ScienceDirect	Czech	●							

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Table 5. *Continued*

Authors	Study Design	Database	Country	Infectious Diseases							
				Dengue	TB	Leptospirosis	Hepatitis B	HIV	Hepatitis C	Malaria	Syphilis
Zhang et al. (2022)	QNS	Scopus	China	●							
Louis et al. (2016)	QNS	Scopus	Sri Lanka	●							
Nagpal et al. (2016)	QNS	Scopus	India	●							
Jamjoom et al. (2016)	QNS	Scopus	Saudi Arabia	●							
De Macêdo et al. (2021)	CS	Scopus	Northeast Brazil	●							
Yang et al. (2014)	CS	Scopus	China	●							
Yoshikawa (2013)	CS	Scopus	Singapore	●							
Mamulwar et al. (2021)	CSS	Scopus	India					●			
Somerset et al. (2022)	QLS	Scopus	UK					●			
Somerset, Evans and Blake (2021)	QLS	Scopus	UK					●			
Middleton et al. (2020)	CS	Scopus	UK					●			
Tarkang and Pencille (2018)	CSS	Scopus	Cameroon					●			
Mendelsohn et al. (2015)	QLS	Scopus	China					●			
Sharif et al. (2022)	CS	ScienceDirect	Bangladesh	●							
Rahman et al. (2022)	QNS	ScienceDirect	Bangladesh	●							
Bashar et al. (2020)	QLS	ScienceDirect	Bangladesh	●							
Edwards and Bowen (2019)	QLS	Emerald Insight	South Africa		●			●			
Bowen et al. (2018)	QNS	Emerald Insight	South Africa		●			●			

(Continued on next page)

Table 5. *Continued*

Authors	Study Design	Database	Country	Infectious Diseases							
				Dengue	TB	Leptospirosis	Hepatitis B	HIV	Hepatitis C	Malaria	Syphilis
Kashyap, Sharma and Singh (2021)	QNS	ScienceDirect	India		●						
Hishamshah et al. (2018)	EX	Scopus	Malaysia	●		●					
Toh and Chan (2019)	QNS	Scopus	Malaysia			●					
Fang et al. (2018)	Case Study	ScienceDirect	China		●						
Toemjai, Thongkrajai and Nithikathkul (2022)	QNS	ScienceDirect	Thailand			●					
Garshasbi et al. (2018)	QNS	ScienceDirect	Iran			●					
Porusia et al. (2021)	QNS	Scopus	Indonesia			●					
Yih et al. (2019)	QNS	Scopus	Nicaragua			●					
Patel et al. (2014)	QNS	Scopus	India			●					
Nakazawa et al. (2022)	CS	ScienceDirect	Japan				●		●		
Arshad et al. (2016)	QNS	Scopus	Pakistan				●				●
Liu et al. (2013)	QNS	ScienceDirect	China					●			
Bowen et al. (2014)	QLS	Scopus	South Africa					●			
Weine et al. (2013)	QNS	Scopus	Tajikistan					●			
Dayanand et al. (2017)	QLS	Scopus	India							●	
Haque et al. (2013)	QNS	Scopus	Bangladesh							●	

Notes: QLS = Qualitative study; EX = Experiment; QNS = Quantitative study; CCS = Cross-sectional study; CS = Case study.

Thematic Review

The thematic review was conducted by drawing upon professional-related and theoretical knowledge pertaining to infectious diseases that are prevalent at construction sites. For this study, eight themes were discussed: Dengue (n = 27), followed by TB (n = 4), Leptospirosis (n = 7), Hepatitis B (n = 2), HIV (n = 11), Hepatitis C (n = 1), Malaria (n = 3) and Syphilis (n = 1), as shown in Figure 4.

