

Knowledge and Preventive Practices Regarding Dengue Fever Among Nurses at Prince Mohammed Bin Nasser Hospital, December 2022

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Abstract

Background: Dengue fever is a viral disease posing a major public health threat. Nurses are crucial in patient education and prevention. **Aim:** This study assessed the knowledge and preventive practices of nursing staff regarding dengue fever at Prince Mohammed bin Nasser Hospital, Saudi Arabia, in 2022.

Methodology: A descriptive cross-sectional design was employed, with (89) nurses randomly selected. Participants were categorized by age, educational level, work experience, and department. A structured self-administered questionnaire was used to assess knowledge and preventive practices. Data were analyzed using SPSS version (26) with descriptive and inferential statistics.

Results: The nurses demonstrated good knowledge (Mean = 2.855) and moderate preventive practices (Mean = 1.5854). A moderate positive correlation was observed between knowledge and practice ($r = 0.33$, $P = 0.001$). Knowledge was also positively correlated with qualifications and work experience ($r = 0.33$, $P < 0.001$), whereas the correlation between preventive practices and work experience was not significant ($r \approx 0.03$, $P = 0.735$).

Conclusion: Nurses possess good knowledge about dengue fever; however, preventive practices require improvement. Continuous professional training and targeted educational interventions are essential to enhance preventive measures.

Keywords: Knowledge, Practice, Dengue Fever, Nurses, Prince Mohammed bin Nasser Hospital.



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1. Introduction

Dengue virus (DENV) is transmitted to humans through the bite of an infected *Aedes* mosquito, chiefly *Aedes aegypti* and *Aedes albopictus* (Näslund et al., 2021). Southeast Asia, Africa, and Latin America are just a few examples of tropical and subtropical regions where it is found most frequently (Quesada-Román et al., 2022).

Dengue fever, a virus carried by mosquitoes, is characterized by intense muscular and joint stiffness, headache, nausea, weakness, lymph node swelling (lymphadenopathy), and rashes on the skin (Trivedi & Chakravarty, 2022). Dengue fever is highly characterized by gingivitis, excruciating pain in the eyes, and palms and soles. (Gerlicki, 2024)

Dengue is not harmful to everyone, but people with compromised immune systems are more susceptible (Soiza et al., 2023). Acquisition of dengue fever can occur repeatedly as it is caused by five dengue contagion stereotypes (Verma et al., 2024). Acquisition of a dengue attack, however, would grant lifetime immunity to that serotype to which an individual has been previously exposed. This disease is also known as breakbone fever and dandy fever (B. Halstead, 2023).

The aggravated form of dengue fever can be called dengue hemorrhagic fever or dengue shock syndrome. The severe form of dengue hemorrhagic fever leads to hemorrhages within the body (Trivedi & Chakravarty, 2022). It is a life-threatening disease that may progress to dengue shock syndrome, the most dangerous type (Singh et al., 2023). It is considered as being among the most contagious diseases worldwide. The virus belongs to *Flavivirus* genus which is a genus under the family *Flaviviridae* [single-strand, non-segmented RNA viruses] (Varsha, 2023). Dengue is transmitted by two species of *Aedes* mosquitoes: *Aedes aegyptian* and *Aedes albopictus*. Cross-immunity evidence: None exists; only protection against re-infection with its own serotype is lifetime (Tsheten, 2023).

As over half the world resides in a region where dengue can be transmitted, dengue ranks among the most serious harming infections transmitted by arthropods in terms of morbidity and mortality (Sarker et al., 2024). Humans are susceptible to any of the various serotypes of dengue viruses through being bitten by an infected *Aedes* mosquito, most commonly *Ae. Aegypti* (Sarker et al., 2024).

The mosquito has a global distribution and is primarily found in tropical and subtropical regions. Dengue fever is a systemic disorder that produces acute and moderate symptoms, appears suddenly, and occurs in three phases: febrile, critical, and recovery. It may either lead to asymptomatic infection or symptomatic infection (Biswas et al., 2021).

