

2: INFLUENZA OUTBREAK AT PRETORIA POLICE COLLEGE

2.1 INTRODUCTION

Epidemics of Influenza occur during the winter months nearly every year and are responsible for many deaths per year (e.g. approximately 20,000 in the United States alone)¹. Influenza viruses can also cause global pandemics, during which rates of morbidity and mortality from influenza-related complications can increase dramatically. Influenza viruses cause disease in all age groups.² Rates of infection are highest among children, but rates of serious morbidity and mortality are highest among persons aged 65 years and above and persons of any age who have medical conditions that place them at high risk for complications from influenza.^{3, 4}

Influenza A and B are the two types of influenza viruses that cause epidemic human disease. Since 1977, influenza A (H1N1) viruses, influenza A (H3N2) viruses and influenza B viruses have been in global circulation. A person's immunity to the surface antigens, especially haemagglutinin, reduces the likelihood of infection and the severity of disease if infection occurs.⁵ The constant development of antigenic variants through antigenic drift is the virologic basis for seasonal epidemics and the reason for incorporation of one or more new virus strains in each year's influenza vaccine.

2.3 SOUTH AFRICA

Cases of influenza are seen each year in the health facilities but because influenza is not a notifiable medical condition, it has not attracted adequate attention. Systematic data is not readily available at national level to support planning process for this condition, but is available at various

health facilities. There is seasonality of cases especially during the winter period (May – July). The possibility of crowding during winter can be favourable for the transmission of the disease.

2.3 BACKGROUND

Whilst influenza is not notifiable in South Africa, an outbreak occurred between May and June 2003 at the Pretoria Police College, Gauteng that precipitated a multisectoral response. The National Department of Health (NDOH), Gauteng Department of Health (GDH), private sector hospital groups (Netcare, Afrox), National Health Laboratory Service (NHLS) and the South African Police Service (SAPS) worked together to curb the spread and limit the severity of the disease.

Based on data available at the SAPS training college, suspected outbreaks of influenza of varying magnitude have previously (2000/01) been reported at the college. On average, 30% of all medical consultations during the intake periods between May 2001 and June 2002 were due to influenza. However, most of these were mild - moderate symptoms of flu, cough with fewer complications (e.g., pneumonia) during the winter months.

On the 29th May 2003, the NDOH received a report of a high number of influenza cases at the Pretoria West Police College from the Gauteng Department of Health. There was concern about the quick spread of the disease and the severity of some cases, which had already been hospitalised at three private hospitals in the city.

The National Outbreak Response Team and the provincial teams were quickly mobilised to participate in control efforts together with the relevant stakeholders including the college and SAPS, the 3 private hospitals and the NHLS.

2.3.1 Work process

- Met and held meetings with epidemic control committee members and Director of the college.
- Assessed the situation and recommended appropriate intervention measures for management and control of the outbreak at the college and the province as a whole.
- Visited the affected areas (student dormitories) as well as the hospitals that managed patients.
- Investigated the outbreak.
- Feedback to epidemic control committee members, provincial DOH, students as well as instructors at the college.

2.4 MANAGEMENT OF THE EPIDEMIC

2.4.1 Coordination

A Joint Epidemic Control Committee (Public and private sectors including national and provincial Department of Health) was set up. The team met everyday to review the process, monitor and evaluate implementation of epidemic control measures. Five operational subcommittees were set up i.e., case management, surveillance, health education, prevention and communication.

2.4.2 Preventive measures taken

Because of the high contagiousness of the disease the following outbreak control measures were taken;

- The college was quarantined and the sick students isolated from the healthy ones.

- Classes were suspended for a week to minimise risk of further spread of the disease.
- All non-essential large gatherings including sports were suspended. Physical exercise sessions for students were also suspended
- Environmental health monitoring of buildings especially ventilation and hygiene were undertaken.
- Good hygiene, particularly hand washing was re-emphasised.

2.4.3 Health education

The importance of education and information in the control of this viral infection was emphasised to the students as well as the general population. The symptoms and signs of the disease were highlighted and a hotline provided for assistance to the general public as well as referrals. In addition, the panic associated with the outbreak particularly among the students and parents was also addressed.

