

Vaccination Coverage of Nursing Staff against Hepatitis B and Information Source about Hepatitis Prevention: a Study in a Regional Teaching Hospital

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S u m m a r y. *The aim of this epidemiological study was to define the prevalence of immunization against Hepatitis B (HB) and to investigate the factors that may influence the vaccination coverage of the nursing staff (NS) in a regional teaching hospital. In this study the prevalence of HbsAg, positivity of antibodies against HB in blood samples as well as the prevalence of vaccination of the NS, have been recorded. All participants filled out a specific questionnaire. Ninety six per cent of the sample (n=144) reported having being tested for HBsAg without prior vaccination and 2.8% (n=4) of these were found HbsAg positive, 15.7% (n=21) had antibodies against HB, 3.3% (n=5) had already been infected with HB, and 77.3% (n=116) were vaccinated. The main factor that contributed to the performance of the vaccine was prevention (98.3%, n=114/116). Regarding the reason why they hadn't been vaccinated, 22.2% (n=4) stated they were afraid of the adverse effects, 11.1% (n=2) reported health reasons, 61.1% (n=11) already had*

antibodies and 5.6% (n=1) were infected with HB. The majority of participants (58.3%, n=74) reported they were informed about HB during first degree training, 15.7% (n=12) by the Committee of Nosocomial Infections, 7.1% (n=9) by leaflets administered by the Ministry of Health, 13.4% (n=17) by friends or relatives and (4.7% (n=6) through the mass media. From the findings of the present study it is obvious that there is a need to educate health care workers to take all the precautions against hepatitis B infection during any invasive procedures. It is also considered essential to provide counseling, adequate support and retraining services for the prevention of the disease.

INTRODUCTION

The prevalence of HB is still high despite the development of a safe and effective vaccine and the establishment of preventive measures to avoid transmission. It is estimated that 2 billion people have already been infected with the HB virus the last 40 years. According to the World Health Organisation (WHO), 100,000,000 new cases occur every year, especially in

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highly endemic countries. It is estimated that chronic hepatitis B affects than 5% of the global population (350,000,000) by causing 1 to 2 millions of deaths worldwide (1-4). Greece is among the medium endemic countries, showing reducing rates the last years. The incidence of carriers is almost 3% while it appears to be raised among immigrants (500,000 people in estimate) (5). In certain communities the prevalence of the carriers is more than 10%, a percentage that reaches the limits of high endemicity (6). The virus is transmitted through direct contact with contaminated blood or biological fluids. Health care workers (HCW) are more often exposed to the virus mainly because of needle injuries or other sharp objects injuries that are contaminated or by biological fluids that come in contact with exposed skin or mucosa. It needs to be mentioned that there is a risk of transmission in cases there is a wound or a lesion and the skin isn't intact. People who are HbsAg positive are considered to be highly infective. Blood and blood products have the highest viral concentration (7).

The risk of HBV transmission after an accidental needle puncture with a HbeAg positive blood is 30% for HBV infection, while the risk drops to 14%, in case the blood on the needle is HbeAg negative. It goes without saying that preventive vaccination of all health care workers is imperative and there is a need to implement a suitable vaccination program in all health care settings (8,9). The representatives of the European Health Committee agreed in May 1992 that all countries should integrate a vaccination program in their health care plan by the year of 1997 (WHO guidelines) (10,11). In Greece, vaccination against HB became part of the National Vaccination Program by November 1997, following Ministry of Health's memorandum regarding all infants.

The aim of this study was to define the vaccination prevalence against HB among the NS of a regional University hospital, as well as the reasons for being vaccinated or not and the source of their information about the active immunization against hepatitis. The results of the study may help enhance the implementation of

the preventive vaccination program against HBV in NS.

SAMPLE AND METHODS

The sample, a convenience one, consisted of 150 nurses and midwives. For the data collection a specific questionnaire for the purpose of this study was used. Data collection lasted from January till March 2007.