In 2009 the Tropical Disease Research [TDR] and World Health Organization [WHO] developed the classification of dengue by severity based on the indicators under the sub category dengue to assist clinicians to treat and closely monitor the disease (Yang et al., 2023). Symptoms include fluid accumulation, stomach pain, and vomiting. Associated with platelet count plummeted sharply, mucosal bleeding, fatigue, liver enlargement, and the rising hematocrit (Held-Warmkessel, 2023).

Vector control is one of the paramount preventive measures of dengue fever without a vaccine or special antiviral medication. Prevention of dengue disease is possible in many ways (Côrtes et al., 2023). One method of controlling the vectors is environmental management which involves modifying the environment in a manner that prevents or minimizes the propagation and human contact with the pathogen by destroying, altering, removing or recycling unnecessary containers which serve as larval habitats (Ababa, 2021). The Enhancement of water storages and delivery systems to handle *Aedes* vectors, especially *Ae. aegypti*, is another applicable prevention approach. Rooftop catchments, communal standpipes, wells, and other water-storage structures cannot provide the same quality of water as piping directly in-home. Mosquitoes can be kept off ovipositors by mosquito proofing of water storage containers (Ligsay et al., 2021).

In Saudi Arabia, dengue fever is a growing public health concern, particularly in the western and southwestern regions such as Jeddah, Jazan, Makkah, Madinah, and Najran (Alalawi, 2023). Recent seroprevalence studies reported rates up to 33.6% in Jazan, while a large outbreak in Jeddah during 2022–2023 recorded nearly 10,000 confirmed cases within 31 weeks. Incidence rates in Jazan increased sharply from 7.6 per 100,000 in 2016 to about 100 per 100,000 in 2019 (Zrieq et al., 2023). These figures highlight the significant health burden of dengue in the Kingdom, reflecting recurrent outbreaks, rising incidence, and persistent challenges in vector control.

Rainwater can be collected from rooftops, and mosquitoes can be prevented from entering it by using tightly sealed containers or well-fitted mesh screens (Ngugi, 2023). Removable covers should be replaced each time water is removed, and covers should be maintained clean to prevent damage that permits entries and exits by mosquitoes. Solid waste management should be well managed through collecting, storing, and disposing of so that it does not pose a threat to the health of the people with dengue (Oluwagbayide et al., 2024).

Several studies from different countries have highlighted gaps in knowledge, attitudes, and practices (KAP) regarding dengue fever among healthcare workers and the community. For example, a study in the Philippines

found that while nurses had adequate knowledge of dengue, preventive practices were inconsistent (Guad et al., 2021). Similarly, a study in Malaysia revealed significant associations between knowledge levels and preventive practices, suggesting that education directly influences behavior (Lim et al., 2021). Findings from Ethiopia also indicated that healthcare workers had knowledge gaps, particularly in identifying breeding sites, which affected their ability to implement control strategies effectively (Zerfu et al., 2023). These studies emphasize the importance of continuous training and capacity building for healthcare providers in diverse settings.

2. Significance of the Study

Dengue fever is a major public health concern in arid regions like Saudi Arabia, with recurrent outbreaks in Jeddah, Jazan, and Makkah. Nurses, as the first line of defense, play a vital role in education and prevention. However, previous studies show variable knowledge levels (60–80%) and relatively weak preventive practices (<50%). This study is significant as it identifies strengths and gaps, guiding training and preventive strategies to reduce the burden of dengue fever.

3. Aim of the Study

The study aimed to assess the knowledge and preventive practices of nurses regarding dengue fever at Prince Mohammed Bin Nasser Hospital, Saudi Arabia, in 2022.

4. Research Questions

1. What is the level of nurses' knowledge about dengue fever?
2. What are their preventive practices regarding dengue fever?
3. Is there a relationship between demographic characteristics and knowledge?
4. Is there a relationship between demographic characteristics and practices?
5. Is there a correlation between knowledge and preventive practices?

