Scientific Research Publishing

Open Journal of Epidemiology, 2026, 16(1), 12-26
https://www.scirp.org/journal/ojepi
ISSN Online: 2165-7467
ISSN Print: 2165-7459

Assessment of Zika Virus Knowledge among Healthcare Professionals in Bobo-Dioulasso: Implications for Public Health Strategies

Abdrahamane Camara[1,2], Dieudonné Tialla[1,2*], Brou N'Guessan Akuèlou Kouamé[3], Merci Muhigwa[2], Aboubacar Kiendrébeogo[1], Moussa Namountougou[2], Salimata Pousga[2], Abdoul Salam Ouédraogo[2], Ibrahim Sangaré[2]

[1]Microbiology-Epidemiology, Zoonosis and One Health Laboratory (LMEZOH), Infectious and Parasitic Diseases Research Laboratory (LR-MIP), Unit of Epidemic-Prone Diseases, Emerging Diseases and Zoonosis (UMEMEZ), National Reference Laboratory for Influenza (LNR-G), Department of Biomedical and Public Health, Health Science Research Institute (IRSS), National Centre for Scientific and Technological Research (CNRST), Ouagadougou, Burkina Faso
[2]Department of Public Health, Nazi BONI University (UNB), Bobo-Dioulasso, Burkina Faso
[3]Department of Public Health, Pafeforo Gon Coulibaly University, Korogho, Ivory Coast
Email: *tialladfaso@yahoo.fr

How to cite this paper: Camara, A., Tialla, D., Kouamé, B.N.A., Muhigwa, M., Kiendrébeogo, A., Namountougou, M., Pousga, S., Ouédraogo, A.S. and Sangaré, I. (2026) Assessment of Zika Virus Knowledge among Healthcare Professionals in Bobo-Dioulasso: Implications for Public Health Strategies. *Open Journal of Epidemiology*, **16**, 12-26.
https://doi.org/10.4236/ojepi.2026.161002

Received: October 22, 2025
Accepted: December 28, 2025
Published: December 31, 2025

Abstract

Zika virus infection became a global concern after the 2015 outbreak in Latin America. Primarily transmitted by Aedes mosquitoes, Zika virus can also spread sexually and vertically, leading to various complications. Although its circulation in Burkina Faso has not been clearly established, the presence of the vector and serological evidence raises a real risk. This study aims to assess the knowledge, attitudes, and practices of health workers in Bobo-Dioulasso to improuve care and prevention in a context of limited ressources and re-emerging threats. A cross-sectional study was conducted in public and private hospitals in Bobo-Dioulasso and its surrounding areas from August 2024 to February 2025. A pre-tested structured questionnaire, including a series of questions on these diseases, was used to assess healthcare workers' knowledge specifically of Zika virus its causative agent, mode of transmission, and symptoms and their management practices with regard to its diagnosis, preventive measures, and treatment. Face-to-face interviews were conducted with study participants, including doctors, nurses, midwives, laboratory technicians, and medical assistants. The study conducted among 210 healthcare professionals in Bobo-Dioulasso reveals that 67.14% are aware of the Zika virus, primarily through the media 39.01% or workplace training 29.79%. However, some gaps persist: 71.63% wrongly believe that urban areas are more affected than tropical regions, and 54.61% are unaware of its main mode of transmission (mosqui-

toes). Although fever 54.61% and headaches 50.35% are well identified, nearly half confuse the symptoms with other diseases. In diagnosis, 58.87% knew appropriate testing methods, but 41.87% demonstrated insufficient knowledge. Only 46.8% know effective preventive measures, and 50.35% applied correct symptomatic treatment. The analysis revealed that 56.74% of healthcare professionals possessed a high level of knowledge, with significant variations on experience and profession. Among respondents with good knowledge, 69.49% had more than 15 years of experience, and those with better were more prevalent among doctors, laboratory technicians and nurses. The sector, *i.e.*, public or private, did not influence the results, highlighting instead the importance of continuing training to fill in the gaps in order to reinforce their knowledge. This first assessment on Zika in Bobo-Dioulasso reveals that 67% of healthcare workers are aware of the virus, with 57% demonstrating adequate clinical proficiency. Although higher than in some countries, these results remain lower than in endemic areas, underlining the need for targeted training. The study thus provides a basis for strengthening epidemic preparedness in Burkina Faso and sub-Saharan Africa.

