การสอบสวนไข้หวัดใหญ่ในศูนย์ฝึกพัฒนาศักยภาพและอาชีพคนพิการ อำเภอแม่แตง จังหวัดเชียงใหม่

An Influenza outbreak investigation in Disability Empowerment Center, Mae Taeng District, Chiang Mai Province

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Received: Apr 9, 2024 **Revised:** Jun 14, 2023 **Accepted:** Jun 24, 2024

บทคัดย่อ

เมื่อวันที่ 16 พฤศจิกายน 2566, สำนักงานป้องกันควบคุมโรคที่ 1 เชียงใหม่ ได้รับรายงานการติดเชื้อเป็นกลุ่มก้อนโรคไข้หวัดใหญ่ในศูนย์ฝึกผู้พิการ ได้สอบสวนเพื่อยืนยันวินิจฉัยโรคและการระบาด ค้นหาปัจจัยเสี่ยงต่อการติดเชื้อ และให้ข้อเสนอแนะ โดยค้นหาผู้ป่วยเพิ่มเติมในศูนย์ฯ ผู้ป่วยสงสัย คือ ผู้ที่อยู่หรือทำงานในศูนย์ฯ นี้ และมีอย่างน้อย 2 อาการ ได้แก่ ไข้ ไอ เจ็บคอ มีเสมหะ มีน้ำมูก หอบเหนื่อย ปวดกล้ามเนื้อ ปวดศีรษะ หรืออ่อนเพลีย ระหว่างวันที่ 26 ตุลาคม-25 พฤศจิกายน 2566 ผู้ป่วยยืนยัน คือ ผู้ป่วยสงสัยที่มีผลตรวจจำเพาะพบเชื้อไวรัสไข้หวัดใหญ่ ทำการศึกษาเชิงวิเคราะห์ด้วยรูปแบบ Retrospective cohort โดยใช้นิยามผู้ป่วยเดียวกัน วิเคราะห์ตัวแปรเดี่ยวและพหุตัวแปร เพื่อคำนวณ risk ratio และ adjusted odds ratio ร่วมกับศึกษาสิ่งแวดล้อม พบผู้ป่วยทั้งสิ้น 54 ราย (อัตราป่วยร้อยละ 52.94) อัตราป่วยในกลุ่มผู้พิการร้อยละ 68.49 ผู้ป่วยยืนยันทั้ง 5 รายเป็นสายพันธุ์ A (H3N2) การเป็นผู้พิการเป็นปัจจัยเสี่ยง โดยเฉพาะพิการซ้ำซ้อน (Adjusted OR=24.63, 95% CI= 2.65-583.06) แม้ศูนย์ฯ ได้ดำเนินมาตรการคัดกรองผู้ป่วยโดยใช้เครื่องวัดอุณหภูมิแบบอินฟราเรด แต่มิได้ใช้อาการในการคัดกรอง การใช้และความพร้อมของอุปกรณ์ป้องกันโรคไม่เหมาะสม ขาดการฟื้นฟูทักษะและความรู้ ความครอบคลุมของวัคซีนไข้หวัดใหญ่ไม่เพียงพอ ศูนย์ฯ ควรเพิ่มอาการในการคัดกรอง และคัดกรองเจ้าหน้าที่และผู้มาเยี่ยมด้วย เฝ้าระวังเป็นพิเศษในผู้ที่มีความพิการสูง และจำกัดกิจกรรมในช่วงการระบาด หน่วยงานสาธารณสุขในพื้นที่ควรสนับสนุนวัคซีนไข้หวัดใหญ่ การอบรมทักษะความรู้ และการสนับสนุนอุปกรณ์ป้องกันส่วนบุคคล

