Knowledge about Hepatitis B Virus Infection among Medical Students in University of Dammam, Eastern Region of Saudi Arabia

Magdy A. Darwish [1] and Nuha M.Al Khaldi.[2]

[1] Family & Community Medicine Department, College of Medicine, University of Dammam, Saudi Arabia
[2] Family Medicine Department, King Fahd Military Medical Complex Dhahran
magdar9123@yahoo.com

Abstract: Objectives: to assess the Knowledge related to hepatitis B among fourth year medical students, in University of Dammam. **Subjects and Methods:** This was a cross sectional study conducted in College of Medicine, University of Dammam; Eastern Saudi Arabia. A total of 139 students represented the sample of the study. Data were collected by using structured, self-administered questionnaire which was divided into two parts with a total of thirty four questions. The first part included socio-demographic data and other information as histories of hepatitis B vaccination status, needle stick injury and family history of hepatitis B family. The second part included second part included questions to assess the level student knowledge concerning hepatitis B infection. The data were entered and analysed using Statistical Package for Social Sciences (SPSS) software version 16. **Results:** The mean age of participating students was 21.2 ± 0.72 years and the female participants constituted 52.5% of the study group. The mean knowledge score of all the students was 17.63 ± 4.8. Almost 50% of the students had good knowledge; 39.6% and 10.1% had average and poor knowledge respectively. The level of knowledge about hepatitis B infection among male and female students was not statistically significantly different. Also this knowledge was not significantly related to either vaccination or screening for hepatitis B or Needle stick exposure. There was a significant relationship between marital status and hepatitis B knowledge (p<0.01) with more knowledge among unmarried students. Level of hepatitis B knowledge was significantly (p<0.05) higher among students with negative family history for HBV infection. **Conclusion**: This study highlights the satisfactory knowledge of the fourth year medical students but there was a gap which needs to be corrected or modified regarding methods of transmission, prevention and post-exposure management of hepatitis B. Medical students should be well educated about counseling for accidental needle pricks and availability of post-exposure prophylaxis.

[Magdy A. Darwish and Nuha M.Al Khaldi **Knowledge about Hepatitis B Virus Infection among Medical Students in University of Dammam, Eastern Region of Saudi Arabia**] *Life Sci J* 2013; 10(2):860-867] (ISSN: 1097-8135). http://www.lifesciencesite.com

Key words: knowledge, hepatitis B infection, medical students

1. Introduction

Hepatitis B infection is a major worldwide health problem since it is the main cause of acute and chronic hepatitis as well as liver cirrhosis and hepatocellular carcinoma.[1] The World Health Organization estimated that more than 600,000 persons died each year worldwide due to the acute or chronic consequences of hepatitis B.[1]

Hepatitis B virus is efficiently transmitted by percutaneous or mucous membrane exposure to infectious blood or body fluids and not by casual contacts. Modes of transmission of Hepatitis B virus (HBV) is the same as the human immunodeficiency virus (HIV), however, HBV is 50 to 100 times more infectious.[1] HBV infection has been recognized as an important occupational hazard for health care workers.[4] Health care workers are at risk of infection through exposure to blood and other body fluids coupled with the high contagiousness of HBV.[5-6] Fortunately, infective hepatitis B is largely preventable disease by hepatitis B vaccine which is 95% effective in preventing such disease and its chronic consequences.[7] Transmission of infection is rare among persons who have been immunized and transmission rate may be as high as 30% among those who are not immunized.[8]

Saudi Arabia was considered as one of the endemic countries for HBV infection, and acquisition of HBV infection occurs mainly by the horizontal route in early life. [9, 10] Sero-survey studies in Saudi Arabia before 1990 showed that the prevalence of HBsAg sero-positive among Saudi children up to 12 years of age was on average 6.7%, 7.4% among adults. [9,10] Since 1990, the national strategy to eliminate HBV infection in Saudi Arabia has included universal administration of HBV vaccine to all infants and issue of birth certificates has been made conditional upon completion of the first year vaccinations to ensure complete vaccination coverage.[11] The prevalence of HBsAg sero-prevalence in Saudi Arabia had dropped to 0.05% and 0.22%, among children and adults respectively due to the national vaccination strategy of infants in the first year of life.[10] The prevalence varied by region, ranging from 0.03% to 0.72% with a mean prevalence of 0.15%. There was a clear decline in incidence among children whereas the incidence in adults slightly rose, perhaps owing to population growth and was estimated to be 3.3% annually.[11] although eradication of HBV is theoretically possible, it will be very difficult to achieve with the current tools, because of the pool of

chronic carriers.[3]

