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## 68. SOUTH AFRICAN MILITARY HEALTH SERVICE INVOLVEMENT DURING OUTBREAK OF CHOLERA IN KWAZULU-NATAL

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### INTRODUCTION

Cholera is an acute diarrhoeal disease endemic to Africa, which is caused by the bacterium *Vibrio cholerae*. It may cause a formidable epidemic, and even a single case of cholera needs to be notified within 48 hours to the World Health Organization. Epidemiological features of the disease include inter alia:

Cholera is spread by the ingestion of water and food contaminated by the excrement of persons with symptomatic or asymptomatic infection.

Epidemics are characteristically explosive and abrupt, and can cause an acute public health problem, but outbreaks may also be protracted.

In endemic areas, outbreaks usually occur during warm months, and the incidence is highest in children.

The epidemic reaches a peak and subsides gradually, owing to the acquisition of temporary immunity as well as the occurrence of large numbers of sub-clinical cases.

Elimination of contaminated water does not immediately bring an outbreak to an end, owing to the continuation of transmission through contact.

Since 1817, seven cholera pandemics have been reported worldwide, of which the seventh originated in 1958 with endemic disease in Sulawesi in Indonesia. The dynamic spread of this pandemic can be subdivided into three geo-chronological periods, viz. South East Asia (first), Mainland Asia (second) and Middle East, Africa and Europe (third). Cholera in South Africa can be traced back to the third period, when South Africa was considered to be at risk as early as 1971, with sporadic outbreaks between 1980 and 1987. More recently, 68 cases of cholera were reported during 1999 in the Durban metropolitan and surrounding area, while the current epidemic started at Empangeni along the KwaZulu-Natal north coast during August 2000. The total population at risk in the affected areas is estimated at more than 1,8 million, while by the end of October 2000, more than 4000 cases had been recorded, of which some 22 victims had died.

Subsequently, the Department of Health formally requested the Surgeon General of the South African National Defense Force to provide health support via the South African Military Health Service (SAMHS). Although not directly or indirectly related to acts of terrorism in this particular case, the problems and challenges presented by massive outbreaks of disease may be very similar to those associated with incidents involving the deliberate use of biological agents by terrorist groups. In support of the stated objective of this "First World Congress on Chemical and Biological Terrorism", this contribution will provide insight into the first South African experience of large scale Public and Military Health Service co-operation in dealing with such a situation.

Foremost in the planning of support and response operations of such magnitude was the need to consider the socio-economic and environmental profile of the affected areas, as outlined below.

## **SOCIO-ECONOMIC AND ENVIRONMENTAL FACTORS**

There are currently two districts north of Durban that are mainly affected by the epidemic, namely the Lower Umfolozi district around Empangeni and the Eshowe/Nkandla district, covering an area of approximately 2500 km<sup>2</sup>. Owing to a combination of factors such as lack of economic activity, overpopulation, illiteracy, unemployment, political unrest and high HIV/AIDS figures, these areas represent some of the most deprived and poverty-stricken in South Africa. Subjected to an economy of subsistence, people live under dire circumstances and are literally compelled to "live off the land". High population densities place tremendous demands on the overburdened infrastructure, particularly in respect of education, health care facilities, piped water and sanitation, and it is extremely difficult to provide and maintain such services adequately with a national economy in transition. The inevitable result is overexploitation of natural resources, particularly water sources, which in many instances, are limited to small mountain streams that must provide for all needs such as for drinking by man and beast, cooking, and washing. These problems are compounded by mismanagement of such resources through ignorance and carelessness, political distrust and suspicion, and in general, low standards of personal hygiene prevailing among most of the population. The topography of the region is such that communities are isolated and restricted to remote villages, in most instances separated by hills and valleys that are virtually inaccessible by road, particularly during the rainy season. Severely dehydrated patients often need to be transported to health care centers over long distances, using wheelbarrows as the only means available.

## **PLANNING AND EXECUTION**

Against the above background, planning and execution of support and response operations were conducted by the KwaZulu-Natal Health Department in collaboration with the SAMHS. This involved inter alia:

- Establishment of sub-district, regional and provincial Joint Operational Crisis Committees/Centres (JOCC's) with daily meetings.
- Assessment of situation.
- Prioritization of requirements.
- Acquisition of essential medical and other supplies.
- Involvement of community stakeholders.
- Briefing and deployment of suitably qualified personnel.
- Establishment and maintenance of temporary Rehydration Centres.
- Provision of field ambulances, water tankers and containers for potable water at strategic locations.
- Record keeping.
- Promoting increased health care knowledge and awareness among the local population.