2.4.4 Communication

- Daily press releases.
- Compiled pamphlets on Control/prevention of influenza.
- Interviews on radio /TV.
- Communicated with the parents of the students about the situation and steps being taken to control the outbreak.
- Technical information was shared in the daily meetings at the SAPS training college.

2.4.5 Vaccination/prophylaxis

Besides the students already affected, all other members of the college (students; instructors, support staff and their families) identified as close contacts were vaccinated with Vaxigrip to minimise further spread of the disease. A total of 70 students and instructors from the Ambulance Training colleges (SRQ, Netcare 911 and Critical Care) participated in this

immunisation exercise on the 5th June 2003.

Because the vaccine takes about two weeks before acting, these contacts were counselled and provided information before being given Amantidine (symmetrel) 100mg per day. Altogether a total of 1188 persons were vaccinated and given prophylaxis in a period of two and a half hours (total of 16 persons per health worker and a total of 13 persons per minute). This high level of efficiency is because of the availability of appropriate capacity; vaccinations are part of Emergency care practitioner training.

2.5 Epidemiological characteristics of the Influenza A epidemic at SAPS Training College

The SAPS Training College is located in the Western part of Pretoria. The College which had for the first time admitted a large number of students, about 2000 (previous intakes, batches of less than 1000) had just reopened on 25th May 2003. The students are selected from all over the country and training lasts about 6 months. The students reside in ten dormitories at the closed campus. Male students predominate, 1321 (69%) of total intake. The training covers both class sessions and outdoor rigorous physical exercises organized in platoons.

The first two days at the college cover registration and orientation. On arrival at the college, the students are registered in the gymnasium, which is

surrounded by a student's dormitory on the one side and the mess (dining hall) on the other side. During the registration period students are given numbers, allocated dormitories, platoon numbers and other items for the training. Those covered spend the rest of the time either in the dormitories, around the canteen or the sports ground close to the instruction buildings within the campus where there is a lot of interaction among the students. During the first week all students are vaccinated against meningococcal infection subtypes A & B.

2.6 SURVEILLANCE

Data available and reviewed at the SAPS training college reveals that suspected outbreaks of influenza of varying magnitude have previously (2000/01) occurred at the college. On average, 30% of all medical consultations during the intake periods between May 2001 and June 2002 were due to influenza.

However, most of these were mild - moderate symptoms of flu, cough with fewer complications (e.g., pneumonia) during the winter months, see table 2.1. Detailed information on the cases was not readily available, however, it is known that the students were neither immunised against influenza nor placed in quarantine. Similar strains of Influenza type A and C had previously been in circulation.

Table 2.1: Medical consultations at SAPS training college hospital.

| Intake | Intake strength* | Consultations | |
|-----------|------------------|------------------------------------|-------------------------------------|
| | | Total (For all medical conditions) | Proportion of influenza A cases (%) |
| 2001 May | 498 | 391 | 31 |
| 2001 June | 684 | 645 | - |
| 2002 May | 595 | 565 | 37.5 |
| 2002 June | 1430 | 888 | 20.0 |

*- Number of recruits at the college

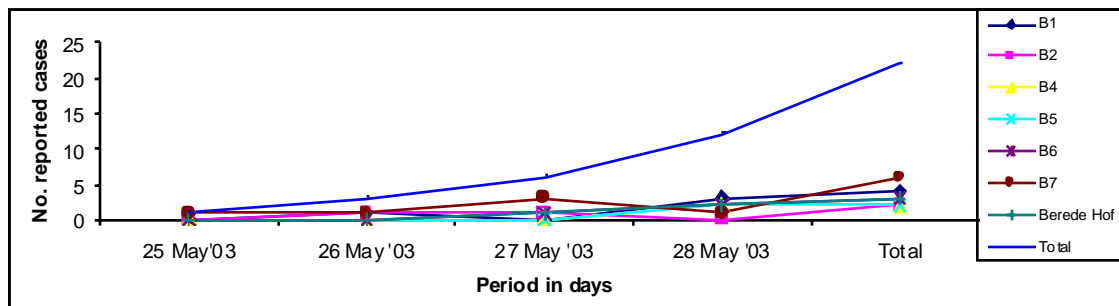
Source: South African Police Service, Pretoria West Training College Hospital.

