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Syndromic Surveillance for Detection of Influenza in Albania

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Abstract

Motivated by the threat of infectious diseases and bioterrorism, syndromic surveillance systems are being developed and implemented around the world. The aim of the study was to describe the early warning surveillance system in Albania for detection of pandemic influenza 2009. Syndromic surveillance is a primary health care-facility-and emergency room-based syndromic surveillance system aiming at detecting outbreaks and undertaking public health actions. Acute Respiratory Infections (ARI) consist of two syndromes: Upper and Lower respiratory infection. Weekly ARI consultation rates in 2009 were compared with the rates observed in the same period in the previous 10 years (1999-2008) of influenza season: weeks 40-20.

Unlike previous years' pattern, the rate of reported ARI increased sharply from 45th week, and peaked nationally at week 47, starting on 16 of November and representing 30% increase compared to previous week, 46. This rate was the highest observed compared to the same period of past 10 years of influenza surveillance and exceeded the 95th percentile of expected rates, thus, suggesting the circulation of a novel virus. Despite the end of the pandemic period, influenza A(H1N1)pdm09 virus continued to circulate and became the most commonly detected virus in Albania and many other countries in the winter season of 2010–2011. The system is useful for detecting and responding to natural disease outbreaks such as seasonal and pandemic flu, and thus it has the potential to significantly advance and modernize the practice of public health surveillance

Keywords: ***public health, early event detection, situational awareness***

1. Introduction

Public health surveillance is the monitoring of data to detect and quantify unusual health events.

Traditional surveillance systems have served public health well in detecting and responding to infectious disease outbreaks. While generally passive and dependent on laboratory confirmation,

they have provided sufficient information to identify disease clusters [1-3]. The early detection of infectious disease outbreaks in order to minimize the spread of epidemics is central to countermeasures against the diseases. In recent years, "syndromic surveillance" has attracted attention as a new technology that meets these demands [4-7].

Syndromic surveillance does not replace but supports existing public health surveillance structures. Monitoring pre-diagnostic data enables rapid detection of disease outbreaks.

In the absence of speedy biological diagnosis, nonspecific syndromes (e.g. "diarrhoea causing death in adults" or "rash with fever") are used to monitor health events and initiate response, serving as proxy for specific diseases (cholera and measles).

The field of syndromic surveillance is best understood through the context of global efforts to respond and adapt to modern-day surveillance challenges and disease threats. Globalization and the ease of international spread of disease require improved global surveillance capacity in order to rapidly detect and contain public health emergencies [8-11]. Recognition of this need has led to increased efforts to enhance disease surveillance and demands examination of all available tools—one of which is syndromic surveillance. Such thinking is exemplified by the World Health Organization's (WHO) decision to revise the International Health Regulations (IHR).

The Albanian Epidemiological reporting Tool (ALERT) system, an early warning system for infectious diseases was established in September 1999 as part of the national surveillance networks coordinated by the Albanian National Institute of

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Public Health (IPH) [12]. The aim of the study was to describe the early warning surveillance system in Albania for detection of pandemic influenza 2009.

2. Material and Methods

Influenza in Albania is subject to several Nationwide Surveillance Systems, but the ALERT Syndrome-Based Surveillance use Acute Respiratory Infections (ARI) which consists of two syndromes: Upper and Lower respiratory infection.

It is an Early Warning Surveillance System GP and Emergency Room based throughout the country. It consists of weekly mandatory notification of ARI consultation from Hospitals and Primary health Care services all over the country.

2.1 The ALERT system

The aim of the ALERT system is the early detection of outbreaks. It is a primary health care-facility- and emergency room (ER)-based syndromic surveillance system which produces information for action. Participation to surveillance and prevention activities is mandatory for general practitioners (GPs) and included in their contract with the Health Insurance Institute. The system has been extended in the past year to include ER in all hospitals in the 36 districts of Albania. Most GPs complete a tally sheet at the end of each week, with the aggregated cases of notifiable syndromes examined during that week, including zero reporting [13,14]. The syndromes monitored are shown in **Error! Reference source not found.**. The influenza season is defined as starting during week number 40 (around the first of October) and ending on week 20 of the following year, which is usually at the end of May. From October through May, providers within the Surveillance Network submit weekly reports to IPH of the total number of patients seen with ARI. IPH calculates and reports weekly rates on country scale. Virological surveillance was implemented to collect respiratory specimens and provide detailed and timely information on circulating influenza virus strains. We matched individual specimens with outpatient clinic visits that occurred during a week. Time series of weekly percent of ARI were compared to weekly counts of laboratory confirmed influenza cases. The early warning potential of the trend of weekly ARI rate was evaluated for the influenza season prior to pandemic (2008-2009) for pandemic season (2009-2010) and post pandemic season (2010-2011). A warning was identified if either lab confirmed case counts or weekly rate of ARI crossed over their respective baselines. The ARI baseline and threshold provided advanced warning of influenza and allowed for the classification of influenza severity in the community.

