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RESEARCH ARTICLE

PUBLIC HEALTH EMERGENCY MANAGEMENT (PHEM) FOR THE COVID-19 PANDEMIC: LESSONS LEARNED FROM PUBLIC HEALTH REGION 10TH UBON RATCHATHANI, THAILAND

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ABSTRACT

The COVID-19 pandemic affected the health of the Thai people. PHEM was essential for the surveillance, prevention, and control of COVID-19. This study aimed to present the process of the PHEM for COVID-19 from February 29, 2021, to April 30, 2022, and the factors affecting the successful outcome.

The study area covered three provinces. The Target group included 37 public health personnel. The data were collected through in-depth interviews and focus group interviews based on the non-structure interview guideline and were analyzed by content analysis.

The components of COVID-19 prevention and control in the process of PHEM included (1) Emergency Operation Center (EOC) with the incidence command system (ICS) from the district to the provincial level to propose the provincial measure, (2) Provincial Communicable Disease Committee (PCDC) to manage the provincial measure, (3) the measure for surveillance, prevention, control, and treatment of COVID-19, and (4) outcomes and best practices for surveillance and control of COVID-19. The success factors of 4S and EC included space to prepare for the quarantine (HQ, LQ), Cohort Ward (CW), field hospitals, community isolation, and home isolation to face the patient and risky group, Staff from various organizations, and groups including the community leader and Health Volunteer (HV), Stuff to manage and share the medical and non-medical equipment, System of COVID-19 response including EOC, ICS, Joint Investigation Team (JIT) and Communicable Disease Control Unit (CDCU) for monitoring the real-time of surveillance and control of COVID-19 output, Environment to conduct management in hospital and the community with Infections Control (IC), and Culture in term of social capital on "the relationship of Isan people" to provide the good care and support for the patients. The structure of PHEM, Isan's culture, and good preparation were the significant factors in the three provinces.

KEYWORDS

public health, emergency management, COVID-19, pandemic

BACKGROUND

The outbreak of COVID-19 originated in China. It was an emerging disease since December 30, 2019, with confirmed cases from many countries around the world [1]. Since the virus can spread from person to person through nasal or mouth secretions from COVID-19 patients along with coughs, sneezes, or talking [2]. Thailand announced the situation of COVID-19 on December 31, 2020, with 194 new cases and 4,869 infected patients in the country [3]. According to the data on the new wave of outbreaks on May 14, 2021, it was revealed that Thailand was ranked the 94th in the world with confirmed cases of 96,050 patients,

new cases of 2,256 patients, and a cumulative death of 548 cases as well as 30 deaths and 62,316 patients who were fully recovered [4]. In Thailand, according to measures for surveillance, prevention, and control of the disease are under the authority and responsibilities of the Ministry of Public Health (MOPH) or government agencies under the MOPH and Article 43 specified that the MOPH has a government agency [5].

The MOPH created public health approaches for managing the outbreak of COVID-19 according to Section 9 of the Emergency Decree on Public Administration in Emergency Situations B.E. 2548, totaling two copies. The first one was effective from March 26, 2020, and the second one was effective from April 3, 2020, onwards, to manage the outbreak of COVID-19[6]. This is in conjunction with the strong structure of the public health system in Thailand covering all 6 main components [7]. Management guidelines have been prepared for a crisis as well as public health personnel at the provincial and district levels to handle the emergency situation in the country [8]. Besides, the system approach is to allocate available resources for smart use based on the environment and context, leading to effective performance [9]. Strategies for the development of national disease prevention and control systems under the National Health Development Plan of the 12th National Economic and Social Development Plan B.E. 2560-2564 (Recommended Edition) [10] imposed measures to monitor COVID-19 to know the scope of the problem, identify an outbreak and track the direction of the disease with timely screening among risk populations in risk areas [11].

The literature review on systematic management approaches based on the concepts and Imperial College led to Thailand's "Lockdown and Reopening" [12]. The management of the COVID-19 epidemic prioritizes guidelines based on national policies and measures along with operations as a working group to manage the situation through mainly proactive approach [13-15]. Slum communities' implementations in Bangkok were based on the principles of community empowerment through participation in managing, developing, and solving problems in the community. The treatment for a large number of COVID-19 patients should be establishing COVID-19 centers in community settings to increase the number of facilities [16]. Additionally, the improvement of people's social quality of life and epidemic prevention is mainly conducted through the participation of the people and the community [17], especially for enhancing health literacy (HL) of vaccination for COVID-19 prevention to people in the community [18].