The questionnaire was distributed to a teaching hospital in Northern Greece. Two hundred fifty questionnaires have been administered but only 150 were filled out adequately (completion rate 60%). The remaining 100 were not included in the analysis. The administration, filling and collection of the questionnaires took place at each department of the hospital and one of the researchers of this paper was available to answer any questions regarding the terminology contained in the questionnaire or the objective of the study. The sample comprised registered nurses (University and TEI graduates), nurse assistants and some midwives (n=5, 3.3%).

The collection of the questionnaires was done in the health care personnel's workplace and they were encouraged to ask for further explanations whenever needed, as a member of the research team was present during the collection.

Potential subjects were recruited on the basis of their availability after an informed consent was obtained. They received a brief explanation of the purpose and the aim of the study by a member of the research team and those who agreed to participate were asked to sign an informed consent form. The hospital's Directory gave the permission to proceed and facilitated the research process by informing the personnel about the importance and the scope of the research.

Data analysis

The data were analysed using SPSS-15 for Windows. The associations between nominal variables were tested by chi-square test. Values less than 0.05 were considered statistically significant.

Table 1
Social, professional and demographic characteristics of the sample

Characteristics		N (%)
Gender N=150	Women	105 (70%)
	Men	42 (28.0)
	No answer	3 (2.0)
Family Status N=150	Married	100 (66.7%)
	Single	44 (29.3)
	Other	6 (4.0)
Children N=150	Yes	93 (62.0)
	No	55 (36.7)
	No answer	2 (1.3)
Nursing Education N=150	University	13 (8.7%)
	Technological	62 (41.3)
	Two years nursing education	69 (46.0)
	Other	5 (3.3%)
Work Experience N=150	≤10 years	80 (53.3%)
	>10 years	70 (46.7%)
Nursing Department N=150	Hospital Blood Bank Department	4 (2.7%)
	Operating theatre	14 (9.3%)
	Internal Medicine-Cardiology Department	35 (23.3%)
	Surgical Department	32 (21.3%)
	Haemodialysis Unit	7 (4.7%)
	Emergency and outpatient Department	20 (13.3%)
	Maternal Gynaecologic Department	12 (8.0%)
	Pediatric	5 (3.3%)
	Psychiatric	14 (9.3%)
	Oncology Unit	2 (1.4%)
	Chemotherapy Unit	1 (0.7%)
Pharmacy	1 (0.7%)	
No answer	3 (2.0%)	

Table 2
Results of HbsAg screening

		N (%)
HbsAg screening N=150	Yes	144 (96%)
	No	6 (4.0%)
HbsAg test result N=144	Positive	4 (2.8%)
	Negative	140 (97.2)

RESULTS

From the analysis of data it shows that the sample consisted of 42 (28.0%) men and 105 (70.0%) women. The majority of the participants (n=100, 66.7%) were married and 93 of them (62%) had children. Four percent (n=6) were

separated and 29.3% (n=44) were single. As seen in the Table 1, 8.7% (n=13) of the participants were University graduates, 41.3% (n=62) were graduates of the Technological Educational Institution, 46.0% (n=69) have completed a two years nursing education course and 3.3% (n=5) were midwives. According to the findings, 53.3% (n=80) of the health care personnel work less than 10 years.

Fourteen (9.3%) of the participants worked in the Psychiatric ward, 2.7% (n=4) worked in the Hospital Blood Bank Department, 9.3% (n=14) in the Operating Theatre, 23.3% (n=35) in the Medical and Cardiology Department, 21.3% (n=32) in the Surgical Ward. Eight per cent (n=12) of the participants in this study worked in the Maternal/ Gynaecologic Department, 4.7% (n=7) in the Haemodialysis Unit, 13.3% (n=20) in the Emergency and Outpatient Department, 3.3% (n=5) in the Paediatric ward and 2.1% (n=3) in the Oncology/Chemotherapy Unit (Table 1).

The participants have been asked to report whether they had ever been tested for HbsAg. One hundred and forty four (96.0 %) of the participants reported that they were tested for HbsAg and four of them (2.8%) were found to have a positive test result (Table 2).