3. Results and Discussion

Data from Surveillance of ARI

Weekly ARI consultation rates in 2009 were compared with the rates observed in the same period in the previous 10 years (1999-2008) of influenza season: weeks 40-20. Starting from 13 of April (week 16) to 1st of November (week 44) the influenza activity remained low or fell below the national baseline levels according to percentile-based intensity levels generated from historical weekly ARI consultation.

Unlike previous years' pattern the rate of reported ARI increased sharply from 45th week, and peaked nationally at week 47, starting 16 of November and representing 30% increase compared to previous week, 46. This rate was the highest observed compared to the same period of past 10 years of influenza surveillance and exceeded the 95th percentile of expected rates, thus, suggesting the circulation of a novel virus.

Children aged 0-14 years had the highest incidence rates of ARI.

On 2010 the increase of ARI rates followed the previous years' pattern starting by the end of December 2010 and reaching the peak on first week of February 2011. (Figure 1).

The first imported human A(H1N1)pdm09 cases were sporadically detected in Albania in July and August and subsequently the first wave of activity occurred from November 2009 to February 2010 during the expected influenza season [15-17]. The influenza activity increased suddenly at the beginning of November 2009, much earlier compared to the pattern of the same period of past years. Clusters of influenza cases were detected in schools, day care centers and within families and a remarkable increase of confirmed cases was noted, highlighting the intensive circulation of the pandemic virus.

Table 1. Syndromes under surveillance and case de Finitions.

Syndrome	**Clinical definition**	**Disease (s) targeted**
Upper respiratory infection	Fever and at least one of the following: rhinitis, cough, redness or soreness of throat	Influenza…
Lower respiratory infection	Fever and fast breath (=50 breaths/min) and at least one of the following : cough, difficulty in breathing	Bacterial or viral pulmonary infection, sars…
Diarrhea without blood	More than 3 smooth stools per day (24 hours)	Salmonellosis…
Rash with fever	Rash with fever	Measles, chickenpox, …
Unexplained fever	Fever (> 38,5°c) for more than 48 hours and not meeting the above case definitions	Brucellosis, salmonellosis, detection of clusters…
Jaundice	Yellow eyes or skin	Hepatitis virus infection, …
Diarrhea with blood	More than 3 smooth stools with blood per day (24 hours)	Shigellosis…
Suspected meningitis	12 months and over: sudden onset of fever (>38°c) with stiff neck. Under 12 months of age: fever with bulging fontanelae	Bacterial meningitis…
Hemorrhagic fever	Acute and unexplained onset of fever (> 38,5° c) with hemorrhage	Crimean-congo haemorrhagic fever, hantavirus…
Acute flaccid paralysis (afp)	Cases of any age with flaccid paralysis with sudden onset	Poliomielitis, traumatic neuritis, transvers mielitis, guillain-barre sindrome, etc.. *Poliovirus, enterovirus, toxins etc*
Unexplained fever (>48 h)	Fever (> 38° c) for more than 48 hours not meeting the above case definitions without alteration of tests.	Brucellosis, tiphus, influenza etc Tuberculosis leishmaniosis
Unexplained prolonged fever (>3 weeks)	Fever (> 38° c) for more than 3 weeks and tests fail to provide a ground for diagnosis.	*Brucella sp, s.typhi, mycobaterium tuberculosis etc*
Severe respiratory illness, respiratory failure	Fever (> 38° c), fast breath and at least one of the following : shortbrethness, cough, cyanosis of skin etc, confusion and drowsiness. Decreasing oxygen in blood.	Avian influenza in humans, sars etc *A/h1n1, a/h5n1, h2n7,* sars-cov *etc.*

