

**MINISTRY OF EDUCATION
& TRAINING**

MINISTRY OF HEALTH

NATIONAL INSTITUTE OF HYGIENE AND EPIDEMIOLOGY

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**CURRENT SITUATION OF CAPACITY OF VIETNAM
INTERNATIONAL HEALTH QUARANTINE CENTRES TO
MEET REQUIREMENTS OF THE INTERNATIONAL
HEALTH REGULATIONS**

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BACK GROUND

Border health quarantine plays an important role in timely detecting and preventing dangerous epidemic diseases and contributing to ensuring national health security. Border health quarantine system of Viet Nam has actively contributed to the prevention of cross border transmission of infectious epidemic diseases. The International Health Regulations (IHR) requires countries to equip with core capacities in prevention and response to infectious diseases and public health events. The assessment of the capacity of Vietnam's International Health Quarantine Centres (IHQ) in the context of globalization and international integration is found necessary to meet the requirements of the IHR and so as to propose the development orientations to improve national capacity in cross border prevention and control of dangerous infectious diseases. Research topic "*Current situation of capacity of Vietnam International Health Quarantine Centres to meet requirements of the International Health Regulations*" is given with the following objectives:

1. Describe the current capacity of Vietnam's International Health Quarantine Centres to meet requirements of the International Health Regulations in 2016.
2. Evaluate the effectiveness of some intervention measures to strengthen capacity in surveillance and prevention of the Ebola virus disease at points of entries in Viet Nam.

NEW CONTRIBUTIONS OF THE THESIS

1. It is the first study conducted at all 13 IHQ centres in Vietnam to assess the real situation of human resources, facilities, essential equipment and the abilities of responding to the epidemic spread through the border gate following the IHR approach and in the context of international integration.
2. Application of intervention measures to enhance the capacity of Ebola virus surveillance and response confirms that intensive training for health quarantine officers is one of effective interventions in prevention of entry of infectious diseases into Viet Nam.
3. The study has revealed a number of shortcomings and limitations of Vietnam's border health quarantine system as a basis for proposing recommendations to improve the operational efficiency of the border health quarantine system.

STRUCTURE OF THE THESIS

The thesis consists of 146 pages, 4 chapters, 37 tables, 02 charts and 08 figures; the appendix includes 119 references (59 in Vietnamese, 60 in English) and investigative tools. In which: Background (2 pages); Research objectives (1 page); Chapter 1 – Literature review (30 pages); Chapter 2 - Research methods (18 pages); Chapter 3 - Research results (32 pages); Chapter 4 - Discussion (22 pages); Conclusion (2 pages); Recommendations (1 page) and list of research publications (01 page).

CHAPTER 1: LITERATURE REVIEW

1.1. General health quarantine and International Health Regulations

1.1.1. History and concept of health quarantine

Health quarantine has existed in the world since the beginning of the XIV century with the aim to protect coastal cities from the spread of plague. Health quarantine activities are implemented by a state organization with purpose of protecting the community from being infected by infectious diseases transmitted into from other places based on regulations and laws of that country. "Health quarantine is a medical examination to detect quarantined diseases and to monitor infectious diseases likely causing harms to people, means of transport entry/exit, luggage and goods, postal parcels imported/exported in accordance with the provisions of the IHR".

1.1.2. Infectious disease epidemic in the context of globalization

In the world, newly emerging infectious and infectious diseases have always developed in a complicated way with potential risks of becoming outbreaks and pandemics. In recent years, some dangerous infectious diseases such as influenza A (H7N9), influenza A (H5N1), MERS-CoV, Ebola, yellow fever ... have been recorded in many places. In the current trend of globalization, travel and trade between countries all over the world have created favorable conditions for dangerous infectious diseases to easily cross border spread between countries and between continents.

1.1.3. The role of border health quarantine in preventing infectious diseases

In the context of globalization, the role of border health quarantine is increasingly important and an integral part of the system of surveillance and prevention of dangerous infectious diseases. Border health quarantine plays an important and necessary role to ensure national health security and contribute to ensuring global health security. Health quarantine units are considered as frontline forces in monitoring, detecting and preventing contagious infectious diseases at border gates.

1.1.4. International Health Regulations

The International Health Regulations (IHR) is an international legal document that applies to all countries committed to the prevention, protection, control and response of dangerous infectious diseases and public health events likely to spread internationally. The IHR requires all member states to strengthen 13 core capacities including capacity for points of entry. As specified in the IHR, this core capacity includes:

- The regular capacities: Availability of materials, facilities, equipment and human resources capable of inspecting and supervising health quarantine subjects; Readiness of medical services to monitor, detect and handle medical treatment at border gates; Availability of necessary equipment for transporting sick or suspected passengers with infectious diseases.
- The capacities of preparedness and response to public health events may cause international concern: Implementing health quarantine and surveillance activities for passengers exit and entry at border gates; arranging isolation and health quarantine areas and applying medical treatment measures at border gates.

