

Awareness of Hepatitis A and Hepatitis B among Residents in Kuala Lumpur and Selangor

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ABSTRACT

A survey was carried out to assess the level of knowledge and vaccination coverage of hepatitis A and B among 753 subjects (>12 years of age) from rural areas, town areas, undergraduates and healthcare workers. The main objective of the study was to assess the relationship between the extent of hepatitis A and B knowledge and vaccination status of the participants. A questionnaire was distributed and completed by the subjects. The results showed that the overall level of knowledge among the public was low compared to healthcare workers and undergraduates. The hepatitis A vaccination coverage was very low among all the groups (<8%). The hepatitis B vaccination coverage was generally low among the groups of non-healthcare workers (<35%) and higher among healthcare workers (65.6%). There was a strong correlation between the extent of knowledge of hepatitis A and B and the status of vaccination among the participants ($p < 0.01$). The study concluded that health education on hepatitis A and B should be provided and vaccination programmes should be held more frequently among the public, especially in rural areas.

Keywords: hepatitis, healthcare workers, knowledge, survey, vaccination

INTRODUCTION

Hepatitis A and B continue to be a major health problem in Malaysia and also worldwide. Although hepatitis B and A vaccines were approved in late 1981 (1) and in 1992 (2), respectively, hepatitis A and B continue to be the most frequently reported vaccine-preventable diseases. Data from Ministry of Health Malaysia (2000) (3) indicated that the incidence of viral hepatitis was 1 326 cases with 13 fatalities in 1991 and this was reduced to 686 cases with 7 fatalities in 1995. The average incidence rate from 1991 to 1995 was about 4.2 per 100,000 population. As most of the infections are

asymptomatic and subclinical, it is almost certain that cases of hepatitis are under-reported. According to the Malaysian Liver Foundation (1999) (4), there are 2.4 million hepatitis B virus (HBV) carriers in Malaysia, and they will continue to be the source of HBV infection to the others.

Both hepatitis A virus (HAV) and hepatitis B virus (HBV) infections may result in a wide spectrum of clinical outcomes, ranging from silent anicteric infection to subclinical disease and classical icteric hepatitis to fulminant hepatic

failure with coma and occasionally death (5). Hepatitis A will not lead to long term complications, and most of the patients recover within two months from the onset of illness (6), however, acute liver failure due to severe hepatitis A is well documented and no specific drug treatment is available (7). Exposure to HBV, particularly in early in life, may also result in an asymptomatic carrier state that can progress to chronic active hepatitis, cirrhosis of the liver and eventually hepatocellular carcinoma (8). As both infections can spread from person to person, the key control of HAV and HBV infections is immunoprophylaxis.

This study was carried out to determine the level of knowledge and the vaccination coverage of both hepatitis A and B in different groups of population, including the general public, healthcare workers and undergraduates. The relationship between the extent of hepatitis A and B knowledge and vaccination status of the participants was assessed. Hopefully this study can provide the information relevant to the development of the vaccination strategies for both hepatitis A and B and contribute to the elimination of hepatitis A and B in Malaysia.

METHOD

Study design

The study was conducted from January to July 2000 in Kuala Lumpur and Selangor. A cross-sectional survey was carried out to identify the level of knowledge of hepatitis A and B and the vaccination coverage among the population through questionnaires.

Study population

The study population consisted of subjects above 12 years of age. The study population was made up from four groups: (I) residents from rural areas i.e. Kampung Nakhoda and Sungai Tua Bahru, Selayang, Selangor Darul Ehsan; (II) residents from town areas who were mainly from Serdang, Sri Kembangan, Balakong, Cheras, Kajang and Bangi; (III) healthcare workers from the nephrology unit and blood bank, Hospital Kuala Lumpur; and (IV) undergraduates from Faculty of Dentistry and Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia (UKM). Sampling was on voluntary basis.

Questionnaires

Questionnaires were presented in English and Malay. The survey was carried out in divided sessions. Participants were given a questionnaire and explanation was provided to assist them in completing the questionnaire. Participants who were illiterate were interviewed with understandable language. The information obtained through the questionnaires included age, gender, race, occupation, education level, household income, knowledge about hepatitis A and B, awareness of vaccination for hepatitis A and B, awareness of blood testing for hepatitis A and B virus, and family members' or subject's previous diagnosis of hepatitis.

