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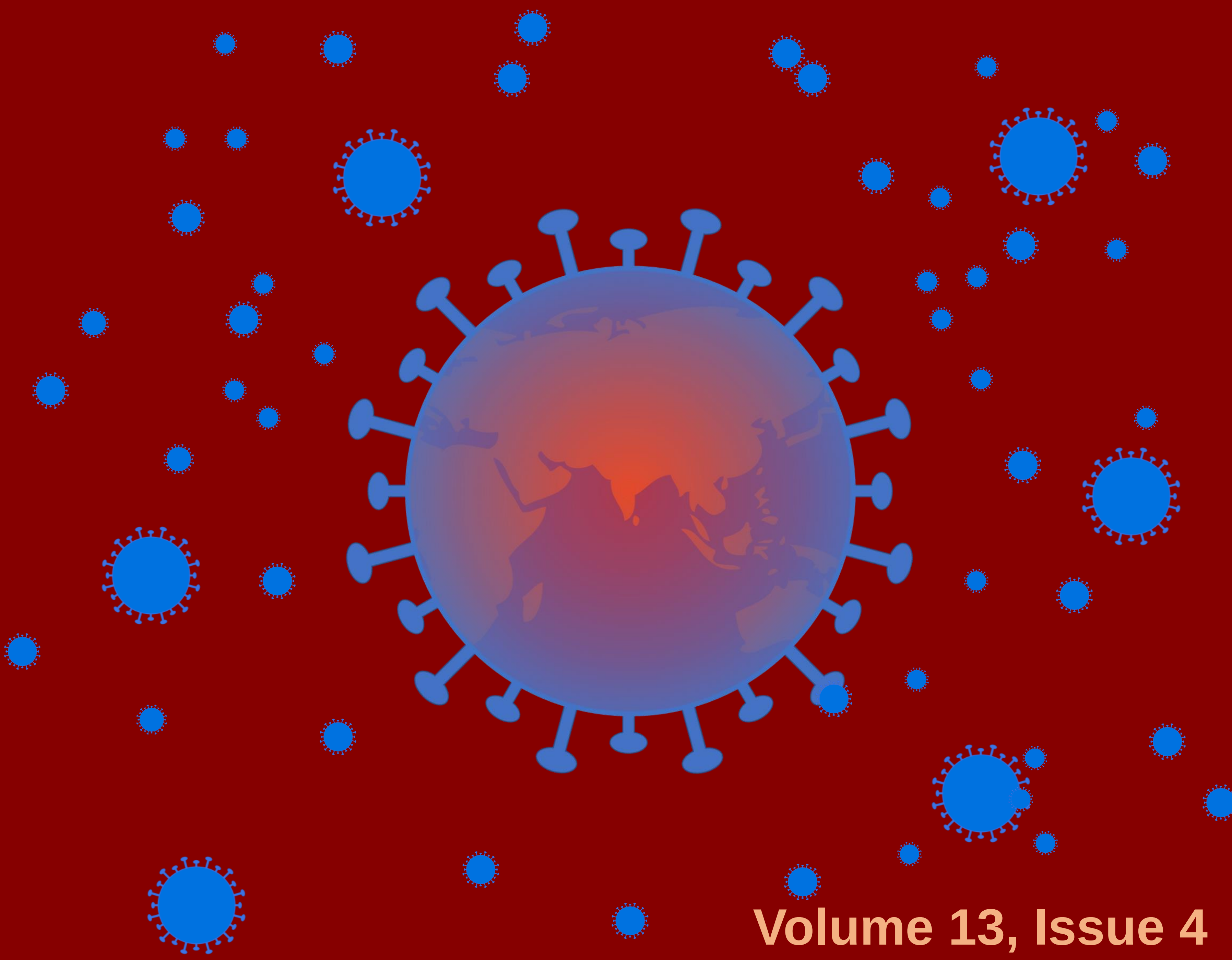

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Editorial

Second Wave of Coronavirus Disease (COVID-19) in Thailand: What Lessons did We Learn?

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Thailand demonstrated an outstanding performance in responding to COVID-19 since the early phase of the pandemic. It is the first country outside China that officially declared the presence of COVID-19 cases. The country passed through difficult times during March-April 2020, when a few clusters of local transmission were originated from entertainment venues and a boxing stadium. Lockdown policies were introduced, combining strict physical distancing measures. By May 2020, the situation seemed to be relaxed as the number of local cases sharply diminished. Since then, the majority of cases were Thai returnees and international travellers from affected countries who were detected during the 14 days mandatory state quarantine. Many Thais look forward to celebrating the 2021 new year with an expectation that the economy will gradually resume and all expect returning to 'normal life'.

However, such a hope was turned down as recently, on 20 Dec 2020, there emerged several large clusters of COVID-19 cases which widespread to almost half of the provinces in a week period. In late November 2020, there were Thai female workers illegally crossed through natural border from Myanmar to Thailand. These workers had epidemic linkage with one of the notorious entertainment areas in Myanmar. The border crossing took place without legitimate travel documents and not captured by state quarantine. Soon later, there was a shocking event in Samut Sakhon, a neighbour province of Bangkok, which is one of the most populated areas of cross border migrants in Thailand. The event happened in a renowned shrimp fresh market at the provincial center. Just a few days after the index case was notified, with an active case finding of the public health officers, members of Surveillance and Rapid Response Team, more than 1,000 cases were identified. This meant that the accumulative national cases sharply increased from 4000 in 1 Dec 2020 to around 6,020 in 26 Dec 2020. Over 90% of cases in Samut Sakhon were asymptomatic cases who are Myanmar workers and their dependants living crowdedly in the market dormitories. The investigation teams of the Ministry of Public Health are now working untiringly and concertedly with other partners to topple down this crisis. At the time of this writing, the Thai Government has introduced restrict mobility measures of all people at the epidemic centers for active case findings and proper case management according to the Protocol. All social gathering events in Samut Sakhon and affected provinces were prohibited.

What lessons can be drawn from these events? What are behind the veneer of "the new wave of COVID-19 cases?" Though there might not be a simple answer, these questions are still worth considering. First, the situation teaches us that COVID-19 is a borderless issue. While Thailand is able to contain the number of cases for quite a while since May 2020, the outbreaks in Myanmar has become worse during the last few months; cases increased exponentially from 919 in 1 Sep 2020 to 121,280 in 26 Dec 2020. This indicates that Thailand needs to work with Myanmar to strengthen cross-border health systems which support pandemic control and prepare adequate resources in case of case explosion. This is the time that Southeast Asian countries work collectively to strengthen cross-border preparedness and responses to contain the pandemic. Single country efforts are not effective as people can carry virus through the porous natural borders for economic opportunities in another country.

Second, at the height of very large second wave transmission, the social mentality is in favour of tightening the border control. However, a complete border seal is next to impossible, and the local community know the natural passes better than the security officers and recognizing the fact that Thailand shares a very long border with neighbouring countries. The second wave large outbreak largely caused by migrant workers exposes a deeper and larger conundrum related to labour policy. The large demand for labour from neighbouring countries to fill the gaps of 3 D jobs (dirty, dangerous and demanding) is not addressed by systematic labour policy and properly managed in the last decades. This gives a large room for human trafficking, regulatory capture, low employment standards, inadequate social security and work safety among migrants. Though the tip of iceberg of registered migrants are covered by payroll tax financed social security systems, their dependants and unregistered migrants are inadequately covered by voluntary migrant health insurance managed by Ministry of Public Health. All of these challenges cannot be addressed by the health sector alone; policy coherence and effective multi-sectoral actions are required.

Finally, at the peak of crisis, the common blaming narratives against 'scapegoats' emerge in the Thai society; instead of a deep reflection on its root causes and other contextual factors. There is a fine line between searching and blaming scapegoat and identifying and addressing the root of the outbreak. Social discrimination, victimization and stigmatisation make the situation worse and compromise the well-being of not only migrant populations, but also the local Thai community living in the epidemic centres. The Government should work with the media to transmit positive and supportive message, and ban all the hatred speeches, stereotyping and xenophobia statements in particular viral in the social media discourses.

Throughout 2020, OSIR has committed to publish numerous articles relevant to COVID-19 in the region. One of the highlights in this issue is a paper by Kripattanapong et al, "Clusters of coronavirus disease (COVID-19) in pubs, bars and nightclubs in Bangkok, 2020". Other articles include a variety of issues, such as comorbidities of people living with HIV, road traffic injuries and concentration index, claims for antiretroviral therapy, vaccination and chemotherapy in public facilities for migrants in Thailand, and the assessment of knowledge and performance of village health volunteers in Myanmar. We hope the readers enjoy and maximize benefit from all articles published in this issue.

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Non-AIDS-related Comorbidities among People Living with HIV Aged 50 Years and Older: A Cross-sectional Study at Hua Hin Hospital, 2018-2019

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Abstract

With the success of combination antiretroviral therapy (cART), HIV-infected individuals are living longer and, as a consequence, are experiencing an increasing number of and more varied age-related comorbidities. Nevertheless, there are limited data regarding the profile of these chronic comorbidities among aging people living with HIV in Thailand. We therefore aimed to determine the prevalence and risk factors of non-AIDS-related comorbidities in this population. A cross-sectional study was conducted utilizing an electronic medical record database from the HIV clinic at Hua Hin Hospital. We assessed the prevalence of chronic comorbidities among HIV patients aged at least 50 years. Multivariate logistic regression analysis was performed to identify factors associated with multimorbidity. Among 307 HIV patients, nearly half (49.2%) had at least 1 comorbidity and multimorbidity was present in 22.5% of the patients. The most common comorbidities were dyslipidemia (33.9%), hypertension (21.5%) and diabetes (8.1%). Age (OR 1.11, 95% CI 1.06-1.18), duration of HIV infection (OR 1.11, 95% CI 1.04-1.19), body mass index (OR 1.10, 95% CI 1.02-1.19) and stavudine-containing regimens (OR 2.63, 95% CI 1.46-5.90) were associated with multimorbidity. The finding underscores a significant burden of non-AIDS-related comorbidities in aging HIV patients. Given the complexity of clinical care in this population, a comprehensive multidisciplinary approach is of paramount importance to optimize overall health outcomes.

Keywords: HIV, PLHIV, comorbidity, elderly, Thailand

Introduction

The availability of combination antiretroviral therapy (cART) has effectively reduced AIDS-related mortality worldwide and made HIV a manageable chronic disease. Globally, AIDS-related deaths have declined by 33% since 2010 and people living with HIV (PLHIV) who are on cART and virally suppressed are living longer and enjoying a better quality of life.[1] As a result, they have almost a normal life span similar to non-HIV infected populations, and the proportion of PLHIV aged more than 50 years has increased from 8% in 2000 to approximately 17% in 2016 with an expected notable upward trend.[2-4]

However, these aging PLHIV are facing new challenges from other comorbidities such as cardiovascular diseases (CVD), neurodegenerative diseases and malignancies. In addition to the traditionally recognized risk factors that cause these comorbidities, the accelerated aging process due to chronic immune activation and persistent systemic inflammation caused by HIV infection itself and side effects from long-term use of ART also play a role in the development of these chronic diseases.[5] These non-AIDS-related comorbidities among aging PLHIV have been reported in several studies and when compared to non-HIV-infected populations, the onset of the diseases is earlier and the disease prevalence is higher among the seropositive population.[6-9] Consequently, the HIV management strategy has shifted to optimize the long-term clinical outcome and to improve the overall quality of life of this aging population.

HIV/AIDS is one of the important public health issues in Thailand given the high burden of disease. It is estimated that the number of PLHIV is approximately 480,000 or 1.1% of the adult population, accounting for 9% of PLHIV in Asia and the Pacific region.[10] Nevertheless, Thailand is one of the developing countries that has successfully responded to the HIV epidemic through multisectoral collaboration between the government, the Thai Ministry of Public Health (MOPH), the National Health Security Office (NHSO) and non-governmental organizations (NGOs). Intervention programs implemented by the MOPH have considerably reduced the number of new HIV infected cases over the past few decades. In 2018, the estimated number of people newly infected with HIV was 6,400, which is a 59% reduction compared to 2010.[10,11] It is estimated that AIDS-related deaths have also decreased to 18,000 per year in 2018 or a 39% decline since 2010.[11]

Previous studies conducted in Thailand reported a high prevalence of aging-related comorbidities among PLHIV.[12-15] However, these studies either had a small sample size, focused on specific diseases, or included young HIV patients. Moreover, to the best of our knowledge, there has been no published study focussing specifically on aging PLHIV populations and conducted in non-urban areas of Thailand which are known to have a different HIV distribution and population characteristics from the metropolitan area such as access to healthcare, socio-economic status and health literacy. Hua Hin Hospital is a governmental general hospital with a 340-bed capacity. It is situated in Hua Hin District, Prachuap Khiri Khan Province, western Thailand. The hospital provides a wide range of specialty healthcare services for patients, serving primarily the population of 60,000 in Hua Hin area and also receives patient referrals from the adjacent district hospitals, which have lower levels of healthcare. In 2019, the outpatient HIV clinic of Hua Hin Hospital serviced 1,376 HIV patients, while at the provincial level, it is estimated that there are approximately 4,000 PLHIV.[16]

Since there have been limited studies on the aging PLHIV population and age-related comorbidities in Thailand, and given the number of HIV patients and the proportion of aging PLHIV in Thailand are increasing each year, evidence-based data are needed to inform strategic planning, policy development, and resource allocation. The objective of this study was to assess the prevalence of non-AIDS-related comorbidities among aging PLHIV who were registered at the HIV clinic of Hua Hin Hospital and to explore the factors associated with multiple comorbidities.

Methods

Study Design and Study Population

We conducted a cross-sectional study at Hua Hin Hospital, Prachuap Khiri Khan Province, Thailand. The study population consisted of clinic records of all HIV-positive patients aged 50 years and older who attended the outpatient HIV clinic during 1 Jul 2018 to 30 Jun 2019. Patients were excluded if they were referred to other hospitals for HIV care or died before the study period began.

The data were collected from HIV clinic patient records and the electronic medical records database. The HIV patients were identified from the international classification of diseases, tenth revision (ICD-10) diagnostic code for human immunodeficiency virus (HIV) disease (B20-B24) and the HIV clinic appointment registry. The diagnosis of HIV in each patient was confirmed based on the anti-HIV test result in the record. For the non-AIDS-related comorbidities diagnoses, we used a composite definition from the medical records, laboratory results and the ICD-10 diagnostic code. Given that there might be some recording and coding errors, we also checked for the consistency between clinical diagnosis in the electronic medical records and laboratory results. There was no direct contact with the patients during the study period.

Outcome Measurement

Three categories of variables were collected: (1) the socio-demographic data of patients including gender, age, race, body mass index (BMI), type of health coverage and healthcare utilization over past 12 months, (2) the HIV-related characteristics and HIV-treatment data including ART data, CD4 count, viral load, duration of HIV infection since diagnosis, retention in care and viral suppression status, and (3) non-AIDS-related comorbidities of clinical relevance in the aging HIV-positive population. The chronic comorbidities included hypertension, diabetes mellitus, dyslipidemia, obesity, acute coronary syndrome, neurological disease (epilepsy, dementia and Parkinson disease), liver disease (chronic hepatitis B virus (HBV), hepatitis C virus (HCV) infection or cirrhosis), chronic kidney disease, bone disease (osteopenia or osteoporosis) and non-HIV-related malignancy. Apart from the diagnosis of comorbid diseases, the number of co-medications that the patients use on a daily basis was also collected. Co-medication was defined as non-antiretroviral medication prescribed during the study period. Multimorbidity was defined as having at least 2 of these non-AIDS-related chronic diseases and polypharmacy was defined as the concurrent use of 5 or more medications.[17,18]

Statistical Analysis

Exploratory data analyses were conducted to examine the distributions of the variables. Continuous variables were summarized by mean, standard deviation, median, and range according to their distributions while categorical variables were described by frequency and percentage. Multivariate logistic regression was performed to identify factors associated with multimorbidity. To select independent variables into the model, we used the stepwise method which predicts the best model that yielded the lowest Akaike information criterion (AIC) as a penalized measure of model fit. Subsequently, the goodness of fit of the predictive model was determined by diagnostic plots.

In order to provide a valid statistical analysis in the presence of missing data, a multiple imputation (MI) method was implemented under the assumption that the unobserved values were missing at random (MAR). We used the Predictive Mean Matching approach for MI and after deriving the imputation model, we evaluated the plausibility of the imputed data by graphically comparing its distribution with the observed values.[19,20] A sensitivity analysis was conducted to examine differences between the original model with missing values and the imputed. Statistical significance was defined with an alpha level set at 0.05. All analyses were performed using the R language and environment version 3.6.3 (Foundation for Statistical Computing, Vienna, Austria).[21]

Ethical Approval

The data were collected during a 3-month period from 1 Jul to 30 Sep 2019 after ethical approval from the Institutional Review Board of the University of California, Los Angeles (reference number 19-001205) and permission to conduct the study from the ethics committee of Hua Hin Hospital.

Table 1. Socio-demographic and characteristics of PLHIV aged 50 years and older in Hua Hin hospital, Thailand, 2018-2019 (n=307)

Characteristic	n (%)
Age (years)^t	55.0 (50.0, 83.1)
Gender	
Male	139 (45.3)
Female	168 (54.7)
Race	
Thai	300 (97.7)
Myanmar	2 (0.7)
Other	5 (1.6)
BMI (kg/m^2)*	22.3 ± 3.6
Health Insurance Schemes	
Universal Coverage	193 (62.9)
Social security	76 (24.8)
Civil Servant Medical Benefit	30 (9.8)
Others	8 (2.6)
Duration of diagnosed infection (years)*	8.3 ± 4.5
Late presentation (CD4 <350 cells/mm^3), (n=246)	
Yes	199 (80.9)
No	47 (19.1)
AIDS-defining events	
Yes	181 (59.0)
No	126 (41.0)
Last CD4 <200 cells/mm^3, (n=300)	
Yes	20 (6.7)
No	280 (93.3)
Last CD4 count (cells/mm^3)^t	501.5 (38.0, 1514.0)
Current HIV viral load, (n=291)	
0-20 copies/ml	244 (83.9)
21-500 copies/ml	41 (14.1)
>500 copies/ml	6 (2.1)

*Note: ^{t} Data are shown in median with range. * Data are presented in mean with standard deviation.*

Table 2. Antiretroviral therapies and healthcare service utilization of PLHIV aged 50 years and older in Hua Hin hospital, Thailand, 2018-2019 (n=307)

Characteristic	n (%)
ART[a] duration (years)*	7.3 ± 4.3
0-1 years	19 (7.6)
1-5 years	72 (28.9)
5-10 years	80 (32.1)
10-15 years	70 (28.1)
>15 years	8 (3.2)
Number of ART regimens*	1.5 ± 0.7
Time from diagnosis to ART initiation (years)[t]	0.2 (0.0, 12.0)
ART regimen, (n=306)	
NRTI[c] + NNRTI[d]	274 (89.5)
NRTI + PI[e]	31 (10.1)
PI	1 (0.3)
Viral suppression, (n=291)	
Yes	285 (97.9)
No	6 (2.1)
Retention in care	
Yes	290 (94.5)
No	17 (5.5)
Healthcare utilization	
HIV clinic	300 (97.7)
Number of visits*	7.0 ± 2.6
Outpatient department	121 (39.4)
Number of visits*	3.7 ± 2.8
Hospitalization	21 (6.8)
Number of hospitalizations*	1.1 ± 0.3

Note: *[A] Antiretroviral therapy, [c] nucleoside reverse transcriptase inhibitor, [d] non-nucleoside reverse transcriptase inhibitor, [e] protease inhibitor. * Data are presented in mean with standard deviation. [t] Data are shown in median with range.*

Results

The records of 307 patients were included in this study, which accounts for 22.3% of all patients attending the HIV clinic at Hua Hin Hospital. The median age of the patients was 55.0 years (range 50.0–83.1 years). Almost half (45.3%) were male and 62.9% received care under the universal health coverage insurance scheme. Around one-quarter (26.4%) were diagnosed with HIV after the age of 50 years. The mean known duration of HIV infection was 8.3 ± 4.5 years, and 59% had a history of AIDS-defining events. The median CD4 count at presentation was 117 cells/mm^3 (1.0-1018.0 cells/mm^3) and 80.9% were late presenters (CD4 <350 cells/mm^3). The median CD4 cell count at the last visit was 501.5 cells/mm^3 and the median value of the change in CD4 count measured between the last CD4 count and CD4 count at presentation was 345 cells/mm^3 (-582.0-1273.0 cells/mm^3). The majority (83.9%) had HIV viral load <20 copies/ml (Table 1).