As for the research review, factors affecting the success in controlling and preventing COVID-19 included the 4S-EC Theme, consisting of Space, Staff, Stuff, and System [19]. Environment culture includes the physical structure of the health infra-structure [20]. As for teamwork, the implementation is related to interdisciplinary professions, history of success, knowledge and understanding of the nature of the disease, the proper use of necessary materials, equipment, and tools for the prevention and control of the diseases, and clarity and simplicity in managing the health system, enabling personnel to implement policies, leading to concrete results[19], systematic media management and the enhancement of people's digital literacy to increase their collaboration in disease control and prevention[21], community participation in the management [22], policy implementation as a leverage point in driving the entire body [23], and culture influencing behavior and lifestyles[24].

Therefore, the systematic management of the COVID-19 is crucial in Public Health Region 10th Ubon Ratchathani. The Public Health Emergency Management (PHEM) for COVID-19 has been implemented to effectively control the outbreak in the area. This study aimed to study the public health emergency management for COVID-19: A case study of management in Public Health Region 10th Ubon Ratchathani, consisting of the process of PHEM for COVID-19 and human resources in public health, and factors affecting success in the emergency situation management.

METHODS

This qualitative research was to explore the community base lesson learned on COVID-19 management [25]. The study area was Public Health Region 10th consisting of three provinces located in border areas of Thailand, including LAO PDR, Mukdahan, Amnat Charoen, and Ubon Ratchathani.

Two target groups were the representatives of public health personnel who responsible for the COVID-19 pandemic at provincial and district level, 64 people, consist of the provincial health office, district health office, provincial hospital, and district hospital and the

representative of community level, 36 people consist of the community leader, NGOs/ private, Local Administrative Organization (LAO), and Village Health Volunteers (VHV). The tool was non-structure interview guide about the direst experience of the stakeholder for COVID-19 management in the community. Method of data collecting was in-depth and group interview. Data was analyzed by content analysis.

Ethics issues have been certified by the Ethics Committee for Research in Human Subjects (IHRP, No. FWA 027-2564).

A: DEMOGRAPHIC DATA OF KEY INFORMANTS

Demographic data of key informants 100 people , key informant from Ubon Ratchathani (34.0%) and Mukdahan equally to Amnatcharoen (33.0%), most of key informants were male (51.0%), aged 36 to 50 years (53.0%, Mean = 45.69, S.D.=8.17, Min.=27, Max=58), work group of VHV (26.0%), position as PHT (29.0%), and career is work in the government office (64.0%)

B. FOUR WAVES OF COVID-19 PATIENT ACCUMULATION.

Regarding the situation of patients with COVID-19 in Public Health Region 10th, the first case of COVID-19 was found in Ubon Ratchathani on March 19, 2020. During the first wave, the report on March 31, 2020, Public Health Region 10th reported 18 cumulative patients. During the second wave from December 15, 2020, to March 31, 2021, there were 29 cumulative patients. During the third wave, from April 1, 2021, to October 31, 2021, there were 25,011 cumulative patients, and during the fourth wave, from November 1, 2021, to April 30, 2022, there were 59,852 cumulative patients. The situation at the national level was as follows: the first wave reported 456 patients, the second wave reported 1,582 patients, the third wave reported 22,565 patients, and the fourth wave reported 910,171 patients. The cumulative total on April 30, 2022, was 2,058,223 patients.

The impact and severity in each wave from the COVID-19 are as follows:

As for the first and second waves, there was a shortage of necessary equipment, such as PPE suits, masks, and alcohol gel to prevent infection by disease investigation teams and service providers in hospitals. There was also a lack of knowledge of patient treatment, resulting in panic and fear among the personnel.

