Influenza A (H1N1) outbreak in the Asokore Mampong Sub – Municipal, Ghana: A case report

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Abstract: Swine Flu or Influenza A (H1N1) is caused by one of several swine influenza A strains and its highly contagious. The transmission of the virus is from person-to-person and is similar to how seasonal influenza spreads. This report describes an Influenza A Virus (H1N1) outbreak in Asokore Mampong Sub-Municipal. Ninety-six (96) people were infected by the Influenza A (H1N1), and four (4) of them died. Those who died were lodging at the Sadler house; Jubilee House and Yaa Achiaa House. Three (3) health staff at KNUST hospital emergency unit were also infected, but they were treated and discharged. Three (3) of those who died as a result of the outbreak were males. An outbreak of H1N1 influenza type A caused by the H1N1 pdm09 virus on the campus of Kumasi Academy (KUMACA) led to Ninety-six (96) people becoming infected and four (4) dying. Several steps were taken by a national and regional multi-sectoral team from the World Health Organization, Ghana Health Service HQ as well as the Regional Health Directorate to manage the situation. Health education on H1NI must be intensified and sustained in the municipality as well as disease surveillance.

Subjects: Public Health Policy and Practice; Social Work and Social Policy; Medicine; Nursing; Specialist Community Public Health Nursing; Allied Health

Keywords: Swine Flu; influenza; H1N1 virus; Asokore Mampong

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PUBLIC INTEREST STATEMENT
There was an outbreak of H1N1 influenza type A on the campus of a Senior High School in Kumasi, Ghana known as Kumasi Academy (KUMACA). The outbreak is suspected to have been caused by the H1N1 pdm09 virus. Ninety-six (96) people were confirmed to have been infected, and four (4) deaths were recorded. The Municipal Health Directorate responded to the outbreak on the same day they were informed of the death of a student. Considering the number of people involved, more deaths would have been recorded if the response had not been swift.
1. Introduction

Swine Flu or the Influenza A (H1N1), refers to an acute respiratory disease that originated from pigs. It is known to have been caused by one of several swine influenza A strains and its highly contagious (Dandagi & Byahatti, 2011). It is transmitted like a virus from one person to another in the same way influenza spreads (Fotedar, Fotedar, Sharma, & Bhardwaj, 2013) and it is typically incubated within one (1) to four (4) days averaging two (2) to three (3) days (Fotedar et al., 2013). Symptoms of the virus include sore in the throat, severe headache with chills, coughs, weakness as well as general unpleasant feeling similar to the symptoms of influenza. There have been cases where some persons who had swine flu showed severe respiratory illness such as pneumonia or respiratory failure resulting in death (Fotedar et al., 2013). Those that are at a higher risk for complications from swine flu are usually those suffering from chronic medical conditions such as heart disease, diabetes as well as women who are pregnant (Connecticut State Department of Public Health, 2018).

The World Health Organization (WHO) raised its pandemic alert level to the highest one suggesting an outbreak of the pandemic H1N1 flu (Kamate et al., 2010). This particular flu has been reported in different parts of the world and particularly mid-western United States, Canada, Mexico, South America, Kenya, China, Taiwan, Japan, and many areas of Eastern Asia including India (World Health Organization [WHO], 2015).

Even though H1N1 pandemic is notorious for causing such rapid, viral pneumonia, which can kill within hours. Public health practice in the time of the H1N1 flu outbreak at Kumasi Academy Senior High school was rudimentary, and knowledge of the disease prevention and management was poor. This was evident in how the outbreak was managed in the initial stages as vaccinations, antivirals, and antibiotics to treat secondary infections were not readily available, and systematic response plans were not evident. This report will facilitate the design and streamlining of novel effective and efficient interventions to address complexities and complications attributed to Swine Flu or Influenza A (H1N1). Besides, it will help drive health authorities to promote habits which are pertinent to ensuring the passage of sustainable strategies key to preventing future H1N1 flu outbreaks.

The authors report an outbreak of Influenza A known as H1N1 which led to four (4) deaths at Kumasi Academy Senior High in Ghana. This report aims to describe the magnitude of the outbreak as well as the possible causes, diagnosis and outcome of the outbreak.
2. Case presentation

2.1. Case description
The Municipal Health Directorate was notified of the sudden death of a student at KUMACA on 29 November 2017 (with another death following about 18 hours after the first death). (See Figure 1)

There were two additional deaths on 2nd and 5th December, 2017. A team from the directorate was immediately sent to the school to investigate. The local team was supported by a national and regional multi-sectoral team from the World Health Organisation, Ghana Health Service HQ and Regional Health Directorate in Ashanti Region of Ghana. The health investigative team sought to confirm an outbreak; estimate the magnitude of the outbreak; identify the possible cause and source of the outbreak as well as search for additional cases and to institute remedial actions to control the outbreak and prevent future occurrence.