2.7 INVESTIGATION OF MAY-JUNE 2003 OUTBREAK

Two initial cases recorded were on the 25th May 2003 (one residing in building number 7 and the other not indicated). By day four of the epidemic, the disease had spread to 6 other

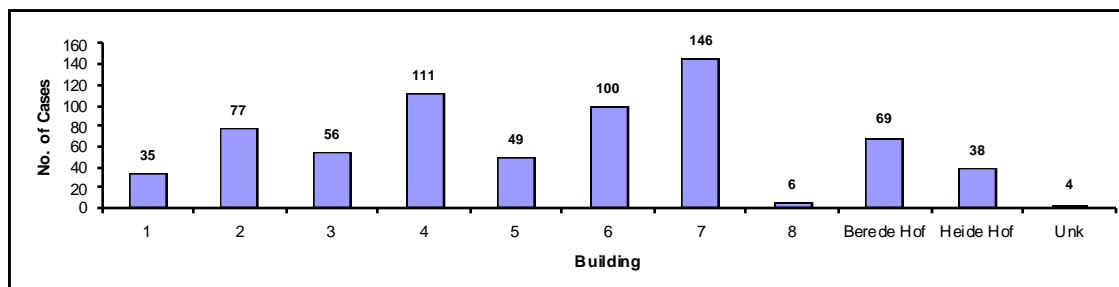
buildings, see Figure 2.1. By day 6 a cumulative number of 22 influenza cases had been reported in these four buildings. Building number 7 was the most affected followed by 4 and 2, see figure 2.2 below.

Figure 2.1: Influenza cases reported during the first four days of the epidemic, 25th – 28th May 2003.



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control - South Africa.

Figure 2.2: Distribution of influenza cases by residence (dormitory)



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control - South Africa.

Blood tests taken on admission during the period 1-6th June 2003; cardiac enzymes, creatinine kinase was higher (200-350) in 3 of the initial 4 cases, the normal range 26-190 IU/L and CK-MB in 1 of these cases (normal range 0.0-5.0). Further laboratory tests, methods used and the results are described below.

2.7.1 Method

A total of sixteen specimens (throat swabs and bronchial lavages) were taken from patients in two of the

hospitals where students were admitted (6 from Pretoria East hospital and ten from SAPS college hospital). These were sent to the National Institute for Communicable Diseases (NICD) and tested positive for influenza H3 by a multiplex nested PCR. The positive specimens were sequenced from the A/Panama/2007/99 vaccine strain.

There was no significant drift and there is no evidence that the genetic changes in the H3N2 isolates received

are associated with antigenic changes sufficient to render the available vaccine ineffective. This was critical when deciding on the use of the vaccines as the strains in vaccines had to match those of the influenza virus in circulation.

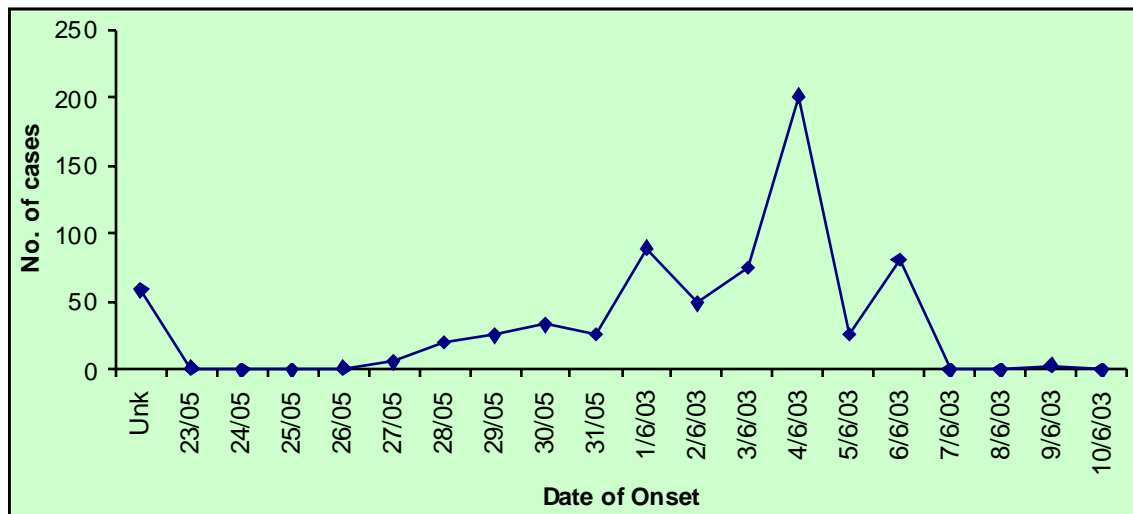
This outbreak followed a recent report of the first two influenza A H3N2 viruses that were detected at NICD, South Africa this season (isolated on 23rd and 26th May, 2003). The haemagglutinin HA1 subunit of these 2 isolates on sequencing appear to have drifted genetically from the A/Panama/2007/99 vaccine strain, with fifteen amino acid changes relative to vaccine strain. However, the South African strains share the