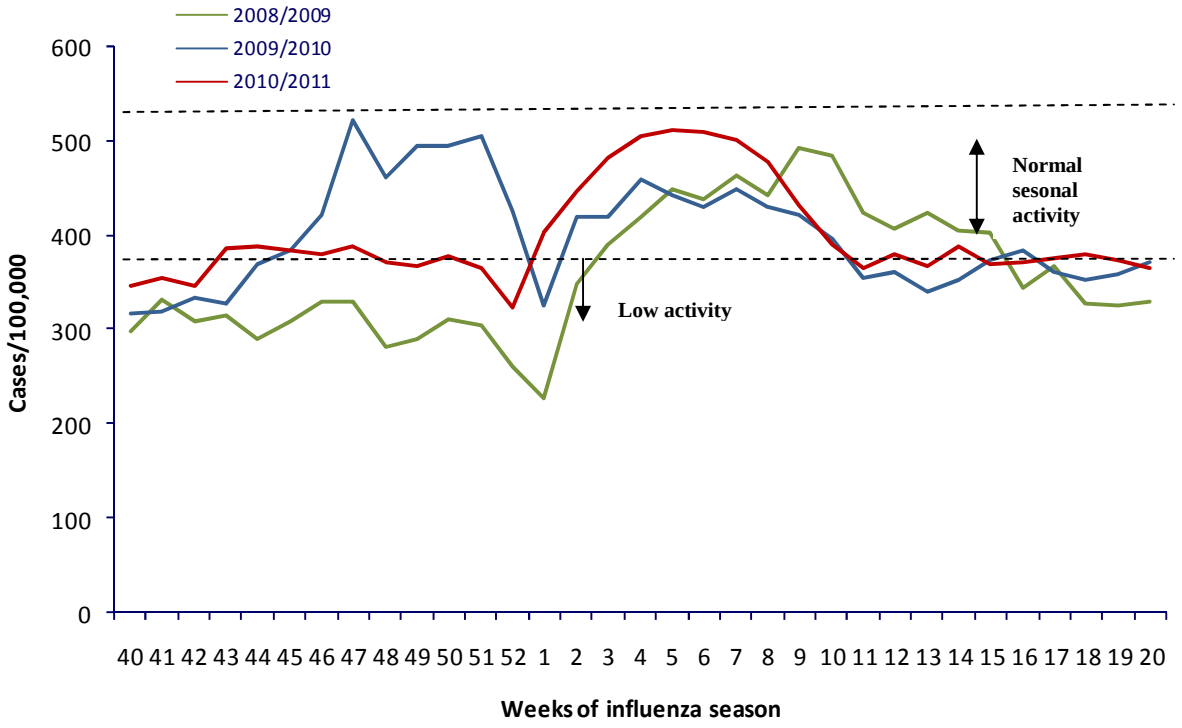

Figure 1. Comparison of ARI rates and epidemic threshhold of influenza seasons, weeks 40-20.

Widespread influenza activity was reported during November and December from all geographical areas of the country which denotes the circulation of the virus in the whole country. It is important to emphasize that the increase in numbers of confirmed A(H1N1)pdm09 cases correlates with the population density and reflects the intense levels of influenza activity occurring in main urban areas.

Modelling of the pandemic wave and data from syndromic surveillance were used to estimate the community burden of pandemic influenza infections in Albania. By January 2010 the epidemic began to subside. The sharp rise of the ARI notified through syndromic surveillance suggested the circulation of a new virus. During the season 2010-2011 influenza activity increased at the beginning of January 2011, representing the normal seasonal influenza pattern in Albania and ARI consultation rates observed during this season were comparable with pre-pandemic influenza seasons. Experience from past pandemics suggested that the pandemic virus would gradually take on the behavior of a seasonal influenza virus and circulate for some years [18-21]. However, considering the likelihood for transformation of the virus into a more virulent form [22-25] as suggested by higher rates of mortality during second pandemic waves in Copenhagen (1918), the United States (1957), and Eurasia (1968–1970), the World Health Organization acknowledged the unpredictability of pandemic viruses; recommended continued surveillance and issued advice and guidelines on surveillance of severe cases, vaccination, and appropriate clinical management of cases during the postpandemic phase [26-29]. Indeed, during the subsequent influenza season 2010-2011 the circulation of A(H1N1)pdm09 virus took on the normal seasonal pattern as in the previous ten years of surveillance of ARI. A number of studies have demonstrated the potential of syndromic surveillance for earlier warning of the arrival of epidemic influenza

4. Conclusions

The ALERT component of infectious diseases surveillance in Albania is one of few nationwide early warning systems in the world. The syndromic surveillance is a useful tool for detecting and responding to natural disease outbreaks such as seasonal and pandemic influenza, and thus they have the potential to significantly advance and modernize the practice of public health surveillance.