1.2. Border health quarantine in the world

Almost all countries in the world are implementing the IHR's core capacities as committed to the World Health Organization (WHO), in which international health quarantine is mandatory. Although countries have different health quarantine models in term of structural organization and operation, they basically share the same purpose of strictly monitoring of such health quarantine subjects as people, goods and conveyances at the border gates so as to detect and prevent the international spread of dangerous infectious diseases.

1.3. Border health quarantine in Vietnam

1.3.1. Legal basis for implementing border health quarantine activities

In Viet Nam, the border health quarantine activities have been implemented in compliance with the the Law on Prevention and Control of Infectious Diseases; Decree on border health quarantine issued by the Government; guidelines and technical documents on border health quarantine issued by the Ministry of Health and other related ministries/sectors.

1.3.2. Border health quarantine system

At central level, the General Department of Preventive Medicine directly advises the Minister of Health and takes the lead of guidance to implementation of border health quarantine activities nationwide. Hygiene and Epidemiology and Pasteur Institutes are responsible to direct, supervise and support for local health quarantine units in term of technical issues. At

provincial level, in addition to 13 IHQ Centres, there are 29 Preventive Medicine Centres carrying out border health quarantine activities at airports, ports, border gates and railway.

CHAPTER 2: RESEARCH METHOD

2.1. Objective 1: Current situation of capacity of Vietnam IHQ Centres to meet the IHR's requirements in 2016

2.1.1. Describe current situation of Vietnam IHQ Centres' capacity

2.1.1.1. Research subjects

- Facilities, human resources and equipment of IHQ Centres.
- Managers and experts on border health quarantine of GDPM and IHQ Centres.
- Annual reports, assessment reports, statistics of GDPM and IHQ Centres.
- Legal documents, technical guidelines on border health quarantine.

2.1.1.2. Study time: From January to June 2016.

2.1.1.3. Research location: GDPM and 13 IHQ Centres of Vietnam.

2.1.1.4. Research design: cross-sectional survey, comparative analysis, combined quantitative and qualitative method.

2.1.1.5. Sample size:

- For quantitative method: intensively selected 13 IHQ centres.
- For qualitative research: Leaders of GDPM, leaders of Border Health Quarantine Division and leaders of 13 IHQ centres.

2.1.1.6. Research content: Human resources, facilities, equipment and core capacities as required by the IHR.

2.1.1.7. Research variables: Variables of facilities, equipment, and human resources in accordance with the research contents.

2.1.1.8. Research tool: Use quantitative information collection form and semi-structured questionnaire form for in-depth interviews.

2.1.2. Assessing knowledge, attitudes and practices of health workers in monitoring and preventing Ebola virus disease

2.1.2.1. Subjects: Managers, experts, health quarantine officers working in IHQ Centres of provinces/cities.

2.1.2.2. Study time: From January to June 2016.

2.1.2.3. Location: in 13 IHQ Centres.

2.1.2.4. Design: Cross-sectional investigation, analysis of quantitative research results.

2.1.2.5. *Sample size*: 195 health quarantine officers.

The sample size is chosen according to the formula:

$$n = Z_{1-\alpha/2}^2 \frac{p(1-p)}{d^2} \times DE \quad \text{in which:}$$

Z: reliability coefficient = 1.96.

p: is the percentage of health workers who answer correctly the professional requirements. Choose $p = 0.5$ to reach the maximum minimum sample size; $q = 1 - p = 0.5$

d: is the permissible error (choose 10%); DE: is the design effect = 2

2.1.2.6. *Sampling method*: randomly select 15 health quarantine officers from IHQ Centres.

2.1.2.7. *Research content*: Research on knowledge, attitude and behavior of health workers for monitoring and prevention of Ebola virus disease.

2.1.2.8. *Research variables*: According to the research contents.

2.1.2.9. *Research process*: According to the field survey steps.

2.1.2.10. *Research tool*: A set of questionnaires for personal interview

2.2. Objective 2: Evaluate the effectiveness of some intervention measures to improve the capacity of monitoring and prevention of the Ebola virus disease at points of entry in Vietnam.

In 2015, the Ebola virus disease outbreak occurred in Africa and became a public health event that caused international concern with a great potential risk of international spread. Thus, the Ebola virus disease was selected to evaluate the effectiveness of intervention to improve surveillance and prevention of the disease from entering into Vietnam.

2.2.1. *Subjects of the study*: Health quarantine officers of IHQ centers with two intervention and control groups

2.2.2. *Intervention time*: 7 months, from 12/2016 to 7/2017.

2.2.3. *Intervention location*:

- 3 intervention points of entry: Lao Cai, Da Nang, TP. Ho Chi Minh.

- 3 control points of entry: Lang Son, Khanh Hoa and Hai Phong.

2.2.4. *Design of intervention research*: Control intervention, combining analysis of results before and after intervention to evaluate effectiveness.

2.2.5. *Sample size and sampling method*: Select the whole sample.

2.2.6. *Research content*: Knowledge, attitude, practice on Ebola virus disease prevention and control of health workers.

2.2.7. *Intervention measures*: Intensive training on legal documents, technical guidelines of monitoring process and implementation of supportive monitoring in IHQ Centres.

2.2.8. *Research variables*: According to the research contents.