characteristic changes at residues 155 (histidine to threonine) and 156 (glutamine to histidine) seen in some of the recent viruses globally⁶.

2.7.2 EPIDEMIC TREND

The “Index” case was on the 25th May 2003. There was a gradual rise in the number of new cases, and this peaked on 4th June 2003 and gradually declined. The rise observed on 6th June, was possibly due to reaction to the vaccine, and increased awareness prompting more students to seek medical care. The last case was observed on the 9th June 2003, see Figure 2.3 below .

Figure 2.3: Epidemic curve, 25th May – 9th June 2003.



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control - South Africa.

2.7.3 DISTRIBUTION OF CASES BY AGE GROUP AND SEX

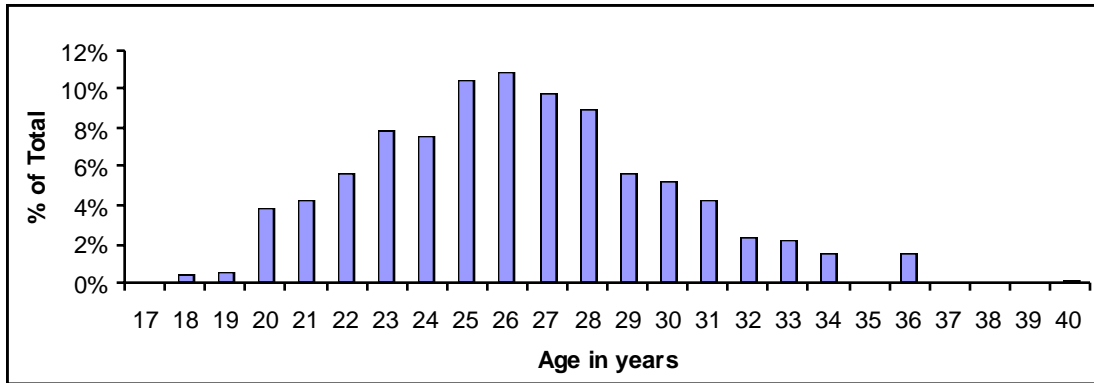
As on 9th June 2003, the cumulative number of cases was 695 (36% of all students) with no deaths. Most affected students were male 73.9%, age group between 25 and 27 years, which corresponds to the average age at recruitment, see Figure 2.4 below .

When comparing sex, males were more at risk of getting the disease than females (p value < 0.005). However, this could be due to the fact that males are over-represented in the general student population. The risk of getting the disease as a result of crowding especially in places of residence (dormitories with 34 students per room) in comparison to residing in less

crowded dormitories (Berede Hof and Heide Hof with 2 students per room) was not statistically significant (p value 0.629 at 95% CI). Given the high contagiousness of influenza and the