คำสำคัญ: โรคไข้หวัดใหญ่, ผู้พิการ, การสอบสวนเหตุการณ์การระบาด

ABSTRACT

On November16, 2023, the Office of Disease Prevention and Control 1, Chiang Mai received a report of a suspected influenza cluster from Mae Taeng Disability Empowerment Center, Chiang Mai. We investigated to confirm the diagnosis, verify and describe the outbreak, identify risks of the infection, and to provide recommendations. We performed an active case finding by announcement. Suspected case was defined as a person in this center with at least 2 of these following symptoms including fever, cough, sore throat, productive cough, rhinorrhea, dyspnea, myalgia, headaches, or fatigue, during October 26 to November 25, 2023. The confirmed case was a suspected one who had a positive test for influenza virus by reverse transcriptase polymerase chain reaction (RT-PCR). A retrospective cohort study was to conduct using the same case definition. Univariable and multivariable analyses were performed to calculate the risk ratio, adjusted odds ratio, and 95% confidence interval. Environmental study was also carried out. We found 54 cases (attack rate=52.94%) and the specific attack rate among the disabled was 68.49%. All five confirmed cases were positive for influenza A (H3N2). The study implied that having any disability was a risk for influenza infection, especially who had multiple disabilities (Adjusted OR=24.63, 95%CI=2.65-583.06). The center had done Influenza-like illness screening by using an infrared thermometer without symptoms screening, therefore the outbreak still occurred. There were improper protective equipment usage, no refreshing of knowledge and practice, and insufficient seasonal influenza vaccine. The center should include staff and visitors together with adding symptoms in the screening, especially persons who have a higher level of disability, and restrict isolation during the outbreak. Local public health sectors should allocate seasonal influenza vaccines in a timely fashion to those who had higher level of disability, regular health education and training, and protective equipment to the center.

Keywords: Influenza, Persons with disability, Outbreak investigation

Introduction

Influenza is a respiratory infectious disease caused by influenza virus, which influenza A and B strains are mostly responsible for seasonal influenza. Influenza is transmitted via respiratory droplets produced by coughing and sneezing of infected people. Incubation period ranges from 1-4 days. Symptoms are fever, sore throat, cough, nasal congestion, rhinorrhea, myalgia, and fatigue. Diagnosis is made mainly using clinical symptoms. Influenza usually resolves on its own but in high-risk groups giving antiviral treatment and influenza vaccination are crucial to reduce the risk of severe complications and death (Centers for Disease Prevention and Control [CDC], 2023a, b). High-risk groups are the elderly, persons with chronic medical conditions, pregnant women, and persons with disabilities. These groups are targets for annual influenza vaccination in Thailand

without any charge. (Division of Epidemiology, Department of disease Control [DoE, DDC], 2023a).

Thailand has around 2.2 million persons with disabilities. The northern region has the second-highest number of persons with disabilities and Chiang Mai Province has the highest number among the northern region (Department of Empowerment of Persons with Disabilities, 2023). Anyway, Seasonal Influenza Vaccine Services (2022) reported around 130,000 persons with disability who were the target population. This group only got seasonal influenza vaccine 7.74%

November 16, 2023, the Office of Disease Prevention and Control 1 Chiang Mai (ODPC1) was notified by the Chiang Mai Public Health Office of a suspected influenza cluster in the Disability Empowerment Center. A total of 34 cases were identified with symptoms compatible with influenza. Joint Investigation Team investigated at the Disability Empowerment Center during November 20 -21, 2023. The objectives were to confirm the diagnosis, verify and describe the outbreak, identify risk factors related to infection, and provide recommendations and prevention measures.

Methods

1. Descriptive Study

Reviewing influenza situation in Mae Taeng, Chiang Mai during 2018-2023 was firstly started from Report 506 Surveillance (National Infectious Disease Surveillance), and then reviewing previous outbreaks that occurred in the disability center in the northern region from the Event-Based Surveillance System (DDC), conducting active case finding by announcement all people in the center and individual with face-to-face interview using semi-structured questionnaires to collect demographic data, clinical details, and risk factors, and reviewing medical records of patients from the center who visited Mae Taeng Hospital with symptoms compatible with influenza. A suspected case was a person with at least two of the following symptoms such as fever, cough, sore throat, productive cough, rhinorrhea, dyspnea, myalgia, headache, and fatigue in the Disability Empowerment Center during October 26 to November 25, 2023 and the confirmed case was a suspected case with reverse transcriptase polymerase chain reaction (RT-PCR) positive for influenza virus.