Materials and Methods

Study Design:

A descriptive cross-sectional study was conducted to assess the knowledge and preventive practices of nurses regarding dengue fever. The study was carried out over one month, in December 2022, at Prince Mohammed Bin Nasser Hospital, Saudi Arabia.

Setting of the Study:

Prince Mohammed Bin Nasser Hospital is a tertiary care hospital located in Jazan, southwestern Saudi Arabia, serving a large population in both urban and rural areas. The hospital provides comprehensive medical services, including emergency care, intensive care, surgical, and

outpatient departments. This hospital was chosen because it has a high patient turnover, diverse nursing staff, and is located in a region endemic for dengue fever, making it an ideal site to assess nurses' knowledge and preventive practices.

5. Study Population and Sample:

The study population included all nurse specialist working at the hospital during the study period. The required sample size was calculated using Slovin's formula with a 95% confidence level and a 5% margin of error, based on a total nurse population of approximately 115. The minimum required sample was 89 nurses. A total of 89 nurses were randomly selected from different departments using simple random sampling, ensuring that every nurse had an equal chance of selection. The response rate was 100%.

6. Inclusion and Exclusion Criteria:

Inclusion criteria were:

- Nurse specialist employed at the hospital during the study period.
- Willingness to participate in the study.
- Exclusion criteria included:
- Student nurses, interns, and administrative staff.
- Nurses who were on leave or unavailable during data collection.

7. Sample Size Calculation:

The sample size was calculated using Slovin's formula with a 95% confidence level and a 5% margin of error, based on the total nurse population at the hospital ($N \approx 115$). The minimum required sample was 89 nurses; however, 89 participants were ultimately recruited, which was sufficient to achieve the study objectives.

8. Data Collection Tool:

A structured, self-administered questionnaire was developed by the current study researcher based on relevant literature and guidelines from the World Health Organization (WHO, 2021) (Organization, 2021) and the Saudi Ministry of Health (MOH, 2022) (Siddiq et al., 2022). The questionnaire included three sections:

- Demographic characteristics (5 questions: age, gender, qualification, years of experience, department)
- Knowledge about dengue fever (10 multiple-choice questions on causes, symptoms, transmission)
- Preventive practices (8 Likert-scale questions on personal protection and environmental control measures)

9. Reliability and Validity:

- The questionnaire was reviewed by three experts in nursing and public health for content validity.
- A pilot study was conducted with 10 nurses (excluded from the main study) to assess clarity and reliability.
- Cronbach's alpha coefficient was calculated for internal consistency and found to be 0.82, indicating good reliability.

10. Research Procedure:

The data collection was conducted in three main stages. First, the researchers obtained permission from the hospital administration and ethical approval from the Research Ethics Committee. Second, the structured questionnaires were distributed in paper form to all selected participants in their respective departments. Nurses were briefed on the purpose of the study and provided verbal informed consent before participation. Third, completed questionnaires were collected on the same day to ensure completeness and data integrity. Data collection took place over one month, from December 1 to December 31, 2022, and all 89 selected nurses completed the questionnaires, resulting in a 100% response rate.

11. Ethical Considerations:

Ethical approval was obtained from the Research and Ethics Committee of Prince Mohammed Bin Nasser Hospital (Approval No.: PMBNH/REC/2022/024, Date: November 27, 2022). Participation was voluntary, and verbal informed consent was obtained after explaining the study objectives, confidentiality measures, and the purpose of using data solely for academic research. No physical, psychological, or social harm was anticipated.

12. Data Analysis:

Data were coded and analyzed using SPSS version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' socio-demographic characteristics, knowledge, and preventive practices regarding dengue fever.

Associations between demographic variables (categorical variables such as age, gender, qualification, and work area) and knowledge or practice levels were tested using chi-square tests, with significance set at $p < 0.05$.

The relationship between continuous knowledge and practice scores was assessed using Pearson correlation coefficient, with significance set at $p < 0.05$. A positive correlation indicates that higher knowledge is associated with better preventive practices.