After completing the questionnaires, participants were given brochures about hepatitis A and B. Brochures in different languages, including Malay, English, and Chinese were available. Posters about prevention of hepatitis A and B were also exhibited. Participants were encouraged to seek vaccination for both hepatitis A and B. All the brochures and posters were provided by SmithKline Beecham Sdn. Bhd (now known as GlaxoSmithKline Sdn. Bhd.).

Statistical analysis

Data were analysed using *Statistical Package for Social Sciences* (SPSS) version 9.05. Descriptive statistics, including frequencies and percentages, were calculated for each item on the questionnaires; cases with missing data were excluded. In addition, comparisons of the level of knowledge on the diseases and vaccination rate among four groups of subjects were made by descriptive analysis.

In order to enable further assessment on the relationship between the extent of knowledge and the vaccination status of hepatitis A and/or B among the participants, answers to questionnaires were marked. One mark was given to each correct answer and the total mark was 15. The subjects were classified into three groups based on their overall knowledge about hepatitis A and B. The classification is as following:

Degree of knowledge	Score of correct answers
Low	≤ 5
Intermediate	6-10
High	≥ 11

Chi-squared test (testing of independence) was performed to evaluate the correlation of the extent of knowledge and receiving hepatitis A and/or B vaccine(s) among the participants. The two parameters were considered not independent if the p value was less than 0.01.

RESULTS

A total of 753 subjects were enrolled in the survey from 4 study groups: (I) residents from rural areas i.e. Kampung Nakhoda and Sungai Tua Bahru, Selayang, Selangor Darul Ehsan (n=165) with a mean age of 37.7±12.1; (II) residents from town areas (n=206), mainly from Serdang, Sri Kembangan, Balakong, Cheras, Kajang and Bangi with a mean age of 24.8±8.2; (III) healthcare workers (HCWs) (n=194) from the nephrology unit (64.0%) and blood bank (36.0%) from Hospital Kuala Lumpur with a mean age of 32.3±9.2 and mean working period of 98 months; and (IV) undergraduates (n=188) from the Faculty of Dentistry (24.5%) and Faculty of Allied Health Sciences (75.5%), Universiti Kebangsaan Malaysia (UKM) with a mean age of 22.1±1.9.

Generally, the mean age of the participants from rural areas and HCWs were higher than the participants from town areas and undergraduates. Female participants outnumbered males. Most of

the residents from the rural areas, HCWs and undergraduates were Malays (97.6%, 84.3% and 73.5%, respectively). However, the percentage of Malay and Chinese participants from town areas were almost equal, with 49.5% and 47.5%, respectively.

Most of the participants from rural areas (59.4%) had secondary education, however, most of the participants from town areas (67.8%) had tertiary education. There was an almost equal percentage of HCWs with secondary education and tertiary education. 41.5% and 40.4% of the participants from rural areas were from low and middle income groups, respectively. For those from town areas, 29.3%, 42.5%, and 28.2% were from low, middle and high income groups, respectively. Most of the HCWs were in the middle income group (69.1%), while most of the undergraduates were from the low (36.5%) and middle (37.7%) income groups. Demographic details of the subjects are shown in Table 1.

Knowledge of hepatitis A and B

A high proportion of undergraduates (85.0%) had knowledge on hepatitis compared to the public from town areas (63.6%) and rural areas (52.7%). Most of the public knew about the diseases through the mass media; undergraduates, however, acquired knowledge of the diseases through formal education. All

Table 1: Demographic data of patients.

Groups	Public from rural areas (%)	Public from town areas (%)	Health care workers (%)	Undergraduates (%)	Total subjects (%)
No. of subjects (n)	165	206	194	188	753
Mean age (years)	37.67	24.75	32.29	22.06	28.87
Gender					
Male	63 (38.2)	84 (40.8)	33 (17.3)	45 (24.3)	225 (30.1)
Female	102 (61.8)	122 (59.2)	158 (82.7)	140 (75.7)	522 (69.9)
Race					
Malay	161 (97.6)	102 (49.5)	161 (84.3)	136 (73.5)	560 (75.0)
Chinese	2 (1.2)	98 (47.5)	10 (5.2)	30 (16.2)	140 (18.7)
Indian	1 (0.6)	3 (1.5)	18 (9.4)	12 (6.5)	34 (4.6)
Others	1 (0.6)	3 (1.5)	2 (1.1)	7 (3.8)	13 (1.7)
Education level					
Primary school	25 (15.6)	8 (3.9)	11 (6.1)		44 (6.0)
Secondary school	95 (59.4)	58 (28.3)	81 (45.3)		235 (32.1)
College/University	40 (25.0)	139 (67.8)	87 (48.6)	188 (100)	453 (61.9)
Family monthly income					
<RM 1000	39 (41.5)	53 (29.3)	48 (27.0)	55 (36.5)	195 (32.3)
RM 1000-2500	38 (40.4)	77 (42.5)	123 (69.1)	57 (37.7)	295 (48.8)
RM 2500-4000	9 (9.6)	28 (15.5)	5 (2.8)	27 (17.9)	69 (11.4)
>RM 4000	8 (8.5)	23 (12.7)	2 (1.1)	12 (7.9)	45 (7.5)

Note: The total number of respondents does not equal 753 due to missing values.
The percentages are based on the number of subjects who responded to the items.