The third wave is the most severe in terms of preparation for treatment, disease control, and management to treat patients due to the lockdown situation in Bangkok. In the provincial, district, and sub-district levels, the CIW, field hospitals, the CI, and the QC were prepared. It was so chaotic in the whole system, including treatment services, the services to support the patient, and the workload of physicians, nurses, public health personnel, village health volunteers, and community leaders at sub-district and village levels. As for severity among patients, patients who were infected from Bangkok took about 3-5 days to get proper treatment. For most of them, the virus could reach the lungs. Many people expressed severe symptoms. And there were deaths including people in the HR group who traveled with patients. However, in this wave, vaccines provided by public health agencies were distributed to the public.

As for the fourth wave, there was the highest number of infections, but the impact and severity were less than in the third wave since most patients expressed mild symptoms along with vaccination covering all age groups. Most patients were asymptomatic or had only mild flu which can be treated at the HI, except group 608 and the regular group with pulmonary abnormalities who were admitted to the hospital.

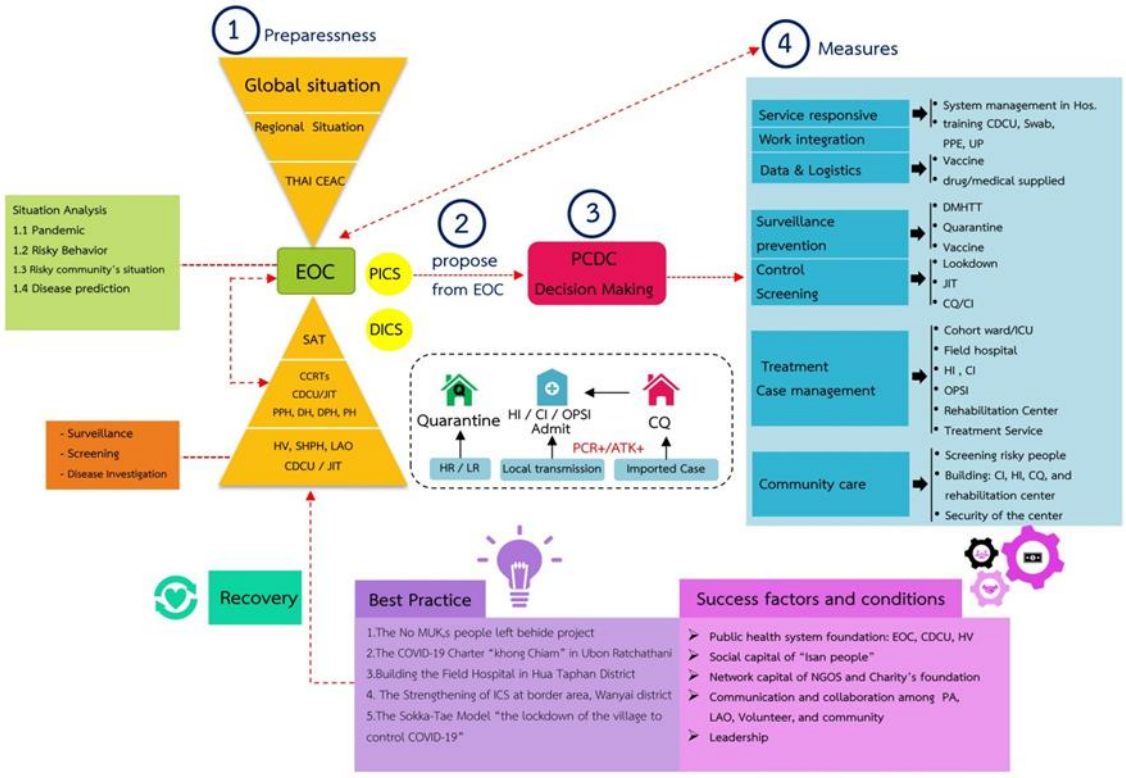
C: PUBLIC HEALTH EMERGENCY MANAGEMENT (PHEM) FOR COVID-19

The PHEM for COVID-19 consists of 5 components: Emergency Operation Center (EOC) with Incidence Command System (ICS), planning or measure proposal, Provincial Communicable Disease Committee (PCDC), measures for surveillance, prevention, control and treatment of COVID-19, and outcomes and best practices as follows:

