

Second Scientific Conference for Eastern Mediterranean Acute Respiratory Infections Surveillance (EMARIS): Conference Precedings

Casablanca, Morocco

November 12–15, 2019

ORAL PRESENTATION

Respiratory Disease Epidemiological Surveillance

Factors Associated with Lower Respiratory Tract Infections among Children in a Tertiary Care Hospital, Rawalpindi, Pakistan, 2018–2019: A Case Control Study

A. Minallah

Field Epidemiology and Laboratory Training Program (FELTP), Islamabad, Pakistan

ABSTRACT

Objectives: Lower respiratory tract infections (LRTIs) are a leading cause of childhood morbidity and mortality worldwide. The objective of this study was to evaluate the factors leading to LRTI among children and recommend preventive measures. **Methods:** A case control study was conducted from October 2018 to March 2019 at a tertiary care hospital in Rawalpindi, Pakistan. Consecutive sampling was used to select 150 hospitalized children < 60 months who met the operational definition of LRTI. Nasopharyngeal aspirates were taken for virus identification. Age and sex-matched controls were taken from other departments at a ratio of 1:1. A structured questionnaire was used to collect information from parents of both cases and controls. Frequencies were calculated and odds ratio (OR) determined at a 95% confidence interval (CI) with p -value < 0.050. **Results:** The 150 cases had a male to female ratio of 1.4:1 and a median age of 32 months (range 5 to 58 months). Parainfluenza 3, influenza A, respiratory syncytial virus, and influenza B viruses were detected in 32 (21.0%), 33 (22.0%), 21 (14.0%) and 7 (5.0%) children, respectively. Among the cases, 88 had no immunization against influenza (OR = 3.9, 95% CI: 2.5–6.0); in 84 cases the parents were smokers (OR = 2.5, 95% CI: 1.6–3.8) and 79 cases had been regularly left in day care by parents (OR = 2.3, 95% CI: 1.5–3.6). **Conclusions:** Lack of immunization against Influenza was significantly associated with LRTI in children, as was parental smoking and unhygienic day care. Four health education sessions for parents and carers were given at the pediatric department

covering vaccination, the hazards of passive smoking, and the importance of hygienic day care provision.

Influenza Morbidity and Mortality in Tunisia, 2017–2018

H. Bouguerra¹, L. Bouabid¹, R. Yazidi², N. Abdeddaïem³, L. Maazaoui³, W. Zaatour¹, S. Abid⁴, A. El Moussi⁴, M. Zorruga³, M. Sakly³, A. Slim⁴, A. Ben Salah² and N. Ben Alaya¹

¹National Observatory of New and Emerging Diseases, Public Health, Tunis, Tunisia

²Pasteur Institute of Tunisia, Epidemiology, Tunis, Tunisia

³Primary Healthcare Directorate, Public Health, Tunis, Tunisia

⁴Charles Nicole Laboratory, Microbiology, Tunis, Tunisia

ABSTRACT

Objectives: Morbidity and mortality associated with influenza varies according to season, the virus strains in circulation, and the preventive and control measures in place. The study aimed to gauge the severity of the 2017–2018 influenza season in Tunisia and identify associated risk factors. **Methods:** Data for the retrospective descriptive and analytical study from 1 October 2017 to 30 April 2018 was provided by severe acute respiratory infections (SARI) sentinel sites and the National Influenza Center. SARI cases were defined as per WHO case definition. Data entry and analysis used SPSS-20. **Results:** Of a total of 1636 notified hospitalized cases 839 (50.7%), including 114 deaths (13.5%), were from the six nominated SARI sites. The majority of SARI cases had co-morbidity (69.8%) and 43.0% were hospitalized in intensive care unit (ICU). Only 5.0% of cases had been vaccinated. Antivirals were used in 7.5% of cases before admission and 57.4% during hospitalization. Influenza severity was significantly associated with age, region, asthma, and other respiratory diseases. Type A(H1N1)pmd09 and A(H3N2) were identified in 76.4% and 10.0% of cases, respectively. **Conclusions:** The 2017–2018 influenza season in Tunisia resulted in a large number of deaths and SARI cases being hospitalized in ICUs. The predominant circulation of the A(H1N1)pmd09 virus may explain these results. While assessing influenza severity is essential in all countries, for better results and sustainability during routine assessments in Tunisia, Pandemic Influenza Severity Assessment should be implemented.

Influenza Epidemic with High Mortality During the Winter Months in Yemen, 2018–2019

M. Al Amad¹ and A. Al Mahaqri²

¹Ministry of Health, Yemen Field Epidemiology Training Program, Sana'a, Yemen

²Ministry of Health, Influenza Program, Sana'a, Yemen

ABSTRACT

Objectives: Influenza follows a seasonal pattern in Yemen. The winter season November 2018 to February 2019 saw a two-fold increase in the incidence of influenza. The aims of the study are to describe the epidemiology and magnitude of influenza and recommend preventive measures for future epidemics. **Methods:** A descriptive analytical study was undertaken. Surveillance staff used questionnaires to collect data from patients meeting the WHO case definition. Nasopharyngeal samples were sent to the National Public Health Laboratory for polymerase chain reaction tests. Proportions were calculated with the cut point of significance chi-square test with p -value < 0.050. **Results:** The 470 reported cases studied were from 15 of Yemen's 23 governorates. The majority – 81.0% (379) – were from cold climate areas. The first case occurred in week 45/2018 and cases peaked in week 3/2019. Almost 71.0% (334) were male, 30.0% (139) ≥ 65 years, 28.0% (131) < 5 years, and 20.0% (96) had chronic diseases. Influenza viruses were isolated from 55.0% (126/230) of tested samples (44.0% type A(H1N1) and 11.0% type B). The overall fatality rate was 22.0%. Fatality rates were significantly higher among patients ≥ 45 years (30.0% vs 16.0%, p -value < 0.001), and among those with influenza B (52.0% vs 26.0%, p -value < 0.007) and influenza A (46.0% vs 15.0%, p -value < 0.001) compared to patients negative to the same pathogens. **Conclusion:** Following the high mortality rate that occurred during the 2018–2019 winter season strengthening laboratory capacity for early diagnosis and early provision of anti-influenza drugs for case management are recommended.

Quantitative Assessment of Severe Acute Respiratory Infection Surveillance Database, Lebanon, 2018

N. Ghosn¹, P. Mrad², N. Haddad¹, M. Beaini³, A. Rady² and W. Ammar⁴

¹Ministry of Public Health, Epidemiological Surveillance Program, Beirut, Lebanon

²WHO Country Office, Beirut, Lebanon

³Rafik Hariri University Hospital, National Influenza Center, Beirut, Lebanon

⁴Ministry of Public Health, General Directorate, Beirut, Lebanon

ABSTRACT

Objectives: Severe acute respiratory infections (SARI) sentinel surveillance was initiated in Lebanon in 2015. Following a World Health Organization workshop in April 2019 an evaluation protocol was developed for SARI

surveillance with six components, including quantitative assessment of the SARI database. The objective of this study was to measure the SARI database's quality and identify any necessary corrective measures. **Methods:** SARI cases were entered at source using offline EpiData for the period 2015–2017 and the online DHIS2 platform since 2018. The target quantitative attributes were data quality, completeness, and timeliness. Using the DHIS2 platform, indicators were defined and an evaluation dashboard established with automatic updates for selected indicators. The dashboard was accessible at a hospital and national level. **Results:** Of the 892 cases examined for 2018 completeness for core variables (age, sex, fever, cough, onset date, admission date, specimen collection, ward, and residence) was 61.0%. Completeness for preexisting conditions, antiviral treatment, and influenza vaccination was 100.0%, 100.0% and 34.0%, respectively. Completeness for information concerning the case definition was 76.0%. Completeness of specimen collection and laboratory results was 89.0% and 93.0%, respectively. The positive predictive value was 15.0%. Timely specimen referral (within seven days of collection) and specimen testing (within seven days of receipt) were both 99.0%. **Conclusions:** In June 2019 the evaluation dashboard was presented to SARI focal staff as a tool for assessing the quality of case detection, data entry, and specimen testing. The tool will be used to monitor and enhance SARI database quality.

Epidemiology of Influenza Among Patients with Influenza-like Illness (ILI) and Severe Acute Respiratory Infections (SARI) in Pakistan: A 10-year Surveillance Study 2008–2017

N. Nisar

National Institute of Health, Public Health Laboratories Division, Islamabad, Pakistan

ABSTRACT

Objectives: Until 2008 the burden of influenza in Pakistan was unclear as no formal surveillance system was in place. In 2008 an influenza surveillance system with eight sentinel sites was set up. This study describes the epidemiology of the influenza virus using surveillance data from 2008 to 2017. **Methods:** Nasopharyngeal and throat swabs, together with relevant epidemiological information, were collected from patients with influenza-like illness (ILI) and severe acute respiratory infections (SARI). The samples were tested for influenza viruses using real time reverse transcriptase-polymerase chain reaction. **Results:** A total of 17 209 samples were tested for influenza of which 3552 (20.6%) were positive. Of these, 2151/11 239 (19.1%) were from patients with ILI and 1401/5970 (23.5%) from patients with SARI. The 82.3% (n = 2922) of cases were identified from Islamabad sites. Influenza A(H1N1) pdm09 was the predominant strain – 40.6% (n = 1442) – followed by influenza B (936, 26.4%). Seasonality was

observed, with peaks during the months of December to February, though there was sporadic activity round the year. Influenza A(H1N1)pdm09 was predominant among children (5-14 years) and adults (15-64 years), accounting for nearly half of all cases in both age groups. Nearly 48.0% of cases among the elderly (> 65 years), and 37.0% among children aged between two and four years were influenza B strain. Shortness of breath was significantly associated with influenza positivity. **Conclusions:** The 10-year surveillance data provides evidence of influenza activity in Pakistan throughout the year, with seasonal winter peaks. The results can be used to strengthen epidemic preparedness and response planning.

Respiratory Disease Virological Surveillance

Genetic Characterization of Influenza Viruses Circulated in Oman During 2018–19 Winter Season

S. Al-Mahruqi¹, H. Al-Kindi¹, A. Al-Busaidi¹, A. Al-Amri¹, A. Al-Amri¹, I. Al-Shukri¹, R. Daniels², J. McCauly², B. Ermetal², L. Whittakar² and A. Al-Jardani¹

¹Central Public Health Laboratories-MOH-Oman, Virology, Muscat, Oman

²WHO Collaborating Center for Reference and Research on Influenza Francis Crick Institute, virology, London, UK

ABSTRACT

Objectives: Limited data is available about the genetic profile of seasonal influenza viruses circulating in Oman. Therefore, this study aimed to assess the genetic characteristics of influenza viruses circulated in Oman during the winter 2018-19 season and to correlate the genetic profile among hospitalized and severe cases. **Methods:** Respiratory specimens were collected from patients from different governorates treated for ILI or SARI in health centers or hospitals from week 35/2018 to week 18/2019. Specimens were typed and subtyped for influenza viruses by real time RT-PCR. Subset of positive influenza specimens were sent to WHO-CCs for influenza at the Francis Crick institute-UK and CDC-Atlanta for further characterization. **Results:** During the 2018-19 winter season, Influenza A(H3N2) viruses was most common accounted for 49% of the cases followed by A(H1N1) pdm09 (36%) and a low circulation of type B viruses (16%). Hospitalized cases were ~25% of the total positives among them 44 cases were severe. A(H3N2) was detected in 52 % of the severe cases and 41% for A(H1N1) and only 7% of the cases had type B. Sequences of HA gene A(H3N2) viruses belonged to subclade 3C.2a1b, the most common globally. The analyzed HA A(H1N1) pdm09 viruses fell in clade 6B.1A (~60% and ~45% belonged to subclades 6B.1A-5 and 6B.1A6 respectively). 5 B/Victoria fell in clade 1A, but later during the season clade V1A.Δ3 viruses were detected. All the ten B/Yamagata clustered in clade 3. **Conclusions:** This study highlights the need for continuous epidemiological and virological surveillance to monitor the evolution of influenza viruses.