2.2.9. *Evaluation of intervention effectiveness*: Using efficiency index (EI) is calculated according to the formula:

$$EI (\%) = \frac{|p1-p2| \times 100}{p1} \quad \text{in which:}$$

- p1 is the percentage of efficiency index at the time of pre-intervention.
- p2 is the percentage of efficiency index at the time of post-intervention.

The true effectiveness of intervention is calculated by comparing before and after intervention and with the control group:

Intervention efficiency = Equality (intervention group) - Equitization (control group)

2.2.10. *Implementation steps*: According to the intervention process.

2.2.11. *Research tools*: Use a set of personal interview questionnaires.

2.3. *Research errors*: Errors often occur during data collection and data entry. Error should be avoided at designing and testing toolkits, and by selecting experienced and honest investigators.

2.4. *Data processing and analysis*: Clean data before using Epidata 3.1. Data processing on Stata 12 software.

2.5. *Research ethics*: The Council of Science and Ethics of the National Institute of Hygiene and Epidemiology approved.

CHAPTER 3: RESEARCH RESULTS

3.1. Real situation of the capacity of Vietnam IHQ to meet the IHR's requirements in 2016

3.1.1. Status of regular capacities at points of entry

3.1.1.1. Types of points of entry

As of 2016, there were 13 IHQ Centres nationwide in charge of 65 points of entry including 19 at international level and 46 at national level, of which there were 5 airports, 22 seaports and 38 ground crossings.

3.1.1.2. Organizational structure of IHQ Centres

Assessment results in 2016 showed that 9/13 IHQ Centres established 4 specialized departments (69.2%); 13/13 (100%) had the Border Health Quarantine Department and the Medical Treatment Department according

to Decision No.14/2007/QD-BYT regulating functions, duties, obligations and organizational structure of the IHQ Centres.

3.1.1.3. Current situation of human resources of IHQ Centres

As of 2016, there were total 389 staff working in 13 IHQ Centres, with an average of 30 officers per unit, of which 48.1% were medical doctors; 6.7% of pharmaceutical specialists. 4/13 Centres recruited enough and exceeded number of permanent staff comparing to regulated number as specified in the Joint Circular 08/2007/ TTLT-BYT-BNV. The number of permanent staff recruited to work for 13 IHQ Centres only met 74.2% of the demand.

16.7% of health workers were doctors or bachelors; staff with post graduate education only accounts for 10.3%, 52.4% of health quarantine staff could use English for working (204 people) and only 10.8% could use computer fluently.

3.1.1.4. Current situation of facilities and equipment

All 13 IHQ Centres had office buildings, 100% of the Centres had clean water supply systems. 100% of international check points had offices for health quarantine performance. At the national check points and sub-border gates, the ratio was 80.9% and 19.2 respectively.

There were 77.8% of international check points with isolation rooms for suspected cases, however, only 20.5% were provided with medical treatment areas.

Medical equipment: 11/13 IHQ Centres were equipped with a laboratory as stipulated in the Decision No. 14/2007 / QD-BYT. 65 check points managed by IHQ Centres were equipped with 45 remote body temperature gauges, and 78 portable and portable body temperature gauges. 100% of the international airports were equipped with remote body temperature gauges.

Medical treatment equipment: Only 10.8% of check points had automatic disinfection systems. All check points had at least 01 ULV chemical sprayer and an electric chemical sprayer used for vehicles disinfection.

All IHQ Centres were equipped with 01 to 03 cars used for health quarantine performance; only Ho Chi Minh IHQ Centre was equipped with canoes for waterway quarantine.

All 19/19 international check points and 39/46 national points of entry were equipped with fixed phone machines and computers with internet connection.

3.1.2. Monitoring capacity at points of entry

Table 3.1. Number of turns of health quarantine subjects checked by year

Year	2012	2013	2014	2015	2016	2017
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Turns of people	6.320.083	6.221.377	8.652.963	13.350.000	19.857.993	31.527.930
Turns of vehicles	334.894	297.134	351.354	412.200	702.870	1.494.514
Turns of aircrafts	58.237	55.048	62.367	78.060	88.053	122.604
Turns of Waterway conveyances	33.687	33.200	34.586	35.220	49.002	60.459
Goods (tons)	4.616.257	4.532.170	5.102.050	5.562.450	8.642.846	15.047.094

The table 3.1 shows that number of turns of people, goods and conveyances checked for health quarantine had increased year by year from 2012 to 2016.

There were 9/13 IHQ Centres to carry out the monitoring of disease transmission vector such as monitoring of rat density, fleas index and density of mosquitoes.

3.1.3. Current status of inter-sectoral coordination at points of entry

13 IHQ Centres signed many written agreements on inter-sectoral coordination with other agencies working at points of entry, especially in duration of the outbreaks of the Ebola virus diseases, MERS-CoV, etc in the world in the past years.

