Use of existing data for public health planning: a study of the prevalence of hepatitis B surface antigen and core antibody in Al Ain Medical District, United Arab Emirates

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Introduction Hepatitis B is of major public health importance. Accurate information on its occurrence, with particular reference to the prevalence of immunity and chronic infection (marked by the presence of hepatitis B core antibody and surface antigen, respectively, in serum), is essential for planning public health programmes for the control of the disease. The generation of marker prevalence data through serological surveys is costly and time-consuming. The present study in Al Ain Medical District, United Arab Emirates, investigated the possibility of obtaining sufficiently accurate marker prevalence estimates from existing data to plan public health programmes.
Methods Two antenatal screening databases, one student serological survey database, one immunization programme database and one pre-marriage screening database containing information on marker prevalence were identified. Epidemiological data were abstracted from these databases and analysed.
Results The data showed that the prevalence of hepatitis B surface antigen and the prevalence of core antibody in young citizens in 1998 were approximately 2% and 14% respectively, that any immunization campaign aimed at citizens of the United Arab Emirates should target teenagers as they had the highest risk of acquiring the disease, and that pre-immunization screening of young adults would be wasteful. However, the data did not yield information on the prevalence of hepatitis B surface antigen and core antibody in other population subgroups of public health significance.
Discussion While data generated by the study are sufficient to support a hepatitis B immunization programme targeted at teenaged citizens, more accurate data, generated by a well-designed serological survey, would be essential for optimal public health planning.

Keywords: hepatitis B, prevention and control; databases, factual; health planning, methods; hepatitis B surface antigens; hepatitis B core antigens; prevalence; adolescence; United Arab Emirates.

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Introduction

Hepatitis B (HB) is of major public health importance, infecting more than one person in every three of the world's population at some time during life and causing 2 million deaths annually (*1*, *2*). Some infections clear up and are followed by long-term immunity (identified by the presence of HB core antibody (HBcAb) without the presence of HB surface antigen (HBsAg) in serum). Chronic infections, however, which do not clear up (identified by the presence of HBsAg in serum for more than six months), lead to the largest burden of disease and death (*3*). Public health officials need to know the prevalence of chronic infection and immunity in the population and the characteristics of those who are infected (risk groups) in order to plan public health programmes, particularly vaccination programmes (*4*). In the Eastern Mediterranean Region prevalence of chronic infection varies from 1.5% in Kuwait (*5*) to 1.8% in East Jerusalem and the West Bank (*6*) and 28% in Saudi Arabia (*7*).

There were no accurate estimates of the prevalence of disease markers or the risk groups in which they occurred in the population of Al Ain Medical District, United Arab Emirates. However, it was known that most children aged under 11 years were immune because of universal childhood immunization programmes in which 92% received

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all three doses (*8*). A formal study to gather this information would have been costly and time-consuming. It was therefore decided to identify existing databases that could be used to generate data on the prevalence of HBsAg and HBcAb and to determine whether sufficiently accurate information could be obtained from them for planning public health programmes, particularly immunization programmes (by identifying disease burden and risk groups and by aiding cost calculations).

Methods

Five databases were identified which contained recent information on the prevalence of the HBsAg marker; one of them also contained information on the prevalence of the HBcAb marker (Box 1). It was assumed that persons found to be HBsAg+ were chronic carriers as all the databases were created by screening of apparently healthy individuals. Approval for the study was obtained from the Research Ethics Committee of the Faculty of Medicine and Health Sciences, United Arab Emirates University. Information was abstracted from each database on nationality (United Arab Emirates or non-United Arab Emirates), age, sex (where available) and the presence of HB markers for each individual tested, and was analysed separately for each database by means of the SPSS software. The statistical significance of differences between two or more categorical variables was determined by means of the χ^2 test, in which $P < 0.05$ was considered significant.

In order to decide whether a pre-immunization screening programme could be justified by savings in vaccine costs, expenditure on HB vaccine and HBcAb screening was determined by interviewing the administrators of facilities.