Keywords

Zika, Knowledge of Healthcare Professionals, Public Health, Bobo-Dioulasso, Burkina Faso

1. Introduction

Zika virus infection has recently emerged as a major global public health concern due to sporadic outbreaks from one region to another. Zika virus was first isolated in 1947 from a rhesus monkey in the Zika forest in Uganda [1] [2]. The first human infection cases were reported in Nigeria in 1954 [3] [4]. Later, Zika virus was discovered in human populations in many countries in Africa, Asia and South America, including Sierra Leone, Nigeria, Senegal [5], Ivory Coast, Egypt, India, Malaysia, Philippines and Indonesia [6] [7]. However, it was not a public health concern at the time [5]. It was following the epidemic in Latin America in 2015 that vigilance against ZIKV took on a global dimension [8]. Consequently, on February 1, 2016, the World Health Organization declared Zika infection a Public Health Emergency of International Concern. By May 2016, the presence of Zika virus had been reported in 58 countries and territories worldwide, particularly in South America [9] [10].

Zika virus is a Flavivirus transmitted mainly by the bite of infected mosquitoes of the genus Aedes, particular *Aedes aegypti* [8] [11]-[13]. Additionally, ZIKV can be sexually transmitted, as documented cases in Argentina, France, Chile, Italy, and New Zealand demonstrate. It can also spread by vertical transmission from mother to child during pregnancy [7], which can lead to microcephaly, a severe congenital brain malformation. While ZIKV infection is frequently asymptomatic, clinical manifestations may include headache, mild fever, arthralgia, con-

junctivitis, myalgia, and maculopapular rash [7] [14]-[16].

Virus infection has been associated with microcephaly and Guillain-Barré Syndrome (GBS) in newborns [17] [18]. Microcephaly is a condition characterized by abnormal head development in newborns, making them much smaller than those of babies of the same age. Head size is often used as an important parameter for monitoring brain growth in children. Clinical manifestations of microcephaly can range from mild to severe and may include intellectual disability, speech impairment, seizures, as well as auditory and visual abnormalities [19] [20]. Moreover, its treatment is only symptomatic, as there is no proven cure at present. Conversely, GBS represents a serious autoimmune disorder in which the immune system attacks and destroys healthy nerve cells in the peripheral nervous system. Its clinical manifestations include muscle weakness, numbness and tingling of the extremities, loss of bladder control, difficulty breathing, back pain and paralysis [21].

ZIKV has the potential for rapid spread in countries where its primary vector, *Aedes aegypti*, is present. To date, active Zika virus circulation has not been conclusively documented in Burkina Faso, despite arboviral surveillance systems implemented since 2016 [22]. A serological survey of the general population carried out between 1963 and 1964 showed serological evidence of Zika virus circulation in the Republic of Upper Volta, now Burkina Faso [23]. Burkina must be particulary vigilant about the spread of the Zika virus, because the presence of competent vectors in the country, combined with silent circulation of the virus, exposes the population to a real risk. The potential consequences particularly neurological complications (Guillain-Barré syndrome) and congenital malformations (microcephaly) in fetuses of infected pregnant women, constitute a critical challenge for healthcare systems. In this context, health workers play a central role in early detection, case management and raising community awareness. However, the effectiveness of their interventions depends on their Knowledge, Attitudes and Practices (KAP) regarding Zika virus. In Burkina Faso, where dengue fever is already endemic, lack of familiarity with Zika could lead to underestimation of the risk, diagnostic confusion or an inappropriate response. Furthermore, logistical (limited access to diagnostic tests) and sociocultural (local perceptions of the disease) challenges could affect the application of recommendations. In a healthcare system with limited resources and weak Zika surveillance, what are the knowledge, attitudes, and practices of Burkinabe health workers regarding this virus? How do practitioners manage suspected cases, particularly in high-risk pregnant women?