The distribution of antiretroviral therapies and healthcare utilization are shown in Table 2. The mean duration of receiving ART was 7.3 ± 4.3 years with only 3.2% of the patients receiving treatment for more than 15 years. The median time from HIV diagnosis to ART initiation was 0.2 years (range 0–12 years). The mean number of ART regimens was 1.5 ± 0.7. According to the Thailand national HIV treatment guideline 2017, the triple therapy regimen is recommended for all HIV patients with Tenofovir/Emtricitabine/ Efavirenz or Tenofovir/Lamivudine/Efavirenz as a first line regimen.[22] The majority (89.5%) of patients received regimens based on nucleoside Reverse Transcriptase Inhibitors (NRTI) plus a non-Nucleoside Reverse Transcriptase Inhibitor (NNRTI). The most common treatment regimen was Tenofovir/Lamivudine/ Efavirenz (56.2%) and Lamivudine was prescribed to most of the patients (92.2%). Regarding the treatment target, 97.9% of the patients achieved viral suppression and 94.5% remained in HIV care. The mean (SD) number of HIV clinic visits in the past 12 months was 7.0 (2.6) and 7 patients missed their last appointment at the HIV clinic. In the previous year, 121 patients (39.4%) attended the outpatient department, and 21 patients (6.8%) were hospitalized.

Nearly half of the patients (49.2%) had a diagnosis of at least 1 comorbidity of interest and 7.8% had 3 or more comorbidities (Figure 1). Sixty-nine patients (22.5%) were multimorbid and the prevalence of multimorbidity increased with age: 14.2% (50-54 years), 30.4% (55-59 years) and 31.7% (≥60 years), respectively. The mean number of comorbidities was 0.8 and the median was 0 (range 0-5). The mean number of comorbidities increased slightly with age (Figure 2). The most common comorbidities were dyslipidemia (33.9%), hypertension (21.5%) and diabetes mellitus (8.1%) (Table 3).

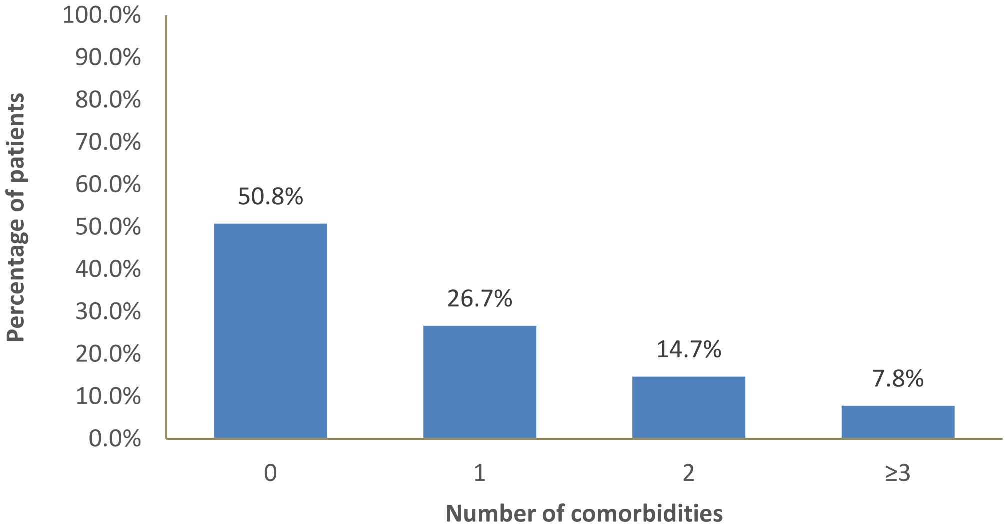

Figure 1. The percentage of patients and number of comorbidities of PLHIV aged 50 years and older in Hua Hin hospital, Thailand, 2018-2019

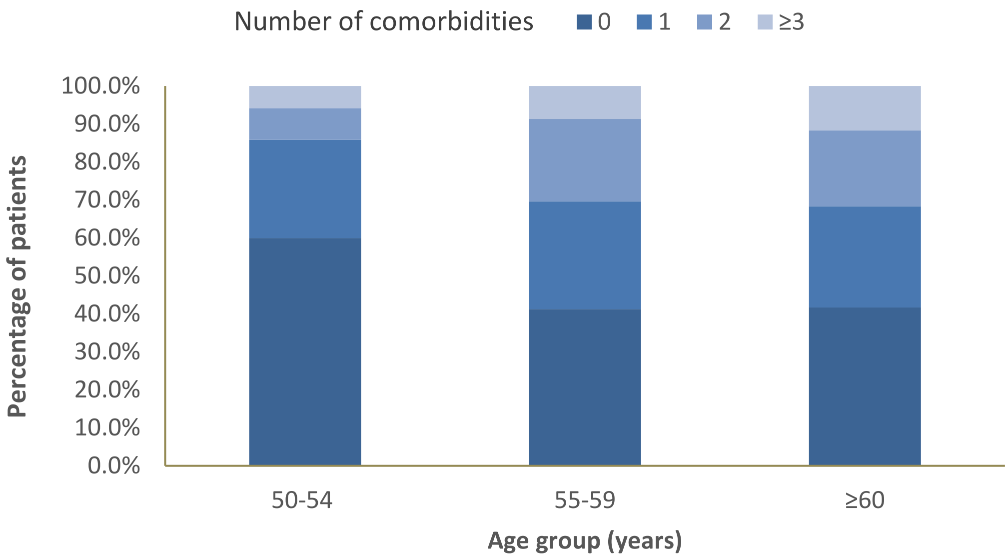

Figure 2. The distribution of the number of comorbidities of PLHIV aged 50 years and older, by age group, in Hua Hin hospital, Thailand, 2018-2019

In addition, 2.3% of the patients were obese while 12.7% were underweight (BMI <18.5 kg/m^2) and 15.3% were overweight (BMI 25.0–29.9 kg/m^2). Nearly 70% were receiving at least one non-ART medication and approximately one-third (34.5%) had polypharmacy; these patients were prescribed 5 or more drugs on a daily basis.

Results of the multivariate logistic regression analysis is presented in Table 4. According to the predetermined criteria for model selection, both initial and imputed models were found to be optimally fit for the data. Considering the imputed model, use of a stavudine-containing regimen was a strong predictor of multimorbidity (OR 2.63, 95% CI 1.46–5.90; *p*-value 0.02) while age (OR 1.11, 95% CI 1.06–1.18; *p*-value

<0.001), BMI (OR 1.1, 95% CI 1.02–1.19; *p*-value 0.009) and duration of HIV infection (OR 1.11, 95% CI 1.04–1.19; *p*-value 0.002) were weakly associated with the occurrence of multimorbidity. A sensitivity analysis was conducted since approximately 20% of the study subjects did not have an initial CD4 count or date of HIV diagnosis. The strength of association was not drastically different between the models except for the stavudine-containing regimen variable.

Table 3. Non-AIDS-related comorbidities and comedications in PLHIV aged 50 years and older in Hua Hin hospital, Thailand, 2018-2019 (n=307)

Characteristic	n (%)
Non-AIDS related comorbidities*	0.8 ± 1.0
50-54 years	0.6 ± 0.9
55-59 years	1.0 ± 1.0
≥60 years	1.1 ± 1.1
Multimorbidity	
Yes	69 (22.5)
No	238 (77.5)
Distribution of non-AIDS related comorbidities	
Dyslipidemia	104 (33.9)
Hypertension	66 (21.5)
Diabetes mellitus	25 (8.1)
Chronic hepatitis C	16 (5.2)
Chronic kidney disease	10 (3.3)
Obesity	7 (2.3)
Acute myocardial infarction	5 (1.6)
Chronic hepatitis B	5 (1.6)
Non-AIDS-defining Malignancy	3 (1.0)
Stroke	3 (1.0)
Other heart diseases	2 (0.7)
Cirrhosis	1 (0.3)
Epilepsy	1 (0.3)
Polypharmacy	
Yes	105 (34.5)
No	199 (65.5)

*Note: *Data are presented in mean with standard deviation.*

Table 4. Multivariate logistic regression regarding multimorbidity of PLHIV aged 50 years and older in Hua Hin hospital, Thailand, 2018-2019

	Initial Model			Imputed Model		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age (years)	1.07	1.01-1.15	0.02	1.11	1.06-1.18	<0.001
BMI[c]	1.13	1.04-1.24	0.005	1.10	1.02-1.19	0.009
Duration of HIV infection (years)	1.13	1.05-1.22	0.002	1.11	1.04-1.19	0.002
Stavudine-containing regimen	2.02	0.79-4.96	0.12	2.63	1.46-5.90	0.02
P-value	<0.0001			<0.0001		
Adjusted-R^2	0.26			0.15		
AIC[d]	249.88			305.85		

Note: [c] BMI stands for body mass index; [d] AIC stands for akaike information criterion.

Discussion

This study explored the prevalence of non-AIDS-related comorbidities among aging PLHIV and factors associated with multimorbidity. Almost half of the patients had at least 1 comorbidity and approximately 20% had multimorbidity. These findings are in agreement with previous studies conducted in Asia in which the prevalence of chronic conditions ranged from 40-60%.[15,23,24] However, some studies conducted in other regions reported a considerably higher prevalence of age-related comorbidities and multimorbidity.[25-27]

Consistent with previous studies, the most common chronic comorbidities were dyslipidemia, hypertension, and diabetes.[23,24,28] The prevalence of these diseases in our study was comparable with the results from another HIV-positive Asian regional cohort study.[29] However, when compared to other previous reports from Thailand, the results from our study are somewhat different.[12,15] A previous study conducted in 2018 showed considerably higher prevalence of chronic diseases: 69.8%, 27.3% and 23.9% of the patients had dyslipidemia, hypertension, and diabetes, respectively. This discrepancy might be explained by differences in the inclusion criteria for the study subjects as this study focused on HIV patients aged 50 years and older. The difference might also be attributable to the rate of screening uptake and coverage at the HIV clinic. According to the fifth Thai national health examination survey (NHES V) conducted in 2014, the prevalence of hypercholesterolemia, hypo-HDL-cholesterolemia and hypertriglyceridemia among Thais older than 15 years of age were 43.8%, 25.4% and 31%, respectively. And although the prevalence of hypertension and diabetes were 24.7% and 8.9% respectively, this study showed a comparable prevalence of these comorbidities to the general Thai population, which is in agreement with the findings from a study conducted in Portugal.[25,30] Nevertheless, some studies indicated that the prevalence of non-AIDS-related comorbidities were significantly higher among PLHIV.[26,31]

We found that the duration of HIV infection, age and BMI had a modest but significant positive association with multimorbidity. Similar findings were reported in other studies concerning the effect of HIV infection and aging associated with chronic metabolic conditions.[25,26] Interestingly, approximately 17% of the patients had excessive weight. However, the proportion was much lower than those reported in developing countries.[32,33] As obesity is one of the major modifiable risk factors for cardiovascular diseases, it is essential to focus on optimizing HIV patients' body weight as well. Nevertheless, we did not include ART duration in the model given that it was highly correlated with HIV infection duration. Some studies have shown an independent effect of ART duration in association with metabolic comorbidities.[27,34]

Of note, the occurrence of metabolic syndrome among PLHIV is known to be partly attributable to long-term use of certain ARTs, such as nucleoside reverse transcriptase inhibitors (NRTIs) and protease inhibitors. Similar to findings of the current study, HIV patients who received a stavudine-containing ART regimen were more likely to have multimorbidity. Other studies also showed similar associations between chronic conditions and the use of NRTIs.[35-37]

Our study is subject to some limitations. As the data were extracted from an electronic medical record database, some important variables that can potentially influence the outcome, such as mode of transmission and socioeconomic status such as education level, were not collected. We were also unable to include traditional risk factors of metabolic diseases such as smoking, alcohol consumption and physical activity into the model since these factors were not well-documented in the electronic medical record. Moreover, information on previous ART regimens and duration of cumulative exposure were not captured, so we were unable to assess the association of these variables with the comorbidities. In addition, external validity is an important concern. One should be cautious when extrapolating the results to another population since the study was conducted in a non-urban setting of Thailand where population characteristics may differ from those in metropolitan areas. Lastly, due to the cross-sectional design of the study, we cannot make any causal inferences from the findings; only associations can be made from this study.

Implication for Practice and Policy

The main objective of this study was to determine the prevalence of non-age-related diseases among PLHIV aged 50 years and over and assess the associated factors of multimorbidity. Accordingly, the practical implication derived from this research is that a specific screening protocol implementation for chronic age-related diseases is strongly recommended since early detection and treatment will be greatly beneficial for the aging HIV population. In the Thai government hospital setting, clinical care for chronic diseases is generally incorporated into HIV clinic services for practical purposes. Furthermore, a multidisciplinary approach for clinical care is also crucial since older PLHIV are also affected by other conditions such as geriatric syndromes. The issues of frailty, neurocognitive impairment, and falls should be also taken into consideration.

Secondly, in order to track the performance of an HIV clinic service, a comprehensive and timely data collection system is necessary. Consequently, the conceptual framework for service quality improvement and annual operation plan can be developed according to the Reach, Recruit, Test, Treat, and Retain (RRTTR) approach. Moreover, data regarding traditional risk factors for metabolic diseases is particularly important in order to evaluate the effectiveness of treatment and prevention services. With this system established, the HIV clinic team will be able to address gaps and opportunities for improvement, which will inform policy decisions regarding resource allocation and hospital strategic planning.

Lastly, future research could further evaluate the impact of HIV on chronic comorbidities among aging PLHIV by comparing the disease prevalence with an HIV-negative control group. The study could be extended longitudinally to monitor treatment outcomes, incidence of multimorbidity and effectiveness of the screening and intervention program. It could also be expanded to the provincial level to address other aspects of health issues such as nutritional status, psychosocial wellbeing, or geriatric syndromes by incorporating additional assessment tools in order to provide comprehensive clinical care and improve the overall quality of life of aging PLHIV.

Suggested Citation

Duriyaprapan P. Non-AIDS-related comorbidities among people living with HIV aged 50 years and older: a cross-sectional study at Hua Hin hospital, 2018-2019. OSIR. 2020 Dec;13(4):127-36.

References

1. UNAIDS. Global HIV & AIDS statistics — 2019 fact sheet [Internet]. 2019 [cited 2020 Apr 1]. <https://www.unaids.org/en/resources/fact-sheet>
2. May MT, Gompels M, Delpech V, Porter K, Orkin C, Kegg S, et al. Impact on life expectancy of HIV-1 positive individuals of CD4+ cell count and viral load response to antiretroviral therapy. AIDS. 2014 May 15;28(8):1193-202.
3. UNAIDS. UNAIDS/PCB (39)/16.26 Agenda 11 thematic segment: HIV and ageing. 39th meeting of the UNAIDS PCB; 2016 Dec 8; Geneva, Switzerland. Geneva: UNAIDS; 2016 Nov 22.
4. Autenrieth CS, Beck EJ, Stelzle D, Mallouris C, Mahy M, Ghys P. Global and regional trends of people living with HIV aged 50 and over: estimates and projections for 2000-2020. PloS one 2018 Nov 29;13(11): e0207005-e.
5. Wing EJ. HIV and aging. Int J Infect Dis. 2016 Dec; 53:61-8.
6. Patel P, Rose CE, Collins PY, Nuche-Berenguer B, Sahasrabuddhe VV, Peprah E, et al. Noncommunicable diseases among HIV-infected persons in low-income and middle-income countries: a systematic review and meta-analysis. AIDS. 2018 Jul 1;32 Suppl 1(Suppl 1): S5-S20.
7. Bijker R, Choi JY, Ditangco R, Kiertiburanakul S, Lee MP, Siwamogsatham S, et al. Cardiovascular Disease and cardiovascular disease risk in HIV-positive populations in the Asian region. Open AIDS J. 2017 Aug 21; 11:52-66.
8. Schouten J, Wit FW, Stolte IG, Kootstra NA, van der Valk M, Geerlings SE, et al. Cross-sectional comparison of the prevalence of age-associated comorbidities and their risk factors between HIV-infected and uninfected individuals: the AGEhIV cohort study. Clin Infect Dis 2014 Dec 15;59(12):1787-97.
9. Guaraldi G, Orlando G, Zona S, Menozzi M, Carli F, Garlassi E, et al. Premature age-related comorbidities among HIV-infected persons compared with the general population. Clin Infect Dis. 2011 Dec;53(11):1120-6.
10. AVERT. HIV and AIDS in Thailand [Internet]. 2020 [cited 2020 Apr 1]. <https://www.avert.org/professionals/hiv-around-world/asia-pacific/thailand>
11. UNAIDS. Thailand: 2018 country factsheet [Internet]. 2018 [cited 2020 Mar 20]. <https://www.unaids.org/en/regionscountries/countries/thailand>
12. Kiertiburanakul S, Luengroongroj P, Sungkanuparph S. Clinical characteristics of HIV-infected patients who survive after the diagnosis of HIV infection for more than 10 years in a resource-limited setting. J Int Assoc Physicians AIDS Care (Chic). 2012 Nov-Dec;11(6):361-5.
13. Riyaten P, Salvadori N, Traisathit P, Ngo-Giang-Huong N, Cressey TR, Leenasirimakul P, et al. New-onset diabetes and antiretroviral treatments in HIV-infected adults in Thailand. J Acquir Immune Defic Syndr. 2015 Aug 1;69(4):453-9.
14. Jantarapakde J, Phanuphak N, Chaturawit C, Pengnonyang S, Mathajittiphan P, Takamtha P, et al. Prevalence of metabolic syndrome among antiretroviral-naive and antiretroviral-

experienced HIV-1 infected Thai adults. AIDS Patient Care STDs 2014 Jul;28(7):331-40.

15. Nakaranurack C, Manosuthi W. Prevalence of non-AIDS comorbidities and factors associated with metabolic complications among HIV-infected patients at a Thai R referral hospital. J Int Assoc Provid AIDS Care. 2018 Jan-Dec; 17:2325957417752256.

16. Bureau of registration administration, Ministry of Interior, Thailand. Official statistics registration system [Internet]. 2019 [cited 2020 Apr 1]. <http://www.bora.dopa.go.th/index.php/th/>

17. Fortin M, Stewart M, Poitras ME, Almirall J, Maddocks H. A systematic review of prevalence studies on multimorbidity: toward a more uniform methodology. Ann Fam Med. 2012 Mar-Apr;10(2):142-51.

18. Gnjidic D, Hilmer SN, Blyth FM, Naganathan V, Waite L, Seibel MJ, et al. Polypharmacy cutoff and outcomes: five or more medicines were used to identify community-dwelling older men at risk of different adverse outcomes. J Clin Epidemiol. 2012 Sep;65(9):989-95.

19. Morris TP, White IR, Royston P. Tuning multiple imputation by predictive mean matching and local residual draws. BMC Med Res Methodol. 2014 Jun 5;14(1):75.

20. Nguyen CD, Carlin JB, Lee KJ. Model checking in multiple imputation: an overview and case study. Emerg Themes Epidemiol. 2017 Aug 23;14(1):8.

21. R Core Team. R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing; 2020.

22. Ongwandee S, Kiertburanakul S, Avihingsanon A, Sukkul A, Lolekha R, editors. Thailand national guidelines on HIV/AIDS treatment and prevention 2017. Bangkok: The Agricultural Co-operative Federation of Thailand; 2017.

23. Ruzicka DJ, Imai K, Takahashi K, Naito T. Comorbidities and the use of comedications in people living with HIV on antiretroviral therapy in Japan: a cross-sectional study using a hospital claims database. BMJ Open. 2018 Jun 14;8(6): e019985.

24. Wu PY, Chen MY, Hsieh SM, Sun HY, Tsai MS, Lee KY, et al. Comorbidities among the HIV-infected patients aged 40 years or older in Taiwan. PloS One. 2014 Aug 13;9(8): e104945.

25. Serrão R, Piñero C, Velez J, Coutinho D, Maltez F, Lino S, et al. Non-AIDS-related comorbidities in people living with HIV-1 aged 50 years and older: The AGING POSITIVE study. Int J Infect Dis. 2019 Feb;79:94-100.

26. Maciel RA, Klück HM, Durand M, Sprinz E. Comorbidity is more common and occurs earlier in persons living with HIV than in HIV-uninfected matched controls, aged 50 years and older: A cross-sectional study. Int J Infect Dis. 2018 May;70:30-5.

27. Levy ME, Greenberg AE, Hart R, Powers Happ L, Hadigan C, Castel A, et al. High burden of metabolic comorbidities in a citywide cohort of HIV outpatients: evolving health care needs of people aging with HIV in Washington, DC. HIV Med. 2017 Nov;18(10):724-35.

28. Wong C, Gange SJ, Moore RD, Justice AC, Buchacz K, Abraham AG, et al. Multimorbidity among persons living with human immunodeficiency virus in the United States. Clin Infect Dis. 2018 Apr 15;66(8):1230-8.