Since seasonal and pandemic influenza viruses undergo constant antigenic drift and may change in virulence, WHO recommends that countries maintain pandemic monitoring systems to detect changes in severity or characteristics of disease and therefore to

allow for appropriate targeting of prevention and control and treatment of influenza. ARI is useful for the initial detection of influenza season and for detecting other respiratory illnesses that initially cause similar symptoms. Epidemiological characteristics of both seasonal and pandemic influenza suggest that syndromic surveillance system is more sensitive and faster than traditional surveillance methods. It is likely to make an important contribution beyond the capabilities of existing surveillance systems, and thus enable a more effective public health response to influenza outbreaks in a particular area. It is becoming more prevalent and more accepted as a measure of yearly influenza outbreaks. It can be improved by re-examining case definitions and the disorders under surveillance, and its integration with routine surveillance at the district level.

5. Acknowledgements

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6. References

1. Andreasen V, Viboud C, Simonsen L. Epidemiologic characterization of the 1918 influenza pandemic summer wave in Copenhagen: implications for pandemic control strategies. J Infect Dis. 2008;197:270–8. http://dx.doi.org/10.1086/524065.
2. Bean NH, Martin SM. Implementing a network for electronic surveillance reporting from public health reference laboratories: an international perspective. Emerg Infect Dis 2001 Sep;7(5):773-9.
3. Buehler JW, Sonricker A, Paladini M. Syndromic Surveillance Practice in the United States: Findings from a survey of state, territorial, and selected local health departments. Advances in Disease Surveillance. 2008;6:3. [Note: this is a web publication and each paper is given a number (3) rather than page numbers]
4. Brownstein JS, Kleinman KP, Mandl KP. Identifying pediatric age groups for influenza vaccination using a real-time regional surveillance system. American Journal of Epidemiology. 2005;162:686–693. doi: 10.1093/aje/kwi257. [PMC free article] [PubMed]
5. Cash R, Narasimhan V. Impediments to global surveillance of infectious diseases: consequences of open reporting in a global economy. Bull World Health Organ 2000;78(11):1358-67.
6. D'Ortenzio E, Do C, Renault P, Weber F, Filleul L. Enhanced influenza surveillance on Réunion Island (southern hemisphere) in the context of the emergence of influenza A(H1N1)v. Euro Surveill. 2009; 14(23):19239.
7. Enserink M. Infectious diseases. WHO wants 21st-century reporting regs. Science 2003 May 2;300(5620):717-8.
8. EuroFlu Weekly Electronic Bulletin-Week 2 (2011) Available: http://www. euroflu.org/cgi-files/bulletin_v2.cgi.Accessed 2011 Nov 22.
9. Evolution of a pandemic: A(H1N1) 2009, April 2009–March 2010. Geneva: World Health Organization (2010).
10. Gesteland PH, Wagner MM, Chapman WW, Espino JU, Tsui FC, Gardner RM, et al. Rapid deployment of an electronic disease surveillance system in the state of Utah for the 2002 Olympic Winter Games. Proc AMIA Symp 2002;285-9.
11. Global influenza virological surveillance. WHO. Available from: http://www.who.int/csr/disease/influenza/influenza network/en/ index.html. Accessed: April 10, 2011.
12. Heffernan R, Mostashari F, Das D, Karpati A, Kuldorff M, Weiss D. Syndromic surveillance in public health practice, New York City. Emerg Infect Dis 2004 May;10(5):858-64.
13. H1N1 in post-pandemic period World Health Organization. [cited 2012 May 2]. http://www.who.int/mediacentre/news/statements/ 2010/h1n1_vpc_20100810/en/index.html
14. Hong Kong Center for Health Protection (2011) Flu Express-Volume 8, Number 5. Available: http://www.chp.gov.hk/files/pdf/flu_express_week 5_2_
15. Influenza A(H1N1)v investigation teams. Modified surveillance of influenza A(H1N1)v virus infections in France. Euro Surveill. 2009; 14(29):pii=19276.
16. Infectious Disease Surveillance Center (2011) Infectious Agents Surveillance

Report- The Topic of This Month- 2010/11 influenza season, Japan. Available: http://idsc.nih.go.jp/iasr/32/381/tpc381.html. Accessed 2011 Nov 21.