This study therefore aims to assess the KAP of health workers in the town of Bobo-Dioulasso and its surrounding area regarding the Zika virus, in order to identify any gaps and strengthen their capabilities for optimal preparation in the event of an epidemic. The results could guide training policies and preventions strategies, thus contributing to the resilience of the health system in the face of emerging arboviruses.

2. Materials and Methods

2.1. Study Area and Period

An anonymous survey was conducted in the city of Bobo-Dioulasso and its surrounding areas from August 2024 to February 2025 in healthcare facilities. Bobo-Dioulasso is located in the west, about 365 kilometers from the political capital, Ouagadougou. It has a Sudanian climate characterized by a relatively long rainy season from June to October, with rainfall ranging from 1000 to 1200 mm, and a dry season from November to May. As the second largest and most populous city in the country, it has a high number of healthcare facilities and health personnel, though their distribution is uneven, with areas of high density like urban centers and lower density in the outskirts of the city (Figure 1).

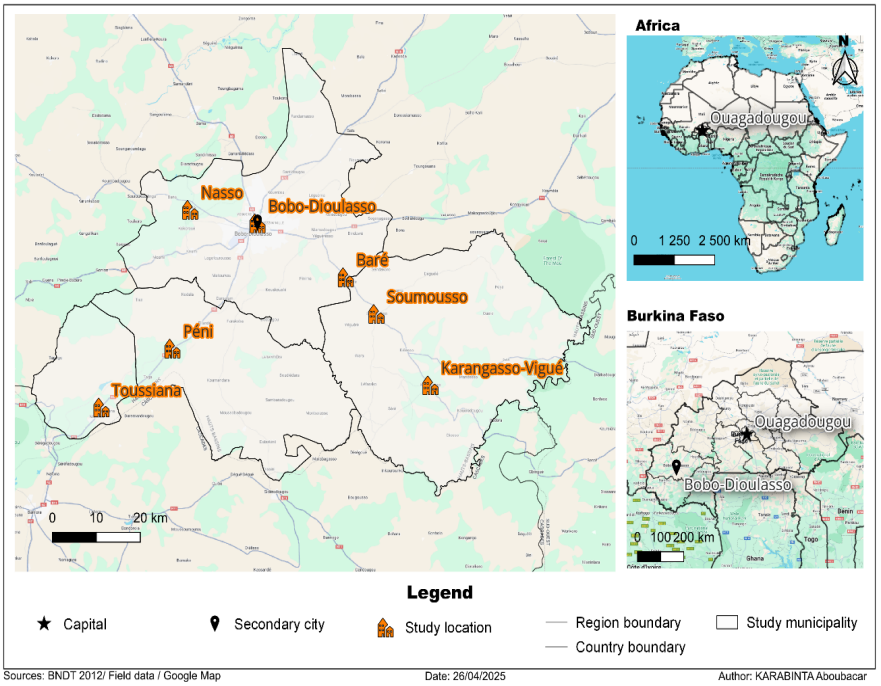

Figure 1. Location map of the study area.