The EOC was the core system in the ICS when facing the emergence of COVID-19. The role of provincial EOC included the ICS in all district and sub-district levels. The origin of the response to the COVID-19 pandemic was the CDCU to take a role in the surveillance, detection, and screening of COVID-19. The Subdistrict Health Promotion Hospital (SHPH), health Volunteer (HV), Local Administrative Organization (LAO) District Health Office (DHO), and District Hospital (DH) at the district level work together as the Joint Investigation Team (JIT) and Situation Analysis Team (SAT). SAT was a key team to propose planning and the measure to the EOC. Planning or measure proposal was considered by the PCDC which was the main mechanism of decision-

making for the provincial measure to cope with COVID-19. Almost all the measures for surveillance, prevention, and control were launched by the PCDC while some of the measures were launched directly by the MOPH. The outcomes were COVID-19 control within 28 days in any size of COVID-19 clusters in 3 provinces and the care and treatment coverage of COVID-19 patients during the severe pandemic in the third wave. The best projects included the No MUK's people left behind project, the COVID-19 charter at the subdistrict level, conflict management in field hospitals, and the Sokka-Tae model of lockdown of the village to control COVID-19 (Diagram 1). The successful factors for controlling the COVID-19 outbreak within 28 days were the structural factors of the state's emergency operations, consisting of PCDC, EOC committees, CIS systems, and the development of CDCU capacity covering the district level. The success in treating COVID-19 patients in hospitals, field hospitals, and communities was due to community participation, awareness of joint problem solving, and the social capital of the Isan (north-eastern part of Thailand) communities that provide care for patients as if they were family members. Community cooperation in preparing patient care facilities both in field hospitals and in communities, as well as sacrifices by community health volunteers, community leaders, monks, schools, local administrative organizations, people, and volunteers both in and outside the community.

DIAGRAM1: MANAGEMENT MECHANISM TO COVID-19 OF THREE PROVINCES LOCATED IN PUBLIC HEALTH REGION 10TH, THAILAND



The process of prevention and control of COVID-19 in Public Health Region 10th, Ubon Ratchathani, employed the analytical framework according to the Public Health Emergency Management (PHEM) 2P2R process (P1: Prevention and Mitigation, P2: Preparedness, R1: Response, R2: Recovery) as follows:

P1: Surveillance/Prevention/Mitigation is the overall surveillance and prevention in the country through a national emergency surveillance plan. The DDC, MOPH, prepared to manage emergencies with the development of the EOC and the ICS as a guideline for public health personnel development in all provinces, including the provincial public health physicians and hospital directors.

Moreover, in all provinces, the EOC must be established while the Communicable Diseases Act was issued along with the development of the CDCU at the district level. The development of the JIT team and the SAT team at the provincial, district, and sub district levels were contributing to the preparation of the Thai public health system to deal with emergency situations and to reduce severity.

P2: Preparedness was to structurally deal with the COVID-19 outbreak in the three provinces. Every province used the term "Activate EOC" in the EOC committee meeting to acknowledge the roles, duties, and preparations as well as the epidemic situation and the severity of the disease at the national and international level from the CEAC to analyze the situation and to report to the EOC committee under Communicable Diseases Act. This is to issue measures for surveillance, prevention, and control of the disease in each province. The key contributors to the preparations included the President of the OEC and the EOC in each province.

R1: Respond was operated through measures, surveillance, prevention, and control of COVID-19 when facing the situation of COVID-19. This includes situation analysis as the main role of the SAT team in the provincial EOC committee by collecting data on the situation within the province at the sub district and the district levels through the CDCU committee or CCRTs from disease surveillance and investigation field visits, and disease management of risky groups for quarantine according to the measures. Data on all patients receiving care in a healthcare facility were managed by the EOC and the SAT team and sent to the provincial SAT team to conduct a situation analysis which was presented to the provincial public health physicians and hospital directors. The tendency of infected people, the situation, and the spread of COVID in the area were predicted. The inspector of the MOPH assigned the ODPC 10 team to analyze the overall picture of the district while the SAT team was responsible for the provincial level due to its size and severity. This includes preparation guidelines to handle the situation which were presented to the EOC to impose measures or operational guidelines at the provincial level. This effective response was dependent on the essential performance, skills, and techniques of public health personnel (PHP), which were developed before and during the COIVD-19 pandemic. The process of issuing measures in the provincial level starts with the SAT team in the EOC committee presenting the tendency and severity of the situation in the area to the CDC for decision-making to issue work plans and guidelines. The key measures to respond to COVID-19 included surveillance measures to prevent and control the disease, logistics system management, service system and operational integration, and the nursing care team in the community.