13. Results

The study involved the participation of 89 nurses. Table (1) shows that most of the respondents are aged between 20 and 25 (39, 43.8%), with about half of the respondents being males and half being female. They are qualified as indicated in table (1) where most of them have a BSc 39 (43.9%) degree, diploma 21 (23.6%) and a master's degree approximations 29 (32.5%).

Table (1): Socio-demographic data

variable	frequency	%
Age		
20-25 years	39	43.8
More than 25-30 years	21	23.6
More than 30-40 years	29	32.6
Qualification level		
diploma	21	23.6
BSc Nursing	39	43.9
master degree	29	32.5
Sources of information regarding dengue fever		
Television	19	21.3
Newspapers/ Magazines	21	23.6
Radio	2	2.2
Leaflets/ Pamphlets	0	0
Internet	47	52.8
Work experience		
1-3 years	38	42.7%
> 3 years	51	57.3%

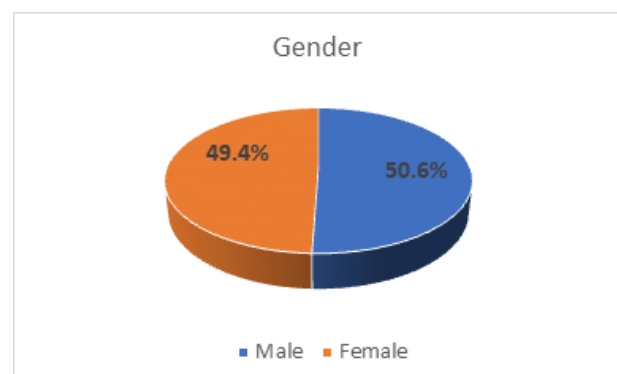


Figure (1): - Percentage distribution of nurses according to gender

Table (2) Shows their knowledge of the mosquito *Aedes aegypti*, which is the mosquito that causes dengue illness.

Table 2: Knowledge of nurses regarding dengue fever No (89)

variable	True	False	Correct %
Dengue fever is caused by the mosquito; <i>Aedes aegypti</i>	80(89.9%)	9(10.1%)	89.9%
The life cycle of the <i>Aedes</i> mosquito is one week	73(82%)	16(17%)	82%
Dengue fever affects all age groups	89(100%)	0	100%
Dengue epidemics start during hot weather	80(89%)	9(10.1%)	89%
Dengue is a flu-like illness.	67(75.3%)	22(24.7%)	75.3%
Chills and high fever, intense headache, muscle, and joint pains are the most common presentation of dengue fever	84(94.3%)	5(5.7%)	94.3%
Dengue can be transmitted by direct blood contact	77(86.6%)	12(13.4%)	86.6%
The transmission cycle is "Man-Mosquito-Man"	56(62.9%)	33(37.1%)	62.9%
Mosquitoes transmitting dengue infection bite only early in the morning	89(100%)	0	100%
Control of dengue is by combating the breeding of mosquitoes	88(98.9%)	1(1.1%)	98.9%
Abate can be beneficial in killing mosquito larvae	80(89%)	9(10.1%)	89%
There is a vaccine for dengue	56(62.9%)	33(37.1%)	62.9%
Paracetamol is the drug of choice for dengue treatment	89(100%)	0	100%
Do I have to worry if one of my family members was diagnosed with dengue a year ago	85(95.5%)	4(4.6%)	95.5%
Mean knowledge score	frequency	%	
Good knowledge ($\geq 65\%$)	82	92.1	
Fair knowledge (65-50%)	5	5.7	
Poor knowledge ($\leq 50\%$)	2	2.2	

Table (3) shows that there is a fair mean of 50 (56.2%) of the respondents in the awareness of protecting dengue fever by covering the water tanks. Inspecting the refrigerator pans for water accumulation and checking with a mosquito coil or net the trays left anywhere in the house in which water collects, participating in the community-wide campaign to clean our own environments.