Table 2: Knowledge about hepatitis (hep.) A and B among respondents.

Knowledge about hep. A or B	Public		Healthcare workers (%)	Undergraduates (%)	Total (%)
	Rural areas (%)	Town areas (%)			
Know about hepatitis.					
Yes	87 (52.7)	131 (63.6)	-	159 (85.0)	377 (63.4)
<i>Through media</i>	66 (76.7)	78 (59.5)		54 (34.0)	
<i>Education</i>	17 (20.0)	45 (34.4)		140 (88.1)	
<i>Family</i>	10 (11.6)	18 (13.7)		10 (6.3)	
<i>Friends</i>	13 (15.1)	17 (13.0)		21 (13.2)	
<i>Healthcare workers</i>	10 (11.6)	9 (6.9)	-	5 (3.1)	
No	51 (30.9)	20 (9.7)	-	2 (1.1)	55 (9.2)
Not sure	27 (16.4)	55 (26.7)		26 (13.9)	163 (27.4)
Knowledge of organ affected					
Liver	78 (50.3)	143 (69.4)	190 (99.0)	186 (100.0)	579 (78.3)
Heart	27 (17.4)	31 (15.0)	1 (0.5)	0 (0.0)	59 (8.0)
Kidneys	10 (6.5)	23 (11.2)	22 (11.5)	0 (0.0)	55 (7.4)
Brain	3 (1.9)	6 (2.9)	2 (1.0)	0 (0.0)	11 (1.5)
Not sure	43 (27.7)	20 (9.7)	1 (0.5)	0 (0.0)	64 (8.7)
Knowledge of spreading by virus					
Yes	81 (50.3)	120 (58.5)	176 (95.1)	182 (96.8)	559 (75.6)
No	15 (9.3)	19 (9.3)	5 (2.7)	0 (0.0)	39 (5.3)
No sure	65 (40.4)	66 (32.2)	4 (2.2)	6 (3.2)	141 (19.1)
Knowledge of causing jaundice					
Yes	84 (52.2)	107 (52.7)	190 (99.0)	164 (87.7)	545 (73.4)
No	14 (8.7)	10 (4.9)	2 (1.0)	3 (1.6)	29 (3.9)
Not sure	63 (39.1)	86 (42.4)	0 (0.0)	20 (10.7)	169 (22.7)
Knowledge of transmission of hep. A through food & water					
Yes	68 (42.5)	100 (48.6)	177 (91.8)	147 (79.0)	492 (60.2)
No	22 (13.8)	26 (12.6)	8 (4.1)	4 (2.2)	60 (7.4)
Not sure	70 (43.7)	80 (38.8)	8 (4.1)	35 (18.8)	265 (32.4)
Knowledge of mode of hep. B transmission					
Blood	94 (60.6)	106 (51.7)	180 (93.8)	168 (89.8)	548 (74.2)
Saliva	34 (21.9)	60 (29.3)	80 (41.7)	87 (46.5)	261 (35.3)
Sexual	26 (16.8)	35 (17.1)	99 (51.6)	140 (72.9)	300 (40.6)
Mother to child	42 (27.1)	63 (30.7)	106 (55.2)	112 (58.3)	323 (43.7)
Casual contact	8 (5.2)	13 (6.3)	2 (1.0)	14 (7.3)	37 (5.0)
Not sure	38 (24.5)	20 (9.8)	1 (0.5)	0 (0.0)	59 (8.0)
Knowledge of complications of hep. B					
Liver damage	86 (55.1)	114 (55.9)	158 (82.7)	172 (93.5)	530 (72.1)
Liver cancer	44 (28.2)	57 (28.9)	112 (58.6)	113 (61.4)	326 (44.3)
Death	33 (21.2)	62 (30.4)	49 (25.7)	96 (52.2)	240 (32.7)
Heart disease	22 (14.1)	20 (9.8)	4 (2.1)	4 (2.2)	50 (6.8)
Kidney failure	27 (17.3)	23 (11.3)	6 (3.1)	8 (4.3)	64 (8.7)
Knowledge of treatment availability for hep. B					
Yes	82 (50.9)	94 (46.1)	105 (56.4)	86 (51.5)	367 (51.1)
No	32 (19.9)	51 (25.0)	63 (33.9)	63 (37.7)	209 (29.1)
Not sure	47 (29.2)	59 (28.9)	18 (9.7)	18 (10.8)	142 (19.8)
Knowledge of availability of hep. A vaccine					
Yes	91 (56.5)	137 (66.5)	107 (57.5)	153 (81.8)	488 (65.9)
No	24 (14.9)	14 (6.8)	63 (33.9)	4 (2.1)	105 (14.2)
Not sure	46 (28.6)	55 (26.7)	16 (8.6)	30 (16.1)	147 (19.9)
Knowledge of availability of hep. B vaccine					
Yes	91 (56.5)	133 (64.6)	183 (94.3)	175 (93.1)	582 (77.7)
No	24 (14.9)	17 (8.2)	5 (2.6)	1 (0.5)	47 (6.3)
Not sure	46 (28.6)	56 (27.2)	6 (3.1)	12 (6.4)	120 (16.0)
Knowledge of number of shots in a full course of hep. B vaccination					
1X	19 (13.4)	19 (9.5)	4 (2.2)	9 (5.0)	51 (7.2)
2X	27 (19.0)	46 (22.9)	8 (4.4)	8 (4.4)	89 (12.6)
3X	34 (23.9)	111 (55.1)	167 (91.3)	155 (86.1)	467 (66.2)
4X	3 (2.1)	7 (3.5)	3 (1.6)	1 (0.6)	14 (2.0)
Not sure	59 (41.6)	18 (9.0)	1 (0.5)	7 (3.9)	85 (12.0)
Note: The total number of respondents does not equal 753 due to missing values. The percentages are based on the number of subjects responded to the items.					