Medical students are high risk group for blood borne infections including HBV, since they are in direct contact with patients, blood, injections, surgical instruments, during the course of clinical work. [12] The Saudi 4th year medical students are the most junior members of the medical team who are encountering patients and practicing real clinical work. They may do all of these procedures with lacking clinical experience and skills which make them vulnerable to many infectious diseases in particular hepatitis B infection. The aim of the present study is to assess level of hepatitis B knowledge among fourth year (4th year) medical students, college of Medicine, Dammam University.

2. Methodology

A cross-sectional study was conducted to assess the knowledge about hepatitis B infection among total of 168 (males and females) 4th year medical students at College of Medicine, Dammam University ; Eastern Saudi Arabia. 139 medical students completed the questionnaire with response rate of 82.7%. The data were collected using a structured , self-administered questionnaire which was written in Arabic/English and composed of two main components: The first part included socio-demographic data as age, gender, and marital status besides other information like vaccination status, histories of HB virus screening, needle stick injury and family history of hepatitis B infection. The second part included thirty four questions reflecting knowledge of the students towards hepatitis B such as sources of infection, high risk groups, modes of transmission and preventive measures.. The participants were requested to respond to questions according to their own awareness about subject. A scoring system was used giving a value of one for each correct knowledge item, and a value of zero for the wrong knowledge item. The cut-off point for knowledge was the mean value for the corresponding total scores. The knowledge score was considered poor with a score of ≤10 = poor; average knowledge with a score of 11-18; and good knowledge with a score of 19-26.

A pilot study was done on 10 students to test the pre-designed questionnaire and modifications were done accordingly. These students were not included in the study sample. The completed questionnaire forms were subjected to review; all data was recorded and undergoes preliminary editing and coding. Data entry and verification and were done using Statistical Package for Social Science (SPSS) software version16. Data were presented using descriptive statistics in form of frequencies and percentages for qualitative variables, and mean and standard deviation (SD) for quantitative variables. Chi-square test was used as appropriate to determine association. The level of statistical significance was set to be less than 0.05

3. Results

The mean age of the participating students was 21.2 ± 0.72 years; 87.1%were not married and female participants constituted 52.5% of the study group.

Only 28.1% reported that they were immunized by hepatitis B vaccine; out of which 15.4% received one dose of vaccine, 5.1% received two doses, 17.9% received three or more doses, and 61.5% was uncertain about the number of doses received. About quarter of students (25.9%) indicated that they were screened for hepatitis B; 16.5% reported that they have had accidental needle pricks and 11.5% had family history of hepatitis B (Table1).

Table (2) shows students knowledge about hepatitis B where the majority of the students (93.5% and 92.8%) agreed that health care workers and intravenous drug users were at risk respectively . About two thirds (66.2%) thought that people with high risk sexual behavior were vulnerable to infection . on the other hand 88.5% and 71.9% of students agreed that screening blood donor and pre-operative patients for HBV respectively is mandatory. Regarding dialysis 86.3% of students aware that it is responsible for HBV transmission. There is an agreement that sexual contact, dental procedure, and Higama are modes of transmission of HBV by 70.5%, 73.4% and 77.7% respectively, while 51.8% regarded ear /nose piercing as a mode of infection transmission. Sharing of toilet or tooth brush with an infected person could transmit the infection as reported by 16.5% and 58.3% of students respectively. 73.4% of students were aware about the vertical transmission, and only 25.2% were sure that breast milk of infected mother does not transmit HBV. Availability of highly effective vaccine is appreciated by 76.3% of students meantime, 34.5% of students agreed to use antibiotic after exposure as a prophylaxis. Safe disposal of sharp waste was known by 76.3% of students as the preventive measures for hepatitis B, and 41.7% correctly mentioned that it is not a curable diseases.

