

# Outbreak of Meningococcal Infection amongst Soldiers Deployed in Operations

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## Abstract

**Background:** Meningococcal infection may lead to life threatening meningitis and fulminant meningococcal sepsis. Sporadic cases of meningococcal infection have been reported in soldiers but no outbreak in soldiers has been reported earlier from India. This outbreak in soldiers serving in counter insurgency role under field setting was effectively controlled without compromising their operational commitment.

**Methods:** This is an epidemiological investigation and control of an outbreak of meningococcal infection, bringing out the predisposing factors and highlighting the role of early diagnosis and management of cases. Mass chemoprophylaxis in contacts was used as an effective control measure in the absence of vaccine in this institution based outbreak.

**Result:** Out of a total of 17 cases reported, 14 presented as meningitis and three as meningococemia. Two cases of meningococemia ended fatally. Serogroup A of *Neisseria meningitidis* was responsible for this outbreak. Gross over-crowding was the predisposing factor.

**Conclusion:** An outbreak of meningococcal infection in soldiers deployed in counter- insurgency role was effectively contained using mass chemoprophylaxis in the absence of meningococcal vaccine.

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**Key Words :** Meningitis; Meningococcal infection; Outbreak; Soldier

## Introduction

Meningococcal disease occurs worldwide as isolated (sporadic) cases, institution or community-based outbreaks and in the form of large epidemics. Meningococcal infection can lead to two life threatening conditions i.e. meningitis and fulminant meningococcal sepsis (FMS). Without epidemics, one million cases of bacterial meningitis are estimated to occur with at least two lakh deaths globally every year. About three lakh cases and 30,000 deaths are estimated to occur due to meningococcal infection. In India, outbreaks have been reported from different parts in 1985, 2000 and 2005-2006 [1-4]. Between 01 Feb and 26 May 2006, 17 cases of meningococcal infection were reported amongst soldiers deployed in Kashmir.

## Material and Methods

This is an observational, epidemiological study amongst soldiers deployed in field setting. The index case was reported from a training institute on 01 Feb 2006. A suspicion of an impending outbreak of meningococcal meningitis was considered, awaiting lab confirmation. When the second case occurred on 03 Feb, the outbreak was confirmed. The case definitions adopted were as given by WHO [5]. A "suspected" case as one with fever with stiff neck or petechial or purpur

rash or both. "Probable" case was defined as a suspected case with turbid cerebro-spinal fluid (CSF) with or without positive Gram stain in ongoing epidemic. A "confirmed" case was any suspected or probable case and either positive CSF antigen or positive culture. Ongoing passive surveillance using case definition for a suspect case was established and instructions for early institution of antibiotics were issued to all units. Epidemiological case sheets were developed and data collected on all cases. The cases were studied for their distribution in time, place and person; data collected and analyzed. A detailed study of their living conditions was done and a list of close contacts prepared. Data on prevailing meteorological conditions was collected. On 04 Feb 06, a team comprising of a community medicine specialist, health assistant, laboratory assistant and an ENT operating room assistant visited the training institute to carry out investigation. A portable incubator was also carried to ensure safe transport of the specimen as ambient temperature was low. All the contacts of two cases were segregated, examined, and throat swabs collected. They were administered chemoprophylaxis after collecting throat swab samples. Chemoprophylaxis was done by using rifampicin 600 mg twice a day for two days to close contacts. Others in the unit or subunit were administered ciprofloxacin 500 mg stat. A close contact was defined as any person who stayed in the same room, bunker or was in contact with the case being his

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buddy or friend and health care workers.

Previous morbidity data was reviewed from the records available. A health awareness drive was also organised highlighting the signs and symptoms of disease with preventive measures to be taken by the troops. On occurrence of any case, all the contacts were identified, segregated, administered chemoprophylaxis and put under medical surveillance for ten days. All units reporting suspected / probable case were visited by health staff of concerned formation and necessary instructions on preventive measures instituted, including chemoprophylaxis.