the undergraduates and almost all the HCWs knew that hepatitis would affect the liver compared to only 69.4% and 50.3% of the public from town areas and from rural areas, respectively. A relatively high percentage of the undergraduates and HCWs knew that some types of hepatitis are caused by viruses and can cause jaundice compared to only about 50% of the public with that knowledge.

HCWs (91.8%) were superior in knowing that food and water are the sources of transmission of hepatitis A, followed by undergraduates (79.0%), participants from town areas (48.6%), and those from rural areas (42.5%). Blood is generally more acknowledged as a transmission mode of hepatitis B among the participants with 93.8% for HCWs, 89.8% for undergraduates, 60.6% for those from rural areas, and 51.7% for those from town areas. Generally, half of the HCWs and undergraduates recognised that sexual, mother to child and saliva as transmission modes of hepatitis B, compared to a relatively low percentage (<30%) of the public.

Undergraduates were superior to the other groups in knowing liver damage (93.5%), liver cancer (61.4%) and death (52.2%) as the complications of hepatitis B, followed by HCWs with 82.7%, 58.6% and 25.7, respectively; participants from town areas with 55.9%, 28.9% and 30.4%, respectively; and those from rural areas with 55.1%, 28.2% and 21.2%, respectively. 31.4% and 21.1% of the public from rural areas and town areas, respectively, said that hepatitis B can cause complications of heart disease and renal failure, which is not correct.

The availability of hepatitis A and B vaccines was generally well known among HCWs and undergraduates (81.7%), with the exception that only 57.5% of HCWs knew about the availability of hepatitis A vaccine. About half of the participants from town and rural areas knew about the availability of hepatitis A and B vaccines. Details of the knowledge about hepatitis A and B among the four different groups are shown in Table 2.

Vaccination coverage of hepatitis A and B

Majority of the participants were not vaccinated for hepatitis A with only 7.8% of the participants from town areas, 3.6% of the participants from rural areas, 3.2% of the HCWs and none of the

undergraduates was vaccinated for hepatitis A. From the total of those who received the vaccination, 100% of the HCWs had received the full course of the vaccination. However, all the participants from rural areas and 31.2% of those from town areas, who had received the hepatitis A vaccination could not remember the number of doses taken.