2.2. Study Design

We conducted a descriptive cross-sectional study aimed at evaluating the knowledge and practices regarding Zika among healthcare workers. After obtaining the approval of the ethics committee and the agreement of the regional health director of the Hauts-Bassins, copies of both letters were made and submitted to the district chief doctors, specifically those of Do, Dafra, and Karangasso-Vigué. These various district officials have shown us their full availability to support us in making the study a success. The actual investigation began in August at the CSPS Guimbi Ouattara. The methodological approach used was convenience sampling, that is, data collection where participants are selected based on their immediate availability and willingness to participate. In each health center, the following personnel were involved in the study (doctors, nurses, laboratory technicians, midwives, state magne-

tician, and medical assistants) on a voluntary basis. After a non-exhaustive literature review, a questionnaire containing several open-ended questions was developed; and the questionnaire was structured into 3 parts: i) patient identification, ii) general knowledge, iii) case management. The recorded demographic variables were district, gender, seniority, and profession. Internal checks were conducted by colleagues and researchers to assess the accuracy of the questions. The investigators were instructed on the use of the questionnaire and techniques to interact with participants and obtain their consent. The number of individuals surveyed per hospital varied according to their willingness to participate in the study.

2.3. Ethics Statement

This study received approval from the Institutional Ethics Committee for Health Sciences Research under the reference number 049-2022/CEIRES on 23 July 2024. The objectives of the research were clearly explained to the heads of the healthcare facilities involved as well as to the participants. The gap between the mentioned year and the approval date is due to the fact that the study launch was delayed in 2022 because of a few minor issues. Therefore, the committee will be renewed for a 12-month period starting in July 2024 to begin the study.

2.4. Data Collection

We developed a questionnaire after conducting a non-exhaustive review of the literature. Following this, a digital platform was created to facilitate data collection. During the survey, the interviews were limited to a maximum of 10 minutes per healthcare worker within the facilities. One of the key criteria for inclusion in the study was being "a permanent staff member of the facility at the time of the survey"; as a result, interns and trainees were not included. The interviews were conducted in French, in a confidential office within the establishment, thus facilitating open and unreserved speech from the participants. After each interview, a 5-minute clarification is conducted to explain the knowledge and preventive practices against Zika in order to eliminate any ambiguity. The details provided by participants were kept strictly confidential and were not disclosed to anyone. Before entering the collected data into the database, the completed questionnaires were carefully checked and double-checked for completeness and consistency. The questionnaires aimed to assess the understanding of healthcare workers regarding the process of Zika (symptoms, transmission, and vector) and standard prevention strategies (use of mosquito nets and repellents, destruction of breeding sites). The information gathered fell into two categories: the first category included socio-demographic variables like years of experience, type of establishment, gender, and profession; the second category focused on the information obtained from the analysis of the collected data concerning variables such as knowledge and diagnostic practices.

2.5. Data Processing and Analysis

The study data collected on kobocollecte was reported on Excel before being ana-

lyzed. Microsoft Excel was used to edit, sort, and code the responses. Statistical analysis was conducted using Stata version 17. There were two categories of missing data: systematic missing values and non-response missing values. Non-responses were handled using the imputation approach, employing the mode for each variable. Next, we conducted a univariate and bivariate descriptive analysis to study trends within our sample and explore potential relationships (Khi-2) between variables of interest, such as profession, seniority, and knowledge level. Additionally, we developed scoring systems to assess the level of knowledge of each disease, focusing solely on factors related to the pathogen, symptoms, transmission methods, diagnostic practices, and case management. The Khi-2 was conducted after establishing the scores. Statistical significance was set at a p-value of <0.05 and Cramer's statistic was used to measure the strength of the dependency between the two variables. A good understanding was determined when participants correctly answered questions related to the infectious agent, mode of transmission, symptoms, diagnostic methods, and case management. For each knowledge item, correct answers were scored as "1," while incorrect answers were marked as "0." For better analysis, the scores were categorized into the following levels: low knowledge (0% - 39%), moderate knowledge (40% - 69%), and high knowledge (70% - 100%).

