MINISTRY OF HEALTH, VIETNAM
NATIONAL INSTITUTE OF HYGIENE AND EPIDEMIOLOGY

SURVEY REPORT

THE NEED OF EQA SERVICE AND STRENGTHENING THE QUALITY OF LABORATORIES MEDICAL TESTING IN MEKONG REGION

SUPPORTED BY
Canada's Weapons Threat Reduction Program &
Mekong Basin Disease Surveillance

HANOI - 2021

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ACKNOWLEDGEMENTS

Report on "The Need of EQA Service and Strengthening the Quality of Laboratories Medical Testing in Mekong Region" was jointly developed by the Mekong Basin Disease Surveillance (MBDS) Foundation and National Institute of Hygiene and Epidemiology (NIHE) – Vietnam team lead by (Dr. Nguyen Thanh Thuy; MSc. Dang Thi Kieu Oanh; Assc. Prof. Le Thi Phuong Mai; Dr. Trinh Quynh Mai). This document is expected to provide baseline assessment in supporting the establishment of an EQA network among Southeast Asia countries.

MBDS would like to express its gratitude and appreciation to several regional, national, and subnational stakeholders, who contributed significantly in coordination and providing EQA data and information. The contribution of Ministry of Health (Cambodia), Ministry of Health (Lao P.D.R), Ministry of Health and Sports (Myanmar), Ministry of Health (Vietnam), and respective EQA country focal points has been invaluable in gathering the original data and information from public health laboratories and hospitals in CLMV countries.

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ABBREVIATIONS

AMS	ASEAN Member States
BS	biosafety
BSL2	biosafety level 2
CA	the police
CDC	Centre for Disease Prevention and Control
CLMV	Cambodia, Lao PDR, Myanmar, and Viet Nam
CO2	carbon dioxide
COVID-19	Coronavirus Disease 2019
DC	Disease Control
ĐV	unit
ELISA	enzyme-linked immunosorbent assay
EQA	external quality assessment
HIV	Human Immunodeficiency Virus
HTLV	Human T-lymphotropic Virus
ISO	International Organization for Standardization
LAB	laboratories
MBDS	Mekong Basin Disease Surveillance
MOH	Ministry of Health
NIHE	National Institute of Hygiene and Epidemiology
PCR	polemerase chain reaction
PMC	Preventive Medicine Centers
SARS-CoV-2	Severe Acute Respiratory Syndrome Corona Virus 2
SPSS	Statistical Package for the Social Sciences
TB	Tuberculosis
/QĐ-	decision
QĐ	the military
QM	quality management
Vet	veterinary facilities
WHO	World Health Organization

PREFACE

The establishment of an external quality assessment (EQA) network among Southeast Asia countries is of importance in strengthening the quality of medical testing in disease control and response. This report has covered five main topics: testing capacity, physical facilities, equipment, human resources, and epidemic response.

This report has assessed the testing capacity for pathogenic microorganisms of health facilities, identified the needs of EQA participation for improving testing capacity and needs for training from the facilities/ laboratories, and assessed the availability of testing capacity for epidemic prevention and controls of the facilities/ laboratories. Information has been collected using standardized questionnaire and analyzed by point-by-point based for each type of public health laboratories and hospitals.

This report was prepared within short duration during COVID-19 pandemic, which may not be able to cover all the subjects on EQA. However, the five main topics have been chosen carefully by considering the current situations and related references, followed by specific training need assessment. The results of this study are promising to be adopted and expanded for next regional, national, and subnational studies. The results also can be used as references for continuous improvement plan and advocacy purposes, especially for developing countries.

MBDS Foundation Secretariat
Mekong Basin Disease Surveillance Foundation

EXECUTIVE SUMMARY

External Quality Assessment Scheme (EQAS) strengthening is able to improve the reliability and reproductivity of laboratory result. Testing capacity not only plays an important role in disease diagnosis, but also in disease surveillance and response systems, especially in responding to public health emergencies. The results provided by this report are expected to be used as a baseline information in developing EQA program, training plan and technical assistance, to improve testing capacity for the regional and national health system and agencies followed by collaboration capabilities.

Altogether, 289 facilities in Cambodia, Lao P.D.R, Myanmar, and Viet Nam have been selected and of which 176 facilities have completed the responses. The standardized questionnaire has been developed and sent out by email or web-based tools for public health laboratories and hospitals in CLMV countries. There were several types of hospitals and medical facilities that have participated including CDCs/ PMCs, public hospitals, private hospitals, medical universities hospitals, army/ policy medical facilities, and veterinary facilities. The findings have been analyzed descriptively to explain the capacity in performing biological-agents test, the need for capacity strengthening, and any relevant essential supporting factors that should be considered.

Each facility has different capacity for biological-agents handling. Public hospitals and army/ policy medical facilities have highest capacity to handle biological agents. Most of bacterial agents are handled by public hospitals, while viral and fungal agents are mostly handled by CDCs/ PMCs and private hospitals respectively. In addition, CDCs/ PMCs have capacity to conduct isolation/ culture, serology, and molecular biology techniques. The isolation/ culture was the common technique provided by most of the facilities. ISO certification for isolation/ culture and molecular biology techniques have been certified in most of the facilities. Some facilities also performed other testing capacity such as rapid tests, scans, staining, immunochromatography, electroluminescence, biochemical assessment techniques and gene decoding. Isolation/ culture was the common technique that has been found in this external quality assessment.

Findings described that the physical facilities and laboratory biosafety assurance have been well established. However, there were common challenges faced by most of facilities in handling the biological-agents: the absence of sample sources and chemicals/ biologicals as well as inadequate equipment and human resource. Based on the result of training need assessment, each facility has different need for capacity development, both for specific biological-agents handling and for biosafety, sampling, and quality management. Strengthening coordination and supporting EQAS networks are also pivotal to improve quality of medical testing for better disease control and public health response.

CHAPTER 01

BACKGROUND

Establishment or strengthening laboratory quality assurance system will allow laboratories to improve the reliability and reproductivity of laboratory results. External quality assessment scheme (EQAS) is necessary to ensure comparability of results among laboratories. Therefore, EQAS is a valuable tool in the quality improvement process. They provide objective evidence of laboratory competence for customers, accrediting bodies, and regulatory agencies, and serve as a unique source of information that is not obtainable in the other ways.

According to the World Health Organization (WHO), an External quality assurance program (EQAP) is critical for laboratories to provide the high-quality test results. The EQAP encompasses: (1) investments in building human capacity; (2) investments in building laboratory management systems, infrastructure and management of quality systems; (3) well-written policies and procedures; (4) a quality control system, quality improvement (QI) and external quality assessment (EQA); and (5) accreditation standards.

In ASEAN Member States (AMS), due to resource limitation, many laboratories have no opportunity to participate in any EQA scheme. The establishment of an EQA network in the region can help increasing the number of laboratories which can provide accurate test results. EQA schemes are also valuable for early detection of laboratory errors and identification of underlying problems facing peripheral laboratories.

Testing capacity plays an important role not only in disease diagnosis but also in disease surveillance and response systems, especially in responding to emergencies. The Decision 153/2006/QD-TTg of the Prime Minister approving the master plan for development of the health system in Vietnam until 2010 and vision to 2020 (issued on 30/6/2006) mentioned upgrading of the system of laboratories at the central and provincial levels as a key task. On February 27, 2016, the Prime Minister issued the Decision 316/QD-TTg approving the Project to strengthen capacity of the medical testing quality management system for the period 2016 – 2025. In addition, the Ministry of Health also issued the Decision 5458 / QD-BYT dated September 29, 2016 approving the plan to improve capacity of the infectious disease testing system of preventive medicine for the 2016-2020 period, showing that testing has been a focus in recent years and in the next period.

The lessons learned from the COVID-19 pandemic showed clearly that the epidemic response ability depends a lot on the testing capacity and the ability to mobilize the engagement of different authorities in the province.

The Project "Establishment of an EQA network among Southeast Asia countries to strengthen the quality of medical testing in disease control and response as well as public health care", and the report " The Need of EQA Service and Strengthening the Quality of Laboratories Medical Testing in Mekong Region" will be the foundation for developing a EQA program, training plan and support to improve testing capacity for the health system and agencies with capability of collaboration and support.

CHAPTER 02

OBJECTIVES

- Assess the testing capacity for pathogenic microorganisms of health facilities at provincial level, including facilities under the Ministry of Defense, Ministry of Public Security and veterinary facilities
- Identify the needs for improving testing capacity and needs for training from the facilities
- Assess the availability of testing capacity for epidemic prevention and controls of the facilities

CHAPTER 03

ASSESSMENT METHODOLOGIES

3.1 ASSESSMENT FRAMEWORK

Assess the testing capacity of different facilities based on the Assessment framework including the following basic areas:

(a). The capacity to perform testing of the facilities including performing testing techniques for 45 agents and basic agent groups including 27 bacteria, 15 groups of viruses and 3 groups of fungi; with 3 categories of testing techniques including isolation and culture, serology, and molecular biology. In addition, if the facilities conduct testing on other agents out of the list with techniques other than the above 3 techniques, they are also recommended to report.

(b). The essential supporting factors to perform testing such as human resources, physical facilities, Equipment, and quality assurance materials; training needs, capacity buildings for staff are also assessed to develop training plans to provide support.

(c). The availability of the factors to support testing for Epidemic response. (Figure 1)

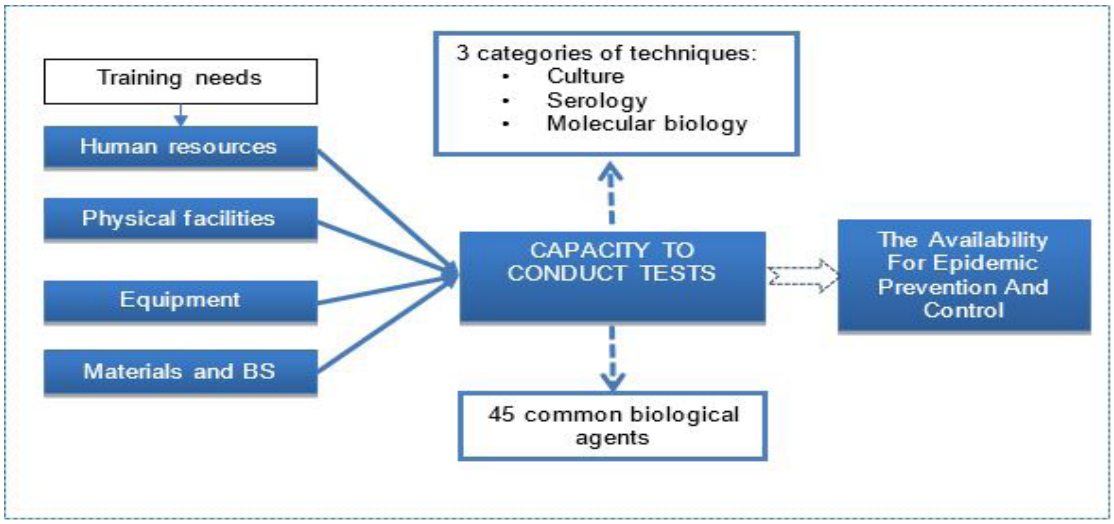

Figure 1. Framework to assess testing capacity

3.2 SUBJECTS OF ASSESSMENT

Subjects of assessment are provincial/ city public health facilities, private health facilities, hospitals affiliated to medical universities, medical facilities under the Ministry of Defense and the Ministry of Public Security and veterinary facilities that are performing or capable of performing microbiological tests.

The list of subjects of assessment is compiled based on the national inventory of medical examination and treatment agencies, the list of CDCs/ PM centers, the directory of medical universities and veterinary facilities. In total, 289 provincial health facilities in Viet Nam and 3 ASEAN Member State (AMS) (Lao P.D.R, Cambodia and Myanmar) were selected for the assessment (Table 1).

Table 1. Number of facilities selected for assessment

Facilities	*Number*
Vietnam	
CDCs / PM centers	63
Provincial level public hospitals	125
Private general hospitals	30
Medical universities	10
Medical facilities under the Ministry of Defense and the Ministry of Public Security	23
Veterinary facilities	8
Lao PDR	10
Myanmar	10
Cambodia	10
Total	289

3.3 METHODS AND TOOLS FOR DATA COLLECTION

a. **Data collection method**

Data was collected based on self-administered questionnaires, which were sent to the facilities to fill in online through the link 'https://enketo.ona.io/x/5kL1sF1S', through official letters, and email with file to Lao P.D.R, Cambodia and Myanmar.

The instruction on how to fill in the questionnaire was sent to the facilities and support is provided through phone.

b. **Timeframe: 12/2020 – 3/2021**

c. **Data collection tools**

The questionnaires include the key sections as follows:

- General Information
- Capacity of implementing tests
- Human resources of the testing departments
- Physical facilities
- Equipment
- Biosafety
- Training needs
- Epidemic response

3.4 DATA MANAGEMENT AND ANALYSIS

a. Data was downloaded daily to update the number of respondents and check the completeness and relevance of the information.

b. The final data sets were extracted in Excel format for cleaning and analysed using SPSS 23.0 data analysis software.

c. Data is presented in quantities and rates, based on 6 types of units.

