Under-reporting in hepatitis B notifications

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Summary

Notification and laboratory data for the period January 1985 - December 1988 were compared in order to estimate: (*i*) the minimum level of under-reporting of hepatitis B; and (*ii*) the consistency of the level of under-reporting, both regionally and nationally. Ratios between hepatitis B notifications and positive hepatitis B laboratory tests (reporting ratios) were calculated to quantify the discrepancy between these parameters. There were at least 7 positive hepatitis B laboratory results for each notified case of hepatitis B during each year studied. The differences between the national reporting ratios for each of the study years were small, indicating that nationally the level of reporting of hepatitis B is fairly consistent. The Cape region had the highest and most constant level of hepatitis B reporting compared with other regions. We conclude that the national incidence of hepatitis B is at least 7 times higher than that calculated from notification data. Further, the inter-year analysis of hepatitis B notification data to identify trends nationally and within the Cape region is valid. However, caution is called for when comparing the incidence rates between regions due to inter-region and region-specific inter-year inconsistencies in reporting levels.

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The endemic nature of hepatitis B, with its concomitant high mortality rate, was clearly identified by the incisive analysis of national surveillance data even before the causative agent was discovered.[1] Voluntary notification by health care providers, known as passive surveillance, exists in some form in many countries including South Africa.

An analysis of hepatitis B notification data by Viljoen[2] revealed an average incidence rate of 0,73 per 100 000 population per annum in South Africa for the period 1980 - 1987. Furthermore, the highest incidence rate for hepatitis B was found in the Cape Province.

Under-reporting in passive surveillance systems may lead to inaccurate and unreliable notification data.[3] Notwithstanding this problem, and assuming that the level of under-reporting remains reasonably constant, data generated by passive surveillance systems can be useful in identifying trends.[3] To obtain any meaningful incidence rates and trends from notification data, it is important to estimate both the level of under-reporting and the consistency of these levels.

Another, generally under-utilised, source of surveillance data comes from routine diagnostic laboratories. Referring to public health, research and diagnostic laboratories at universities, the Centers for Disease Control and large hospitals in the USA, Evans[4] concluded that the '. . . consolidation and utilization of information from these various sources represent the best ongoing method for surveillance of viral infections'.

The National Institute for Virology (NIV) collates routine diagnostic hepatitis B data from 7 virology laboratories (the NIV and 6 virology laboratories attached to medical schools) in South Africa that offer this serological test, while the Department of National Health and Population Development collates all notifications of hepatitis B. Laboratory and notification data are published monthly in the *South African Virus Laboratories: Surveillance Bulletin* and *Epidemiological Comments*, respectively.

The objectives of this study were to estimate the minimum level of under-reporting of hepatitis B and to investigate the consistency of the level of under-reporting at national and regional levels.

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Methods

Sources of data

The number of hepatitis B notifications for 1985,[5] 1986,[6] 1987[7] and 1988[8] were collated from published data. The data for 1985 and 1986 represent notifications received and computerised by 21 February 1986 and 20 February 1987, respectively, while the data for 1987 and 1988 represent notifications received and computerised by 12 July 1988 and 25 July 1989, respectively.

Information on the number of positive hepatitis B laboratory tests was collated from 44 issues (February 1985 - January 1989) of the *South African Virus Laboratories: Surveillance Bulletin.*[9]

The virology laboratories that contribute to the *South African Virus Laboratories: Surveillance Bulletin* were requested to provide guestimates of the proportions of their reported positive results, which are repeat specimens, in an attempt to obtain a crude estimate of the extent of double counting in the laboratory data.

Analysis of data

The data were collated and analysed for each 12-month interval (January - December) for the 4-year period from January 1985 to December 1988 according to geographically defined regions. Since the two sources presented data for differing geographically defined areas, comparable regions were produced by aggregating data from existing categories.

With regard to hepatitis B notifications, data for the Natal region were obtained by combining available data from Natal, KwaZulu and Transkei. Similarly, data for the Orange Free State (OFS) region were obtained by aggregating data from OFS and Qwa-Qwa; those for the Transvaal region from southern Transvaal, northern Transvaal, Gazankulu, Lebowa, KaNgwane, Venda, Bophuthatswana and KwaNdebele; and those for the Cape region from eastern Cape, western Cape, northern Cape and Ciskei.