As for R2: Recovery, the three provinces prepared to restore tourism in the provinces and reopen the country to stimulate the economy, especially Mukdakarn and Ubon Ratchathani. Public relations were prepared for a Covid-free setting in tourist attractions, restaurants, and hotels, and there were also legal and regulatory systems that facilitate tourism to stimulate the economy within the provinces.

DISCUSSION AND CONCLUSION

The process of the prevention and control of COVID-19 in Public Health Region 10th was compared to the systematic approach for the sustainable development goal which was consisting of 3C principles [27], namely classification, coordination, and collaboration. According to the factors affecting the success of the COVID-19 prevention and control of the Public Health Region 10th Ubon Ratchathani above, when compared to factors affecting the success of COVID-19 disease prevention and control operations with 4S-EC Theme [19], similarities and differences were found. As for Space, the three provinces were prepared to accommodate patients and risk groups at the household, village, and sub district levels, while foreign countries only prioritized hospitals. As for Staff, importance was placed on patient care from the hospital to the community level, and this differed from other countries. To clarify, they did not focus on taking care of the community. However, the findings in the study areas of the three provinces suggested that community care was the most important to prevent and control the disease effectively. The key roles in caring at the community level included VHVs, community leaders with the SHPH as mentors, and the Provincial Public Health Office to direct the implementation of the measures. Thus, the performance and essential skills, knowledge of prevention and control, and care and treatment on COVID-19 were crucial the most for all staff of PHP, VHVs, LAO, community leaders, and villagers.

As for Stuff, it was not quite different from the case of other countries. As for System, a working structure and system were clear including collaboration from the village, sub district, district, province, and national levels under the structure or work model of the EOC, ICS, OEC, and CDCU.

As for Environment, the same principles of environmental management were employed to prevent and control the disease. However, the IC was used to design environmental management at the village, household, and sub district levels for risk groups and patients. As for Culture, it was different from the case of other countries. The household culture was stressed in disease prevention and control while, in the study area, a social capital emphasizes the relationship between relatives with neighbors as a relative affecting the care and assistance of risk groups and patients in the community. The details are as follows:

COMPARISON OF FACTORS AFFECTING THE SUCCESS OF THE PREVENTION AND CONTROL OF COVID-19 IN PUBLIC HEALTH REGION 10TH UBON RATCHATHANI AND 4S - EC THEME FROM ABOARD

Public Health Region 10th Ubon Ratchathani	4S-EC Theme
Space: The HQ and LQ were prepared to support risk groups and the group waiting for PCR results before being admitted to the hospital and the CIW, ICU, field hospitals, CI, and HI were prepared to treat patients.	**Space:** Health infra-structure [1, 8] included quarantine areas, number of beds and wards, and necessary tools for sufficient patient treatment.
Staff: Operations were in form of a network from all sectors with clear roles. The common goal was to prevent and control COVID-19 in the area and reduce the loss to a minimum. The key groups contributing to the community level included VHVs and community leaders. All staff were enhancing their performance to fight COVID-19.	**Staff:** It included public health personnel with multidisciplinary personnel from other agencies and the public.
Stuff: The COVID-19 situation led to a centralized operation in the management of necessary medical equipment to execute resource sharing, distribution, and stocking for emergencies.	**Stuff:** Materials, equipment, and tools necessary for disease prevention and control included masks, PPE suits, face shields, and various technologies and innovations in reducing the spread of infection.
System: The COVID-19 response measure of Public Health Region 10th Ratchathani was according to EOC, ICS, JIT, and SAT standards. With the CDCU team in every subdistrict, measures, orders, and guidelines from the OEC resulted in effective surveillance, prevention, and control. Moreover, the President of the OEC and the EOC supervised the performance in real-time every day.	**System:** It includes a management system and system standards.
Environment: Environmental management was based on the measures of the OEC, including isolation, quarantine, and home zones in the villages for risk groups. This includes the IC system to design the environment in the hospital and in the community to prevent the spread of infection in the community, society, and in the hospital.	**Environment:** It included topography and climate [22, 26] affecting the trigger and suppression of the spread of the virus, including condition management to prevent the spread of infection.
Culture: Social capital "Isaan people" prioritizes the relationship of the relatives, leading to support and compassion with comprehensive care for COVID-19 patients.	**Culture:** Local culture influences the behavior and lifestyle [24] of people involved in disease control and prevention by themselves and their family members.