CHAPTER 04

FINDING

The rates of response were: 63/63 CDCs/ PM centers, 72/125 public hospitals, 17/30 private hospitals, 5/10 hospitals affiliated to Medical/ Pharmaceutical Universities of, 12/23 military/ police hospitals, 6/8 veterinary agencies Viet Nam) and 1/30 facilities of AMS (National Center for Laboratory and Epidemiology – Lao PDR) have submitted reports (described in Table 2).

Table 2. Number of the reporting facilities by category

Facilities	Selected entities	Reporting entities
Viet Nam		
CDCs / PM centers	63	63
Provincial level public hospitals	125	72
Private general hospitals	30	17
Medical universities	10	5
Medical facilities under the Ministry of Defense and the Ministry of Public Security	23	12
Veterinary facilities	8	6
Lao PDR (CDCs/ PM Centers)	10	1
Myanmar	10	0
Cambodia	10	0
Total	289	176

Table 2 show that only one health facility from Lao PDR out of 30 health facilities of AMS have responded to the survey. This is a health facility in the field of preventive medicine. As a result, its data will be included in CDCs/ PM center's data for analysis.

Figure 2 shows the distribution map of the facilities participating in the testing capacity assessment. The map on the left shows the facilities that have been selected to participate in the assessment, the map on the right shows the facilities that have submitted the responses and reports. The results stated that the testing capacity assessment covered most of the facilities at the provincial level in Vietnam.

Figure 2. Distribution of facilities selected and ones submitting reports

4.1 TESTING CAPACITY

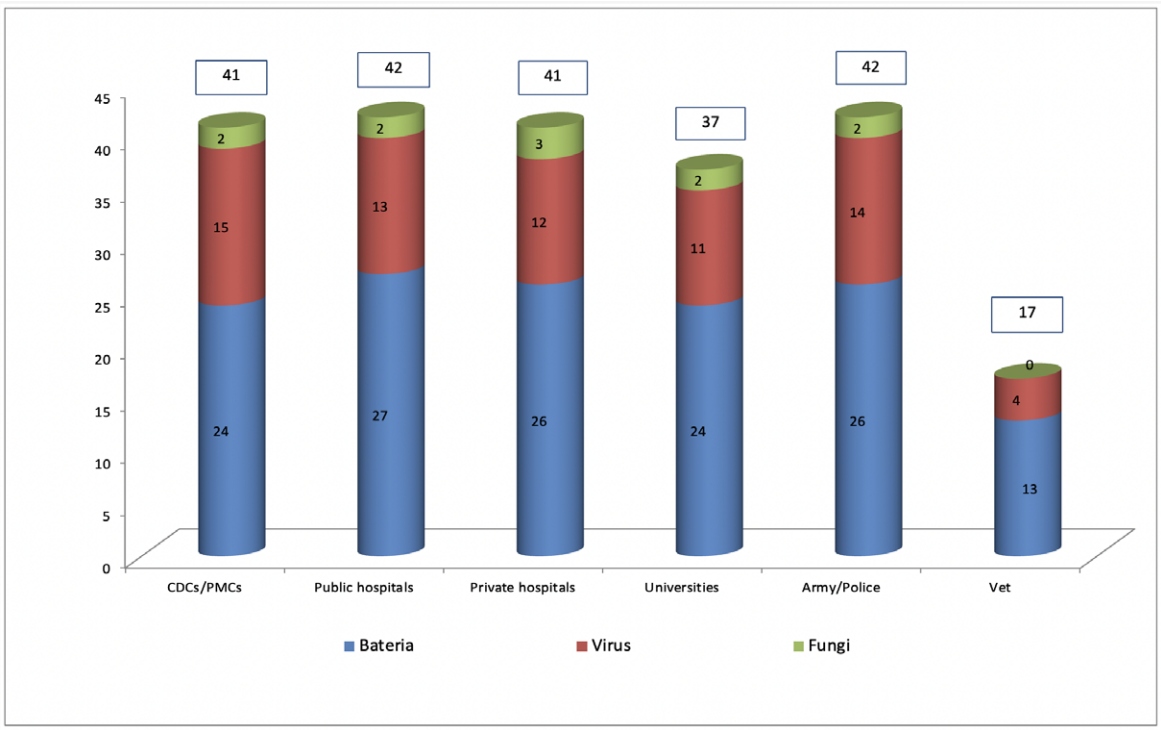

Figure 3. Number of agents could be handled

Among the categories in submitted reports, the categories of public hospitals and Military/ police medical facilities have capacity to perform the highest number of agents (42 agents), followed by CDCs and private hospitals with 41 agents, universities with 37 agents, veterinary facilities with 17 agents. Among the agents that the facilities could handle, the public hospitals and private hospitals could handle 100% of bacteria and fungi, CDCs/ PMCs could perform 100% of viral agent (Figure 3).

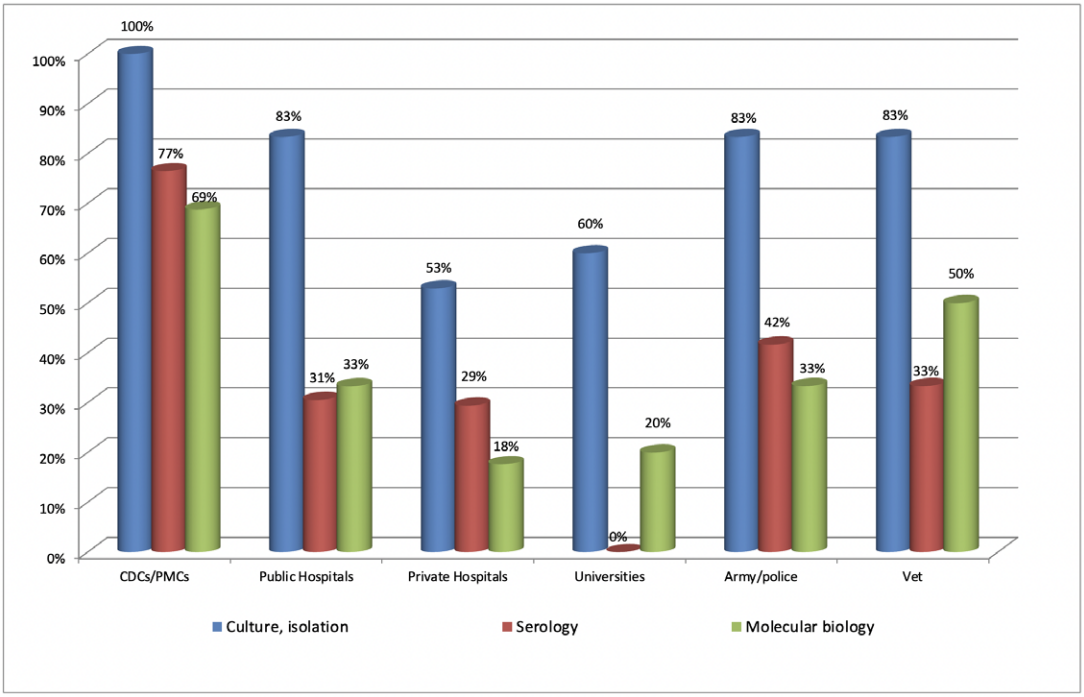

Figure 4. Testing techniques performed

Of the three groups of testing techniques evaluated, the isolation and culture technique prevailed in most categories of facilities. 100% of CDCs/PMCs and over 83% of public hospitals, military / police and veterinary medical facilities implement this technique. With private hospitals and universities, only over 50% of the facilities conducted this technique. With serological and molecular biology techniques, about two thirds of the CDCs/ PMCs conducted them, which showed a great improvement in the capacity of these units compared to the past. While these categories of techniques are only performed at around 20% -50% of other groups, even medical universities do not implement serological techniques with microbiological agents (Figure 4).

In addition to the three categories of basic testing techniques mentioned above, a number of other testing techniques are also performed in the facilities, for example, CDCs/ PMCs, public and private hospitals, universities, military/ police facilities and institutions perform rapid tests, scans, staining, immunochromatography, electroluminescence. Veterinary facilities also deploy more biochemical assessment techniques and gene decoding.

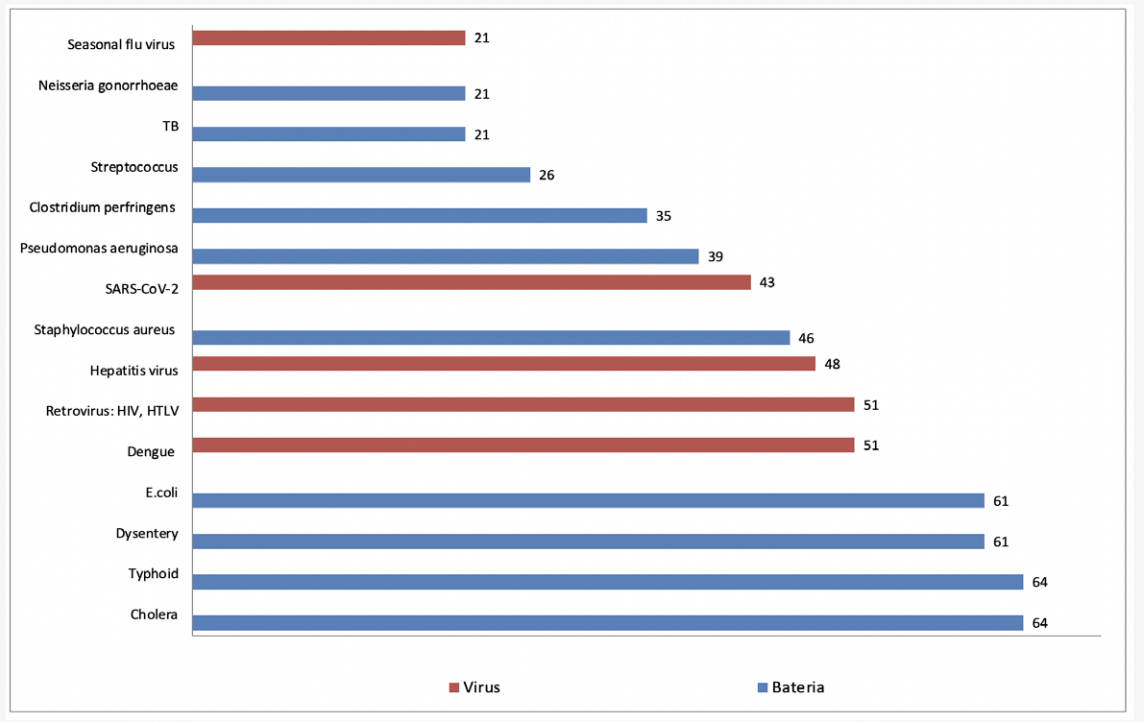

Figure 5. Types of most common agents that are handled in CDCs/PMCs

Among the 15 most common agents handled in the CDCs/ PMCs, the agents implemented at almost 64 CDCs/ PMCs were the gut bacteria group, followed by the dengue virus group, retrovirus and hepatitis viruses. Agents such as staphylococcus aureus, staphylococcus aureus are also handled by more than 50% of CDCs/ PMCs. In particular, there are 43 CDCs/ PMCs capable of performing the testing techniques for SARS-CoV-2 (Figure 5).

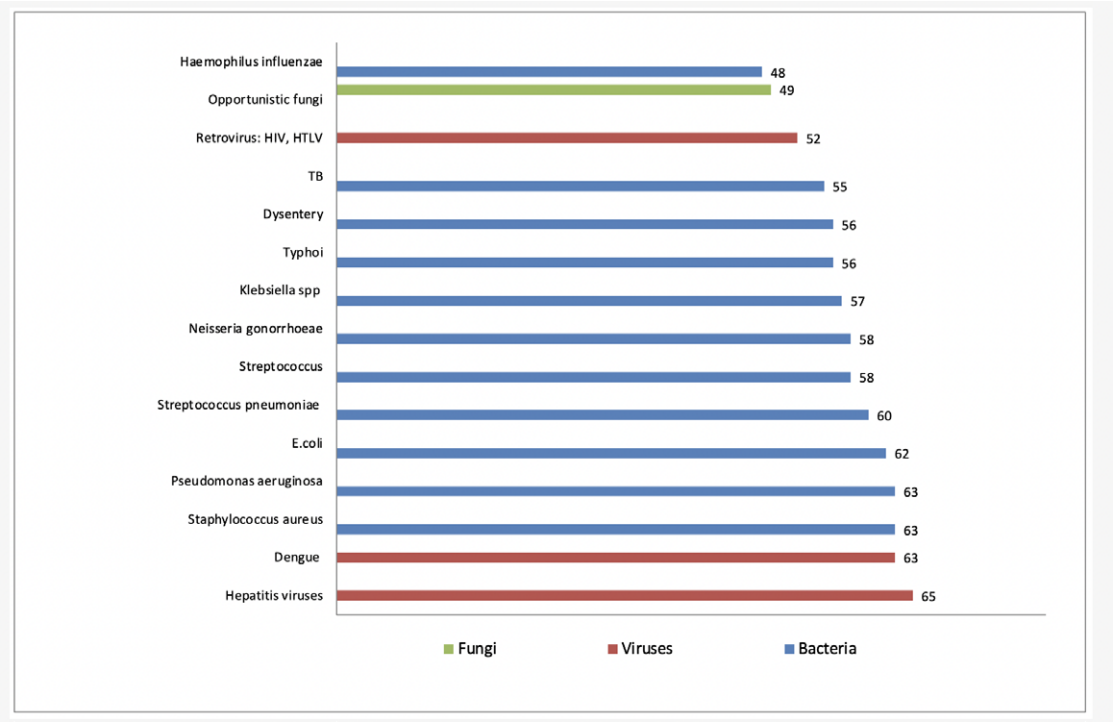

Figure 6. Types of most common agents that are handled in public hospitals

In public hospitals, out of 15 common pathogenic agents handled, 65/72 facilities have testing capacity for hepatitis viruses. The next most common agents are dengue virus and some common pathogenic bacteria and opportunistic infections in hospitals such as staphylococcus aureus, and pseudomonas aeruginosa, E. coli, Streptococcus pneumoniae (Figure 6).