65.6% of the HCWs were vaccinated against hepatitis B compared to a relatively low percentage of participants from town areas (31.6%), undergraduates (21.9%), and those from rural areas (13.9%). From those who had received the vaccination, 73.0% of HCWs, 56.9% of those from town areas and 39.0% of undergraduates had fulfilled the 3- dose vaccination course. However, a relatively low percentage of them, ranging from 5% to 19.5%, had received the vaccine in the last five years. Most of the HCWs were exposed to blood or body fluids of patients everyday (>90%) and only 6% of them were not exposed to blood or body fluids of patients.

Investigation on the previous diagnosis of hepatitis of the subjects or their household members showed that the average prevalence of hepatitis infection for subjects or their household members was 6.6% with the highest prevalence among participants from rural areas (9.3%), followed by participants from town areas (8.3%), undergraduates (8.0%), and HCWs (1.0%). Hepatitis B was the major type of infection.

A relatively small proportion of participants from rural areas (17.2%), participants from town areas (25.7%), and undergraduates (19.8%) have had a blood test conducted before, compared to HCWs (67.7%). Again, hepatitis B was the more common disease tested for. Details of the results are shown in Table 3.

Association between the extent of knowledge and the vaccination status among the study population

Figures 1 and 2 depict the level of knowledge and vaccination status for hepatitis A and/or B among the subjects of different groups, respectively. Figure 3 shows the association between the level of knowledge and vaccination status. There was a strong association between the level of knowledge and vaccination status among the study population. For those with a low level of knowledge, only a small proportion

Table 3: Vaccination of hepatitis A & B coverage among respondents.

	Public		Healthcare workers (%)	Undergraduates (%)	Total (%)
	Rural areas (%)	Town areas (%)			
Ever received hepatitis A vaccine					
Yes	6 (3.6)	16 (7.8)	6 (3.2)	0 (0.0)	28 (3.7)
Dose: 1X	0 (0.0)	4 (25.0)	0 (0.0)		4 (14.3)
2X	0 (0.0)	7 (43.8)	6 (100.0)		13 (46.4)
cannot remember	6 (100.0)	5 (31.2)	0 (0.0)		11 (39.3)
No	139 (84.3)	134 (65.0)	157 (83.5)	148 (79.1)	578 (77.5)
Not sure	20 (12.1)	56 (27.2)	25 (13.3)	39 (20.9)	140 (18.8)
Ever received hepatitis B vaccine					
Yes	23 (13.9)	65 (31.6)	126 (65.6)	41 (21.9)	255 (34.0)
Dose: 1X	2 (10.0)	9 (13.9)	11 (8.7)	3 (7.3)	25 (9.9)
2X	0 (0.0)	10 (15.4)	18 (14.3)	1 (2.5)	29 (11.5)
3X	0 (0.0)	37 (56.9)	92 (73.0)	16 (39.0)	145 (57.5)
cannot remember	18 (90.0)	9 (13.8)	5 (4.0)	21 (51.2)	53 (21.1)
Time: <5 years ago	1 (5.0)	8 (12.3)	24 (19.0)	8 (19.5)	41 (16.3)
5-10 years ago	0 (0.0)	12 (18.5)	21 (16.7)	12 (29.3)	45 (17.9)
>10 years ago	1 (5.0)	3 (4.6)	8 (6.3)	8 (19.5)	20 (7.9)
cannot remember	18 (90.0)	42 (64.6)	73 (57.9)	13 (31.7)	146 (57.9)
No	124 (75.2)	87 (42.2)	55 (28.7)	117 (62.6)	383 (51.1)
Not sure	18 (10.9)	54 (26.2)	11 (5.7)	29 (15.5)	112 (14.9)
Household member or subject ever had hepatitis					
Yes	15 (9.3)	17 (8.3)	2 (1.0)	15 (8.0)	49 (6.6)
hepatitis A	0 (0.0)	3 (17.6)	0 (0.0)	2 (13.3)	
hepatitis B	15 (100.0)	13 (76.5)	2 (100.0)	13 (86.7)	
hepatitis C	0 (0.0)	1 (5.9)	0 (0.0)	0 (0.0)	
No	146 (90.1)	184 (89.3)	188 (98.0)	162 (86.6)	680 (91.0)
Not sure	1 (0.6)	5 (2.4)	2 (1.0)	10 (5.4)	18 (2.4)
Ever had blood test for hepatitis					
Yes	28 (17.2)	49 (25.7)	86 (67.7)	35 (19.8)	198 (30.1)
hepatitis A	0 (0.0)	9 (18.4)	23 (26.7)	2 (5.7)	
hepatitis B	27 (96.4)	45 (91.8)	77 (89.5)	34 (97.1)	
cannot remember	1 (3.6)	0 (0.0)	0 (0.0)	1 (2.9)	
No	135 (82.8)	137 (71.7)	37 (29.1)	136 (76.8)	445 (67.6)
Not sure	0 (0.0)	5 (2.6)	4 (3.2)	6 (3.4)	15 (2.3)
Note: The total number of respondents does not equal 753 due to missing values. The percentages are based on the number of subjects who responded to the items.					