Table 3
Screening for antibodies against hepatitis B and subsequent reasons for performing the test

		N (%)
Test for antibodies against hepatitis B	Yes	141 (94.0)
	No	9 (6.0)
Result	Positive	21 (14.9)
	Negative	112 (79.4)
	Unknown	1 (0.7)
	No answer	7 (5.0)
Reasons for seeking HBV antibodies testing	Needle-stick injury	36 (25.6)
	Fear of potential infection	7 (5.0)
	Belief on the effectiveness of prevention	66 (46.8)
	Blood donation	13 (9.2)
	Pregnancy	13 (9.2)
	Recent surgery	4 (2.8)
	No answer	2 (1.4)

As shown in the Table 3, before performing the hepatitis B vaccine 79.4% (n=112) of the

participants reported a negative HBV test result as opposed to 14.9% (n=21) who reported a positive result. Seven (5.0%) did not answer and one doesn't remember the result (0.7%). A further investigation of the matter at hand showed that the main reason for not being tested was their negligence (66.7%), while another 22.2% said they didn't find the time to have the test (Table 3).

One hundred sixteen (77.3%) of the sample had been vaccinated against HBV. From the remaining 34 participants (22.7%), only 18 reported the reason for which they hadn't had the vaccine done: 22.2% (n=4) were afraid of the adverse events, 5.6% (n=1) already had antibodies, 61.1% (n=11) were infected and 11.1% (n=2) for health reasons (Table 4).

Table 4
Vaccination Rates against HBV

		N (%)
Vaccination against hepatitis B N=150	Yes	116 (77.3%)
	No	34 (22.7%)
Reason for having the vaccine N=116	Accidental exposure to the virus	2 (1.7%)
	As a preventive measure	114 (98.3)
Reason for not being vaccinated N=18	Fear of adverse events	4 (22.2%)
	Health reasons	2 (11.1%)
	Infection by HBV	11 (61.1%)
	Presence of antibodies	1 (5.6%)

Table 5
Source of information about HBV, protective measures, vaccine

Source of information	N (%)
Leaflets by Ministry of Health	9 (7.1%)
Nursing schools and scientific bodies	74 (58.3%)
Nosocomial Infections Committee	20 (15.7%)
Mass media	6 (4.7%)
Close environment (friends, relatives, others)	17 (13.4%)
Department of Blood Donation	1 (0.8%)
Total	127 (100%)

With regard to the adverse effects from the vaccine, 9 participants didn't answer. From the remaining participants, 21.5% (23/107) report pain on the site of injection, 3.7% reported redness, 3.7% oedema and one person had temperature above 37 °C. Sixty seven (62.6%) had

no adverse events while 6 (5.6%) participants reported pain, redness and oedema at the same time.

The participants reported they were informed about HB during first degree training (58.3%, n=74), 15.7% (n=20) by the Committee of Nosocomial Infections, 7.1% (n=9) by leaflets administered by the Ministry of Health, 13.4% (n=17) by friends or relatives and 4.7% (n=6) through the mass media and one (n=0.8) (Table 5).

There wasn't any strong correlation among participants with a positive test of antibodies against HBV and their socio-demographic characteristics and more precisely with gender (p=0.811), age (p=0.33), family status (0.67), having children (0.43), nursing education (0.74) and years of work experience (0.44) (Table 6).

Table 6
Correlation of positive antibodies result of the sample with demographic, professional and social characteristics (percentages shown for population with positive antibodies result)

Sample characteristics		%	P
Gender	Women	71.4	0.811
	Men	28.6	
Age	>30	71.4	0.33
	≤30	28.6	
Family status	Married	76.2	0.67
	Single	23.8	
Children	Yes	71.4	0.43
	No	28.6	
Nursing Education	Registered nurse	52.4	0.74
	Two years nursing education	47.6	
Years of experience	≤10 years	52.4	0.44
	>10 years	47.6	

DISCUSSION

Infection from hepatitis B virus constitutes a well documented risk for health care workers in the working environment. It has been reported that globally, high risk groups are people undergoing frequent blood transfusions, renal patients and health care personnel (12). The risk of occupational transmission depends on: a) the frequency of exposure to blood or other biological fluids, b) the incidence of the disease, c) the virulence of the disease d) the potential

of transmission by one only exposure, that depends on the concentration of the virus inside the infective material (7,13). Since 1992 the World Health Organisation recommends the immediate and full control of HBV infections around the globe and recommends vaccination of children and adolescents along with high risk groups (14). Currently, the vaccine against HBV is manufactured by the recombinant DNA technique and is highly safe. It is estimated that in case the vaccine was introduced during the seventies, 95% of the HB cases may have been avoided (15).