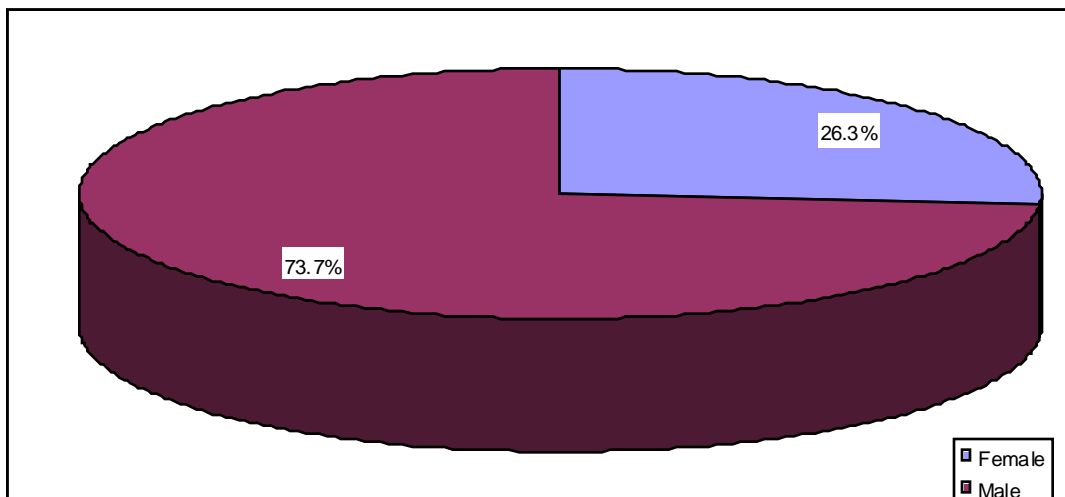
short incubation period, it is possible that transmission could have occurred during formal interactions (e.g., within platoons) and other informal interactions e.g., in mess etc.

Figure 2.4: Distribution of Influenza cases by age group.



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control-South Africa.

Figure 2.5: Distribution of Influenza cases by sex.



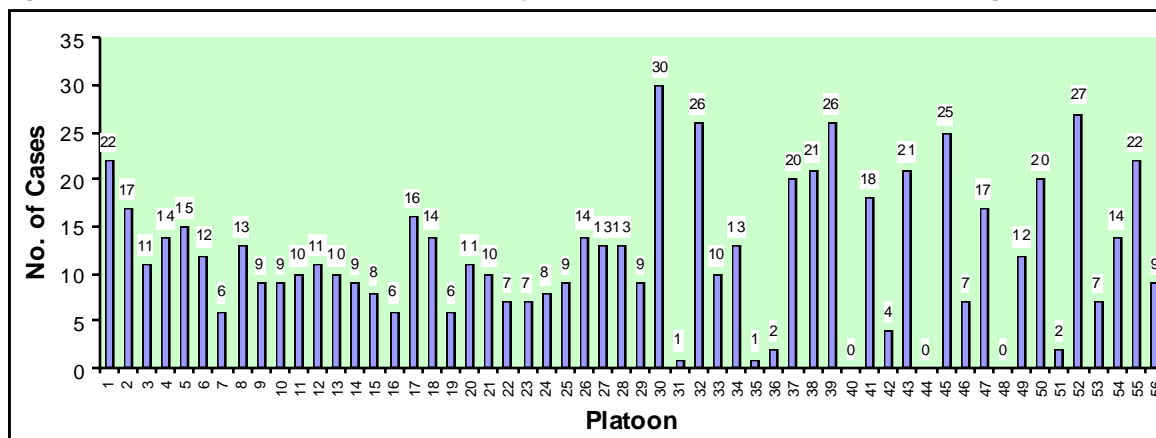
Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control -South Africa.

DISTRIBUTION OF CASES BY PLATOON

| Platoon Number | Number of Cases |
|----------------|-----------------|
| 30 | 29 |
| 32 | 27 |
| 39 | 26 |
| 55 | 22 |

Platoon 40, 44 and 48 were not affected. Distribution in the rest of other platoons, see Figure 2.6 below .

Figure 2.6: Distribution of influenza cases by Platoon, at Pretoria West Police College.



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control -South Africa.

2.7.4 Attack rates

Attack rates by residence and platoon were assessed. Dormitory 6 (Males), and dormitory 3 for the female students were the most affected.