The mean knowledge score of all the students was 17.63 ± 4.8. Almost half of the participating students their knowledge was good, 39.6% and 10.1% of the participants had average and poor knowledge respectively (Figure 1). There was no statistically significant difference between males and females in knowledge level about hepatitis B. Neither vaccination nor screening for hepatitis B showed any significant relation with knowledge level. No statistically significant relation was found between Needle stick exposure and level of hepatitis B knowledge. There was a significant relationship between marital status and hepatitis B knowledge (P <0. 01) with more knowledge among unmarried students. Level of hepatitis B knowledge was significantly higher in those who reported negative family history for HBV infection (P value < 0.05) (Table 3).

Table 1: Hepatitis B-related characteristics of the students (n= 139)

Characteristics	No.	%
1.Screened for hepatitis B		
Yes	36	25.9
No	62	44.6
Don't know	41	29.5
2.Vaccinated against hepatitis B		
Yes	39	28.1
No	26	18.7
Don't know	74	53.2
3. Ever had a needle prick injury		
Yes	23	16.5
No	116	83.5
4. Have hepatitis B in family		
Yes	16	11.5
No	110	79.1
Don't know	13	9.4

Table 2: Students' knowledge about hepatitis B (n=139)

Statement about hepatitis B	No	%
1. You can get hepatitis B infection from apparently healthy person	113	81.3
2. The following are at increased risk of contracting HBV		
a. Health care workers	130	93.5
b. Intravenous drug users	129	92.8
c. High risk sexual behaviors	92	66.2
3. All patients undergoing major surgeries should be investigated for HBV	100	71.9
4. Screening blood donors for HBV is mandatory for safe transfusion	123	88.5
5. Dialysis could be a source of spreading hepatitis B infection	120	86.3
6. Endoscopy could be a source of spreading hepatitis B infection	78	56.1
7. Community barber shops could be a source of spreading hepatitis B infection	94	67.6
8. HBV may be transmitted by / through :		
a. Ear/nose piercing	72	51.8
b. Higama (Cupping)	108	77.7
c. Contaminated dentistry tools	102	73.4
d. Sexual contact	98	70.5
e. Shaking hands with an infected person[a]	120	86.3
f. Sharing toilet seats with an infected person[a]	85	61.2
g. Sharing eating utensils with an infected person[a]	78	56.1
h. Sharing toothbrushes with an infected person	81	58.3
i. Coughing and sneezing [a]	105	75.5
j. From mother to child during delivery	102	73.4
k. through breast milk of infected mother [a]	35	25.2
9. Measures to prevent hepatitis B		
a. highly effective Hepatitis B vaccine	106	76.3
b. Antibiotic prophylaxis following exposure to HBV [a]	48	34.5
c. Proper disposal of sharp waste	106	76.3
d. Avoiding contaminated water [a]	84	60.4
e. voiding improperly cooked food [a]	80	57.6
10. Hepatitis B patients can be cured by drugs [a]	58	41.7

a = indicates wrong statement

Table 3: Association between student Knowledge about hepatitis B and their characteristics (n=139)