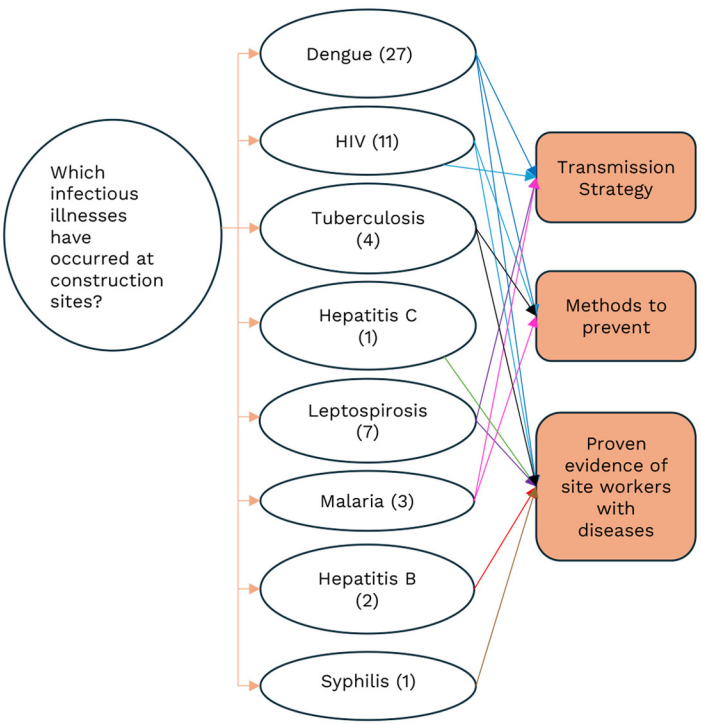

Figure 4. Thematic map

Dengue

Among these eight infectious diseases, dengue had the highest recorded study, with nine out of 27 articles highlighting the prevalence of dengue on construction sites in Malaysia. As a response, the studies by Adnan et al. (2021), Zamzuri et al. (2022), Liang et al. (2018), Louis et al. (2016), Salami, Ajayi and Oyegoke (2022), Lutomiah et al. (2016), De Macêdo et al. (2021), Nazni et al. (2019), Hamidun et al. (2021) and Sim et al. (2020) found that construction sites can increase the risk of transmissions during dengue outbreaks in construction sites. In Malaysia, over the past 40 years, climate change has facilitated the

spread of the dengue virus through higher temperatures, increased rainfall and humidity (Azman and Karim, 2018). The problem of spreading dengue fever on construction sites is also a concern in China (Liu et al., 2021).

There were many reasons for dengue exploration on-site. For example, the worker family's construction projects generated a variety of factors that contributed to dengue outbreaks on-site (Nguyen-Tien, Probandari and Ahmad, 2019), the public health department stored rainwater-collecting materials (Dickin, Schuster-Wallace and Elliott, 2014) or construction sites and garbage were thought to cause dengue (Yung et al., 2016; Trojánek et al., 2016). Moreover, dengue can be caused by human mobility in nearby residential areas or logged forest areas (Azman and Karim, 2018; Jebrail and Dawood, 2020).

In contrast, stored water in tanks allows Aedes mosquitoes to breed and potentially spread the outbreak from the construction site to the community (Zhang et al., 2022; Sharif et al., 2022; Nagpal et al., 2016). Water tanks are peri-domestic containers that are left unattended by contractors during construction (Jamjoom et al., 2016). Yang et al. (2014) indicated that the workers at construction sites with poor living environments were infected with dengue fever. Hence, for dengue prevention, large construction companies should be involved in public health initiatives, as demonstrated by Singapore's vector control programme, although some may opt to pay fines rather than allocate money and personnel for vector control (Yoshikawa, 2013). Correspondingly, other related articles are by Rahman et al. (2022), Bashar et al. (2020) and Hishamshah et al. (2018).

Tuberculosis

Tuberculosis (TB) is a bacterial infection (*Mycobacterium tuberculosis complex*) (Natarajan et al., 2020), which is transferred through inhaling tiny droplets from an infected person's cough or sneezes. A total of four studies reported construction workers with TB. Notably, the related articles were by Kashyap, Sharma and Singh (2021), Fang et al. (2018), Bowen et al. (2018) and Edwards and Bowen (2019).

Leptospirosis

The third highest-reviewed infectious disease for this study was leptospirosis. Leptospirosis is an infrequent bacterial infection that animals can spread to humans (Khatri, 2021). Leptospirosis pathogens can survive in the body through the eyes, nose, skin cuts and abrasions. Employees should avoid touching their

faces at work and practice good personal hygiene. In this study, a total of seven previous articles are related to leptospirosis on-site. The articles which discussed the transmission strategy and the proven evidence of site workers with this infected illness were Hishamshah et al. (2018), Toh and Chan (2019), Toemjai, Thongkrajai and Nithikathkul (2022), Garshasbi et al. (2018), Porusia et al. (2021) and Yih et al. (2019).

Hepatitis B

Hepatitis B is a potentially fatal liver infection that produces swelling and can cause liver damage (WebMD Editorial Contributors, 2022). The SLR found only two associated articles. In Japan, construction workers were recorded with Hepatitis B (Nakazawa et al., 2022). Also, in Pakistan, an evaluation of the characteristics of the infections revealed that single construction worker donors had a greater likelihood of contracting the Hepatitis B virus (Arshad et al., 2016).

HIV

The second-highest disease was HIV, with 11 related articles. HIV is a viral infection that targets the body's immune system. The related articles were by Mamulwar et al. (2021), Somerset et al. (2021), Somerset et al. (2022), Middleton et al. (2020), Tarkang and Pencille (2018), Liu et al. (2013), Mendelsohn et al. (2015), Edwards and Bowen (2019), Bowen et al. (2018), Bowen et al. (2014) and Weine et al. (2013). These articles discussed the transmission strategy, the method of prevention, and the proven evidence of site workers' involvement in this illness.