Males were at higher risk of contracting disease (Table 2.1).

Table 2. 1: Attack rate by building (dormitory):

| Dormitory | No. Of occupants | Sex | No. Of cases | Attack rate/100 population. |
|-----------|------------------|-----|--------------|-----------------------------|
| 6 | 206 | M | 97 | 47 |
| 4 | 242 | M | 110 | 45 |
| 7 | 394 | M | 141 | 36 |
| 3 | 153 | F | 52 | 34 |
| 5 | 145 | F | 45 | 31 |
| Berde Hof | 221 | M | 65 | 29 |
| 2 | 258 | M | 64 | 25 |
| Heide Hof | 133 | F | 33 | 25 |
| 1 | 162 | F | 33 | 20 |
| 8 | - | F | 8 | - |
| Total | 1914 | | 648 | 34 |

Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control - South Africa.

Platoon 39 was most affected and in all these platoons, males were the most affected. Female students were also at a higher risk in platoon 39 (Table 2.3).

follows; 144 were well, majority 178 (about 50%) was improving and only 5 reported to be worse.

2.7.5 Progress of patients

Status of 362 patients as of 6th June 2003 was assessed and findings are as

2.7.6 Attack rate by most affected platoon and sex

Table 2.3: Attack rate by most affected platoon and sex

| Platoon | Capacity of platoon (M, F) | No. Of cases | | | Attack rate /100 popn. | | |
|---------|----------------------------|--------------|----|-------|------------------------|----|---------|
| | | M | F | Total | M | F | Platoon |
| 30 | 34 (34, 0) | 27 | 0 | 27 | 79 | 0 | 79 |
| 32 | 35 (22, 13) | 20 | 7 | 27 | 91 | 54 | 77 |
| 39 | 32 (18, 14) | 16 | 10 | 26 | 89 | 71 | 81 |
| 55 | 36 (36, 0) | 21 | 0 | 21 | 58 | 0 | 58 |

Source: NDOH, Health Systems Research, Research Coordination & Epidemiology - South Africa.
F=female, M= male

2.8 INFLUENZA LABORATORY DIAGNOSIS

Specimens were received in 3 batches on 3 June processed and tested by the Polymerase Chain Reaction (PCR) assay.

This test increases the amount of viral genetic material that was originally present in the specimen. The PCR products were run on a gel to identify whether the virus was influenza A subtype H1 or H3. The results were obtained within 24 hours.

2.8.1 Influenza strain characterisation

The specimens were cultured to grow the viruses. The HA gene was sequenced to determine changes from the A/Panama/2007/99 vaccine strain. This showed that the Pretoria "outbreak" virus was different to the vaccine strain at the genetic level. The SA viruses were similar to those seen in some European countries that had flu outbreaks in March 2003.

The PCR is a rapid, sensitive and specific test to detect influenza virus directly from throat swabs. Molecular tests (sequencing the viral HA gene) showed that all the Pretoria outbreak viruses were the same.

2.8.2 Possible risk factors:

Crowding especially in the buildings of residence, most of the buildings are dormitory style with 30-34 occupants per large room. Possibility of carriers (asymptomatic) in communities.

2.9 CASE MANAGEMENT

A case of influenza was defined as: sudden onset of high fever, muscle pains, sore throat, dry cough and coryza. During the period 25th May to 9th June 2003, a total number of 1150 medical consultations were made by the 695 cases. Of these cases 97 (14%) were admitted into various hospitals while the majority (66%) was managed on an outpatient basis, see Table 2.4.

Table 2.4: Distribution of cases by Health facility

| Health facility | | Admissions | Outpatients |
|-----------------|---------------------------------|------------|-------------|
| Private | Pretoria East Hospital | 13 | - |
| | Little Company of Mary Hospital | 8 | - |
| | Eugene Marais Hospital | 6 | - |
| Public | SAPS College Hospital | 70 | 598 |
| Total | | 97 | 598 |

Source: NDOH, Health Systems Research, Research Coordination & Epidemiology & Communicable Diseases Control - South Africa.