Respondent characteristic	Knowledge grade			Total	*p*. value
	good	average	poor		
1. Sex					
Male	31 (47%)	25 (37.9%)	10 (15.2%)	66 (100%)	0.166
Female	39 (53.4%)	30 (41.1%)	4 (5.5%)	73 (100%)	
2.Marital status					
Married	9 (50%)	3 (16.7%)	6 (33.3%)	18 (100%)	0.001
Unmarried	61 (50.4%)	52 (43%)	8 (6.6%)	121 (100%)	
3.Screened for hepatitis B					
Yes	20 (55.6%)	11 (30.6%)	5 (13.9%)	36 (100%)	0.544
No	32 (51.6%)	26 (41.9%)	4 (6.5%)	62 (100%)	
Don't know	18 (43.9%)	18 (43.9%)	5 (12.2%)	41 (100%)	
4.Vaccinated against hepatitis B					
Yes	18 (46.2%)	16 (41%)	5 (12.8%)	39 (100%)	0.927
No	13 (50%)	10 (38.5%)	3 (11.5%)	26 (100%)	
Don't know	39 (52.7%)	29 (39.2%)	6 (8.1%)	74 (100%)	
5. Ever had needle prick injury					
Yes	10 (43.5%)	8 (34.8%)	5 (21.7%)	23 (100%)	0.126
No	60 (51.7%)	47 (40.5%)	9 (7.8%)	116 (100%)	
6. Have hepatitis B in family					
Yes	6 (37.5%)	5 (31.2%)	5 (31.2%)	16 (100%)	0.032
No	59 (53.6%)	44 (40%)	7 (6.4%)	110 (100%)	
Don’t know	5 (38.5%)	6 (46.2%)	2 (15.4%)	13 (100%)	

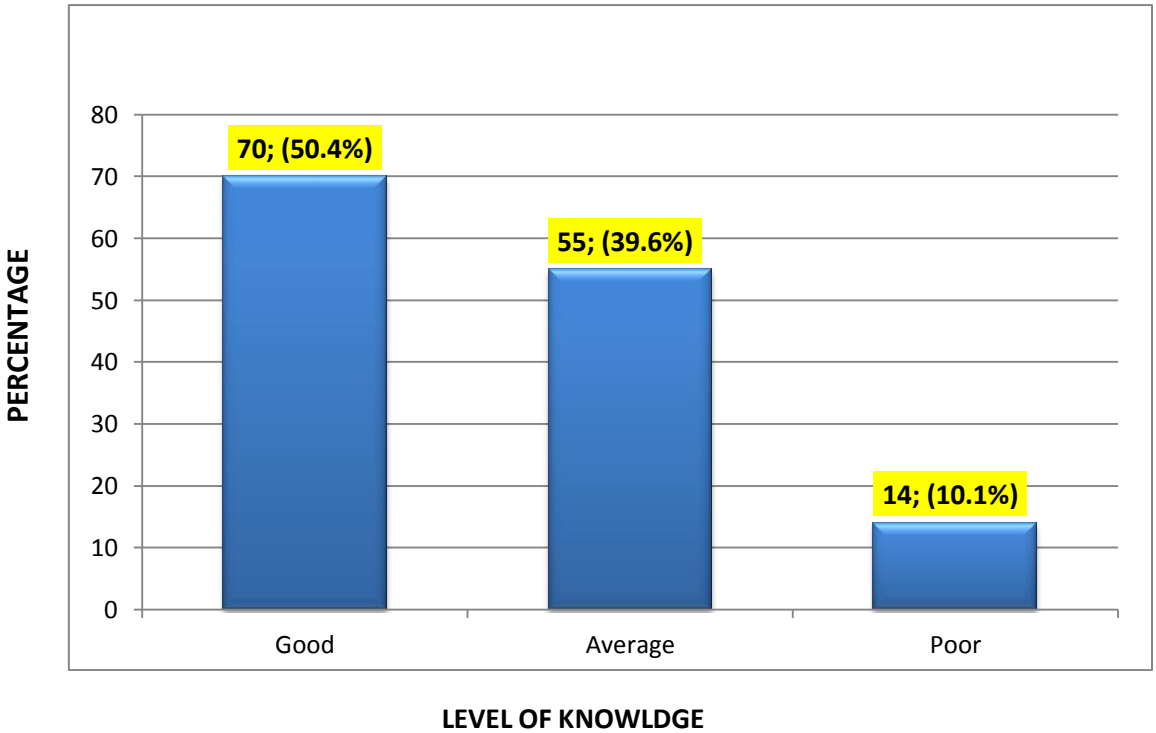

Figure 1 : level of knowledge about hepatitis B (n = 139)

4. Discussion

Viral hepatitis B infection is considered as a serious health problem in the developing countries since it causes chronic liver cirrhosis and hepatocellular carcinoma.[1] In the present study, only 28.1% of students were vaccinated against HBV and a little more than half of participants were unaware about their vaccination status. This was comparable to vaccination rate (29.5%) found among medical sciences students at Sana'a University.[13] However, other studies in Pakistan show a higher vaccination rate (≥ 70%) among medical students.[14, 15, 16] Although hepatitis B vaccination was included in expanded program for immunization (EPI) in Saudi

Arabia since 1990, the coverage rate was much below expected value due to the fact that most of the studied medical students were born between year1987 and 1990. Those who don't know their vaccination status/or who are not vaccinated mostly reflect their unawareness about importance of hepatitis B vaccine.