3. Results

3.1. Characteristic of the Population Studied

The study was conducted on a sample of 210 healthcare professionals recruited from 42 health facilities. Among these participants, 164 individuals were from 31 public institutions, while 46 came from approximately 10 private facilities. The gender distribution in the sample was relatively balanced, with a sex ratio of 0.96 men to 1 woman. One third of our sample, or (33.80%, n = 71) was made up of nurses, by Midwives and State-qualified magneticians (26.67%, n = 56), doctors (15.24%, n = 32), medical assistants (14.28%, n = 30), and laboratory technicians (10%, n = 21). The distribution of healthcare professionals according to their professional experience reveals that the majority (45.24%, n = 95) had more than 15 years' seniority in the medical sector. The remaining categories were distributed as follows: 25.71% (n = 54) had <5 years' experience, 19.52% (n = 41) had between 6 - 10 years' experience, and 9.53% (n = 20) possessed 11 - 15 years of practice (Table 1).

Table 1. Demographic characteristics of the population studied.

Characteristics	Frequencies	Percentage
Gender		
Male	103	49.05
Female	107	50.95
Profession		
Doctors	32	15.24

Continued

Medical assistant	30	14.28
Nurses	71	33.80
Laboratory technicians	21	10
Midwives and state-qualified magneticians	56	26.67
Experience		
<5	54	25.71
[6 - 10]	41	19.52
[11 - 15]	20	9.53
>15	95	45.24
Unit		
Public	164	78.10
Private	46	21.90

3.2. General Knowledge of the Studied Population about Zika Virus Infection

This study of 210 healthcare professionals reveals significant gaps in understanding of the Zika virus. Although 67.14% (n = 141) had already heard of it, mainly through the media (39.01%, n = 55) and workplace (29.79%; n = 42), 32.86% (n = 69) had absolutely no knowledge of it. Misconceptions persist: 71.63% (n = 101) wrongly believe that urban areas are more affected than tropical/subtropical areas (n = 37), while 54.61% (n = 77) are unaware of how it is spread (mainly by mosquitoes). Although fever (54.61%, n = 77) and headache (50.35%, n = 70) were correctly identified, nearly half of participants confused these symptoms with other diseases (particularly dengue, chikungunya, and malaria), underscoring the critical need for targeted training on differential diagnosis (Table 2).

Table 2. Healthcare professionals' knowledge of Zika virus infection.

Questions	Options	Frequencies	Percentage
Have you ever heard of the Zika virus?	Yes	141	67.14
	No	69	32.86
	Total	**210**	**100**
How did you heard about of the Zika virus?	Service framework (statistical training health)	42	29.79
	Medias	55	39.01
	School (High school, university)	35	24.8
	Personal research	8	5.67
	Word of mouth	1	0.71
	Total	**141**	**100**

Continued

Which populations are most affected?	Subtropical	4	2.84
	Tropical	33	23.40
	Urbain	101	71.63
	Rural	3	0.71
	Total	**141**	**100**
What is the pathogen?	Wrong answers (mosquitoes, contact with a sick person...)	64	45.39
	Virus	77	54.61
	Total	**141**	**100**
How is it transmitted to Humans?	Correct answers (by mosquito bite, from mother to child)	64	45.39
	Wrong answers	77	54.61
	Total	**141**	**100**
What are the symptoms of the infection?	Headaches	70	50.35
	Stomach aches	9	6.38
	High fever	77	54.61
	Body aches	27	19.15
	Vomitting	48	34.04
	Hemorrhages	33	23.40
	Wrong answers	68	48.23
	Correct answers	73	51.77
	Total	**141**	**100**

3.3. Knowledge of Healthcare Professionals Regarding Diagnostics Practices, Prevention, and Treatment for Zika Virus

The study reveals worrying gaps in healthcare practitioners' management of the Zika. Regarding diagnosis, although 58.87% (n = 83) of healthcare providers correctly identify screening methods (rapid tests, serology, PCR), 41.87% (n = 58) have insufficient knowledge, which could delay differential diagnosis with other arboviruses. The statistics are more alarming when it comes to prevention. The statistics are even more alarming concerning prevention, where only 46.8% (n = 66) of professionals master effective strategies such as vector control or the use of mosquito nets and repellents, while 53.2% (n = 75) have incorrect knowledge that compromises epidemic control. In terms of clinical management, there is a balanced distribution 50.35% (n = 71) of healthcare providers are aware of appropriate symptomatic treatment, compared with 49.65% (n = 70) who suggested inappropriate approaches that could lead to unnecessary therapeutic prescriptions (Table 3).