Table 3: Practice of Nurses regarding dengue fever No (89)

Variable	True	False	Correct %
Cover water tanks	87(97.8%)	2(2.2%)	97.8%
Inspect refrigerator tray	56(62.9%)	33(37.1%)	62.9%
Examine mosquito larvae in both indoor and outdoor pots	53(59.5%)	36(40.4. %)	59.5%
Drain water from the flower pot	45(50.5%)	44(49.4%)	50.5%
Examine any discarded material that holds water around your house	40(44.9%)	49(55%)	44.9%
Use mosquito net or mosquito coil at night	58(56.1. %)	31(34.8%)	56.1. %
Participate in community 'clean our surroundings' activities	57(64%)	32(35.9%)	64%
Mean practice score frequency %	frequency	%	
Good practice ($\geq 65\%$)	35	39.3	
Fair practice (65-50%)	50	56.2	
Poor practice ($\leq 50\%$)	4	4.4	

The mean knowledge of dengue fever of the respondents is considered good, $M+SD$ (2.855+.892), and their P-value is 0001, r value 0.33. The results indicate a moderate positive correlation ($r = 0.33$, $P = 0.001$), suggesting that higher knowledge is associated with better preventive practices, as shown in Table (4).

Table (4) Correlation between respondents' knowledge and practice

Variable	Mean	SD	P value	r value
knowledge	2.855	.892	0.001	0.33
practice	1.5854	1.0569		

Table 5 shows the differences in knowledge and practice scores based on nurses' sociodemographic characteristics were examined using T-tests for dichotomous variables (Gender and Work experience)

Table 5: Difference of nurses' knowledge and preventive practices of dengue fever based on their sociodemographic characteristics

Demographic Variable	Knowledge			P value	Practice			P value
	Good (%)	Fair (%)	Poor (%)		Good (%)	Fair (%)	Poor (%)	
Age	66	31.9	2.1	0.001	56	39	5	0.004
Gender	67.1	30.6	2.3	0.001	45	40	15	0.735
Qualification	57	43	0	0.001	57	43	0	0.023
Work experience	78	22	0	0.001	42	54	4	0.152

14. Discussion:

According to the results of our study, most participants demonstrated good knowledge about dengue fever (DF), considering it a serious illness and correctly identifying its symptoms and signs, indicating awareness that DF is caused by the mosquito *Aedes aegypti*. This finding is more favorable than those reported in previous studies conducted in Thanh Tri District, Hanoi, Vietnam (Khan et al., 2024).

The respondents' knowledge was largely obtained from online resources and other educational materials, reflecting awareness of the cause and mode of transmission of DF. These results align with a study conducted in Pakse, Laos, where participants were able to identify headache, joint pain, and high fever as the main clinical features of DF (Nikookar et al., 2023). Socioeconomic status, education level, and workplace location were positively associated with better knowledge, consistent with findings from Jazan, Saudi Arabia (Mahfouz et al., 2023), and other studies (Pajic et al., 2021). Individuals with higher education or employed in certain health settings are more likely to participate in health programs, which may explain their higher level of knowledge.

Regarding preventive practices, participants showed moderate adherence to DF prevention measures, such as eliminating mosquito larvae from indoor and outdoor containers and using insect repellents, bed nets, and mosquito coils, particularly at night. This observation confirms previous research indicating that knowledge does not always translate into practice (Elliott, 2021).

and ANOVA for variables with more than two categories (Age and Qualification).

Age, gender, qualification, and work experience were significantly associated with knowledge scores ($P < 0.05$). In contrast, associations between these demographic variables and practice scores were weaker and mostly non-significant, suggesting that sociodemographic factors influenced knowledge more than actual preventive practices.

The majority of participants correctly identified mosquito bites as the primary mode of transmission and recognized the importance of avoiding stagnant water, consistent with WHO guidelines stating that *Aedes* mosquitoes are predominantly active during daylight hours (Paz-Bailey et al., 2024). Although piped water is available, residents often store water in containers due to supply interruptions, creating potential breeding sites for mosquitoes. In our study, 49% of participants reported regularly cleaning stored water to prevent larval growth. Overall, 82 nurses (92.1%) had good knowledge of DF, while 50 (56.2%) demonstrated fair preventive practices.