Hepatitis C

There was only one article related to Hepatitis C in the context of construction sites. Hepatitis C is a viral infection that primarily affects the liver, with the Hepatitis C virus being the causative agent (Chaudhari et al., 2021). A previous study was only in Japan. There were 710,269 construction workers with and without Hepatitis C tested for Hepatitis C (Nakazawa et al., 2022).

Malaria

Malaria is an infectious illness caused by a parasitic organism that is transmitted by the bite of a particular kind of mosquito that primarily targets

human hosts (WHO, 2022). There were three articles discussing malaria in the context of construction sites. The related articles are written by Jebrail and Dawood (2020), Dayanand et al. (2017) and Haque et al. (2013).

Syphilis

Syphilis is a bacterial infection typically transmitted through sexual contact (CDC [Centers for Disease Control and Prevention], 2022). On construction sites, only one article about syphilis was present. According to Arshad et al. (2016), when the characteristics of the infections were compared, it was discovered that syphilis and the Hepatitis B virus were more likely to infect unmarried donors than the other infections. However, compared to the other infections, syphilis was more likely to infect construction workers and married organ donors. People with co-infections were infected by multiple pathogens, regardless of their marital status or occupation.

DISCUSSION

A comprehensive review of four databases yielded 50 articles about eight infectious diseases on construction sites. Previously, a total of 10 types of infectious diseases were considered. However, after a systematic literature review (SLR), only eight types of infectious diseases were highlighted in related articles. Infectious diseases on construction sites can be a significant public health concern, and the findings can vary from one country to another. The differences in findings can be due to several factors, such as variations in the prevalence of specific diseases, differences in construction practices and regulations and variations in the availability and use of preventive measures. For example, Seresht's (2022) study proposed a framework for enhancing resilience in construction against infectious diseases using a stochastic multi-agent approach. The proposed framework motivates future research on micro-level modelling of infectious diseases and efforts to intervene in the spread of diseases.

In general, the current study demonstrated the importance of implementing preventive measures to protect workers and the public from the risks associated with exposure to biological agents. These measures can include hygiene facilities, protective clothing, respiratory protection and vaccination programmes, as suggested by Jensen et al. (2005) and Organização Pan-Americana da Saúde (2021). The differences in findings from one country to another can be due to variations in construction practices and regulations, as well as differences in the prevalence of specific diseases. For example, in construction, the risk of infection on construction worksites is compounded by overlapping exposures in the construction workforce, which includes a

variety of workers, such as labourers, carpenters, electricians and plumbers (Pasco et al., 2020). In contrast, a study that has been conducted in another country may find that workers in different industries or occupations are at higher risk for specific diseases. Therefore, it is important to consider the context and specific circumstances of each country when interpreting and comparing the findings of studies on infectious diseases at construction sites.

RECOMMENDATIONS FOR FUTURE STUDY

The current body of research indicates a significant lack of knowledge about HFMD and gonorrhea. The researchers have encountered a dearth of literature pertaining to the occurrence of these two infectious diseases on construction sites throughout the time frame from 2013 to 2023. Therefore, the first suggestion entails conducting a comprehensive study, encompassing site surveys and interviews, to gather empirical data on HFMD and gonorrhea occurrences inside construction sites.

Second, there remains a dearth of studies for TB, Hepatitis B, Hepatitis C, malaria and syphilis. Hence, it is recommended that future studies thoroughly investigate the reasons and prevention methods specific to construction sites or among construction workers. According to Shaffril, Krauss and Samsuddin (2018), PRISMA is frequently used in the health sciences, especially on the infectious diseases commonly reported on construction sites.

Based on the review of the previous journals on the eight types of infectious diseases, the researcher concludes that the studies of these diseases on construction sites are limited. Therefore, further studies are recommended because the construction sector is one of the sectors that drive infectious diseases. Based on the World Statistics (2011), work-related illness is a leading cause of death among workers. As a result, on-site infectious diseases should be given special care.

CONCLUSIONS

The current study emphasised the critical need for comprehensive research on infectious diseases occurring on construction sites, pointing out the lack of systematic literature reviews and empirical investigations in this area. The research problem highlighted the gap in understanding and addressing infectious diseases, specifically within the context of construction sites.

In addressing the limitations of this study, it is important to acknowledge that while the systematic review has provided insights into the eight types of infectious diseases that are prevalent on construction sites, it may not have covered the entire spectrum of infectious diseases relevant to this setting.

However, by thoroughly examining 50 articles, the study aimed to mitigate this limitation and provide a comprehensive perspective within the scope of its resources and timeframe. Although the study was extensive, it is important to acknowledge the potential for overlooking certain infectious diseases or research gaps because of limitations such as restricted access to certain literature sources or language hurdles. To address this issue, future researchers should aim to conduct more thorough literature reviews and empirical studies to fill these gaps and limitations.