3.1.4. Results of the IHR implementation in Viet Nam

3.1.4.1. Results of the implementation of 13 core capacities as required by the IHR

Table 3.2. The evaluation results of the IHR core capacities by years

TT	Core capacities	% met IHR's requirement					
		2012	2013	2014	2015	2016	2017
1	National laws, policies and finance	60	80	80	100	100	100
2	IHR coordination, communication and advocacy	57	83	100	100	100	94
3	Surveillance	61	66	88	88	100	96
4	Response	92	85	85	89	89	93
5	Preparedness	59	85	95	95	95	86
6	Risk communication	33	70	80	100	100	100
7	Human Resources	57	85	85	100	100	100
8	Laboratory	48	95	100	100	100	91
9	Point of entry	59	89	84	89	94	68
10	Zoonosis	100	92	100	100	100	100
11	Food safety	90	83	100	100	100	92

TT	Core capacities	% met IHR's requirement					
		2012	2013	2014	2015	2016	2017
12	Chemical incidents	38	44	88	88	88	83
13	Nuclear radiation	75	64	100	100	100	82

The table 3.2 shows that Vietnam had significantly improved 13 core capacities of the IHR in the period of 2012-2014. However, evaluation results of the year 2017 revealed that some core capacities had lower percentage of meeting the IHR requirements than the same of year 2016.

3.1.4.2. The evaluation results of Point of entry capacity to meet the IHR

Point of Entry capacity was assessed with 03 indicator groups, including: regular activities implementation at points of entry; regular capacities and capacities of preparedness and response at points of entry. Results of evaluation of Point of entry capacity in the period 2012-2017 were presented in the Table 3.3.

Table 3.3. Evaluation results of the IHR implementation at points of entry in the period of 2012-2017.

Year	Assessment indicator group						% meet requirement
	General activities implementation		Regular capacities		Capacities of preparedness and response at points of entry		
	Yes	No	Yes	No	Yes	No	
2012	8/12	4/12	1/3	2/3	1/2	1/2	59
2013	13/14	1/14	1/2	1/2	3/3	0/3	89
2014	13/14	1/14	2/2	0/2	1/2	2/3	84
2015	13/14	1/14	2/2	0/2	2/3	1/3	89
2016	13/14	1/14	2/2	0/2	3/3	0/3	94
2017	10/14	4/14	2/2	0/2	1/3	2/3	68

Evaluation results show that:

- General activities implementation at points of entry: It recognized improvement of 8/12 indicators "are active" in 2012 to 13/14 "active" indicators in 2013-2016, however this trend changed in 2017.
- The indicator group of regular capacities at points of entry had improved steadily from 2014 to 2017.

- The group of indicators on capacity of preparedness and response at point of entry had not been stable by years as required by the IHR.

3.1.5. Knowledge, attitude, practice of health quarantine officers in surveillance and prevention of Ebola virus disease in 2016

3.1.5.1. Characteristics of group of health quarantine officers at IHQ Centres

59.4% of health quarantine officers participated in the intervention study were male; 61.0% were over the age of 35 years. Most of staff obtained education at college and university level, accounting for 47.7% and 34.9% respectively. 82.6% has medical qualification and the remaining of 17.4% has other specializations.

3.1.5.2. Knowledge of Ebola virus disease

a) Knowledge of pathogens and pathways for disease transmission

Table 3.15. Knowledge of pathogens and transmission routes

Knowledge	Number (n=195)	Percentage (%)
<i>Disease cause factors</i>		
Virus	157	80,6
Bacteria	35	17,9
Parasites	1	0,5
<i>The main route of disease transmission</i>		
Digest	26	13,4
Water pollution	17	8,7
Through insects (mosquitoes, fleas)	35	17,9
Contact through blood, skin, mucosa	114	58,5

The table 3.15 shows that 80.6% of health workers know virus is the the right pathogen causing the disease; 58.5% understand correctly that Ebola virus is transmitted by contact through blood, skin and mucous membranes.

b) Knowledge of symptoms of Ebola virus disease

More than half of health workers interviewed knew two common symptoms of Ebola virus disease, of which hemorrhage or nosebleeds was known by 57.8% of interviewees and vomiting/nausea, acute diarrhea was recognized by 53.4% of interviewees. 71.3% of health workers understand that fever, headache, muscle aches were onset symptoms of the disease.

c) Knowledge of disease case monitoring criteria

Table 3.16. Knowledge of the criteria of Ebola virus disease monitoring

Criteria for determining case of surveillance	Number (n=195)	Percentage (%)
Sudden high fever	132	67,7
Diarrhea, vomiting, nausea	94	48,2

Criteria for determining case of surveillance	Number (n=195)	Percentage (%)
Fatigue, headache, muscle aches	114	58,5
Have a history of staying/ going/ coming from affected area/ country or close contact with Ebola infected person/animal within 21 days.	147	75,4
Have direct contact with the infected case in any circumstances	50	25,6

The table 3.16 shows that up to 75.4% of health workers had a correct understanding of the criteria for determining case of surveillance to identify cases of Ebola virus disease in history, 21 days. However, 25.6% of health workers had not identified important standards such as direct contact with the case.