Medical students work, as colleagues, with physicians in caring for patients. They commonly exposed to sustained needle stick injuries during their clinical training, which may lead to serious or fatal infections with blood-borne pathogen such as HBV, HCV or HIV.[17, 18] The present study revealed that 16.5% of the medical student had past history of a needle stick injury (NSI). This finding is in-accordance with the same result reported among Malaysian medical students, [17] however, other studies reported higher frequencies.[20, 21]

Health workers have a high risk of being infected with HBV by virtue of their work. Samuel *et al.* (2009), stated that 92.6% of Nigerian health workers felt that their jobs put them at risk of contracting hepatitis B infection.[22] The same result was also found in present study since 93.5% of medical students perceived that health workers as a high risk group for contracting hepatitis B infection. Persons with chronic infection are often asymptomatic and may not be aware that they are infected; and are capable of infecting others.[2] Approximately one-third of health workers in China were unaware of the typical asymptomatic nature of chronic HBV infection.[23] In this study, 81.3% of the studied medical students knew that asymptomatic individuals can be carriers and transmit disease to others, this was consistent with the Khan *et al.* (2010), who mentioned that 85% Pakistani medical students agreed that asymptomatic cases or carriers of viral hepatitis B can transmit the disease to healthy individuals.[14] Moreover, 92% of medical students in the present study agreed that blood screening is mandatory for safe blood transfusion. Comparable result was found among Indian medical interns[24], while only 71.7% of Omani medical students appreciated this fact . [25] 85.9% of Indian interns agreed about importance of pre-operative screening for HBV [24], in comparison to 71.9% of the studied medical students. Great majority (92.8%) of students in the present study recognized that intravenous drug users were the high risk group. This was in contrast to the finding observed among first year MBBS students at Lahore where only 8% thought that intravenous drug users at risk.[26] Also 59% of Vietnamese American college students correctly indentified intravenous drug use as a mode of hepatitis B transmission.[27] In the present study 86.3% students claimed dialysis to be a source of spreading hepatitis B infection and 56.1% knew that endoscopy could be a source also. Lower responses were obtained among students of private medical university in Karachi, since 67% and 35% claimed dialysis and endoscopy as sources of spreading infection respectively.[16] HBV can be transmitted at the barber's shop through shaving or hair cutting. 67.6% of the studied students appreciated this risk as other study among university students at Lahore.[26] Moreover, 70.5% of medical students, in the present study, regarded sexual relation as a mode of transmission of hepatitis B infection. Similar results were found among Omani medical students[25] and Vietnamese American college students.[27] However, only 37% of Nigerian health workers said that the disease can be transmitted through sexual contact.[22] Engaging in high risk sexual behaviors increased risk of getting hepatitis B infection. This risk of the disease was appreciated by 66.2% of students in present study in comparison to 26.4% of male medical students at private university in Hyderabad,[15] and Only 2% of first year MBBS students at Lahore identified this risk.[26] Regarding ear/nose piercing as a mode of transmission of HBV, only 51.8% of the studied medical students identified it correctly in comparison to 69.6% of Omani medical students.[25] Higher percentage of Indian medical interns (89.1%) [24] and biological science students in Pakistan (73%) [28] recognized it as mode of hepatitis B infection transmission. Higama recognized by 77.7% of the students, in the present study, as potential risk factor for transmitting hepatitis B.