With regard to the number of positive hepatitis B laboratory results, the data for the Transvaal region were obtained by combining data from the NIV, the Medical University of Southern Africa and the University of Pretoria, while the data for the Cape region were obtained by aggregating the data from the Universities of Cape Town and Stellenbosch. The data for the Natal and OFS regions were obtained without further collation.

Laboratory data were adjusted using the mean of the guestimates of the extent of double counting. Ratios between hepa-

titis B notifications and positive hepatitis B laboratory results (reporting ratios) were calculated at both regional and national levels to quantify the difference between the numbers of notifications and positive serological tests.

Results

The guestimates of the proportion of double counting in the laboratory data varied from negligible to 20%. The mean of the guestimates was 10%.

Nationally, there was 1 notified case of hepatitis B for every 7 positive hepatitis B laboratory results for the entire study period. The national and regional reporting ratios for each year from 1985 to 1988 are shown in Table I.

The annual national reporting ratios varied between 1:7 and 1:9. At the regional level, the reporting ratios ranged from 1:5 to 1:9 in the OFS, 1:7 to 1:13 in Natal and 1:14 to 1:25 in the Transvaal. The reporting ratio for the Cape was 1:3 in each year studied. With regard to inter-region differences for the entire 4-year period, the Transvaal reporting ratio was substantially lower than all other regions and the Cape reporting ratio was the highest.

Discussion

There were 7 times more positive hepatitis B laboratory results than hepatitis B notifications during each of the 4 years studied. This ratio provides a crude estimate of the level of under-reporting of hepatitis B, which is similar to that found in a study of reporting rates in the USA, where a review of the discharge records of 11 hospitals in Washington, DC, revealed that only 11% of cases of viral hepatitis were notified.[10]

The differences between the national reporting ratios for each of the study years were small indicating that nationally the level of reporting of hepatitis B is fairly consistent. Hence, analysis of the hepatitis B notifications could provide useful information on trends in the incidence of this disease.

Regional comparisons demonstrated marked differences in the level of under-reporting. The Cape region had the highest and most constant level of hepatitis B reporting, while the Transvaal region had the lowest level of reporting. The Transvaal and Natal regions had erratic levels of reporting with a distinctly different ratio for at least one of the years within the study period.

The marked differences in the level of reporting between regions may spuriously create considerable inter-region differences in incidence rates. It is essential therefore that differences in the reporting level be taken into consideration when comparing, between regions, the hepatitis B incidence rates calculated from notification data.

These conclusions must be tempered by consideration of the accuracy of the notification and laboratory data and the validity of the comparisons between these two sources of data.

Accuracy of notification data

The accuracy of notification data may have been influenced by the dates on which the data were produced, the so-called 'run-dates'. Although the run-dates differed for each of the years because of the unavailability of standardised annual data, there was an interval of at least 8 weeks between the end of each year and the run-date. After this period the increase in the number of notifications was small, mainly affecting the data for November and December. In our opinion, the use of data that were not generated on a standard run-date would affect our results, at most, minimally.

Accuracy of laboratory data

The problem of 'double counting', i.e. repeat positive laboratory results on patients found to be positive by previous serology, was partially overcome by adjusting the laboratory data using the guestimates of double counting. Until all virology laboratories develop mechanisms to identify patients who have had positive hepatitis B serology before, little can be done to circumvent this limitation. Since this study uses these data to develop crude estimates of the level of under-reporting, this rough method of adjusting the laboratory data can be considered adequate.

Data from privately owned laboratories and the South African Institute for Medical Research were unavailable and could not be included in the analysis. If these data were included the number of positive hepatitis B laboratory tests would be greater than those reported here and this would have the effect of increasing the reporting ratios. The reporting ratios derived from the available data are therefore minimum estimates.