2. Analytical Study

A retrospective cohort study was to performed by using the cases defined as same as in the descriptive study to collect demographic data such as gender, age, underlying diseases, disability types, residential type, departments worked in, and personal hygiene assigned as independent variables. Dependent variable was the case cohering with case definition. Data were collected using semi-structured questionnaires and analyzed using Multivariable Logistic Regression, selecting variables from literature review and Univariable analysis with p-value <0.1. Calculations for relationship of variables explicated risk ratios (RR), adjusted odds ratios (aOR), and 95% confidence intervals (95% CI).

3. Laboratory study

Cases with symptoms according to case definition were purposive sampling for nasopharyngeal swabs and sent for COVID-19 antigen testing using professional Antigen Test Kits (ATK) at Mae Taeng Hospital and/or RT-PCR using Respiratory Pathogen Panel 23 at the Bamrasnaradura Infectious Diseases Institute.

4. Environmental study

Inspected areas in the center such as dormitories, workshop stations, canteen, laundry areas, and gathering areas, were also observed and open-questionnaire interviewed with staff about activities, and hygiene behaviors of both persons with disability and staff of the center before the outbreak and prevention and control measures implemented during the outbreak period.

Ethical consideration

This outbreak investigation was the authority of public health officers according to the Communicable Disease Act. The investigation team disseminated only aggregated information and individual information was confidential.

Results

Descriptive study result

During 2018-2023 in Mae Taeng, Chiang Mai found that influenza cases in 2023 raised above 5-year median and there had no previous outbreak in this disability center in the last 5 years.

The center had a total of 102 people. (73 persons with disability and 29 staff), 71 disabled and 19 staff stayed in the center (one staff stayed in the nursery of each dormitory). The others were round-trip. There were 3 dormitories for persons with disability and 1 apartment for staff. The disabled were not allowed to go outside without permission and they were assigned to train in one of five workshops; Mechanic, Agriculture, Handicraft, Computer, and Supporting workshops. There were 2 training semesters, the second semester started on October 1, 2023.There were 39 persons who had at least 1underlying disease. However, 5 persons (4.9%, 5/102) got seasonal influenza vaccine.

During October 30 - November 19, 2023, there were 54 cases (Attack rate=52.9%, 50 suspected and 4 confirmed cases). The attack rate among persons with disability and staff were 68.5% (50/73) and 13.8% (4/29) respectively. Median age was 30 years. Male to female ratio was 2.4:1. Seasonal influenza vaccine coverage among cases, persons with disability, and staff were 6%, 4%, and 7%, respectively. All 44 cases visited the hospital and treated as OPD cases, among these, 13 cases (29.5%) received antiviral treatment, and no death was found. The primary case had an intellectual disability and attended supporting workshop which had contacts to many people. His onset was on October 30, 2023. The secondary group of cases included two staff in the center who had no day off. The highest number of cases found on November 12, 2023. The onset of the last case was on November 17, 2023 (Figure 1). Common symptoms included rhinorrhea (83%), fever (72%), cough (58%), productive cough (57%), sore throat (53%), headache (53%), myalgia (30%), and dyspnea (11%), respectively.