17. Kakarriqi E. Survejanca e Shendetit Publik. Leksion per Specializantet Pasuniversitare te Fakultetit te Mjekesise (Universiteti i Tiranes) 2003
18. Kakarriqi E. Epidemiologjia e semundjeve infektive ne Shqiperi (1960-2001) dhe kontrolli e parandalimi i tyre ne kontekstin: fatkeqesite natyrore dhe semundjet infektive.Tiranë, 2003.
19. Lemay R, Mawudeku A, Shi Y, Ruben M, Achonu C. Syndromic surveillance for influenzalike illness. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science. 2008;6:161–170. doi: 10.1089/bsp.2007.0056. [PubMed]
20. Lu J. Could outpatient visits enhance our ability of early detecting influenza-like illness outbreaks? Advances in Disease Surveillance. 2006;1:44.
21. Lau EHY, Cowling BJ, Ho LM, Leung GM. Optimizing use of multistream influenza sentinel surveillance data. Emerging Infectious Diseases. 2008;14:1154–1157. doi: 10.3201/eid1407.080060. [PMC free article] [PubMed]
22. Lewis MD, Pavlin JA, Mansfield JL, O'Brien S, Boomsma LG, Elbert Y, et al. Disease outbreak detection system using syndromic data in the greater Washington DC area. Am J Prev Med 2002 Oct;23(3):180-6.
23. Malison MD. Surveillance in developing countries. In: Halperin W, Baker ELJr, Monson RR, editors. Public Health Surveillance.New York: Van Nostrand Reinhold; 1992. p. 56-61
24. Moran GJ, Kyriacou DN, Newdow MA, Talan DA. Emergency department sentinel surveillance for emerging infectious diseases. Ann Emerg Med 1995 Sep;26(3):351-4.
25. Morens DM, Taubenberger JK, Harvey HA, Memoli MJ. The 1918 influenza pandemic: lessons for 2009 and the future. Crit Care Med. 2010;38(Suppl):e10–20. http://dx.doi.org/10.1097/CCM.0b013e3181ceb25b
26. Miller MA, Viboud C, Balinska M, Simonsen L. The signature features of influenza pandemics–implications for policy. N Engl J Med. 2009;360:2595–8. http://dx.doi.org/10.1056/NEJMp0903906
27. Review of the 2010–2011 winter influenzaseason, northern hemisphere. World Health Organization (2011) Weekly Epidemiological Record 86: 221–232.
28. Vogt RL. Laboratory reporting and disease surveillance. J Public Health Manag Pract 1996;2(4):28-30.
29. Valenciano M, Coulombier D, Lopes CB, Colombo A, Alla MJ, Samson S, et al. Challenges for communicable disease surveillance and control in southern Iraq, April-June 2003. JAMA 2003 Aug 6;290(5):654-8.
30. Valenciano M, Pinto A, Coulombier D, Hashorva E, Murthi M. Surveillance of communicable diseases among the Kosovar refugees in Albania, April-June 1999. Euro Surveill 1999 Sep;4(9):92-5.
31. Weber SG, Pitrak D. Accuracy of a local surveillance system for early detection of emerging infectious disease. JAMA 2003 Aug 6;290(5):596-8.
32. World now at the start of 2009 influenza pandemic. World Health Organization (2010) Available: http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html.Accessed 2010 Mar 27.
33. Weekly National Influenza Report- Week 4. Health Protection Agency (2011) Available: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/ 1294740643915. Accessed 2011 Nov 21.
34. York I, Donis RO. The 2009 pandemic influenza virus: where did it come from, where is it now, and where is it going? Curr Top Microbiol Immunol. 2012; 26.2_2011.pdf. Accessed 2011 Nov 21.