The initial cases presented with severe myalgia, headache, high fever, dry cough and coryza and an impression of viraemia/meningitis was made. Due to the severity of symptoms, abnormal

laboratory findings (raised cardiac enzymes, serum myoglobin, serum phosphate, urine myoglobin, C-reactive protein, urea and electrolytes, low magnesium and calcium) suggestive of damage to muscles and

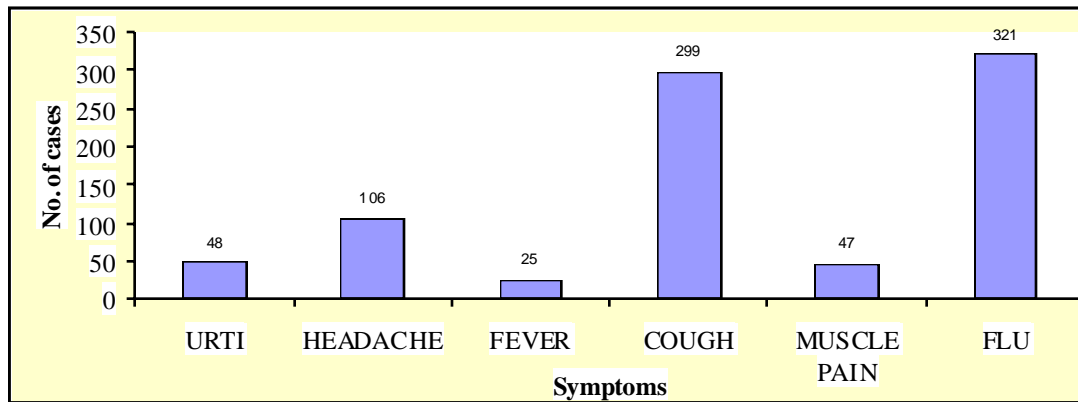
kidney function, patients were referred to hospitals outside the college for specialised management. These patients were managed on antibiotics and strong analgesics; cough mixtures as well as supportive treatment. In order to minimize exacerbation of symptoms and complications, physical exercises at the college were temporarily suspended. Besides the few cases of pneumonia (possibly due to influenza virus infection or secondary bacterial pneumonia) and myositis, there were no other complications such as myocarditis,

encephalitis etc. However, it is not clear to what extent influenza virus might have triggered the other diseases such as otitis media, sinusitis (non-specificity of symptoms).

2.10 FREQUENCY OF SYMPTOMS

The most common presentations were; cough, flu and headache. Flu represents a combination of symptoms (figure: 2.6). Fever was not a common symptom. It is possible several other cases of common cold could have been recorded based on the broadness of the case definition.

Figure 2.6: Frequency of symptoms



Source: NDOH, Health Systems Research, Research Coordination & Epidemiology - South Africa.

2.11 COMMENTS

The average incubation period for influenza is 3-5 days. The fact that the “index” case presented on 25th May (the reporting day at college) and a few others on day 2 and 3 of the outbreak indicates possible infection prior to residing at the college. The subsequent cases are likely to have acquired infection at the college. The crowding especially in the male dormitories might have contributed to high incidence rate in this category. The disease spectrum ranged from mild/asymptomatic cases to severe forms necessitating admission. The

teamwork exhibited by both SAPS training college administration, the private and public sectors is highly commended. These efforts among others contributed to the quick control of the epidemic and abated any fatality.

Outbreaks in closed communities e.g., residential institutions, colleges etc can be prevented by influenza vaccination before the commencement of the winter season (ideally during April). Individuals who are at risk and who have not yet been vaccinated should be encouraged to receive influenza vaccine as soon as possible.

2.12 RECOMMENDATIONS, CONSTRAINTS AND CONCLUSION

2.12.1 Recommendations

1. Before and during outbreak periods, health education must be strengthened to enhance epidemic preparedness and response.
2. Epidemic preparedness plans have to be available at all levels (provincial, district, health facility) and ensure timely implementation.
3. Implementation of the Integrated Disease Surveillance and Response (IDSR) strategy, including laboratory surveillance. Conditions of epidemic potential and public health importance should be addressed.
4. Students are encouraged to get flu vaccines in particular before reporting to college in May. The college should make arrangements to support those who may not be able to do so at college. This should avert future outbreaks, which subsequently interfere with college work.
5. A policy on vaccinations must be developed especially for infectious and epidemic potential diseases particularly in institutions.
6. There is need for strengthening general measures for prevention and control of communicable diseases.
7. The DOH should continue to strengthen private public partnerships in EPR activities to maximize from the existing potential.