29. Do TC, Boettiger D, Law M, Pujari S, Zhang F, Chaiwarith R, et al. Smoking and projected cardiovascular risk in an HIV-positive Asian regional cohort. HIV Med. 2016 Aug;17(7):542-9.

30. Aekplakorn W, editor. The fifth Thai national health examination survey 2014. 1st ed. Nonthaburi (Thailand): Health System Research Institute;2016.

31. Ruzicka DJ, Imai K, Takahashi K, Naito T. Greater burden of chronic comorbidities and co-medications among people living with HIV versus people without HIV in Japan: a hospital claims database study. J Infect Chemother. 2019 Feb;25(2):89-95.

32. Becofsky KM, Wing EJ, Wing RR, Richards KE, Gillani FS. Obesity prevalence and related risk of comorbidities among HIV+ patients attending a New England ambulatory centre. Obes Sci Pract. 2016 Jun;2(2):123-7.

33. Obry-Roguet V, Brégigeon S, Cano CE, Lions C, Zaegel-Faucher O, Laroche H, et al. Risk factors associated with overweight and obesity in HIV-infected people: aging, behavioral factors but not cART in a cross-sectional study. Medicine (Baltimore). 2018 Jun;97(23): e10956.

34. Hidalgo JA, Florez A, Agurto C, Pinedo Y, Ayarza R, Rodriguez L, et al. Metabolic and cardiovascular comorbidities among clinically stable HIV patients on long-term ARV therapy in five ambulatory clinics in Lima-Callao, Peru. Open AIDS J. 2018 Oct 17;12:126-35.

35. D:A:D Study Group, Sabin CA, Worm SW, Weber R, Reiss P, El-Sadr W, et al. Use of nucleoside reverse transcriptase inhibitors and risk of myocardial infarction in HIV-infected patients enrolled in the D:A:D study: a multi-cohort collaboration. Lancet. 2008 Apr 26;371(9622):1417-26.

36. Feeney ER, Mallon PWG. HIV and HAART-associated dyslipidemia. Open Cardiovasc Med J. 2011;5:49-63.

37. Non LR, Escota GV, Powderly WG. HIV and its relationship to insulin resistance and lipid abnormalities. Transl Res. 2017 May;183:41-56.

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Association between Incidence of Road Traffic Accidents and Provincial Economic Status in Thailand: An Application of the Concentration Index

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Abstract

In Thailand, various preventive measures have been implemented to control and minimize the volume of road traffic accidents (RTAs). However, the country still faces varying degrees of success in curbing the incidence of RTAs, which has devastating consequences to the Thai economy. Since there are many factors related to the density of RTAs, this study examines the density according to three main causes-humans, the environment, and vehicles-relative to the provincial economic status in Thailand. A time-series cross-sectional design was employed. Descriptive statistics, Spearman's rank correlation, and the concentration index (CI) were used to measure the degree of inequitable distribution of RTAs relative to the provincial economic levels. The cumulative proportion of accidents was measured against the cumulative proportion of provinces ranked by the gross provincial product per capita. A negative value from CI-RTAs indicated a disproportional accumulation of RTAs among the poor. In contrast, a positive value reflected a disproportional concentration of RTAs among the well-off populations. Since 2006, human causes of RTAs (such as driving while under the influence of alcohol and violation of traffic rules) were the main contribution to RTAs. The RTAs were concentrated among the well-off provinces during 2006-2013, as reflected by positive indices and positive CI-RTAs were stronger for human-caused RTAs. Since 2014, the total incidence of RTAs was higher among the less well-off provinces (negative CI-RTAs). The shifting trend of CI-RTAs from among the affluent to the less affluent provinces provided insightful information for policymakers and implementation in the Thai public health arena. However, the statistical significance of the associations between RTAs and economic status was observed only in the early years of the investigation. The reasons behind the varying degree of statistical significance in the association should be investigated further. Additional studies on CIs and RTAs, which could help inform policymakers and academics regarding the prioritization and optimization of RTA preventive measures of each individual area, are recommended.

Keywords: road traffic accidents, cause of road traffic accidents, concentration index, equity, Thailand

Introduction

Road traffic accidents (RTAs) are among the most critical public health problems in many countries. Globally, RTAs are currently the ninth leading cause of death across all age groups and may become the seventh leading cause of death by 2030 if the incidence continues at the current pace.[1] Low- and middle-income countries account for over 90% of all RTAs worldwide.[1]

To respond to this crisis, the 2030 Agenda for Sustainable Development set a target for reducing the number of deaths and injuries from RTAs by 50% in 2020.[2] The World Health Organization (WHO) has played an active role in directing the road safety agenda, as evidenced by the launch of 'the Decade of Action for Road Safety' in 2011, to which over 110 countries have pledged their agreement.[3]

Thailand is an upper-middle income country where RTAs are a critical concern. Deaths from RTAs in Thailand reached 36.2 per 100,000 persons in 2013, the second largest incidence across the globe.[4] The reported number of traffic crashes in 2017 was 817,444. RTAs were the leading cause of disability-adjusted life years (DALYs) lost among late juveniles and early adults, both males and females, aged 15 to 29 years.[5] The estimated annual economic loss from RTAs in 2013 by the Thailand Development Research Institute was around 539,509 million baht (approximately USD 17,559 million).[6]

To curb this catastrophic situation, various preventive measures have been implemented, such as increase stringency of driving laws and extensive road safety campaigns in the media.[7] Despite such efforts, the degree of success in curbing the incidence of RTAs varies across provinces. Areas with high levels of economic activities were, on the face of it, more likely to encounter RTAs than those with relatively lower economic status.[8] There are many factors that affect the provincial economic status such as the selective investment and development of infrastructure in some areas and the structural power that is linked to the development policy.[9] Bangkok, Chon Buri, and Chiang Mai were included in the top five provinces for road crashes and all had a high economic status in 2016. [10,11]

To this end, we hypothesized that the incidence of RTAs is closely related to the economic level of a province. Therefore, this study aimed to examine the concentration of RTAs (CI-RTAs) sorted by various causes relative to provincial economic activities. Concentration index analysis is a useful method proposed by the World Bank to demonstrate inequity of resource allocation of any outcome variables against the inequity in the socioeconomic status.[12] In recent years, there were studies in the public health field that attempted to apply concentration index on health-related outcomes such as assessing equity in maternal and child health services and health workforce distribution.[13,14] Hence, it is hoped that the results from this study can help inform policy makers and academics in prioritizing the intensity and urgency of RTAs preventive measures that fit the economic context in each province.

Methods

Data Sources and Study Design

This study applied a time series quantitative approach and the unit of analysis was set at the provincial level. Data from 2006 to 2015 were retrieved from two sources: 1) the Royal Thai Police, which publishes the RTA figures (injuries and deaths combined) and 2) Office of the National Economic and Social Development Council (NESDC) which publishes the gross provincial product per capita (GPP) and population in each province.[15] The original source of RTA statistics was the Royal Thai Police, but the data are displayed on the website of the National Statistical Office of Thailand.

The RTA data records the number of people who experienced road traffic accidents in each province classified into three groups according to the sources: human causes, environmental causes, and vehicular causes, based on the discretion of the police investigators. Human causes included several risky driving behaviours, such as drink driving, riding without wearing a helmet, and driving without using a seatbelt. Environmental causes included poor road conditions, rain, and inadequate streetlight intensity. Vehicular causes included defective safety devices and steering failure. Each injury was classified only in a single category of causes even though some events might have been attributed to more than one cause. The analysis was confined to 76 provinces (out of 77 provinces in Thailand) between 2006 and 2015 only. The RTA data of Bueng Kan was not included because of no data available between 2006 and 2010.

Data Analysis

The analysis was divided into three sections. The first section presents a descriptive analysis to demonstrate an overview of the incidence and trend of RTAs throughout the whole period. Since there is no information about the size of population at risk in each province (number of drivers or riders), the incidence of RTAs was estimated by the number of accidents in each province divided by the provincial population.

The second section uses Spearman's rank correlation to determine the relationship between the incidence of RTAs and provincial economic status measured by GPP per capita. This statistic was used to test the null hypothesis that RTAs were not correlated with provincial prosperity.

The last section calculates the concentration index (CI) to measure the distribution of RTAs across various provincial economic levels. The concentration index is an indicator used to explain the occurrence of a selected outcome against the economic distribution. The index can be assessed by a visual inspection of the concentration curve, where the diagonal line reflects perfect equality in resource- or outcome-distribution.[16] All analyses were done using Stata 13 (StataCorp, Serial number: 401406358220). The CI was computed using the following equation presented by O'Donnell;[17]

$$2\sigma_r^2\left(\frac{h_i}{\mu}\right) = \alpha + \beta r_i + e_i$$

In detail, β represents the estimated value of the CI; σ_r^2 is the variance of the provincial economy rank; h_i is the incidence of RTA stratified by the three causes of interest; μ is the mean of h_i ; r_i is the provincial economic rank by economic status; and e_i is a vector of independent and identically distributed random error terms. The mean, standard deviation (SD) and interquartile range (IQR) were used as descriptive statistics, while a 95% confidence interval was used to determine statistical significance. In terms of interpretation, the value of CI ranges from -1 to 1.

Negative values indicate pro-poor concentration while positive values reflects pro-rich concentration.[18]

Ethical Approval

Ethics approval to conduct this study was not required because all data were obtained from a public website and all individual data were anonymized and were not reported.

Results

The incidence of RTAs increased from 2006 to 2011 and then saw a stable trend from 2011 to 2015, and not falling back to 2006 levels. In 2015, the highest incidence appeared in northern regions, followed by the northeastern region and Bangkok. The top five provinces of all causes of RTAs were Phrae (377 per 100,000), Amnat Charoen (329 per 100,000), Chiang Rai (230 per 100,000), Lampang (210 per 100,000), and Bangkok (204 per 100,000). Human-related causes constituted the major share of all RTA causes throughout the observed period. The geometric mean of accident incidence from all causes in Thailand was 71.3 cases per 100,000 persons in 2015, about a 1.5 increase from 2006. Human causes accounted for 42.4 cases per 100,000 persons in 2006 and reached 52.2 cases per 100,000 persons in 2015. Environmental and vehicular causes also showed a similar increasing trend, but the annual incidence was still fewer than 26 cases per 100,000 persons throughout the study period. The standard deviations for all causes were large, ranging from 39.9 to 77.5, and was also high for human causes (Table 1 and Figure 1).

Table 1. Mean and geometric mean of incidence of road traffic accidents in 76 provinces in Thailand, stratified by cause and year (2006-2015)

Cause	Year	Mean (standard deviation)	Geometric mean
All causes	2006	63.8 (39.9)	48.0
	2007	67.5 (42.8)	54.8
	2008	55.4 (46.8)	40.6
	2009	60.5 (43.4)	49.4
	2010	68.1 (41.4)	58.7
	2011	81.9 (54.2)	70.4
	2012	78.2 (52.5)	65.9
	2013	91.4 (77.5)	70.6
	2014	83.4 (59.5)	66.9
	2015	91.1 (69.5)	71.3
Humans	2006	42.4 (30.7)	30.7
	2007	43.8 (33.7)	33.8
	2008	35.3 (38.6)	23.4
	2009	37.6 (33.5)	29.4
	2010	41.2 (31.7)	34.3
	2011	45.8 (33.9)	38.3
	2012	44.0 (33.6)	35.9
	2013	49.5 (42.4)	38.3
	2014	45.6 (34.8)	36.2
	2015	52.2 (40.6)	40.9

Cause	Year	Mean (standard deviation)	Geometric mean
Environment	2006	13.9 (9.2)	10.2
	2007	14.8 (9.3)	11.4
	2008	12.5 (9.1)	9.0
	2009	14.3 (9.5)	11.1
	2010	16.6 (9.3)	13.7
	2011	22.1 (14.8)	18.7
	2012	20.9 (13.8)	17.4
	2013	25.6 (21.8)	18.6
	2014	23.1 (18.0)	17.3
	2015	23.5 (21.0)	16.7
Vehicles	2006	7.5 (6.6)	5.3
	2007	8.9 (8.3)	5.8
	2008	7.7 (8.0)	4.5
	2009	8.7 (8.8)	5.9
	2010	10.3 (7.9)	7.3
	2011	14.0 (12.9)	10.2
	2012	13.2 (11.3)	9.8
	2013	16.3 (17.4)	10.6
	2014	14.7 (13.4)	10.0
	2015	15.4 (17.2)	9.6

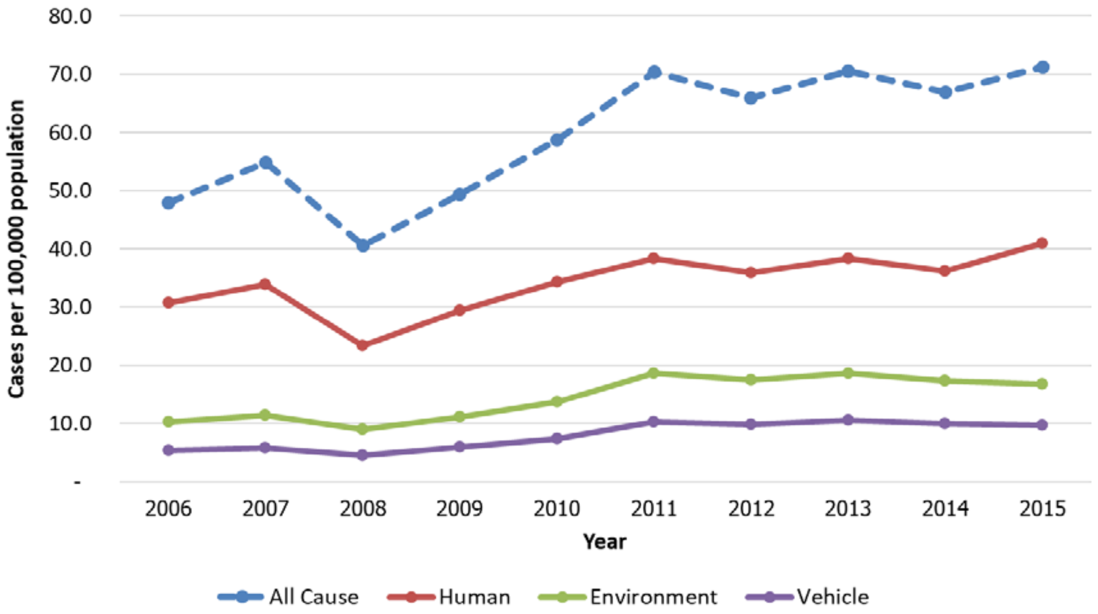

Figure 1. Trend of geometric mean of road traffic accidents in 76 provinces in Thailand by cause, 2006-2015

The degree of correlation between GPP per capita and the incidence of RTAs is displayed in the form of Spearman's correlation coefficients (rs) and shown in Figure 2. A positive relationship between RTAs and GPP per capita was observed during 2006-2013, which meant that GPP per capita and RTAs changed in the same direction (increase or decrease together). By contrast a relatively small negative coefficient presented in 2014 to 2015. The analysis also found that human causes showed a positive coefficient for all years. By contrast, environment and vehicle causes saw a negative coefficient in most years, especially after 2009.

With an in-depth investigation into RTAs at the provincial level, statistical significance was only found in the early study years, especially in all causes (2006-2008) and human causes (2006-2010) whereas environmental causes were statistically significant only in 2015. In later years the coefficient became increasingly negative for environmental causes and vehicular causes, while for all causes and human causes, despite the positive coefficients observed, except in 2014 and 2015, the coefficient became less positive. However, no statistical significance was found in most years, as shown in Table 2.

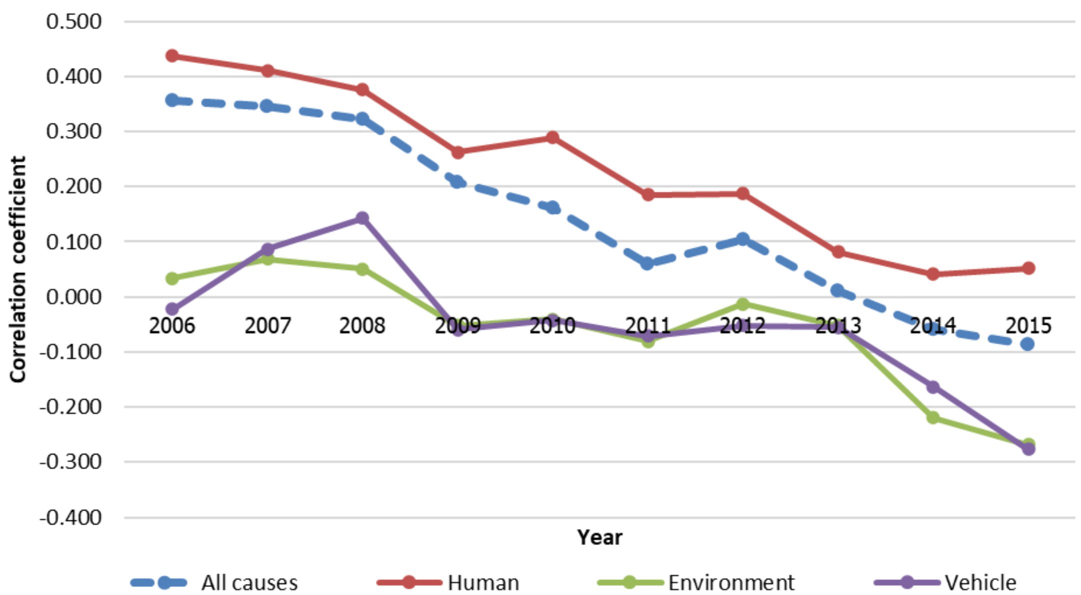

Figure 2. Trend of relationship between road traffic accident incidence and gross provincial product per capita using Spearman's correlation coefficients in 76 provinces in Thailand, 2006-2015

Table 2. Relationship between road traffic accident incidence and gross provincial product per capita using Spearman's correlation coefficients in 76 provinces in Thailand (2006-2015)

Year	All causes		Human		Environment		Vehicle	
	r_s	*p*-value	r_s	*p*-value	r_s	*p*-value	r_s	*p*-value
2006	0.356	0.002	0.437	<0.001	0.034	0.770	-0.023	0.847
2007	0.347	0.002	0.411	<0.001	0.069	0.556	0.087	0.456
2008	0.323	0.004	0.376	0.001	0.051	0.661	0.143	0.218
2009	0.208	0.071	0.263	0.022	-0.052	0.657	-0.059	0.613
2010	0.161	0.165	0.289	0.011	-0.040	0.729	-0.043	0.715
2011	0.059	0.614	0.185	0.110	-0.080	0.490	-0.072	0.539
2012	0.105	0.369	0.187	0.106	-0.013	0.913	-0.052	0.654
2013	0.011	0.926	0.082	0.483	-0.052	0.657	-0.055	0.638
2014	-0.058	0.619	0.041	0.722	-0.220	0.057	-0.164	0.158
2015	-0.086	0.461	0.052	0.658	-0.268	0.019	-0.276	0.016

The CI-RTAs analysis coincides with Spearman's rank correlation above. The years between 2006-2013 saw positive CI-RTAs for all causes, despite an observed downward trend, reflecting that the RTA incidence was mainly concentrated in the well-off provinces in the early years, then shifted towards the less well-off provinces in the later years (CI-RTAs=0.111 in 2009 and 0.022 in 2013). During 2014 to 2015, negative CI-RTAs were observed, indicating that the incidence of RTAs became more concentrated in areas with relatively poor economic levels (CI-RTAs=-0.035 and -0.051 respectively). The negative CI-RTAs were obvious in environmental and vehicular causes with statistical significance (Figure 3). The statistical significance was shown in CI-RTAs for all-causes between 2006 and 2009, and for human causes between 2006 and 2011, as shown in Table 3. The concentration curves in the study periods demonstrate inequity in the incidence of RTAs in provinces with different economic status. The concentration curves were consistent with the CI-RTAs in that the incidence of RTAs tended to be concentrated in less well-off provinces in 2014-2015 (Figure 4).