Box 1. **Summary of databases containing recent information on the prevalence of HBsAg marker**

- Two hospital laboratory databases created during routine antenatal screening between October 1997 and October 1998 (the Tawam and Al Ain antenatal databases)
  - one at Tawam Hospital, created by means of the HBsAg Axsym MEIA Kit (Abbott) for HBsAg and the Core Axsym MEIA Kit (Abbott) for HBcAb;
  - one at Al Ain Hospital, created by means of the Auszyme Monoclonal Diagnostic Kit (Abbott) for HBsAg.
- Database created during screening of students applying for higher education between July and October 1998, by means of the Auszyme Monoclonal Diagnostic Kit (Abbott) for HBsAg (higher education database).
- Database created during screening by the Preventive Medicine Department of individuals seeking immunization between May and July 1997, by means of the Auszyme Monoclonal Diagnostic Kit (Abbott) for HBsAg (preventive medicine database).
- Database created during screening of males applying for the government marriage gift in 1997 (the marriage gift is a government grant available to male United Arab Emirate citizens marrying for the first time who agree to undergo screening), by means of the Auszyme Monoclonal Diagnostic Kit (Abbott) for HBsAg (marriage gift database).

Results

A total of 8713 records were abstracted for individuals ranging in age from 5 to 80 years. The prevalences of HBsAg and HBcAb markers found in the various databases are given, by nationality where possible, in Table 1. In the databases where sex was recorded the prevalences of HBsAg markers were generally similar in males and females (Table 2). The preventive medicine database, which contained information on age, sex and nationality, had the widest age range. In it, persons aged 10 to 19 years had the highest prevalence of HBsAg marker (32 of 509, i.e. 6.3%; cf. 97 of 2625, i.e. 3.7%, overall; $P = 0.03$). A similar pattern was noted for United Arab Emirates citizens in this database (31 of 454, i.e. 6.8% in the 10 to 19 year age group; cf. 54 of 1277, i.e. 4.2%, overall; $P = 0.04$). In contrast the age of United Arab Emirates citizens screened in the higher education database was very narrow, 1162 of 1408 (83%) falling within the 17–19 years range, and the prevalence of HBsAg markers was much lower in this category than in persons of similar age in the preventive medicine database (25 of 1408, i.e. 1.8%). In the Tawam antenatal group, the only group for which HBcAb marker prevalence was available, 42 of 274 (15%) of those with evidence of past infection (HBcAb+) were chronically infected (HBsAg+).

The costs of a course of three doses of vaccine and HBcAb screening were reported by programme administrators to be US$ 16.30 and US$ 2.55, respectively.

Discussion

Although age data were not available for the Tawam antenatal database, a previous study of mothers delivering at Tawam Hospital between 1990 and 1992 found that the age distribution showed little change in frequency across the age band with an average age of 29 and a range from 14 to over 40 (*9*). In all databases where data on sex were available the prevalence of HBsAg was similar in males and females. It was therefore considered that the Tawam antenatal group (83% United Arab Emirates citizens) and the United Arab Emirates citizens applying for higher education best represented unselected young United Arab Emirates adult citizens (mainly aged under 40). Unknown selection biases could have been operating in these groups but some obvious ones can be excluded. Local surveys have shown that less than 1% of United Arab Emirates women deliver at home, making a hospital database representative of these women. Most of the cohort of individuals who were at the correct age to apply for higher education

Table 1. **Prevalence of HB markers by nationality in databases studied**

Age range	Preventive medicine database		Higher education database		Marriage gift database		Al Ain antenatal database[a]		Tawam antenatal database[b]		
	5–80 years		17–44 years		13–47 years		14–49 years		Age not recorded		
Citizenship	**No. tested**	**% HBsAg positive**	**No. tested**	**% HBsAg positive**	**No. tested**	**% HBsAg positive**	**No. tested**	**% HBsAg positive**	**No. tested**	**% HBsAg positive**	**% HBcAb positive**
United Arab Emirates	1277	4.2[c]	1408	1.8[c]	515	0.6	–	–	–	–	–
Not United Arab Emirates	1348	3.2[c]	233	1.3[c]	–	–	–	–	–	–	–
Total	**2625**	**3.7**	**1641**	**1.7**	**515**	**0.6**	**1930**	**6.0**	**2002**	**2.1**	**13.7**

[a] Citizenship not recorded but 74% non-United Arab Emirates according to survey conducted in 1997 (Department of Preventive Medicine, Al Ain Medical District).

[b] Citizenship not recorded but 83% United Arab Emirates according to survey conducted in 1997 (Department of Preventive Medicine, Al Ain Medical District).

