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## Incidence of Hepatitis A Virus Infection among an Italian Military Population

**Summary:** In 1990, a prospective serological survey to estimate the rate of clinical and inapparent infection with hepatitis A virus (HAV) was performed in a cohort of 1,268 soldiers, 18–24 years old, during an 8 month period in the Campania region in Italy. At the time of enrollment 318 (25%) of the 1,268 soldiers were positive for total antibodies to HAV (anti-HAV). None of them was positive for IgM anti-HAV. Among the 950 susceptible subjects who were followed up for 8 months, eight (0.8%) later seroconverted to anti-HAV positivity. This figure corresponds to an incidence of 1.3/100 person/years (eight seroconversions during 633.3 years of observation). There were two clinical (with presence of IgM-anti-HAV) and six inapparent infections. The clinical/subclinical HAV ratio was 1 : 3. These findings indicate that the risk of HAV infection among soldiers residing in this area is not negligible.

### Introduction

In Italy the type-specific hepatitis surveillance system has shown an impressive drop in the incidence of notified viral hepatitis A cases from 10/100,000 in 1985 to 2/100,000 in 1990 [1]. However, reported cases of hepatitis A, as well as of other types of viral hepatitis, underestimate the true incidence of infection as a consequence of underreporting and subclinical infections.

Because incidence figures for hepatitis A virus (HAV) infection (clinical and subclinical) are not available for young Italian subjects, in the present study we have assessed the incidence of HAV infection in a cohort of 18–24 year-old Italian soldiers followed up for 8 months.

This cohort seemed to us a good target population because soldiers can be followed up for a given time without substantial drop-out.

### Materials and Methods

The study population consisted of healthy subjects aged 18–24 years belonging to the Air Force Non-Commissioned Officers (NCO) School, located in the Campania region, where HAV has been reported to be endemic in the past and where other oral-faecal transmitted infectious diseases, such as typhoid fever, are still endemic as a consequence of hazardous dietary habits and inadequate sewage treatment facilities, combined with lack of sanitation in the harvesting and marketing of shellfish [2].

To be admitted to this military school applicants should have a middle-school certificate. They must also pass a thorough physical examination and psychological tests. The number of subjects entering the follow-up study was 1,268. None of them was lost during the follow-up period. Subjects were from central and southern Italy.

*Study design:* After informed consent, blood specimens were taken from all participants at the beginning of the study (within 3 weeks after entering the barracks) and 8 months later.

Sera were frozen and stored at  $-20^{\circ}\text{C}$  for later analysis. In these two phases structured interviews were also held to obtain demographic and behavioral information on living and social habits.

The study period was 15 October 1990 through 15 June 1991.

*Serological assay:* All sera were tested for total anti-HAV antibodies by commercial immunoassay (HABA EIA, Abbott, IL).

Sera from subjects who showed anti-HAV seroconversion during the study period were additionally tested for the presence of anti-HAV-IgM by HAVAB MEIA (Abbott).

*Analysis:* The prevalence of hepatitis A was defined as the proportion of individuals having hepatitis A antibody in the first phase sample. The incidence of hepatitis A was the percentage of individuals who were initially negative for hepatitis A antibodies and who converted to positive between the first and the second phase samples.

Symptoms related to clinical hepatitis were recorded by a military physician. Subclinical hepatitis was defined by the development during the study period of anti-HAV in a hepatitis A susceptible individual in the absence of specific clinical signs.

### Results

#### *Prevalence of Anti-HAV*

At the time of enrollment 318 (25%) of the 1,268 soldiers included in the study were positive for total anti-HAV. None of them was positive for IgM anti-HAV.

#### *Incidence of HAV*

Of the 950 initially susceptible soldiers who were followed up for 8 months, eight (0.8%) later seroconverted to anti-HAV positivity. This figure corresponds to an incidence of 1.3/100 person/years (eight seroconversions during 633.3 years of observation). There were two clinical cases with IgM anti-HAV positivity and elevated aminotransferase levels, and six inapparent infections. These latter subjects were positive for total anti-HAV but negative for IgM anti-HAV (Table 1); they had normal aminotransferase levels. Thus the clinical/subclinical ratio was 1 : 3 (Table 2). All of the eight soldiers had slept and eaten in different rooms. None of them reported risk factors for acquisition of HAV.