Detection of Non-influenza Related Viral Respiratory Infections among Returning Hajj Pilgrims, the Islamic Republic of Iran 2017

K. Sadeghi, T. Mokhtari Azad, S. Azadeh, J. Yavarian and N.z. Shafiei

Virology Department, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Objectives: Pilgrims returning from the Hajj can augment the international spread of viral respiratory infections. In this study the prevalence of non-influenza viral infection in pilgrims returning from the Hajj was investigated. **Methods:** A cross-sectional study in which 120 pilgrims returning from the Hajj participated. Nasal and throat swab specimens were obtained from patients hospitalized for respiratory complications and who tested negative for influenza viruses. All samples were examined for adenovirus using nested-PCR, bocavirus using PCR, rhinovirus using nested-RT-PCR, and RSV, HCoV-229E, HCoV-OC43, HCoV-HKU1, HCoV-NL63 and HMPV using real-time PCR. **Results:** Over 44.0% (n = 53) of participants showed viral-related symptoms. Viruses detected were: adenovirus (n = 24, 20.0%); rhinovirus (n = 19, 15.8%); HCoV-OC43 (n = 3, 2.5%), detected for the first time in Iran; HCoV-229E (n = 2, 1.6% and bocavirus (n = 1, 0.8%). RSV, HMPV, HCoV-NL63 and HCoV-HKU1 were not detected. Co-infection was diagnosed in six participants (5.0%). **Conclusions:** The annual Hajj ritual lasts for at least five days and over three million people participate from around the world. Because antivirals and vaccines are only available for influenza, to prevent other respiratory infections healthcare education during or prior to Hajj, including the importance of using alcohol-based hand scrubs, is recommended.

Contribution of Non-influenza Respiratory Viruses During an Influenza Epidemic Using Influenza Surveillance Platform: Experience from Pakistan

H. Mirza, N. Badar, M. Salman, A. Ahad, A. Ikram

National Institute of Health, Virology Department, Islamabad, Pakistan

ABSTRACT

Objectives: Non-influenza RNA respiratory viruses (NIRV) represent a considerable global health burden. Since 2007 the Pakistan National Institute of Health has undertaken laboratory-based influenza-like illness (ILI) and severe acute respiratory infections (SARI) surveillance at eight sentinel sites across country. This study determined the frequency of NIRV infections through the existing surveillance system. **Methods:** Between December 2017 and October 2018, throat and nasal swabs were collected from children under five suffering from ILI and SARI and tested for influenza and non-influenza viruses (RSV,

adeno, HMPV, ADV, PIV, and rhino) using CDC real-time PCR protocol. **Results:** Of 508 specimens analyzed 56.0% (285/508) tested positive for IV and NIRVs. Of these 40.0% (114/285) were influenza viruses, with subtype (H1N1)pdm09 the major outbreak strain. Nearly 60.0% of cases were positive for non-influenza pathogens. Human respiratory syncytial virus was the most commonly detected (49.0%), followed by rhinovirus (18.3%), metapneumovirus (15.4%), adenovirus (8.4%), and PIV-3 (6.0%). The risk of developing both influenza and NIRV infection was greater in children > 3 years. **Conclusions:** By highlighting the significance of NIRVs as a dominant viral etiologic agent among pediatric acute respiratory infections the study may lead to increased rates of diagnosis of viral infections and improved patient outcomes as well as reducing the overuse of antibiotics and antivirals. It will also augment national epidemiological data on infections caused by these viruses.

Detection and Characterization of Influenza Virus from Influenza-like Illness Cases in Private and Public Sentinel Networks During the 2016–2019 Influenza Seasons in Morocco

H. Oumzil¹, A. Bimouhen¹, Z. Regragui¹, H. Izhmad¹, S. Benkerroum¹, S. Triki², I. Cherkaoui³ and F. El Falaki¹

¹National Influenza Center, Virology Department, National Institute of Hygiene, Rabat, Morocco

²WHO Country Office, Rabat, Morocco

³Epidemiological Surveillance Service, Directorate of Epidemiology, Rabat, Morocco

ABSTRACT

Objectives: Calculations of flu virus circulation among influenza-like illness (ILI) out-patients in Morocco were based on the input of a public sentinel network of eight healthcare centers and a private network of 30 practitioners. The study aimed to characterize and compare patterns of influenza virus infection among ILI patients in public and private settings. **Methods:** Of the 2435 ILI cases examined, 35.6% (n = 867) were from private networks and 64.4% (n = 1568) from public sentinel sites. Subtype influenza viruses were detected using a qPCR-based assay. Data was tested for associations with influenza using chi-squared tests and logistic regression. **Results:** Of 2435 ILI patients, 872 tested positive for influenza, yielding a global positivity rate of 35.8%, and 92.0% of ILIs from both networks met the case definition criteria. Influenza positive rates were significantly higher among ILI cases from the private network (54.0%) than from public sentinel sites (26 %, CI 95%, p-value < 0.0001). ILI from private settings accounted for just 35.6% of all samples but 53.44% of viral strains. Of the influenza A isolates, A(H3N2) was the most prevalent (14.83%, n = 361), followed by A(H1N1)pdm09 (11.54%, n = 281) and influenza B/Yamagata (9.45%, n = 230). Clinical predictors for infection with measured fever ($\geq 38^{\circ}\text{C}$)

were more strongly associated with influenza A (AOR = 1.58; 95% CI: 1.10–2.8). **Conclusions:** Virological surveillance of ILI in Morocco is more efficient in private networks. Broadening surveillance to additional public sentinel sites will require greater attention being paid to quality assurance processes and greater compliance with the criteria for collecting and shipping samples.

Frequent Detection of Enterovirus D68 and Rhinovirus Type C in Children with Acute Respiratory Tract Infections

F. Rezaei and T. Mokhtari Azad

Department of Virology, Tehran University of Medical Sciences, School of Public Health, Tehran, Iran

ABSTRACT

Objectives: This study aimed to evaluate the prevalence of HRVs and the possible emergence of EV-D68 in children with acute respiratory tract infections. **Methods:** A total of 322 nasopharyngeal swab samples from children with initial diagnosis of lower respiratory tract infections (RTIs) were tested for viruses using both real-time RT-PCR and nested RT-PCR. Phylogenetic trees were constructed to determine circulating genotypes. **Results:** Thirty-four (10.5%) and 70 (21.7%) cases tested positive for EV-D68 and HRV, respectively. Mild respiratory symptoms were displayed by 47.1% of EV-D68 patients and 50.0% of HRV cases; severe respiratory symptoms by 52.9% of EV-D68 patients and 50.0% of HRV cases. The phylogenetic analysis revealed the clade Fermon-like and sub-clade B3 as the prevalent genotypes for EV-D68. HRV-positive samples were of three types, HRV-A (37.1%), HRV-B (17.1%), and HRV-C (45.8%). The results revealed a high prevalence of HRV and EV-D68 in the winter. **Conclusions:** The study revealed that in addition to circulating viruses that had already been determined EV-D68 is circulating in Iran and can cause severe clinical symptoms. Children with acute respiratory infection should be tested for all the above mentioned viruses so suitable decisions for treatment can be made.

Influenza Disease Burden

Estimation of the Proportion of SARI Cases Attributable to Influenza, from SARI Sentinel Sites Data for 2015, Jordan

N. Ta'anni and S. Sheikh Ali

Ministry of Health, Communicable Diseases Directorate, Amman, Jordan

ABSTRACT

Objectives: Influenza is an underappreciated contributor to global mortality and morbidity and has significant economic consequences. The burden of influenza is not well known in Jordan. The aim of the study was to estimate the proportion of severe acute respiratory infections (SARI) cases attributable to influenza using data from 2015.

Methods: SARI data from 2015 was used to calculate fatality rates for SARI and influenza and the disease burden estimated according to the World Health Organization (WHO) Manual and Supplement for Estimating Disease Burden Associated with Seasonal Influenza. **Results:** The median proportional contribution of influenza associated with SARI from sentinel sites was 2/100; 95% CI 1.44–2.72. There were 369 538 admissions to Ministry of Health hospitals in 2015, of which 9.5/1000 were SARI cases and 1.9/1000 influenza cases, giving total estimates of 3510 and 702 cases, respectively. The proportion of influenza from total SARI cases was 20%. The median fatality rate for SARI cases in the period 2010–2018 was 3.5%, and 6.2% for influenza. Given public hospitals account for 60% of Jordan's healthcare services, it can be estimated that 5850 SARI cases were hospitalized in 2015 and 204 deaths occurred due to respiratory diseases. The estimate for influenza is 1170 cases nationally, with 72 deaths. **Conclusions:** Although the available data was limited, the WHO Manual for Estimating Disease Burden Associated with Seasonal Influenza allowed the influenza burden to be estimated and the proportion of SARI cases and deaths linked with SARI to be calculated nationally.

Influenza Epidemiology and Risk Factors for Severe Acute Respiratory Infection in Morocco, 2014–2019

H. Ezzine^{1,2}, M. Merabet¹, I. Cherkaoui¹, H. Oumzil³, A. Rguig¹, Z. Dahbi¹, A. Bimohen³, F. Falaki³, Z. Regagui³, M. Naciri² and M. Youbi¹

¹Directorate of Epidemiology and Disease Control, Ministry of Health, Rabat, Morocco

²Research Center BIOBIO, Laboratory of Biodiversity, Ecology and Genome, Faculty of Science, Mohammed V University, Rabat, Morocco

³National Institute of Hygiene /National Influenza Center, Ministry of Health, Rabat, Morocco

ABSTRACT

Objectives: To implement an influenza vaccination programme for high-risk-groups in Morocco, as recommended by World Health Organization (WHO), an epidemiological study indicating the effects of the influenza virus in the development of complicated influenza in subjects with comorbidity was required. The present study aims to identify risk factors for severe acute respiratory infections (SARI) caused by influenza among high-risk groups in Morocco during the last five influenza seasons. **Methods:** A retrospective case series study was conducted using cases with influenza-like illness (ILI) and SARI collected from the surveillance target population during the last five influenza seasons. Only laboratory confirmed cases were included. WHO's case definition was used and severity assessment was based on hospitalization. Information was collected on all risk groups defined by WHO. **Results:** The total number of positive cases for the influenza virus was 1323, including 552 severe acute respiratory infections. The influenza

positivity rate has increased globally by age group, clinical service, and co-morbidity. The subtype A(H1N1)pdm09 was predominant during seasons 2015–2016 (70.9%) and 2018–2019 (70.6%). The risk factors for SARI caused by influenza, identified by multivariate logistic regression, were pregnancy (odds ratio (OR) adjusted = 8.7), chronic respiratory disease or asthma (OR adjusted = 4.5), chronic renal failure (OR adjusted = 3.8), age > 65 years (OR adjusted = 2.2), and diabetes (OR adjusted=1.8). **Conclusions:** The risk assessment of influenza-associated SARI in high-risk groups – particularly pregnant women, patients with chronic disease, and the elderly – led to it being strongly recommended such groups be targeted by an influenza vaccination program in Morocco.

Influenza A(H1N1) and Influenza B Among Pilgrims Attending Al-Mashaer Hospitals during the 1440 (2019) Hajj Period

A. Alowfi¹, A. Almutairi¹, K. Algaali¹, J. Mizjaji¹, A. Mizjaji¹, H. Esawi¹ and J. Gaines²

¹Ministry of Health, Field Epidemiology Training Program, Riyadh, Saudi Arabia

²Centers for Disease Control and Prevention, Field Epidemiology Training Program, Riyadh, Saudi Arabia

ABSTRACT

Objectives: Around 2 to 3 million pilgrims gather annually in Makkah, Saudi Arabia, a concentration that imposes risks of transmission of respiratory infections. Published data show acute respiratory infections (ARIs) are the commonest diseases transmitted during Hajj. Influenza viruses are among the commonest pathogens that cause ARIs, yet almost all published studies on influenza were conducted post-Hajj among returning pilgrims. Our aim was to investigate the prevalence of influenza A and influenza B and their associated factors among all ARI patients attending Makkah and Al-Mashaer hospitals during the Hajj period. **Methods:** A cross-sectional study was conducted among pilgrims with ARIs attending Makkah and Al-Mashaer hospitals during Hajj period 1440 (from 19 July to 16 August 2019). All cases meeting the criteria of acute onset of fever ($\geq 38^{\circ}\text{C}$) and cough within the previous 10 days were included. Nasopharyngeal swabs collected were tested for influenza A and influenza B using RT-PCR. Cases were identified from the Makkah Preventive Medicine Department and Health Electronic Surveillance System (HESN) and descriptive statistics used to present distributions, comparisons, and associations. **Results:** The results estimate the prevalence of influenza A and influenza B among all ARIs and describe sociodemographic factors, clinical features and epidemiological information such as caseload, specific mortality, bed occupancy and other factors. **Conclusions:** The results are expected to generate new information which will help authorities and researchers determine optimal control strategies and aid in the modelling of disease patterns.