The theoretical contributions of this study lie in its systematic approach to synthesising existing research on infectious diseases on construction sites. By identifying common diseases and analysing the strategies presented in the literature, the study provides a foundation for further theoretical development in understanding the dynamics of infectious disease transmission and prevention in construction settings.

The practical contributions of this research are significant for both academia and the industry. For academia, it provides a roadmap for future research endeavours, highlighting areas that warrant further investigation and emphasising that comprehensive literature reviews are essential in understanding infectious disease dynamics on construction sites. For industry stakeholders and policymakers, the study offers insights into potential strategies for mitigating the risk of infectious diseases on construction sites, which ultimately contribute to the health and safety of the workers and the broader community.

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REFERENCES

Adnan, R.A., Ramli, M F., Othman, H.F., Asha'ri, Z.H., Ismail, S.N.S. and Samsudin, S. (2021). The impact of sociological and environmental factors for dengue infection in Kuala Lumpur, Malaysia. *Acta Tropica*, 216: 105834. https://doi.org/10.1016/j.actatropica.2021.105834

Adnan, R.A., Ramli, M.F., Othman, H.F., Asha'ri, Z.H., Ismail, S.N.S. and Samsudin, S. (2018). Environmental and sociology factors associated with dengue cases in Kuala Lumpur, Malaysia. *Preprints.org*, 2018: 2018100212. https://doi.org/10.20944/preprints201810.0212.v1

Ahn, E. and Kang, H. (2018). Introduction to systematic review and meta-analysis: A health care perspective. *Korean Journal of Anesthesiology*, 71(2): 1–38.

Arshad, A., Borhany, M., Anwar, N., Naseer, I., Ansari, R., Boota, S., Fatima, N., Zaidi, M. and Shamsi, T. (2016). Prevalence of transfusion transmissible infections in blood donors of Pakistan. *BMC Hematology*, 16(1): 2–7. https://doi.org/10.1186/s12878-016-0068-2

Awolusi, I., Marks, E. and Hallowell, M. (2018). Wearable technology for personalized construction safety monitoring and trending: Review of applicable devices. *Automation in Construction*, 85: 96–106. https://doi.org/10.1016/j.autcon.2017.10.010

Azman, N.N. and Karim, S.A.A. (2018). Assessing climate factors on dengue spreading in state of Perak. *Journal of Physics: Conference Series*, 1123(1): 012026. https://doi.org/10.1088/1742-6596/1123/1/012026

Bashar, K., Mahmud, S., Asaduzzaman, T.E.A. and Zaman, A.B. (2020). Knowledge and beliefs of the city dwellers regarding dengue transmission and their relationship with prevention practices in Dhaka city, Bangladesh. *Public Health in Practice*, 1: 100051. https://doi.org/10.1016/j.puhip.2020.100051

Bowen, P., Allen, Y., Edwards, P., Cattell, K. and Simbayi, L. (2014). Guidelines for effective workplace HIV/AIDS intervention management by construction firms. *Construction Management and Economics*, 32(4): 362–381. https://doi.org/10.1080/01446193.2014.883080

Bowen, P., Govender, R., Edwards, P. and Lake, A. (2018). HIV infection in the South African construction industry. *Psychology, Health and Medicine*, 23(5): 612–618. https://doi.org/10.1080/13548506.2017.1380836

CDC (Centers for Disease Control and Prevention) (2022). Detailed STD facts: Syphilis. Available at: https://www.cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm [Accessed on 9 November 2022].

Chaudhari, R., Fouda, S., Sainu, A. and Pappachan, J.M. (2021). Metabolic complications of Hepatitis C virus infection. *World Journal of Gastroenterology*, 27(13): 1267–1282. https://doi.org/10.3748/wjg.v27.i13.1267

Dayanand, K.K., Punnath, K., Chandrashekar, V., Achur, R.N., Kakkilaya, S.B., Ghosh, S.K., Kumari, S. and Gowda, D.C. (2017). Malaria prevalence in Mangaluru city area in the southwestern coastal region of India. *Malaria Journal*, 16(1). https://doi.org/10.1186/s12936-017-2141-0

De Macêdo, S.F., Silva, K.A., de Vasconcelos, R.B., De Sousa, I.V., Mesquita, L.P.S., Barakat, R.D.M., Fernandes, H.M.C., Queiroz, A.C.M., Santos, G.P.G., Filho, V.C.B., Carrasquilla, G., Caprara, A. and De Oliveira Lima, J.W. (2021). Scaling up of eco-bio-social strategy to control aedes aegypti in highly vulnerable areas in Fortaleza, Brazil: A cluster, non-randomized controlled trial protocol. *International Journal of Environmental Research and Public Health*, 18(3): 1278. https://doi.org/10.3390/ijerph18031278

Dickin, S.K., Schuster-Wallace, C.J. and Elliott, S.J. (2014). Mosquitoes and vulnerable spaces: Mapping local knowledge of sites for dengue control in Seremban and Putrajaya, Malaysia. *Applied Geography*, 46: 71–79. https://doi.org/10.1016/j.apgeog.2013.11.003