The results of the present study showed that the majority of the nursing staff (96%) mentioned that they have been tested for surface antigen and antibodies against HB (94%). Four participants (2.8%) were positive for hepatitis B surface antigen and 14.9% had antibodies. These findings are congruent with those in the current international and national literature (16, 17). The rates of people with positive antibodies results in this study are similar to those of other studies (17). In Albania, a highly endemic country, Kondili et al report that 8.1% of their sample (n=480 HCW) were HBsAg positive (18).

The possibility of exposure to blood and other biological fluids for health care workers during their work is estimated to be around 36% (13). Also, it has been shown from various studies that accidents during nursing procedures occur in 39% in Merseyside Hospital in UK (16), and 50% in the Teaching Hospital of Sidney, Australia (19). An interesting finding by Hsieh et al was the fact that the majority of sharps injuries were recorded during daytime while it might have been expected that during nighttime the accidents could be more frequent due to increased fatigue or sleeplessness (20).

The rate of vaccination was 77.3%. Almost one out of four people has not been vaccinated against HB while they definitely know they are part of a high risk group. The present study revealed similar vaccination rates against HB with another study performed in Greece which looked in the physicians' vaccination coverage (21), but quite higher, however, from the results of another study in the nursing staff of Greece

(52,2%) (22,23). Rachiotis et al. report an overall 57.1% vaccination rate in a general hospital in Athens (24). Similar to our rates were reported in studies in Europe (60-70%) (25) and Sidney, Australia (85%) (19). Also, in a Turkish study, 125 nurses (27.2%) in a sample of 452 nurses, were not vaccinated (26).

Oh et al. report that the main reason of exposure of health care personnel at work in South Korea is an injury from a sharp object and especially needles (94%) (27). Sharps injury was also the main reason of professional exposure to blood borne viruses (83%) as Gyawali et al. report, who investigated the vaccination coverage of health care personnel in a London hospital (28). In the same way, Talaat et al. found that the main exposure risk was needle stick injuries (35.6%) and replacing the cap of a used needle (29).

The factors that contributed to the performance of the HbsAg test in the present study were: needle-stick injury (25.6%), fear of potential infection (5.0%), belief that vaccination is an effective preventive measure (46.8%) and personal reasons (blood donation 9.2%, test during pregnancy 9.2%, screening before surgery 2.8%). In the case of blood donors (13 participants, 9.2%) blood testing for HBV antibodies is mandatory.

There is no question that all health care workers should be vaccinated against HBV. Currently, the vaccine is highly effective and safe for the prevention of the disease as well as its implications. The adverse events reported by the vaccinated participants of our study are documented in the literature and in the leaflets of the manufacturers of the two commercial forms of the vaccine currently available in Greece (30). However, 22.2% of the sample reported fear of adverse events as the main reason for not having the vaccine and another 61.1% reported having antibodies against HBV.

The present study showed that the first source of information about HB, was firstly during the first degree of studies and secondly the hospital committee of nosocomial infections. These results are in congruence with the findings from other studies in nursing staff that took place in Greece (31-33).

There wasn't any strong correlation among participants with a positive test of antibodies against HBV and their socio-demographic characteristics, while in another study there was a strong relationship with the level of education and work experience (34) a fact that suggests that all health care workers were almost equally susceptible to HBV infection.

It should be noted that although the sample size was not large, it reflects the factors that may influence the vaccination coverage against HBV.