Outbreak Investigation and Response

2017 MERS-CoV Outbreak in Wadi Al-Dawasir General Hospital Renal Dayalysis Unit in Saudi Arabia

S. Aldubaisi¹ and S. Almudarra²

¹Ministry of Health, General Directorate of Eastern Province Health Affairs, Dammam, Saudi Arabia

²Ministry of Health, Field Epidemiology Training Program, Riyadh, Saudi Arabia

ABSTRACT

Objectives: On 1 March 2017 Wadi Al-Dawasir General Hospital's (WDGH) emergency department received a patient on hemodialysis, with severe pneumonia symptoms, from a rehabilitation facility. On 2 March the patient tested positive for Middle East respiratory syndrome coronavirus (MERS-CoV). On 9 March six additional laboratory-confirmed MERS-CoV cases were reported from WDGH. The study describes the scope of the outbreak and identifies risk factors that led to the transmission of MERS-CoV. **Methods:** Using PCR, dialysis patients, relatives of cases, and all WDGH staff were screened to identify additional MERS-CoV cases. Renal dialysis unit staff were questioned about infection control practices and cases interviewed, together with relatives, about possible sources of MERS-CoV infection. Cases' medical records were examined using a standard chart abstraction form to collect information on symptoms and the course of the illness. **Results:** Between 15 February and 15 March 2017, 10 laboratory confirmed MERS-CoV cases were identified and one probable case epidemiologically linked. Six cases were asymptomatic when they were identified. Patients on hemodialysis were significantly more likely to develop symptoms (p -value < 0.050). Symptomatic cases were significantly older than asymptomatic cases (p -value < 0.050). All five symptomatic cases sought medical help from at least one emergency department. Only one case was identified on initial presentation. A second case was identified only after multiple visits. **Conclusions:** Many cases were not diagnosed when they sought care, highlighting the continued importance of considering MERS-CoV infection among patients with respiratory illness in Saudi Arabia. Rapid identification and isolation of MERS-CoV cases is essential in preventing healthcare associated infections.

MERS-CoV and Other Emerging Respiratory Infections

Surveillance and Testing for Middle East Respiratory Syndrome Coronavirus (MERS-CoV), Saudi Arabia, 2016–2019

A. Alzahrani¹, A. Assiri², S. Tunkar³, G.R. Abedi⁴,

S.A. Kujawski⁴, H.M. Biggs⁴, S.I. Gerber⁴, J.T. Watson⁴ and N. Alghawi⁵

¹Ministry of Health, Health Electronic Surveillance Network, Riyadh, Saudi Arabia

²Ministry of Health, Assistant Deputy Minister Preventive Health, Riyadh, Saudi Arabia

³Ministry of Health, Command and Control Center, Riyadh, Saudi Arabia

⁴U.S. Centers for Disease Control and Prevention, Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, Atlanta, GA, USA

⁵Ministry of Health, Field Epidemiology Training Programme, Riyadh, Saudi Arabia

ABSTRACT

Objectives: Middle East respiratory syndrome coronavirus (MERS-CoV) causes severe respiratory illness. The majority of cases worldwide have been reported by Saudi Arabia. Clinicians and health authorities in Saudi Arabia are required to report all suspected MERS-CoV cases to the Health Electronic Surveillance Network (HESN), a national electronic surveillance platform. We aimed to describe trends in MERS-CoV surveillance and laboratory testing in Saudi Arabia over a three-year period. **Methods:** Demographic information and laboratory results were collected for all suspected MERS-CoV cases reported to HESN between 1 March 2016 and 20 March 2019. Demographic and laboratory data of suspected and confirmed cases was analyzed. Data were stratified by local Health Affairs Directorate (HAD) and population estimates obtained from the Ministry of Health. **Results:** During the study period, 200 937 suspected MERS-CoV cases were reported to HESN. MERS-CoV was detected in 698 (0.3%; 0.7 per 100 000 population per year). The majority of suspected cases were male (54.3%) and Saudi nationals (72.8%). Among the confirmed cases, 517 (74.1%) were male, 501 (71.8%) were Saudi nationals, and the median age was 54 years (interquartile range: 40 years–65 years). No MERS-CoV cases were identified among Hajj pilgrims. Percent positivity varied by region, with the highest percentage in Hafer Al-Baten HAD (1.2%), followed by Najran HAD (1.1%). **Conclusions:** Saudi Arabia continues to perform extensive surveillance for MERS-CoV, with an average of ~5400 suspected cases identified and tested per month. Continued surveillance is needed to better understand transmission and to monitor testing practices.

Evidence of Zoonotic MERS-CoV Infection among a High-Risk Population in Morocco

A. Abbad^{1,2}, R.A. Perera³, L. Anga¹, A. Faouzi¹, N.N. Tran Minh⁴, R.M. Mamun⁴, N. Iounes², A. Maaroufi⁵, M.D. Van Kerkhove⁶, M. Peiris³ and J. Nourlil¹

¹Institut Pasteur Morocco, Medical Virology and BSL³ Laboratory, Casablanca, Morocco

²Université Hassan II, Laboratoire d'Ecologie et d'Environnement, Casablanca, Morocco

³Hong Kong University, School of Public Health, Hong Kong, Hong Kong S.A.R.

⁴WHO Regional Office for Eastern Mediterranean, Health Emergencies Program, Cairo, Egypt

⁵Institut Pasteur Morocco, Casablanca, Morocco

⁶WHO Health Emergencies Programme, Geneva, Switzerland

ABSTRACT

Objectives: There have been recurrent spillovers from dromedaries into the human population since the emergence of Middle East respiratory syndrome coronavirus (MERS-CoV). All known zoonotic MERS disease had hitherto occurred in the Arabian Peninsula, with none reported in Africa. This study assesses zoonotic MERS-CoV infection in high-risk groups in Morocco. **Methods:** The study adapted a World Health Organization (WHO) MERS-CoV protocol to assess the seroprevalence of MERS-CoV and the risk factors of infection among high-risk populations in three study sites in the south of Morocco with high-densities of dromedaries. Demographic and camel exposure data was obtained using a questionnaire for three set study groups – members of the general population, slaughterhouse workers, and camel herders. Human sera samples were tested for MERS-CoV IgG antibodies through ELISA, pseudoparticle neutralisation, and plaque reduction neutralisation assay. **Results:** Blood samples from 479 participants enrolled in the study were collected between November 2017 and January 2018. The results produced the first evidence in Africa of human primary cases of MERS-CoV infection with documented direct exposure to dromedaries. Three out of 137 slaughterhouse workers and one of 186 from the general population group showed the neutralizing MERS-CoV antibody. **Conclusions:** This is the first time MERS-CoV transmission risk factors have been examined in Morocco through a seroprevalence study among high-risk populations. It provided evidence of zoonotic transmission, underlining the need for exhaustive investigations of human ARI in likely areas for evidence of MERS circulation.

MERS-CoV Outbreak: The First Report of Nosocomial Transmission in Oman

A. Al-Maani¹, H. Paul¹, J. Al Sooti¹, N. Al Zadjali¹, N. Gonzaga¹, A. Al-Qayoudhi¹, F. al Yaqoobi², A. Al-Wahaibi³, S. Al-Rahbi¹, A. Al Muqbali⁴, M. Al-Balushi⁵, F. Al-Arabi⁶, H. Al Kindi⁷, P. K. Patel², B.R. Bader Rawahi MSc², A. Al-Jardani⁷ and S. Al Abri⁴

¹Infection Prevention and Control, Ministry of Health, Muscat Oman

²Communicable Diseases, Ministry of Health, Muscat, Oman

³Directorate General for Diseases Surveillance and Control, Ministry of Health, Muscat, Oman

⁴Diseases Surveillance and Control for North Al Batinah Governorate, Ministry of Health, Sohar, Oman

⁵Infection Prevention and Control, Sohar Hospital, Sohar, Oman

⁶Infection Prevention and Control, Sur Hospital, Sur, Oman

⁷Central Public Health Laboratory, Ministry of Health, Muscat, Oman

ABSTRACT

Objectives: The first confirmed case of Middle East respiratory syndrome (MERS) in Oman was in 2013. This report describes the nosocomial spread of MERS-coronavirus (CoV) in two regional hospitals in Oman (2019) and highlights opportunities for rapid containment in the future. **Methods:** An outbreak epidemiological description and analysis of contributing factors was undertaken, with infection prevention and control challenges highlighted. A transmission map was created to trace hospital contacts and symptomatic contacts were screened using RT-PCR. Environment decontamination was carried out. Awareness programmes including training and education were augmented and infection prevention and control guidelines were revised, especially those related to the implementation of risk assessment for contact screenings. **Results:** Between 23 January and 16 February 2019, 13 confirmed cases were reported from two hospitals. Seven out of 13 were secondary transmitted cases, including two healthcare workers. Symptoms included fever in six (46%) patients, respiratory symptoms in six (46%), and gastrointestinal symptoms in four (31%). Four out of 13 patients died. High traffic in affected wards, poor adherence to infection control measures, lack of awareness, delay in the diagnosis of primary cases, and inadequate terminal cleaning were identified as contributory factors to the outbreak. Both affected healthcare workers and two secondary patients were missed during contact screenings. **Conclusions:** Lapses in the implementation of infection control measures within a facility can facilitate nosocomial transmission of MERS-CoV. There is a need to revise risk assessment tools for contacts within hospitals so that positive cases can be detected earlier.

One-health Approach to MERS-CoV, 2012–2017: Experience from Qatar

E. Farag Elmoubasher¹, M. Nour¹, M. Islam², A. Mustafa¹, M. Khalid¹, R. Sikkema³, F. Alhajri², A. Bu-Sayaa², H. Mohamed¹, M. Van Kerkhove⁴, A. Elkholy⁵, S.M. Malik⁵, C. Reusken³, M. Koopmans³ and M. AlHajri¹

¹Department of Public Health, Ministry of Public Health, Doha, Qatar

²Department of Animal Resources, Ministry of Municipality and Environment, Doha, Qatar

³Department of Viroscience, Erasmus University Medical Center, Rotterdam, The Netherlands

⁴Global Infectious Hazards Management, Health Emergencies Programme, WHO, Geneva, Switzerland

⁵Infectious Hazard Management, Department of Health Emergency, WHO EMRO, Cairo, Egypt

ABSTRACT

Objectives: The emergence of Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 was accompanied by uncertainty about its epidemiological and clinical characteristics. Once camelus dromedarius was found to be the natural reservoir of the virus public

health systems across the Arabian Peninsula came under unprecedented pressure to control its transmission. This study describes how a One Health approach was used in Qatar to manage the MERS-CoV outbreak between 2012 and 2017. **Methods:** The One Health approach adopted brought together professionals working in the health, animal welfare, and environmental sectors. To manage the MERS outbreak the Qatar National Outbreak Control Taskforce (OCT) was reactivated in November 2012 and experts from the animal health sector were invited to join. Later, technical expertise was requested from the WHO, FAO, CDC, Erasmus University (EMC), and Public Health England (PHE). A One Health roadmap was subsequently delivered addressing surveillance and investigation, epidemiological studies and increased local diagnostic capacity. **Results:** The joint OCT, once trained, was allocated resources and had access to high risk areas to gather evidence on the potential source of the virus and investigate all cases within 24–48 hours of reporting. Lack of sufficient technical guidance on veterinary surveillance and poor risk perception among vulnerable populations constituted major obstacles to maintaining systematic One Health performance. **Conclusions:** A One Health approach is essential for generating evidence and implementing control measures to restrain MERS-CoV and other zoonotic diseases.

