

# The Changing Epidemiology of Viral Hepatitis A in Israel

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## Abstract

**Background:** Between 1970 and 1979, there was an increase in the incidence of viral hepatitis in Israel with a shift of peak incidence to an older age in the Jewish population, followed by a declining trend during the early 1980s. In July 1999 universal immunization of infants against hepatitis A was introduced.

**Objective:** To evaluate the changes in the epidemiology of viral hepatitis A in Israel during the past decade.

**Methods:** Viral hepatitis is a notifiable disease in Israel and cases are reported to the regional health offices, which in turn provide summary reports to the Ministry of Health's Department of Epidemiology. The data in this study were derived from the summary reports and from results of seroprevalence studies.

**Results:** Following the increase in the incidence of reported viral hepatitis (mainly due to type A) between 1970 and 1979, the rates then stabilized and around 1984 began to decline until 1992. Since then there has been a slight increase. Whereas until 1987 the rates were consistently higher in the Jewish population, since then they are higher in the Arab population. The shift in the peak age-specific incidence from the 1–4 to the 5–9 year age group observed in the Jewish population around 1970 occurred 20 years later in the Arab population. The previously described seasonality is no longer evident. Recent seroprevalence studies indicate that by age 18 years only about 30–40% of the Jewish population have anti-hepatitis A antibodies.

**Conclusions:** The decline in the incidence of hepatitis probably reflects the changing socioeconomic condition occurring at different times in the two major population groups. Since hepatitis A accounts for almost all the acute viral hepatitis in Israel, the universal vaccination of infants introduced in 1999 should substantially lower the morbidity within the next few years.

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The results of active surveillance indicate that hepatitis A virus is responsible for the majority of clinical cases [4,5]. In a previous review [3] it was observed that after long periods of relatively stable incidence rates, the incidence of viral hepatitis increased between 1970 and 1979. This increase was accompanied by a shift in peak incidence in the Jewish population from age group 1–4 years to 5–9, which occurred around 1971. In the Arab population, the peak incidence remained in the age group 1–4 years.

Recent surveys showed that the prevalence of HAV antibodies among young adults in the Jewish population has declined markedly [6–8], indicating reduced exposure to the virus during early childhood. Since the clinical to sub-clinical case ratio increases with age [9], one would expect a corresponding increase in the proportion of clinically recognized cases. The reduction in the prevalence of antibodies in young adults implies that a larger percentage of the population remains susceptible to infection at a later age, with more severe morbidity and complications than observed in children.

In July 1999 the Israeli Ministry of Health introduced a universal program of immunization against hepatitis A for infants aged 18 months. In the present study, trends in the reported incidence of viral hepatitis by age in the different population groups in Israel were assessed during the period 1963–1998. The aim of this study was to update trends in the overall and age and population group-specific incidence of the disease. This will be used as a baseline to compare incidence rates before and after the introduction of the hepatitis A immunization program.

## Sources of data

Viral hepatitis is a notifiable disease in Israel. Since 1992, viral hepatitis A has been reported separately from other types. Data on the incidence of all viral hepatitis between 1963 and 1998 were extracted from routine reports of the Department of Epidemiology in the Ministry of Health [10]. Data by population group (Jews and Arabs) were available for the period 1963–98. The rates for the population were computed using the annual average population as the denominator. Age and population group-specific rates were estimated using the

Viral hepatitis has long been known to be highly endemic in Israel [1–3] and the incidence of reported cases has varied around five to ten times that observed in the United States [3].

HAV = hepatitis A virus

corresponding specific annual average population sizes. The source of the population size data was the Israel Central Bureau of Statistics.

The data for the comparisons with the United States were obtained from the summary of notifiable disease [11]. Comparisons with the European countries were based on the World Health Organization's Health for All database [12].