Importantly, our study found that knowledge scores were significantly associated with demographic variables, including age, gender, education, and work experience. For example, nurses with higher education levels and more years of experience had better knowledge, which is consistent with previous studies conducted in Thailand and Malaysia showing that educational attainment and clinical experience are strong predictors of DF knowledge (Chan et al., 2022; Jianvitayakij et al., 2024).

Female nurses in our study also had slightly higher knowledge scores compared with males, aligning with findings in Vietnam where female healthcare workers tended to be more proactive in acquiring health-related knowledge (Vollman et al., 2024). Age was another important factor, as older nurses with more exposure to clinical practice demonstrated better knowledge than younger nurses, which may reflect accumulated professional experience and participation in training programs over time.

These findings highlight the importance of targeted training programs that consider demographic factors to maximize knowledge acquisition. Tailored interventions can focus on younger nurses, those with lower educational levels, or nurses with less clinical experience to improve their understanding of DF and encourage the translation of knowledge into effective preventive practices. This approach is consistent with prior recommendations emphasizing the role of continuous professional development and behavior-focused interventions to reduce the risk and spread of dengue fever in the community (Mbewe, 2021).

15. Conclusion

The findings of this study indicate that the majority of nurses possessed a good level of knowledge about dengue fever, encompassing its causes, symptoms, and preventive measures, and generally demonstrated satisfactory preventive practices. Demographic characteristics such as age, qualifications, and work area were moderately associated with both knowledge and practices, while gender showed minimal or non-significant effects. Moreover, a significant positive correlation was observed between knowledge and preventive practices ($r = 0.33$, $P = 0.001$), suggesting that higher knowledge levels were linked to better implementation of preventive measures. These results highlight the crucial role of nurses' education, experience, and workplace environment in enhancing both knowledge and practice regarding dengue fever, emphasizing the need for continuous professional training and targeted educational programs to further strengthen preventive practices.

16. Recommendations

Based on the study findings, it is recommended to enhance nurses' knowledge and preventive practices regarding dengue fever through regular training aligned with WHO and Saudi Ministry of Health guidelines, hospital-wide awareness campaigns, and periodic monitoring of practices. Targeted interventions should address identified gaps, and further research with larger nursing populations is encouraged to support evidence-based dengue prevention strategies.

17. Limitations of the Study

This study was conducted in a single hospital with a relatively small sample, limiting generalizability. Data were self-reported, which may introduce bias, and the cross-sectional design prevents causal inferences. Long-term adherence to preventive practices and effectiveness of prior training were not assessed.