Edwards, P. and Bowen, P. (2019). Language and communication issues in HIV/AIDS intervention management in the South African construction industry: Interview survey findings. *Engineering, Construction and Architectural Management*, 26(6): 962–988. https://doi.org/10.1108/ECAM-12-2017-0260

Fang, L.-Q., Sun, Y., Zhao, G.-P., Liu, L.-J., Jiang, Z.-J., Fan, Z.-W., Wang, J.-X., Ji, Y., Ma, M.-J., Teng, J., Zhu, Y., Yu, P., Li, K., Tian, Y.-J. and Cao, W.-C. (2018). Travel-related infections in mainland China, 2014–16: An active surveillance study. *The Lancet Public Health*, 3(8): e385–e394. https://doi.org/10.1016/s2468-2667(18)30127-0

Garshasbi, V., Naddaf, S.R., Aghighi, Z., Hassan, N., Pooya, M. and Mostafavi, E. (2018). Leptospirosis in Caspian Sea littoral, Gilan Province, Iran. *Acta Tropica*, 181: 11–15. https://doi.org/10.1016/j.actatropica.2018.01.010

Hamidun, S., Shafie, F.A., Ishak, A.R. and Dom, N.C. (2021). Distribution and abundance of Aedes Mosquito breeding sites at construction site workers hostel in Gelang Patah, Johor, Malaysia. *Serangga*, 26(3): 57–68.

Haque, U., Glass, G.E., Bomblies, A., Hashizume, M., Mitra, D., Noman, N., Haque, W., Kabir, M.M., Yamamoto, T. and Overgaard, H.J. (2013). Risk factors associated with clinical malaria episodes in Bangladesh: A longitudinal study. *The American Society of Tropical Medicine and Hygiene*, 88(4): 727–732. https://doi.org/10.4269/ajtmh.12-0456

Hishamshah, M., Ahmad, N., Ibrahim, H.M., Halim, N.A.N., Nawi, S. and Amran, F. (2018). Demographic, clinical and laboratory features of leptospirosis and dengue co-infection in Malaysia. *Journal of Medical Microbiology*, 67(6): 806–813. https://doi.org/10.1099/jmm.0.000750

Jamjoom, G.A., Azhar, E.I., Kao, M.A. and Radadi, R.M. (2016). Seroepidemiology of asymptomatic dengue virus infection in Jeddah, Saudi Arabia. *Virology: Research and Treatment*, 7. https://doi.org/10.4137/vrt.s34187

Jebrail, E.W. and Dawood, M.M. (2020). Studying the impacts of land use changes on the occurrence of vector mosquitoes in Sabah, Malaysia. *Journal of Tropical Biology and Conservation (JTBC)*, 17: 285–295. https://doi.org/10.51200/jtbc.v17i.2669

Jensen, P.A., Lambert, L.A., Iademarco, M.F. and Ridzon, R. (2005). Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *Morbidity and Mortality Weekly Report*, 54: RR-17. Available at: https://www.cdc.gov/mmwr/PDF/rr/rr5417.pdf

Kashyap, G.C., Sharma, S.K. and Singh, S.K. (2021). Prevalence and predictors of asthma, tuberculosis and chronic bronchitis among male tannery workers: A study of Kanpur City, India. *Clinical Epidemiology and Global Health*, 9: 71–77. https://doi.org/10.1016/j.cegh.2020.07.002j.cegh.2020.07.002

Khatri, M. (2021). What is leptospirosis? Available at: https://www.webmd.com/a-to-z-guides/what-is-leptospirosis [Accessed on 6 July 2022].

Khatri, M.M. (2020). Tuberculosis (TB). Available at: https://www.webmd.com/lung/understanding-tuberculosis-basics [Accessed on 27 June 2022].

Liang, S., Hapuarachchi, H.C., Rajarethinam, J., Koo, C., Tang, C.-S., Chong, C.-S., Ng, L.-C. and Yap, G. (2018). Construction sites as an important driver of dengue transmission: implications for disease control. *BMC Infectious Diseases*, 18. https://doi.org/10.1186/s12879-018-3311-6

Liu, D., Dong, S.-P., Gao, G.-M., Fan, M.-Y., Zhang, Z.-J. and Fang, P.-Q. (2013). The study of KBP of road construction workers of highway AIDS prevention project before and after intervention. *Asian Pacific Journal of Tropical Medicine*, 6(10): 817–822. https://doi.org/10.1016/s1995-7645(13)60144-3

Liu, X., Zhang, M., Cheng, Q., Zhang, Y., Ye, G., Huang, X., Zhao, Z., Rui, J., Hu, Q., Frutos, R., Chen, T., Song, T. and Kang, M. (2021). Dengue fever transmission between a construction site and its surrounding communities in China. *Parasites and Vectors*, 14(1): 1–14. https://doi.org/10.1186/s13071-020-04463-x