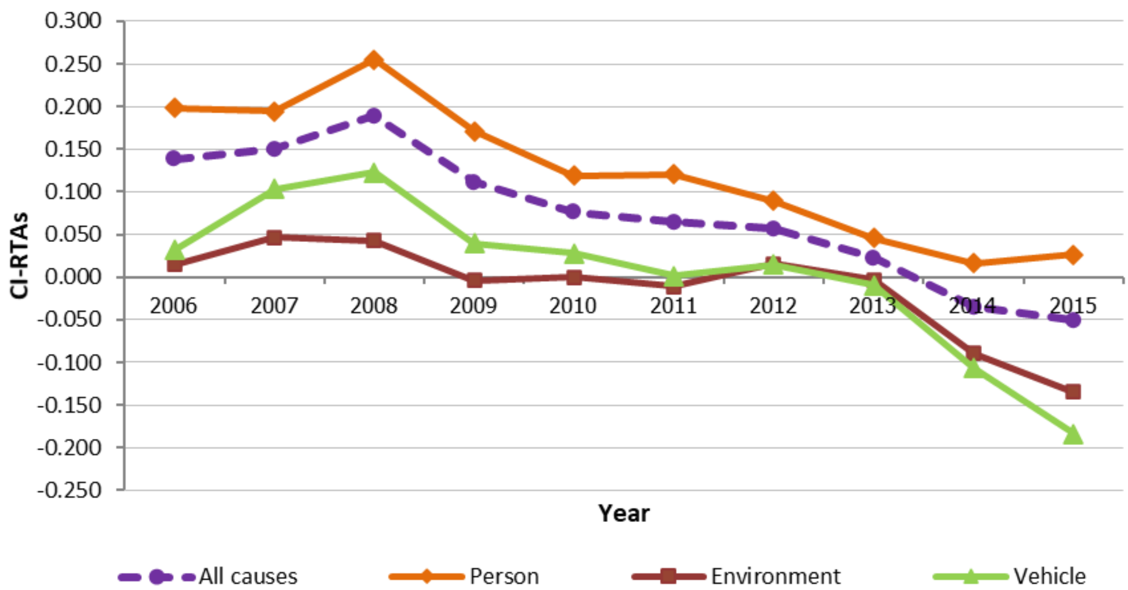

Figure 3. Trend of concentration Index of road traffic accidents by causes, 2006-2015

Table 3. Concentration Index of road traffic accidents by cause in 76 provinces in Thailand, 2006-2015

	All causes				Human				Environment				Vehicle			
Year	CI-RTAs	*p*-value	95% confidence interval		CI-RTAs	*p*-value	95% confidence interval		CI-RTAs	*p*-value	95% confidence interval		CI-RTAs	*p*-value	95% confidence interval	
2006	0.139	<0.001	0.061	0.216	0.198	<0.001	0.112	0.284	0.015	0.740	-0.074	0.103	0.032	0.590	-0.086	0.150
2007	0.150	<0.001	0.072	0.228	0.194	<0.001	0.101	0.288	0.047	0.270	-0.038	0.131	0.103	0.100	-0.020	0.226
2008	0.189	<0.001	0.084	0.294	0.255	<0.001	0.120	0.390	0.043	0.380	-0.055	0.141	0.123	0.080	-0.014	0.260
2009	0.111	0.020	0.018	0.204	0.171	<0.001	0.058	0.285	-0.004	0.940	-0.093	0.086	0.039	0.570	-0.097	0.176
2010	0.076	0.060	-0.004	0.156	0.119	0.020	0.019	0.219	-0.0001	1.000	-0.076	0.076	0.028	0.590	-0.075	0.130
2011	0.065	0.150	-0.023	0.152	0.121	0.010	0.025	0.216	-0.011	0.810	-0.101	0.079	0.001	0.990	-0.124	0.126
2012	0.057	0.210	-0.033	0.146	0.089	0.080	-0.011	0.190	0.016	0.730	-0.073	0.104	0.015	0.800	-0.100	0.130
2013	0.022	0.700	-0.092	0.136	0.046	0.430	-0.069	0.161	-0.003	0.960	-0.117	0.112	-0.010	0.890	-0.154	0.134
2014	-0.035	0.470	-0.131	0.061	0.016	0.760	-0.087	0.119	-0.089	0.090	-0.192	0.014	-0.107	0.080	-0.226	0.013
2015	-0.051	0.320	-0.153	0.051	0.026	0.620	-0.078	0.130	-0.135	0.020	-0.251	-0.019	-0.184	0.010	-0.328	-0.040

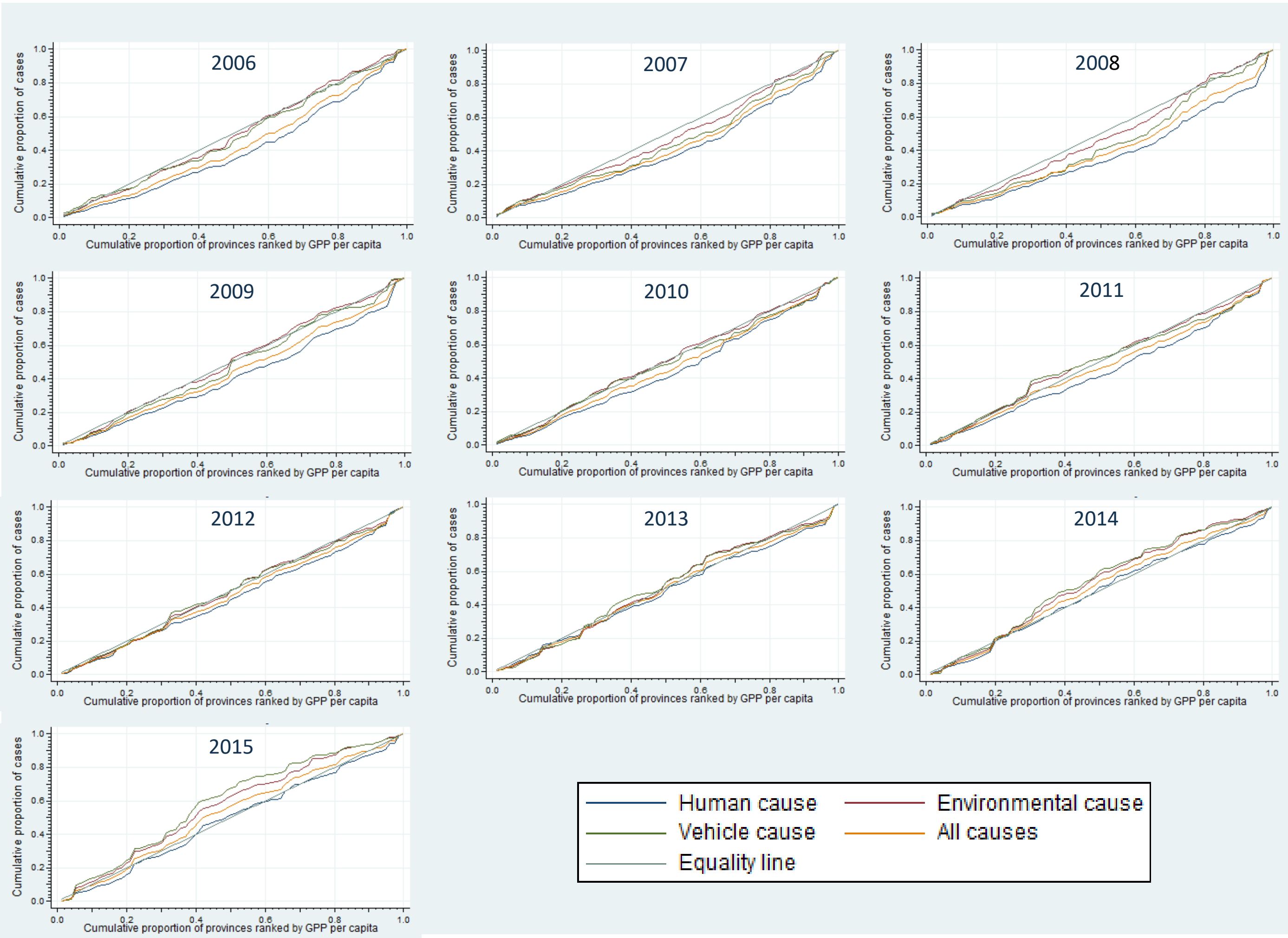

Figure 4. Concentration curves of road traffic accidents by causes, 2006-2015

Discussion

From a macro-perspective, the incidence of RTAs during the study period became less concentrated in the economically well-off provinces and could be seen shifting towards the less well-off areas. This can be confirmed by Spearman's correlation and CI-RTAs, where the coefficients for both analyses became more negative in the latter part of the study. This phenomenon was more apparent in RTAs caused by the environment and defective vehicles.

There are several reasons that provide an explanation for the above findings. First, Thailand has implemented various strategies to curb the high incidence of RTAs and those measures were the focus of intense media campaigns, which are highly accessible to urban populations. Second, most of the campaigns and measures focused heavily on prohibiting risky driving, such as intensifying the punishments given for drink driving[19] and riding a motorcycle without a helmet,[20] while strategies that aimed to correct unsafe environments and vehicle conditions seemed to be less highlighted. Third, around 2010, road safety was declared by the government as a national agenda.[21] During this period, 'Road Safety Group, Thailand' (RSGT) was established to serve as the knowledge generation platform for the government and, at the same time, provide policy recommendations to the wider public on road safety issues.[22] It was noticeable that most campaigns on road safety originated from RSGT started from urban areas. This might explain why urban residents were more likely to benefit from the campaigns than their rural counterparts. Also, the identification of a causal relationship to assess if and to what extent these measures were successful in mitigating RTAs is not straightforward as most of the measures gradually evolved over time rather than being implemented once; and it is not the primary objective of this study. Future studies that assess the effectiveness of RTA-prevention strategies are recommended.

In the past, the majority of road traffic accidents occurred in the better-off provinces such as Bangkok, which had the highest number of registered cars and public motorcycles in Thailand.[23] This study shows that it is necessary for RTA prevention strategies to be made a priority across the country, and not only in affluent provinces such as Bangkok.

The research findings do not indicate that efforts to reduce RTAs in Thailand have been unsuccessful; however, RTA prevention measures should not overlook the less well-off provinces, and that policymakers, given limited time and resource constraints, should intensify different measures in different provinces, taking into account the provincial economy. For instance, more affluent provinces should be given priority with measures that aim to prevent risky behaviors, while for the less well-off provinces, policymakers should first adopt measures to correct problematic environments and intensify vehicle checks. This recommendation extends the value of earlier cross-sectional research by Suphanchaimat et al.,[24] which flags the relatively high concentration index of RTAs caused by unsafe environments and vehicles in the less well-off provinces. The less well-off populations should not be considered as 'the last mile' of RTA prevention policies. A report issued by WHO[25] suggested that health and social impacts from traffic accidents were disproportionately high among the poor and among vulnerable groups. Thus, attempts to promote socioeconomic equality in road safety are of critical importance in the public health arena.

From a methodological point of view, the concentration index is a useful indicator to assess the levels of inequality for various public health problems, including RTAs. However, its interpretation should be made with caution. For instance, the less positive CI-RTAs for human causes in affluent provinces do not mean a reduction in the gross number of RTAs caused by poor driving behaviour. In fact, it reflects a disproportionate concentration of RTAs from that cause relative to the economic disparity across provinces.

Limitations

This study faced some limitations. Firstly, the data analyzed were limited only to cases documented by the Royal Thai Police. It is likely that some cases that were not investigated by the police were missed (for instance, minor accidents or those resulting in minor injuries). Secondly, all the data collected were classified into one of the three main causes conditional upon the discretion of the police investigator in the field. In reality, some incidents can be attributed to various causes simultaneously. Hence, the incidence of RTAs in some causes might be under- or over-estimated due to misclassification bias.

The third limitation lies in the small number of samples. As the unit of analysis is the province, only 76 data points were included. Moreover, an ecological study design such as this one is also a limitation by itself due to the ecological fallacy and a lack of fine-grained analysis that reflects the root causes of RTAs in each individual locality.

Fourthly, results from the CI analysis were subject to change given different proxies of provincial economic level. GPP per capita, despite being useful in representing the provincial economic status, might overly represent industrialized provinces. A better indicator is the asset index, which uses household's goods and assets to measure socio-economic positions of household rather than using income or expenditure;[26] however, the asset index at the provincial level was not publicly available.

Finally, the nature of an RTA study is somewhat different to most routine epidemiological studies. This is because RTAs in a particular area are not a matter of that province only, but also affected by population movement in nearby areas.

Recommendations

The potential bias from data collection points to room for improvement in the nationwide data collecting systems for RTAs in Thailand. The concern on a small number of observations requires further research that delves into the district or sub-district levels, which will provide a clearer insight into the relationship between RTAs and economic status. A primary survey on household economic status in all provinces is recommended to help fill the gaps in knowledge on the provincial economic level. To address the issue that the incidence of RTAs could be affected by the movement of people from nearby areas, further studies that take into account spatial effects are needed.[27] Finally, a more detailed analysis on different types of vehicles and different levels of injuries is recommended to better illuminate the relationship between RTAs and spatial socioeconomic status, and this will help bring about appropriately designed RTA prevention measures in Thailand.

Conclusion

The incidence of RTAs has shifted from the economically well-off provinces to the less well-off provinces. Such findings, shown by the negative CI-RTAs and Spearman's correlation coefficients, point to the need for insightful policy implementation in the Thai public health arena. Provinces with relatively low economic levels should place more emphasis on RTA preventive measures that focus on environmental management and vehicle inspections, while the well-off provinces should put more effort into preventing poor driving behaviour. However, there remained some limitations in this study; for instance, there was a lack of RTA data that were not investigated by the police. This also pointed to room for improvement in the nationwide RTA data collection system. Despite our results, a more detailed analysis on CIs and RTAs, which accounted for the change of RTAs with respect to space and time (temporal and spatial disparities), is likely to be helpful for policy decision making to prioritize the urgency and intensity of various preventive measures to match the economic status of the areas of interest.

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References

1. World Health Organization. Global status report on road safety 2015. Geneva: World Health Organization; 2015.
2. United Nations. SDG Indicators [Internet]. n.d. New York: United Nations; [cited 2020 Sep 2]. <https://unstats.un.org/sdgs/ metadata/>
3. World Health Organization. Global plan for the decade of action for road safety 2011-2020 [Internet]. Geneva: World Health Organization; 2011 [cited 2018 Oct 31]. <https://www.who.int/roadsafety/decade_of_action/plan/plan_english.pdf>
4. Global health observatory data repository. Road traffic deaths, data by country 2013 [Internet]. Geneva: World Health Organization; [cited 2018 Sep 30]. <http://apps.who.int/gho/data/ node.main.A997>
5. Burden of Disease Thailand IHPP, Ministry of Public Health. Burden of disease in Thai population: Disability-Adjusted Life Years (DALYs) 2014. Nonthaburi: Burden of Disease Thailand; 2017 April 21.
6. O-charoen N. Road Accident…The loss to Thai economy [Internet]. Bangkok: Thailand Development Research Institute; 2017 August 11 [cited 2018 Oct 15]. https://tdri.or.th/2017/08/econ_traffic_accidents/. Thai.
7. Road Safety Center. Thailand road safety master plan 2013-2016. Bangkok: Department of Disaster Prevention and Mitigation, Ministry of Interior; 2015.

8. Sompong J, Rapeepong S. Concentration of traffic accident incidence by various causes relative to district economy in Khon Kaen Province: An application of concentration index. Journal of the Department of Medical Services. 2016;6:112-9.

9. Thepkham P. Spatial inequality and implications for Thai economic development. Bangkok: Bangkok of Thailand, 2019.

10. WOW Thailand. Top 5 Road-Crashes Provinces: death & injury [Internet]. 2017 [cited 2018 Oct 15]. <https://bit.ly/2RQi8fW>

11. Gross Regional and Provincial Product (GPP) [Internet]. 2018 [cited 2018 Oct 15]. <http://www.nesdb.go.th/nesdb_en/more_news.php?cid=156&filename=index>

12. O'Donnell O, O'Neill S, Van Ourti T, Walsh B. conindex: Estimation of concentration indices. Stata J. 2016;16(1):112-38.

13. Limwattananon S, Tangcharoensathien V, Prakongsai P. Equity in maternal and child health in Thailand. Bull World Health Organ. 2010;88(6):420-7.

14. Witthayapipopsakul W, Cetthakrikul N, Suphanchaimat R, Noree T, Sawaengdee K. Equity of health workforce distribution in Thailand: an implication of concentration index. Risk management and healthcare policy. 2019; 12:13-22.

15. Gross Regional and Provincial Product (GPP) [Internet]. 2017 [cited 2018 Apr 6]. <https://www.nesdc.go.th/main.php?filename=gross_regional>

16. Clarke P, Van Ourti T. Calculating the concentration index when income is grouped. Journal of Health Economics. 2010;29(1):151-7.

17. O'Donnell O vDE, Wagstaff A, Lindelow M. Analyzing health equity using household survey data: a guide to techniques and their implementation. Washington DC: World Bank; 2008.

18. Koolman X, Doorslaer EV. On the interpretation of a concentration index of inequality. Health Economics. 2004;13(7):649-56.

19. The Nation. Drunk-driving criteria expanded [Internet]. Bangkok: The Nation Thailand. 2017 Jun 01 [cited 2018 Oct 31]:[about 1 p.]. <https://www.nationthailand.com/national/30316926>

20. Patin J. Thailand Tourist Information: A guide to laws in Thailand 2011 [Internet]. Bangkok: Thailand Law Forum. 2011 May 11 [cited 2018 Oct 31]: [about 5 screens]. <http://thailawforum.com/tourst-guide-laws-Thailand-2.html>

21. Royal Thai Government. Security [Internet]. n.d. [cited 2020 August 13]. <https://www.thaigov.go.th/news/contents/details/25289>

22. Thai RS. Road Safety Thai [Internet]. n.d. [cited 2020 August 13]. <http://www.roadsafetythai.org/>

23. Gov Channel. High value datasets [Internet]. 2017 [cited 2018 August 18]. <https://data.go.th/DatasetDetail.aspx?id=19d8d378-6dfd-4a51-a16a-0dd5db308e14>

24. Suphanchaimat R, Bamrung A, Kowit P. Relationship between concentration of traffic accident incidence by various causes and provincial economic status: An application of concentration index. Journal of Health Science. 2017;26(3):821-8.

25. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.

26. Prakongsai P. An application of the asset index for measuring household living standards in Thailand. SSRN. 2006 Apr 4: [17 p.]

27. Thomas I. Spatial data aggregation: exploratory analysis of road accidents. Accident Analysis & Prevention. 1996 Mar;28(2):251-64.

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Clusters of Coronavirus Disease (COVID-19) in Pubs, Bars and Nightclubs in Bangkok, 2020

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Abstract

Two clusters of COVID-19 cases were identified in Bangkok, Thailand linked to entertainment areas, including pubs, bars and nightclubs in March 2020. A joint investigation was carried out by healthcare staff and epidemiologists from the Division of Epidemiology of Department of Disease Control and the Urban Disease Control and Prevention. A descriptive cross-sectional study was performed to describe characteristics of the outbreak clusters, perform contact tracing, and provide recommendations for outbreak control. In total, there were 15 cases in the first cluster and 31 cases in the second cluster; including both the index cases and cases that were later identified from contact tracing. Sharing utensils, glasses and cigarettes was a key risk behavior. Moreover, active case finding was done among the personnel of a pub linked to the majority of the cases. Eighteen percent of the workers in this pub was infected with SARS-CoV-2. After the reopening of pubs, bars and nightclubs, a sentinel surveillance policy and close monitoring program among people with a history of travelling to or working at entertainment places was implemented.

Keywords: coronavirus disease, COVID-19, Thailand, nightclub, contact tracing, sentinel surveillance

Introduction

Many countries around the world, including Thailand, are struggling to cope with the public health and economic impacts of the coronavirus disease (COVID-19).[1] The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The main route of transmission of COVID-19 is mainly through direct contact with droplets spread from infected persons.[2] People infected with COVID-19 usually develop mild to moderate symptoms, for example, fever, muscle aches and rhinorrhea. Those who are at greater risk of severe symptoms and death include people over 60 years and/or those with underlying medical conditions. As of 19 Sep 2020, there have been over 30 million cases of COVID-19 worldwide, with more than 956,000 deaths.[3]

COVID-19 cases were first identified in Wuhan, China, in December 2019.[4] Thailand was the first country outside China to experience COVID-19 cases, with most of the early cases linked to a history of travelling to or from China.[5] On 31 Jan 2020 the first confirmed case from local transmission in Thailand was reported.[6,7] The number of locally transmitted cases has risen since then. Many cases were identified as having a linkage with entertainment areas such as pubs, bars and nightclubs.

On 9 Mar 2020, the COVID-19 operation team of the Division of Epidemiology (DOE), Department of Disease Control (DDC), Ministry of Public Health (MOPH), received a notification from the Institute for Urban Disease Control and Prevention (IUDC) in Bangkok that there were clusters of COVID-19 that might have originated from a common source. The source(s) were suspected to be pubs, bars, nightclubs, restaurants, or other entertainment venues along a street for nightlife activities in Bangkok. The joint operation team comprising staff members from the DOE and IUDC commenced an outbreak investigation on 10 Mar 2020. The aims of the investigation were to describe characteristics of the outbreaks, perform contact tracing to identify likely sources and prevent further transmission, and provide recommendations for outbreak control.