Almost half of Saudi dental patients were aware that HBV is transmitted in dental clinic during surgical procedure or hygiene care.[29] In the present study 73.4% believed that HBV is transmitted by contaminated dentistry tools, compared to 86% of Iranian medical specialist believed that HBV transmission is possible via dentistry.[30] More specifically, toothbrush as a tool of transmitting HBV, 58.3% of studied medical students correctly identified it in comparison to 45% of Vietnamese American college students,[27] and 28% of biological science students at Lahore.[28] Also the present study revealed that shaking hands, sharing toilet and eating utensils with an infected patient are considered safe by 86%, 61.2% and 56.1% of students respectively. The same findings were found among Omani medical students at Sultan Qaboos University[25] and male medical students at private university in Hyderabad, [15] though, more than 90% of Indian interns were aware about this fact.[24] Unfortunately, 15.8% of our students were uncertain about coughing and sneezing as a mode of hepatitis B infection transmission and 8.6% of them believed that it could occur. However, 25.4% of Omani medical students were not sure about coughing and sneezing as a mode of transmission.[25]

About 10-20% of women seropositive for HBsAg transmit the virus to their neonates in the absence of immunoprophylaxis. In women who are seropositive for both HBsAg and HBeAg vertical transmission is approximately 90%.[28] In present study 73.4% of study medical students were aware about vertical transmission of hepatitis B infection.

This result was consistent with other study among Omani medical students where 73.9% of them agreed that mother can transmit the infection to her newborn.[25] Hepatitis B virus is not transmitted through breast milk of infected mother is a fact stated by only 25.2% of the medical students in the present study. Similar findings were found among Omani medical student [25] while, only among 9.4% of Indian medical interns.[24] In present study the availability of hepatitis B vaccine was known to 76.3% of students. However, only 65.2% of Omani medical students appreciated the availability of hepatitis B vaccine.[25] On the other hand, better information about availability of preventive vaccine were found among students of private medical university in Karachi (95%) [17] and Indian medical intern (90.7%).[24] Low level of knowledge about post exposure treatment for hepatitis B was revealed among more than 60% of the studied medical students. However, 76% of Pakistani medical students did not have any knowledge about the post exposure prophylaxis for hepatitis B.[14] Proper disposal of sharps mentioned by 76.3% of studied medical students as a way of preventing hepatitis B; which is in agreement with that reported among Nigerian health workers.[22] Avoiding contaminated water and improperly cooked food was wrongly mentioned in this study as measures of preventing hepatitis B transmission by 18% and 17% respectively. However around three quarter of American Vietnamese college students incorrectly associated HBV transmission with food and water [27] while only few Nigerian health care workers (3-6%) made this wrong association.[22] Hepatitis B infection is non-curable disease; drugs can control it by stopping virus from replicating. This piece of fact was appreciated by 17.2% of Indian medical interns[21] in comparison to 41.7% of medical students in our study. Better response was noticed among Omani medical students (54.3%) . [25] Ashri *et al.* (2008) found that the level of HBV awareness and knowledge were higher among female participants and accredited that to the obstetric care the female obtain when they are pregnant in addition to the required hepatitis B vaccination for children before school admission.[29] This assumption was not clarified in this study where significant correlation between marital status and hepatitis B knowledge was in favor of unmarried students. This could be explained by a large proportion of unmarried to married students in the present study group. Gender was not associated with significant difference in knowledge level which was supported by the result of a survey conducted among students at Shiraz University of Medical Sciences.[31] Khabir *et al.* (2008) in their study among Iranian medical specialists found a non-significant correlation between vaccination and hepatitis B knowledge which could be explained by high percentage of completed vaccination against hepatitis B (88.1%).[30] In the same way, the low percentage of vaccination against hepatitis B in this study (28.1%) could explain a non-significant correlation between vaccination and level of knowledge. Higher levels of HBV knowledge were found among young Vietnamese American college students who had family members with HBV, those who had been screened for HBV and those who had been vaccinated against HBV.[27] However, in the present study, medical students who have reported negative family history of hepatitis B scored significantly higher knowledge than those who did. Furthermore, there was no significant correlation between level of knowledge about hepatitis B and their vaccination status, history of screening for hepatitis B, or history of exposure to NSI. Chao *et al.* (2010) revealed that Chinese Healthcare and public health professionals who scored significantly higher on HBV knowledge-based questions had been screened for HBV themselves. But having been vaccinated or having family history of chronic hepatitis B was not significantly associated with differences in knowledge score.[23]