The first SAMHS members reported for duty on 13 October 2000. The first deployment consisted of two groups, one in Eshowe and the other in the Empangeni area, under a Medical Task Team Commander with the rank of Major and two platoon commanders with the rank of Major and Captain respectively. The Task Team consisted of fourteen Registered Nurses, fourteen Operational Emergency Care Orderlies (OECO's) and fourteen drivers, while seven 2x4 LDV ambulances were made available.

## **REHYDRATION CENTRES**

The Department of Health was responsible for setting up ten Rehydration Centres in the affected areas with all necessary stock and equipment, manning these centres together with SAMHS personnel, and for transport of personnel to and from their point of duty. At the peak of the epidemic, there were a total of twenty-five of these Rehydration Centres in the affected areas, and an additional twenty in other areas outside of the Lower Umfolozi and Eshowe/Nkandla districts.

The Rehydration Centre is the first line of defense and the most important facility in the cholera campaign, and consists of a 4x4 m square tent, equipped with:

- Lighting installation;
- Examination couch;
- Bed and drip stand;
- Cupboard;
- Benches;
- Bedside lockers;
- Canvas chairs;
- Generator;
- Gas lamps;
- Emergency gas bottles;
- Bulk container with toilet paper, soap and household bleach for distribution to the local population.

Other equipment include a diagnostic set, stethoscope, thermometers, equipment for infusions, containers with oral rehydration solution (ORS), catheters, urine drainage bags, bio-hazard containers, gloves, disposable aprons, masks with visors, cleaning materials and plastic buckets for hand washing. A cellular phone is available for communication at each center, and an ambulance is stationed at centers where there is no such service available, while information leaflets are kept at each center. At least one cleaner is assigned to each center for each shift of 12 hours. At some centers, a second tent is used as a holding facility, store room and rest room for personnel.

The establishment of Rehydration Centers was the result of joint planning. Although the idea originated at the Department of Health, most of their personnel lacked the necessary expertise, and SAMHS personnel were requested to physically erect and secure the tents. This was a once-off exercise, and unfortunately, lack of proper maintenance by Department of Health personnel as well as vandalism by criminal elements resulted in large scale deterioration at some centers. As the crisis developed and resources were depleted by sheer numbers of patients, Rehydration Centers were also installed in community halls and other buildings. This came also as a result of adverse weather conditions such as heavy rainfalls flooding the tents from time to time, so that the tents have to be evacuated periodically. The installation of Rehydration Centers in buildings made life easier for personnel because of the availability of running water, toilets and electricity. In contrast to the tents, where sharing of portable chemical toilets with patients may create a health hazard to personnel, these facilities are clearly marked and allocated in the buildings.

## **TREATMENT OF PATIENTS**

The Rehydration Center is seen by the population as the symbol of treatment. The challenge is however, that patients do not necessarily report to the tents at the first sign of illness. There is a definite "rush hour", because elderly patients must wait for children to

return from school at approximately 3:00 pm before they are assisted to the centers, while others may start their journey at first light, arriving at the center around 10:00 in the morning. Upon arrival, all patients are assessed, and if not diagnosed with cholera, they are referred to the nearest Primary Health Care Clinic. This may imply that non-cholera patients are sometimes also transported with SANDF ambulances to the nearest hospital, causing confusion. Those who are diagnosed positively are treated according to the severity of dehydration, based on a treatment regime recommended by the WHO. Specific details of this regime are out of context here, but in broad terms, may be summarized as follows:

**1. Severe dehydration**

Intra-venous fluid replacement

If no improvement after 6 hours, hospitalize and treat with IV antibiotics (No oral antibiotics are issued at the Rehydration Centres)

If improvement after 6 hours, health education and discharge home

**2. Moderate dehydration**

Oral rehydration

Observation for 6 hours

Health education and discharge home

**3. Little or no dehydration**

Health education and discharge home

**WORKING ENVIRONMENT**

Bearing in mind the socio-economic and environmental factors outlined above, it stands to reason that working conditions are exceedingly difficult. These difficulties originate from various factors, as listed inter alia below:

**1. Weather and climate**

The affected areas fall within the summer rainfall region of South Africa, i.e. between October and March. The summer climate in the affected areas is extremely hot and humid, and the tents do not provide adequate shelter against adverse climatic conditions. Poor ventilation leads to extreme temperatures in the tents where patients are already dehydrated.