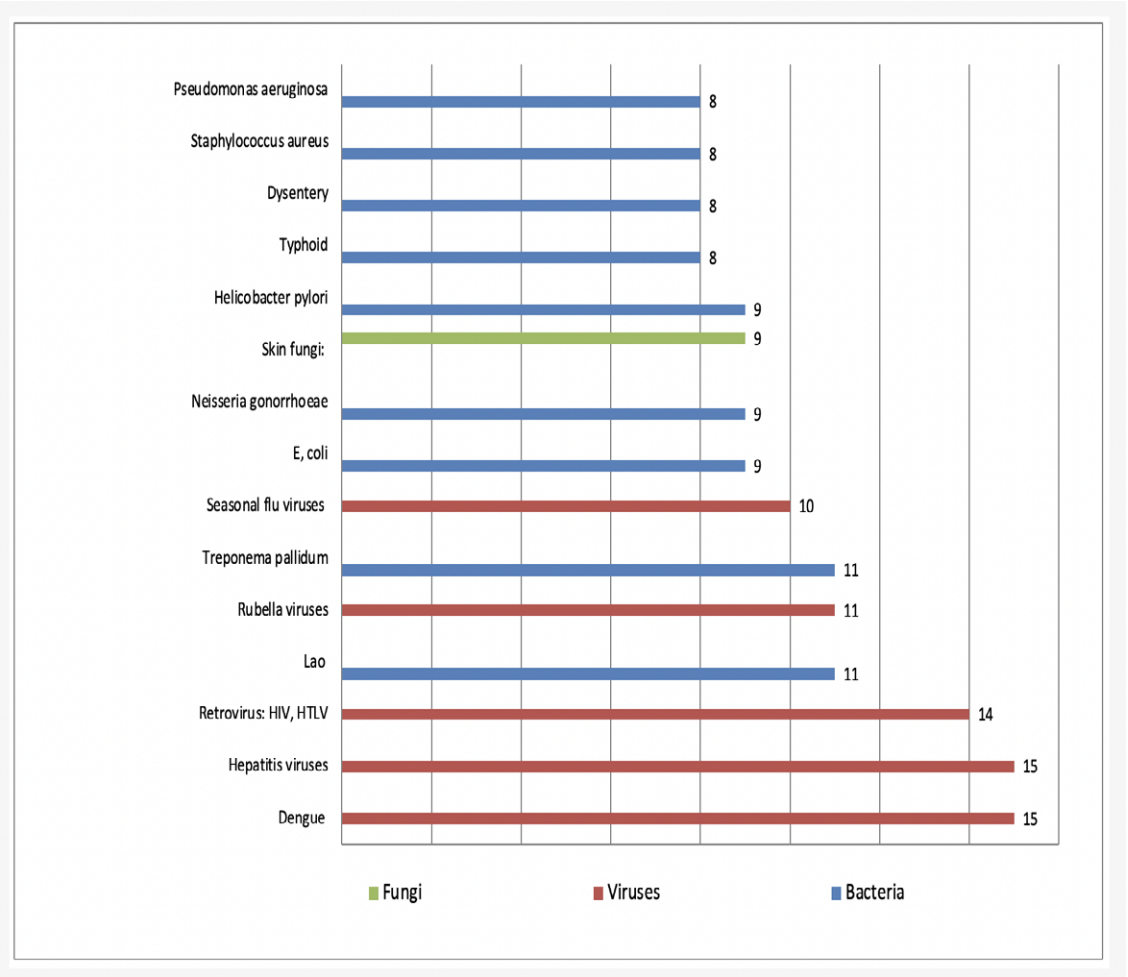

Figure 7. Types of most common agents that are handled in private hospitalst

Similar to the public hospital group, the most common agents handled by the private hospital group are the hepatitis and dengue virus groups, in 15/17 facilities. Followed by the agents of tuberculosis, syphilis and rubella viruses, seasonal flu viruses with 8-11 facilities are capable of handling. These are also common groups of agents encountered in treatment facilities (Figure 7).

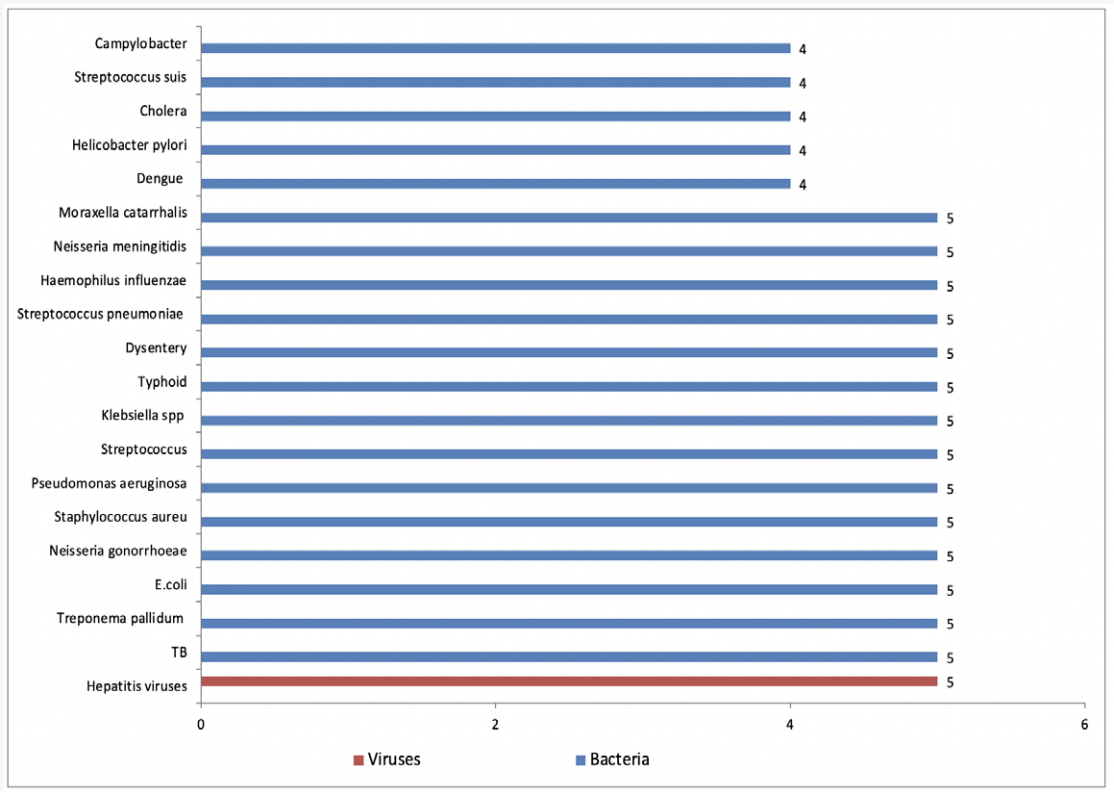

Figure 8. Types of most common agents that are handled in medical universities

For the universities, the testing capacity was relatively similar among them which reported handling about 20 agents. There are 5 out of 5 institutions handling 15 agents, of which 10 are bacteria, the only viral agent group is hepatitis viruses. 4/5 schools are able to implement the remaining 5 agents (Figure 8)

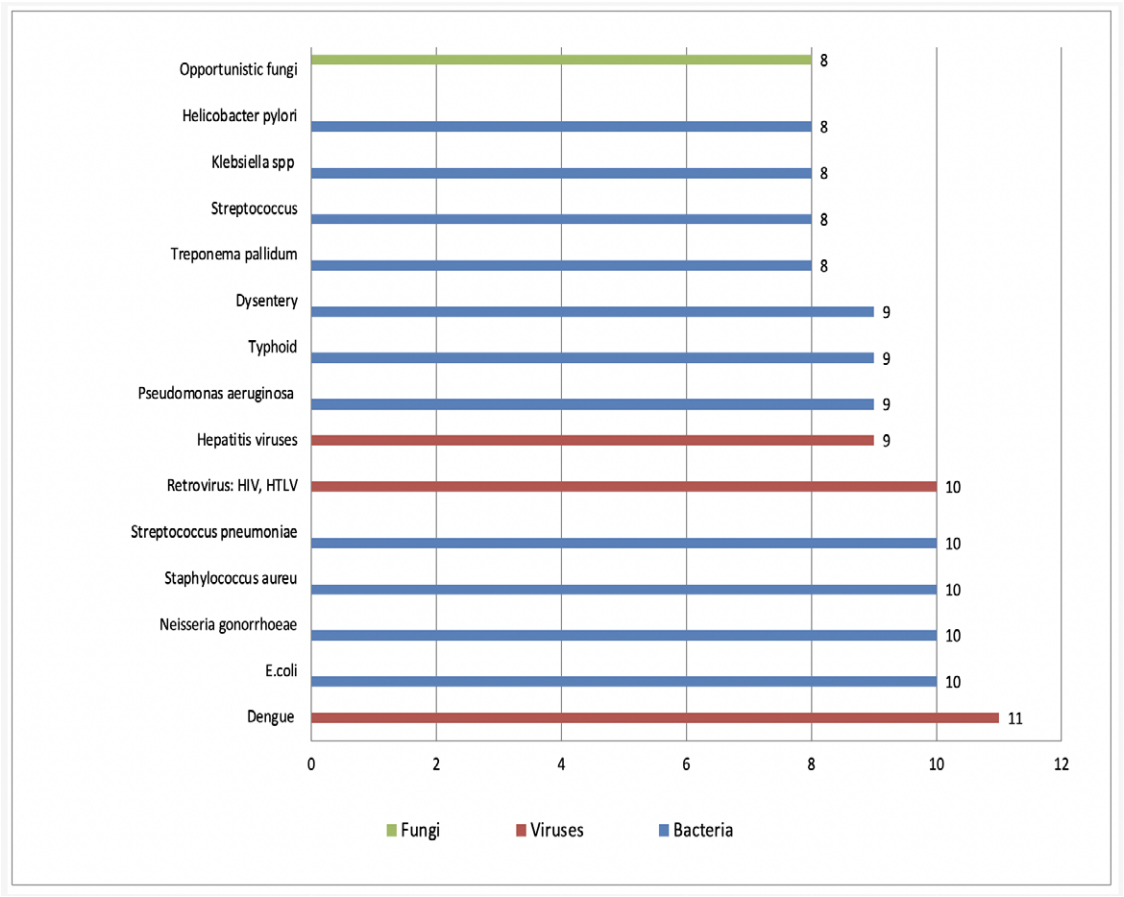

Figure 9. Types of most common agents that are handled in military/ police facilities

Of the 15 most common agents handled in military/ police facilities, 11 are bacteria, 3 are viruses, and 1 agent is fungal; dengue could be handled in 11/12 facilities; 10 facilities are capable of testing E. coli, Neisseria gonorrhoeae, Staphylococcus aureus and Streptococcus pneumoniae. The rest agents are handled at 8-9 facilities out of a total of 12 reporting facilities (Figure 9).

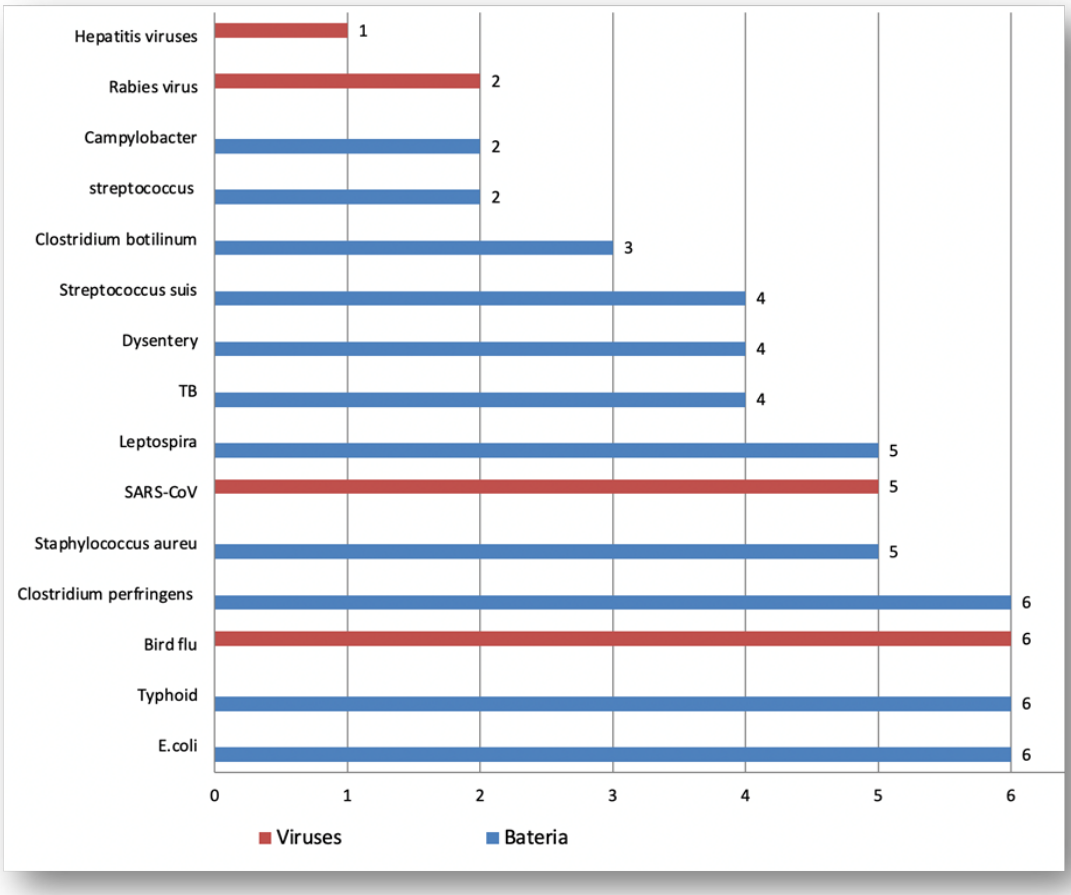

Figure 10. Types of most common agents that are handled in Vet facilities

For veterinary units, the handled microbiological agents mainly focus on agents causing diseases both in humans and animals. No fungal agents were handled in veterinary facilitiess, only bacteria and viruses were handled in these units, in which E. coli, typhoid, avian influenza, Clostridium perfringens were handled at all veterinary facilities. Especially, SARS-CoV-2 was handled in 5/6 facilities (Figure 10).