Methods

The team conducted a descriptive cross-sectional study. Data collection techniques consisted of reviewing medical records of confirmed cases and conducting in-depth interviews with cases and all contacts by phone. The definition of a patient under investigation of COVID-19 case was any person who had fever (body temperature ≥37.5 degree Celsius) or history of fever and any respiratory symptoms (e.g. cough, rhinorrhea, sore throat or dyspnea) with a history of exposure to high-risk places, e.g. entertainment areas, or being in close contact with any person who had a history of exposure to high risk places between 17 Feb 2020 and 20 Mar 2020. A confirmed COVID-19 case was a person who was later reported to have tested positive for SARS-CoV-2 detection from nasopharyngeal or throat swabs during 9 to 22 Mar 2020. Asymptomatic infection was a confirmed COVID-19 case showing no signs and symptoms. Positive test of SARS-CoV-2 was determined by Polymerase Chain Reaction (PCR) from two laboratories certified by Department of Medical Sciences, MOPH.[8,9]

Contact tracing was performed among household members, relatives, friends and any persons who were exposed to the cases during the presence of symptoms. Contacts were divided into two categories; (i) high-risk contacts, defined as any person who contacted with or communicated with, or stayed in a closed space with poor air ventilation (such as air-conditioned room or car) with a case(s) within a one-meter distance for at least five minutes without adequate protective equipment such as face mask or face shield; and (ii) low-risk contacts defined as any person who contacted or communicated with a case but did not meet the high-risk criteria.[10]

High-risk contacts had throat and nasopharyngeal swabs collected on the fifth day after the last exposure date with a confirmed case. High risk contacts were self-quarantined for a further 14 days after the last exposure date if laboratory results were negative for SARS-CoV-2. Low-risk contacts were asked to self-monitor and report their symptoms to the local healthcare providers every day until the 14-day quarantine period ended.

An epidemic curve was constructed to inform characteristics of the outbreak. An exploratory social network analysis (SNA) was applied to determine the connection between cases and contacts. A sociogram was constructed to visualize the SNA findings.

Ethical clearance was waived as this study was performed as part of the routine outbreak investigation of the Thailand-DDC.

Results

In early March 2020, there was a suspected COVID-19 case with no history of travelling abroad but had travelled to nightclubs in the Thong Lo area, Wattana District, Bangkok. After the laboratory confirmation of SARS-CoV-2 infection, this case (index case in Cluster#1) became the first case of a COVID-19 outbreak with a history of visiting a nightclub.

Cluster Number 1

Index case description

The index case was a 29-year-old Thai female who lived in Bangkok. She had a sore throat on 3 Mar 2020. On the following day, she visited the outpatient clinic of Hospital AA to receive treatment. She received only symptomatic treatment without any specific laboratory testing. On 8 Mar 2020, she developed fever with chills and cough. Subsequently, she re-visited the same hospital and was admitted. Nasopharyngeal and throat swabs were collected and were positive for SARS-CoV-2. The result was reported to the IUDC on 11 Mar 2020.

The interview with the index case showed that she went to pub BA and pub BB on 21 to 22 Feb 2020 with five Thai friends and six foreign friends (five from Hong Kong and one from Singapore). No one had respiratory symptoms and the foreign friends reported no symptoms after they went back to their home countries. On 27 Feb 2020, the index case and her husband (B) had dinner with 7 friends (K, L, M, N, R, U and Q) at Restaurant BC. On 29 Feb 2020, she and her husband had a major gathering with 10 friends (C, D, E, F, G, H, I, J, S and T) at pub BD, pub BE and pub BF, all located in Thong Lo area, Wattana District, Bangkok. All of the party members reported that they shared utensils, glasses, cigarettes and a microphone for karaoke. No one wore a mask during the gathering. After the index case developed symptoms (3 Mar 2020), she and her husband had lunch with four friends (K, L, M and N) at the index case's house. After lunch she travelled to Nakhon Ratchasima Province with her husband and one of her friends (L) during 4 to 5 Mar 2020 to join a wedding ceremony with other friends (L, K, M, and N) in Saraburi during 6 to 8 Mar 2020. The index case wore a mask continuously after she had symptoms, except during mealtimes.

Contact tracing

A total of 17 contacts were identified, including three household contacts and 14 non-household close contacts.

Among the three household contacts, her husband developed cough on 5 Mar 2020. No other household contact developed any symptoms. The husband was later identified as a confirmed case. Among the 14 non-household close contacts, there were two main groups of friends who joined the party on 29 Feb 2020 and had lunch on 3 Mar 2020. The attack rates among both groups were 80% (8/10) and 75% (3/4), respectively. The contact tracing was expanded to cover all contacts of the infected people; two of these were friend of the index case's friend (C) who joined the party and were later identified with the COVID-19 virus (Figure 1).

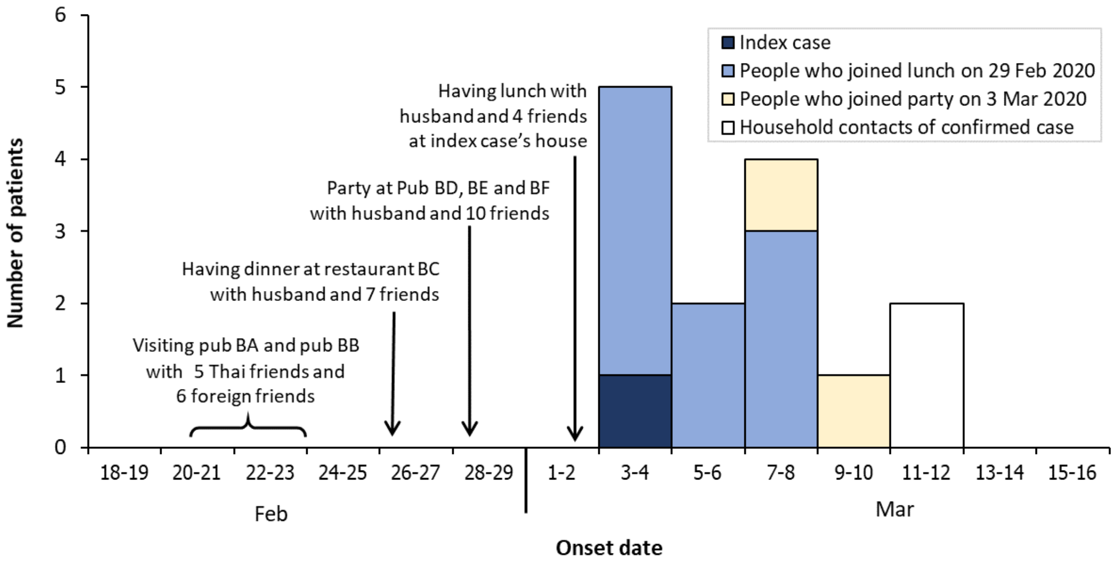

Figure 1. Epidemic curve and risk activities of COVID-19 patients in cluster#1 (N=13)

The majority of cases (13/15; 87%) had at least one symptom. Fever, headache and myalgia were the most common symptoms (62%). Other symptoms were cough (54%), sore throat (46%), rhinorrhea (38%), dyspnea (31%), fatigue (31%) and having sputum (31%). The median age of the patients in this cluster was 33 years (interquartile range: 5.5 years (Q1=31.5, Q3=37)). The male to female ratio was 1.5. All patients were admitted and isolated until their specimen tested negative for SARS-CoV-2 for at least two consecutive tests.

Social network analysis

The onset of illness for the first case was 3 Mar 2020. People who joined the party on 29 Feb 2020 had onset of illness on 4 Mar 2020. Most of the people who shared a meal with the index case on 27 Feb 2020 also shared another meal with the index case on 3 Mar 2020. However, people who only joined the meal on 27 Feb 2020 did not get infected (Figure 2).

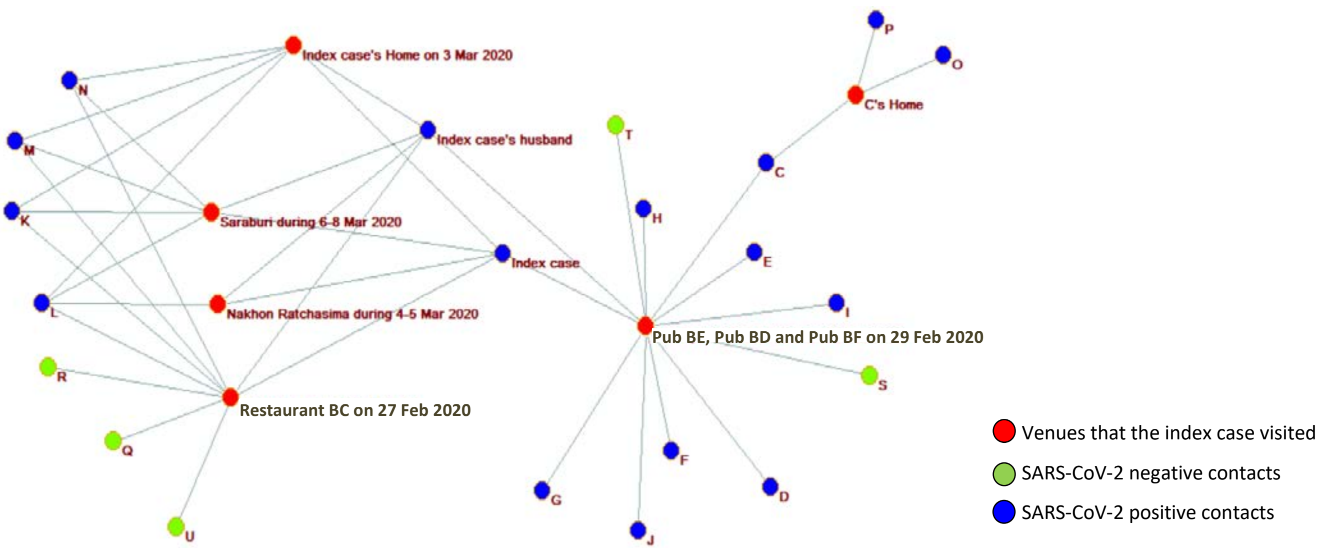

Figure 2. Sociogram illustrating the connection of cases, contacts, and venues that the index case visited in cluster#1 (N=21)

Cluster Number 2

Index case description

The index case was a 27-year-old Thai male living in Bangkok. He developed fever with a body temperature of 37.9°C, cough, and rhinorrhea on 10 Mar 2020. He visited an outpatient clinic in Hospital AB on the same day where he submitted nasopharyngeal and throat swabs. On 11 Mar 2020 the specimens were positive for SARS-CoV-2 by RT-PCR. He was admitted and isolated in the hospital. The index case reported that he travelled to Japan with his four friends during 25 Jan to 2 Feb 2020. No one had symptoms. From 2 Feb to 9 Mar 2020 the index case reported going to several pubs with his wife and 12 of his friends almost every night. The common venues were pub BG, pub BH and pub BI, which were located in Thong Lo area, Wattana District, the same district as cluster#1. The index case and his friends reported sharing utensils, glasses and e-cigarettes during their time in the pubs.

Contact tracing

A total of 13 contacts were identified including the index case's wife and 12 friends. His wife developed fever and myalgia on 8 Mar 2020 and was found to be infected with COVID-19. Likewise, 5 of 12 friends of the index case were infected with COVID-19. Contact tracing was expanded to cover all the contacts of the cases. Three additional friends of friends of the index case were identified as SARS-CoV-2 positive. Active case finding was performed on the staff working at pub BI because many of the cases had reported a history of visiting there. Of the 98 staff who submitted nasopharyngeal and throat swabs to be tested for SARS-CoV-2 by RT-PCR, 20 (18%) were infected with COVID-19. One additional household contact was later identified as positive for COVID-19 (Figure 3).

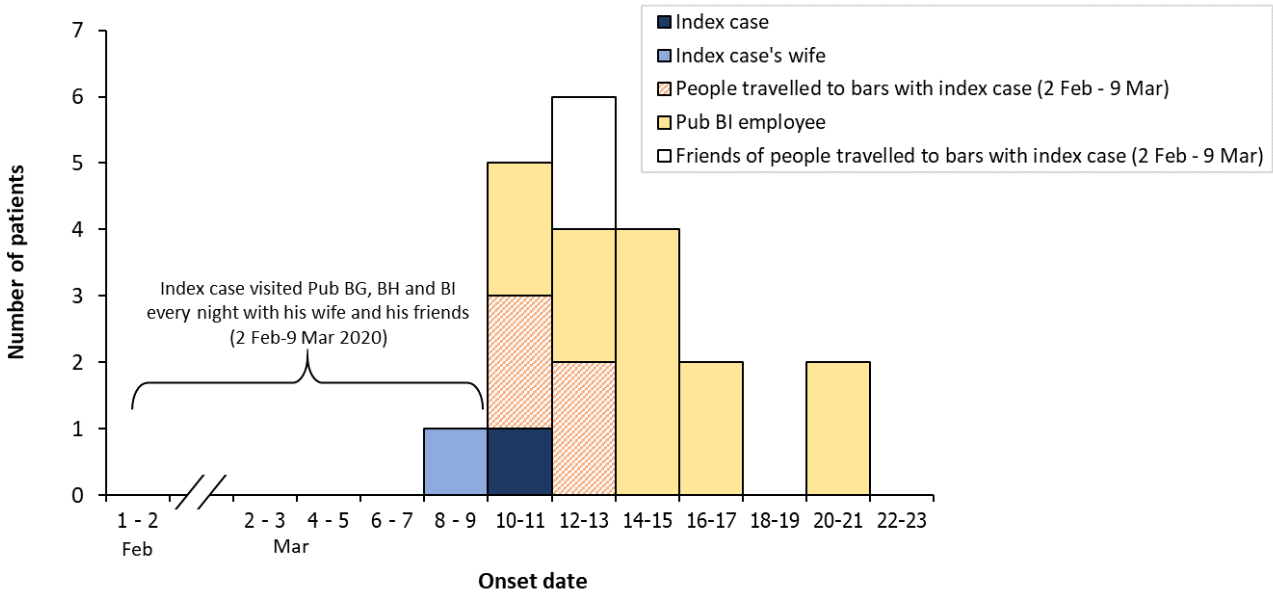

Figure 3. Epidemic curve and risk activity of COVID-19 patients in cluster#2 (N=20)

Most of the cases (65%) had symptoms; fever was the most common (57%), followed by cough (50%), and myalgia with anosmia (27%). The median age of the patients was 31 years (interquartile range: 11.5 years (Q1=24, Q3=38.5)). The male to female ratio was 1.4. All patients were admitted and isolated until their nasopharyngeal and throat swabs were found negative for at least two consecutive days.

Social network analysis

The first contact person identified by contact tracing who became infected with COVID-19 was the index case's wife with illness onset on 8 Mar 2020. This was almost the same onset date as the index case and workers at pub BI (Figure 4).

Government's Actions

According to the investigations of two clusters of COVID-19 infection in Bangkok nightclubs, the definite source of infection could not be identified. However, there was an epidemiological linkage in terms of place as the affected nightclubs were located in Thong Lo area, Wattana District, Bangkok and these clusters happened in the same period. This outbreak, among other things, caused the Government to take immediate actions to control COVID-19 in nightclubs.

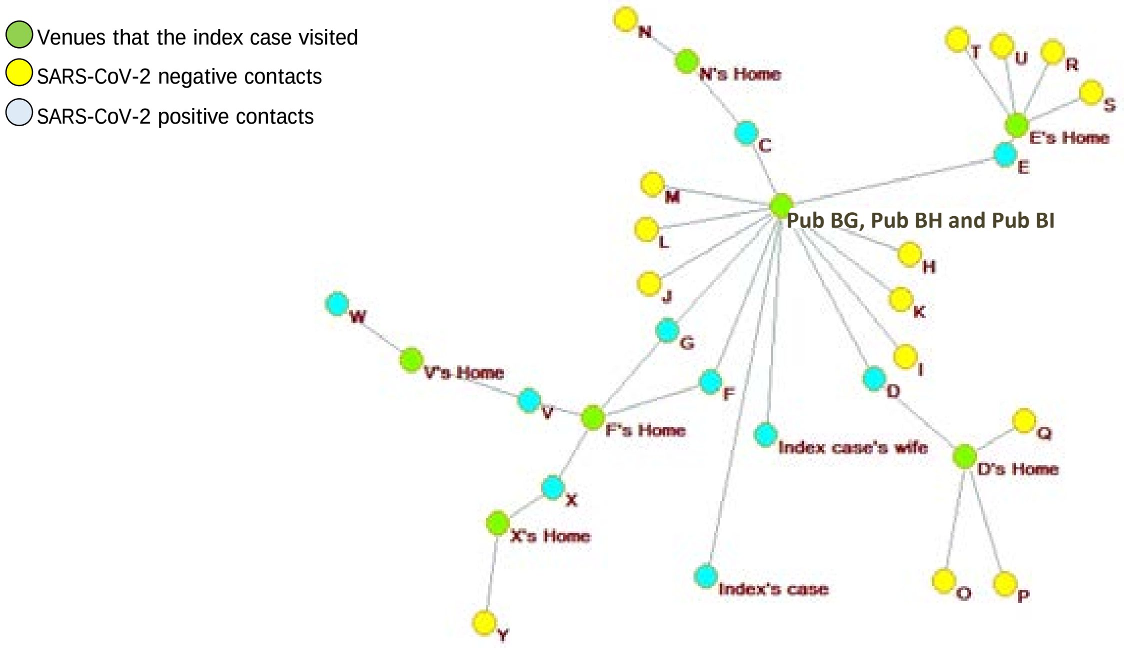

Figure 4. Sociogram illustrating the connection of cases, contacts, and venues that the index case visited in cluster#2 (N=25)

Promptly after this investigation, the Thai Government closed all pubs and nightlife events in Bangkok. This measure was expanded country-wide on 22 Mar 2020.[11,12] There were no reports of COVID-19 cases related to entertainment areas after 5 Apr 2020.[13]

Discussion

These two COVID-19 clusters originated within the same area (Thong Lo, Wattana District) and it is an area that always has a high number of nightlife tourists. Overall, we could identify 46 COVID-19 patients (both the two index cases and those who were identified by contact tracing) and 98 contacts who were not infected with COVID-19. This fact indicates that pubs and bars are among very high-risk areas for COVID-19.

Other countries also faced a similar situation. Japan, South Korea and Hong Kong were reported to experience super spreading events of COVID-19 related to pubs, bars and night clubs.[14-16] These places probably contributed to a high risk area for COVID-19 as they are usually located in a closed indoor space with poor air ventilation and crowded with people.[17,18] These entertainment areas also attract tourists from all over the world, such as Itaewon in South Korea, Lan Kwai Fong in Hong Kong, and Ginza in Japan.[19-22] However, the primary source of these outbreaks could not be exactly identified. We were unable to contact six foreigners who were reported in the first cluster as they had already left Thailand before the outbreak investigation.

At the same time, the investigation team contacted the International Health Regulation (IHR) focal point in Thailand to communicate with the focal point of these foreigners' home countries about the risk of COVID-19 spreading.

Contact tracing is an important public health response to control COVID-19.[23] In this study, we found 14 additional cases in cluster#1 and 9 additional cases in cluster#2 through the investigation and contact tracing process. Most cases were linked with a history of visiting pubs in Thong Lo area, Wattana District and having meals together with the index case. The attack rates among close contacts in both clusters were 80% and 75%, far greater than the attack rate of previous COVID-19 outbreaks in Thailand. On 5 Mar 2020, the attack rate among a cluster of COVID-19 Thai businessmen returning from Italy was 50%.[24] This could be partly explained by the high-risk characteristics of entertainment areas that can facilitate the spread of COVID-19.[17,18]

The behaviors of people attending pubs, bars, and nightclubs increase their risk of COVID-19 infection. These include sharing of utensils, glasses, cigarettes and microphones. This is because COVID-19 transmission can occur via direct contact with objects contaminated with the virus.[25,26] Furthermore, the virus can survive for several hours on a fomite surface (four hours on copper, 24 hours on cardboard and up to two to three days on plastic and stainless steel). In fact, the virus might survive longer than expected, conditional upon the environment and ambient temperature.[27] Additionally, some activities in these entertainment areas may aggravate the risk of COVID-19 spreading, such as drinking alcohol, singing karaoke, shouting and/or talking loudly may increase the production and spread of respiratory droplets.[28] The consumption of alcohol may also cause people to be less aware of the risk of COVID-19; subsequently, some protective behaviors against the disease were relaxed, for instance, keeping a physical distance from others and wearing a protective face mask.