18. References:

1. Ababa, A. (2021). *Arboviral disease vectors surveillance and control guideline*.
2. Alalawi, K. A. (2023). *Prevalence of Professional Burnout Among Nurses Working in HESN in Riyadh City Alfaisal University (Saudi Arabia)*].
3. B. Halstead, S. (2023). *Fighting Dengue, Chikungunya, and Japanese Encephalitis. In History of Arbovirology: Memories from the Field: Volume I: Personal Reflections (pp. 227-313). Springer*.
4. Biswas, P., Ganguly, S., & Debnath, B. (2021). *Dengue fever: stages, complication, diagnosis, and prevention strategies. Asian J Pharm Clin Res, 14(5), 3-11*.
5. Chan, C. M., Ong, M. J. Y., Zakaria, A. A., Visusasam, M. M., Ali, M. F., Jamil, T. R., Aizuddin, A. N., & Abdul Aziz, A. F. (2022). *Assessment of dementia knowledge and its associated factors among final year medical undergraduates in selected universities across Malaysia. BMC geriatrics, 22(1), 450*.
6. Côrtes, N., Lira, A., Prates-Syed, W., Dinis Silva, J., Vuitika, L., Cabral-Miranda, W., Durães-Carvalho, R., Balan, A., Cabral-Marques, O., & Cabral-Miranda, G. (2023). *Integrated control strategies for dengue, Zika, and Chikungunya virus infections. Frontiers in Immunology, 14, 1281667*.
7. Elliott, E. M. (2021). *Potent Plants, Cool Hearts: a landscape of healing in Laos UCL (University College London)*].
8. Gerlicki, C. M. (2024). *Viral diseases affecting the skin. Dermatological Reviews, 5(1), e225*.
9. Guad, R. M., Carandang, R. R., Solidum, J. N., W. Taylor-Robinson, A., Wu, Y. S., Aung, Y. N., Low, W. Y., Sim, M. S., Sekaran, S. D., & Azizan, N. (2021). *Different domains of dengue research in the Philippines: A systematic review and meta-analysis of questionnaire-based studies. Plos one, 16(12), e0261412*.
10. Held-Warmkessel, J. (2023). *Gastrointestinal Symptoms. Core Curriculum for Oncology Nursing-E-Book, 384*.
11. Jianvitayakij, S., Niyomyart, A., Junsawang, C., Bualoy, W., Butsing, N., Monkong, S., & Voss, J. G. (2024). *Knowledge of antibiotics and antibiotic resistance, antibiotic use and eHealth literacy among nursing students in Thailand: a cross-sectional study. BMJ open, 14(11), e090956*.

12. Khan, N., Ullah, H. G., Kashif, M., Zeeshan, M., & Muhammad, W. (2024). Knowledge and Practice of Nurses Regarding Dengue Fever and Its Prevention in District Swat. *National Journal of Life and Health Sciences*, 3(1), 5-13.
13. Ligsay, A., Telle, O., & Paul, R. (2021). Challenges to mitigating the urban health burden of mosquito-borne diseases in the face of climate change. *International journal of environmental research and public health*, 18(9), 5035.
14. Lim, B. C., Kueh, Y. C., Arifin, W. N., & Ng, K. H. (2021). Modelling knowledge, health beliefs, and health-promoting behaviours related to cardiovascular disease prevention among Malaysian university students. *Plos one*, 16(4), e0250627.
15. Mahfouz, M. S., Elmahdy, M., Ryani, M. A., Abdelmola, A. O., Kariri, S. A. A., Alhazmi, H. Y. A., Almalki, S. H. M., Adhabi, O. M., Ali Hindi, S. M., & Muqri, N. M. (2023). Contraceptive use and the associated factors among women of reproductive age in Jazan City, Saudi Arabia: a cross-sectional survey. *International journal of environmental research and public health*, 20(1), 843.
16. Mbewe, R. B. M. (2021). Blood-Meal Host Selection, Malaria Infection, and Genotyping to Delineate Human to Mosquito Plasmodium Transmission: Implication for Malaria Parasite Infections in Malawi. *Michigan State University*.
17. Näslund, J., Ahlm, C., Islam, K., Evander, M., Bucht, G., & Lwande, O. W. (2021). Emerging mosquito-borne viruses linked to *Aedes aegypti* and *Aedes albopictus*: global status and preventive strategies. *Vector-Borne and Zoonotic Diseases*, 21(10), 731-746.
18. Ngugi, H. N. (2023). Ecology of Immature Stages of the Dengue Fever Vector *Aedes Aegypti* (L.) (Diptera: Culicidae) in Rural and Urban Sites of the Southern Coast of Kenya University of Nairobi].
19. Nikookar, S. H., Moosazadeh, M., Fazeli-Dinan, M., Zaim, M., Sedaghat, M. M., & Enayati, A. (2023). Knowledge, attitude, and practice of healthcare workers regarding dengue fever in Mazandaran Province, northern Iran. *Frontiers in Public Health*, 11, 1129056.
20. Oluwagbayide, S. D., Abulude, F. O., Akinnusotu, A., & Arifalo, K. M. (2024). The Relationship between Waste Management Practices and Human Health: New Perspective and Consequences. *Indonesian Journal of Innovation and Applied Sciences (IJIAS)*, 4(1), 19-34.
21. Organization, W. H. (2021). Minimum technical standards and recommendations for reproductive, maternal, newborn and child health care for emergency medical teams. *World Health Organization*.
22. Pajic, S., Buengeler, C., Den Hartog, D. N., & Boer, D. (2021). The moderating role of employee socioeconomic status in the relationship between leadership and well-being: A meta-analysis and representative survey. *Journal of occupational health psychology*, 26(6), 537.
23. Paz-Bailey, G., Adams, L. E., Deen, J., Anderson, K. B., & Katzelnick, L. C. (2024). Dengue. *The Lancet*, 403(10427), 667-682.
24. Quesada-Román, A., Ballesteros-Cánovas, J. A., George, S. S., & Stoffel, M. (2022). Tropical and subtropical dendrochronology: Approaches, applications, and prospects. *Ecological Indicators*, 144, 109506.
25. Sarker, R., Roknuzzaman, A., Haque, M. A., Islam, M. R., & Kabir, E. R. (2024). Upsurge of dengue outbreaks in several WHO regions: Public awareness, vector control activities, and international collaborations are key to prevent spread. *Health Science Reports*, 7(4), e2034.
26. Siddiq, A., Shukla, N., & Pradhan, B. (2022). Spatio-temporal modelling of dengue fever cases in Saudi Arabia using socio-economic, climatic and environmental factors. *Geocarto International*, 37(26), 12867-12891.
27. Singh, R. K., Tiwari, A., Satone, P. D., Priya, T., & Meshram, R. J. (2023). Updates in the management of dengue shock syndrome: A comprehensive review. *Cureus*, 15(10).
28. Soiza, R. L., Scicluna, C., & Bilal, S. (2023). Virus infections in older people. In *Biochemistry and Cell Biology of Ageing: Part IV, Clinical Science* (pp. 149-183). Springer.
29. Trivedi, S., & Chakravarty, A. (2022). Neurological complications of dengue fever. *Current neurology and neuroscience reports*, 22(8), 515-529.
30. Tsheten, T. (2023). Epidemiology of dengue in Bhutan The Australian National University (Australia)].
31. Varsha, A. (2023). RNA Viruses with Central Nervous System Tropism. In *RNA Viruses and Neurological Disorders* (pp. 16-35). CRC Press.