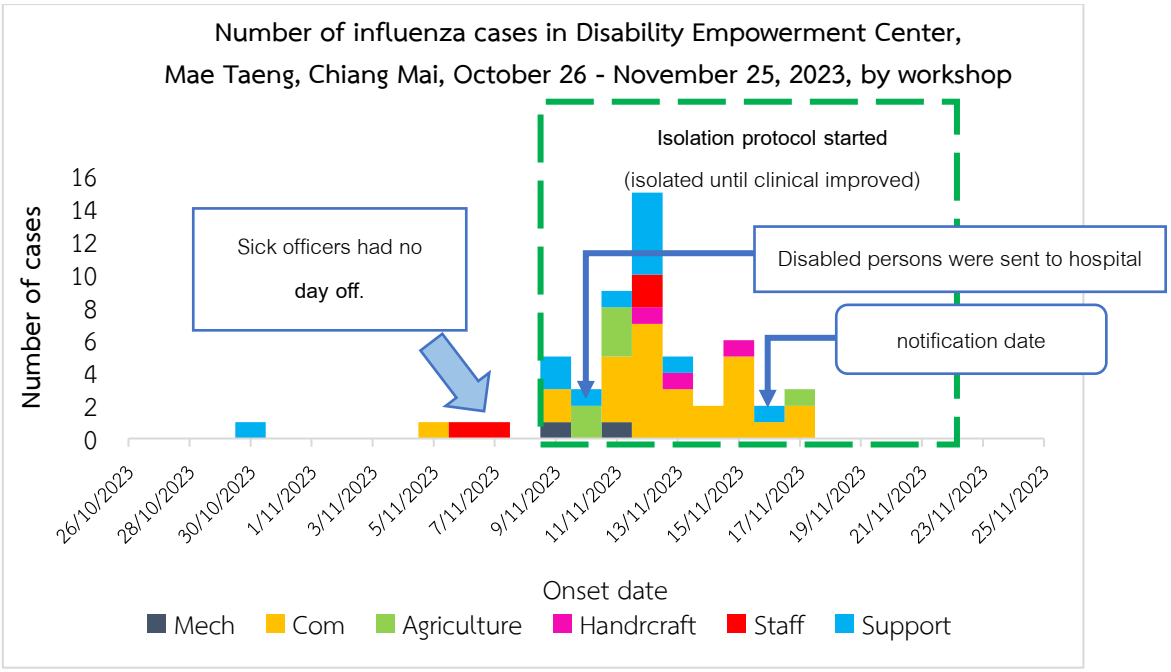

Figure 1 Number of influenza cases in Disability Empowerment Center, Mae Taeng, Chiang Mai, 26 October 26 – November 25, 2023 by workshop (n = 54)

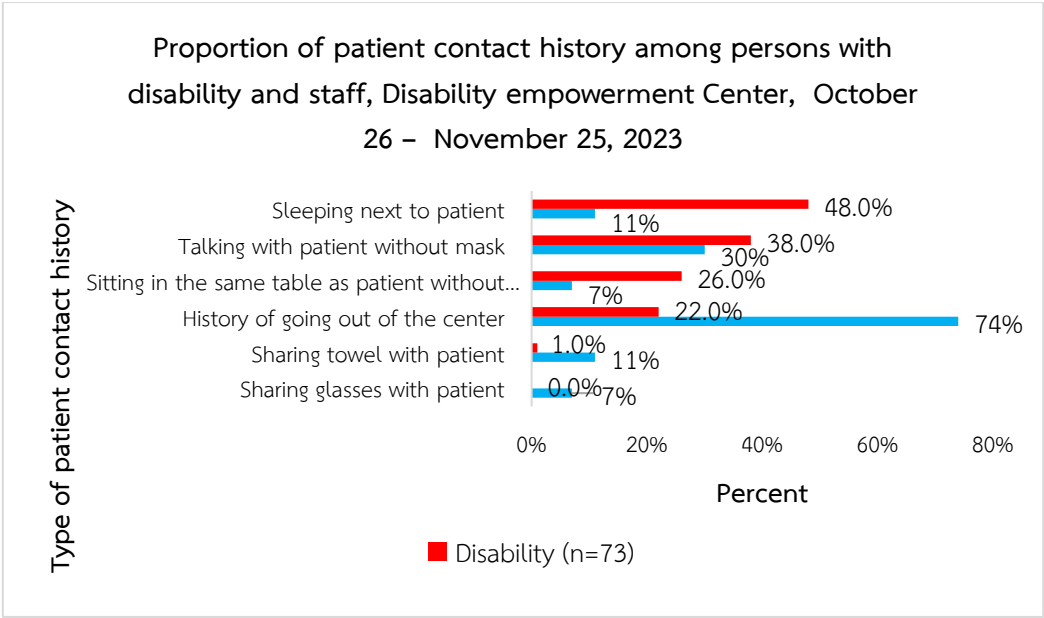

Figure 2 Proportion of patient contact history among persons with disability and staff in Disability Empowerment Center, Mae Taeng, Chiang Mai, October 26 – November 25, 2023