[c] Differences between United Arab Emirates citizens and non-United Arab Emirates persons were not statistically significant.

in Al Ain Medical District (1408 of an estimated 1889, i.e. 75%) (*8*, *10*) were included in the higher education database, making them reasonably representative of the cohort. The prevalences of the HBsAg marker in these two groups were very similar at 2.1% and 1.8% respectively. We conclude that the prevalence of chronic infection in young United Arab Emirates adults in Al Ain Medical District was approximately 2% in 1998, when these two databases were created. This is intermediate between the low endemicity found in developed countries (< 2%) and the high endemicity found in the developing world (> 8%) but approaches the levels found in the former (*11*). It is similar to rates reported in other populations in this region, for example in Kuwaitis and Palestinians (*5*, *6*), although it is much lower than those reported in Saudi Arabia (*7*, *12*).

The antenatal women screened at Al Ain Hospital had a high prevalence (6.0%) of HBsAg marker; 74% of them were not United Arab Emirates citizens, having come from countries of high endemicity and probably belonging to categories not screened prior to acceptance into the United Arab Emirates (married, non-employed). In contrast the non-United Arab Emirates citizens in the preventive medicine database had a lower prevalence (3.2%), probably because most worked at occupations in which screening for HBsAg was required prior to acceptance into the United Arab Emirates. In general the heterogeneity of the non-United Arab Emirates citizens hampered estimation of the prevalence of chronic infection among them by means of the databases available but it probably varied between 1% and 6% in the groups studied. A large group of non-United Arab Emirates citizens, namely male labourers, did not appear in any of the databases studied and would be expected to have a higher prevalence because most came from countries where hepatitis B was highly endemic.

Males applying for the government marriage gift, all of them United Arab Emirates citizens, had the lowest prevalence of any group (0.6%). There was possibly some selection bias in this group as they chose to apply for the gift. The United Arab Emirates citizens in the preventive medicine database had the highest prevalence of any citizen group (4.2%), presumably because they were self-selected individuals concerned enough about infection to apply for immunization.

The only database from which an estimate of population immunity, i.e. the presence of HBcAb marker, can be derived is that of the Tawam Hospital antenatal group (83% United Arab Emirates citizens), where the value was 13.7%. In this group, 15% of those with evidence of past infection were chronically infected. This indicated that the average age of infection in this population was older than infancy (expected rate of chronic infection 90%) but younger than adulthood (expected rate of chronic infection 5–10%) (*13*, *14*). This is supported by the

Table 2. **Prevalence of HBsAg by gender in databases studied**

Gender	Preventive medicine database		Higher education database		Marriage gift database		Al Ain antenatal database		Tawam antenatal database	
	No. tested	**% positive**	**No. tested**	**% positive**	**No. tested**	**% positive**	**No. tested**	**% positive**	**No. tested**	**% positive**
Females	1230	3.7	1112	1.7	–	–	1930	6.0	2002	2.1
Males	1395	3.7	529	1.7	515	0.6	–	–	–	–
Total	**2625**	**3.7**	**1641**	**3.4**	**515**	**0.6**	**1930**	**6.0**	**2002**	**2.1**

fact that the highest prevalence of chronic infection by age was recorded in the 10 to 19 years age group in the preventive medicine database. All United Arab Emirates children aged under 11 years have been offered immunization and very high coverage has been achieved (*8*). Thus any mass vaccination programme should be aimed at the older unprotected group of children.

Pre-immunization screening is not cost-saving in young adult United Arab Emirates citizens if the immunity rate of the Tawam antenatal group (13.7%) can be considered representative. A prevalence of over 16% immunity would be necessary before the cost of vaccine saved would be greater than the cost of the screening at prices reported by programme administrators at the time of the present study.

Conclusion

It was possible to use existing databases to estimate the prevalence of HB chronic infection (2%) and immunity (14%) and identify risk groups (teenagers) in the young adult United Arab Emirates citizen population in the Al Ain Medical District with sufficient accuracy to allow the planning of HB immunization programmes for this group. The same databases could not, however, be used to make comparable estimates for other groups with significant public health importance: older adults and persons who were not United Arab Emirates citizens. While data generated by this study are sufficient to support an HB immunization programme targeted at the teenage group, more accurate data, generated by a well-designed serological survey, would be essential in order to design a strategy for controlling HB transmission in adults, a significant public health problem. ■

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Résumé

Utilisation des données existantes en vue de la planification des activités de santé publique : étude de la prévalence de l'antigène de surface et de l'antigène central de l'hépatite B dans le district médical d'Al Ain (Emirats arabes unis)