32. Verma, I., Dhanawat, M., Malik, G., Saini, A., & Bharti, P. (2024). *Emerging Therapy for Dengue. In Emerging Approaches to Tackle Neglected Diseases: From Molecule to End Product* (pp. 48-65). Bentham Science Publishers.
33. Vollman, K., Cuong, N. L. T., Phuc, N. T., & Quang, T. M. (2024). *Positive Impact on Critical Care Knowledge Acquisition and Skills of Vietnamese Nurses through an Online Standardized Training Program. International Journal of Nursing Education, 16*(3).
34. Yang, J., Mosabbir, A. A., Raheem, E., Hu, W., & Hossain, M. S. (2023). *Demographic characteristics, clinical symptoms, biochemical markers and probability of occurrence of severe dengue: A multicenter hospital-based study in Bangladesh. PLOS Neglected Tropical Diseases, 17*(3), e0011161.
35. Zerfu, B., Kassa, T., & Legesse, M. (2023). *Epidemiology, biology, pathogenesis, clinical manifestations, and diagnosis of dengue virus infection, and its trend in Ethiopia: a comprehensive literature review. Tropical Medicine and Health, 51*(1), 11.
36. Zrieq, R., Alzain, M. A., Ali, R. M., Alazzeah, A. Y., Tirawi, A. O., Attali, R., Acar, T., & Haouas, N. (2023). *Epidemiological profile of urinary and intestinal schistosomiasis in the Kingdom of Saudi Arabia: A Seven-Year retrospective study. Tropical medicine and infectious disease, 9*(1), 11.