TABLE I. RATIOS OF HEPATITIS B NOTIFICATIONS TO POSITIVE HEPATITIS B LABORATORY TESTS FOR EACH REGION FROM 1985 TO 1988

Region	Data source	1985	1986	1987	1988	Total
Natal	Notified cases	85	71	128	107	391
	Laboratory test	787	889	887	886	3 449
	Reporting ratio	1:9	1:13	1:7	1:8	1:9
OFS	Notified cases	9	12	9	14	44
	Laboratory test	50	59	77	108	294
	Reporting ratio	1:6	1:5	1:9	1:8	1:7
TVL	Notified cases	79	81	58	78	296
	Laboratory test	1 212	1 389	1 433	1 125	5 159
	Reporting ratio	1:15	1:17	1:25	1:14	1:17
Cape	Notified cases	158	171	221	258	808
	Laboratory test	548	526	688	876	2 638
	Reporting ratio	1:3	1:3	1:3	1:3	1:3
National	Notified cases	331	335	416	457	1 539
	Laboratory test	2 597	2 863	3 085	2 995	11 540
	Reporting ratio	1:8	1:9	1:7	1:7	1:7

The number of positive laboratory tests were adjusted by 10% to reduce the effect of double counting.

At regional level, falsely lowered reporting ratios may result from a laboratory that produces a substantial number of positive hepatitis B results on patients from a region other than the one in which it is located. While this does occur, it involves only a few specimens (S. Johnson, NIV — personal communication).

The number of laboratories in any region will have an influence on the number of positive results obtained from that region and hence on the reporting ratio. We were unable to quantify this effect and therefore did not attempt to take it into account when comparing inter-region reporting ratios.

Validity of comparisons between notification and laboratory data

The regional categories created by aggregating existing categories of data may not be strictly comparable. This problem may influence inter-region, but not inter-year, reporting ratio comparisons slightly.

Since the different types of viral hepatitis infections are clinically indistinguishable, serology is essential for diagnostic purposes and clinicians with access to laboratory facilities tend to utilise them. Hence, the laboratory data include a large proportion of the clinical cases of hepatitis B being seen in the health care service that has good access to virology laboratory facilities. This is the basis of the comparisons between the laboratory and notification data.

There is an important caveat in the interpretation of these comparisons, viz. laboratory data also include results from individuals who do not have clinical hepatitis but are routinely screened for hepatitis B, e.g. health care workers, patients on haemodialysis and organ or cell donors.

The presence of immunoglobulin M antibody to hepatitis B core antigen could be used as a marker to identify patients with acute[11] and chronic[12] hepatitis. It is, however, not uniformly present in all patients with acute hepatitis[13] and the test is not routinely done or reported by all virology laboratories. This marker is, therefore, not very useful for the purposes of this study. Furthermore, there are no other readily available mechanisms or markers to differentiate between hepatitis B carriers and patients with clinical hepatitis in the laboratory data.

Legislative requirements for notification of hepatitis B do not draw a distinction between clinical disease and asymptomatic carriers; the decision on whether to notify asymptomatic hepatitis B carriers rests with the doctor (H. G. V. Küstner — personal communication). Sixty doctors, constituting a random sample of doctors from King Edward VIII Hospital, Durban, were questioned and 93% said that they would report an asymptomatic hepatitis B carrier (unpublished data). It is therefore legitimate to compare notifications with laboratory data even though the latter would include persons who are asymptomatic.

Conclusion

To the best of our knowledge, the methods for estimating the level of under-reporting that were devised for this study have not been reported previously. These methods are particularly useful because they utilise readily available sources of data and may, with some constraints, be applicable to other notifiable conditions, such as poliomyelitis and rabies.

Unfortunately, the methods cannot be extended to all notifiable conditions because laboratory data are either not available or do not approximate the number of cases of the disease seen by the health care service, as is the case with measles, where laboratory tests are not required for diagnosis.

We conclude that the national incidence of hepatitis B is at least 7 times higher than that calculated from notification data. Further, the inter-year analysis of hepatitis B notification data to identify trends nationally and within the Cape region are valid. However, caution is called for when comparing incidence rates between regions due to inter-region and region-specific inter-year inconsistencies in reporting levels.

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