Ovidendantur, nesto qui officid modi offic tes debis volore laut viducid erumquam voluptaepra et est, simolor The results of this study reflect the ability to manage the COVID-19 emergency situation, which was associated with the study at national management level [28]. The successful factors were the operational structure factors, including PCDC, EOC, CIS, and CDCU, which cover budget, and the necessary medical equipment and technology that can control the spread of COVID-19 according to the outbreak. Factors include community and private sector participation, social capital in providing budget assistance and necessary equipment for disease prevention and control, taking care of the mental health of people facing the outbreak by the Mental Health Crisis Assessment and Treatment Team (MCATT), and the participation and sacrifice of VHVs in the community.

RECOMMENDATIONS

The disease investigation system should be prepared for public health personnel by developing disease investigation skills and analysis of the disease situation based on both public health, social and economic dimensions. Preparation for the treatment service system should be done by developing the potential of emergency situation management for public health personnel, physicians, and nurses as an integrated team. Suggestions for research should be conducted in groups of COVID-19 patients, with studies on the economic impact of the COVID-19 outbreak and control measures.

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ABBREVIATION

CEAC	Covid-19 Epidemic Administrative Center
CLC	Community Laboratory Confirm Center
CRC	Community Rehabilitation Center
CDCU	Communicable Disease Control Unit
CCRTs	Community Covid Response teams
DHO	District Health Office
DH	District Hospital
DICS	District Incidence Command System
CW	Cohort ward
EOC	Emergency Operation Center
HV	Health Volunteer
ICS	Incidence Command System
IC	Infectious Control
JIT	Joint Investigation Team
HCSR	Health Care Service Response
LAO	Local administrative Organization
NCEAC	National Covid-19 Epidemic Administrative Center
OPSI	Out-patient Self Isolation
PICS	Provincial Incidence Command System
PCDC	Provincial Communicable Disease Committee
PPE	Personnel Protective Equipment
PHO	Provincial Health Office
SHPH	Sub-district Health Promotion Hospital
PH	Provincial Hospital
PHP	Public Health Personnel
SAT	Situation Analysis Team
UP	Universal Prevention

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APPENDIX- TABLE 1. DEMOGRAPHIC DATA KEY INFORMANTS OF THE PHEM (N = 100)

Demographic Data	Frequency	Percentage
Province		
Mukdahan	33	33.0
Amnatcharoen	33	33.0
Ubon Ratchathani	34	34.0
Gender		
Male	51	51.0
Female	49	49.0
Age Group		
25-35	16	16.0
36-50	53	53.0
≥50	31	31.0
	Mean = 45.69, S.D.=8.17, Min.=27, Max=58	
Work Group		
Provincial Health office (PHO)	21	21.0
Provincial Office (PO)	4	4.0
District Health Office (DHO)/ Sub-district Health Promotion Hospital (SHPH)	24	24.0
Provincial Hospital (PH)/ District Hospital (DH)	15	15.0
Village Health Volunteer (VHV)	26	26.0
Community Leader/ Local Administrative Organization (LAO)	10	10.0
Position		
Physician	10	10
Provincial Governor	3	3.0
Nurse	19	19.0
Public Health Technician	29	29.0
VHV	26	26.0
Community Leader/ LAO	10	10.0
Pharmacist	3	3.0
Career		
Government Office	64	64.0
Community leader (head of village)	4	40
LAO	10	10.0
Farmer (paddy field)	14	14.0
Housewife	6	6.0
Trader	1	1.0
General employee	1	1.0