Persons with disability who never wore mask in the dormitory, while sneezing, and during workshop were 44%, 38%, and 11% different from staff at 11%, 0%, and 0% respectively. For risk behaviors, persons who never shared learning equipment with others among the disabled and staff were 34% and 63%. For patient contact history, 48% of the disabled had history of sleeping next to patients, and 11% to the staff. Unlike history of going out of the center, 74% of the staff and 22% of the disabled had this history (Figure 2).

Analytic study results

Survey response rate was 98% (100/102). From univariate analysis found that Staying in the dormitory, Type of disability, and Attending workshops had the risk for influenza infection (Table 1) and variables of hygiene behaviors, Sleeping next to an ill person (RR, 95%CI=1.63, 1.15–2.31), Sitting in same table with patient without mask (RR, 95%CI=1.45, 1.02–2.05), History of going out of the center (RR, 95% CI=0.62, 0.40–0.98), and Washing hands regularly (RR, 95%CI =0.53, 0.44-0.64) were statistically significant behaviors (Table 2).

Table 1: Risk ratio of characteristics of people in Disability Empowerment Center, Mae Taeng, Chiang Mai, October 26 – November 25, 2023, by case, and non-case

Characteristic	Risk ratio	95% CI	P-value
Age			
Less than 20	1	Ref	Ref
21 – 40	1.20	0.70 -2.07	0.46
41 – 60	0.68	0.34 – 1.33	0.27
Sex (Male)	0.97	0.65 – 1.44	0.88
Have underlying disease	1.10	0.76 – 1.60	0.61
Dormitories			
Female	11.38*	1.70 – 76.30	<0.01
Male 2	9.63*	1.44 – 64.55	<0.01
Male 1	8.96*	1.32 – 60.59	<0.01
Staff housing	2.15	0.22 – 21.03	0.60
Having any disability	4.62*	1.85 – 11.58	<0.01
Type of disability			
Multiple	5.63*	2.13 – 14.88	<0.01
Neurological and mental**	4.70*	1.85 - 11.95	<0.01
Others**	4.50*	1.55 – 13.08	0.02
Physical and mobility**	4.34*	1.69 – 11.17	<0.01
Workshop station			
Supporting	5.06*	1.96 – 13.06	<0.01
Handicraft	5.06*	1.74 – 14.71	0.03
Computer	4.67*	1.85 – 11.82	<0.01
Agriculture	4.5*	1.63 – 12.42	<0.01
Mechanic	2.7	0.66 – 10.99	0.23
Receive influenza vaccine	1.12	0.53–2.34	0.78

*p-value less than 0.05

**Type of disability were grouped (Other = Vision and Hearing, Neurological = Intellectual, Autism, Learning, and Mental and behavior)

Table 2: Risk ratio of hygienic behaviors of people in Disability Empowerment Center, Mae Taeng, Chiang Mai, October 26 – November 25, 2023

Factors (n = 100)	Exposed		Unexposed		Risk ratio	95% CI
	Case	Noncase	Case	Noncase		
Self-defense behavior						
Washing hands regularly**	52	46	2	0	0.53	0.44 - 0.64
Wearing a mask regularly**	52	44	2	2	1.08	0.40 - 2.90
Risk behavior						
Sleeping next to patient	27	11	27	35	1.63*	1.15 - 2.31
Sitting in same table with patient without mask	15	6	39	40	1.45	1.02 - 2.05
Talking with patient without mask	23	13	31	33	1.32	0.93 - 1.88
Sharing items with others**	35	25	19	21	1.23	0.83 - 1.81
History of going out of the center	14	22	40	24	0.62*	0.40 - 0.98