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Table 1: Prevalence and incidence of hepatitis A virus infection among soldiers aged 18–24 years in Italy in an 8-month follow-up study 1990–1991.

Serological status	Prevalence (No. tested 1,268) (No. positive [%])	Incidence 8-month follow-up (No. susceptible 950) (No. positive [%])	Rate/100 Person/years exposure
Anti-HAV total	318 (25%)*	8 (0.8%)**	1.3

\* No subject was IgM anti-HAV+; \*\* two subjects were also IgM anti-HAV+.

Table 2: Correlation of clinical and serologic HAV attack rate among soldiers in the Campania region, 1990–1991.

Seroconversion rate (%)	No. of clinical cases	Clinical cases among seroconversions (%)
8/950 (0.8)	2	2/8 (25)

Clinical/subclinical ratio = 1:3.

## Discussion

Data from a nation-wide type-specific surveillance system [1] as well as from a recent survey in children and teenagers [3] have shown that at present the spread of HAV infection in Italy is low, as a consequence of remarkable improvements in socioeconomic conditions as well as in the standards of hygiene. Further confirmation comes from a recent survey in a national sample of 1,000 Italian Air Force recruits aged 18–26 years, which showed a prevalence rate of 29.4% anti-HAV positivity [4], much lower than the corresponding figure (66.3%) observed in a similar study on a

national sample of 5,005 navy recruits aged 18–26 years performed in 1981 [5].

This changing epidemiological picture results in fewer children coming into contact with the virus and developing immunity after an anicteric or asymptomatic infection. The adult population thus becomes susceptible to a clinically more severe and debilitating infection.

The risk of exposure to hepatitis A has generally been found to be higher in military personnel than in civilian populations, because of risk factors characteristic of military populations, such as communal living conditions and assignment to endemic areas [6–7].

In the present study we have found a not negligible HAV-infection rate (1.3/100 person/years), which may not have been influenced by the socioeconomic status of the air force recruits, since all these subjects belong to the middle class on the basis of years of schooling.

However, we think that these figures cannot be applied to the entire Italian Armed Forces as the barracks we studied are located in an Italian region (Campania) where oral-fecal transmitted infectious diseases are still endemic, as a consequence of hazardous dietary habits combined with poor sanitation in the harvesting and marketing of shellfish [2]. In contrast, the majority of Italian soldiers are located in regions (north-eastern Italy) where enteric infectious diseases have virtually disappeared [8].

This study also provides the first data in an adult Italian population of the ratio of clinical to subclinical infection. Our data are in agreement with findings (four clinical cases out of 12 seroconversions) of *Beasley* in Taiwan among 704 susceptible university students during 3½ years of follow-up [9], confirming that HAV is a more prevalent disease among adults as compared to children.

**Zusammenfassung: Inzidenz der Hepatitis A Virus Infektion bei einer italienischen Militärpopulation.** Um die Rate der klinischen und subklinischen Infektionen mit dem Hepatitis A Virus (HAV) zu bestimmen, wurde 1990 eine prospektive serologische Überwachungsstudie bei 1268 18–24 Jahre alten Soldaten während einer Zeitspanne von acht Monaten in der Region Campagna, Italien, durchgeführt. Bei Aufnahme wiesen 318 der 1268 Soldaten (25%) Antikörper gegen HAV (anti-HAV) auf. Keiner war positiv für IgM anti-HAV. Unter den 950 empfänglichen Soldaten, die acht Monate lang beobachtet

wurden, traten acht Fälle von Serokonversion zu anti-HAV auf (0,8%). Diese Zahl entspricht einer Inzidenz von 1,3/100 Personen/Jahr, (acht Serokonversionen während 633,3 Beobachtungsjahren). Zwei Infektionen wurden klinisch manifest (mit Nachweis von IgM anti-HAV) und sechs Infektionen verliefen klinisch inapparent. Die Rate klinischer zu subklinischen HAV-Infektionen betrug 1 : 3. Diese Daten zeigen, daß das Risiko für Soldaten, die in dieser Region wohnen, nicht zu vernachlässigen ist.

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