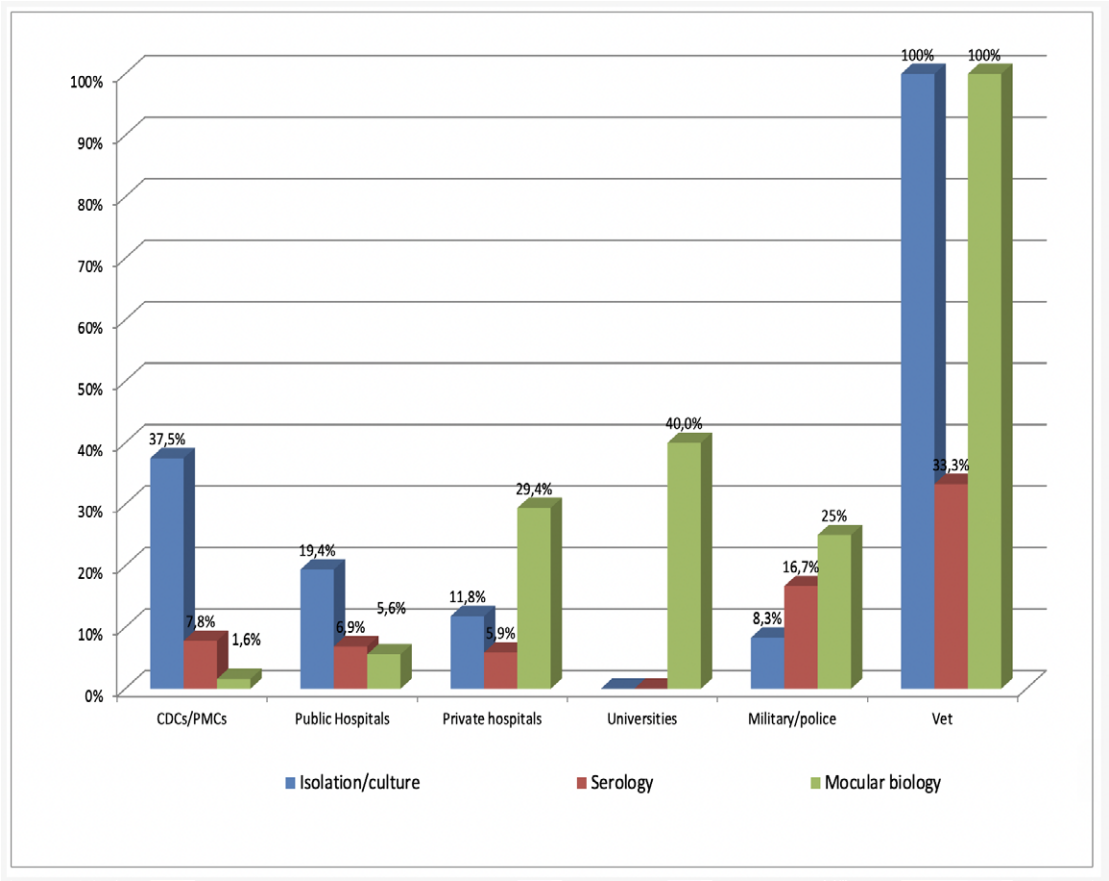

Figure 11. Facilities with ISO certificates

ISO certification is a criterion that demonstrates the quality of testing in facilities. The veterinary facilities group has the highest rate of ISO certification, with 100% of veterinary facilities have been ISO-certified for at least 1 agent with isolation culture and molecular biology techniques, 33.3% of them have been certified with serological techniques. The group of public hospitals has the lowest rate of ISO certification: 19.4% of facilities have been certified for at least 1 agent with isolation culture techniques, and 5.6% - 6.9% have been certified for agents with serological and molecular biology techniques. The group of universities only had ISO certification for molecular biology techniques and 40% of the facilities were certified. The CDCs/ PMCs have also paid much attention to test quality, though not much, in recent years. However, more than one third of them have been ISO certified for isolation culture technique, mainly with microbiological agents in food, with ISO:17025 (Figure 11).

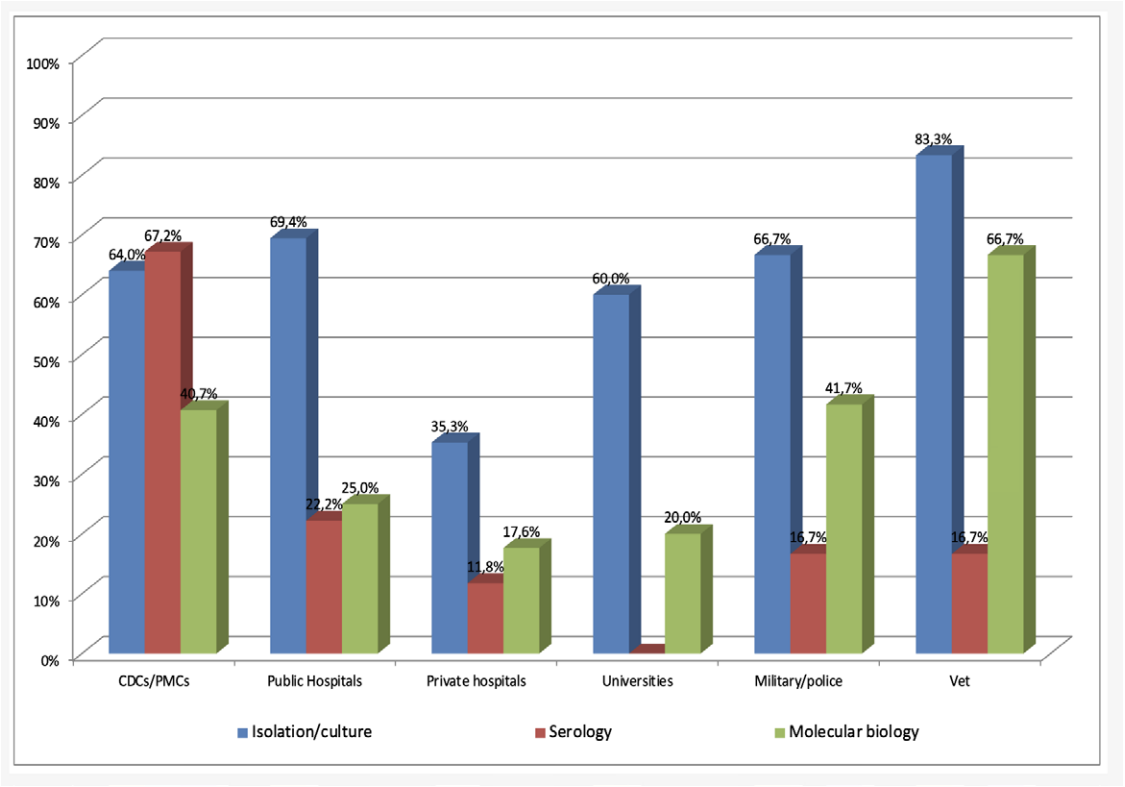

Figure 12. Facilities going through External Quality Assessment

Like ISO certification, going through external quality assessment is a form of quality control for tests; the highest rate of participation is among CDCs/ PMCs, accounting for nearly 70% of agencies certified with isolation culture techniques and serology techniques, 40.7% of agencies certified with molecular biology techniques. They were followed by veterinary facilities with 83.3% participating in external quality assessment for isolation culture techniques and 66.7% engaging external quality assessment for molecular biology techniques. The group of private hospitals has the lowest rate of participation in external quality assessment in all techniques. In general, all of the facilities mainly engaged in external quality assessment for isolation culture techniques, the results showed that they were also interested in assay quality management (Figure 12).

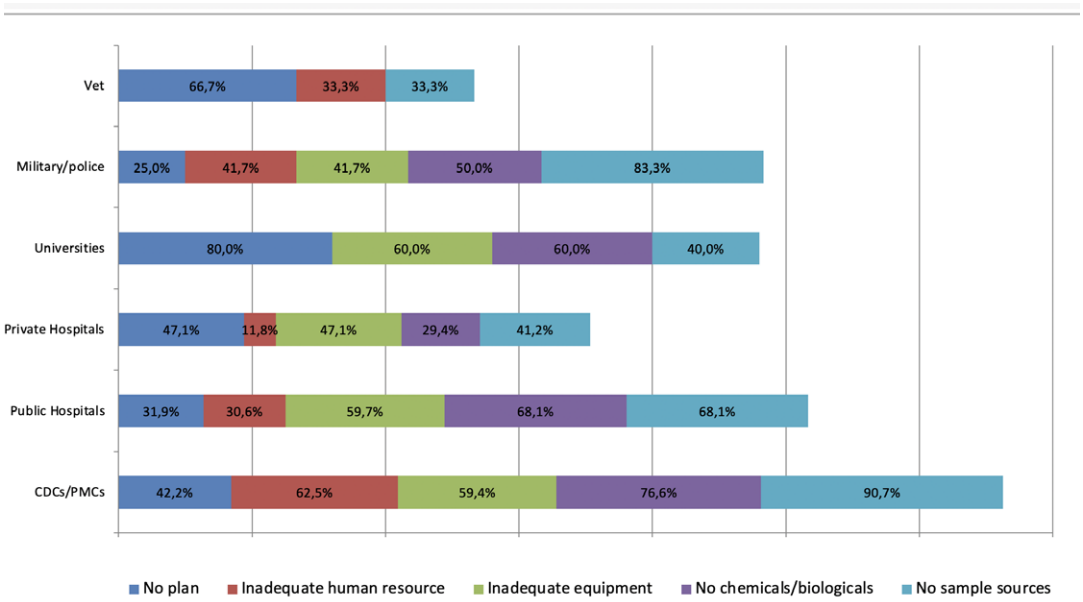

Figure 13. Reasons for not handling some agents

Among the 45 assessed agents, there are agents that the facilities did not conduct tests on them. The most common reasons in most facilities were: not having a sample source, accounting for 90% among the CDCs/ PMCs, 68% in the public hospital group, and 83% in the military/ police facilities. The next important reason is the absence of biologicals, accounting for 77% in CDCs/ PMCs, 68% in public hospitals, 60% in universities and 50% in military / police facilities. In addition, 42% - 60% of the facilities, except veterinary facilities, did not have enough equipment for handling. Other reasons for not handling are: the agents do not cause diseases in animals in veterinary facilities and lack of demand from the clinical departments in hospitals.

4.2 PHYSICAL FACILITIES

Table 3. Zones for isolation culture/ serology/ molecular biology techniques

	CDCs/ PMCs	Public Hospitals	Private Hospitals	Universities	Military/ police	Vet	Total
	n = 64 (%)	n = 72 (%)	n = 17 (%)	n = 5 (%)	n = 12 (%)	n = 6 (%)	n = 176 (%)
No separate zones	2 (3.1)	9 (12.5)	6 (35.3)	0	1 (8.3)	0	18 (10.3)
There are two zones	7 (10.9)	17 (23.6)	4 (23.5)	1 (20.0)	1 (8.3)	0	30 (17.1)
There are three zones	55 (85.9)	46 (63.9)	7 (41.2)	4 (80.0)	10 (83.3)	6 (100)	128 (72.7)
Molecular biology zone has 3 rooms	56 (87.5)	41 (56.9)	8 (47.1)	4 (80.0)	9 (75.0)	6 (100.0)	124 (70.5)

Regarding the physical facilities for the testing area, the reported results showed that they receive quite well attention and investment in the facilities, from 63.9% -100% of the facilities (except for private hospitals) have 3 separate zones to perform 3 groups of testing techniques (i) isolation culture, (ii) serology and (iii) molecular biology. In the group of private hospitals, only 41%, has all three separate testing zones. For the molecular biology testing area, the standard arrangement requires 3 separate rooms or separate zones including: (i) Clean room for biological preparation (ii) a room for extraction of genetic materials and drop samples (iii) a room for genetic material amplification and checking the amplified product. The results show that this rate is also relatively high in most of the groups of facilitiess, except for the groups of public hospitals and private hospitals, with 56.9% and 47.1% respectively. Results also showed that CDCs/ PMCs have quite well invested in physical facilities compared to previous years (Table 3).