L'hépatite B est une maladie d'importance majeure en santé publique, qui touche à un moment ou à un autre de la vie plus d'une personne sur trois dans le monde et provoque 2 millions de décès chaque année. Des informations exactes sur la présence de l'hépatite B dans la population sont indispensables pour la planification des programmes de santé publique visant à endiguer cette maladie. Les deux aspects les plus importants, du point de vue de la santé publique, sont l'existence d'infections aiguës qui guérissent et font place à une immunité durable marquée par la présence dans le sérum d'anticorps dirigés contre l'antigène central de l'hépatite B (HBcAc), et l'existence d'infections chroniques qui ne guérissent pas et qui sont marquées par la présence durable dans le sérum de l'antigène de surface de l'hépatite B (HBsAg). Les informations sur la présence de ces marqueurs et les caractéristiques de leurs porteurs s'obtiennent habituellement au moyen d'enquêtes sérologiques, mais cette méthode est longue et coûteuse. Pour autant qu'elles soient de qualité acceptable, il serait préférable de les tirer des bases de données existantes. Dans le district médical d'Al Ain (Emirats arabes unis), il n'existait en 1998 aucune estimation exacte de la prévalence des marqueurs de l'hépatite B et des groupes à risque qui en étaient porteurs, même si l'on savait que la plupart des enfants de moins de 11 ans étaient immunisés contre la maladie grâce aux programmes menés à bien de vaccination universelle des enfants. Lors de la présente étude, on a exploré la possibilité d'obtenir des estimations suffisamment exactes de la prévalence des marqueurs de l'hépatite B à partir des données existantes en vue de la planification des programmes de santé publique.

On a identifié cinq bases de données contenant des informations récentes sur la prévalence des deux marqueurs de l'hépatite B – HBsAg et HBcAc – chez les résidents d'Al Ain. Une base de données issue du dépistage anténatal pratiqué à l'hôpital de Tawam contenait des informations sur la prévalence des deux marqueurs chez les résidentes, principalement des ressortissantes des Emirats arabes unis. Une base de données issue du dépistage anténatal à l'hôpital d'Al Ain contenait des informations sur la prévalence de l'HBsAg chez des résidentes qui pour la plupart n'étaient pas des ressortissantes des Emirats arabes unis. Une base de données constituée lors d'une enquête sérologique réalisée chez des étudiants et une base de données associée à un programme de vaccination contenaient des informations sur la prévalence de l'HBsAg chez les ressortissants et non ressortissants des deux sexes. Enfin, une base de données issue d'un dépistage prénuptial contenait des informations sur la prévalence de l'HBsAg chez les ressortissants de sexe masculin. Comme toutes ces bases de données ont été créées à partir du dépistage pratiqué chez des personnes apparemment en bonne santé, il a été supposé que les personnes HBsAg-

positives étaient des porteurs chroniques de l'hépatite B. Pour chaque personne testée et chaque base de données, on a extrait les données sur la présence des marqueurs de l'hépatite B ainsi que des données personnelles telles que l'âge, le sexe et la nationalité si ces informations étaient disponibles. Au total, 8173 dossiers concernant des personnes de 5 à 80 ans ont été exploités.

L'analyse des données recueillies a donné suffisamment d'informations pour permettre de conclure que, chez les jeunes ressortissants des Emirats arabes unis, la prévalence de l'HBsAg était, en 1998, d'environ 2 %, celle de l'HBcAc d'environ 14 % et que la prévalence de l'HBsAg était pratiquement la même dans les deux sexes. Il a également été possible de conclure que toute campagne de vaccination destinée aux ressortissants des Emirats arabes unis devait être axée sur les adolescents, groupe chez lequel le risque de contracter la maladie est le plus élevé. D'après des informations sur le coût du vaccin anti-hépatite B et des tests de dépistage de l'HBcAc, il a été établi qu'un dépistage prévaccinal chez les jeunes adultes constituerait un gaspillage de ressources. Les bases de données ont donc fourni des informations suffisamment exactes pour la planification d'un programme de vaccination axé sur les adolescents ressortissants des Emirats arabes unis. Elles étaient toutefois insuffisantes pour fournir des données sur la prévalence de l'HBsAg et de l'HBcAc dans d'autres sous-groupes de population présentant un intérêt du point de vue de la santé publique, comme les adultes plus âgés et les non-ressortissants, en particulier les travailleurs de sexe masculin. Une enquête sérologique bien conçue serait indispensable pour élaborer une stratégie de lutte contre la transmission de l'hépatite B chez l'adulte, un important problème de santé publique.