2.12.2 Constraints

- Early detection and notification
- Incompleteness of some of the medical records

2.13 Conclusion

Influenza is not a notifiable medical condition but a disease of public health

concern. During May (Week 20) the first influenza type A (H3N2) was isolated from sporadic cases in other parts of the country and an outbreak of influenza A (H3N2) in the SAPS residences college in May/June (week 23-25). A well-coordinated multisectoral involvement is critical in the control of this highly contagious disease.

REFERENCES

1. Smonsen L, Schonberger LB, Stroup DF, Arden NH, Cox NJ. The impact of influenza on mortality in the USA. In: Brown LE, Hampson AW, Webster RG, eds. Options for control of influenza III. Amsterdam, Elsevier Science BV, 1996: 26-33.
2. Monto AS, Kioumeht F. The Tecumseh study of respiratory illness. IX Occurrence of influenza in the community, 1966-1971. *Am J. Epidemiol.* 1975; 102: 553-63.
3. Glezen WP. Serious morbidity and mortality associated with influenza epidemics [Review]. *Epidemiol Rev.* 1982; 4: 25-44.
4. CDC. Influenza and pneumococcal vaccination levels among persons aged \geq 65 years. *MMWR.* 1995; 44:506-7, 513-5.
5. Couch RB, Kasel JA. Immunity to influenza in man [Review]. *Annu Rev Microbiol.* 1983 ; 37: 529-49.
6. Influenza, a virus outbreak in adult residential college, NICD, Communicable Diseases Communiqué updates. June, 2003.

3. MANAGEMENT OF CHOLERA EPIDEMICS IN SOUTH AFRICA, AUGUST 2000 TO SEPTEMBER 2003

3.1 Introduction

The large cholera epidemic that broke out in August 2000 in the local area of Ndabayanke near Ngw elazane in the sub-district; Lower Umfolozi, Uthungulu district later spread to other districts within KwaZulu-Natal and other provinces in South Africa. By July 2001 the disease had affected 106 389 people with 229 deaths. Seven out of 9 provinces were affected. Subsequent epidemics have declined in terms of magnitude and duration (18 224 cases with 122 deaths during August 2001 to December 2002). Since the beginning of 2003, a cumulative total of 3 777 cases with 40 deaths has been reported to the national Department of Health from five of the nine provinces in the country.

Cholera outbreaks persist in spite of knowledge of definite causative organism, the modes of transmission, risk factors and a seasonal tendency. Regional variations have been observed in South Africa and occurrence of the disease in the neighbouring provinces/countries poses a challenge to control in the Southern Africa region particularly given the largely focused disease control programmes.

This report covers aspects of the management process, lessons learnt, constraints and opportunities for strengthening control of cholera, other diarrhoeal diseases of epidemic potential and public health

importance. The aim is to draw lessons from this experience to enhance current control measures and guide future planning.

3.2 Background

Communicable diseases constitute a major burden (56.4%) of diseases in developing and underdeveloped countries⁽¹⁾. Water-borne diseases are amongst the most recent emerging and re-emerging infectious diseases in the world that add to this burden. Of these, the most common disease in developing countries including South Africa are diarrhoeal diseases particularly cholera, dysentery, typhoid and other rotavirus infections. There is also an increase of parasites responsible for enteric diseases.

The World Health Organisation (WHO) has reported that the burden of water-borne diseases is most felt in all African countries, especially in the rural parts of the region. The prevalence of common diarrhoea varies, being higher among young children who are most vulnerable. According to a WHO report of 1996 an estimated 3 million deaths occur among children under 5 years old every year and ranked second among all causes of disease burden worldwide⁽³⁾.

3.2.1 Etiology of Epidemic Diarrhoea

Only a few pathogens cause epidemic diarrhoea, although there are many that causes sporadic