*p-value less than 0.05

** Variables were grouped.

Table 3: Adjusted odds ratio of factor-related influenza infection of people in Disability Empowerment Center, Mae Taeng, Chiang Mai, October 26–November 25, 2023

Factors (n=100)	Adjusted OR	95% CI
Type of disability (ref = no disability)		
Multiple	**24.63**	**2.65-583.06**
Neurological and mental	**10.46**	**2.51-53.54**
Other (Vision and hearing)	**9.15**	**1.26-89.99**
Physical and mobility	**8.13**	**1.98-40.49**
Sleeping next to ill person	1.79	0.66 – 4.94
Sitting in same table with ill person without mask	1.47	0.46 – 5.10
History of going out of the center	1.03	0.34 – 3.39

Laboratory study result

All five nasopharyngeal swabs were positive for influenza A H3N2 with 2 samples found co-pathogen with Human metapneumovirus. Of all15 COVID-19 ATK tested revealed negative.

Environmental study result

Persons with disability living in each dormitory 9 -26 persons were packed into the density of 5.9 – 13 m^2/person. In the canteen, food trays were provided for individuals and had a pallet on every table. All workshop stations had no routine cleaning of learning equipment and alcohol gel for hand washing expired in all workshop stations. Persons with disability had to clean all areas in the center every day by themselves under supervision of nursery and staff.

Since COVID-19 pandemic, this center has continuously done influenza-like illness (ILI) screening by using infrared thermometer scan along with clinical observation only in persons with disability by the nursery at breakfast and dinner time daily if abnormal clinical symptoms or temperature were detected, decision and patient management were in charge of the nurse in the center. The center requested seasonal influenza vaccine every year but the influenza vaccine supported by public health sectors was shortage to supply. Implemented measures of the center during the outbreak period were patient isolation, health education to emphasize self-defense behaviors including mask-wearing and hand washing with soap or alcohol gel, and consulting the district hospital when a patient load exceeded center capacity. Isolation protocol started on November 9, 2023 and patients were isolated until clinically improved without specific period. There was no refreshing course, or training.

The investigation team carried out symptom screening of all persons in the center, educated and encouraged them about proper hygiene practices, strengthened ILI screening by including the symptoms and screening in all persons, isolated patient for 7 days, and supported resources for the prevention measures.

Discussion

This event was an influenza A (H3N2) outbreak in long-term care facilities (LTCF) related to the persons with disability. Respiratory infectious outbreaks in LTCF related to persons with disability occurred intermittently. Outbreak reports in LTCF worldwide found influenza the most common pathogen. The overall influenza attack rate in LTCFs ranged varied, meanwhile, the specific attack rate among residents was higher than the staff which was the same as this event (Lansbury *et al.,* 2017). However, compared to a previous outbreak investigation in a special education school in Thailand (Jitpeera *et al.,* 2022), this outbreak had higher both overall attack and specific attack rate among disabled person.

The outbreak started with a person with intellectual disability then spread in a propagated pattern. We found that having any types of disability was a risk of influenza infection especially who had multiple disabilities. Furthermore, we found neurological and mental disabilities as a risk factor same as previous literatures which found neurological

and neuromuscular disease and other chronic medical conditions were related to severe influenza infection (Keren *et al.,*2005; Gaillat *et al.,* 2009; Mertz *et al*., 2013).