Table 3. Knowledge of Zika virus diagnostic, prevention, and treatment practices among healthcare personnel.

Questions	Options	Frequencies	Percentage
Diagnostic methods	Correct answers (serology, PCR, RDT)	83	58.87
	Wrong answers	58	41.87
	Total	**141**	**141**
Preventive measures	Correct answers (Vector control, use of mosquito nets and repellents)	66	46.8
	Wrong answers	75	53.2
	Total	**141**	**100**
Case management	Symptomatic	71	50.35
	Wrong answers	70	49.65
	Total	**141**	**100**

3.4. Association between Sociodemographic Characteristics and Knowledge of Zika Virus

Figure 2 reveals that just over half of healthcare professionals (56.74%, n = 80) have a thorough knowledge of Zika virus infection (knowledge score between 70% and 100%, corresponding to a high level), reflecting overall satisfactory of mastery.

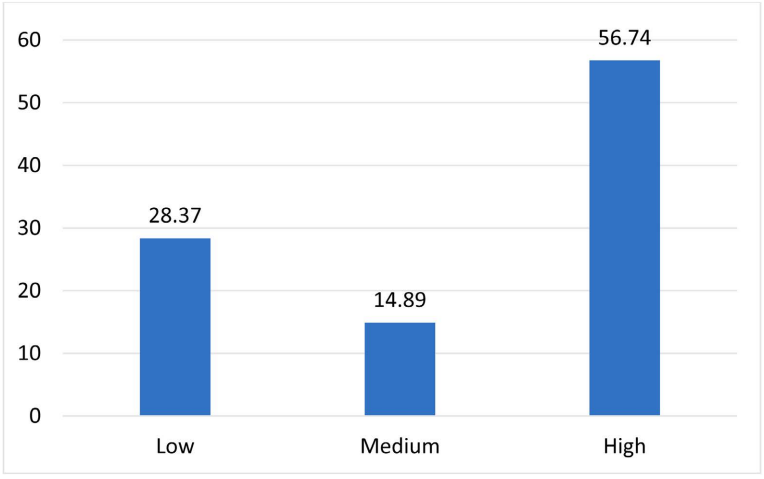

Figure 2. Level of knowledge of Zika virus infection.

This table (Table 4) analyses the socio-demographic and professional characteristics of 141 healthcare professionals according to their level of knowledge (low, medium, high). The p-values associated with the Chi^2 test statistic reveal that certain socio-demographic characteristics may have a possible link between the level of knowledge, with varying intensity of the link (Cramer's V). However, a significant disparity is observed according to professional experience: practitioners with over 15 years of experience demonstrate high knowledge levels in 69.49% of cases (n = 41), while those with 6 - 10 years of experience more frequently exhibit low knowledge levels (51.61%, n = 16). The chi-square test (X^2 = 19.10; p = 0.004)

confirms that years of experience can influence the level of knowledge. The Cramér V statistic (V = 0.260) indicates a weak to moderate association (0.1 ≤ V < 0.3), suggesting that seniority influences, but does not exclusively determine, knowledge of the Zika virus. Furthermore, among the respondents assessed, doctors (77.42%, n = 24), laboratory technicians (66.67%, n = 10), and nurses (61.70%, n = 29) had a better knowledge of the disease than the others (Table 4). Statistical tests were statistically significant (X^2 = 22.67, p = 0.012), with a Cramér V of 0.28 confirming a weak to moderate association between professional status and level of knowledge. Regarding the sector (public/private), the analyses revealed no significant difference between the public and private sectors (X^2 = 3.35; p = 0.501), indicating that the level of knowledge depends more on other factors, such as experience or specific training. Among the respondents, 14.89% (n = 21) presented an average level of knowledge (score between 40% and 69%), while 28.37% (n = 40) demonstrated low knowledge levels (scores 0% - 39%). In summary, status and professional experience had a significant influence on the level of knowledge, while the sector of activity had no impact.