Louis, V.R., Montenegro Quiñonez, C.A., Kusumawathie, P., Palihawadana, P., Janaki, S., Tozan, Y., Wijemuni, R., Wilder-Smith, A. and Tissera, H.A. (2016). Characteristics of and factors associated with dengue vector breeding sites in the City of Colombo, Sri Lanka. *Pathogens and Global Health*, 110(2): 79–86. https://doi.org/10.1080/20477724.2016.1175158

Lutomiah, J., Barrera, R., Makio, A., Mutisya, J., Koka, H., Owaka, S., Koskei, E., Nyunja, A., Eyase, F., Coldren, R. and Sang, R. (2016). Dengue outbreak in Mombasa City, Kenya, 2013–2014: Entomologic investigations. *PLOS Neglected Tropical Diseases*, 10(10): e0004981. https://doi.org/10.1371/journal.pntd.0004981

Majid, N.A., Razman, M.R., Zakaria, S.Z.S. and Nazi, N.M. (2021). Geographical dengue incident analysis using Kernel density estimation in Bandar Baru Bangi, Selangor, Malaysia. *Ecology, Environment and Conservation*, 27(2): 1–9.

Mamulwar, M., Prasad, V.S., Nirmalkar, A., Goli, S., Jadhav, S., Kumbhar, S., Kale, V., Michael, E., Ford, T.M., Nazarov, D., Honig, L., Gangakhedkar, R. and Thakar, M. (2021). Community-based point-of-care testing to identify new HIV infections. *Medicine*, 100(46): e27817. https://doi.org/10.1097/md.0000000000027817

McArthur, D.B. (2019). Emerging infectious diseases. *Nursing Clinics of North America*, 54(2): 297–311. https://doi.org/10.1016/j.cnur.2019.02.006.

Mendelsohn, J.B., Calzavara, L., Light, L., Burchell, A.N., Ren, J. and Kang, L. (2015). Design and implementation of a sexual health intervention for migrant construction workers situated in Shanghai, China. *Emerging Themes in Epidemiology*, 12. https://doi.org/10.1186/s12982-015-0033-8

Middleton, M., Somerset, S., Evans, C. and Blake, H. (2020). Test@Work texts: Mobile phone messaging to increase awareness of HIV and HIV testing in UK construction employees during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 17(21): 7819. https://doi.org/10.3390/ijerph17217819

Ministry of Health (2022). Incidence rate and mortality rate of communicable diseases. Available at: https://www.moh.gov.my/index.php/pages/view/324 [Accessed on 27 June 2022].

Nagpal, B.N., Gupta, S.K., Shamim, A., Vikram, K., Srivastava, A., Tuli, N.R., Saxena, R., Singh, H., Singh, V.P., Bhagat, V.N., Yadav, N.K. and Valecha, N. (2016). Control of Aedes aegypti breeding: A novel intervention for prevention and control of dengue in an endemic zone of Delhi, India. *PLoS ONE*, 11(12): 1–11. https://doi.org/10.1371/journal.pone.0166768

Nakazawa, S., Fukai, K., Furuya, Y., Hoshi, K., Kojimahara, N., Toyota, A., Korenaga, M. and Tatemichi, M. (2022). Occupational class and risk of Hepatitis B and C viral infections: A case-control study-based data from a nationwide hospital group in Japan. *Journal of Infection and Public Health*, 15(12): 1415–1426. https://doi.org/10.1016/j.jiph.2022.11.005

Natarajan, A., Beena, P.M., Devnikar, A.V. and Mali, S. (2020). A systemic review on tuberculosis. *Indian Journal of Tuberculosis*, 67(3): 295–311. https://doi.org/10.1016/j.ijtb.2020.02.005

Nazni, W.A., Hoffmann, A.A., NoorAfizah, A., Cheong, Y.L., Mancini, M.V., Golding, N., Kamarul, G.M.R., Arif, M.A.K., Thohir, H., NurSyamimi, H., ZatilAqmar, M.Z., NurRuqqayah, M., NorSyazwani, A., Faiz, A., Irfan, F.M. N., Rubaaini, S., Nuradila, N., Nizam, M.N., Irwan, S.M., Endersby-Harshman, N.M., White, V.L., Ant, T.H., Herd, C.S., Hasnor, A.H., AbuBakar, R., Hapsah, D.M., Khadijah, K., Kamilan, D., Lee, S.C., Paid, Y.M., Fadzilah, K., Topek, O., Gill, B.S., Lee, H.L. and Sinkins, S.P. (2019). Establishment of *Wolbachia* strain *w*AlbB in Malaysian populations of *Aedes aegypti* for dengue control. *Current Biology*, 29(24): 4241–4248.e5. https://doi.org/10.1016/J.CUB.2019.11.007