Laboratory biosafety assurance is an important global issue and has received a great deal of attention by the Government and the Ministry of Health through the issuance of Decree 103/2016/ND-CP. The Decree is about the biosafety assurance for laboratories and Circular 41/2016/TT-BYT promulgating the list of microorganisms causing infectious diseases by risk group and biosafety level and techniques suitable for testing (Viet Nam legal) and WHO guideline. Accordingly, all laboratories for pathogenic microorganisms need to announce that their laboratories meet BSL2 requirements. The results showed that the rate of announcing BSL2 labs for microbiological laboratories was quite high, especially in veterinary facilities (100%), military/ police facilities (98.4%), CDCs/ PMCs (88.9%) and public hospitals (83.3%) (Figure 14).

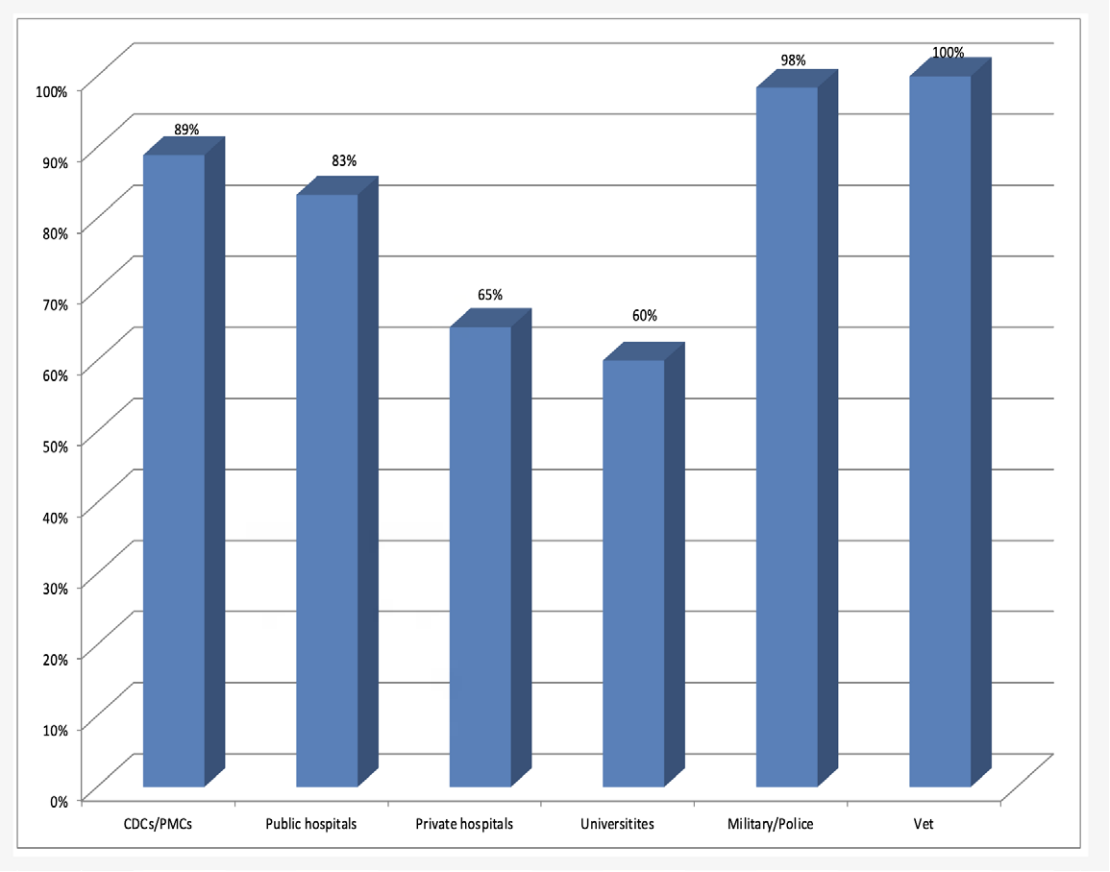

Figure 14. The rate of facilities announcing BSL2 for microorganism testing labs

4.3 EQUIPMENT

Table 4. Essential equipment to perform testing techniques

Equipment for isolation culture	Essential equipment for performing serological techniques	Essential equipment for performing molecular biology techniques
1. BSL2 cabinet	1. ELISA Machine	1. PCR Machine
2. CO2 incubator or normal incubators with closed containers		2. Electrophoresis tank
3. Normal fridges		3. Electro-electrophoresis system to check PCR products
4. Vortex machine		4. Gel electrophoresis imaging system
5. Optical microscope		5. Refrigerated centrifuges
6. pH meter		6. Conventional centrifuges
7. Water bath		7. Heat block
8. Electronic scales		8. Tempering tank
9. Alcohol lamp		9. Biological safety cabinet / clean cabinet to put samples
10. Smear loops		

Table 4 contains a list of essential equipment for performing basic groups of assay techniques, which include 10 types of devices for isolation culture, 1 type of devices for serology technique, and 9 types of devices for molecular biology technique.

Table 5. The rate of facilities having enough testing equipment

	CDCs/ PMCs	Public Hospitals	Private Hospitals	Universities	Military/ police	Vet	Total
	n = 64 (%)	n = 72 (%)	n = 17 (%)	n = 5 (%)	n = 12 (%)	n = 6 (%)	n = 176 (%)
Equipment for isolation culture	98.4 %	59.7%	41.2%	80%	75%	100%	74.9%
Serological equipment	98.4%	50%	52.9%	20%	75%	100%	70.3%
Molecular biology equipment	20.3%	4.2%	5.9%	60%	25%	83.3%	15.4%
Realtime-PCR	76.6%	52.8%	41.2%	80%	83.3%	100%	64.6%
Automatic extraction device	51.6%	40.3%	41.2%	40%	83.3%	100%	49.1%

With basic equipment as listed in Table 4, results show that almost 100% of CDCs/ PMCs have sufficient essential equipment to carry out serological and isolation culture techniques. This result is similar for veterinary facilities. For the other facilities, the proportion of facilities with sufficient equipment to perform isolation culture techniques tended to be higher than serological equipment. Only 20% of universities have ELISA machines. Although the rate of facilities having adequate equipment to perform molecular biology techniques is relatively low, especially in the group of public and private hospitals, the proportion of facilities with realtime PCR machines is relatively high, 100% of the veterinary facilities, 80% of the universities, 76.6% of the CDCs/ PMCs and 83.3% of the military/ police facilities, the facilities with automatic extraction machines also account for high rate, from 40% to 100% depending on the groups of facilities. This shows that during the COVID-19 pandemic, many facilities has been supported to invest in buying additional equipment (Table 5).

4.4 HUMAN RESOURCES OF TESTING DEPARTMENTS AND TRAINING NEEDS

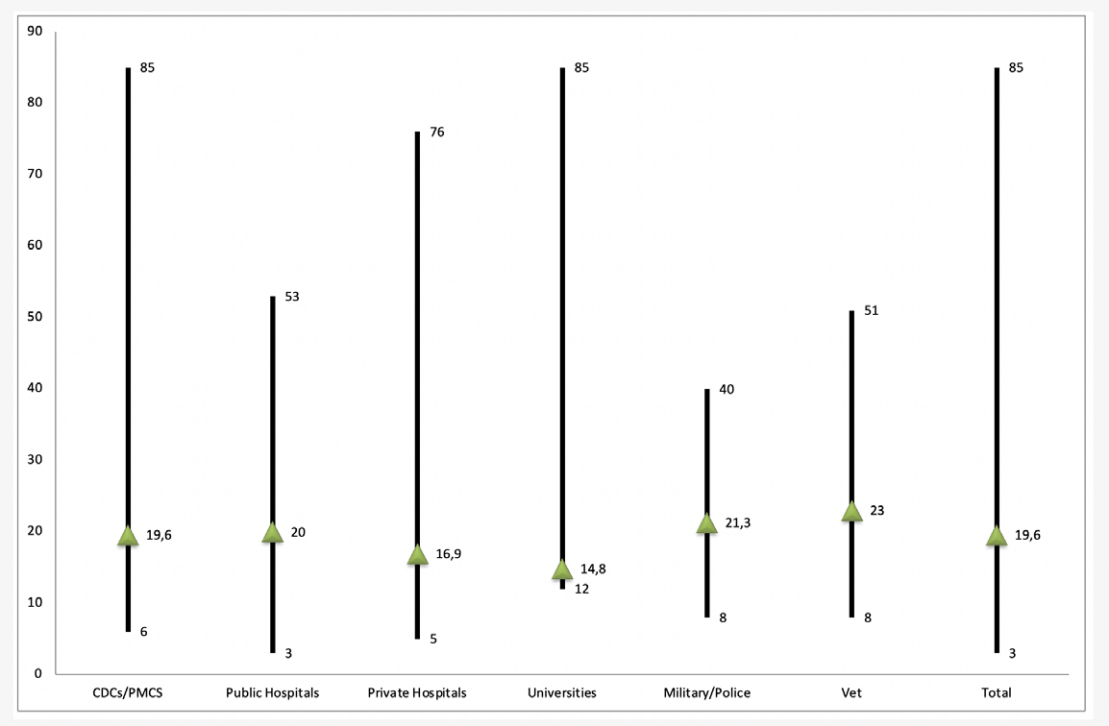

Figure 15. Number of staff members in testing departments

The average number of staff members in each facility is about 20 members, although the number of staff member is lower in universities and private hospitals. In addition, there is also a large difference in the number of staff members in some facilities, such as Hanoi CDC with 85 staff members, Medlatec Hospital with 76 staff members and the University of Medicine and Pharmacy of Ho Chi Minh City with 85 testing workers, while some facilities only have very few staff members in testing departments such as Binh Dien General Hospital, Thua Thien Hue Province, with 3 staff members; CDCs/ PMCs have 6 laboratory testing staff members, (Figure 15).

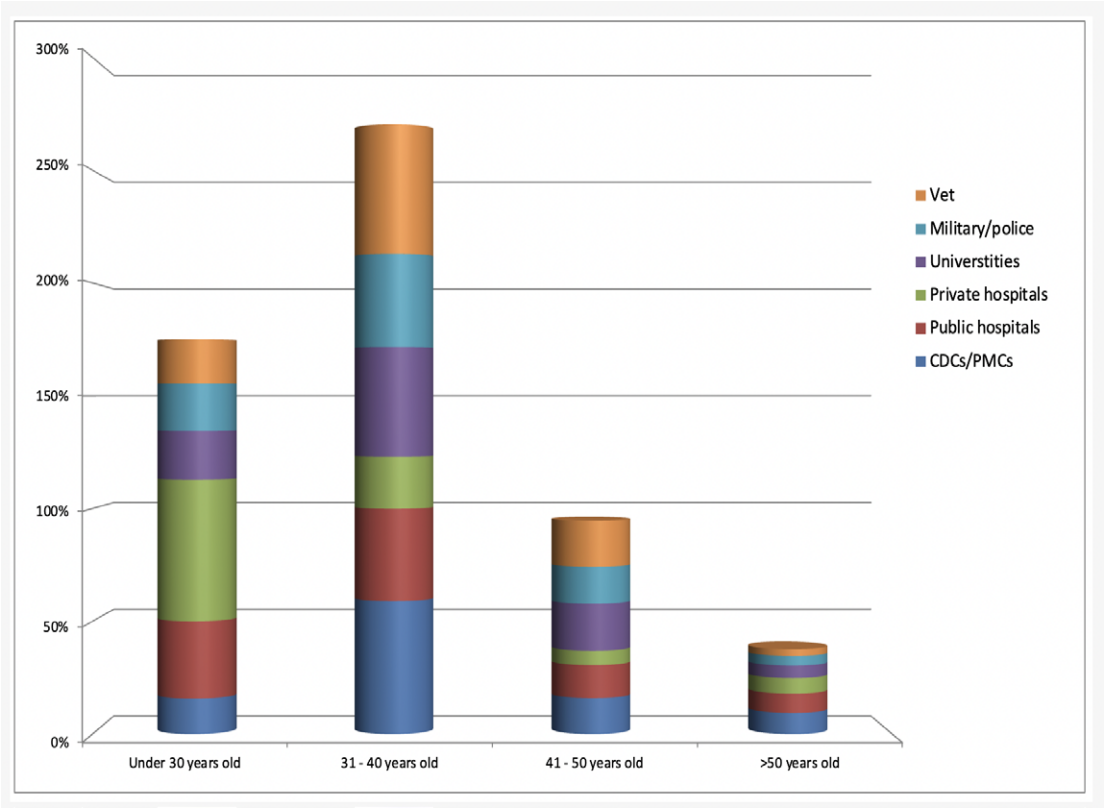

Figure 16. Age distribution of laboratory staff

The workers working in labs in the facilities are mainly at the age of 31- 40 years old in most of the groups of facilities. For the private hospital group, the majority of workers working in testing department are under 30 years old. This is an advantage for the facilities because these age groups that can best contribute to work and promote their competencies (Figure 16).