CONCLUSION

In conclusion, the present study revealed a high percentage of susceptible persons among the HCW so, it is imperative to continue the campaign of informing the HCW about the necessity of the vaccine. Being always on alert, intensive training, shift of behavior in work environment and universal implementation of vaccination in HCW are all regarded as indispensable in order to prevent further spread of the disease and its consequences.

There is a need also to establish strategies including implementation of Universal Precautions, provision of personal, protective equipment and the management of exposures. Successful implementation of these strategies requires an effective infection control committee with support from the health setting management team and the education department of the hospital.

REFERENCES

1. Da Villa G., Picciotto L., Elia S., Peluso F., Montanaro F., Maisto T.: Hepatitis B vaccination: Universal vaccination of newborn babies and children at 12 years of age versus high risk groups. A comparison in the field. *Vaccine* 13: 1240-1243 (1995)
2. Krahn M., Detsky A.S.: Should Canada and the United States Universally Vaccinate Infants against Hepatitis B? A Cost-Effectiveness Analysis. *Med. Decis. Making* 13(1): 4-20 (1993)
3. Andre F.E., Zukerman A.J.: Review: Protective efficacy of hepatitis vaccines in neonates. *J. Med. Virol.* 44: 144-151 (1994)
4. Krahn M.D., Detsky A.S.: Universal hepatitis B vaccination: the economics of prevention (editorial). *CMAJ* 146: 19-21 (1992)
5. Zuckerman A.J., Lavanchy D.: Treatment options for chronic hepatitis. *BMJ* 319: 799-800 (1999)
6. Kattamis Ch.: Vaccines against hepatitis. *Proceedings of 21st National Annual Medical Conference*. Pp.72-80, Athens, Greece, 1995
7. Pavlaku A.A.: Specific infections. What new in anesthesia 1995-1998. *Proceedings of 7th Panhellenic Seminar in Anesthesiology*. Pp.201-212, Athens, Greece, 1999
8. Bonanni P.: Report on Working Group 1: Albania, Andora, Canada, France, Italy, Portugal, Poland, Romania and Spain. *Vaccine* 16 (Suppl.): S58-S60 (1998)
9. Grob P.J.: Report on Working Group 2: Austria, Belgium, Bulgaria, Germany, Greece, Hungary, Malta, Russia, Switzerland, Turkey and Uzbekistan. *Vaccine* 16 (Suppl.): S61-S62 (1998)
10. Melnick J.L.: International prospects for combined vaccines with emphasis on quadrivalent diphtheria-tetanus-petrussis-hepatitis B vaccine. *Ann. N.Y. Acad. Sci.* 754: 267-272 (1995)
11. Zuckerman A.J.: Developing new hepatitis B immunization strategies. *Gut* 38 (Suppl. 2): S60-S62 (1996)
12. European Parliament Committee on Social Affairs: Employment Report on vaccination of health care workers and other at risk occupations against hepatitis B. Session Document A300027/93, p.23, 27 January 1993
13. Greene E.S., Berry A.J., Arnold W.P.3rd, Jagger J.: Percutaneous injuries in anesthesia personnel. *Anesth. Analg.* 83: 273-278 (1996)
14. WHO: Expanded Programme on immunization Global Advisory Group. *Weekly Epidemiol. Record* 3: 11-16 (1992)
15. Gerberding J.L.: The infected health care provider. *N. Engl. J. Med.* 334: 594-595 (1996)
16. Cunningham S.M., Cunningham R., Izmeth M.G., Baker B., Hart C.A.: Seroprevalence of hepatitis B and C in Merseyside hospital for the mentally handicapped. *Epidemiol. Infect.* 112 (1): 195-200 (1994)
17. Noula M., Theodosopoulou E., Margari N., Gesouli E., Amari M., Iordanou P.: Immunologic status of nursing personnel against hepatitis B virus. *Epith. Klin. Farmakol. Farmakokinet.* 20: 37-44 (2002)
18. Kondili L.A., Ulqinaku D., Hajdini M., Basho M., Chionne P., Madonna E., Taliani G., Candido A., Denticio P., Bino S., Rapicetta M.: Hepatitis B virus infection in health care workers in Albania: a country still highly endemic for HBV infection. *Infection* 35: 94-97 (2007)
19. de Vries B., Cossart Y.E.: Needlestick injury in medical students. *Med. J. Aust.* 160: 398-400 (1994)
20. Hsieh W.B., Chiu N.C., Lee C.M., Huang F.Y.: Occupational blood and infectious body fluid exposures in a teaching hospital: a three year review. *J. Microbiol. Immunol. Infect.* 39: 321-327 (2006)
21. Perdikaris P., Anthousi A., Amanatidou A., Papavaggelou G.: Attitudes of Greek physicians regarding general vaccination and hepatitis B. *Arch. Hellenic Med.* 17: 593-599 (2000)
22. Noula M., Theodosopoulou E., Iordanou P., Lavdaniti M., Kotrotsiou E., Ammari M., Konstantinou E.: Frequency of vaccination against Hepatitis B in the Nursing Personnel. *Rev. Clin. Pharmacol. Pharmacokinet. (Int. Ed.)* 16: 141-148 (2002)
23. Kastanis G., Chatzigeorgiou D., Tzavara O., Markou N.: How sensitive is the personnel of a hospital regarding HBV, TB and tetanus vaccination? *Proceedings of 4th National Conference of Infections and Hygiene in Hospital environment*. P. 54, Athens, Greece, 1997