of them (17.0%) had been vaccinated against hepatitis A and/or B. In contrast, a higher proportion of those with intermediate or high level of knowledge had been vaccinated, i.e. 41.8% and 42.5%, respectively. In conclusion, the level of knowledge and vaccination status were significantly dependent in this study ($p < 0.01$).

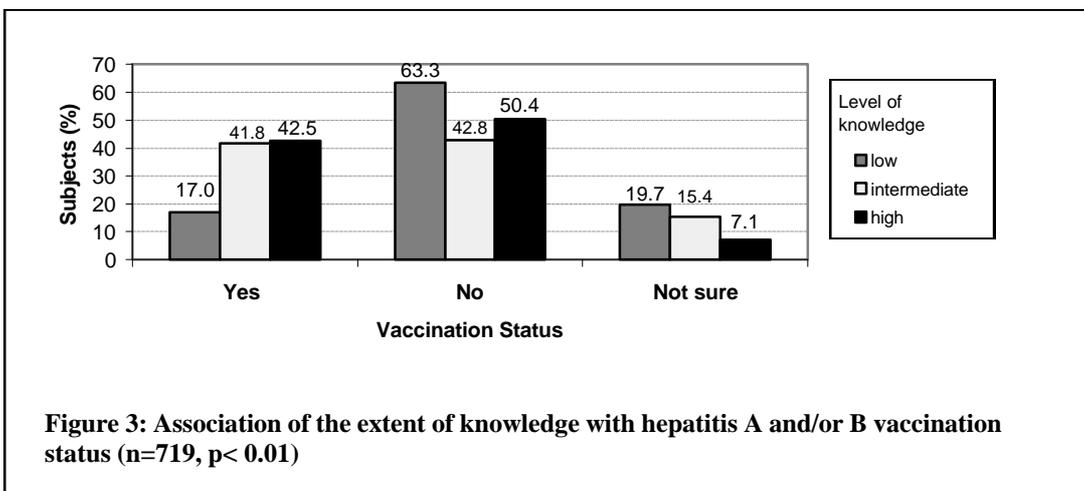
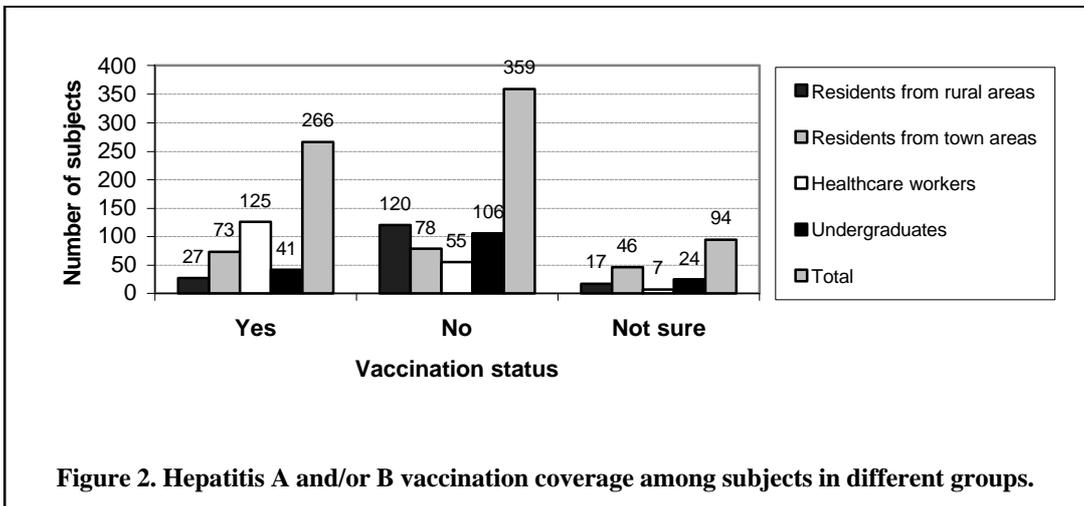
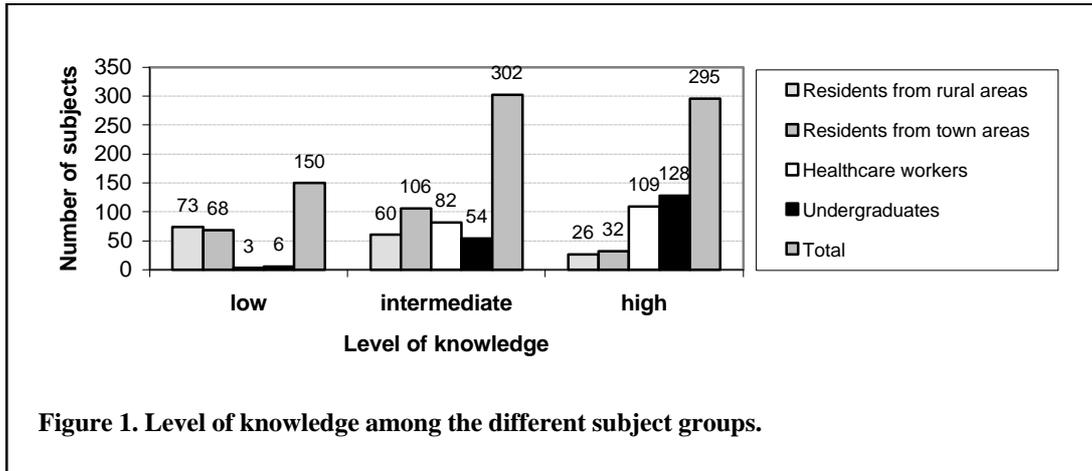
DISCUSSION