Thailand had previously adopted the practice of screening high risk populations, such as migrants and people who had frequent contact with foreigners, for COVID-19. In this investigation, we identified entertainment area staff and visitors to these places as high risk populations for contacting COVID-19 infection. Therefore, we initiated active case finding among workers of pub BI and found that 18% tested positive for COVID-19 infection, of which 60% were symptomatic. Additionally, during May 2020, the MOPH introduced a nationwide COVID-19 sentinel surveillance policy on populations at risk using pooled saliva samples. People working in pubs, bars and nightclubs are populations at risk. Other high-risk populations include migrants, people living in slum communities, people working in the public transportation sector such as bus drivers, and prisoners.[29]

There were some limitations in this study. First, it is likely that reports of travel history during the active case finding were biased due to the fear of stigmatization and discrimination. During the time of the interviews the volume of COVID-19 cases in Thailand was rising and the public response towards COVID-19 was very strong. It was likely that people involved in a super-spreading event would be strongly criticized.[30] Nonetheless, we tried to validate this information by interviewing a number of people. Secondly, the two index cases and their contacts travelled to numerous entertainment areas with a large number of people. Therefore, recall bias might have occurred. Thirdly, we could not contact and retrieve the history of some contacts in the first cluster, especially the foreign friends of the index case. This was a missed opportunity to identify the exact sources of infection.

Public Health Recommendations

The findings from this investigation were provided to the Emergency Operating Center (EOC) of the MOPH. We recommended that the sentinel surveillance and active case finding strategy should be conducted among people who had a history of visiting pubs, bars and nightclubs in Thong Lo area, Wattana District, Bangkok. In late March 2020, the Government imposed a stringent policy on all entertainment venues in the country that required them to stop operating until the COVID situation in Thailand was under control. Since 1 Jul 2020 this measure has been relaxed and these venues have been allowed to re-open, but with strict physical distancing measures.[31] We recommended that close monitoring of high risk populations, including visitors of entertainment areas, should continue. This requires collaboration with the owners of these venues to ensure that all guests wear masks, register themselves on arrival to and departure from the venue, and comply with all hygiene measures stipulated by the Thai Government.[32]

Conclusion

In March 2020, active case finding and contact tracing was conducted as a response to two clusters of COVID-19 cases in a popular entertainment area of Bangkok. As a response to this investigation, the Thai Government issued a stop-operating order until the COVID situation in Thailand was under control. Active case finding and contact tracing was initiated with the identified high-risk groups of employees and customers of pubs, bars and nightlife restaurants in other parts of the country. We recommend close monitoring of high-risk groups with regular sentinel surveillance.

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References

1. World Health Organization. Naming the coronavirus disease (COVID-19) and the virus that causes it [Internet]. Geneva: World Health Organization; 2020 [cited 2020 May 5]. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it>

2. World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations [Internet]. World Health Organization; 2020 [cited 2020 May 5]. <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>
3. World Health Organization. COVID-19 situation reports [Internet]. World Health Organization; 2020 [cited 2020 May 5]. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>
4. Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. J Med Virol. 2020;92(4):401–2.
5. Cheung E. Thailand confirms first case of Wuhan virus outside China. South China Morning Post [Internet]. 2020 Jan 13 [cited 2020 May 5]. <https://www.scmp.com/news/hong-kong/health-environment/article/3045902/wuhan-pneumonia-thailand-confirms-first-case>
6. Pongpirul WA, Pongpirul K, Ratnarathon AC, Prasithsirikul W. Journey of a Thai Taxi driver and novel coronavirus. N Engl J Med. 2020;382(11):1067–8.
7. Department of Disease Control, Ministry of Public Health Thailand. COVID-19 situation reports [Internet]. Nonthaburi: Department of Disease Control, Ministry of Public Health Thailand; [cited 2020 May 5]. <https://covid19.ddc.moph.go.th/>
8. Department of Disease Control, Ministry of Public Health Thailand. Guideline for COVID-19 Investigation, version 3 Mar 2020 [Internet]. Nonthaburi: Department of Disease Control, Ministry of Public Health Thailand; [cited 2020 May 5]. <https://ddc.moph.go.th/viralpneumonia/file/guidelines/G_Invest_03_2.pdf>. Thai.
9. Department of Medical Sciences, Ministry of Public Health Thailand. Manual of COVID-19 laboratory detection [Internet]. Nonthaburi: Department of Medical Sciences, Ministry of Public Health Thailand; [updated 2020 Feb 17, cited 2020 May 5]. <https://www3.dmsc.moph.go.th/post-view/680>. Thai.
10. Department of Disease Control, Ministry of Public Health Thailand. Guideline for COVID-19 investigation, version 23 March 2020 [Internet]. Nonthaburi: Department of Disease Control, Ministry of Public Health Thailand ; [cited 2020 May 5]. <https://ddc.moph.go.th/viralpneumonia/file/g_srrt/g_srrt_250363.pdf>. Thai.
11. Wangcharoen S. Bangkok malls to close from Sunday. Bangkok Post [Internet]. 2020 Mar 21 [cited 2020 May 5] <https://www.bangkokpost.com/thailand/general/1883570>
12. Pattaya Mail. Thailand to allow drinking alcohol in restaurants June 15. Pattaya Mail [Internet]. 2020 Jun [cited 2020 May 5] <https://www.pattayamail.com/news/thailand-to-allow-drinking-alcohol-in-restaurants-june-15-303561>
13. Department of Disease Control, Ministry of Public Health Thailand. Daily report of COVID-19 in Thailand [Internet]. Nonthaburi: Department of Disease Control, Ministry of Public Health Thailand; 2020 [cited 2020 May 5]. <https://ddc.moph.go.th/viralpneumonia/index.php>
14. Furuse Y, Sando E, Tsuchiya N, Miyahara R, Yasuda I, Ko YK, et al. Clusters of coronavirus disease in communities, Japan, January–April 2020. Emerg Infect Dis. 2020;26(9): 2176–9.
15. The Centre for Health Protection, Department of Health HK. Latest situation of cases of COVID-19 (as of 14 June 2020) [Internet]. Hong Kong: Centre for Health Protection, Department of Health; [cited 2020 May 5]. <https://www.chp.gov.hk/files/pdf/local_situation_covid19_en.pdf>
16. Sum LK. Chan H. Coronavirus: 19 new Hong Kong infections linked to growing nightlife cluster, including from Lan Kwai Fong, bringing tally to 43. South China Morning Post [Internet]. 2020 Mar 27 [cited 2020 May 5]. <https://www.scmp.com/news/hong-kong/health-environment/article/3077251/loss-taste-and-smell-listed-covid-19-symptom-hong>
17. Knibbs LD, Morawska L, Bell SC, Grzybowski P. Room ventilation and the risk of airborne infection transmission in 3 health care settings within a large teaching hospital. Am J Infect Control. 2011;39(10):866–72.

18. Lu J, Gu J, Li K, Xu C, Su W, Lai Z, et al. COVID-19 Outbreak Associated with Air Conditioning in Restaurant, Guangzhou, China, 2020. Emerg Infect Dis. 2020;26(7):1628–31.

19. Salmon A. A Covid-19 turns the lights out on Asia's nightlife. Asia Times [Internet]. 2020 May 19 [cited 2020 May 5]. <https://asiatimes.com/2020/05/lights-go-out-over-asias-nightlife/>

20. Sooyeon. S. Korea still vigilant over community spread; club cluster brought under control. Yonhap news Agency [Internet]. 2020 May 19 [cited 2020 May 5]. <https://en.yna.co.kr/view/AEN20200519002100320?section=news>

21. Mengyan G. HK virus cases shoot up 25% on Friday. The Nation Thailand [Internet]. 2020 Mar 21 [cited 2020 May 5]. <https://www.nationthailand.com/news/30384556?utm_source=homepage&utm_medium=internal_referral>

22. Ryall J. Coronavirus: Tokyo's nightlife districts linked to rise in virus patients in their 30s and 40s. South China Morning Post [Internet]. 2020 Apr 2 [cited 2020 May 5]. <https://www.scmp.com/week-asia/health-environment/article/3078156/coronavirus-tokyos-nightlife-districts-linked-rise>

23. Sun K, Viboud C. Impact of contact tracing on SARS-CoV-2 transmission. Lancet Infect Dis. 2020;2019(20):2019–20.

24. Wongsanuphat S, Jitpeera C, Konglapamnuay D, Nilphat C. Contact Tracing and Awareness-Raising Measures for Travelers Arriving in Thailand from High Risk Areas of Coronavirus Disease (COVID-19): A Cluster of Imported COVID-19 Cases from Italy, March 2020. OSIR. 2020;13(2):38–47.

25. World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations [Internet]. Geneva: World Health Organization. 2020 [cited 2020 May 5]. <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>

26. Wongsanuphat S, Wonghirundecha T, Boonwisat P, Kerdsalung K. Behavioral and Environmental Factors Associated with an Influenza Outbreak in a Prison of Thailand. OSIR. 2019;12(4):116–25.

27. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. New Engl J Med. 2020;382(16):1564–7.

28. European Centre for Disease Prevention and Control. Heating, ventilation and air-conditioning systems in the context of COVID-19 [Internet]. Sweden: European Centre for Disease Prevention and Control; 2020 Jun 22 [cited 2020 May 5]. <https://www.ecdc.europa.eu/sites/default/files/documents/Ventilation-in-the-context-of-COVID-19.pdf>

29. Department of Disease Control, Ministry of Public Health Thailand. Target group for COVID-19 to diagnosis, treatment, investigation and active case finding among risk population/places (Sentinel surveillance). Nonthaburi: Department of Disease Control, Ministry of Public Health Thailand; 2020. 14 p.

30. Bruns DP, Kraguljac NV, Bruns TR. COVID-19: Facts, Cultural Considerations, and Risk of Stigmatization. J Transcult Nurs. 2020;31(4):326–32.

31. Mala D, Nanuam W. Pubs set to reopen in July. Bangkok Post [Internet]. 2020 Jun 22 [cited 2020 May 5]. <https://www.bangkokpost.com/business/1938672/pubs-set-to-reopen-in-july>

32. Ditsungnern M. Huge list of 22 rules for pubs & bars to follow when reopening on July 1st [Internet]. [cited 2020 May 5]. <https://sawadeesiam.com/thailand/huge-list-of-22-rules-for-pubs-bars-to-follow-when-reopening-on-july-1st/>

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Assessment of Knowledge and Performance of Village Health Volunteers after Expanding Their Responsibilities in Bago Region, Myanmar, 2017

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Abstract

With declining malaria morbidity in recent years, the National Malaria Control Program, in 2017, expanded Village Health Volunteer (VHV) responsibilities with the integration of other diseases, including dengue haemorrhagic fever, lymphatic filariasis, tuberculosis, leprosy and HIV/AIDS; and changed their name to Integrated Community Malaria Volunteer (ICMV). This study aimed to assess VHV's knowledge and performance before and after integration and to identify challenges. VHV's knowledge was assessed with an uncontrolled pre- vs. post-intervention study, and malaria-related performance was assessed with a pre- vs. post-intervention with a non-randomized comparison group. The number of suspected malaria cases blood tested were compared in an intervention township (Kyauktagar) and comparison township (Daik-U). Data were collected by face-to-face interviews and review VHV's reports and patient registers. The VHV attrition rate was 5% (4/86) over 3 months. All knowledge scores increased significantly after training. However, follow-up knowledge scores were still relatively low. The only difference in reporting status between pre- and post-integration was in timeliness, which was significantly better post-integration. Blood testing was increased in the intervention township. ICMVs had no challenges in malaria activities but some difficulties on reporting forms for other diseases. In conclusion, VHV performance improved in malaria-related aspects after the training. This will support malaria elimination efforts but their performance for non-malaria diseases should be re-evaluated.

Keywords: malaria, volunteers, Integrated Community Malaria Volunteers

Introduction

Malaria is caused by Plasmodium parasites, which are spread to people through the bites of infected female *Anopheles* mosquitoes, called "malaria vectors". There are five parasite species that cause malaria in humans, and two of these species–*P. falciparum* and *P. vivax*–pose the greatest threat. In 2018, there were an estimated 228 million cases of malaria worldwide.[1] In 2015, 291 of the 330 townships in Myanmar were malaria endemic.[2] From 2005 to 2016, malaria cases decreased from 622,373 to 110,146 (82% reduction) and deaths also decreased from 1,707 to 21 (99% reduction).[3]

Myanmar's National Malaria Control Program (NMCP) plans to eliminate malaria by 2030. One objective of the National Strategic Plan is to interrupt transmission of falciparum malaria in at least five states and regions (Bago, Magway, Yangon, Mon, Mandalay) by 2020.

In Myanmar, volunteers, called Community-Owned Resource Persons (CORPs), started working for the NMCP in 2006 in three townships with a goal to give residents increased access to facilities that offer quality diagnosis and effective treatment for malaria in remote areas.[4,5] The volunteer program expanded to other states and regions, with the CORPs calling themselves village health volunteers (VHV). According to an NMCP report in 2016, there were 58,359 positive malaria cases among 134,758 tested. By 2017, there were 9,074 VHVs in 218 townships in Myanmar. These VHVs examined 54,900 individuals with rapid diagnosis tests (RDT) of which 21,505 were found positive and given treatment. Therefore, the VHV case finding rate was approximately 40% of total positive cases.[3] Key activities of VHV include health education, outbreak report, insecticide-impregnation of bed nets, data recording, case reporting and assisting in distribution of long-lasting insecticide-treated nets (LLIN), and early diagnosis and treatment of uncomplicated malaria cases.

The National Malaria Control Program provides annual refresher training courses to VHV to increase their malaria knowledge with a small amount of training on dengue and lymphatic filariasis. Some of the VHVs who had not seen the malaria positive cases since they began working as VHVs had difficulty recalling the names of antimalarial drugs. To continue the community outreach provided by the VHVs in low transmission areas, in June 2017, the NMCP increased their duties by integrating other diseases into their activities and changing their title to "Integrated Community Malaria Volunteer" (ICMV) to reflect this change. The new diseases included dengue haemorrhagic fever (DHF), lymphatic filariasis, tuberculosis, leprosy, and HIV/AIDS. The ICMV training was started in Bago Region as a pilot project. Bago Region is located in central Myanmar and has five million residents with 80% living in rural areas. In 2016, there were 2,021 VHVs working in Bago Region.[6,7] In 2017, there were 1,011 positive malaria cases, of which 67% were detected by VHVs and the malaria positivity rate was 0.49%.[8]

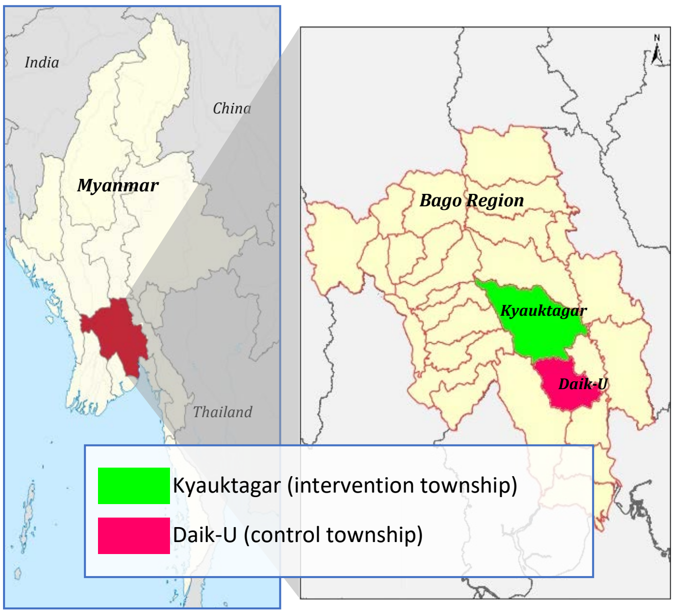

Figure 1. Study areas, Kyauktagar Township and Daik-U Township, Bago Region, Myanmar

To prepare the VHVs for their new duties as ICMVs, the NMCP developed a five-day training course to focus on the mode of transmission, signs and symptoms, and prevention and control methods of each disease. The objective of this study was to evaluate the VHV's knowledge and performance on malaria before and after expanding their responsibilities as ICMVs and then comparing their knowledge on other diseases, including dengue haemorrhagic fever (DHF), lymphatic filariasis, tuberculosis, leprosy, and HIV/AIDS. To help improve support for ICMV, the challenges they perceived were also explored.

Methods

Study Design

We conducted an uncontrolled pre- and post-intervention study to evaluate the participants' knowledge and a pre- vs. post-intervention study with a non-randomized control group to evaluate the participants' performance. Challenges in working as an ICMV was identified from questionnaire and informal interview with all participants. The study was conducted from September to December 2017.

Study Site and Population

We purposively selected two townships in Bago region: Kyauktagar Township (intervention) and Daik-U township (control) (Figure 1). These two townships are located side by side. Malaria cases were still present in these two townships and the situation was not much different. The volunteers' activities were approximately equal. Kyauktagar Township had slightly more volunteers and was chosen to be the intervention township. The study population were all VHV who had been trained by the NMCP and who had at least two years of volunteer service.

Variables and Measurements

Knowledge was evaluated using a semi-structured questionnaire. The questionnaire consisted of 23 questions on malaria with 42.5 being the maximum possible score, eight questions on DHF with 10 the maximum possible score, nine questions on lymphatic filariasis with nine the maximum possible score, eight questions on tuberculosis with 11 the maximum possible score, three questions on leprosy with three the maximum score and three questions for HIV/AIDS with six the maximum score. The maximum total score was therefore 81.5. The questionnaire was administered by face-to-face interview. Open-ended questions asking about challenges in working as an ICMV were asked at the end of survey.

Performance was evaluated using monthly malaria carbonless register reports from October to November 2016, June to August 2017 and October to November

2017 reporting on completeness, accuracy, timeliness, stock status, stockouts and number of rapid diagnostic tests (RDTs) administered.

Completeness was measured using a score of “1” if all cells were filled in and “0” if any cell was blank.

Accuracy (internal consistency) was measured using a score of “1” if there were no data discrepancies during the measurement period (e.g., stock quantities at the end of one month=quantities at the beginning of the next month) and “0” otherwise.

Timeliness was measured using a score of “1” if newly diagnosed cases were reported to a township malaria focal point within 7 days of month, and scored “0” if any report was late.

Stock quantities were measured using a score of “1” if there were no data discrepancies between quantities at the end of one month and the beginning of the next month and “0” if there were any discrepancies.

Stockouts were measured using a score of “1” if there were no stockouts of RDTs and antimalarial drugs for more than one week per month and “0” if there were stockouts for more than one week per month. Expired RDTs and antimalarial drugs were considered as a stockout. For all months during the measurement period we assigned a score of “0” if there was a stockout for more than one week per month.

Malaria blood testing with RDTs was measured by recording the number of individuals tested with an RDT per month and the number of patients with a positive RDT per month.

Data Collection and Analyses

Data collection for knowledge evaluation was done using face-to-face interviews with a semi-structured questionnaire. We collected information before the ICMV 5-day training course in September 2017, and 3 months after the course in December 2017. Performance was evaluated by reviewing carbonless registers and checklists. We collected information from monthly reports of three time periods, October to November 2016, June to August 2017 and October to November 2017. The same data were collected from both intervention and comparison townships of the same time periods.

Change in knowledge scores was analysed using a paired t-test and 95% confidence intervals were calculated. Change in dichotomous performance proportion was analysed using McNemar’s test. Change in number of patients tested for malaria was expressed as an incidence rate of performing blood tests per person-months, and an incidence rate ratio comparing intervention to comparison townships during pre- and post-intervention was presented. All analyses were done using Epi-Info and Stata version 14.

Results

There were 86 VHVs enrolled in the study. Table 1 presents the distribution of the characteristics of the study sample. The youngest was aged 18 years and the oldest was 67 years of age and the mean age of participants was 31.6 years. Around 35% were male and the level of education varied from 8% university graduates, 61% high school level, 27% middle school level and 5% primary level. Previous experience included auxiliary midwife (25%) or community health workers (8%). Around 68% had a low income and 46% had no more than two years of volunteer service while the remaining had more than two years. Among the 86 VHVs, 82 returned at the 3-month follow-up visit. The attrition rate was therefore 5% (4 of 86) over 3 months. The four VHVs who left were aged <35 years and had a high school level of education.

Table 1. Socio-demographic characteristics of the malaria village health volunteers

Characteristic	N	%
Age group (years)		
15-24	27	31.0
25-34	35	40.5
35-44	10	11.9
45-80	14	16.7
Education status		
Primary school	4	4.7
Middle school	23	26.7
High school	52	60.5
University graduate	7	8.1
Income level		
Very low	24	29.3
Low	32	39.0
Moderate	24	29.3
High	2	2.4
Duration of service (years)		
2	40	45.7
3	12	14.1
4	18	21.2
5	16	18.8

Changes in Knowledge

Table 2 shows the mean knowledge scores for the six disease groups and the change at the 3-month follow-up period. The overall mean knowledge score among all participants before the training course was 50 out of a possible 81.5 and the three diseases in which participants had the highest knowledge were lymphatic filariasis (mean=54, DHF mean=49 and malaria mean=48. After the training, the overall mean knowledge score increased by 12 points and the three diseases with the highest increase in knowledge were tuberculosis (mean increase=34), leprosy (mean increase=20) and HIV/AIDS (mean increase=18). Knowledge scores of all six diseases significantly increased at 3 months.

