

Occupational exposure and hepatitis B vaccination among health care workers

Exposição ocupacional e vacinação para hepatite B entre trabalhadores da atenção primária e média complexidade

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ABSTRACT | Background: Through its vaccination schedules, the National Immunization Program ensures immunization against hepatitis B gratis to health care professionals at high risk for infection at the workplace. **Objective:** To analyze the association between variables related to occupational exposure and complete hepatitis B vaccination schedule. **Method:** Cross-sectional study with 3,084 primary care and medium complexity health care workers from five municipalities in the state of Bahia, Brazil. **Results:** The factors associated with complete hepatitis B vaccination schedule on bivariate analysis were: contact with biological materials, preparation of medications, use of personal protective equipment (PPE), search for orientation after a work accident and skill demands. **Conclusions:** Workers in the health sector resist adhering to some preventive measures. Strategies to encourage vaccination might be enhanced by creating room for discussion at work on the burden to which employees are exposed. Plans and policies for workers' health should be formulated in the light of governmental policies set for the overall population.

Keywords | hepatitis B; vaccination; workers' health.

RESUMO | Contexto: O Programa Nacional de Imunização (PNI), por meio dos calendários vacinais, garante imunização gratuita contra hepatite B para os profissionais de saúde que possuem risco aumentado para infecção relacionada aos processos laborais. **Objetivo:** Analisar a associação entre a vacinação completa para hepatite B e as variáveis relacionadas à exposição ocupacional. **Método:** Estudo de corte transversal realizado com 3.084 trabalhadores da atenção primária e média complexidade de cinco municípios da Bahia. **Resultados:** Os fatores associados à vacinação completa para hepatite B na análise bivariada foram: contato com material biológico, preparo de medicação, utilização de equipamento de proteção individual (EPI), procura de orientação após acidente de trabalho e exigência de habilidade no trabalho. **Conclusões:** Os trabalhadores do setor da saúde ainda apresentam resistência em aderir a algumas medidas de prevenção. Por isso, estratégias de incentivo à vacinação podem ser potencializadas com a abertura de espaços de discussão no trabalho a respeito das cargas laborais às quais o grupo está exposto. Reais planos e políticas de enfrentamento relacionadas à saúde do trabalhador precisam ser definidos à luz das políticas governamentais que têm sido constituídas para a população geral.

Palavras-chave | hepatite B; vacinação; saúde do trabalhador.

Project carried out in Salvador (Distrito Sanitário do Centro Histórico), Feira de Santana, Itabuna, Jequié and Santo Antônio de Jesus (BA), Brazil.

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INTRODUCTION

Hepatitis B is a chronic infectious disease that represents one of the major global public health problems. The rate of detection was 6.1/100,000 inhabitants in 2011 in Brazil, 71.8% of the cases corresponding to age range 20 to 49 years old. Only a part of the cases underwent treatment, which suggests that a considerable proportion of carriers has no access to diagnosis¹. Within this context, it is worth observing that the interest in the visibility of hepatitis and formulation of specific policies are rather recent.

Advances were made in recent years in the detection of hepatitis B and C through the System of Information for Notifiable Diseases (Sistema de Informação de Agravos de Notificação — SINAN) at a time the number of cases of hepatitis A decreased. Programs of vaccination against the hepatitis B virus (HBV) reduced the morbidity and mortality of acute and chronic infection. However, recent discoveries emphasize the diversity of the potential routes of transmission of hepatitis B in Brazil. In addition, population-based studies found that the prevalence of infection in the country is lower than the one previously reported by the World Health Organization (WHO)².

Vaccination with hepatitis B surface antigen (HBsAg) is the main protective measure. The schedule recommended in Brazil and worldwide to induce anti-HBs antibodies in 90–95% of healthy adults consists of 3 doses (with 30-day interval between the first and second and 180-day interval between the second and third)³. Through its vaccination schedules, the National Immunization Program (Programa Nacional de Imunização — PNI) ensures vaccination against hepatitis B gratis from childhood to adulthood, with emphasis on individuals at higher risk of infection, which is usually associated with the work environment⁴.

Health care workers at the primary care (PC) and medium-complexity (MC) levels are of particular interest within this context, because they are exposed to occupational hazards (needlestick injuries, percutaneous exposure to blood or bodily fluids). Risk of infection is also ubiquitous in everyday life through blood transfusions or intimate contact with HBV carriers⁵. As a result, health care workers might become infected both at and outside work.