Nguyen-Tien, T., Probandari, A. and Ahmad, R.A. (2019). Barriers to engaging communities in a dengue vector control program: An implementation research in an urban area in Hanoi City, Vietnam. *American Journal of Tropical Medicine and Hygiene*, 100(4): 964–973. https://doi.org/10.4269/ajtmh.18-0411

Organização Pan-Americana da Saúde (2021). *Manual de Biossegurança Laboratorial. Quarta Edição*. Brasília D.F., Brazil: Organização Pan-Americana da Saúde. https://doi.org/10.37774/9789275724170

Ornithological Council (2012). Zoonotic diseases. In E. Paul (ed.), *Emerging Avian Disease*. London: University of California Press, 91–102. https://doi.org/10.1525/california/9780520272378.003.0008

Pasco, R.F., Fox, S.J., Johnston, S.C., Pignone, M. and Meyers, L.A. (2020). Estimated Association of construction work with risks of COVID-19 infection and hospitalization in Texas. *JAMA Network Open*, 3(10): e2026373. https://doi.org/10.1001/jamanetworkopen.2020.26373

Patterson, J.T. and Morshed, S. (2021). Systematic reviews and meta-analyses. In M. Bhandari (ed.), *Evidence-Based Orthopedics*. 2nd Ed. Hoboken, NJ: Wiley-BMJ Books, 11–18. https://doi.org/10.1002/9781119413936.ch3

Porusia, M., Andari, A.F.D., Wulandari, W. and Chotklang, D. (2021). Risk factors of leptospirosis incidence in agricultural area. *International Journal of Public Health Science*, 10(3): 574. https://doi.org/10.11591/ijphs.v10i3.20858

Rahman, M.S., Mehejabin, F., Rahman, M.A. and Rashid, R. (2022). A case-control study to determine the risk factors of dengue fever in Chattogram, Bangladesh. *Public Health in Practice*, 4: 100288. https://doi.org/10.1016/j.puhip.2022.100288

Salami, B.A., Ajayi, S.O. and Oyegoke, A.S. (2022). Coping with the Covid-19 pandemic: An exploration of the strategies adopted by construction firms. *Journal of Engineering, Design and Technology*, 20(1): 159–182. https://doi.org/10.1108/JEDT-01-2021-0054

Seresht, N.G. (2022). Enhancing resilience in construction against infectious diseases using stochastic multi-agent approach. *Automation in Construction*, 140: 104315. https://doi.org/10.1016/j.autcon.2022.104315

Shaffril, H.A.M., Ahmad, N., Samsuddin, S.F., Samah, A.A. and Hamdan, M.E. (2021). Systematic literature review on adaptation towards climate change impacts among indigenous people in the Asia Pacific regions. *Journal of Cleaner Production*, 258: 120595. https://doi.org/10.1016/j.jclepro.2020.120595

Shaffril, H.A.M., Krauss, S.E. and Samsuddin, S.F. (2018). A systematic review on Asian's farmers' adaptation practices towards climate change. *Science of the Total Environment*, 644: 683–695. https://doi.org/10.1016/j.scitotenv.2018.06.349

Shaffril, H.A.M., Samsuddin, S.F. and Samah, A.A. (2020). The ABC of systematic literature review: The basic methodological guidance for beginners. *Quality and Quantity*, 55(4): 1319–1346. https://doi.org/10.1007/s11135-020-01059-6

Shahruddin, S., Zairul, M. and Haron, A.T. (2021). Redefining the territory and competency of architectural practitioners within a BIM-based environment: A systematic review. *Architectural Engineering and Design Management*, 17(5–6): 376–410. https://doi.org/10.1080/17452007.2020.1768506

Sharif, M., Khan, M.A.S., Hasan, M.J., Naher, T., Rudra, S., Fardous, J., Gozal, D., Rahman, M.K. and Amin, M.R. (2022). Spatial association of *Aedes aegypti* with dengue fever hotspots in an endemic region. *Heliyon*, 8(11): e11640. https://doi.org/10.1016/j.heliyon.2022.e11640

Sim, S., Ng, L.C., Lindsay, S.W. and Wilson, A.L. (2020). A greener vision for vector control: The example of the Singapore dengue control programme. *PLOS Neglected Tropical Diseases*, 14(8): 1–20. https://doi.org/10.1371/journal.pntd.0008428

Somerset, S., Evans, C. and Blake, H. (2021). Accessing voluntary HIV testing in the construction industry: A qualitative analysis of employee interviews from the Test@Work study. *International Journal of Environmental Research and Public Health*, 18(8): 4184. https://doi.org/10.3390/ijerph18084184

Somerset, S., Jones, W., Evans, C., Cirelli, C., Mbang, D. and Blake, H. (2022). Opt-in HIV testing in construction workplaces: An exploration of its suitability, using the socioecological framework. *BMC Public Health*, 22(1). https://doi.org/10.1186/s12889-022-13787-5