Resumen

Planificación de la salud pública a partir de datos ya existentes: estudio sobre la prevalencia de HBsAg y anti-HBc en el distrito médico de Al Ain, Emiratos Árabes Unidos

La hepatitis B es una enfermedad de gran incidencia en la salud pública: afecta a más de uno de cada tres habitantes del planeta en algún momento de su vida y causa 2 millones de defunciones anuales. La obtención de información precisa sobre la prevalencia de hepatitis B es fundamental para planificar los programas de salud pública encaminados a controlar la enfermedad. Las dos manifestaciones más importantes de esta dolencia desde una perspectiva de salud pública son las infecciones agudas, que remiten, y a las que sigue un estado de inmunidad prolongada caracterizado por la presencia de anticuerpos contra el núcleo del virus de la hepatitis B (anti-HBc) en el suero, y las infecciones crónicas, que no remiten y se acompañan de la presencia a largo plazo en el suero del antígeno de superficie de la hepatitis B (HBsAg). La información sobre la prevalencia de estos marcadores y las características de sus portadores suele obtenerse mediante estudios serológicos, pero este método es costoso y lleva tiempo. Es preferible obtener la información a partir de las bases de datos existentes, a condición de que esos datos sean de calidad aceptable. En 1998 no se disponía en el Distrito Médico de Al Ain (Emiratos Árabes Unidos) de ninguna estimación precisa de la prevalencia de los marcadores de la hepatitis B o de los grupos de riesgo portadores, aunque se sabía que la mayoría de los menores de 11 años eran inmunes a la enfermedad gracias a los exitosos programas de inmunización universal llevados a cabo entre esos niños. En el presente estudio se investigó la posibilidad de obtener estimaciones suficientemente precisas de la prevalencia de los marcadores a partir de datos existentes a fin de planificar programas de salud pública.

Se identificaron cinco bases de datos que contenían información reciente sobre la prevalencia de los marcadores HBsAg y anti-HBc de la hepatitis B entre los residentes de Al Ain. Una base de datos de cribado prenatal del Hospital de Tawam contenía información sobre la prevalencia de esos dos marcadores en residentes que eran predominantemente ciudadanos de los Emiratos Árabes Unidos. A partir de una base de datos de cribado prenatal del Hospital de Al Ain se obtuvo información sobre la prevalencia de HBsAg en residentes que en su mayoría no eran ciudadanos de los Emiratos Árabes Unidos. En una base de datos sobre el estado serológico de estudiantes y en otra de un programa de inmunización se halló información sobre la prevalencia de HBsAg en ciudadanos y no ciudadanos de los dos sexos. Por último, en una base de datos de cribado prematrimonial se consiguió información sobre la prevalencia de HBsAg en ciudadanos varones. Dado que todas las bases de datos se alimentaban con información de cribado de personas aparentemente sanas, se consideró que las personas HBsAg-positivas eran portadoras crónicas del virus de la hepatitis B. Para cada persona analizada en cada base de datos se extrajo información sobre la presencia de marcadores de la hepatitis B y sobre las características de la persona, como la edad, el sexo y su ciudadanía, cuando había información al respecto. En total se seleccionaron 8173 registros de individuos de edades comprendidas entre cinco y 80 años.

El análisis de los datos reunidos aportó información suficiente para poder concluir que, entre los ciudadanos jóvenes de los Emiratos Árabes Unidos, la prevalencia de HBsAg en 1998 fue aproximadamente del 2%, y la de anti-HBc del 14%, y que la prevalencia del antígeno era similar en hombres y mujeres. Otra conclusión es que cualquier campaña de inmunización destinada a los ciudadanos de los Emiratos Árabes Unidos debería centrarse en los adolescentes, pues son los que corren mayor riesgo de contraer la enfermedad. Considerando la información disponible sobre los costos de la vacuna contra la hepatitis B y las pruebas de cribado de anti-HBc, llegamos asimismo a la conclusión de que el cribado preinmunización de los adultos jóvenes sería un despilfarro. Así pues, las bases de datos existentes proporcionaron información suficientemente precisa

para planificar con fines de salud pública un programa de inmunización centrado en los adolescentes ciudadanos de los Emiratos Árabes Unidos. Sin embargo, las bases de datos no aportaron suficiente información sobre la prevalencia de HBsAg y anti-HBc en otros subgrupos de población de interés para la salud pública, como los adultos de edad avanzada y los no ciudadanos, en particular los trabajadores varones. Es indispensable llevar a cabo un estudio serológico bien diseñado para formular una estrategia de lucha contra el grave problema de salud pública que representa la transmisión de la hepatitis B en la población adulta.

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