The overall knowledge of the medical student, in the present study, regarding hepatitis B ranged between "good" to "average". This was in agreement with students of Sultan Qaboos[25] and Karachi medical colleges.[14]

Conclusion and Recommendations

The overall knowledge of study medical students showed satisfactory outcomes compared to other studies but there was a gap which needs to be corrected or modified regarding transmission, prevention and post-exposure management of hepatitis B. The vaccination coverage, in the present study, was unsatisfactory which reflects lack of awareness about seriousness of hepatitis B infection and availability and / or significance of hepatitis B vaccine. Therefore it is recommended to raise Awareness about hepatitis B vaccination among medical students before starting their clinical training; ensuring documented vaccination and immune status for hepatitis B. Medical students should be well educated about counseling for accidental needle pricks and availability of post-exposure prophylaxis.

Correspondence: Dr. Magdy A. Darwish,
Assistant Professor, Family &Community Medicine Department, College of Medicine,
University of Dammam,
P. O. Box 2114, Dammam 31451, Saudi Arabia.
Fax No. : 00966-3-8645612
Tel. No. : 00966-3-8948964 Work
mobile: 00966569668105
E-mail: magdar9123@yahoo.com

References:

1. World Health Organization (WHO): Hepatitis B Fact Sheet No. 204 [Internet]. 2000 [Cited 2012 Dec 12]. Available from: http://www.who.int/mediacentre/factsheets/fs204/en /
2. Centers for Disease Control and Prevention (CDC). Epidemiology and Prevention of Vaccine-Preventable Diseases. Atkinson W, Wolfe S, Hamborsky J, eds. 12th ed. Washington DC: Public Health Foundation, 2011.
3. Andre F. Hepatitis B epidemiology in Asia, the Middle East and Africa. Vaccine 2000; 1 Suppl: S20-22.
4. World Health Organization (WHO): Wastes from health-care activities: Fact Sheet No. 253 [Internet]. October 2000 [Cited 2012 Nov 20]. Available from: http://www.who.int/mediacentre/factsheets/fs253/en/
5. Centers for Disease Control and Prevention (CDC): Viral Hepatitis [Internet]. Hepatitis B information for health professionals. Hepatitis B FAQs for health professionals. [Cited 2012 Dec 20]. Available from: http://www.cdc.gov/hepatitis/B/bFAQ.htm.
6. Pramoolsinsup C. Management of viral hepatitis B. Gastroenterology Hepatology. 2002 Feb; 17 Suppl: S125-45.
7. World Health Organization (WHO): Immunization, Vaccines and Biologicals,hepatitis B [Cited 2012 Dec 20]. Available from: http://www.who.int/immunization/topics/hepatitis_b/en/index.htm l
8. Centers for Disease Control and Prevention (CDC): Recommendations for Preventing Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Patients during Exposure -Prone Invasive Procedures. MMWR Recomm Rep 1991, 40(RR08); 1-9.
9. Al Faleh FZ. Hepatitis B infection in Saudi Arabia. Ann Saudi Med 1988; 8: 474-480.
10. Al-Faleh FZ, Ayoola EA, Arif M, Ramia S, Al-Rashed R, Al-Jeffry M, *et al.* Seroepidemiology of hepatitis B virus infection in Saudi children: a baseline survey for a mass vaccination against hepatitis B [Abstract]. J Infect 1992; 24: 197-206.
11. Madani TA. Trend in incidence of hepatitis B virus infection during a decade of universal childhood hepatitis B vaccination in Saudi Arabia. Trans R Soc Trop Med Hyg 2007;101:278-83
12. Elliott SK,Keeton A, Holt A. Medical student's knowledge of sharp injuries. J Hosp Infect 2005; 60: 374-7.