Tarkang, E.E. and Pencille, L.B. (2018). Psychosocial predictors of consistent condom use among migrant road construction workers in the Southwest Region of Cameroon using the Health Belief Model. *Pan African Medical Journal*, 29. https://doi.org/10.11604/pamj.2018.29.215.15130

Toemjai, T., Thongkrajai, P. and Nithikathkul, C. (2022). Factors affecting preventive behavior against leptospirosis among the population at risk in Si Sa Ket, Thailand. *One Health*, 14(2021): 100399. https://doi.org/10.1016/j.onehlt.2022.100399

Toh, S.S.E. and Chan, Y.W. (2019). A 5-year retrospective study of melioidosis cases treated in a district specialist hospital. *Medical Journal of Malaysia*, *74*(6): 472–476.

Trojánek, M., Maixner, J., Sojková, N., Kynčl, J., Roháčová, H., Marešová, V. and Stejskal, F. (2016). Dengue fever in Czech travellers: A 10-year retrospective study in a tertiary care centre. *Travel Medicine and Infectious Disease*, 14(1): 32–38. https://doi.org/10.1016/j.tmaid.2015.06.005

WebMD Editorial Contributors (2022). Hepatitis B. Available at: https://www.webmd.com/hepatitis/digestive-diseases-hepatitis-b [Accessed on 9 November 2022].

Weine, S., Bahromov, M., Loue, S. and Owens, L. (2012). HIV sexual risk behaviors and multilevel determinants among male labor migrants from Tajikistan. *Journal of Immigrant and Minority Health*, 15(4): 700–710. https://doi.org/10.1007/s10903-012-9718-z

WHO (2022). Malaria. Available at: https://www.who.int/news-room/fact-sheets/detail/malaria [Accessed on 9 November 2022].

WHO-Eastern Mediterranean Region (2021). Infectious disease. Available at: http://www.emro.who.int/health-topics/infectious-diseases/index.html [Accessed on 27 June 2021].

WHO-Representative Office for Malaysia, Brunei Darussalam and Singapore (2019). *Country Fact Sheet Public Health Data at a Glance*. Selangor, Malaysia: WHO-Representative Office for Malaysia, Brunei Darussalam and Singapore.

World Statistic (2011). World Statistic: The enormous burden of poor working conditions. Available at: https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm

Yang, F., Guo, G.Z., Chen, J.Q., Ma, H.W., Liu, T., Huang, D.N., Yao, C.H., Zhang, R.L., Xue, C.F. and Zhang, L. (2014). Molecular identification of the first local dengue fever outbreak in Shenzhen city, China: A potential imported vertical transmission from Southeast Asia? *Epidemiology and Infection*, 142(2): 225–233. https://doi.org/10.1017/s0950268813000897

Yih, W.K., Kulldorff, M., Friedman, D.J., Leibler, J.H., Amador, J.J., López-Pilarte, D., Galloway, R.L., Ramírez-Rubio, O., Riefkohl, A. and Brooks, D.R. (2019). Investigating possible infectious causes of chronic kidney disease of unknown etiology in a Nicaraguan mining community. *The American Journal of Tropical Medicine and Hygiene*, 101(3): 676–683. https://doi.org/10.4269/ajtmh.18-0856

Yoshikawa, M.J. (2013). Vector control and surveillance operations in the Republic of Singapore. *Tropical Medicine and Health*, 41(2): 61–66. https://doi.org/10.2149/tmh.2011-04.

Yung, C.F., Chan, S.P., Thein, T.L., Chai, S.C. and Leo, Y.S. (2016). Epidemiological risk factors for adult dengue in Singapore: An 8-year nested test negative case control study. *BMC Infectious Diseases*, 16(1): 1–9, https://doi.org/10.1186/s12879-016-1662-4

Zamzuri, M.I.A., Naserrudin, N.A., Ali, N.K.M., Aziz, S.A., Rashid, M.F., Dapari, R., Ramdzan, A.R., Hod, R. and Hassan, M.R. (2022). "Best of both world": The amalgamation of Fuzzy Delphi Method with nominal group technique for dengue risk prioritisation decision-making. *Journal of Function Spaces*, 2022: 1–8. https://doi.org/10.1155/2022/9581367

Zhang, M., Huang, J.-F., Kang, M., Liu, X.-C., Lin, H.-Y., Zhao, Z.-Y., Ye, G.-Q., Lin, S.-N., Rui, J., Xu, J.-W., Zhu, Y.-Z., Wang, Y., Yang, M., Tang, S.-X., Cheng, Q. and Chen, T.-M. (2022). Epidemiological characteristics and the dynamic transmission model of dengue fever in Zhanjiang City, Guangdong Province in 2018. *Tropical Medicine and Infectious Disease*, 7(9): 209. https://doi.org/10.3390/tropicalmed7090209