Influenza Vaccination

Seasonal Influenza Vaccination Coverage among Healthcare Workers in the Eastern Mediterranean Region: Meta-analysis

A. Ahmed¹, F. Andraous², M.F. Allam³ and J. Jabbour¹

¹WHO Country Office, Cairo, Egypt

²Faculty of Medicine, Family Medicine Department, Ain Shams University, Cairo, Egypt

³Faculty of Medicine, Community, Environmental and Occupational Medicine Department, Ain Shams University, Cairo, Egypt

ABSTRACT

Objectives: Though WHO recommends annual influenza vaccination for healthcare workers (HCWs), cross-sectional studies have shown low influenza vaccination coverage rates among HCWs. The aim of the study was to pool the prevalence/frequency of seasonal influenza vaccination coverage rates among HCWs in the Eastern Mediterranean Region (EMR) and compare it with other WHO Regions. **Methods:** A comprehensive search of PubMed/MEDLINE, Scopus, Google Scholar, previous reviews, and cited reference source was conducted and discussions held with a number of experts. A prevalence/frequency with a 95% confidence interval (CI) was calculated or estimated whenever possible. **Results:** A total of 197 publications, 23 of which were original researches investigating seasonal influenza vaccination

coverage rates among HCWs in the EMR, were identified. The 23 studies, published between 2007 and 2019, covered 19089 HCWs and were conducted in Saudi Arabia, UAE, Kuwait, Oman, Morocco, Qatar, Jordan, Iran, Tunisia, and Pakistan. The overall pooled coverage rate among HCWs in EMR was 27.3% (95% CI: 26.7%–29%). The three main reasons identified for poor vaccination uptake rates were: lack of time on the part of HCWs, lack of awareness of vaccine availability, and doubts about vaccine efficacy. We now plan to compare coverage rates among HCWs in different WHO Regions. **Conclusions:** Seasonal influenza vaccination coverage among HCWs in the EMR is relatively low. Institutional and national programmes are needed to increase HCWs uptake of seasonal influenza vaccination.

Influenza Vaccination among Healthcare Workers: Vaccine Coverage and Reasons for Non-compliance, El Mahalla El Kubra, Gharbia Governorate, Egypt 2018

S. Elghazaly¹, H. Abu El Sood¹, S. El Shorbagy² and A. Eid³

¹Preventive Sector, Epidemiology and Surveillance, Ministry of Health and Population, Cairo, Egypt

²Communicable Disease Control Department, Ministry of Health and Population, Cairo, Egypt

³Preventive and Endemic Affairs, Ministry of Health and Population, Cairo, Egypt

ABSTRACT

Objectives: Influenza is a major cause of morbidity and mortality worldwide, causing 3 million to 5 million severe illnesses and 500 000 deaths every year. Healthcare workers (HCWs) are liable to infection and can spread influenza at their facilities. Vaccination remains the most effective measure for the prevention and control of influenza in healthcare settings. The study's objectives were to measure influenza vaccine coverage and identify causes of non-compliance with vaccination guidelines among HCWs in three hospitals (chest, general, and infectious disease) in the Mahalla district. **Methods:** Hospitals were visited and a questionnaire delivered to HCWs to collect demographic characteristics, influenza vaccination status and the reasons for compliance or non-compliance with vaccination guidelines. A descriptive and multivariate analysis of the statistics was conducted. **Results:** The mean age of the 384 HCWs who completed the questionnaire was 34±8.66, of which 11.7% were male. Overall influenza vaccine coverage was 61.9%. It did not vary significantly between males and females (71.1% vs 60.7%) or between nurses and physicians (64.5% vs 54.1%). Vaccination rates were significantly higher in the chest and general hospitals compared to the fever hospital (68.7% and 63.9% vs 44.5%, *p*-value < 0.001). The main reasons cited for compliance were disease prevention (63.0%) and prevention of transmission to others (44.5%). The main reasons for non-compliance were concern about side

effects (43.1%) and a preference for natural immunity over vaccination (23.2%). **Conclusions:** The study highlights the need to augment influenza vaccination coverage among HCWs, especially physicians and staff at infectious diseases hospitals. Improving HCWs knowledge about the benefits of vaccination and its side effects could increase vaccine coverage and prevent influenza outbreaks in healthcare settings.

Seasonal Influenza Vaccination: Knowledge, Attitudes and Behaviour in Pregnant Women, Morocco, 2018

L. Alji¹, I. Cherkaoui², M. Anouar Sadat³, H. Aoufi⁴, A. Ezzahidi⁵, H. Ezzine², M. Youbi² and A. Khattabi⁶

¹Centre Anti Poison et de Pharmacovigilance du Maroc, Ministry of Health, Rabat, Morocco

²Direction de l'Epidémiologie et de la Lutte contre les Maladies, Ministry of Health, Rabat, Morocco

³Délégation de la Province de Casablanca-Médiouna-Casablanca, Ministry of Health, Casablanca, Morocco

⁴Direction Médicale de Santé de la Province de Tétouan, Ministry of Health, Tétouan, Morocco

⁵Cellule Provinciale d'Epidémiologie, Délégation de la Santé Province d Ouarzazate, Ministry of Health, Ouarzazate, Morocco

⁶Ecole Nationale de Santé Publique, Ministry of Health, Rabat, Morocco

ABSTRACT

Objectives: Pregnant women are identified by World Health Organization as a high priority group in countries considering initiating or expanding influenza vaccine programmes. The objective of the study was to assess the acceptability, and identify its determinants, of seasonal influenza vaccine (SIV) among pregnant women in Morocco. **Methods:** A cross-sectional study among a convenience sample of pregnant women at 31 primary health centers from three provinces was conducted. Data were collected using a structured questionnaire. Univariate and multivariate logistic regression with Epi info 7 was used to identify factors associated with the acceptability of SIV among the women. The statistical significance level was set at p -value < 0.050. **Results:** Of the 1152 women included in the analysis 70.87% said they were willing to receive SIV during pregnancy. Key factors supporting acceptance were the availability of safety information on SIV (odds ratio (OR) = 1.96, 95% confidence interval (CI): 0.99–3.89), the health care professional (HCP) who was the source of this information (OR = 2.55, 95% CI: 1.61–4.04) and the fact that SIV was recommended by a HCP (OR = 3.17, 95% CI: 2.12–4.74). The perceived possibility of adverse effects of influenza immunization was a major barrier to receiving SIV (OR = 0.38, 95% CI 0.19–0.78). **Conclusions:** For optimal vaccination coverage of pregnant women an SIV national communication strategy should be tailored to take into account of the identified determinants.

Evolutionary Analysis of Influenza B Lineages in Pakistan 2011–2019: Surveillance to Evaluate Vaccine Effectiveness

N. Badar¹, M. Salman¹, U. Bashir², M. Umair¹, J. Ansari¹, A. Ikram¹, N. Nisar¹, H. Ahmed Mirza¹ and A. Ahad¹

¹National Institute of Health, Virology Department, Islamabad, Pakistan

²WHO Country Office, Islamabad, Pakistan

ABSTRACT

Objectives: The evolutionary dynamics of human influenza B viruses have resulted in two distinct lineages, B/Yamagata and B/Victoria, based on hemagglutinin (HA) divergence. The study analyzed the genetic diversity of influenza B viruses circulating in Pakistan from 2011 to 2019 and their compatibility with vaccine strains. **Methods:** Throat and nasal swabs collected from influenza-like illness (ILI) and severe acute respiratory infections (SARI) patients were examined for influenza viruses according to CDC protocol. Phylogenetic analysis of HA and NA genes was carried out using MEGA 6.0. Statistical analysis used SPSS version 17. **Results:** Of 18 685 samples, 14% were positive for either influenza A or B. Of these, influenza A was detected in 78.0% and influenza B in 22.0%. Among influenza B viruses, 60.0% were B/Yamagata and 40.0% B/Victoria. Mean age was higher for B/Yamagata, 24 ± 22 years, than for B/Victoria, 19 ± 16 years. Phylogenetic analysis revealed HA and NA genes of influenza B viruses clustered with global strains. B/Yamagata-like strains clustered within Clade 2 and 3 showed signature amino acid markers in HA gene: N181 (Clade 2), P187 (Clade 3). During 2013–2014, analysis of HA and NA showed Yamagata-Victoria inter-lineage reassortment and during 2018 a Victoria lineage virus carrying HA deletions at residues K162 and N163 of HA1(1A(Δ 2)) circulated. **Conclusions:** This is the first report on the molecular evolution of influenza B viruses in Pakistan. Antigen characteristics of circulating influenza B differed from recommended vaccine strains. Regular characterization of influenza B is important if representative B-lineage strains are to be included in annual influenza vaccines.

Biosafety and Biosecurity

Assessment of the Compliance of the National Influenza Center (Morocco) with Laboratory Biorisk Management Standard CWA 15793:2011

H. Ihazmade^{1,2}, Z. Regragui¹, A. Bimouhen¹, F. El Falaki¹, B. Samira¹, H. Oumzil¹ and A. Filali Maltouf²

¹National Institute of Hygiene, National Influenza Center, Rabat, Morocco

²Mohamed V University, Department of Biology, Rabat, Morocco

ABSTRACT

Objectives: Handling dangerous pathogens, chemicals and toxins always involves degrees of risk that must be identified and mitigated. Adhering to Laboratory Biorisk Management standard CWA 15793:2011 guarantees this is done in a structured way. Morocco's National Influenza Center (NIC) has implemented a number of measures to mitigate biorisk in the laboratory. The aim of this study is to evaluate NIC's compliance with CWA 15793 and identify any deficiencies. **Methods:** An assessment of NIC's biorisk management implementation status was undertaken by an external auditor from the Robert Koch Institute (Germany) using a structured evaluation questionnaire covering the 16 CWA 15793 requirements. **Results:** Audit findings pointed to 80.0% compliance with CWA 15793 requirements. The role of the biosafety officer was among the gaps identified and requires review. An appropriate tool for assessing biorisks during internal audits must also be defined and the lack of specific continuous biosafety training addressed. **Conclusions:** The quality management system and WHO manuals, guidance and standard operating procedures used by NIC over the years were shown to be compatible with CWA 15793 requirements. Filling the identified gaps has been scheduled in NIC's action plan.

The Role of the Biorisk Department in Improving Biosafety and Biosecurity when Dealing with Infectious Disease

S. Obied, A. Elameen, S. Mirghani and O. Huyam

National Public Health Laboratory, Ministry of Health, Khartoum, Sudan

ABSTRACT

Objectives: Sudan's National Public Health Laboratory (NPHL) deals with a wide range of pathogens and requires an effective biorisk management system (BRM). The Biosafety and Biosecurity Department established at NPHL in 2014 manages risk across all Ministry of Health laboratories and adopted Laboratory Biorisk Management standard CWA 15793:2011 for use in 17 departments. This study aimed to determine the elements to be prioritized in a step by step approach to implementing BRM and to assess BRM performance. **Methods:** Laboratory assessment using gap analysis was undertaken to assess CWA 15793:2011 implementation, and an audit checklist as per CWA 15793 compiled. **Results:** A number of measures were identified to fill the detected gaps. They included better establishing of risk assessment procedures, improving documentation and communication, improving microbiological practice and procedure, and increasing training and awareness of laboratory staff. **Conclusions:** NPHL's Biorisk Department has a leading role to play in protecting laboratory staff who deal with highly infectious agents.

Establishing a Biosafety Level III Laboratory (Reference Laboratory

for Infectious Diseases), Sheikh Khalifa Medical City, Abu Dhabi

S. Weber¹, H. Imambaccus², J. Lacanaria², S. Abdulmajeed², K. Encelan², M. Al Mansoori², A. Al Shehhi² and G. Donnelly¹

¹Sheikh Khalifa Medical City, Microbiology, Abu Dhabi, UAE

²Sheikh Khalifa Medical City, Molecular Infectious Disease, Abu Dhabi, UAE

ABSTRACT

Objectives: At a time when emerging pathogens such as viral hemorrhagic fevers are becoming more common the Abu Dhabi Department of Health opted to establish a safe laboratory environment with experienced staff to deal with infectious pathogenic organisms. The laboratory was designed and built by an American company with container modules pre-manufactured and then shipped to Abu Dhabi for assembly on site. **Methods:** The laboratory operates to the highest standards of biosafety and biosecurity. Biosafety is ensured by implementing varying degrees of laboratory control and containment through laboratory design and access restrictions, professional expertise and training, use of containment equipment and using appropriate methods to manage infectious materials in laboratory settings. Biosecurity involves securing or limiting access to the facilities, research materials and information. **Results:** Procedures which are performed in the Biosafety Level 3 Laboratory (RLID) are PCRs for highly contagious infectious diseases such as viral hemorrhagic fever viruses, PCRs for various respiratory pathogens and cell culturing, especially for influenza, measles and rubella viruses. **Conclusions:** The laboratory is the national reference laboratory for influenza and the designated national reference laboratory for measles and rubella.