3.1.5.3. Attitude towards Ebola virus disease

a) Attitude about the danger of disease

Table 3.18. Attitude about the danger of Ebola virus disease to human health

The danger of Ebola	Number (n=195)	Percentage (%)
Very dangerous	31	15,9
Dangerous	96	49,2
Normal	62	31,8
Less dangerous	6	3,1
Not dangerous	0	0,0

According to the table 3.18, 49.2% of health care workers agreed that Ebola virus disease is dangerous, meanwhile 15.9% said this disease was very dangerous to human health.

b) Attitudes about the need for Ebola screening at points of entry

Table 3.19. Attitude about need for Ebola monitoring at points of entry

The need for screening	Number (n=195)	Percentage (%)
Required for all passengers	142	72,8
Only for suspected cases	47	24,1
Not necessary	6	3,1
No need for monitoring	0	0,0

The table 3.19 shows that 72.8% of health workers believe that it is necessary to monitor all passengers for Ebola virus disease at points of entry and 24.1% agree to monitor suspected cases only.

3.1.5.4. Practice of health-care workers for Ebola virus disease

a) Practice on prevention and control of Ebola virus infection

Table 3.20. Practice on prevention of Ebola virus infection

Ebola virus disease prevention measures	Number (n=195)	Percentage (%)
Personal hygiene (hand washing and sanitizing)	109	55,9
No direct contact with patients/secretions	103	52,8
Use personal protection equipment (PPE)	82	42,0
Other measures	25	12,8
Do not know at least 1 of the above measures	0	0,0

The table 3.20 show that all health quarantine officers know at least 01 preventive measures, of whom 55.9% agree with practicing personal hygiene measures such as hand washing and sanitizing; 52.8% said not directly contact with patients or secretions.

b) Steps to screen for Ebola virus disease at points of entry

Table 3.21. Steps for screening Ebola virus disease at points of entry

Steps to screen for Ebola	Number (n=195)	Percentage (%)
Fully description of 3-steps of Ebola screening at points of entry.	98	50,3
Inadequate description of steps	83	42,5
No description	14	7,2

The table 3.21 shows that 50.3% of health quarantine officers provided fully description of 3 steps of screening for Ebola virus disease at points of entry.

c) Surveillance steps in accordance with the health quarantine procedure at points of entry

Table 3.1. Practice on surveillance steps in line with the health quarantine procedure

Surveillance in line with the health quarantine procedure	Frequency	Percentage (%)
Fully practice of 3 steps of surveillance	131	67,2
Partly practice of 3 steps	64	32,8
Unknown	0	0

The table 3.22 shows that 67,2% of health quarantine officers conducted fully practice of 3 steps of surveillance in compliance with the health quarantine procedure at points of entry, 32,8% took insufficient application of these 03 steps. None of health quarantine officers do not know how to conduct surveillance for this disease.

3.2. Effectiveness of some intervention measure to improve the capacity of surveillance and prevention of Ebola virus disease

3.2.2. Changed knowledge of Ebola virus disease

3.2.2.1. Knowledge of pathogens and pathways for disease transmission

Table 3.24. Changed knowledge of pathogens and transmission way of Ebola virus

Survey content	Intervention group				Control group				IE Psct (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI (%)	P ₍₂₎	
Agent by virus	78,1	94,3	20,7	p<0,05	80,8	87,0	7,7	p>0,5	13
Transmission through direct contact	58,2	90,5	32,3	p<0,05	57,7	64,8	12,3	p>0,5	20

The table 3.24 shows the knowledge of Ebola virus disease of the intervention group after being trained was improved compared to that of the control group with "Agent by virus" (Intervention efficiency = 13) and knowledge of "Transmission through direct contact" (Intervention efficiency = 20).

3.2.2.2. Knowledge of symptoms of Ebola virus disease

Table 3.25. Changed knowledge about symptoms of Ebola virus disease

Survey content	Intervention group				Control group				IE Psct (1-2)
	TCT (%) (n=55)	SCT (%) (n=53)	CS HQ (%)	P ₍₁₎	TCT (%) (n=52)	SCT (%) (n=54)	CS HQ (%)	P ₍₂₎	
Fever, headache, muscle aches	73,6	81,1	7,5	p>0,5	73,0	83,1	10,1	p>0,5	(2,6)
Hemorrhage, nosebleeds	58,1	79,2	36,3	p<0,05	57,7	72,2	25,1	p>0,5	11,2

The table 3.25 reveals that there was a change with intervention efficiency of 11.2 between two groups for knowledge about Ebola virus disease symptoms of "Hemorrhage, nosebleed", but no change of

Intervention efficiency for symptoms "Fever, headache, muscle pain" (IE = - 2.6).

3.2.2.3. Knowledge of the criteria of surveillance for Ebola virus disease infected case

Table 3.26. Changed knowledge about the criteria of Ebola virus surveillance

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI HQ (%)	P ₍₂₎	
History of to/from affected areas	70,9	90,6	27,8	p<0,05	73,1	81,5	11,5	p>0,5	16,3
History of exposure to infected cases.	27,3	62,3	128,2	p<0,05	26,9	46,3	72,1	p>0,5	56,1
Know at least 2 preventive measures	60,1	86,7	44,3	p<0,05	61,5	75,9	23,4	p>0,5	20,9

According to the table 3.26, knowledge of intervention group of Ebola virus disease surveillance criteria has significantly improved with efficiency index of 27,8% for "History of to/from affected areas"; 128,2% for "History of exposure to infected cases" và 44,3% for "Know at least 2 preventive measures" (với p<0,05). Intervention efficiencies of these contents between two groups were 16.3; 56.1 and 20.9 respectively.