Table 4. Relationship between demographic factors and knowledge level of Zika virus infection.

Characteristics	Level of knowledge			X^2	p-value	Cramer's
	Low (n = 40)	Medium (n = 21)	High (n = 80)			
Gender						
Male	14 (35)	8 (38.10)	61 (76.25)	23.14	0.00	0.4051
Female	26 (65)	13 (61.90)	19 (23.75)			
Profession						
Doctors	4 (12.90)	3 (9.68)	24 (77.42)	22.67	0.0120	0.2835
Medical assistant	9 (47.37)	2 (10.53)	18 (42.11)			
Nurses	10 (21.28)	8 (17.02)	29 (61.70)			
Laboratory technicians	2 (13.33)	3 (20)	10 (66.67)			
Midwives and state-qualified magneticians	15 (51.72)	5 (17.24)	9 (31.03)			
Experience						
<5	8 (19.05)	10 (23.81)	24 (57.14)	19.10	0.0040	0.2602
[6 - 10]	16 (51.61)	3 (9.68)	12 (38.71)			
[11 - 15]	5 (55.56)	1 (11.11)	3 (33.33)			
>15	11 (18.64)	7 (11.86)	41 (69.49)			
Unit						
Public	10 (27.78)	7 (11.86)	19 (52.78)	3.35	0.5013	
Private	30 (28.57)	14 (13.33)	61 (58.10)			

4. Discussion

Understanding a community's knowledge of the Zika virus can be an important tool for developing future interventions and educational materials. To our knowledge, this study is the first systematic investigation of knowledge, attitudes and practice related to the Zika virus among healthcare professionals practising in Bobo-Dioulasso, Burkina Faso. It aimed to assess healthcare professionals' knowledge of ZIKV infection and its associated factors in several healthcare facilities. The study provided a better understanding of the knowledge, practices and attitudes of healthcare professionals in Bobo-Dioulasso regarding the Zika virus, while also clarifying the relationship between sociodemographic factors and knowledge levels. Our findings revealed that most respondents (67.14%) who had already heard of ZIKV were more or less familiar with the infection.

Among the 141 respondents assessed, 56.74% demonstrated good knowledge of ZIKV infection. A similar study conducted among healthcare professionals in Indonesia showed comparable results (50%) to ours [24]; this concordance of data indicates a need for continuing education programmes. Compared to previous studies [24] [25], healthcare workers in our study exhibited relatively higher knowledge (60.2%). Another recent study conducted among general practitioners in Indonesia showed that 64% of them had good knowledge of ZIKV [26]. In contrast, other similar studies reported insufficient knowledge levels. One of them was conducted among dentists in India [25]. This study surveyed 412 participants and found that the majority (61.8%) had inadequate knowledge of ZIKV [25]. In addition, another study conducted among Middle Eastern practitioners in Qatar revealed that among 446 participants, 66% reported having poor knowledge about ZIKV [27]. Also, a study surveyed practitioners from different countries revealed that the majority of participants have insufficient knowledge about ZIKV [28]. This difference in results could be due to exposure to epidemics and the quality of local training. This indicates that in nations such as ours, following the dengue epidemic, emphasis has been placed on continuous education and training of healthcare professionals regarding emerging diseases, resulting in a moderately high knowledge score. In our study, nearly one-third (28.37%) of respondents demonstrated poor knowledge, which could compromise early detection and case management. This cohort was primarily composed of medical assistants and midwives. The study revealed that professional status was significantly associated with ZIKV infection knowledge levels. Our results showed that respondents who were doctors or laboratory technicians had better knowledge than others. This makes sense, as education has long been associated with good health practices, particularly the assimilation of medical information [29]. A study conducted in the Middle East [27] revealed a significant association between levels of education and knowledge of the Zika virus. These findings align with our observations, as nearly all laboratory technicians held either a Master's degree or were completing their graduate studies (Master's level), while all physicians possessed a State Medical Doctorate. Notably, nurses, who are also clinicians, had a good knowledge of the infection.