The overall level of knowledge about hepatitis A and B was generally poor among the general public. In comparison, HCWs and undergraduates had far better knowledge about hepatitis A and B (Table 2) as they had a higher level of education and were more exposed to health information. Participants from town areas had slightly better level of knowledge about hepatitis A and B than those from rural areas which could be attributed

to the fact that a higher number of them had tertiary education compared to participants from rural areas (Table 1). This agreed with the findings of the study of Wiecha (9) and Taylor et al. (10) that there is a significant association between the level of knowledge about hepatitis B and the education level.

Both of the groups from rural and town areas were poor in recognising the modes of transmission of both hepatitis A and B. Awareness of the transmission modes is important, so that effective preventive measures could be taken such as modification of lifestyles and vaccination against hepatitis A and B.

In East and Southeast Asian countries, 30 to 50% of all chronic infections among children result from perinatal transmission and 9 500 infants



would become infected if prophylaxis is not provided (11). Understanding the possibility of HBV transmission from mothers to babies would enable women to be more aware about the importance of hepatitis B surface antigen (HBsAg) screening, so that prophylactic measures could be taken to protect the babies from HBV infection.

With the successful implementation of the national childhood immunisation programme against hepatitis B in Malaysia, sexual transmission would inevitably emerge as the leading cause of HBV infection among healthy susceptible adolescents and adults as in the West. So, the public should be aware that their sexual behaviour could lead to HBV infection.

Awareness of the complications of hepatitis B is also important, so that people would realise about the importance of taking preventive measures, especially vaccination against the disease. Unfortunately, most of the public did not know that hepatitis B can lead to severe complications of liver cancer and death (Table 2).

Malaysia had incorporated hepatitis B vaccination into the national immunisation programme since 1989. According to Ministry of Health Malaysia (12), the vaccination coverage among babies is 98.3% for first dose, 91.6% for second dose and 89.6% for third dose. However, there is no data available about the rate of hepatitis A or B vaccination among adults in Malaysia. According to the results in this study, the overall vaccination coverage was very low for hepatitis A (3.7%) and low for hepatitis B (34.0%). Only about 2% of the total study population received both hepatitis A and B vaccines (not shown in results). The results also implicated that most of the subjects who had been vaccinated, did not complete the course of vaccination and also did not follow-up on their immunisation status. Preventive strategies against the diseases, especially vaccination programmes, should be developed and taken aggressively to improve the vaccination coverage among the adults.

A study by Chen et al. (13) and Hsu et al. (14) showed that after a nationwide mass vaccination programme was launched in Taiwan in July 1984, the HBsAg prevalence decreased markedly from the year 1984 to 1994. Chang et al. (15) reported that after the implementation of nationwide hepatitis B immunisation programmes, the annual incidence of hepatocellular carcinoma in children

had declined. So, immunisation programmes have proven effective not only in controlling hepatitis B infection, but also in controlling hepatocellular carcinoma in Taiwan.