3.2.3. Effectiveness in changing attitudes towards Ebola virus disease

3.2.3.1. Attitude about the danger of Ebola virus disease

Table 3.27. Changed attitudes of health quarantine officers about the danger of Ebola virus disease

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI (%)	P ₍₂₎	
Assess danger level of the disease to human health	63,6	88,7	39,5	p<0,05	65,3	70,4	7,8	p>0,5	31,7
Assess transmission level	69,1	90,6	31,1	p<0,05	67,3	72,2	7,3	p>0,5	23,8

The table 3.27 show that efficiency indexes (EI) of two these contents of the intervention group increased to 39.5% and 31.1% (p<0.05) respectively. Intervention Efficiencies (IE) between two groups reach 31,7 for “Assess danger level of the disease to human health” and 23,8 for “Assess transmission level”.

3.2.3.2. Attitudes about the need to conduct screening for Ebola virus disease at points of entry

Table 3.28. Changed attitudes of health quarantine officers about the need of sreening Ebola virus disease at points of entry.

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI (%)	P ₍₂₎	
Need for close monitoring	70,9	96,2	35,7	p<0,05	67,3	81,5	21,1	p>0,5	14,6
Need for multisectoral coordination	72,7	84,9	16,8	p>0,5	71,1	87,0	22,4	p>0,5	(5,6)

The table 3.28 shows that EI of the attitude “Need for close monitoring” improved markerably with statistical significance (EI = 35.7%, p<0.05) in the intervention group. Meanwhile, the IE for this content was 14.6.

3.2.4. Effectiveness in changing of Ebola virus disease prevention practices

3.2.4.1. Practice on prevention of Ebola virus disease infection

Table 3.29. Change of correct behavior on prevention of Ebola virus disease infection

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI (%)	P ₍₂₎	
Correct behavior on prevention measures	54,5	92,5	69,7	p<0,05	55,8	72,2	29,3	p>0,5	40,4

The table 3.29 show that behavior in Ebola virus disease prevention of the intervention group was significantly changed (EI = 69.7%, p<0.05) and IE between two groups reached 40.4.

3.2.4.2. Practice on steps of screening for Ebola virus disease

Table 3.30. Changes in practice of Ebola virus screening at points of entry

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	before (%) (n=52)	after (%) (n=54)	EI (%)	P ₍₂₎	
Properly apply the Ebola screening chart	52,7	92,4	75,3	p<0,05	50,1	57,4	14,6	p>0,5	60,7

The table 3.30 show EI of the intervention group about " Properly apply the Ebola screening chart" was 75.3% (p<0.05) and IE between two groups was 60.7.

3.2.4.3. Practice on implementation of Ebola virus disease monitoring steps in line with the health quarantine (HQ) procedure at points of entry.

Table 3.31. Changes in practice of Ebola virus disease surveillance in line with the HQ procedure at points of entry

Survey content	Intervention group				Control group				IE P _{sct} (1-2)
	before (%) (n=55)	after (%) (n=53)	EI (%)	P ₍₁₎	TCT (%) (n=52)	SCT (%) (n=54)	EI (%)	P ₍₂₎	

Correctly apply the HQ procedure	65,5	88,7	35,4	p<0,05	63,5	77,8	22,5	p>0,5	12,9
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The table 3.31 show that the proportion of health quarantine officers in the intervention group who properly apply HQ procedure at points of entry increased with EI of 35.4% ($p<0.05$), meanwhile the IE of this content between two groups was 12.9.

CHAPTER 4: DISCUSSION

4.1. Situation of the capacity of 13 IHQ Centres of Vietnam to meet requirements of the IHR in 2016.

4.1.1. Border health quarantine system

The organizational structure and titles of health quarantine units were inconsistent between levels from the central to regional and provincial levels. It is revealed that there was no unique organizational name, structure and personnel for health quarantine in four regional Hygiene and Epidemiology/Pasteur Institutes. Functions and duties of health quarantine units were stipulated in the Decision No. 14/2007/QD-BYT, meanwhile tasks of provincial/municipal Preventive Medicine Centres (including the HQ team/department) was regulated in the Circular 51/2014/TT-BYT.

4.1.2. Actual situation of regular capacities at points of entry

- Management structure of 13 IHQ Centres

As of 2016, 13 IHQ Centres manage 65 points of entry including 19 international ones and 46 national and secondary check points. Risk of infectious diseases transmission in different points of entry is not the same. Therefore, the Centres need to allocate human resources, equipment and facilities in a appropriate way.

- Organizational structure of specialized departments at the IHQ Centres.