Influenza at the Human-animal Interface

Identifying Inappropriate Practices Associated with Highly Pathogenic Avian Influenza Spread among Backyard Poultry Flocks Using Participatory Epidemiology: A New Approach in Egypt, 2014–2017

H. Elsheikh¹, H. Abou Elsouad² and S. Samy²

¹General Organization for Veterinary Services, Epidemiology Department, Cairo, Egypt

²Ministry of Health, Epidemiology Department, Cairo, Egypt

ABSTRACT

Objectives: The study identified inappropriate practices associated with highly pathogenic avian influenza (HPAI) transmission among backyard poultry with the objective of facilitating disease prevention and control. For the first time in Egypt community animal health outreach teams (CAHO) used participatory epidemiology (PE) in the surveillance of HPAI.

Methods: Between 2014 and 2017, CAHO teams visited 2600 villages across Egypt. They conducted 11 000 focus group discussions and interviewed 55 000 poultry keepers using semi structured questionnaires to elicit information about the handling of poultry flocks. Information was verified using PE tools. Samples from poultry with symptoms matching the case definition were collected and tested for HPAI by RT-PCR and practices for dealing with backyard poultry in villages with positive HPAI foci were compared to those without. **Results:** The teams found positive foci in 413 (15.9%) villages and identified the source of infection in 85.0% of positive villages. Practices found to be significantly associated with HPAI included: the introduction of new poultry to existing flocks without an initial 10 day segregation period (odds ratio (OR) = 3.6, 95% confidence interval (CI): 1.9–5.2); slaughtering of sick birds in rearing areas (OR = 3.0, 95% CI: 2.2–6.8); purchase of poultry from unreliable sources (OR = 2.3, 95% CI: 1.3–5.5); the use of viscera wastes for poultry feeding (OR = 2.1, 95% CI: 1.5–4.2); the breeding of sudani ducks (OR = 2.0, 95% CI: 1.6–3.2) and unsupervised scavenging (OR = 1.7, 95% CI: 1.1–3.2). **Conclusions:** Poultry keepers play a significant role in facilitating HPAI spread among backyard poultry flocks in Egypt. CAHO teams can help educate poultry keepers in appropriate methods for the handling of flocks to help reduce the incidence of HPAI in the household sector. A strategic plan should be designed addressing best practice at nursery farms since such farms represented 51% of the identified sources of HPAI outbreaks in the household sector

Molecular Evolution of Low Pathogenic H9N2 Influenza Viruses in Poultry in North Africa

M. Ducatez¹, S. Fellahi², B. Abdelheq³, F.Z. Sikht², A. Boudaoud³, A. Ghram⁴, J. Lachhebe⁴, N. Allouj³, C. Camus-Bouclainville¹, M. EL Houadfi² and R. Webby⁵

¹Institut National de la Recherche Agronomique, Animal Health, Toulouse, France

²Institut Agronomique et Vétérinaire Hassan II, Department of Pathology and Veterinary Public Health, Rabat, Morocco

³Batna University, Département Vétérinaire, Batna, Algeria;

⁴Pasteur Institute, Virology, Tunis, Tunisia;

⁵St Jude Children's Research Hospital, Infectious Diseases, Memphis, USA

ABSTRACT

Objectives: H9N2 low pathogenic avian influenza viruses (LPAIV) were first detected in Morocco in early 2016 and in Algeria in 2017. The H9N2 viruses have since spread, most recently to West Africa, causing severe economic losses to the poultry industry. H9N2 influenza viruses have caused human infections in Asia. While no human cases have been reported in North Africa monitoring H9N2 influenza viruses is extremely important for early stage identification of possible pandemic strains.

The study aimed to characterise H9N2 LPAIV from Morocco and Algeria between 2016 and 2019 and thus fill a gap in understanding H9N2 epidemiology in North Africa. **Methods:** Oropharyngeal swabs and organs were collected from Algerian poultry flocks exhibiting severe respiratory signs (sneezing, coughing, rales and gasping) in 2017, and from Moroccan flocks between 2016 and 2019. H9N2 virus infection was confirmed by real-time RT-PCR. Positive samples were isolated in embryonated chicken eggs and full genome sequences obtained. Phylogenetic analyses were carried out using Maximum Likelihood estimation in Mega. Antigenic properties were studied by hemagglutination inhibition assays with reference antisera. **Results:** All the Algerian and Moroccan isolates clustered together and belonged to the Middle East group H9N2 G1-like. However, the isolates were distinct from strains detected in bordering Tunisia and Libya between 2010 and 2013. Algerian and Moroccan H9N2 shared similar antigenic properties and cross-reacted with antisera generated against available H9N2 WHO vaccine candidates. **Conclusions:** The study contributed to knowledge of avian influenza in poultry in North Africa and is likely to be significant in the event of any spillover. The data could be used for risk assessment and should be disseminated among public health colleagues working in the region.

Evidence Of H9N2 Avian Influenza Virus Infection in Lebanese Poultry: Findings of Active Surveillance March to June 2017

R. Badra¹, A. Sirawan², A. Berry³, B. Bazzal², M. Dabaja², H. Kataya³, A. Kandeil⁴, M. Ali⁴ and G. Kayali¹

¹Human Link, Hazmieh, Lebanon

²Lebanese Ministry of Agriculture, Beirut, Lebanon

³Lebanese Ministry of Public Health, Beirut, Lebanon

⁴National Research Centre, Giza, Egypt

ABSTRACT

Objectives: Avian influenza viruses (AIV) can cause severe illness in humans and pose significant socioeconomic and health concerns. In Lebanon, an AIV H9N2 outbreak occurred in 2006 among chickens in several provinces. In 2010, H9N2 was detected in quails and H4 and H11 antibodies were detected in backyard poultry growers in two governorates. An outbreak of highly pathogenic AIV H5N1 occurred in poultry in April 2016 and was cleared by June 2016. H9N2 vaccination of poultry has taken place since 2016. The study took the form of active surveillance for evidence of AIV at the human-animal interface in a sample of Lebanese poultry and exposed poultry growers between March and June 2017. **Methods:** A total of 1000 cloacal and oropharyngeal swabs were collected from asymptomatic poultry (breeders, broilers, layers) from farms in seven governorates between March and June 2017. Swabs were screened for influenza infection using real-time PCR. Positive M segment samples underwent

additional RT-PCR to determine HA and NA subtypes. Gene segments of positive specimens were cloned and subjected to full length sequencing. Sixty nine workers from selected farms were also enrolled in the study. Blood was collected and sera tested for antibodies against AIV using the microneutralization assay against H9N2 and H5N1 viruses. **Results:** Six out of 1000 (0.6%) chickens tested positive for H9N2. Sequences obtained clustered tightly with those of neighboring countries origin, as well as Lebanese H9N2 viruses from 2010, and are related to G1-like viruses. All human samples tested negative. Our findings showed evidence of infection with H9N2 AIV among Lebanese chickens. Sampling was performed over the spring months which may have led to the incidence of AI among poultry being underestimated given AI infections are most frequent during winter months. Lack of antibodies against AIV among exposed humans does not mean exposed humans are not at risk of infection: the study was cross-sectional by design so offered fewer chances to detect human infection. **Conclusions:** The results revealed evidence of H9N2 AIV infection among Lebanese poultry, suggesting that H9N2 viruses may be enzootic in Lebanon and that genetic drift, and potentially antigenic drift, may be occurring. The presence of H9N2 infection in Lebanese poultry despite the use of vaccine suggests that the protection induced by AI vaccines has been attenuated by antigenic changes in the viruses. Regular active surveillance of the human-animal interface using a One Health approach and characterization of circulating influenza viruses in farmed poultry is recommended to monitor the evolution of the genetic and antigenic characteristics of influenza viruses. This will allow for early detection of virulent strains and the gathering of more information on their virulence, antigenic properties and potential spillover events into humans. Data sharing between researchers and animal health and public health specialists will aid preparedness to prevent, detect and respond to AI.

Pandemic Preparedness and Response

Defining Influenza Baseline and Threshold Values Using Weekly Sentinel Surveillance Data, Afghanistan, 2018–2019

H. Safi¹, M.N. Sahak¹ and A. Fatima²

¹WHO, Infectious Hazard Management Unit, Kabul, Afghanistan;

²Florida International University, Epidemiology, Miami, USA

ABSTRACT

Objectives: Pandemic influenza severity assessment is needed to select appropriate surveillance parameters and set thresholds for the assessment of seasonal influenza severity. The objective of this paper is to define threshold values and measure influenza severity indicators. **Methods:** Influenza sentinel surveillance data from 2016 to 2018 were used to define baselines and measure three pandemic influenza severity indicators (transmissibility, impact and

seriousness of disease). Moving epidemic method (MEM) was used to calculate the indicators and 2018/2019 season data compared to the threshold. The number of severe acute respiratory infections (SARI) and influenza-like illness (ILI) cases each week was used as a parameter to define transmissibility. SARI hospitalization out of total hospital admissions determined impact. A lack of reliable data meant seriousness could not be defined. **Results:** Based on SARI data, epidemic onset was most often in week 48 and the average epidemic length 18 weeks. Goodness of model values for SARI data with the slope parameter of 2.1 are: sensitivity (0.60), specificity (0.71), positive predictive value (0.39), negative predictive value (0.85). Based on MEM results, ILI and SARI-associated consultation rates were lower in the 2018–2019 season than in the 2017–2018 and 2016–2017 seasons. During the 2018–2019 season SARI cases crossed the epidemic threshold in week 50/2018 with 264 cases and gradually declined. Week 14/2019 saw 217 recorded SARI cases. Based on ILI consultation per 1000 outpatient consultations, the ILI associated consultation rate was below the threshold and lower for the 2018–2019 season compared to the 2017–2018 and 2016–2017 seasons. **Conclusions:** Influenza thresholds based on appropriate parameters have the potential to inform public health measures in a country where monitoring influenza activity has been challenging. Both the ILI and SARI-associated consultation rate was lower in the 2018–2019 season compared to the 2017–2018 and 2016–2017 seasons.

Implementation of Pandemic Influenza Severity Assessment Tool in Morocco, 2018–2019

S. Triki¹, C.I. Cherkaoui², A. Rguig², H. Oumzil³, G. El Falah¹, A. Elkholy⁴, A. Abubakar⁴ and M. Bigdeli¹

¹WHO Country Office, Rabat, Morocco

²Directorate of Epidemiology and Disease Control, Ministry of Health, Epidemiological Surveillance Service, Rabat, Morocco

³National Influenza Center, Ministry of Health, Rabat, Morocco

⁴World Health Organization, Infectious Hazard Management, Health Emergencies Department, WHO EMRO, Cairo, Egypt

ABSTRACT

Objectives: In 2011, the IHR Review Committee on Pandemic Influenza A(H1N1)pmd09 recommended developing measures to assess the severity of influenza epidemics and pandemics. In 2017, World Health Organization (WHO) developed the Pandemic Influenza Severity Assessment (PISA) tool which defines influenza severity based on three indicators: transmissibility, seriousness, and impact. Morocco started using PISA during the implementation of the 2018–2019 Pandemic Influenza Preparedness (PIP) work plan. **Methods:** The method followed the WHO guidelines; initially the parameters that to be used to assess severity indicators were selected then the thresholds of these parameters were identified. The Moving Epidemic

Method (MEM) was used to calculate the thresholds in order to compare the current influenza season to previous seasons. **Results:** The transmissibility indicator has been incorporated in the surveillance system. The measured parameter is the number of influenza-like illnesses (ILIs) divided by the number of consultations in primary health care centers multiplied by the rate of ILI positivity. For the seriousness indicator, incorporation of which is in progress, the parameter chosen is the number of severe acute respiratory infections (SARI) cases divided by SARI cases hospitalized in Intensive Care Units (ICU) in eight sentinel hospitals. Currently we are collecting historical data of hospitalizations in the ICUs over a three-year period so as to be able to calculate the threshold using MEM. **Conclusions:** With the support of WHO, from headquarters to country office level, Morocco has made significant progress in PISA implementation, especially in terms of transmissibility. In 2020–2021 Morocco aims to consolidate seriousness and impact implementation.