24. Rachiotis G., Goritsas C., Alikakou V., Ferti A., Roumeliotou A.: Vaccination against hepatitis B virus in workers of a general hospital in Athens. *Med. Lav.* 96(1): 80-86 (2005)
25. Hallauer J.: VHPB: Summary of strategies and recommendation. Viral Hepatitis Prevention Board. *Vaccine* 13 (Suppl. 1): S61-S63 (1995)
26. Kosgeroglou N., Ayranci U., Vardareli E., Dincer S.: Occupational exposure to hepatitis infection among Turkish nurses: frequency of needle exposure, sharps injuries and vaccination. *Epidemiol. Infect.* 132(1): 27-33 (2004)
27. Oh H.S., Yi S.E., Choe K.W.: Epidemiological characteristics of occupational blood exposures of healthcare workers in a university hospital in South Korea for 10 years. *J. Hosp. Infect.* 60: 269-275 (2005)
28. Gyawali P, Rice P.S., Tilzey A.J.: Exposure to blood borne viruses and the hepatitis B vaccination status among healthcare workers in inner London. *Occup. Environ. Med.* 55: 570-572 (1998)
29. Talaat M., Kandeel A., El-Shoubary W., Bodenschatz C., Khairy I., Oun S., Mahoney F.J.: Occupational exposure to needlestick injuries and hepatitis B vaccination coverage among health care workers in Egypt. *Am. J. Infect. Control* 31: 469-474 (2003)
30. RECOMBIVAX VACCINE, MSD & ENGERIX-B VACCINE. Smithkline Beecham Biological SA. In Greek National Formulary, EOF Edition, Athens, Pp.597-598 (2000)
31. Noula M., Iordanou P., Gessouli E., Evaggelou E.: The nurses awareness of the occupational risk regarding hepatitis B. *ICUs Nursing Web J.* 10th Issue: 1-16 (2002)
32. Noula M., Iordanou P., Gesouli E., Margari N., Vardaki Z.: Knowledge of nursing staff about the methods of HBV transmission and occupational hazards. *Medical Annals* 24: 435-439 (2001)
33. Gessouli-Voltiraki E., Tsetsekou E., Koutrouba P., Vompiris G., Vourdaha-Vompiri E.: Vaccination coverage of Health Care Professional against Hepatitis B. *Medical Annals* 30: 177-183 (2007)
34. Gessouli-Voltiraki E., Koutrouba P., Vompiris G., Deltsidou A.: HBV immunization status of health care personnel: a study in two Greek regional hospitals. *Rev. Clin. Pharmacol. Pharmakinet. (Int. Ed.)* 21: 197-202 (2007)