According to the Decision No. 14/2007/QD-BYT, it is required that each IHQ centres should be reorganized with 04 professional departments including Health quarantine, Health Management, Medical Treatment and Laboratory Department. As of 2016, 09/13 Centres (accounting for 69.2%) established these 04 faculties, this proportion is higher than that of Le Hong Phong's research in 2012 (only 60%).

- Human resources of IHQ centres

As of 2016, the total number of permanent staff of 13 IHQ Centres was 389 people, meanwhile there was 266 health quarantine workers the study

of Pham Minh Hoang in 2008, meeting only 74.2% of workforce for health quarantine as stipulated in the Joint Circular No. 08/2007 / TTLT-BYT-BNV.

In 2016, all 13 IHQ Centres had 48.1% of health quarantine workers with medical qualification. Currently, none of health quarantine modules were presented in the training and education institutions. Due to lack of training codes for health quarantine sector, staff working for health quarantine are very diverse in term of education and qualification level.

In 2016, only 52.4% of health quarantine workers could use English for basic communication (at level A, B) and 50.1% ones have basic computer use level.

- *Facilities and equipment of IHQ Centres*

As of 2016, all 13 IHQ Centres had office buildings. 77.8% of international points of entry arranged isolation areas/rooms for suspected and infected cases, not meeting the requirement of 100%. However, this proportion is much higher than that of the study by Le Hong Phong and et al in 2012 (30,4%)

- *Laboratory equipment:* Most of these Centres were equipped with laboratory facilities. However, because of the lack of necessary equipment and human resources as listed in the Decision No. 5159 / QD-BYT, those labs were not operational with full functions.

Equipment for screening entry passengers and medical treatment equipment at points of entry was extremely insufficient. Only Hanoi and Ho Chi Minh IQ Centres were equipped with enough number of remote body thermometers of 05 and 06 sets respectively. Other IHQ Centers with many points of entry were just provided with 2 to 3 machines .

4.1.3. Preparedness and response at points of entry

4.1.3.1. Capacity of inspection and supervision of health quarantine subjects at points of entry

In the period from 2012 to 2017, it was witnessed the increasingly number of health quarantine subjects at points of entry, of which passengers entry from other countries around the world took the top 1 of the list with an average of around 1,650,000 turns of people per month and concentrated mainly at airports with 64%. Up to now, Vietnam had effectively carry out surveillance activities to prevent infectious diseases from potential spreading into the country.

4.1.3.2. Inter-sector coordination and international cooperation

It is found in the study that health quarantine units and other agencies set up and maintained a good inter-sector coordination at points of entry especially in duration of such outbreaks/epidemics as influenza A (H7N9) in China, Ebola in Africa, MERS- CoV in the Middle East. Many Joint Memorandums of Understanding were signed to create a favorable coordination among those agencies at points of entry in joint prevention and control of infectious diseases. The Health Quarantine Agreements were signed between Vietnam and other countries sharing the same borders had created favorable conditions for international coordination, timely information sharing of communicable diseases and public health events in accordance with the IHR.

4.1.4. Points of entry capacity meeting the IHR's requirements

According to the results of the Annual Self Assessment of the IHR implementation of Viet Nam since 2012, preparedness and response at points of entry has significantly improved meeting the IHR's requirement. In 2016, the capacity was scored at 94%, higher than the basic requirement of the IHR (minimum 75%).

4.1.5. Current status of knowledge, attitude and practice of health quarantine workers in Ebola virus disease

Evaluation results show that health quarantine workers had basic knowledge, attitude and practice of Ebola virus disease and prevention and control measures. This result was similar to the study by Khalid M Almutairi in Saudi Arabia.

Understanding of the Ebola pathogen: 80.6% of health quarantine workers know about the virus. This rate was similar to the survey in Saudi Arabia by Khalid M. Almutairi, but lower than the study in Benin (97%), the reason may be that Benin was an African country affected with Ebola virus disease, so more health care workers were interested in and provided more information channels.

Proper understanding of transmission routes and disease symptoms would help effective implementation of the Ebola virus disease prevention activities. As resulted in the study, 58.5% of health quarantine workers responded that the Ebola epidemic was transmitted by direct contact with skin, blood, and fluid secretions. This proportion was higher than a study in Saudi Arabia (67.1% of health care workers do not know the way of transmission). Regarding the main symptoms of the Ebola virus disease, 71.3% of health quarantine workers knew well of fever, headache, and muscle pain as main symptoms of the disease. This rate was higher than that in a study in Saudi Arabia (23.3%).

Regarding attitudes and concerns about the need for regulatory screening for all passengers entry at points of entry, 72.8% of health quarantine workers agreed with the need for screening for all passengers. This rate was higher than that in the research by Amenze Oritsemofe and et al (61%).

Proportion of health quarantine officers applied personal hygiene (soap washing, using hand sanitizer solution) to prevent the Ebola virus disease infection accounted for 55.9% which was higher than that in the study by Gidado and et al (2.2%).

4.2. Effectiveness of some intervention measures to improve the capacity of surveillance and prevention of Ebola virus disease.