**2. Location of Rehydration Centers**

The placement of the tents was determined by community nursing staff together with the community leadership, without proper consideration of the physical environment. This is the cause of many problems such as communal water holes and domestic animals close to the centers, while no running water is available. The Department of Water Affairs provided a 5000 litre water tank at each center for use by both the staff and the patients.

**3. Working hours**

Personnel from the Department of Health often work their 12 hour shifts in the hospital, and then report for duty at the Rehydration Center, probably because they are being paid overtime. SAMHS personnel work 4 x 12 hour shifts per week, while ambulance drivers change shifts every 12 hours.

**4. Relaxation areas**

Initially, no separate shelters were available for health care workers where they could relax or have lunch. An additional tent was since provided for this purpose at each center.

## **5. Insects**

The affected areas are notorious for a variety of crawling and other insects such as mosquitoes and ticks, which cause severe inconvenience and may endanger the health of personnel.

## **6. Safety of personnel**

Crime, violence and faction fighting are rife throughout the whole of the Province of KwaZulu-Natal. Ensuring the safety of nursing staff, particularly during the night, is a matter of concern. Vandalism resulted in the placement of an armed guard at each center by a private security company, in consultation with the tribal leadership.

## **OTHER COMPLICATING FACTORS**

Apart from adverse working conditions, personnel have to cope with a number of complicating problems and challenges on a daily basis, caused by factors such as ignorance, carelessness and distrust. Some examples are given below:

Irrespective of extensive health education and awareness programmes, there is still much confusion among the population regarding the procedures and formulations for water purification with household bleach, and the preparation of oral rehydration fluids that have been demonstrated to them. This may be attributed to cultural differences, distrust and a reluctance to adapt to higher living standards.

Very few SAMHS personnel can speak or understand the Zulu language, which causes severe communication problems.

In rocky areas, pit latrines are shallow and infected waste is washed by heavy rain into nearby rivers and streams. Inhabitants tend to believe that the water is now clean, and continue to drink such water without precaution. Some youths continue to play and swim in infected pools, streams and rivers, having been told by certain health educators that it would be safe as long as they keep their mouths closed!

Household bleach (provided free of charge) is being used for purposes other than water purification such as washing, while many inhabitants believe that water purified in this way may cause "internal" bleaching.

Clean water provided at various locations is often collected in contaminated containers.

Despite on-going health education, poor standards of personal hygiene persist. Inhabitants continue to prepare food with soiled hands, while the habit of several people eating simultaneously from a communal food container without using cutlery, prevails.

Political distrust causes reluctance to use water supplied by tankers, because of fear that such water may have been deliberately contaminated by opposing factions.

Large numbers of mild and asymptomatic cases occur who may remain untreated and may continue to spread the epidemic.

Some cases are infected and report for treatment more than once.

High incidences of non-bacteriological diarrhea cases are encountered during the summer rainfalls who also need to be assessed.

Mass gatherings of religious groups who perform traditional baptizing ceremonies in potentially contaminated and positively tested rivers present a constant threat of looming disaster, particularly with regard to spreading the disease to other areas. In some cases, the population were convinced to use portable swimming pools for such purpose.

Incorrect statistics as well as manipulation thereof by certain parties for political or personal gain, resulted in wrong decisions at the planning level.

Encumbering factors such as the above demonstrate the complexity of response and support operations in underdeveloped areas, and underscore the necessity of health awareness through continued education and training of the local population.