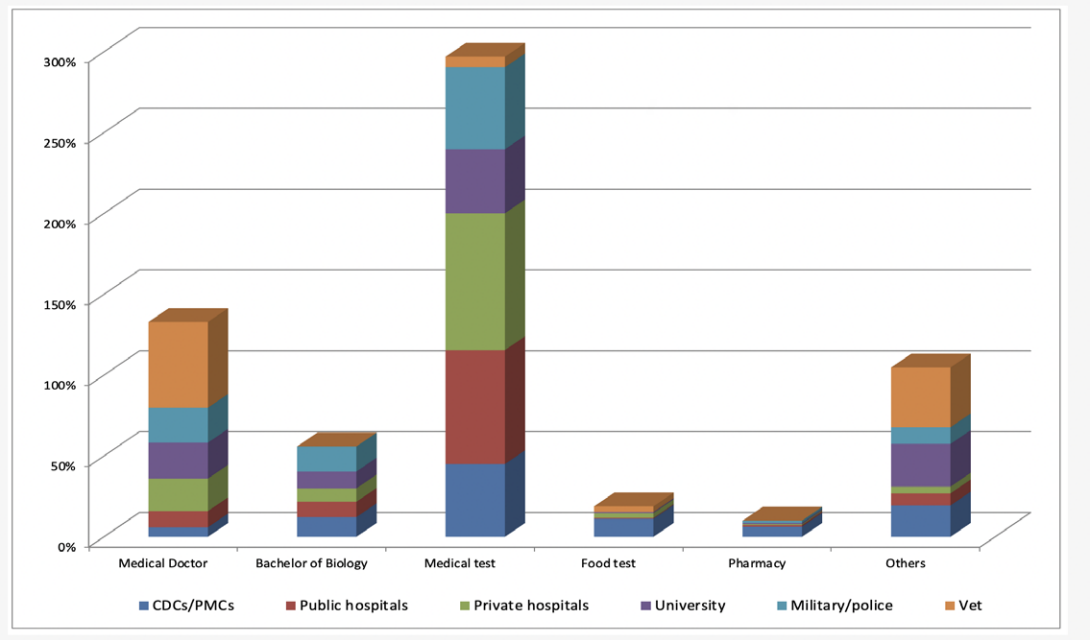

Figure 17. The key majors of the testing workers

The majors of the testing workers in the facilities are mainly medical testing, except for veterinary facilities where they are mainly veterinarians and from other majors. Medical testing is the major of 84% of the total number of testing workers in private hospitals; the number of testing workers having doctors as the major is also relatively high, there is at least 1 doctor in the testing department. The number of doctors in testing department of universities is even more than 6 staff members.

Table 6. Qualifications of testing workers

	CDCs/ PMCs	Public Hospitals	Private hospitals	Universities	Military/ police	Vet
	n = 64 (%)	n = 72 (%)	n = 17 (%)	n = 5 (%)	n = 12 (%)	n = 6 (%)
Post-graduate	12.1%	12.5%	14.2%	57.0%	33.3%	33.3%
University graduate	55.1%	47.0%	52.1%	32.2%	36.6%	52.8%
College/middle level vocational school	25.1%	31.5%	25.4%	2.0%	20.2%	2.2%
Other	7.7%	9.0%	8.3%	8.7%	9.9%	11.7%

Staff qualifications in the facilities are satisfactory. According to the evaluation results, most of the facilities have staff with postgraduate qualifications, especially in veterinary, military / police facilities. As for universities, the proportion of staff with postgraduate degrees accounts for more than 30%. For the CDCs/PMCs, there are also 12.1% of staff with postgraduate qualifications; most of staff of the facilities have university degrees showed that the quality of laboratory staff has also improved significantly (Table 6).

Table 7. Human resource for quality management and biosafety in LABs

	CDCs/ PMCs	Public Hospitals	Private hospitals	Universities	Military/ police	Vet
	n = 64 (%)	n = 72 (%)	n = 17 (%)	n = 5 (%)	n = 12 (%)	n = 6 (%)
Heads of testing departments with QM certificates	78.1%	83.3%	52.9%	80%	91.7%	83.3%
Having staff in charge of QM	89.1%	95.8%	82.4%	80%	91.7%	83.3%
Having staff in charge of biosafety	96.9%	97.2%	70.6%	80%	100%	83.3%
Testing workers have biosafety certificates	75%	66.7%	35.3%	60%	66.7%	50.%

Test quality and biosafety as mentioned above are the most important issues in testing, biosafety training is a mandatory condition for testing workers, Currently, most of the facilities have assigned staff to monitor QM and BS; the results of this assessment also show that more than 2/3 of the facilities have staff in charge of QM and BS. However, there are up to 1/3 or even nearly half of the facilities (the private hospitals) where heads of testing departments have not been trained in QM; BS training for staff of testing department is still modest, especially the group of private hospitals and veterinary facilities only have 35.5% and 50% of staff trained in BS respectively (Table 7).

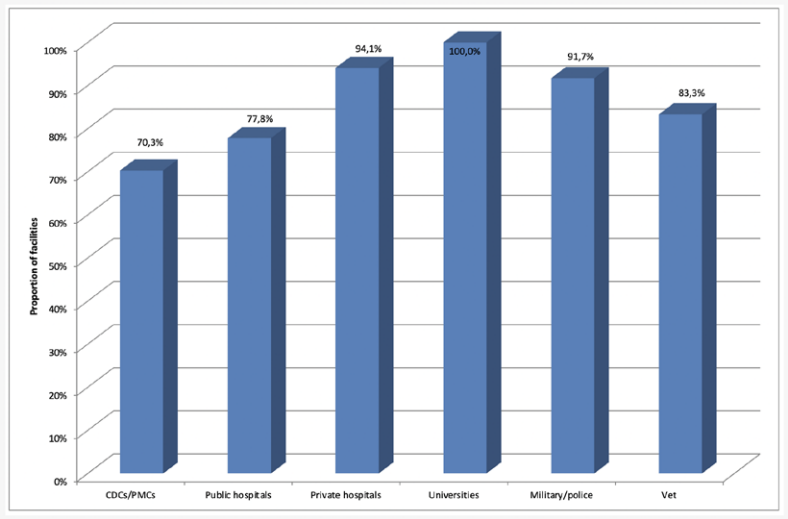

Figure 18. Adequacy of testing workers in the facilitiesv

There have been more and better testing workers in the facilities, which is reported that 100% of the universities, 94% of the private hospitals and 92% of the military/ police facilities can meet the needs for testing workers. But, only about 70% to more than 80% of the remaining facilities think that the number of testing workers meet their work requirements (Figure 18).

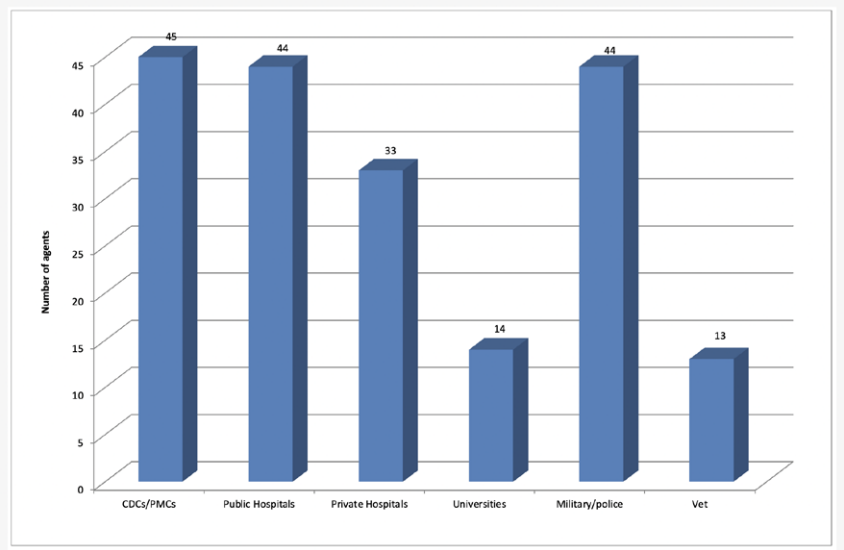

Figure 19. The training needs by quantity of agents

Regarding training for staff on testing techniques to identify the pathogenic agents, all the 45 assessed agents are all mentioned by the CDCs/PMCs and the universities; For the public hospitals and the military/ police facilities, 44/45 agents need training; Number of agents need training the private hospitals are 33 types of agents, while the universities and veterinary facilities only need training for 14 and 13 agents respectively. The training content includes not only the training of new test techniques, but also retraining or updating new content about pathogens (Figure 19).

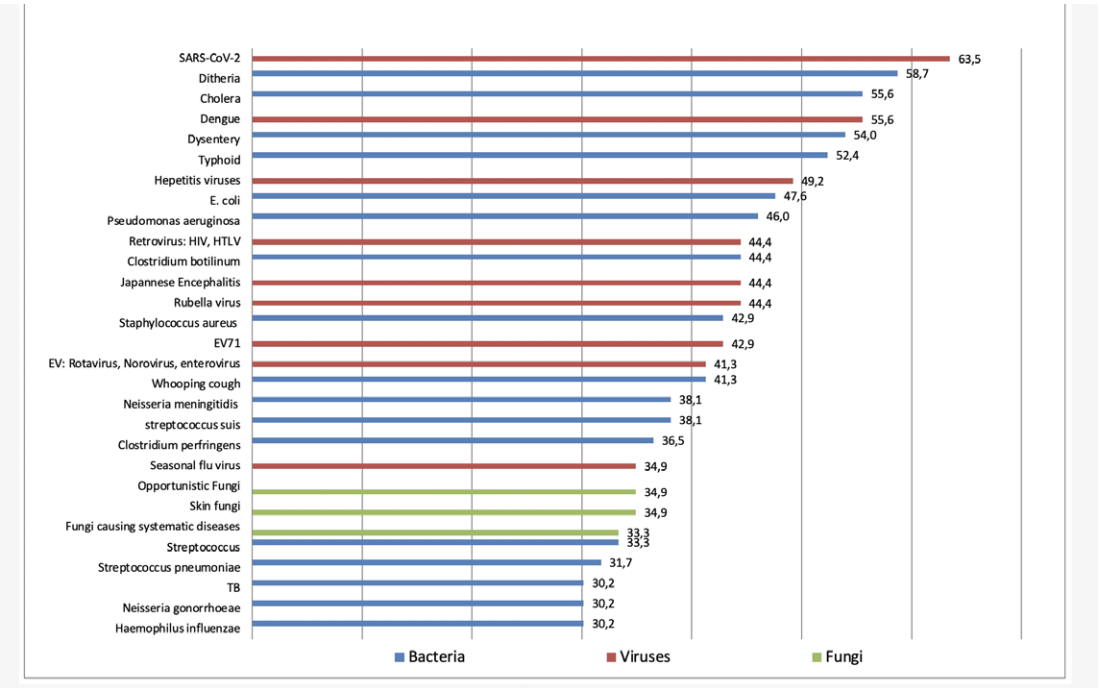

Figure 20. The most common needs for training from CDCs/PMCs

Regarding the specific training needs, each group of facilities has different training needs: the CDCs/ PMCs not only have the largest number of agents that need training, but also have the largest number of centers requested training. Figure 20 contains the agents that required training by from 30% of the centers. The agents with highest needs of training for staff include: SARS-Cov-2, accounting for 63% of the facilities, followed by the group of intestinal and respiratory bacteria, Pseudomonas aeruginosa, and hepatitis viruses. In addition to SARS-CoV-2, up to 8 other groups of viruses that need training. Especially, fungal agents are also requested training by the CDCs/ PMCs.

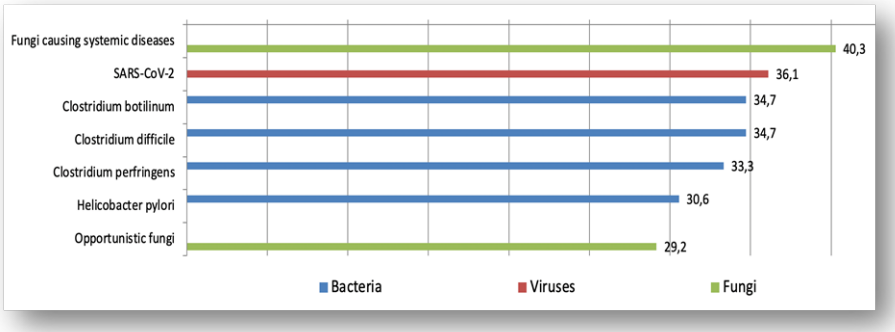

Figure 21. Greatest needs for training of public hospitals

For public hospitals, training needs are only scattering in a few facilities with the highest number of requests of training on fungi causing systemic diseases (40%) followed by SARS-CoV-2. In addition, group of anaerobic bacteria is also requested by many hospitals, accounting for over 30% of the facilities (Figure 21).