Overall, 420 students and school staff who exhibited signs and symptoms of the flu were screened for Swine Flu or the Influenza A (H1N1).

Cerebrospinal fluid (CSF), blood and throat swabs of cases and those who complained of headache, fever, chills, vomiting, bodily pains, diarrhea, neck pains, stains of blood from the nose, burning sensation in the eye, cough and sore throat were sent to four (4) labs namely Noguchi, KCCR, PHRL and KATH for further investigation.

Noguchi

- 26 samples of CSF were all Negative
- 12 out of 19 throat swabs tested positive for H1N1 pdm09

PHRL

- Initial 9 CSF were all Negative
- Additional 6 CSF were all Negative

KCCR

- 7 out of 25 throat swabs tested positive for H1N1 pdm09

KATH

- Blood and CSF samples all tested Negative

The diagnosis for H1N1 was conducted using real-time RT-PCR. Specimen processing was performed following existing national biological safety regulations.

**Acceptable specimens:** Respiratory specimens included bronchoalveolar lavage, tracheal aspirates, sputum, nasopharyngeal or oropharyngeal aspirates or washes, and nasopharyngeal or oropharyngeal swabs. Swab specimens were collected only on swabs with a synthetic tip (such as polyester or Dacron®) and an aluminium or plastic shaft.

**Rejection Criteria:** Specimens not kept at 2–4°C (≤4 days) or frozen at −70°C or below and inappropriate specimens not listed above.

The team interviewed the staff stationed at the sick school bay. They also spoke to the school administration to get a good understanding of the situation and they also reviewed the OPD
register for any relevant information such as signs/symptoms being presented, number of suspected cases referred, dates of onset of signs/symptoms, boarding houses the cases were lodging among others.

The investigators also tried to establish a link between the pig farm which is situated close to the school and the virus, but there was no empirical evidence to claim any direct and indirect contact with an asymptomatic carrier pig. Other risk factors such as classroom space, outdoor activities as well as classroom ventilation, handwashing practices, and modes of travel were evaluated.

Furthermore, information was shared with colleague health professionals on both regional and national platforms to look out for similar cases and to gather detailed information on the situation.

3. Findings

Overall, 96 persons were infected with the virus and males were the majority. The mean age of those infected was 17 years and their ages ranged between 13 to 35yrs. The sociodemographic profile of cases can be found in Table 1.

Four deaths were recorded and the first patient (Patient 1) was a 15-year-old male student of Kumasi Academy Senior High who died at the Kwame Nkrumah University of Science and Technology Hospital on 30th November 2017. The second patient (Patient 2) was a 16-year-old male student of Kumasi Academy Senior High who also died at Kwame Nkrumah University of Science and Technology Hospital on 30th November 2017. The third patient (Patient 3), another male student of Kumasi Academy Senior High died at the Komfo Anokye Teaching Hospital on 2nd December 2017 aged 16-years. The fourth patient (Patient 4) was the only female among those who died. She was aged 16years and a student of Kumasi Academy Senior High school. She died at the Kwame Nkrumah University of Science and Technology Hospital on December 5th, 2017.

The common signs and symptoms exhibited by the patients included headache, fever, chills, vomiting, bodily pains, diarrhoea, neck pains, stains of blood from the nose, burning sensation in the eye, cough and sore throat. The source of infection is unknown, though there is a pig farm located within one kilometre to the school, there was no established link to the index case or the other cases. Also, there were no isolates of Influenza H1N1 recovered from any pig or piglets at the pig farm. The influenza was suspected to have spread mainly from person to person through coughing or sneezing by those with influenza. Others were infected by touching surfaces or objects with the virus on it and then touching their mouth or nose. The risk factors identified were classroom space, outdoor activities as well as classroom ventilation, handwashing practices, and modes of travel.

| Age | Male  | Female | Total |
|-----|-------|--------|-------|
| 13  | 1 (100%) | 0 (0%) | 1     |
| 14  | 1 (33%)  | 2 (67%) | 3     |
| 15  | 8 (80%)  | 2 (20%) | 10    |
| 16  | 18 (55%) | 15 (45%) | 33   |
| 17  | 18 (64%) | 10 (36%) | 28    |
| 18  | 10 (67%) | 5 (33%) | 15    |
| 19  | 3 (100%) | 0 (0%)  | 3     |
| 20+ | 3 (100%) | 0 (0%)  | 3     |
| Total | 62 (65%) | 34 (35%) | 96    |
It was found that 96 people were infected and four (4) of them died. Blood, CSF, and throat swab specimens were taken to the various labs for testing. Three (3) health staffs at KNUST hospital emergency unit were also infected, but they were treated and discharged. All the other cases were treated and discharged. The students who died as a result of the outbreak were lodging at the Sadler house; Jubilee House and Yaa Achiaa House (see Figure 2). Figure 3 shows the Influenza A (H1N1) spread from the index case to the last case.