POSTER PRESENTATIONS

Respiratory Disease Epidemiological Surveillance

Analysis of Risk Factors for Influenza in Severe Acute Respiratory Infections Cases in Tunisia, 2015–2018

R. Yazidi¹, G. Kharroubi², B.K. Jalila³, B.J. Mounir⁴, B. Hind⁵, B. Jihene¹, E.M. Awatef⁶ and B.S. Afif⁷

¹Pasteur Institute of Tunis, Medical Epidemiology, Tunis, Tunisia

²Abderrahmen Mami Hospital, Intensive Care Department, Ariana, Tunisia

³Hedi Chaker University Hospital, Department of Infectious Diseases, Sfax, Tunisia

⁴Observatoire National des Maladies Nouvelles et Emergentes de Tunis, Observatoire National des Maladies Nouvelles et Emergentes, Tunis, Tunisia

⁵Charles Nicolle's Hospital, National Influenza Centre, Virology Unit, Microbiology Laboratory, Tunis, Tunisia

⁶Arabian Gulf University, Department of Family and Community Medicine, College of Medicine and Medical Sciences CMMS, Manama, Bahrain

ABSTRACT

Objectives: Syndromic surveillance of severe acute respiratory infections (SARI) is important in assessing the seriousness of disease. Tunisia has had a SARI surveillance system, based on six university hospital departments, in place since 2014. The aim of this study is to describe characteristics of SARI patients and to explore risk factors for a severe outcome in SARI patients. **Methods:** Data was retrospectively collected from two SARI sentinel sites in Tunisia between 2015 and 2018. All samples were tested for influenza viruses using RT-PCR. Factors associated with ICU admission or death in hospitalized patients with severe influenza were investigated. **Results:**

During the study period, 476 SARI cases were enrolled from two sites. The influenza positivity rate was 28.0% (n = 94), with a predominance of influenza A(H1N1) pdm09 (69.2%). 57.6% (n = 274) of patients were admitted to ICUs and 50.5% required at least one mode of mechanical ventilation. 23.6% (n = 103) died. Risk factors associated with ICU admission included a previous history of smoking in 44% (odds ratio (OR) = 1.83; 95% confidence interval (CI): 1.04–3.19) of cases. In a multivariate analysis, chronic respiratory disease (OR = 14.7; 95% CI: 6.23–34.5) and the presence of complications (OR = 14.7; 95% CI: 79.8–2181.8) were significantly associated with worse outcomes in SARI patients. **Conclusions:** The results identified high-risk groups which should be considered as potential targets for influenza vaccination in Tunisia.

Epidemiology and Associated Factors of Severity of Pneumonia among Children Under Five in North Afghanistan in 2018: Experiences from a Chronic Conflict Setting

M.H. Rasooly¹ and A. Shirpoor²

¹Ministry of Public Health Afghanistan, National Disease Surveillance and Response, Khairkhana Part I, District 11, Afghanistan

²Ministry of Public Health Afghanistan, National Disease Surveillance and Response, Kabul, Afghanistan

ABSTRACT

Objectives: Four decades of conflict in Afghanistan has resulted in high mother and child mortality. Acute respiratory infection is the leading cause of morbidity and mortality among children in Afghanistan. The aim of this study is to present the epidemiology and associated factors of pneumonia severity among children < 5 years in north Afghanistan. **Methods:** Children aged 2–59 months admitted to Balkh Regional Hospital with pneumonia or severe pneumonia during January and February 2018 were enrolled. Socio-demographic, clinical, lab, and anthropometric measurements were collected. Factors associated with pneumonia severity were assessed using a chi-squared test at a level of significance of 0.050. **Results:** Of the 752 children with pneumonia investigated, 66.5% had severe disease, and 4.3% died. Factors significantly associated with severe pneumonia were residence in rural areas (odds ratio (OR) = 2.06; 95% confidence interval (CI): 1.51–1.80), living more than one hour distance from a health center (OR = 2.2; 95% CI: 1.2–4) and the use of kitchens with windows (OR = 0.37; 95% CI: 0.26–0.53). Children aged between 2 and 5 months also had an increased risk of pneumonia severity (OR = 1.44; 95% CI: 1.06–1.95). **Conclusions:** Modifiable factors for severe pneumonia include access to health care services and improved cooking spaces. Improvement of both could reduce the severity of pneumonia cases.

Epidemiology of Influenza Associated Lower Respiratory Tract Infections: Results of Sentinel Severe Acute Respiratory Infections Surveillance in Egypt, 2010–2019

M. Fahim¹, H. Abu Elsood¹, B. AbdElGawad¹, H. Hassan¹, A. Mohsen², A. Naguib¹ and A. Eid¹

¹Preventive Sector, Ministry of Health and Population, Egypt

²World Health Organization Country Office, Egypt

ABSTRACT

Objectives: Severe acute respiratory infections (SARI) are a leading cause of hospitalization, morbidity, and mortality worldwide. This study describes the epidemiology and trends of SARI due to influenza in Egypt between 2010 and 2019. **Methods:** Surveillance of acute respiratory infections takes place in eight hospitals across Egypt. All hospitalized patients with fever $\geq 38^\circ\text{C}$ and cough within 10 days prior to admission are eligible. Nasopharyngeal and oropharyngeal swabs are collected from patients and tested for influenza type and subtype by RT-PCR. **Results:** A total of 22 703 patients with SARI were enrolled. The mean age was 31.5 ± 24 years. Of the total, 48.9% were males. Of the 22 703 SARI patients, 4436 (19.5%) were positive for influenza viruses, just 13 (0.3%) of whom had been vaccinated for influenza. The 163 (3.7%) were admitted to intensive care and 86 (1.9%) died during hospitalization. The 1661 (37.4%) patients tested positive for A(H1N1)pdm09, 1136 (25.6%) for A(H3N2), 1387 (31.3%) for influenza B and 252 (5.7%) were positive for two influenza viruses. Compared to other subtypes A(H1N1)pdm09 cases had higher case fatality rate (3.6% vs 0.9%), ICU admission (6.6% vs 1.9, $p < 0.001$) and length of hospital stay (5.7 vs 5.1 days, $p < 0.001$). The highest rates were reported in coastal and Cairo governorates (9.0% and 6.1%, respectively). In 2010 a second wave of A(H1N1)pdm09 was identified followed by two years of remission. The virus re-emerged in subsequent years. **Conclusions:** Surveillance showed a substantial burden of SARI in Egypt is caused by influenza viruses. Surveillance identified several risk factors for severe outcomes in influenza-positive SARI patients which are relevant for targeting and prioritizing vulnerable populations given low vaccination and antiviral use rates in Egypt.

Evaluation of Severe Acute Respiratory Infections Surveillance System in Kuwait

M. Mansouri, M. Abdeldayem, H. Alrashed and M. Alsaleh

Communicable Diseases Control Division, Ministry of Health, Kuwait

ABSTRACT

Objectives: Severe acute respiratory infections (SARI) is a significant cause of morbidity and mortality worldwide. It is associated with a large number of different viral and/or bacterial agents. In keeping with WHO and CDC

recommendations SARI sentinel surveillance was initiated in Kuwait in 2016. It includes representatives from the public and private sectors. The aim of the study is to evaluate the national SARI sentinel surveillance system in Kuwait. **Methods:** The evaluation of the SARI sentinel surveillance system covers the period between April 2016 and May 2018 at the two sentinel sites active at the time. CDC guidelines for evaluation of surveillance systems were used and nine attributes considered for evaluation. The score of each attribute was calculated and averaged to determine the final score value. **Results:** During the evaluation period, 2375 SARI cases were reported from the two sentinel sites. Mean scores for the nine attributes for evaluation were calculated. Data quality and completeness scored 3, signaling good performance. Acceptability, stability, sustainability, and utility were also good. Scores for timeliness, representativeness, simplicity, and flexibility indicated moderate performance and require improvement. The overall score was 2.5, representing good performance. **Conclusion:** The SARI surveillance system in Kuwait performs well and provides a reliable data source for public health interventions. To enhance performance staff numbers and training were increased and a new sentinel site added in a third district.

Evaluation of the Influenza Sentinel Surveillance System, Morocco, 2007–2019

T. Benamar¹, I. Cherkaoui², H. Oumzil³, S. Triki⁴, M. Akrim⁵, A. Khattabi⁵ and A. Rguig²

¹National School of Public Health, Field Epidemiology Training Programme, Ministry of Health, Rabat, Morocco

²Directorate of Epidemiology and Diseases Control, Epidemiological Surveillance Service, Ministry of Health, Rabat, Morocco

³National Institute of Hygiene, Virology Division, Ministry of Health, Rabat, Morocco

⁴WHO Country Office, Rabat, Morocco

⁵National School of Public Health, Ministry of Health, Rabat, Morocco

ABSTRACT

Objectives: The Moroccan Ministry of Health set up an influenza sentinel surveillance system through staggered implementation in 1996, 2004, 2007, and 2014. It is now composed of public and private networks and provides clinical, epidemiological and virological data from influenza-like illness (ILI), acute respiratory infection (ARI) and severe acute respiratory infection (SARI) cases. In line with the WHO Pandemic Influenza Preparedness (PIP) Framework Morocco developed an action plan for strengthening the influenza surveillance system and implementing the PISA tool recommended by WHO. Computerization of the entire surveillance system is underway with support from CDC. The aim of the current evaluation is to assess the surveillance system's ability to sustain these improvements. **Methods:** A comprehensive evaluation was undertaken using surveillance system attributes in accordance with CDC guidelines (2001) and a protocol developed during a training workshop organized

by WHO EMRO and CDC in Tunisia in April 2018 and adapted thereafter to the Moroccan context. The evaluation covered pre- and post-pandemic periods extending from 2007 to 2019. **Results:** Final results of the assessment scores of nine surveillance system attributes (data quality and completeness, timeliness, representativeness, flexibility, stability, utility, simplicity, acceptability, and sustainability) were presented during the EMARIS workshop in November 2019. **Conclusions:** Evaluation results will be used to strengthen the current surveillance system and prepare it for PISA tool implementation and computerization in compliance with PIP objectives and IHR recommendations.

Influenza-associated Severe Acute Respiratory Infections Among Children Under Five Years in Morocco, September 2017 to March 2019

Z. Regragui^{1,2}, A. Bimouhen¹, H. Ihazmad¹,
S. Benkerroum¹, S. Triki³, I. Cherkaoui⁴,
A. Filali-Maltouf², F. El Falaki¹ and H. Oumzil¹

¹National Institute of Hygiene, National Influenza Center of Morocco, Rabat, Morocco

²Mohamed V University, Biology Department, Rabat, Morocco;

³WHO Country Office, Rabat, Morocco

⁴Ministry of Health, Directorate of Epidemiology, Epidemiological Surveillance Service, Rabat, Morocco

ABSTRACT

Objectives: Children under five with severe acute respiratory infections (SARI) are among the groups with a greater susceptibility to influenza infection and which experience a greater burden of illness. The present study aims to estimate the influenza infection rate among children under five years with SARI. **Methods:** From September 2017 to March 2019, nasopharyngeal swabs were collected from 942 children under five admitted in the pediatric services of eight sentinel hospitals. The notification forms were reviewed and 81.5% (768/942) of the children met the case definition of SARI. Molecular investigations were processed by the National Influenza Center at the National Institute of Hygiene using a qRT-PCR monoplex assay developed by the CDC. **Results:** The median age of participants was 11 months and 40% was female. A total of 112 samples were positive yielding a frequency of 14.5% (112/768). Among all influenza confirmed cases, 68, 75% (77/112), 15,17% (17/112), 16% (18/112) were typed as influenza A/H1N1pdm09, A/H3N2 and influenza B B/Yam, respectively. 6.9% (n = 53) of the cases were admitted at the intensive care unit, of which 9.23% (n = 5) were AH1N1pdm09. **Conclusions:** The findings highlighted that influenza viruses are not the only cause of SARI among children under five and that attention needs to be given to non-influenza respiratory viruses. The data also confirmed the burden of influenza among children with SARI, flagging questions about extending influenza vaccination among children under five years.