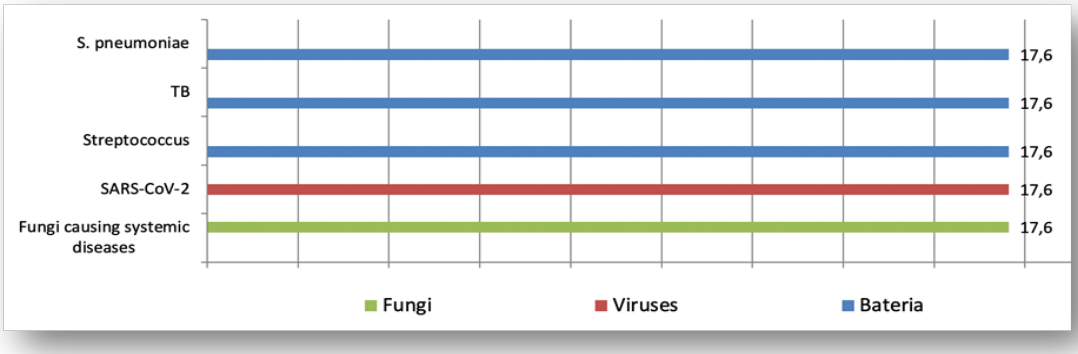

Figure 22. Greatest needs for training of private hospitals

For private hospitals, the number of facilities with training needs is not high, mainly focusing on 5 agents as shown in Figure 22. However, the SARS-CoV-2 receives interest from private hospitals. In fact, microbiological tests are not a priority option for private hospitals that are less responsive to service development.

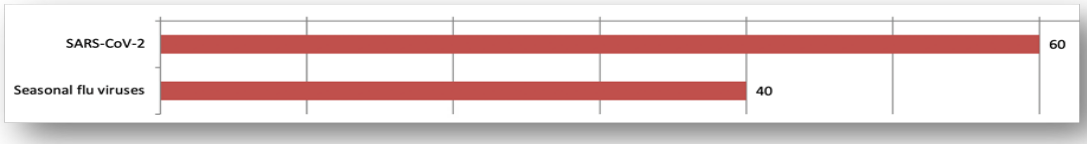

Figure 23. Greatest needs for training of universities

Not many universities have the need for training in testing techniques. The main agents requested training are SARS-CoV-2 and influenza viruses. Some other agents are only requested be one institution (Figure 23).

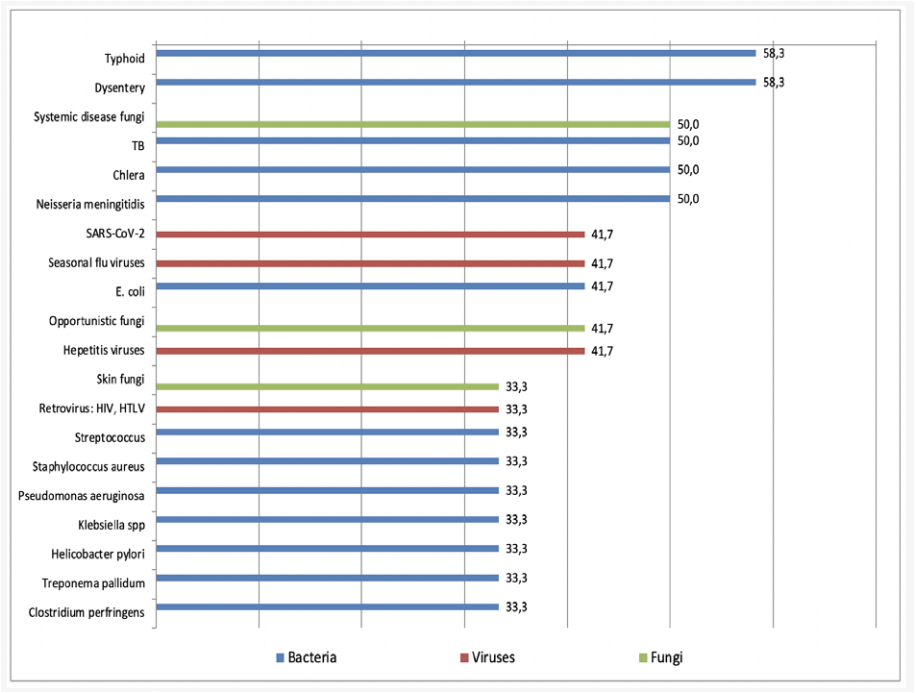

Figure 24. Greatest needs for training of military/police facilities

Training needs from military/ police facilities are relatively diverse, from common agents to uncommon agents, including bacteria, viruses and fungi. In addition to SARS-CoV-2, other viral agents such as seasonal flu, hepatitis virus, and Retroviruses are requested for training in military/ police facilities (Figure 24).

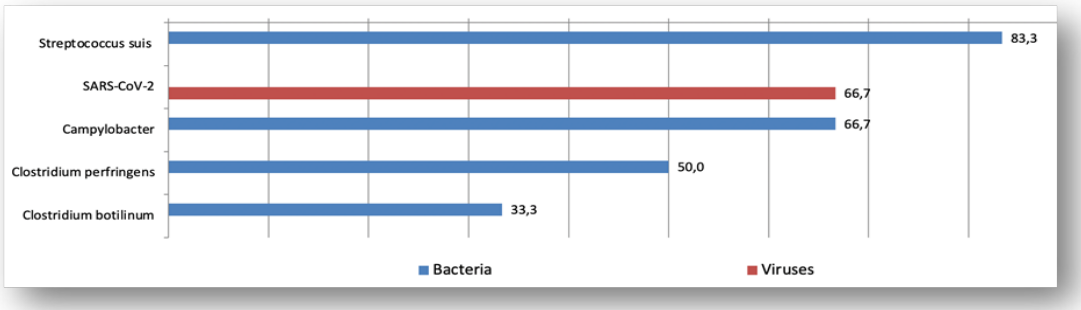

Figure 25. Greatest needs for training of Vet facilities

For veterinary facilities, training needs concentrated in both human and animal pathogens. The assessment results showed that training needs focused mainly on 3 types of bacteria and SARS-CoV-2 virus (Figure 25).

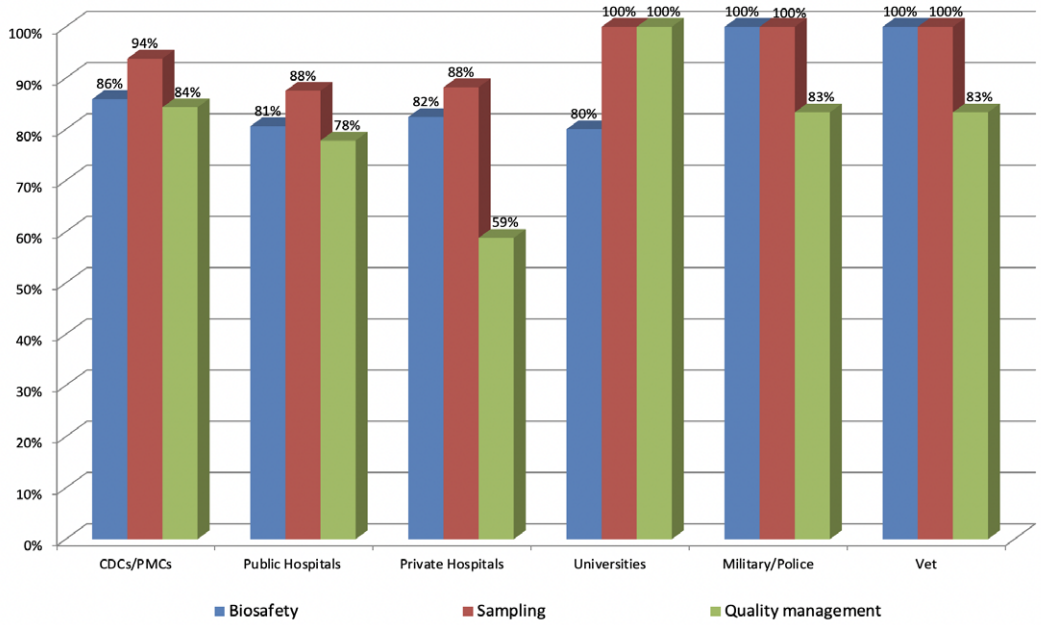

Figure 26. Training needs in biosafety, sampling and QM

Training needs in biosafety, QM, sample collection, preservation, and transportation are requested by most of the facilities, it showed that the facilities have great interest for test quality and issues related to biosecurity. Especially, for the universities, military/police and vet facilities, training needs in such topics were requested by 100% of the facilities (Figure 26).

4.5 EPIDEMIC RESPONSE

Assessment of the level of epidemic response in the facilities includes 6 groups of supporting factors: reported information, budget, human resources, equipment, chemicals/ biologicals and requirements for test quality assurance and biosecurity. For facilities engaged in epidemic control activities, the scale of availability could be divided into 5 levels from 1 to 5, of which 1 reflects the lowest availability and least engagement in epidemic prevention and control activities and 5 represents the highest availability and greatest engagement in epidemic prevention and control. As the key facilities in epidemic prevention and control, assessment results show that for CDCs/PMCs, the availability and engagement in epidemic prevention are mainly at level 4 and 5, of which the engagement in terms of reported information and the availability of budget for epidemic prevention was assessed at level 5, and the other factors are assessed at level 4. No facility is assessed as either unavailable or not engaging in epidemic prevention and control.

For the group of public hospitals, the engagement and availability were assessed at level 4 in most factor groups. The reported information group was assessed at level 5 and the availability of budget for epidemic prevention and control was rated at level 3. Even so, there is at least 1 facility rated as not participating in the reporting system and was not informed about epidemic situation and 3 hospitals see that there was no budget plan for epidemic prevention and control.

For private hospitals, there is no hospital assessed as unavailable or not engaging in epidemic prevention and control. The assessment results tend to be highest at level 5 with most of the groups of factors, although some hospitals still rated them at level 2 or 3. Human resources involved in epidemic prevention and control are rated at level 3.

For the group of universities, the majority of the institutions rated the availability and participation in epidemic prevention and control as level 1. Even some institutions assessed themselves as neither having information to report nor reporting on epidemics; and there is no funding plan for epidemic prevention and control. However, human resources involved in epidemic prevention and control are rated at level 5.

For military/ police facilities, more than half of the facilities rated most groups of factors at level 4 and none of them assessed themselves as not participating or unavailable for disease prevention and control.

For veterinary facilities, none of them assessed as not participating or not available, but the level is very low (level 1). From 50% to 83.3% of facilities rated the availability and engagement in epidemic prevention and control at level 4.

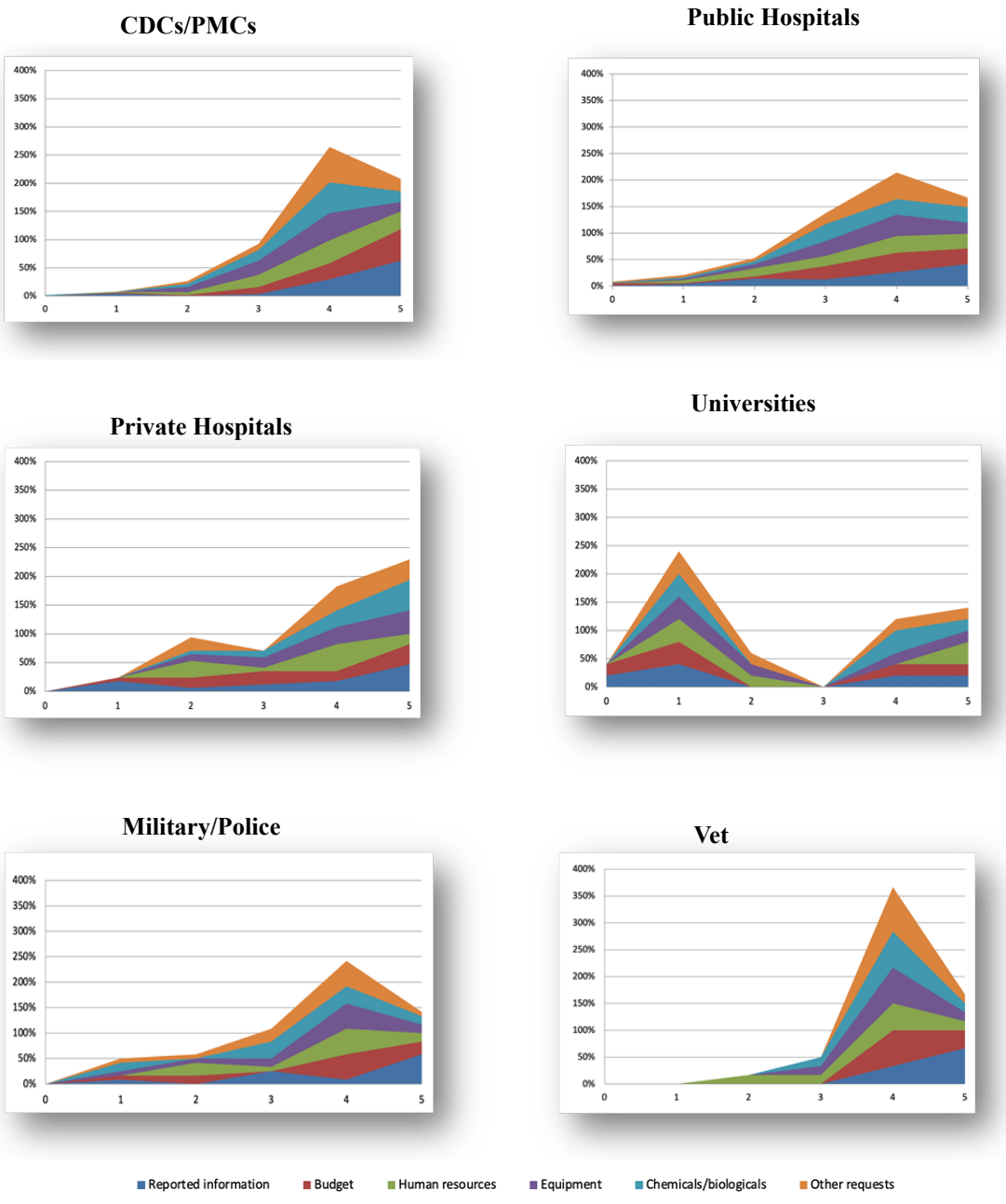

Figure 27. The level of epidemic response in the facilities

CHAPTER 05

CONCLUSION

a. The facilities have EQA program and training needs to improve the quality of staff and the quality of testing, especially the CDCs/PMCs.

b. The capacity to test for pathogenic microorganisms of the assessed facilities from survery participating countries are well functioning, reflected in a wide variety of agents handled, as well as high technology application capabilities.

c. Physical facilities and equipment invested in testing microorganisms causing diseases and epidemics of the facilities are quite reliable, especially veterinary facilities.

d. The human resources conducting the test has also been better in terms of quantity and quality, although there are still some facilities that have not yet fully met with their job requirements.

e. Level of epidemic response in the facilities and availability/readiness are high level in most participating units

LIMITATIONS

a. The data from survey report are provided by laboratories from Lao P.D.R and Vietnam and reflects information from 175 participating laboratories, which represent 60% of hospitals, staff/ CA units and universities from participating countries

b. The questionnaire was developed and sent out by email or web-based tools for Cambodia, Lao P.D.R, Myanmar, and Viet Nam; including public health laboratories and hospitals. However 2 countries responsed before 15 March 2021, which is targeted date for developing of this survey report.