Over crowding was tackled by dispersal and head to foot arrangement of beds. Ventilation was improved by keeping doors and windows open during day. The barracks reporting cases were mopped with 2.5 % cresol and fumigation was done. All healthcare providers were also given chemoprophylaxis besides adopting standard precautions as applicable in preventing droplet infections. The laboratory investigation of the cases included routine blood count, examination of CSF for cytology, biochemistry, Gram stain and culture. Examination of skin smear from purpuric spots to demonstrate Gram negative diplococci was done in one case and was positive. The throat swabs were inoculated on blood and chocolate agar media and incubated at 35°C in presence of 5 to 10% CO<sub>2</sub>. The gram negative colonies were then subjected to oxidase test and further confirmed by testing for biochemical utilization of sugar. Three samples of culture isolate were sent to All India Institute of Medical Sciences, Delhi for serotyping. All admitted cases were discharged only after throat swab cultures tested negative for *Neisseria meningitidis*.

**Results**

All the cases were from locations at an altitude of around 3000- 5000 feet. The weather conditions were late winters to early spring. The relative humidity was recorded from 74 % to 85 %. There were no reports of a similar outbreak amongst army personnel in the past in the same geographical area or amongst the civil population during the same period.

There was considerable overcrowding in the training institute where focal outbreak occurred. A total of 2976 troops were accommodated whereas the living accommodation was designed to cater for only 2227 troops. The deficiency was limited to trainee accommodation (Tables 1, 2). Moreover the use of double bunk beds reduced the available per capita air space and air volume. Lack of any heating appliances led to huddling up by the soldiers. Amongst sporadic cases in field setting, gross overcrowding and poor ventilation was noted in most cases. There was an overall deficiency of 34% in living accommodation and cots were deficient by 50% (Table 1). This was further aggravated due to poor and inadequate ventilation. On study of a barrack, it was revealed that per capita floor space was 30-36 sq ft as against recommended 50 -100 sq ft and air space available was 300- 350 cubic ft as against minimum laid down air space 500-1000 cubic ft per capita. The bed to bed distance was 0 to 3.4 feet as against a minimum of 6 feet. Windows and doors were kept closed due

to cold weather, further compromising ventilation. Window space was much below desired standard of minimum of 10% of floor space. The available window space was only 48 square feet against a desired minimum of 86 square feet in a room of 864 square feet.

**Distribution of Cases**

The entire outbreak lasted for about four months, from 01 Feb to 26 May 2006 (Fig. 1). The focal outbreak lasted for 19 days only while sporadic cases continued upto 26 May 06. The first ten cases were clustered in time and space, probably forming a part of the initial outbreak. Out of total 17 cases reported, a cluster of six were from a training establishment and 11 were sporadic coming from different locations. In the focal outbreak at training establishment, all six cases were from adjacent barracks. Sporadic cases did not give history of contact with cases or their contacts from the site of focal outbreak. However, four cases reported from a general area lying along a common axis, shared distribution in time and space with the focal outbreak. Out of 17 reported cases, 15 were young trained soldiers (21- 26 years of age).

**Clinical Profile**

Out of 17 cases reported, 14 (82.3%) presented as meningitis and three had features of meningococcal septicemia (fulminant meningococcal sepsis). All cases of meningitis had headache, fever and signs of meningeal irritation (Table 3). Three cases presenting as meningococemia had features of coma, hypotension, seizures and petechial rashes (Fig.2). One case developed features of Waterhouse-Friderichsen Syndrome and died (Fig.3). Late reporting in another case of fulminant meningococemia led to fatal outcome. Timely reporting in one case of meningococemia,

**Table 1**  
Summary of accommodation state and bed deficiency in the Training Institute

Course	Accommodation		Bed	
	Available	Deficient	Available	Deficient
CTC (RR)	948	312	672	588
CTC (OA & S)	280	70	300	50
UTT	40	14	50	04
GARUD & MARCOS	54	06	60	0
PIT Units	576	324	70	830
Adm & Staff	329	23	352	0
<b>Total</b>	<b>2227</b>	<b>749</b> (34%)	<b>1504</b>	<b>1472</b> (50%)

**Table 2**  
Accommodation and deficiency in Barracks reporting cases (Focal outbreak)

Barrack No.	Capacity	Accommodated	Available beds	Remarks
T-68	112	152	112	I <sup>st</sup> case
T-70	112	160	32	II <sup>nd</sup> case
T-69	112	135	32	III <sup>rd</sup> case
T-116	112	112	112	V <sup>th</sup> case
T-49	96	130	70	IV <sup>th</sup> &VI <sup>th</sup> case

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