### **LESSONS LEARNED**

An extensive and comprehensive response and support operation such as described above can never be expected to proceed smoothly in all respects, and the SAMHS, together with the Department of Health, proceeded through a steep learning curve with many pitfalls and obstacles. From a SAMHS viewpoint, a number of important lessons were learned in the process, as summarized below:

1. Early involvement of the SAMHS at all levels would have resulted in more purposeful planning of acquisitions and operations.
2. A deployment period of two weeks for SAMHS personnel before they are relieved causes administrative and logistical difficulties and was subsequently extended to one month.
3. Four wheel drive ambulances are essential in remote areas with limited infrastructure.
4. Duplication and manipulation of statistics encumbers proper planning.
5. Timeous treatment with oral rehydration fluid may result in 80 - 90% of patients recovering completely.
6. Antibiotic treatment shows only moderate success owing to resistant strains.
7. The most basic requirements for preparedness are: reliable surveillance and reporting systems, availability of essential supplies, and trained workers.
8. Health education alone has little effect, but practicing the knowledge by deliberately changing an unhealthy way of life is the key to prevention of disease.
9. Command and control structures, channels and procedures for a support operation of this magnitude need to be streamlined and simplified as far as possible to avoid over-reporting and confusion, and should be supported by an HQ element with at least a 2IC, a personnel clerk and a log clerk.
10. An exit point for withdrawal should be established beforehand, to prevent military personnel being used as cheap labor ("mission creep").

### **CURRENT SITUATION AND CONCLUSION**

At the time of writing, the cholera epidemic in KwaZulu-Natal was typified as advanced, and in spite of intensive and on-going efforts by all parties concerned, appeared to proliferate. As many as 1007 new cases have been reported for a 24 hour period during March 2001. Up to 13 March 2001, a total of 69761 cases have been reported for the region, of which 139 have died, indicating a case fatality ratio of 0.199 %, while 660 patients were still in hospital at that stage. The low case fatality ratio indicates a very high standard of support by the SAMHS to the Department of Health during the whole period, despite extremely difficult operational conditions and circumstances prevailing in the affected areas.

Finally, there is no evidence that the current cholera epidemic in KwaZulu-Natal originated outside the borders of South Africa. However, increasing globalization and its possible effect on the spread of disease across international borders may have significance for the overall theme of this Symposium, particularly with reference to planning of emergency preparedness and response programmes throughout the world. This is borne out by the spread of foot-and-mouth disease through large parts of Europe and the UK during the past two months, and failure by international authorities to install timeous precautionary measures against such events may eventually result in global catastrophe. It is hoped that the CBMTS-

Industry II Symposium will enhance international awareness and co-operation, and thereby contribute towards the prevention of looming disaster.

## REFERENCES/ACKNOWLEDGEMENTS

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## KEYWORDS

Cholera, health care, planning, preparedness, response

## INTRODUCTION

Cholera is an acute diarrhea disease endemic to Africa caused by *Vibrio cholerae*.

## EPIDEMIOLOGY

- Ingestion of water and food contaminated with feces of infected persons
- Epidemics characteristically explosive and abrupt, also protracted
- During warm months in endemic areas - highest incidence in children
- Reaches a peak, then subsides - temporary immunity, sub clinical cases
- May continue through contact after elimination of contaminated water

## HISTORY AND BACKGROUND

- Seven cholera pandemics since 1817
- Seventh pandemic originated during 1958 in Indonesia, spread to Mainland Asia, Middle East, Africa and Europe
- South Africa at risk in 1971 - sporadic outbreaks between 1980 and 1987, facilitated by:
  - Hot, humid summers
  - Over-crowded communities
  - Low standards of sanitation and scanty and unprotected water supplies in certain areas
- Current South African epidemic
  - KwaZulu Natal north coast, August 2000
  - 1,8 million inhabitants at risk
  - Over 4000 cases reported by end October 2000, 22 fatalities
  - SAMHS involvement since October 2000

## **SOCIO-ECONOMIC AND ENVIRONMENTAL PROFILE OF AFFECTED AREAS**

Two major areas affected, viz:

- Lower Umfolozi district (Empangeni)
- Eshowe/Nkandla district

### **AREA MAP**

Affected areas are deprived and poverty- stricken

- Lack of economic activity
- Overpopulation
- Illiteracy
- Unemployment
- Crime, violence, political unrest, faction fighting
- HIV/AIDS
- Overburdened infrastructure (Education, health care, water, sanitation)
- National economy in transition unable to provide adequate services

### **PLANNING AND EXECUTION**

- Establishment of JOCC's
- Assessment
- Prioritization
- Acquisition
- Deployment
- Establishment of Rehydration Centres
- Provision of ambulances, water tankers and containers
- Record keeping
- Continued health education

### **REHYDRATION CENTRES**