Nutritional Factors of Acute Respiratory Infections among Children Under Five Years of Age in Rural Islamabad

M. Bullo

Federal General Hospital Islamabad, Public Health Administration, Islamabad, Pakistan

ABSTRACT

Objectives: Acute respiratory infection (ARI) is a significant public health problem and a leading cause of mortality among young children. The objective of the study was to evaluate nutritional factors involved in ARI among children below five years of age in rural Islamabad. **Methods:** A case control study was conducted at the Federal General Hospital (FGH) Islamabad. Cases were defined as the sudden onset of fever (> 38°C) and cough in children under five years presenting to FGH from 1 November 2018 to 28 February 2019. A total of 389 cases were selected together with one control (age and sex matched) for each case. A structured questionnaire was used for data collection and the odds ratio (OR) calculated with a 95% confidence interval (CI). **Results:** Of the 778 children recruited, the mean age was 2.6 months (R = 59–1 months): 54% of cases were male and 46% female. The most affected age group was 24 months and below. Fifty three percent (206/389) of cases had upper respiratory tract infections and 47% (183/389) lower respiratory infections. Significant nutritional factors were inadequate breast feeding (OR = 8.1, CI: 5.7–11), childhood stunting (OR = 7.3, CI: 5.2–10), underweight (OR = 6.2, CI: 4.6–8.5), food allergies (OR = 5.9, CI: 4.4–8.1), bottle feeding (OR = 5.1, CI: 3.8–6.8), unhygienic feeding practices (OR = 3.4, CI: 2.6–4.4) and undernourished mothers (OR = 2.6, CI: 2.1–3.3). **Conclusion:** Nutritional factors have a significant impact on childhood ARI. Nutritional education and counselling is required at the institutional and community level for prevention of ARI. On our recommendation, ARI prevention campaigns were started at FGH.

Review of the Surveillance System for Influenza-like Illness and Severe Acute Respiratory Infections in Palestine for Influenza Season 2018–2019

D. Hjaija

Ministry of Health, Preventive Medicine Department, Ramallah, Palestinian Authority

ABSTRACT

Objectives: Influenza can result in serious respiratory disease. Surveillance can identify novel strains, detect unusual symptoms, assess disease burden, and expose outdated case definitions, substandard laboratories, and gaps in the capacity to rapidly respond to outbreaks. Palestinian influenza surveillance networks were developed in 2009, enhancing epidemiological capacity for disease surveillance, developing laboratory-based surveillance and

training, and testing local rapid response teams. This paper describes the surveillance systems. The objective of this systematic review of influenza surveillance was to identify novel viruses and assess the effectiveness of the influenza-like illness (ILI) and severe acute respiratory infections (SARI) surveillance system. **Methods:** A retrospective review was undertaken of ILI and SARI cases caught by the ILI and SARI surveillance system which follows Global Epidemiological Surveillance Standards (World Health Organization, 2014). Other information collected included demographic data, underlying conditions, clinical symptoms, and laboratory test results. The ILI surveillance system catches outpatients while the SARI surveillance system can include in-patient cases. **Results:** From September 2018 to June 2019, 70 ILI and 2868 SARI cases were reported of which 964 (32.8%) were influenza positive (24% of ILI and 33% of SARI cases). The most common influenza strain was H1N1 (17% of ILI and 20.8% of SARI cases), followed by A/H3 (0.07% in ILI and 10.7% in SARI cases), and B strains (0.0% in ILI and 0.0003% in SARI system). **Conclusions:** The identification of groups with a higher burden of disease can help inform where preventive measures should be targeted and contribute to more efficient resource allocation.

Sentinel Surveillance of Severe Acute Respiratory Infections Caused by Influenza Viruses in Qatar, 2017–2018

S. Nadeem, H. Romaihi, A. Elberdiny and N. Ganesan

Ministry of Health, Public Health, Doha, Qatar

ABSTRACT

Objectives: Influenza can cause severe respiratory infection leading to hospitalization. The aim of this study was to determine the prevalence of influenza viruses in cases of severe acute respiratory infection (SARI) between 2017 and 2018. **Methods:** A retrospective hospital based epidemiological study was conducted. Patients who met the WHO SARI case definition were enrolled. Demographic and epidemiological information as well as respiratory swabs were collected for respiratory virus isolation by RT-PCR. **Results:** In 2018, a total sample positivity rate of 44.4% was recorded compared with 37.8% for 2017. Highest positivity was among 16–50 year olds in both 2018 and 2017 ($p = 0.001$). In 2018, 23% patients were pregnant compared with 13% in 2017 ($p = 0.358$). Around half of the patients suffered from chronic medical conditions in both years ($p = 0.106$). In 2018, 7.5% were admitted to intensive care units (ICU) compared with 6.4% in 2017 ($p = 0.964$); 5.2% patients were ventilated in 2018 compared with 4.5% in 2017 ($p = 0.108$); 2 out of 692 cases died in 2018 compared with 1 out of 534 in 2017 ($p = 0.602$). Most patients were hospitalized for less than three days in both 2018 and 2017, 53.7% and 64.4%, respectively ($p = 0.025$). Of SARI positive samples in 2018, 59.3% were influenza

A(H1N1)pdm09, 22.1% influenza A:unsubtyped, 16.0% influenza B, and 2.6% seasonal influenza A(H3N2) compared with 58.1%, 18.7%, 8.4%, and 14.8% in 2017. **Conclusions:** Influenza viruses A and B are responsible for high levels of morbidity each year, making campaigns encouraging influenza vaccine take-up among high-risk groups essential.

Severe Acute Respiratory Infections of Viral Origin In Moroccan Intensive Care Units: Incidence, Predictive And Prognostic Factors

T. Dendane, I. EL Messaoudi, K. Abidi and A.A. Zeggwagh

Mohamed V University, Medical Intensive Care Unit, Rabat, Morocco

ABSTRACT

Objectives: Severe acute respiratory infections (SARI) are common in critically ill patients. The aim of this study was to describe the epidemiological characteristics of viral SARI and identify the predictive and prognostic factors of infection. **Methods:** A retrospective study was conducted at the Medical Intensive Care Unit over five years. One hundred eighty adult patients were enrolled in the study and laboratory tested for influenza and other respiratory viruses using PCR. The study included all patients who developed SARI, with or without identified viruses. The determination of the predictive factors of viral SARI was obtained by comparing the group with positive results with the group with negative viral results. To identify factors associated with mortality, survivors were compared with those who died. **Results:** Of the 180 patients admitted to intensive care during the study period, 55 tested positive to viral specimens. The main isolated virus was influenza A (60.0%). Predictive factors of viral ARI were: winter season, pneumonia, and eosinopenia < 10 . The mortality of patients with viral SARI was 37%. Multivariate analysis showed that a charlson score $>$ (odds ratio (OR) = 3, 95% confidence interval (CI): 1.4–7.2), CURB 65 score > 3 (OR = 2.9, 95% CI: 1.1–7.6), and more than one organ failure (OR = 2.6, 95% CI: 1–6.6) were associated with a greater risk of death. **Conclusions:** Mortality appears to be related to the presence on admission of a charlson score > 2 , CURB 65 score > 3 , and/or more than one organ failure.

Respiratory Disease virological Surveillance

Respiratory Disease Surveillance and Laboratory Capacity at the National Influenza Center, Lebanon, 2015–2019: Results and Achievements

M. Albuaini¹, N. Ghosn², N. Jammal¹, L. Mroueh¹, N. Haddad², M. Saleh², P. Mrad³, A. Rady³, F. Abiad¹ and W. Ammar²

¹Rafik Hariri University Hospital, National Influenza Center, Beirut, Lebanon

²Ministry of Public Health, Beirut, Lebanon

³World Health Organization, Country Office, Beirut, Lebanon

ABSTRACT

Objectives: Hospital sentinel-based surveillance of severe acute respiratory infection (SARI) in Lebanon was initiated in 2015 with WHO support with the objective of estimating influenza morbidity, identifying circulating and novel viruses, and contributing to global influenza surveillance. The study assesses the performance of the National Influenza Center (NIC), identifying both achievements and gaps. **Methods:** NIC was established at the Rafik Hariri University Hospital. Case detection, specimen collection, and testing are done following national protocol and standard operation procedures set for epidemiological surveillance and laboratory testing. Naso-opharyngeal swabs collected from SARI cases are referred to NIC and tested using RT-PCR for influenza A and B viruses. Three NIC performance indicators are monitored: annual external quality assurance, weekly data sharing to WHO platforms and the timely sharing of influenza viruses. **Results:** In the five consecutive influenza seasons between week 1/2015 and week 20/2019, 4503 cases were reported, 4303 (95.0%) of which were tested. Of these, 19.0% were influenza positive. The main identified strains were A(H3N2) (37.0%), A(H1N1)pdm (23.0%), and B/Yamagata (11.0%). Internal validation of PCR results is done routinely. External validation is conducted with WHO and CDC. Since 2018, three proficiency tests were performed: the first two had a 100% success rate while the result of the third is pending. Laboratory data sharing with the WHO platform reached 100% in 2017. One hundred thirteen isolates covering the last two influenza seasons were shared with WHO-CCs and contributed to two vaccine preparations. **Conclusions:** NIC is an important pillar of SARI surveillance. While current improvements focus on initiating virus culture, enhancing human capacity is a constant priority, particularly during season peaks.

Influenza Disease Burden

Clinical Presentation of Influenza among Children Admitted to Mohamed Alamin Hamid Pediatric Hospital, 2017

J. Eissa

Ministry of Health, Epidemiology, Khartoum, Sudan

ABSTRACT

Objectives: The study determined the prevalence and clinical presentation of influenza among children admitted to the acute respiratory tract infection ward in Mohamed Alamin Hamid Hospital, Omdurman, Sudan in February 2018. **Methods:** The study took the form of a descriptive, cross-sectional hospital-based simple random sampling of patients admitted to the acute respiratory

tract infection ward with symptoms conforming to the influenza-like illness (ILI) case definition. Collected data was analyzed by computer using SPSS version 20 and the results presented in graphs and tables. **Results:** Of a total of 299 cases, 176 (59.0%) were female and 123 (41.0%) male. The majority of cases (84.0%) were from Khartoum State. Of infected patients, 64.3% were under one year, 14.3% were between one and three years old and 21.4% between three and five years. The most commonly presented symptoms were fever and nonproductive cough, sore throat, and nasal congestion. **Conclusion:** The prevalence of influenza was 4.7%, and the most common strain detected in children under five years was H3N2. We recommended that to decrease mortality and morbidity all children under five years should be vaccinated against seasonal influenza.

Description of Epidemic Severe Influenza A(H1N1)pdm09 Circulating in Tunisia during the 2017–2018 Season

S. Abid^{1,2}, A. El Moussi^{1,2}, L. Charaa¹, A. Slim^{1,2} and I. Boutiba^{1,2}

¹Charles Nicolle Hospital, National Influenza Centre, Virology UNIT, Microbiology Laboratory, Tunis, Tunisia

²Tunis El Manar University Faculty of Medicine, Research Laboratory LR⁹⁹ES⁹⁹, Tunis, Tunisia

ABSTRACT

Objectives: The constant evolution of influenza viruses means all countries must remain alert to mutations in the dominant seasonal strains. This study aims to explain why A(H1N1)pdm09 viruses caused high mortality in severe acute respiratory infections (SARI) cases during the 2017–2018 season in Tunisia compared with the 2016–2017 and 2018–2019 seasons. **Methods:** Real time PCR was used to analyze 3802 respiratory samples during three seasons (2016–2019). The detection and subtyping of influenza viruses were performed using CDC protocols. Molecular characterization of samples from fatal cases infected with influenza A(H1N1)pdm09 from the 2017–2018 season were undertaken using the Sanger method. **Results:** During the 2017–2018 season, 1915 specimens from SARI cases were tested for influenza, 50.0% more than in the previous season. Of these, 35.7% of specimens were positive for influenza compared with 12.8% in the 2016–2017 season, and 23.9% in the 2018–2019 season. Influenza A(H1N1)pdm09 circulated at high levels between weeks 51/2017 and 13/2018. This is longer than in other recent seasons. Of the positive cases 90.0% were severe, and 30.0% of SARI cases were fatal. The HA gene of influenza A(H1N1)pdm09 isolated in the 2017–2018 season were genetically not close the vaccine strain but clustered with globally circulating strains of genogroup 6B. **Conclusions:** Molecular analysis explained the rise in influenza A(H1N1)pdm09 activity and the high rates of morbidity and mortality: the circulation of drifted strains drove the high hospitalization rate given the mismatch with the vaccine strain.