4.2.2. Effectively changing knowledge of the Ebola virus disease

Evaluation results at pre- intervention and post-interventions shows that basic knowledge of epidemiology of Ebola virus disease of intervention group was changed with statistical significant ($p < 0.05$), meanwhile improvement was also found in the control group without statistical significant. The Intervention efficiency (IE) of 20% on knowledge of transmission route between 2 groups revealed that the knowledge provided through training courses helped health quarantine workers of the intervention group have better understanding of the disease than ones of the control group.

4.2.3. Effectiveness in changing attitudes to prevent Ebola virus disease

The attitude of health quarantine officers of the intervention group on prevention of Ebola virus disease improved significantly after intervention ($p < 0.05$), meanwhile no improvement was found in the control group ($p > 0.05$). Intervention efficiency (IE) between the two groups increased to the highest ratio for the attitude index of the danger of Ebola epidemic (31.7%). This was explained that after being trained, health quarantine officers were provided with more information about the pathogen, transmission routes and the high mortality of the disease.

4.2.4. Effectiveness in changing the practice of preventing Ebola virus disease

The practice of Ebola virus disease prevention and control of the intervention group had significantly improved in all research indicators ($p < 0.05$). Once having proper understanding of the Ebola virus disease relating to pathogen, transmission routes, danger as well as proper application of monitoring procedures at points of entry, health quarantine workers practiced well effective measures of the disease prevention and control.

CONCLUSION

5.1. Capacity of Vietnam's IHQ centres to meet the IHR's requirement in 2016.

- Capacity of points of entry met the requirements of the International Health Regulations of the WHO (reaching 94%).
- The number of permanent staff working for all 13 IHQ Centres only met 74.2% of the demand. Of the current health quarantine workers in 2016, only 48.1% were graduated from medical institutions, 52.4% could communicate in English.
- 100% of the IHQ Centres had office building; 69.2% of the centres established 4 Specialized Faculties in charge of directly implementing health quarantine activities.
- 100% of international points of entry and 80.9% of national check points were provided with offices for staff. Only 77.8% of international points of entry arranged isolation places/rooms.
- 100% of the IHQ Centres installed remote body temperature thermometers to screen passengers exit and entry at points of entry. Chemical sprayers for medical treatment were available at all points of entry. 10.8% of points of entry were equipped with automatic disinfection systems for vehicles; testing equipment, specialized cars for implementation of health quarantine activities were still insufficient compared to regulated requirement.

5.2. Effectiveness of some intervention measures to improve the capacity of monitoring and prevention of the Ebola virus disease from potential entry into Vietnam.

- In 2016, the proportion of health quarantine workers with the best knowledge of Ebola virus disease accounted for 80.6%; the best attitude was 49.2% and the best practice was 67.2%.
- Knowledge, attitude and practice for Ebola virus disease of the intervention group presented Intervention Efficiencies (IE) of 56.1 for knowledge, 31.7 for attitude and 60.7 for practice.
- The intervention activities and the intervention measures were evaluated appropriately and feasibly, accounting for 81.1% to 96.2% and conducted with active participation of over 92.3% of the health quarantine workers at the IHQ centres.

RECOMMENDATIONS

Based on the research results, following recommendations are proposed to continue strengthening effective implementation of border health quarantine activities in the whole country:

1. The Ministry of Health should finalize a common model of management and organization of health quarantine system nationwide.
2. The Ministry of Health should provide education and training on border health quarantine under various forms; set up an education code for health quarantine sector; develop and issue health quarantine officer's criteria to be used as a base for selecting right health quarantine officers.
3. The Provincial Department of Health should develop a project of position and job arrangement based on the functions, tasks and organizational structure of the health quarantine unit; conduct assessment of current status of personels so as to plan for recruitment of sufficient staff working for health quarantine.
4. The Government should invest appropriately in human resources, facilities and necessary equipment to meet professional requirements in accordance with international integration and International Health Regulations. At the same time, remuneration policies should be taken into account so as to attract officers to work in the field of border health quarantine in remote border area.

LIST OF RELATED ARTICLES

1. Dang Quang Tan, Tran Thanh Duong, Nguyen Thuy Hoa, Vu Ngoc Long, Hoang Van Ngoc (2018), *Current situation of human resources, facilities and equipment of Vietnam International Health Quarantine Centres, 2016*, Special Journal of Preventive Medicine of the Scientific Research Conference of the National Institute of Hygiene and Epidemiology, 2018, p.128 - 135.
2. Vu Ngoc Long, Dang Quang Tan, Nguyen Thuy Hoa, Tran Thanh Duong, Hoang Van Ngoc (2018), *Knowledge of Ebola virus disease of health quarantine officers in the International Health Quarantine Centres, 2016*, Special Journal of Preventive Medicine of the Scientific Research Conference of the National Institute of Hygiene and Epidemiology, 2018, p.121 - 127.
3. Dang Quang Tan, Nguyen Thuy Hoa, Tran Thanh Duong, Tran Dai Quang, Hoang Van Ngoc (2018), *Effective interventions to improve the monitoring and prevention capacity of Ebola virus disease of the International Health Quarantine Centres*, Special Digital Preventive Medicine Journal of the Scientific Research Conference of the National Institute of Hygiene and Epidemiology, 2018, p.182 - 188.