**Results**

**Secular trends in incidence**

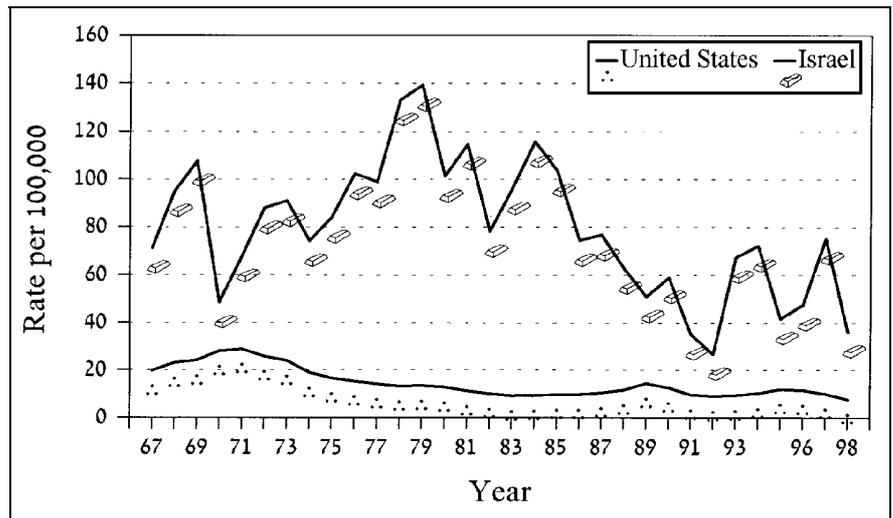
The overall incidence rates for viral hepatitis in Israel and for the United States between 1951 and 1998 are presented in Figure 1. As previously observed in Israel, the relatively stable rates between 1951 and 1970 were followed by an increase in the incidence to a peak in 1979 [3]. The incidence then stabilized and around 1984 began to decline steadily until 1992 when it was about 20% of that observed in 1979. Since 1992 there has been a slight increase and the 1997 rate was similar to that in 1987. Since 1992, the Ministry of Health's Department of Epidemiology has reported cases of viral hepatitis by type, and this has shown that more than 90% of all cases are type A [10]. This observation has been confirmed in reports from active surveillance in the military [4] and in sentinel reporting in the civilian population [5].

In the 1960s and 1970s the incidence of hepatitis in Israel was about four times higher than that of hepatitis A in the United States. It increased to about tenfold higher during the peak in 1979, and returned to about four times higher in 1998. A comparison of the incidence rates in Israel with selected European countries in 1996–97 is shown in Figure 2. The rates in Israel were more than ten times that of the average for the European Union, but lower than those of most central and eastern European states.

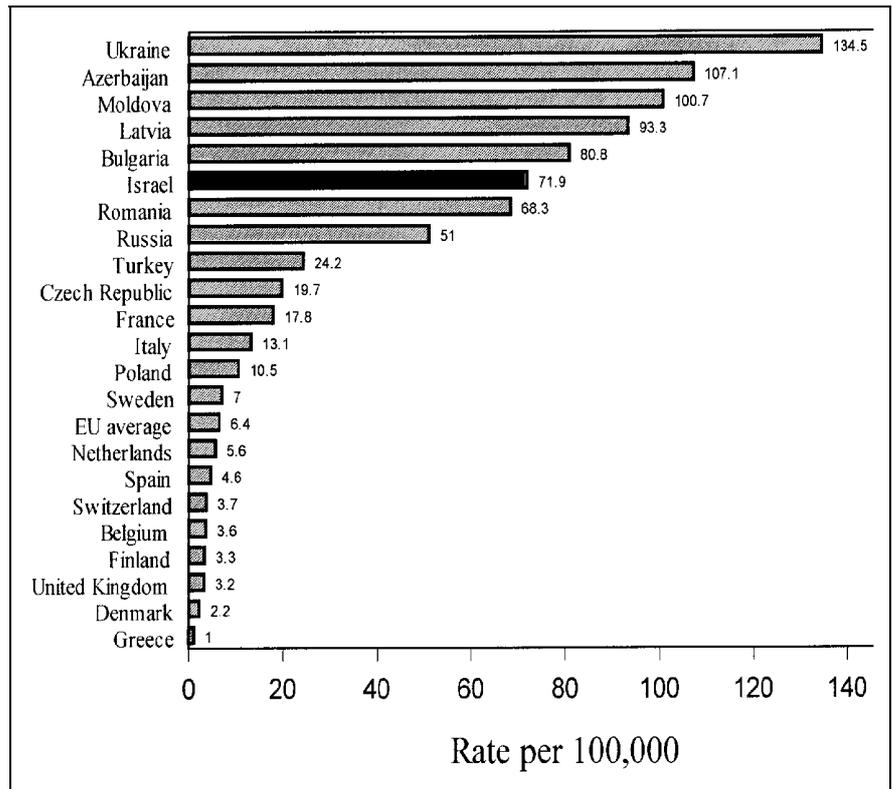
**Population group differences**

A comparison of the incidence rates between the Jewish and Arab population groups is shown in Figure 3. Until 1987 the incidence rates were consistently higher in the Jewish population, particularly between the years 1972 and 1982. The gap then began to narrow, largely due to a decline in rates in the Jewish population, but also due to a