Table 2. Comparison of knowledge scores (%) from pre and post ICMV package in the intervention township (Kyauktagar)

Subject	Pre-ICMV mean (n=86)	Post-ICMV mean (n=82)	Difference in mean and 95% CI (n=82)
Malaria	48	63	15 (13–17)
Dengue hemorrhagic fever	49	68	12 (9–16)
Lymphatic filariasis	54	63	9 (4–14)
Tuberculosis	22	56	34 (30–38)
Leprosy	22	42	20 (15–26)
HIV/AIDS	42	60	18 (14–22)
Total scores for all diseases	50	62	12 (10–13)

Changes in Performance

Comparing the performance (completeness, consistency, timeliness and stock management) between the pre and post intervention, the completeness of malaria reporting increased from 91% to 96%, and the internal consistency increased from 83% to 89%. There was no difference in completeness of reporting and the internal consistency. However, timeliness was significantly better in post intervention township. The antimalarial drugs stockout percent was markedly decreased for RDT, artemether-lumefantrine, chloroquine and primaquine, in post ICMV package. Except the RDT, the decreasing in stockout of anti-malaria drugs were statistically significant (Table 3).

The number of blood examination was increased pre and post ICMV intervention package in intervention township than comparison township regarding all conditions were the same except the intervention. The average number of patients tested, or incidence of testing, in the intervention township was increased from 4.3 tests per person-month to 7.7 tests per person-month after the intervention. Comparing to the comparison township, rate of testing in the intervention was 1.56 time (95% confidence interval: 1.39-1.76) during pre-intervention period. And the rate-ratio of blood testing was increased to 3.84 (95% CI: 3.29-4.51) at post-intervention period (Table 4). Although blood testing was increased, only one malaria positive case found in Kyauktagar Township in November 2017 and Daik-U township in July 2017 during the study period.

Table 3. Reporting status of the VHVs and malaria commodities in the intervention township (Kyauktagar)

	Baseline survey	Follow-up survey	Difference(%) and 95% CI
Malaria reporting status			
Completeness	91	96	5 (-4,13)
Internal consistency	83	89	7 (-3,17)
Timeliness in 7 days	85	98	13 (5,22)
	Pre-ICMV	**Post-ICMV**	**Difference (%) and 95% CI**
Malaria commodities: No stockout in past 3 months			
Rapid diagnostic test	91	98	6 (-1,14)
Artemether-lumefantrine	69	99	28 (17,39)
Chloroquine	62	94	31 (8,43)
Primaquine	57	94	37 (23,50)

Table 4. Number of patients tested per VHV per month pre- and post-ICMV package in intervention and control townships

Township	Period of performance measure: Total number of tests	Number of volunteers	Average number of tests per month per VHV
October-November 2016			
Intervention	808	86	4.7
Control	298	46	2.3
June-August 2017			
Intervention	1115	86	4.3
Control	382	46	2.8
October-November 2017			
Intervention	1284	84	7.7
Control	183	46	2.0

Challenges reported by VHVs and ICMVs

ICMVs reported having no difficulty in performing blood testing duties, diagnosis, treatment, recording, or reporting for malaria. However, they faced problems on reporting of non-malaria diseases because of a lack of reporting forms. Villagers were not interested in health education so ICMVs had difficulty in assembling the villagers. Therefore, ICMVs provided health education during blood testing, religious ceremonies, or other situations where people were already assembled in a group. Although there was no available data on the performance for other diseases, most VHVs wanted to continue as an ICMV. VHVs gave health education about malaria only but ICMVs could give health education for more diseases. They would like to get information education communication (IEC) materials for health education and distribute these to the community. They would also like to assist with tuberculosis case finding programs and be involved in directly-observed therapy (DOT).

Discussion

This study illustrates a real-world challenge of achieving malaria elimination in rural populations and evaluates a programmatic response to that challenge, that is, expanding the responsibilities of village health volunteers (VHVs). Although (theoretically) knowledge is necessary to correct performance, a systematic review of 18 intervention studies found no correlation between health worker knowledge and health worker practices (Pearson's r=0.13, p=0.62).[8] Our study demonstrated that not only the knowledge of VHV was improved, but also some performances were improved after their responsibilities were increased. Moreover, we found no evidence of any negative impact from the increased responsibilities or the change in title to Integrated Community Malaria Volunteer (ICMV).

Almost all (95%) ICMVs returned for the second survey 3 months after the initial survey, demonstrating a low attrition rate. One review reported an annual attrition rate of 6.8% which was similar to our study.[9] Despite annual refresher training, VHV's malaria knowledge at baseline was low (48%) and similar to knowledge levels for other diseases. This was likely because they were unable to open their handbooks during face-to-face interviews. For all diseases, knowledge was raised, but follow-up scores were still somewhat low on knowledge and performance outcomes. There was no control group but given the lack of programmatic activities (besides the ICMV package) it seems implausible that outside influences caused an important secular trend in study outcomes.

With evidence from hard copy reports, improvement was found on the performance of malaria reporting (accuracy or internal consistency), which was 83% before the training package and 89% afterwards. These are similar to results of a Cambodian cross-sectional study in which 84% of VHVs maintained accurate registers.[10]

At baseline, only two-thirds of VHVs reported that antimalarials were in stock, while after 3 months, there was an increase of 28–37 percentage points. At baseline, many VHVs reported expired antimalarials (counted as stockouts), so the ICMV package provided new drugs. Antimalarials were rarely used (very few positive cases), and thus nearly all community health workers had drugs in stock during the follow-up survey. The rate of RDT stockout was 9% in pre and 2% in post intervention, rates much lower compared to the 57% stockout reported from a study in Cambodia.[11]

The training was associated with very large improvements in the number of patients tested per month. ICMVs had no problems concerning malaria blood testing and RDT requirements but VHVs faced problems concerning the regular supply of RDTs (9.9%) and anti-malaria drugs.[12]

Limitations

This study had a few limitations. First, the follow-up period was too short (3 months) for measuring the impact of the training package on the performance of village health volunteers for non-malaria diseases. Second, assessment of stockouts might have been affected by recall bias or social desirability bias. Third, there was a lack of information on quality of testing. Finally, VHVs only registered the people who they tested for malaria; there was no information on patients with febrile illness who were not tested.

Conclusion and Recommendation

Knowledge scores for all diseases and the performance of malaria activities generally increased after the training. However, knowledge levels for all diseases were still somewhat low after the training. If VHVs can perform as well as ICMVs, the program will be effective. The performance of malaria-related duties improved, so the training program was very effective in the support for malaria elimination.

We recommend that the National Malaria Control Program consider selecting VHVs who are aged >35 years to reduce the attrition rate. Close supportive supervision and on-the-job training should be provided to further improve their knowledge and performance related to all diseases. Efforts should emphasize the importance of recognizing expiration dates for RDTs and antimalarial drugs so that fresh supplies can be ordered before stocks expire.

Sufficient recording and reporting forms should be distributed to all ICMVs. Other programs, such as those involving tuberculosis, HIV and leprosy, should coordinate and cooperate with the malaria program by supplying reporting forms and IEC materials. Qualitative studies aiming to identify factors influencing the performance of volunteers should be done.

In conclusion, the training package was effective in improving knowledge and performance of VHVs in malaria-related duties and should be expanded to other townships. Moreover, in an evaluation of a public health program, performance indicators should be included in the package.

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References

1. World Health Organization. Malaria Fact sheet [Internet]. Geneva: World Health Organization; c2020 [cited 2020 Aug 01]. <https://www.who.int/news-room/fact-sheets/detail/malaria>
2. Myanmar, Ministry of Health. Department of Public Health: National Strategic Plan for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020. Nay Pyi Taw: Ministry of Health; 2015.
3. Myanmar, Ministry of Health. Department of Public Health: Annual Book VBDC 2016. Nay Pyi Taw: Ministry of Health; 2017.
4. KyawTT. Improving Access to treatment in Myanmar, MMV Stakeholders Meeting; 2012 Nov 7-8; New Dehli.
5. Ngin SN.Training of trainers for training of Integrated Community Malaria Volunteers; 2017; Nay Pyi Taw.
6. National Malaria Control Programme Department of Public Health, Ministry of Health, The Republic of the Union of Myanmar. Manual for Village Health Volunteers. Nay Pyi Taw: Ministry of Health, WHO; 2015.
7. National Malaria Control Programme Department of Public Health, Ministry of Health and Sports, The Republic of the Union of Myanmar. Integrated Community Malaria Volunteers guideline (draft). Nay Pyi Taw: Ministry of Health and Sports; 2017.
8. Rowe AK, Rowe S, Peters DH, Holloway KA, Chalker J, Ross-Degnan D. The effectiveness of strategies to improve health worker knowledge in low- and middle-income countries and the association between knowledge and clinical practice: a systematic review. The 66th Annual Meeting of the American Society for Tropical Medicine and Hygiene; 2017 Nov 5–9; Baltimore, Maryland, USA.
9. Castro Lopes S, Guerra-Arias M, Buchan J, Pozo-Martin F, Nove A. A rapid review of the rate of attrition from the health workforce. Hum Resour Health. 2017; 15(1):21. doi:10.1186/s12960-017-0195-2
10. Blanas DA, Ndiaye, Y, Nichols K, Jensen A, Sidduqui A, Hennig N. Barriers to community case management of malaria in Saraya, Senegal: training, and supply chains. Malar J. 2013;12:95. doi: 10.1186/1475-2875-12-95
11. Canavati SE, Lawpoolsri S, Quintero CE, Nguon C, Ly P, Pukrittayakamee S, et al. Village malaria worker performance key to the elimination of artemisinin-resistant malaria: a Western Cambodia health system assessment. Malar J. 2016;15:282. doi:10.1186/s12936-016-1322-6
12. Nyunt MH, Aye KM, Kyaw KT, Han SS, Aye TT, Wai KT, et al. Challenges encountered by local health volunteers in early diagnosis and prompt treatment of malaria in Myanmar artemisinin resistance containment zones. Malar J. 2016;15:308. doi:10.1186/s12936-016-1368-5

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Equity of Claims for Antiretroviral Therapy, Vaccination and Chemotherapy in Public Facilities among Migrants in Thailand

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Abstract

Despite remarkable efforts from the Ministry of Public Health (MOPH) to promote access to health services among migrants, there remains an important gap about equity in utilizing health services among migrants residing in different economic status areas. This study aims to explore the equity in health service utilizations of migrants registered with Health Insurance Card Scheme. A cross-sectional quantitative design using provincial-level data was employed. Claim data of antiretroviral therapy (ART) and high-cost outpatient services, namely, vaccination and chemotherapy, in 2015 and 2016, and Gross Provincial Product per capita were analyzed by descriptive statistics, Spearman's rank correlation and concentration index (CI). Significant negative Cis were found in the claims for ART in both years, which indicates that migrants residing in poor provinces access to ART more than migrants in rich provinces. However, the distribution of claims for children's vaccinations across provincial income was relatively equal showing that access to vaccination is quite equal across different geographical location as vaccinations were provided regardless of children's nationality. While the claims for chemotherapy had positive significant CIs in both years indicating better access to chemotherapy was observed in richer provinces because resources needed are relatively pooled in urbanized cities. This study suggests that access to health care services are not equal among migrants residing in rich and poor provinces. The most concern was on access to chemotherapy which is heavily concentrated among the economically well-off provinces. Thus, it is worth exploring whether and to what extent there are hindrances against access to care for such services, especially in the economically deprived areas. The non-reported claims for children's vaccinations in half of the provinces should also be explored. If there was a case of low coverage, a strategy to support and promote vaccinations to migrants is recommended.

Keywords: equity, migrant, antiretroviral therapy, access, health services, health insurance card scheme

Introduction

Thailand has been a hub for migration in the Greater Mekong Sub-region, particularly for labor migrants from Myanmar, Cambodia, and Lao PDR. According to data from the Foreign Worker Administration Office, the Ministry of Labour, the number of migrant workers in Thailand increased dramatically from around 1.3 million migrant workers in 2014 to 2.2 million in 2018.[1] This figure did not include undocumented or illegal migrants whose actual volume is still in question.

Undocumented migrant workers and dependents are subject to deportation according to Thai immigration law unless they are registered with the government to participate in the nationality verification process and acquire a work permit.[2] The registration process involves enrolling migrants in the insurance arrangement, the so-called Health Insurance Card Scheme (HICS). The HICS is managed by the Ministry of Public Health (MOPH). The scheme was established in 2004. It was funded by an annual premium paid by migrants ranging from $12-123 USD depending on the type of coverage period.[3] The scheme enables migrants to access health care services at public facilities and reduces catastrophic health expenditures. In 2018, there were 862,870 undocumented migrants enrolled in the scheme.[4]

Undocumented migrants mainly work in dirty, dangerous, and degrading conditions which make them at exceptional risk of experiencing physical and mental health problems including diseases that may cause public health threats like HIV/AIDS or tuberculosis.[5] Evidence shows that migrants are among the most vulnerable group to contract HIV/AIDS due to their unsafe sexual practices such as condomless sex and having multiple sex partners. A recent study in Ranong, Thailand, suggested that 63% of migrant seafarers had visited a sex worker in the past 12 months, and only 66% of those reported condom use.[6] This coincides with another research piece in Trat, Thailand, which demonstrated that around 65-70% of migrant fishermen had ever visited a sex worker.[7]

In 2013, the MOPH expanded the HICS benefit package to cover the antiretroviral therapy (ART) and high-cost treatment including chemotherapy, prosthetic instruments, and advanced surgical procedures. The facilities can get reimbursed for the expense of ART, vaccinations, and high-cost services directly from the MOPH.

Although the HICS demonstrates Thailand's achievement in advancing the agenda for migrants' right to health, there has been limited access to HIV diagnosis and treatment from time to time. Several challenges were identified, such as inadequacy of health service availability and migrant patients' ignorance of the benefits.[8] Even legal migrant workers still faced numerous difficulties in utilizing the HICS benefit package; for example, the employers can confiscate insurance cards from the workers, or the workers prefer private clinics over public hospitals due to shorter waiting times.

Many factors have been reported to limit migrants from accessing the scheme. For example, lack of funding limited the full implementation of HICS policy.[9] Moreover, communication barriers and long distances from residential areas to the public facilities, could further limit access to health services.[8] Thus, it is imperative to explore if and to what extent these factors equitable affect migrants' access to care.

In this regard, this study aims to explore the equity situation in access to health care services among the migrant population using three service items as a proxy: vaccination as a proxy for basic health care and disease prevention activities; chemotherapy for malignancy as a proxy for high-cost care; and ART.

Materials and Methods

This study applied a cross-sectional quantitative design using provincial-level data. The dataset comprised: 1) claims data of high-cost outpatient services among migrants registered with HICS in 2015 and 2016; and 2) information about Gross Provincial Product (GPP) per capita in respective years. The claim data were obtained from the database of the Division of Health Economics and Health Security (DHES), MOPH, Thailand. This database contained information about expenses and claims for outpatient treatment for migrants covered by the HICS.

The aspect of the focus of this study means the frequency of claims. The study did not include inpatient care as claims for inpatient care operate separately by the Diagnostic Related Groups (DRGs) system. The information on GPP per capita was acquired from the Office of the National Economic and Social Development Council, Thailand. Claim rates were calculated based on number of claims in one year divided by number of migrants registered with HICS in the same year.

The analysis consisted of three parts. First, a descriptive study was conducted to present an overview of the data. Second, the relationship between the reimbursement rate for each of the three items (vaccination, ART, and chemotherapy) and GPP per capita was determined by Spearman's rank correlation. The last step was to assess the equity in reimbursement rates among migrants at different provincial economic statuses by concentration index (CI). The CI can be acquired from regressing $2\sigma_r^2\left(\frac{h_i}{\mu}\right)$ on βr_i , where the coefficient β represents point estimate of the CI, σ_r^2 is the variance of the fractional economic rank, h_i is the health variable of interest (in this case, the reimbursement rates), μ is the mean of h_i, and r_i is the rank of population unit in the economic rank.[10]

Statistical significance was determined by 95% confidence level (95% CI). All calculations were performed by STATA software v.15.1. The positive CI represents the reimbursement rates are concentrated among the wealthy provinces. On the contrary, negative CI value represents the concentrated reimbursement rates among the poorer provinces. The results were visualized using the concentration curve.

Ethical approval was received from the Institute for the Development of Human Research Protections in Thailand (IHRP 893/2560). The facilities' names are kept anonymous. Dissemination of data can be done only for academic interest and individual information cannot be identified.

Results

Overall, the greatest cumulative claim rates for migrant insurees were for ART, followed by children's vaccinations and chemotherapy. When comparing the claims between 2015 and 2016, a declining trend was observed for all service items. The average claim rate for ART was 308.6 claims per 100,000 persons in 2015, which further decreased to 231.6 claims in 2016. Similarly, the average claim rate for children's vaccinations was 186.6 claims in 2015, which fell to 176.3 claims per 100,000 persons in the following year. The average claim rates for chemotherapy were 8.7 claims and 7.9 claims per 100,000 persons in corresponding years. In addition, half of the provinces did not report claims for children's vaccinations or chemotherapy in both years as shown by the zero figure for the medians (Table 1).

Table 1. Descriptive statistics on cumulative claim rates (n=77)

Parameters	Mean	Standard deviation	Median	Interquartile range	Range
Claim rate per 100,000 persons in 2015					
Antiretroviral therapy	308.6	737.0	75.8	255.6	0-5618.0
Children vaccination	186.6	600.1	0	63.3	0-3821.7
Chemotherapy	8.7	27.8	0	0	0-186.5
Claim rate per 100,000 persons in 2016					
Antiretroviral therapy	231.6	360.3	118.5	253.8	0-1932.4
Children vaccination	176.3	430.5	0	195.1	0-2832.1
Chemotherapy	7.9	21.7	0	3.4	0-126.4

Table 2. Descriptive statistics excluding no claim

Parameters	Mean	Standard deviation	Median	Interquartile range	Range
Claim rate per 100,000 persons in 2015					
Antiretroviral therapy (n=63)	377.2	799.7	138.5	251.2	2.0-5618.0
Children vaccination (n=27)	532.2	928.3	178.7	679.3	2.6-3821.7
Chemotherapy (n=18)	37.3	48.2	16.9	45.9	3.3-186.5
Claim rate per 100,000 persons in 2016					
Antiretroviral therapy (n=65)	274.3	377.2	150.9	242.4	53.9-1932.4
Children vaccination (n=35)	387.8	574.3	206.2	380.8	7.3-2832.1
Chemotherapy (n=22)	27.6	33.7	13.5	29.2	1.83-126.4

After excluding no claim data, the mean claim rates increased in all services as shown in Table 2.

The median GPP per capita was 64,427 and 68,847 Thai Baht respectively. GPP is an indicator of the provincial economic. It is calculated based on provincial-level production of agricultural, forestry and fishing sector, mining and quarrying sector, manufacturing sector, construction sector, accommodation and catering services sector, and education sector. The GPP per capita was used in policy and planning for provincial development.

Spearman's correlation coefficients (rs), which reflect the strength of the association between the number of claims and GPP, are shown in Table 3. A small degree of negative correlation between the rate of reimbursements for ART costs and provincial economic status was observed (Table 3). None of the associations were statistically significant. In contrast, moderate positive correlations were revealed between the claims of children's vaccinations and GPP showing rs of 0.327 in 2015 and rs of 0.365 in 2016. Moderate positive correlations were also noted in the claims of chemotherapy (rs=0.486 and rs=0.527).

Table 3. Correlation between claim rates and Gross Provincial Product (GPP) per capita by Spearman's rank correlation (n=77)

Parameters	Spearman's rho
2015	
Claim rate of antiretroviral therapy and GPP	-0.124
Claim rate of children vaccination and GPP	0.327
Claim rate of chemotherapy and GPP	0.486
2016	
Claim rate of antiretroviral therapy and GPP	-0.122
Claim rate of children vaccination and GPP	0.365
Claim rate of chemotherapy and GPP	0.527

Table 4. Concentration indices of claim rates by year (n=77)

Parameters	CI	(95% Confidence interval of CI)	*p*-value
2015			
Claim rate of antiretroviral therapy	- 0.324	(-0.634, -0.013)	0.041
Claim rate of children vaccination	0.079	(-0.179, 0.339)	0.543
Claim rate of chemotherapy	0.001	(0.00041, 0.43)	0.046
2016			
Claim rate of antiretroviral therapy	-0.244	(-0.444, -0.043)	0.018
Claim rate of children vaccination	0.251	(-0.070, 0.572)	0.124
Claim rate of chemotherapy	0.368	(0.011, 0.727)	0.043

In the CI analysis, significant CIs were found in the claims for ART in both years, showing CI=-0.324 with p=0.041 in 2015 and CI=-0.244 with p=0.018 in 2016. The negative CI implies that the distribution of claims for ART was rather concentrated in less well-off provinces. However, the distribution of claims for children vaccinations across provincial income was relatively equal in 2015 (CI=0.079, p=0.543) and 2016 (CI=0.251, p=0.124); while claims for chemotherapy had positive significant CIs in both years (CI=0.001, p=0.046 and CI=0.368, p=0.043 respectively). The positive CIs suggest that the claims for chemotherapy slightly favored the provinces with better economic prosperity and this inequitable distribution was more pronounced in the year 2016 than in 2015. The summary of the CIs is displayed in Table 4, which corresponds with the concentration curves shown in Figure 1 and Figure 2.