13. Raja'a YA, Saeed GG, Al-Hattami AA, Al-Asadi MH, Mohammad AA, Ahmed AA, Al-Ammari NM. Coverage and perceptions of Medical Sciences students towards hepatitis B virus vaccine in Sana'a City, Yemen. Saudi Med J. 2002 Oct; 23(10):1222-6.
14. Khan N, Ahmed SM, Khalid MM, Siddiqui SH, Merchant AA. Effect of gender and age on the knowledge, attitude and practice regarding hepatitis B and C and vaccination status of hepatitis B among medical students of Karachi, Pakistan. J Pak Med Assoc. 2010 Jun; 60(6):450-455
15. Nisar N, Baloach R, Munir AA. Does clinical experience affect knowledge regarding hepatitis-B among male medical students at a private university? J Pak Med Assoc. 2009 Dec; 59(12):808-11.
16. Anjum Q, Siddiqui H, Ahmed Y, Rizvi SR, Usman Y. Knowledge of students regarding hepatitis and HIV/AIDS of a private medical university in Karachi. J Pak Med Assoc. 2005 Jul; 55(7):285-288.
17. Norsayani MY, Noor Hassim I. Study on incidence of needle stick injury and factors associated with this problem among medical students. J Occup Health. 2003 May; 45(3):172-178.
18. National Institute for Occupational Safety and Health (NIOSH). NIOSH Alert: Preventing Needlestick Injuries in Health Care Settings. 1999 Nov. Publication no. 2000-108.
19. Saleem T, Khalid U, Ishaque S, Zafar A. Knowledge, attitudes and practices of medical students regarding needle stick injuries. J Pak Med Assoc. 2010 Feb; 60(2):151-156.
20. Resnic FS, Noerdlinger MA. Occupational exposure among medical students and house staff at a New York City Medical Centre. Arch Intern Med 1995; 155: 75-80.
21. Tirounilacandin P, Krishnaraj S, Chakravarthy K. Hepatitis-B infection: Awareness among medical, dental interns in India. ATMPH. 2009;2(2):33-36
22. Samuel SO, Aderibigbe SA, salami TA, Babatunde OA. Health workers' knowledge, attitude and behavior towards hepatitis B infection in Southern Nigeria. IJMMS. 2009 Oct; 1(10):418-424.
23. Chao J, Chang ET, So SK. Hepatitis B and liver cancer knowledge and practices among healthcare and public health professionals in China: a cross-sectional study. BMC Public Health. 2010 Feb 25; 10:98.
24. Daud S, Hashim NR, Manzoor I. Prevention of hepatitis B; knowledge and practice among first year MBBS students. Professional Med J Dec 2007; 14(4): 634-638.
25. Al-Jabri AA, Al-Adawi S, Al-Abri JH, Al-Dhahry SH. Awareness of hepatitis B virus among undergraduate medical and non-medical students. Saudi Med J. 2004 Apr;25(4):484-487
26. Razi A, Rehman R, Naz S, Ghafoor F, Ullah Khan MA. Knowledge, attitude and practice of

university students regarding hepatitis B and C. ARPN Journal of Agricultural and Biological Science. 2010 July; 5(4): 38-43.
27. Hwang JP, Huang CH, Yi JK. Knowledge about hepatitis B and predictors of hepatitis B vaccination among Vietnamese American college students. J Am Coll Health. 2008 Jan-Feb; 56(4):377-382
28. Michielsen PP, Van Damme P. Viral hepatitis and pregnancy [Abstract]. Acta Gastroenterology Belg. 1999 Jan-Mar; 62(1):21-9.
29. Ashri NY. Hepatitis B and C knowledge among Saudi dental patients. Saudi Me J. 2008;29 (12): 1785-1790
30. Kabir A, Tabatabaei SV, Khaleghi S, Agah S, Faghihi- Kashani AH, *et al.* Knowledge, attitudes and practice of Iranian medical specialists regarding hepatitis B and C. Hepat Mon. 2010; 10(3): 176-182.
31. Ghahramani F, Mohammadbeigi A, Mohammadsalehi N. A survey of the students' knowledge about hepatitis in Shiraz University of Medical Sciences. Hepatitis Monthly 2006; 6(2): 59-62.