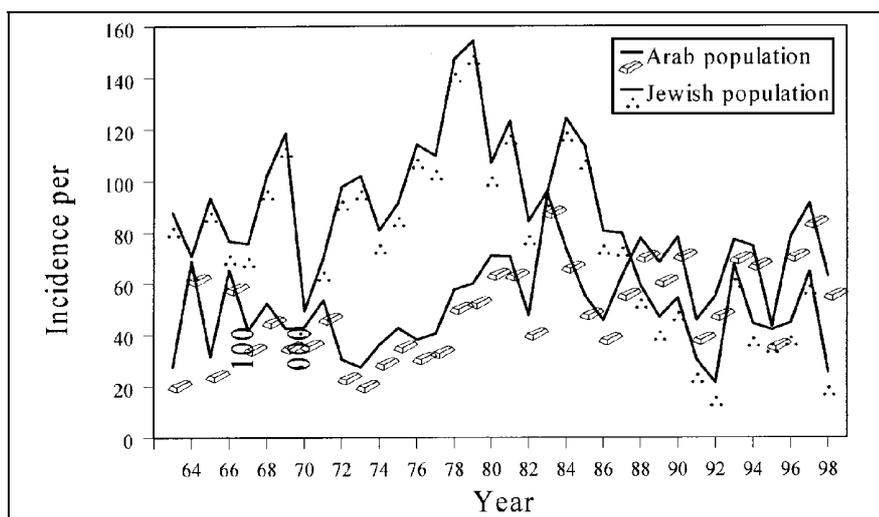
gradual increase in rates in the Arab population (the rates in the latter group doubled between 1972 and 1988). In 1988, for the first time, the rates in the Arab population exceeded those of the Jewish population and this has persisted until 1998 (the last year for which data were available).



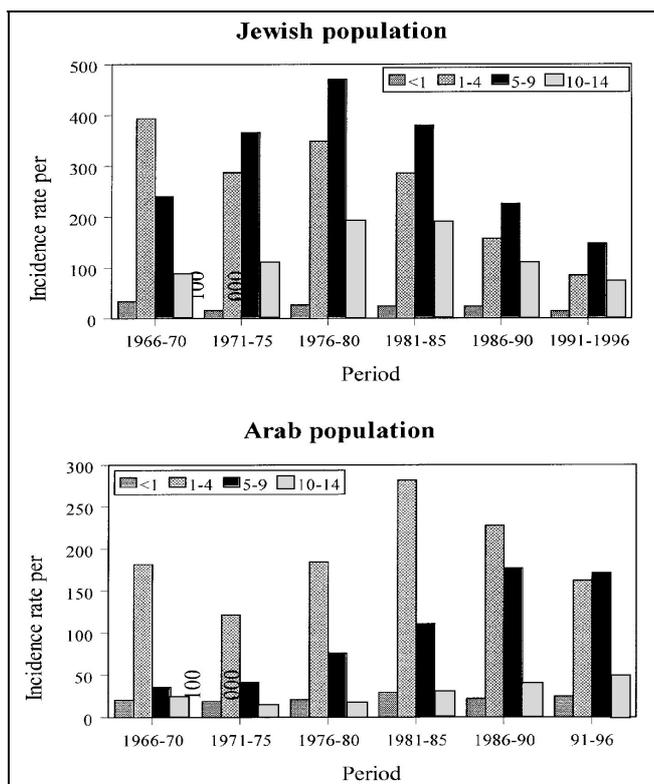
**Figure 1.** Incidence of viral hepatitis per 100,000 in Israel and the United States (type A only) during 1967–98.



**Figure 2.** Incidence of viral hepatitis A per 100,000 in Israel compared with selected European countries in 1996–97.



**Figure 3.** Incidence of viral hepatitis per 100,000 in Israel during 1963–98 by population group.



**Figure 4.** Age-specific incidence of viral hepatitis per 100,000 in Israel during 1966–96 by population group.

### Age-specific trends

Selected age-specific rates for Jews and Arabs up to age 14 years are given in Figure 4 (the rates for the ages above 15 are not shown but are considerably lower). Until 1970, in the Jewish population the highest rates were in the 1–4 age group, followed by 5–9 and 10–14 respectively. During 1971–75, the incidence rates for the 1–4 and 5–9 groups crossed and the highest

incidence has since persisted in the 5–9 age group. In the Arab population, the same change in peak age specific occurred around 1990 and since then the maximal incidence has also been in the 5–9 age group.