A low vaccination rate among participants from rural areas was probably due to the low level of knowledge about the diseases and the availability of the vaccines. Compared to those from rural areas, vaccination coverage of participants from town areas was slightly better probably as they had a higher level of knowledge about hepatitis A and B. However, undergraduates, who had a high level of knowledge, had a very low vaccination coverage for both hepatitis A (none) and hepatitis B (21.9%) (Table 3). This might be due to their dependence on parents or study loans for financial assistance.

HCWs are always at the risk of HBV infection because of the occupational exposure to blood borne pathogens (16). Risk increases with percutaneous exposures involving deeper penetration, larger volume of blood, high viral titres and repeated or prolonged exposures (16-18). It is noteworthy to mention that in this study most of the HCWs (over 90%) were exposed to blood and other body fluids of patients everyday, however, only about two thirds of them received the hepatitis B vaccine and only 73% of them completed the 3-dose course.

Only six of the total number of HCWs in this study received the hepatitis A vaccine (Table 3). This might be due to the fact that HAV is not a blood-borne pathogen and that the disease is usually self-limiting and non-fatal. So, there is less emphasis on the risk of hepatitis A among the HCWs and this was proven by a lower percentage of HCWs (57.5%) knowing about the availability of the hepatitis A vaccine compared to the hepatitis B vaccine (94.3%) (Table 2). Although HAV generally will not be transmitted through blood or blood products, however, prevention of hepatitis A is potentially important among HCWs and particular care should be required when nursing patients with diarrhoea (19).

Considering the long-term consequences of HBV infection, the health of the HCWs is at risk. The health of the general population is also at risk considering the transmission risk of the virus to the patients treated by the infected HCWs. In 1991, the Centers For Disease Control And Prevention (CDC) estimated that during the past 20 years more than 300 patients in the USA had

been infected with HBV 'in association with treatment' by infected HCWs (20).

Over 80% of 84 nurses and 26 physicians from five St. Louis-area hospitals agreed that every hospital employee should get the hepatitis B vaccine (17). Mahoney et al. (21) showed that the number of infections among HCWs declined from 17 000 in 1983 to 400 in 1995 after the implementation of hepatitis B vaccination and barrier precautions for blood exposure. So, all HCWs should be vaccinated against hepatitis B.

This study revealed a strong correlation between the extent of knowledge and vaccination status of hepatitis A and/or B among the participants ($p < 0.01$) (Figure 3). Similar studies by Adebamowo & Ajuwan (22) and Kamolraranakul et al. (23) showed that the overall level of knowledge about HBV infection was deemed poor and lack of knowledge on HBV infection was one of the reasons that leads to non-immunisation.

Limitations

There are some limitations to the findings in this study. Firstly, the study only involved certain groups of the population from particular residential areas or working places, so the results may not represent the general population in Malaysia. Secondly, by using the convenience sampling based on voluntary basis, the proportion of races, gender, age, numbers of subjects were not the same in each group, thus potentially introducing bias into the analysis. Thirdly, all data were self-reported and the validity of the responses were not evaluated. Fourthly, the history of vaccination and blood tests was based on the ability to recall and this might introduce inaccuracy in recording of the data. Fifth, the inclusion of 13-16 year old subjects could have

caused a problem of irreliability of information. Lastly, people with a low literacy level may have had difficulty with comprehension and tended not to answer the questions, especially those regarding knowledge of the disease.

CONCLUSION

Generally the degree of knowledge about hepatitis A and B among the public was low. Undergraduates and HCWs had a high degree of knowledge about hepatitis A and B. The overall vaccination coverage for hepatitis A and B was poor and the vaccination rate for hepatitis B was higher than hepatitis A. Not all the HCWs were vaccinated against hepatitis B as they were supposed to be. Most of them who received the hepatitis B vaccine did not follow up on their immunisation status. Quite a number of the public did not know their immunisation status. The extent of knowledge is a crucial factor in determining the vaccination status of the participants ($p < 0.01$).

The results of this study showed that more attention should be addressed at providing health education on hepatitis A and B to the public, particularly those in the rural areas. Large scale nationwide awareness programmes, campaigns, and vaccination programmes should be carried out frequently in various states, especially in rural areas. More specific educational efforts should start before launching vaccination programmes in order to increase acceptance. As most of the public got to know about hepatitis through the mass media, information about the disease and its preventive measures can be broadcasted to the public through television, radio, newspapers and magazines. HCWs and undergraduates should be routinely immunised before starting work in health institutes, especially in hospitals.



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