Although hepatitis B vaccination is considered beneficial for prevention, it fails to attain the ideal protection levels after the 3-dose series is completed. For this reason, studies investigating the prevalence of vaccination, exposures associated with greater adherence to vaccination and seroconversion are needed to reinforce actions for health promotion, specific protection and control of disease among the more vulnerable groups.

The present study is justified considering the regulatory norms for work and the National Policy for Workers' Health, which understand health actions and work as determinants of the health-disease process and recommend surveillance of diseases, work environments and processes and analyses of the health situation⁶.

Facing the magnitude of hepatitis B and the possibility of prevention, the aim of the present study was to investigate the status of vaccination among PC and MC health care workers from the state of Bahia, Brazil, with occupational exposure to disease.

METHODS

The present cross-sectional and multicenter study was conducted in five cities in Bahia: Salvador (Historical Area Health District), Feira de Santana, Itabuna, Jequié and Santo Antônio de Jesus. The study population comprised PC and MC health care workers, including the ones who provide direct patient care, perform administrative tasks, housekeepers and security personnel, among others. For sample size calculation we considered the total population of workers (6,191), 95% confidence interval (95%CI), event proportion of 79.2% and error of 3.0%. However, the sample included 3,084 employees. Data collection was performed from 2010 through 2012 by means of a structured instrument divided in eight parts with questions on social and health conditions, occupational exposure and vaccination. The questionnaire was directly responded by participants with higher education, and applied by an interviewer to participants with lower educational level.

In regard to hepatitis B vaccination we considered oral reports on doses taken and performance of serology testing for immunization confirmation. The recommended schedule for hepatitis B is 3 doses (with 30- and 180-day

intervals after the first dose) and serology should be performed after completion of the full series. Inclusion of skill demands was based on a particularity of the JCQ-Questionnaire. Statistical analysis was performed with *Statistical Package for the Social Sciences (SPSS)*, version 15.0, for Windows. Following univariate descriptive analysis, we performed bivariate analysis to investigate the association between complete hepatitis B vaccination and variables related to occupational exposure. For this purpose we calculated prevalence ratios (PR) with 95%CI as measure of statistical significance. Interviews were performed after the participants signed an informed consent form. The study complied with the National Health Council Resolution No. 466/2012 and was approved by the ethics committee of State University of Feira de Santana, ruling no. 081/2009.

RESULTS

The sample comprised 3,084 PC and MC workers from the five investigated municipalities. About 78.1% of the participants were female, 57.3% had a partner and 80.6% were 20 to 49 years old.

Most participants reported to have a permanent employment relationship, with 40-hour weekly working time (70.1%). About 20.7% of the sample self-reported their state of health as average, poor or very poor. Most stated they were non-smokers (82.4%).

About 86.5% of the sample reported to have received 1 dose of hepatitis vaccine. A little more than half (59.7%) stated they had completed the 3-dose series. Only 34.8% reported having performed confirmatory serology testing of circulating antibodies; within this group, 3.0% stated they had not developed immunity against disease (Figure 1).

Factors related to occupational exposure and complete hepatitis B vaccination (on separate bivariate analysis for PC and MC workers) were contact with biological materials (PR=0.58; IC=0.52–0.66 / PR=0.65; CI=0.51–0.83, respectively) and preparation of medications (PR=2.65; CI=2.12–3.31 / PR=1.99; CI=1.40–2.85, respectively). Use of personal protective equipment (PPE) (PR=1.72; CI=1.45–2.04), looking for orientation after a work accident (PR=1.44; CI=1.20–1.73)

and skills demands (PR=0.74; CI=0.64–0.85) were associated with hepatitis vaccination only among PC workers (Tables 1 and 2).