Senior practitioners (with over 15 years of experience) demonstrated extensive knowledge of the disease (69.49%), potentially attributable to their likely exposure to recent epidemics. During global disease outbreaks, medical staff receive brief training on the disease. Consequently, our research confirmed that professional experience is significantly associated with knowledge levels. Regarding practice setting, no notable differences were observed. A similar study was conducted in Indonesia, where the authors noted that doctors working in private hospitals had a higher probability of having good knowledge of ZIKV infection than those working in public hospitals [24]. These results differ from ours because all health workers of the same status generally receive the same basic training, and also, most in public hospitals are the same ones who work in private hospitals.

Nearly half of the healthcare professionals involved in this study were aware that mosquito bites represent the primary mode of Zika virus transmission. It is therefore understandable that this group, and potentially more, are in favour of the importance of personal protection as a means of preventing infection. Thus, 56.74% of respondents supported the introduction of vaccines against these arboviruses, which are clearly re-emerging. These results suggest that most of the health professionals surveyed are familiar with preventive measures against the Zika virus. Furthermore, studies demonstrate that avoiding areas where Zika virus is actively transmitted is one of the most effective strategies to prevent Zika virus infection. Although almost all of the healthcare professionals involved in this study were able to recognize the pathogen and the signs and symptoms of Zika virus infection, it would be wise to step up ongoing training. However, a number of respondents were unaware that Zika, dengue and chikungunya virus diseases have similar symptoms [30]. These findings suggest that even some physicians among them might be unable to make the differential diagnosis of a Zika virus infection. Given the broad differential diagnosis associated with Zika virus, the Centers for Disease Control and Prevention (CDC) recommends that patients with suspected Zika infection should also be evaluated and managed for potential dengue and chikungunya co-infections [7]. There is proven evidence that there is no cure for Zika virus infection [7]. Symptoms are generally mild and self-limiting. To practice effectively, healthcare professionals need this data and knowledge.

5. Limitations

This study has some limitations that should be considered, as they will contribute to a better understanding and interpretation of the implications of its results. The small sample size and its unique location in a specific region limit the generalization of the results across the entire countries. Another limitation lies in the lack of practical skill assessments (such as simulated clinical cases). Furthermore, the cross-sectional aspect of the study prevents observation of knowledge progression over time. These limitations do not invalidate the conclusions but call for further research. Nevertheless, this study, although pioneering, has identified critical areas (paramedical training, differential diagnosis) requiring targeted inter-

ventions.

6. Conclusion

This study is the first to assess the knowledge, attitudes, and practices (KAP) of healthcare professionals in Bobo-Dioulasso regarding the Zika virus. The results reveal that most (67.14%) of respondents have already heard of the virus, and more than half (56.74%) demonstrated good clinical and preventive knowledge of it. The figures, although higher than those observed in some regions, such as India and Qatar, remain below those observed in countries heavily affected by epidemics (Brazil). Nevertheless, it provides a solid basis for strengthening the fight against Zika in Burkina Faso, but highlights the need for interventions adapted to local realities and different professional profiles. An integrated approach, combining capacity building and continuous training, will be essential to prevent future outbreaks. Finally, these results could guide similar policies in other sub-Saharan African countries facing the challenges of re-emerging diseases.

Acknowledgements

The authors would like to thank all participants and the heads of each healthcare facility for their collaboration.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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