4. Discussions
Influenza is likely to occur in a broad range of settings including hospitals, schools, long-term care centres and other confined settings (World Health Organization [WHO], 2014). This was confirmed by an outbreak at Kumasi Academy Senior High school in Ghana which has a confined setting. A similar outbreak of influenza A (H1N1) virus was also confirmed in 2009 in a boarding school in South East England involving 102 symptomatic cases with influenza-like illness. In this case, Influenza A (H1N1) virus infection was laboratory-confirmed by PCR in 62 pupils and one member of staff (Smith et al., 2009). There was another report of a massive school outbreak of influenza A(H1N1) virus in Birmingham, United
Kingdom in 2009, where influenza A(H1N1) virus was confirmed among 64 of 175 (36%) symptomatic pupils and members of staff (Health Protection Agency West Midla, 2009). A similar outbreak of Influenza A (H1N1) occurred at a school setting in Hawaii in 2009 (Park, 2009), and the Hawaii Department of Health (HDOH) also confirmed two pandemic H1N1 cases from the same school in Oahu. However, the outbreak in Hawaii in 2009 did not lead to any hospitalizations or death which is contrary to the outbreak at Kumasi Academy Senior High School where four (4) deaths were recorded. This implies that the school environment is one area where several influenza A(H1N1) cases have been recorded.

Influenza spreads between humans through coughing or sneezing and people touching something with the virus on it and then touching their nose or mouth (Dandagi & Byahatti, 2011). This could explain the spread of the virus, which led to the death of four (4) students who were all residing within an enclosed environment and most likely to touch infected surfaces and then touch their nose or mouth. In Northern Ireland in 2009, a higher death rate (14 deaths) was reported as a result of swine flu (Smith, 2009). An outbreak in Nepal in the spring of 2015 resulted in the loss of 26 lives (Jadhav, 2016). Also, over a hundred confirmed cases of swine flu resulted in a slightly higher death rate of six (6) in the Maldivian capital of Male’ in 2017 (Blanton et al., 2017). The lower death rate recorded in the outbreak at Kumasi Academy Senior High in Ghana could be attributed to the prompt response by the national and regional health team.

However, the key challenge in managing this outbreak was the lack of health facilities and lack of equipment’s to manage the situation in the district where the outbreak occurred. The locations of the hospitals made tracking of cases quite tricky in some instances, and this could have attributed to the death outcomes. It would be helpful if hospitals in the Asokore Mampong district are well equipped to handle such cases in the future. Ryan, Christian, and Wohlrabe (2001) opined that patients with confirmed or suspected swine influenza infection should be placed in a single-patient room with the door kept closed. It would, therefore, be helpful to also isolate or quarantine persons with this virus in future outbreaks.

5. Conclusion
This is a documentation of an outbreak of H1N1 influenza type A caused by the H1N1 pdm09 virus on the campus of Kumasi Academy Senior High (KUMACA). Overall, ninety-six (96) people were infected by the influenza and four (4) deaths were recorded. Various control measures were put in place, with the support of all relevant stakeholders. Health education on H1NI must be intensified and sustained in the municipality as well as disease surveillance.

Abbreviations

| Abbreviation | Description |
|--------------|-------------|
| WHO          | World Health Organisation |
| HQ           | Head Quarters |
| KUMACA       | Kumasi Academy |
| RT-PCR       | Reverse Transcription Polymerase Chain Reaction |
| KATH         | Komfo Anokye Teaching Hospital |
| CSF          | Cerebrospinal fluid |
| KCCR         | Kumasi Centre for Collaborative Research |
| PHRL         | Public Health Reference Laboratory |
| OPD          | Outpatient Department |
| KNUST        | Kwame Nkrumah University of Science and Technology |

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Competing interests
The authors declare that they have no competing interest.

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Ethics approval and consent to participate
Written informed consent was obtained from the school authorities and the Ministry of Education before the investigations were conducted.

Availability of data and materials
A complete document of this study and its results can be found at the School of Medical Sciences Library of the Kwame Nkrumah University of Science and Technology, Kumasi.

Authors contribution
The secondary data compilation and interpretation were done by the first author (JOA). The second author (RA) prepared and revised the manuscript accordingly while the third (AM), fourth (FAE) and fifth (BYJ) played a significant role in the case investigation. In the revision of the manuscript, all authors played a significant part as well as in designing and preparing the manuscript. Proofreading and the final approval process were also shared accordingly among all authors, and all authors have agreed to its submission for publication.

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