CHAPTER 06

RECOMMENDATIONS

a. This survey report to support EQA program and training, updating and capacity development for the facilities with needs, with special emphasis on QM and BS training and particularly for private hospitals.

b. It is important to maximize the ability to use physical facilities and equipment available in the facilities, especially CDCs/PMCs.

c. Strengthen coordination and build a network to support collaboration among different facilities inside and outside the health sectors to improve capacity for testing and disease prevention.

d. This survey results to be adopted and expanded for next regional, national, and subnational studies.

e. Support from development partners also important role for strengthening EQA network establishment.

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1. The Government. Decision No. 153/2006/QD-TTg dated June 30, 2006 of the Prime Minister on: 'Approving the master plan for development of the health system of Vietnam for the period up to 2010 and a vision to 2020'. Hanoi: Government; 2006.

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5. The Ministry of Health. Circular No. 41/2016/TT-BYT dated November 14, 2016 of the Minister of Health on 'Promulgating the list of microorganisms causing infectious diseases by risk group, biosafety level and techniques appropriate for tests'. Hanoi: Ministry of Health; 2016.

ANNEXES

1. LIST OF SURVEY PARTICIPANTS

No	Organization	Country
1.	Lai Chau Center for Disease control	Viet Nam
2.	Quang Binh Center for Disease control	Viet Nam
3.	Long An Center for Disease control	Viet Nam
4.	Hai Phong Center for Disease control	Viet Nam
5.	Ninh Thuan Center for Disease control	Viet Nam
6.	Nam Dinh Center for Disease control	Viet Nam
7.	Hoa Binh Center for Disease control	Viet Nam
8.	Ha Giang Center for Disease control	Viet Nam
9.	Lam Dong Center for Disease control	Viet Nam
10.	Binh Duong Center for Disease control	Viet Nam
11.	Ha Noi Center for Disease control	Viet Nam
12.	Tuyen Quang Center for Disease control	Viet Nam
13.	Ninh Binh Center for Disease control	Viet Nam
14.	Phu Tho Center for Disease control	Viet Nam
15.	Hai Duong Center for Disease control	Viet Nam
16.	Quang Ngai Center for Disease control	Viet Nam
17.	Soc Trang Center for Disease control	Viet Nam
18.	Cao Bang Center for Disease control	Viet Nam
19.	Ca Mau Center for Disease control	Viet Nam
20.	Lao Cai Center for Disease control	Viet Nam
21.	Bac Ninh Center for Disease control	Viet Nam
22.	Dak Lak Center for Disease control	Viet Nam

No	Organization	Country
23.	An Giang Center for Disease control	Viet Nam
24.	Tien Giang Center for Disease control	Viet Nam
25.	Thua Thien Hue Center for Disease control	Viet Nam
26.	Dong Nai Center for Disease control	Viet Nam
27.	Thanh Hoa Center for Disease control	Viet Nam
28.	Vinh Long Center for Disease control	Viet Nam
29.	Binh dinh Center for Disease control	Viet Nam
30.	Ha Nam Center for Disease control	Viet Nam
31.	Kien Giang Center for Disease control	Viet Nam
32.	Bac Cạn Center for Disease control	Viet Nam
33.	Ben Tre Center for Disease control	Viet Nam
34.	Hung Yen Center for Disease control	Viet Nam
35.	Thai Nguyen Center for Disease control	Viet Nam
36.	Can Tho Center for Disease control	Viet Nam
37.	Son La Center for Disease control	Viet Nam
38.	Binh Phuoc Center for Disease control	Viet Nam
39.	Thai Binh Center for Disease control	Viet Nam
40.	Bac Giang Center for Disease control	Viet Nam
41.	Vinh Phuc Center for Disease control	Viet Nam
42.	Đak Nong Center for Disease control	Viet Nam
43.	Bac Lieu Center for Disease control	Viet Nam
44.	Lang Son Center for Disease control	Viet Nam
45.	Tra Vinh Center for Disease control	Viet Nam
46.	Tay Ninh Center for Disease control	Viet Nam
47.	Phu Yen Center for Disease control	Viet Nam
48.	Dien Bien Center for Disease control	Viet Nam
49.	Khanh Hoa Center for Disease control	Viet Nam
50.	Kon Tum Center for Disease control	Viet Nam
51.	Quang Nam Center for Disease control	Viet Nam
52.	Quang Tri Center for Disease control	Viet Nam
53.	Nghe An Center for Disease control	Viet Nam

No	Organization	Country
54.	Ha Tinh Center for Disease control	Viet Nam
55.	Yen Bai Center for Disease control	Viet Nam
56.	Quang Ninh Center for Disease control	Viet Nam
57.	Dong Thap Center for Disease control	Viet Nam
58.	Binh Thuan Center for Disease control	Viet Nam
59.	Gia Lai Center for Disease control	Viet Nam
60.	Hau Giang Center for Disease control	Viet Nam
61.	HCM Center for Disease control	Viet Nam
62.	Vung Tau Center for Disease control	Viet Nam
63.	Đa Nang Center for Disease control	Viet Nam
64.	National Center for Laboratory and Epidemiology	Laos
65.	Dien Bien Provincial General hospital	Viet Nam
66.	Ha Tinh Provincial General hospital	Viet Nam
67.	Ba Ria Hospitall	Viet Nam
68.	Long An Provincial General hospital	Viet Nam
69.	Lao Cai Provincial General hospital	Viet Nam
70.	Binh Đinh Provincial General hospital	Viet Nam
71.	Thong Nhat General hospital	Viet Nam
72.	Bai Chay Hospital	Viet Nam
73.	Quang Tri Provincial General hospital	Viet Nam
74.	Nguyen Đinh Chieu General hospital	Viet Nam
75.	Soc Son General hospital	Viet Nam
76.	An Giang Central General Hospital	Viet Nam
77.	General Hospital in the North of Binh Thuan	Viet Nam
78.	Nguyen Trai Hospital	Viet Nam
79.	Van Dinh General Hospital	Viet Nam
80.	Hung Yen Provincial General Hospital	Viet Nam
81.	Bac Thang Long Hospital	Viet Nam
82.	Ninh Hoa General Hospital	Viet Nam
83.	Nghia Lo Regional General Hospital	Viet Nam

No	Organization	Country
84.	Binh Duong Provincial General Hospital	Viet Nam
85.	Kon Tum Provincial General Hospital	Viet Nam
86.	Thanh Tri General Hospital	Viet Nam
87.	Pham Ngoc Thach Hospital	Viet Nam
88.	Lang Son Provincial General Hospital	Viet Nam
89.	Lam Dong II Hospital	Viet Nam
90.	Tra Vinh General Hospital	Viet Nam
91.	Trung Vuong Hospital	Viet Nam
92.	Gia Dinh People Hospital	Viet Nam
93.	Saint Paul General Hospital	Viet Nam
94.	Sa Dec General Hospital	Viet Nam
95.	Southern Regional Hospital in the Northern of Quang Nam	Viet Nam
96.	Hong Ngu Regional General Hospital	Viet Nam
97.	Lam Dong Provincial General Hospital	Viet Nam
98.	Danang Transport Hospital	Viet Nam
99.	Ninh Binh General Hospital	Viet Nam
100.	Ha Dong General Hospital	Viet Nam
101.	Thanh Nhan Hospital	Viet Nam
102.	Binh Dan hospital	Viet Nam
103.	Post Office General Hospital - Facility I	Viet Nam
104.	Binh Thuan Provincial General Hospital	Viet Nam
105.	Hai Phong Viet Tiep Friendship Hospital	Viet Nam
106.	Ba Tri Regional General Hospital	Viet Nam
107.	Trieu Hai Regional General Hospital	Viet Nam
108.	Dong Da General Hospital	Viet Nam
109.	Hoa Nhai General Hospital	Viet Nam
110.	Hung Vuong Hospital	Viet Nam

No	Organization	Country
111.	Binh Dien General Hospital	Viet Nam
112.	General Hospital in the Southern of Binh Thuan	Viet Nam
113.	Duc Giang General Hospital	Viet Nam
114.	Bac Ninh Provincial General Hospital	Viet Nam
115.	Hai Duong Provincial General Hospital	Viet Nam
116.	Thanh Hoa Provincial General Hospital	Viet Nam
117.	Ha Giang Province General Hospital	Viet Nam
118.	Bac Kan Provincial General Hospital	Viet Nam
119.	Thai Binh Provincial General Hospital	Viet Nam
120.	Nam Thang Long Hospital	Viet Nam
121.	Phu Tho Provincial General Hospital	Viet Nam
122.	Cao Bang Provincial General Hospital	Viet Nam
123.	Tuyen Quang Provincial General Hospital	Viet Nam
124.	Son La Province General Hospital	Viet Nam
125.	Soc Trang Province General Hospital	Viet Nam
126.	Ca Mau General Hospital	Viet Nam
127.	Kien Giang General Hospital	Viet Nam
128.	Hoa Binh Provincial General Hospital	Viet Nam
129.	Nghe An General Friendship Hospital	Viet Nam
130.	Bac Giang Provincial General Hospital	Viet Nam
131.	Ha Nam Provincial General Hospital	Viet Nam
132.	Nam Dinh Provincial General Hospital	Viet Nam
133.	Dak Nong Provincial General Hospital	Viet Nam
134.	Hau Giang Provincial General Hospital	Viet Nam
135.	Bac Lieu Provincial General Hospital	Viet Nam
136.	Military Hospital 5 - Military District 3	Viet Nam
137.	Viet Nga Tropical Center	Viet Nam

No	Organization	Country
138.	Military Hospital 7A	Viet Nam
139.	198 Hospital - Ministry of Public Security	Viet Nam
140.	354 Hospital	Viet Nam
141.	Military Hospital 175 - HCM	Viet Nam
142.	Military Hospital 105	Viet Nam
143.	Hospital 103	Viet Nam
144.	Hospital 4, Logistics Department of Military District 4	Viet Nam
145.	110 Hospital - Bac Ninh	Viet Nam
146.	Military Institute of Preventive Medicine	Viet Nam
147.	108 Hospital	Viet Nam
148.	199 Hospital - Ministry of Public Security	Viet Nam
149.	Hai Phong Medical University Hospital	Viet Nam
150.	Hue University of Medicine and Pharmacy Hospital	Viet Nam
151.	University Medical center Ho Chi Minh	Viet Nam
152.	Hanoi Medical University Hospital	Viet Nam
153.	Thai Binh Medical University Hospital	Viet Nam
154.	Minh Anh International Hospital	Viet Nam
155.	Dong Do Hospital	Viet Nam
156.	Hong Duc III General Hospital	Viet Nam
157.	16A Ha Dong Private General Hospital	Viet Nam
158.	An Phuoc Hospital	Viet Nam
159.	Duc Khang Hospital	Viet Nam
160.	Hong Ngoc Hospital	Viet Nam
161.	Hong Ha Private General Hospital	Viet Nam

No	Organization	Country
162.	MEDLATEC General Hospital	Viet Nam
163.	Tam Anh General Hospital	Viet Nam
164.	Vinmec International General Hospital	Viet Nam
165.	Vinmec Central Park International General Hospital	Viet Nam
166.	Hoan My Saigon Hospital	Viet Nam
167.	Trang An Private General Hospital	Viet Nam
168.	Viet Phap Hospital (FV Hospital)	Viet Nam
169.	Quoc Anh General Hospital	Viet Nam
170.	Phuong Bac General Hospital	Viet Nam
171.	Regional Animal Health Office No.6	Viet Nam
172.	Regional Animal Health Office No.4	Viet Nam
173.	Regional Animal Health Office No.2	Viet Nam
174.	National Centre for Veterinary Diagnosis	Viet Nam
175.	Regional Animal Health Office No.7	Viet Nam
176.	Regional Animal Health Office No.3	Viet Nam

2. SURVEY QUESTIONAIRE

Please go to the following link.
https://mbdsnet.org/wp-content/uploads/2021/11/Survey_Questionnaire.pdf