### Seasonal trends

Seasonal variation for three 5–6 year time periods between 1961 and 1996 was analyzed (data not shown). The seasonal trend, with maximum incidence in late summer and the winter months, that was clearly evident in the 1960s and 1970s has almost disappeared. In the time period 1991–96 there was almost no seasonal variation in rates.

## Discussion

### Trends in incidence

The declining trend in the incidence of hepatitis in Israel since 1987 reflects mainly a decline in the rates in the Jewish population, and follows the trend towards improved infrastructure and sanitation in particular. Although water-borne transmission of hepatitis A has been well-documented [13], water-borne outbreaks of hepatitis have almost never been reported in Israel [14] and it is unlikely that better treatment of drinking water has played a role. On the other hand, in the Arab population during the same period there has been an increase in morbidity rates. This is similar to the pattern observed in the Jewish population some 15 years earlier. The improvements in socioeconomic conditions in the Arab population is most likely accompanied by a transition period during which there will be less morbidity in the youngest age groups and greater susceptibility at an older age. Thus, while it is likely that the overall incidence will continue to decline due to continuing improvements in socioeconomic status, in the Arab population there may still be a period of increasing incidence. In general, in a region where the disease has traditionally been highly endemic, a greater proportion of the population will be susceptible to the disease, with increased risk of outbreaks in older children and adults.

### Age differences in incidence

The incidence of viral hepatitis A would be expected to decline together with improvement in socioeconomic conditions. Paradoxically, in Israel the incidence increased between 1970 and 1979. This may be explained by the parallel shift in age of peak incidence from 1–4 to 5–9 years, since infection at an older age is more likely to be symptomatic [3,9]. Even a small shift in susceptibility in the older age groups may result in a relatively large increase in reported cases. This same age shift occurred 20 years later among Arabs, accompanied by an increase in incidence. The almost complete disappearance of seasonality in the disease cannot easily be explained, but it may be associated

with the higher age at which clinical hepatitis A is now occurring.

### International comparisons

In the United States the age of maximum incidence is now 25–39, with a slight decline in incidence that occurred mainly between 1971 and 1977 [15]. This emphasizes the changing trend of morbidity in older ages. Many countries in the European region of the WHO are experiencing declines in incidence, especially in West Germany from 1965 to 1975 [16] and in Greece [17]. In general, there is evidence that rates have declined in central and northwestern Europe and to a lesser extent in Eastern Europe [12,18]. A steep decline in the incidence has also been observed in Japan [19].

### Reporting rates

During the 1960s, it was found that the reporting rate in the civilian population varied between 40 and 60% [3], with marked regional differences. The results of recent studies suggest that the current reporting rate may be somewhat lower [5,20]. In the sentinel reporting system at the Israel Center for Disease Control, the rates are about double nationally reported rates [5]. Thus, in common with similar studies in other countries, the data in this paper can be used for the examination of time trends or differences in subgroups but are severely limited for estimates of the true incidence of the disease.

### Seroprevalence studies

The prevalence among military recruits aged 18–19 years has declined from about 70% in 1980 to 60% in 1984 and about 55% in 1996 [8]. In a seroprevalence survey based on a sample of 1,200 serum samples from the Israel Center for Disease Control's national serum bank, 6% of those aged 2 years old and 27% of 16 year olds were positive for HAV antibodies (Israel Center for Disease Control, unpublished data).

There have always been large ethnic differences – with much higher prevalence in those of Eastern origin than those of Western origin – and these still persist [21]. There is evidence that the ethnic differences are partly explained by family size [22]. Among immigrants who arrived from Ethiopia, the prevalence of antibodies in young adults is likely to be close to 100% [23]. Studies of immigrants from the Soviet Union show varying prevalence rates depending on the republic of origin [24,25]. Those from the European republics have prevalence rates similar to the Israeli population, whereas those from the Asian republics have much higher rates.

### Conclusions

In conclusion, the fluctuating incidence of viral hepatitis A in Israel during the last two decades reflects the socioeconomic changes occurring at different times in the two major population groups. Vaccination of all infants against hepatitis B at birth was started in 1992. However, since type A is the cause of most viral hepatitis in Israel, this program will have a relatively

small impact on future overall viral hepatitis rates. The introduction in July 1999 of universal vaccination of infants against hepatitis A, together with increasing use of the vaccine in other age groups, should dramatically reduce the morbidity from the disease in Israel over the next few years. However, simultaneously, the peak incidence is likely to move to older age groups.

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