From univariable analysis, we found that sleeping next to patient was statistically significant risk behavior and sitting in the same table with patient without mask was non-statistically significant risk behavior. Persons who reported risk behaviors were persons with disability the most and they might have defects in self-awareness and self-protection (CDC, 2023a). In the other hand, history of going out of the center showed protective behavior due to this population was mostly staff of the center and the infection confined in the center. Anyway, we found no significant association between influenza infection and behavioral factors from multivariable analysis, unlike a large-scale population study in China showed that optimal hand hygiene and face mask use were protective behaviors (Wu *et al.,* 2016). Meta-analysis about hand hygiene and risk for influenza infection also found that hand hygiene and face mask use were significant protective factors. (Wong *et al.,* 2014). In addition to CDC recommendations for influenza prevention, persons with disability should do standard protective behavior and avoid risky behavior as normal populations.

ILI prevention and control measures done in the center contributed to an early detection of this outbreak, anyway it could be improved. First, adequate screening should include all persons of the center and visitors and screen by using infrared thermometers along with clinical symptoms. Furthermore, using infrared thermometers requires proper skill (Piccinini *et al.,* 2021; Aggarwal N *et al.,* 2020), so the local public health sectors should support regular health education and training. Standard ILI prevention and control measures for LTCF were not established in Thailand before, while some countries developed specific influenza outbreak management, prevention, and control measures for LTCF (Cools, 2005; Public Health Agency of Canada, 2010; CDC, 2023c; Centre for Health Protection, Department of Health, 2023).

Persons with neurological disability were the target population of the annual influenza vaccine according to the national guideline (DoE, DDC, 2023a), however low vaccine coverage was found among all persons with disability in the center. Report of Seasonal Influenza Vaccine Services (2022) also found this low coverage in all persons with disability due to insufficient dosage of seasonal vaccine in each year. In limited resource setting, vaccine allocation prioritized by the degree of disability, especially in persons with multiple disabilities should be considered. We also found low vaccine coverage among staff. Seasonal influenza vaccination for LTCF staff can reduce death, morbidity, and health service resource usage (Hayward *et al.,* 2006), some guidance recommended all residents in LTCF should get seasonal influenza vaccine (Grohskopf *et al.,* 2023; CDC, 2023c).

This influenza A H3N2 outbreak in the Disability Empowerment Center occurred at the end of the year with overall attack rate 52.9%. The majority of cases were persons with disability (Attack rate=68.5%). Having any type of disability was the risk for influenza infection especially who had multiple disabilities. Low influenza vaccine coverage found in this center despite persons with disability being the target population for seasonal influenza vaccination. Personal prevention behaviors were crucial among persons with disability and also the staff. ILI prevention and control measures done by the center could not prevent this outbreak due to inadequate screening coverage, improper protective equipment usage, no refreshing of knowledge and practice, and vaccine allocation by local public health sectors. Improving prevention and control measures along with the findings may prevent further outbreaks and be the guide for other LTCFs.

Recommendations

Short-term recommendations for improving ILI prevention and control measures in the center were strengthening screening by using symptoms together with infrared thermometers and including staff and visitors in the screening, isolation patient for 7 days, regular checking of resources for prevention measures, and identifying and closely observing persons with disability who have more defects in self-protection. In the long-term, activity limitation, absenteeism of symptomatic staff, support by related organizations should be provided such as seasonal influenza vaccine prioritizing by the risk, health training and education, protective equipment. In the national level, Cooperation between public health sectors and the Department of Empowerment of Persons with Disabilities to identify and prioritize persons with disability who should get seasonal influenza vaccine every year might protect future outbreaks in LTCF related to persons with disabilities. Furthermore, developing guidance for influenza prevention and control in the outbreak period for LTCF should be considered in the national level.

Limitations

First, information bias might occur during investigation due to recall bias, furthermore disability type might affect the understanding of questions during interview. However, we paired persons with disability with their nursery during interview along with observed their behaviors to get more reliable information. Second, contact tracing of the primary case could not done due to his intellectual disability so we could not identify the source of this outbreak. Last, we did not have enough study participants to find the association between behavioral factors and influenza infection. Further study with adequate study participants was recommended.

Acknowledgment

This outbreak investigation was successful with the support of Mae Taeng Hospital, Officer in Disability Empowerment Center, and Office of Disease Prevention and Control 1, Chiang Mai.

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