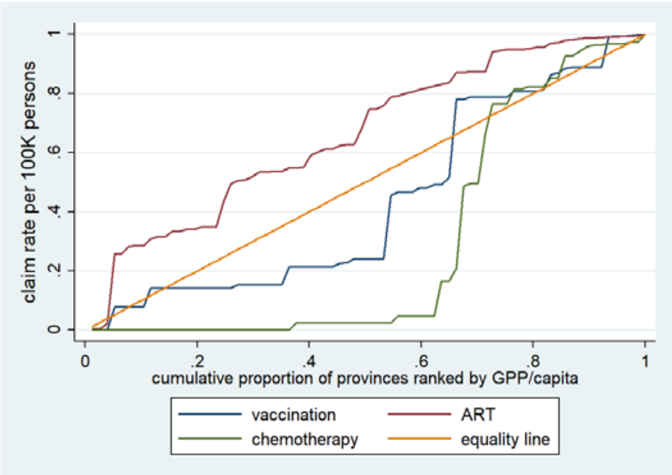

Figure 1. Concentration curve in 2015

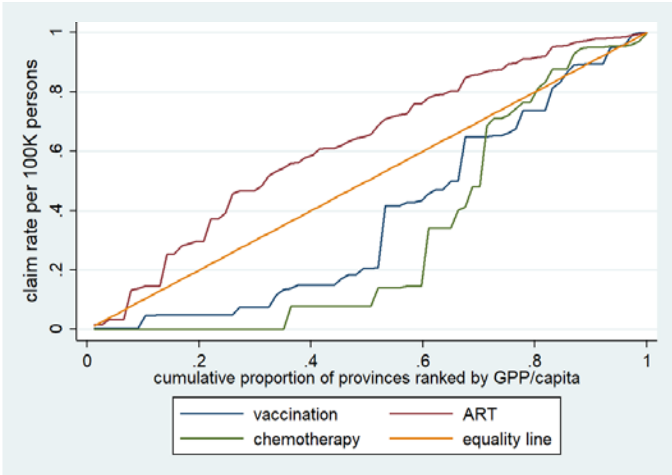

Figure 2. Concentration curve in 2016

Note: (i) The diagonal line was defined as the 'equality line', which means that the claims are equally distributed across provincial economic status; (ii) if the curve lies below the diagonal line, the claims are concentrated more heavily among the wealthy provinces and (iii) if the curve is above the diagonal line, the claims are concentrated more heavily in the poor provinces.

Discussion

This study explored claim data as a proxy of access to basic health care and disease prevention activities, cost care, and special services. This study found significant negative CIs in the claims for ART in both years as illustrated by the red curves lying above the diagonal line in figures 1 and 2. The findings indicated that migrants in low income provinces accessed ART relatively with more visits than those in high-income provinces. It demonstrates that access to ART among migrants was more concentrated among poor migrants. This discovery may be possibly explained by the fact that HIV infections are positively related to unfavorable economic status. Thus, the high reimbursement rates in poorer provinces may be associated with the high prevalence of HIV. This finding is supported by a surveillance study for HIV infection among migrant worker in ten provinces in Thailand in 2010. The study revealed that provinces with highest prevalence of HIV infection (5%, 1.3% and 1%) had relatively low GPP (for instance, Trat, Kanchanaburi and Trang).[11] This notion is also supported by much literature from abroad.[12] For example, the Center for Disease Control and Prevention (CDC) in the United States of America reported that HIV prevalence was higher among those with lower socioeconomic status: 2.6% among the unemployed compared with 1.0% among the employed and 2.3% among participants whose household incomes were below the national poverty line compared with 1.0% among those with incomes above the poverty line.[13]

Another explanation is that in many provinces, there exist non-governmental organizations and charitable agencies that play important roles to facilitate healthcare access among migrants.[14] For example, the Prevention of HIV/AIDS among Migrant workers in Thailand (PHAMIT) project is run by one of the renowned non-profitable private agencies in Thailand and is implemented in 22 provinces. The project aims to improve migrants' awareness and knowledge of HIV, increase condom use, and support the uptake of proper reproductive and sexual health services as well as voluntary counseling and testing services. These initiatives try to enhance access to ART among migrants and thus promote equity of access. Although equity of access was found by this study, the decrease in reimbursement rates of ART services from 2015 to 2016 need a more thorough exploration in future studies.

This study found non-significant positive CIs for claims of children vaccinations as demonstrated by the blue curves lying below the diagonal line in figures 1 and 2. The findings indicates that the distribution of claims for children's vaccinations is more equitable across provinces in Thailand (relative to ART claims). This might be because local healthcare providers tend to provide basic vaccinations for all children regardless of their nationality and insured status. Insured migrant children can also access essential vaccines through public health facilities as suggested by Tuangratananon et al's study.[15] Although there is no explicit policy to provide essential vaccinations for uninsured migrant children in Thailand, a study by Kosiyaporn et al in 2018 found that in practice, health providers delivered vaccination services free of charge for all migrant children regardless of their insurance status through spare vaccines in the facilities.[16] This practice has been performed nationwide. In addition, the study found that Thai health care providers mostly perceive the value of providing vaccines for all children in Thailand regardless of their citizenship status. However, the relatively low vaccination coverage among migrant children compared with Thai children as found in Tuangratananon et al's study remained a concern; this point is consistent with the findings in Table 1 presented above. In addition, reporting of no claims for vaccinations in half of the provinces is another key concern. If migrant children in these provinces were under-vaccinated, it would mean that the herd community to protect against certain preventable diseases in the whole community (or the whole country) was compromised. Hence, strategies to promote and support adequate vaccination for migrants should be put in place nationwide.

This study found significant positive CIs for the claims of chemotherapy in both years as demonstrated by the green curves lying below the diagonal line in figures 1 and 2. The findings show a pro-rich effect on the claims of chemotherapy in both years. One possible explanation of this is that resources needed for diagnosis and treatment of malignancy such as imaging instruments and specialized human resources are pooled at high-level tertiary hospitals, mostly located in major provinces with relatively high GPP or in urbanized cities. For example, most Magnetic Resonance Imaging (MRI) and mammography are more available in private hospitals than public hospitals and are also concentrated in Bangkok rather than in other regions.[17,18] Therefore, this disparity may lead to unequal access to health services among migrants in different areas. The disparity in access to advanced health technologies is also observed in the Thai population. A study on the equity of healthcare utilization on mammography examination and Pap smear screening in Thailand by Chongthawonsatid also indicated that richer people undertook mammography and Pap smears screening more than poorer people.[19]

Many studies have explored barriers and problems of access or utilization of advanced health services among migrants. Various factors impeding the utilization of cancer services, particularly cervical and breast cancer screening, were identified and one of those was the lack of knowledge or information about the services.[20-22] Chamchan et al reveal that some migrants in Thailand covered by HICS or Social Security Scheme (SSS) lacked information or understanding about their health benefits. Most migrants were aware of the health benefits of treatment for minor illnesses, work injuries, and pregnancy, and less aware of high-cost treatments.[23] Migrants who live in provinces with high GPP may have better access to information about their health benefits and the availability of advanced health-technology, which may result in more access to malignancy treatment. However, these explanations were assumptive and require further study.

Limitations

Despite thorough analysis, some limitations remain. Firstly, the scope of the data is confined to public hospitals affiliated to the MOPH. Hospitals that do not affiliate with the MOPH such as medical schools under public universities, military hospitals, mental health hospitals, and private hospitals contribute to approximately 36% of Thailand hospital capacity were not included in the study due to data unavailability.

Secondly, the database contained information only about migrants who are insured by the HICS. Unregistered and undocumented migrants or other groups of non-Thai populations such as stateless people, tourists, and expats were not included.

Thirdly, the analysis was confined to service reimbursements presented to the MOPH. Services exercised at the facilities including general outpatient and inpatient care or emergency treatment were not included. However further studies that involve general inpatient and outpatient services are recommended.

Fourthly, this study used GPP as a proxy for socioeconomic status. It captures economic aspects at the provincial level, which may not necessarily represent a household's socioeconomic status. Provinces in industrialized areas are likely to have higher GPP than non-industrialized provinces. The best measure for a household's economic status is the asset index, which requires a thorough survey of the assets and goods of an individual. Unfortunately, the national household survey performed by the National Statistical Office is not routinely performed in migrants' households. Accordingly, these data were still lacking in the migrant research field in Thailand. Further work on this issue is required.

Fifthly, the sample size of 77 provinces is quite limited. The small number of samples might be a possible explanation for the limited strength of the relationship between the model and the dependent variables and likelihood to yield statistical significance. Thus, future studies are recommended to delve into the district- or subdistrict-level data, which will not only result in a larger number of samples, but also enable researchers to have a clearer insight on the micro-economy of the studied areas.

Finally, the interpretation and the application of the above findings to real-world practice should be made with caution. The close-to-zero, negative, and positive CIs, as observed in all health problems, do not mean that the uptake of services for these health problems is sufficient. The CI is a tool for quantifying inequality in the distribution of the variable of interest against the economic gradient of the studied areas. Therefore, future research on access to health services to solve the health problems of migrants is still needed.

Public Health Recommendations

The most important concern from the findings above is chemotherapy which is heavily concentrated among the economically well-off provinces. Thus it is worth exploring whether and to what extent there are hindrances against access to care for such services, especially in the economically deprived areas. This also points to the reorientation of the health service system for migrants. For instance, health resources for chemotherapy should be re-allocated more to less affluent provinces and migrants in these areas should be promoted to be aware of their rights to the services. For ART and vaccination where the analysis showed pro-poor or equitable distribution, policymakers should continue the status quo practices but still be vigilant if any disparity in service access occurs.

Conclusion

The reimbursement of ART is concentrated among poor provinces. By contrast, the positive CIs found in chemotherapy suggest that the volume of reimbursements slightly favored economically well-off provinces where more advanced technologies are available. The reimbursements for children's vaccinations are relatively equitable across provincial economic status, partly due to the practice of sharing vaccines for Thai children with migrant children. Future research may need to focus more on the degree of accessibility and utilization of health care among migrants residing in different geographical areas.

Author Contributions

Conceptualization, R.S. and R.K.; methodology, R.K., D.C.; validation, T.B; formal analysis, R.K., R.S.; data curation, T.B., S.P.; writing—original draft preparation, R.K., M.S., T.B., D.C., S.P.; writing—review and editing, R.S., R.K.; supervision, R.S.; project administration, M.S., S.P., P.S.; funding acquisition, P.S.

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Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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References

1. Office of Foreign Workers Administration. Statistics of remaining cross-border migrants holding work permit in Thailand as of October 2018 [Internet]. Bangkok: Department of Employment, Ministry of Labour; 2018 [cited 2018 Dec 18]. <https://www.doe.go.th/prd/assets/upload/files/alien_th/98802fed607243cb1c1afe248b3d29eb.pdf>. Thai.
2. Thai immigration Act, B.E. 2522 (1479) [Internet]. [cited 2018 Dec 18]. <http://www.sc.mahidol.ac.th/IC/images/thailaw_immigration_act_thai.pdf>
3. Tangcharoensathien V, Thwin AA, Patcharanarumol W. Implementing health insurance for migrants, Thailand. Bulletin of the World Health Organization. 2017;95(2):146-51. doi: 10.2471/BLT.16.179606.
4. United Nations Thematic Working Group on Migration in Thailand. Thailand migration report 2019. Bangkok, Thailand; 2019.
5. International Organization for Migration. Migration and HIV/AIDS in Thailand: a desk review of Migrant Labour Sectors. Bangkok, Thailand; 2008.
6. Hu J, Ramasoota P, Charupoonphol P, Wongsawass S, Toonkool S. Factors related to sexual risk behaviour of HIV Infection among migrant fishermen in Ranong. Thailand. Journal of Public Health and Development. 2005;3(2):45-59.
7. Asian Research Center for Migration; Institute of Asian Studies, Family Health International (FHI) and the National committee for the Control of AIDS. Cross border migration between Thailand and Lao PDR: a qualitative assessment of Lao migration and its contribution to HIV vulnerability. Bangkok: Asian Research Center for Migration, Institute of Asian Studies, Chulalongkorn University; 2004.
8. Khongthanachayopit S, Laohasiriwong W. Accessibility to health services among migrant workers in the Northeast of Thailand. F1000Research. 2017;6:972. doi: 10.12688/f1000research.11651.1. eCollection 2017.
9. Suphanchaimat R. Progress report of migrant health research to Health Insurance System Research Office (HISRO): Responses in implementation and outcome evaluation of 'Health Insurance Card for Foreigners' policy for cross-border migrants and their dependants in Thailand. Nonthaburi: HISO, Bamrasnaradura Infectious Diseases Institute; 2015.
10. O'Donnell O, van Doorslaer E, Wagstaff A, Lindelow M. Analyzing health equity using household survey data: a guide to techniques and their implementation [Internet]. Washington DC: World Bank; 2008 [cited 2018 Dec 14]. < http://hdl.handle.net/10986/6896>
11. Poonkasorn S, Thanaisawanyangkoon S. Effective surveillance for HIV infection: sexually transmitted diseases and behavior associated with HIV among migrant worker in 10 provinces of Thailand, 2010. Thai AIDS Journal. 2019:31(2);55-69
12. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. AmPsychol. 2013;68(4):197-209. doi: 10.1037/a0032694.
13. Characteristics associated with HIV infection among heterosexuals in urban areas with high AIDS prevalence-24 cities, United States, 2006-2007. MMWR. 2011;60(31):1045-9.
14. Thailand National AIDS Committee. Thailand national operational plan accelerating ending AIDS, 2015-2019. Nonthaburi: National AIDS Management Center, Department of Disease Control, Ministry of Public Health; 2014.
15. Tuangratananon T, Suphanchaimat R, Puangkanta W, Wanwong Y, Sinam P, Julchoo S, et al. Situation analysis in providing education services and health promotion and disease protection activities in schools for migrant children in Thailand. Nonthaburi: International Health Policy Program, Thailand, Ministry of Public Health; 2019. Thai.
16. Kosiyaporn H, Suphanchaimat R, Nipaporn S, Wanwong Y, Nopparattayaporn P, Poungkanta W, et al. Budget impact and

situation analysis on the basic vaccination service for uninsured migrant children in Thailand. Journal of Health Systems Research. 2018;12(3):404-19. Thai.

17. Putthasri W, Tangcharoensathien V, Mugem S, Jindawatana W. Geographical distribution and utilization of mammography in Thailand. Regional Health Forum. 2004;8(1):84-91.

18. Teerawatananon Y and Manosoontorn S. Situation and trends of factors associated with health. In: Prakongsai P, editor. Thai Public Health B.E. 2554-2558. Nonthaburi: Bureau of Policy and Strategy, Office of the Permanent Secretary:2016. 115-6 p.

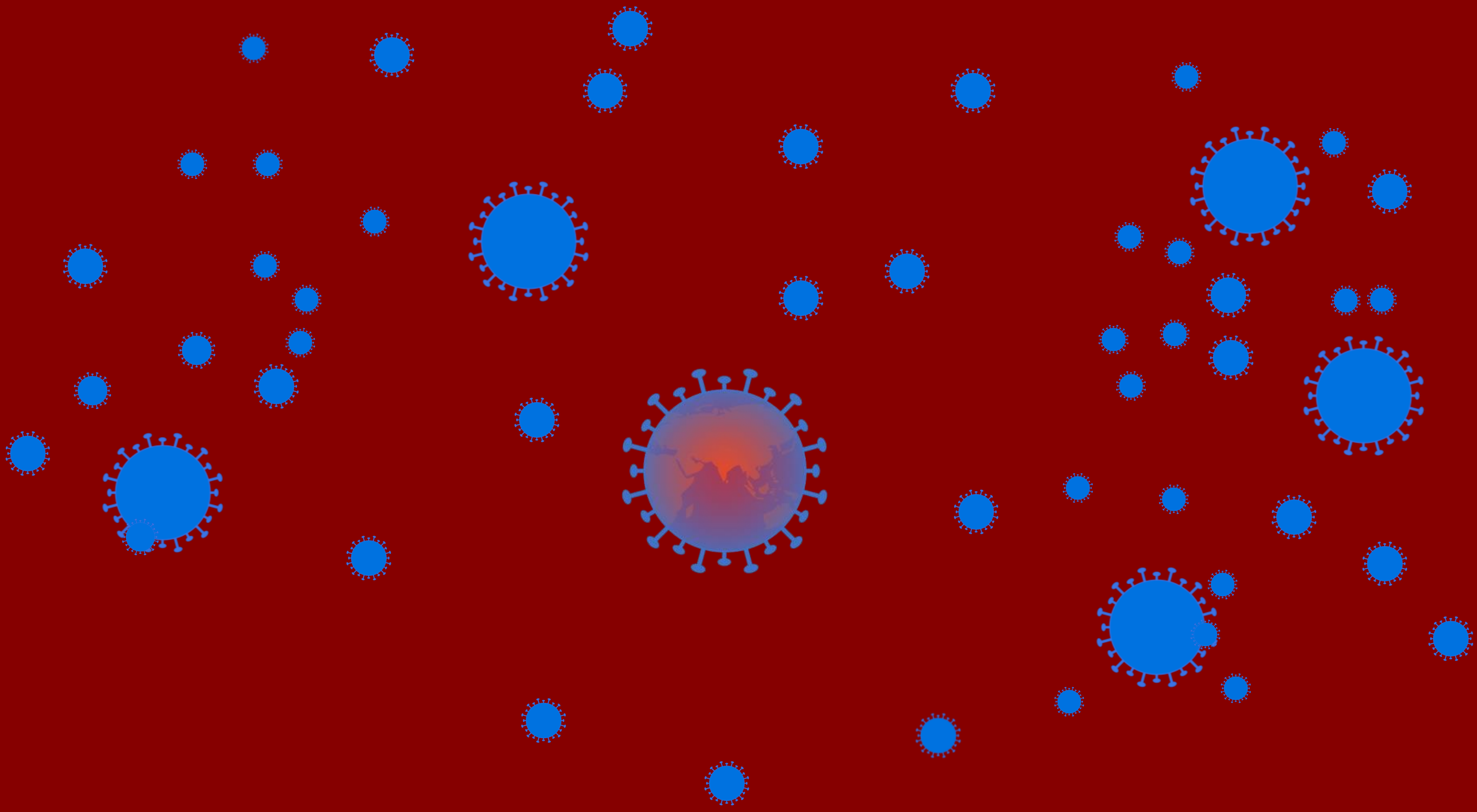
19. Chongthawonsatid S. Inequity of healthcare utilization on mammography examination and pap smear screening in Thailand: analysis of a population-based household survey. PLoS ONE. 2017;12(3):1-12. doi: 10.1371/journal.pone.0173656. eCollection 2017.

20. Ahmad F, Mahmood S, Pietkiewicz I, McDonald L, Ginsburg O. Concept mapping with South Asian immigrant women: barriers to mammography and solutions. J Immigr Minor Health. 2012 Apr;14(2):242-50. doi: 10.1007/s10903-011-9472-7.

21. Suwankhong D, Liamputtong P. Early detection of breast cancer and barrier to screening programmes amongst Thai migrant women in Australia: a qualitative study. Asian Pac J Cancer Prev. 2018;19(4):1089-97. doi: 10.22034/APJCP.2018.19.4.1089

22. Wongwatcharanukul L, Promthet S, Bradshaw P, Jirapornkul C, Tungsrithong N. Factors affecting cervical cancer screening uptake by Hmong Hilltribe women in Thailand. Asian Pac J Cancer Prev. 2014;15(8):3753-6.

23. Chamchan C, Sunpuwan M, Tadee R, Taweesit S. The management of the health insurance system and health service provision which is appropriate for migrant labor after the change of migrant labor management policy B.E. 2555 (2012). Nakhon Pathom: Institute for Population and Social Research, Mahidol University; 2017. Thai.



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