Outbreak Investigation and Response

Linking Bioinformatics Approach to an Epidemiological Outbreak Investigation of Influenza Respiratory Infection, Integrating Molecular Technologies into Public Health

H. Yahya

Dubai Health Authority, Communicable Diseases, Dubai, UAE

ABSTRACT

Objectives: Terminating disease clusters and preventing similar occurrences requires an understanding of how such outbreaks originate. **Methods:** The sequencing characteristics of outbreaks, with a focus on whole-genome sequencing (WGS) which can be informative at multiple stages of the outbreak investigation, were examined. **Results:** The study showed that genomic analysis of strains from influenza virus outbreaks contributes to identifying the transmutation chain. Bioinformatics data (the Isolate Genome Sequence Database (IGSdb), can be utilized in epidemiological investigations in a clinical and public health environment. During outbreak times, isolates help in constructing a phylogenetic tree. Linking phylogeny with geography enables the origins and spread of pandemics and epidemics to be traced. Genomic information, along with estimates from the sequence data since isolates diverged (molecular clock estimates), allows the reconstruction of detailed routes of transmission within the region. High-resolution genotyping is simple, quick, and cheap enough to fall within average-sized clinical or research laboratory budgets. Linking epidemiology to pathogen biology and delivering unprecedented insights into genome evolution, genome structure, and gene content, including information on clinically important markers, has wide range applications such as resistance and virulence genes. **Conclusions:** Bioinformatics can make a significant contribution to the investigation of outbreaks and help ensure the integration of epidemiological investigation, diagnostic assays and antimicrobial susceptibility testing.

MERS-CoV and Other Emerging Respiratory Infections

Middle East Respiratory Syndrome Coronavirus (MERS-CoV) Testing in Qatar: Preliminary Study

M.A. Ben Hadj Kacem¹, H. Al Khalili¹, N. Hassan Abdulla Al Molawi¹, E. Abu Baker Abd Farag² and P. Valentine Coyle¹

¹National Influenza Center, Virology and Molecular Biology Section, Department of Laboratory Medicine and Pathology, Hamad Medical Corporation, Doha, Qatar;

²Communicable Diseases Control Programmes, Public Health Department, Ministry of Public Health, Doha, Qatar

ABSTRACT

Objectives: Middle East respiratory syndrome coronavirus (MERS-CoV) surveillance in Qatar is guided by WHO recommendations and based on the assumption the virus circulates throughout the Gulf region and all cases of pneumonia need to be tested. The objectives of the study were to collect and analyze laboratory data on MERS-CoV in humans in Qatar and verify the usefulness of testing respiratory samples for MERS-CoV in all pneumonia cases without considering case definitions. **Methods:** The retrospective study was based on monthly data extracted from the database of the reference laboratory, Virology and Molecular Biology Section, Department of Laboratory Medicine and Pathology at the Hamad Medical Corporation. Commercial real-time PCR was used for MERS-CoV testing. The period covered ran from September 2012 to June 2019. **Results:** A total of 106 315 tests for MERS-CoV were conducted. To date, 24 laboratory confirmed MERS-CoV cases have been identified, the most recent in December 2017. Requests for MERS-CoV testing were made for respiratory infection investigation and only rarely to specifically target MERS-CoV. The number of requests for MERS-CoV testing peaked with no visible correlation to the number of MERS-CoV cases confirmed in Qatar or in countries with high MERS-CoV prevalence. The peaks did, however, match with influenza virus' requests. Nor was the distribution of Qatari cases correlated to the activity recorded in countries where MERS-CoV is highly prevalent. **Conclusions:** Though this preliminary study suggested MERS-CoV is not circulating in Qatar's human population, more detailed data needs to be collected and the results of epidemiological investigations of the virus in the animal population considered before more concrete conclusions can be drawn.

Middle East Respiratory Syndrome, Human Rhinovirus and Respiratory Syncytial Virus in Iranian Pilgrims in 2015 and 2017

J. Yavarian, N.Z. Shafiei Jandaghi and T. Mokhtari Azad

School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Objectives: Each year more than two million Muslims from 185 countries gather in Mecca for the pilgrimage. Respiratory viral infections are the most common diseases that occur during the Hajj. The aim of this study was to examine Iranian pilgrims with severe acute respiratory infections (SARI) returning from Hajj in 2015 and 2017, with particular attention paid to the detection of human rhinovirus (HRV), human respiratory syncytial virus (HRSV), and Middle East respiratory syndrome coronavirus (MERS-CoV). **Methods:** A total of 451 throat swabs collected from pilgrims with SARI but negative for influenza viruses were tested for HRV,

HRSV, and MERS-CoV in 2015 and 2017. RT-PCR was used for MERS-CoV and HRSV detection and conventional nested RT-PCR for HRV detection. **Results:** None of the cases had MERS-CoV but HRV was detected in 8.4% (38/451) patients, 5.6% (19/338) in 2015, and 16.8% (19/113) in 2017. A single case of HRSV was detected in 2015 (1/338). **Conclusions:** The study showed HRV to be the most common infection. The test results contributed towards continuing surveillance efforts, infection control, and comprehensive planning and the process should be replicated for other respiratory viruses in pilgrims.

Outbreak of Middle East Respiratory Syndrome in Wadi AlDawasir City, Saudi Arabia, 2019

F. Alghawi¹, J. Gaines¹, S. Almudarra¹, A. Assiri², K. Alanazi³ and Y. Alnshbah³

¹Ministry of Health, Field Epidemiology Training Programme, Riyadh, Saudi Arabia

²Ministry of Health, Preventive Health, Riyadh, Saudi Arabia

³Ministry of Health, General Directorate of Infection Prevention and Control, Riyadh, Saudi Arabia

ABSTRACT

Objectives: In 2012, a novel corona virus emerged in Saudi Arabia, named Middle East respiratory syndrome (MERS-CoV), it causes severe lower respiratory infections in humans. Between January and April 2019, a MERS-CoV outbreak was identified in Wadi AlDawasir. **Methods:** All laboratory-confirmed MERS-CoV cases in Wadi AlDawasir reported to the Saudi Arabian Ministry of Health between 26 January and 5 April 2019 were identified. Home interviews with confirmed patients were undertaken, their hospital records reviewed, and descriptive analysis conducted. **Results:** By 5 April, a total of 51 confirmed cases had been identified. They ranged in age from 23 to 84 years (mean = 46 years), and 38 (74.0%) were male. Of the confirmed cases, 25 (49.0%) reported camel exposure. Eleven were classified as primary cases, all of whom reported camel exposure, with 2 (20.0%) also reporting exposure to WDGH prior to symptom onset. Of the 51 cases, 14 (27.0%) were classified as secondary and 24 (47.0%) as tertiary cases. Two (4.0%) were classified as sustained human-to-human transmission (quaternary cases). Fourteen (35.0%) cases worked at WDGH, although 6 (43.0%) did not provide direct patient care. Seven cases died (case fatality rate = 14.0%). **Conclusion:** That the majority of patients in the outbreak had contact with both the hospital and camels highlighted the need for more precise categorization of cases as either primary or secondary. This will require genetic comparison of camel isolates with human isolates.

Biosafety and Biosecurity

Assessment of Disaster Health Management

Systems at Kasserin Regional Hospital 2018

M. Dalel¹, M. Mhamdi¹, H. Ietaief² and N. Ben Alaya²

¹Ministry of Health, Health Care Directorate, Kasserine, Tunisia

²Ministry of Health, National Observatory for New and Emerging Diseases, Tunis, Tunisia

ABSTRACT

Objectives: The objective of the study was to evaluate crisis management systems at the Kasserine Regional Hospital. The hospital is a critical regional structure, reporting to the Ministry of Health, which must be able to support the local population in the immediate aftermath of any unexpected disaster. **Methods:** A quantitative and qualitative study was conducted. Two questionnaires using the Hospital Safety Index were distributed, the first eliciting general hospital information, the second Hospital Safety Checklist information. **Results:** The structural and non-structural safety index, and emergency and disaster management capacity were respectively 0.66 (class B), 0.43 (class B), and 0.38 (class B). The overall safety rating of the Kasserine Regional Hospital was 0.49 (class B). **Conclusions:** The safety of patients and hospital staff, and Kasserine Regional Hospital's ability to function during and after emergencies, are potentially at risk. Intervention measures are necessary in the short term and the study provides decision-makers with a starting point from which to identify priorities and reduce risks and vulnerability.

Multilateral Collaboration Towards the Implementation of a Biorisk Management Programme in Libyan Universities: Promoting a One Health Concept

O. Elahmer

National Center for Disease Control, Reference Laboratory for Disease Control, Tripoli, Libya

ABSTRACT

Objectives: Biosafety complements biosecurity. It encompasses the implementation of laboratory practices and procedures, specific construction features of laboratory facilities, safety equipment and appropriate occupational health programmes when working with potentially infectious microorganisms and other biological hazards. Measures are designed to reduce the exposure of laboratory personnel, the public, agriculture and the environment to potentially infectious agents and other biological hazards. **Methods:** A multilateral cooperation was established to develop a Biorisk Management Programme between the National Centre for Disease Control (NCDC) in Libya and WHO, the Biosecurity Engagement Programme (BEP) and Sandia National Laboratories Global Chemical and Biological Security group (GCBS). **Results:** The programme formulated included seven components: a cascade of training programmes dedicated to laboratory workers focused on a core concept of risk assessment and management; the training of members of

university staff to support the course; specialized biorisk management; a MENA-BRM twinning programme; a questionnaire to evaluate laboratory personnel's knowledge of, and attitude and approach to, BRM; strengthening health security systems across Libya, and the Libyan Universities' Biorisk Management Network. **Conclusions:** The seven components provide a solid foundation on which to build and develop well-trained personnel equipped with the requisite knowledge, skills and competency while at the same time strengthening multilateral cooperation and partnerships with national and international stakeholders

Influenza at the Human-animal Interface

Characterization of Avian Influenza Viruses in Poultry in Egypt: Results from Epidemiological Surveillance 2016–2018

D.H. Hosni¹, H. Abu Elsood², M. Fahim³, S. Samy⁴ and H. Elsheikh¹

¹General Organization for Veterinary Services, Epidemiology, Giza, Egypt

²Ministry of Health, Head of Epidemiology Department, Cairo, Egypt

³Ministry of Health, Epidemiology, Cairo, Egypt

⁴Ministry of Health, Egypt Field Epidemiology Training Program, Cairo, Egypt

ABSTRACT

Objectives: Egypt has a high number of outbreaks of influenza A(H5N1) among poultry. At the end of December 2016, H5N8 emerged as a new strain. The co-circulation of high and low pathogenic avian influenza viruses raises concerns over potential reassortment. The transmission of influenza A(H5N1) to 13 humans in

Egypt in the last three years was linked to the large number of epizootics among poultry. As part of the response, vaccination was implemented in a 9 km radius around positive foci. This study aims to describe the types of avian influenza viruses circulating in poultry between 2016 and 2018 using national epidemiological surveillance data. **Methods:** Poultry from various regions, from both backyard producers and farms, suspected of having avian influenza were swabbed and tested for avian influenza. In 2016, 2017, and 2018, 11 113, 8648 and 9094 samples were tested, respectively. Types H5, H9, and H7 and subtypes were confirmed by RT-PCR conducted by the National Laboratory for Quality Control of Poultry Production. Descriptive and bivariate data analysis used SPSS. **Results:** Of the 28 855 samples collected, 1218 (4.2%) tested positive for low pathogenic avian influenza H9 and 500 (1.7%) for A(H5). H9 results were highest in 2016 and peaked in April. H5 was high in 2017 and peaked in April and May. H5 was significantly higher among backyard poultry (odds ratio (OR) = 27.7, 95% confidence interval (CI): 21.3–36.1) than farm poultry. In Upper Egypt (OR = 3.1, 95% CI: 2.6–3.7) it was higher than in Lower Egypt and more prevalent in duck species (OR = 1.26, 95% CI: 1.05–1.5) than chickens. It peaked during the winter season. A9 was significantly higher in farm poultry (OR = 1.5, 95% CI: 1.1–1.9) than backyard flocks and in chickens (OR = 2.6, 95% CI: 2.23.0) than ducks. **Conclusions:** Avian influenza continues to threaten human and animal health in Egypt. Poultry vaccination and health education campaigns should focus on backyard breeders raising duck species, especially in Upper Egypt. Avian influenza surveillance is crucial for monitoring avian influenza viruses and developing appropriate prevention and control strategies.