DISCUSSION

The prevalence of complete hepatitis B vaccination was 59.7%. This finding deserves some consideration, because the Ministry of Health recommends and ensures vaccination gratis for health care workers. The prevalence rate we found is higher than the one reported for PC health workers

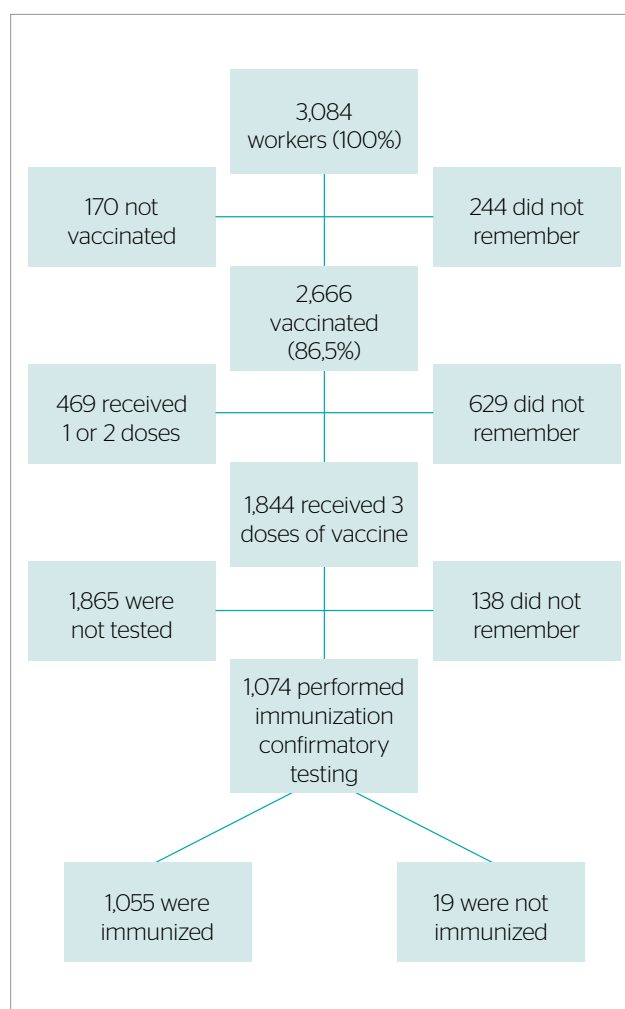


Figure 1. Flowchart representing frequency of hepatitis B vaccination and confirmatory serology testing among primary care and medium complexity health care workers (n=3,084), Bahia, 2013.

in Montes Claros (52.5%) and hospital employees in Piauí (51.1%) but lower than the one for public health care workers in Belo Horizonte (74.9%)⁷⁻⁹.

Table 1. Association between variables related to occupational exposure and situation of vaccination against hepatitis B among primary care (PC) health care workers (n=2.532), Bahia, 2012.

Variable	Vaccination prevalence		PR ^a	95%CI ^b	p ^c
	n	%			
Use of PPE*					
Yes	180	37.5	1.72	1.45-2.04	0.000
No	187	21.7	1.00		
Contact with biological materials					
Yes	305	23.9	0.58	0.52-0.66	0.000
No	397	40.6	1.00		
Work accidents with biological materials					
Yes	684	31.5	1.54	0.95-2.45	0.050
No	14	20.5	1.00		
Sought orientation after work accident					
Yes	267	38.9	1.44	1.20-1.73	0.001
No	110	26.9	1.00		
Prepares or administers medication					
Yes	633	36.5	2.65	2.12-3.31	0.035
No	72	17.7	1.00		
Skill demands at work					
Yes	562	29.6	0.74	0.64-0.85	0.000
No	140	39.8	1.00		
Excessive workload					
Yes	338	30.2	0.93	0.82-1.05	0.268
No	361	32.3	1.00		
Enough time for tasks					
Yes	601	32.0	1.16	0.97-1.38	0.082
No	104	27.5	1.00		
Emotional demands at work					
Yes	451	29.5	0.83	0.73-1.05	0.086
No	255	35.2	1.00		

*PPE: personal protective equipment; a: prevalence ratio; b: 95% confidence interval; c: chi-square test.

Several barriers hindering access to vaccination were described: doubts on the efficacy of vaccination, neglect, fear of side effects, little information on the transmission

Table 2. Association between variables related to occupational exposure and situation of vaccination against hepatitis B among medium complexity (MC) health care workers (n=463), Bahia, 2012.

Variable	Vaccination prevalence		PR ^a	95%CI ^b	p ^c
	n	%			
Use of PPE*					
Yes	26	38.2	1.21	0.84-1.73	0.311
No	66	31.5	1.00		
Contact with biological materials					
Yes	83	32.5	0.65	0.51-0.83	0.000
No	76	49.5	1.00		
Work accidents with biological materials					
Yes	147	38.6	1.01	0.60-1.66	0.982
No	10	38.4	1.00		
Sought orientation after work accident					
Yes	49	47.1	1.31	0.87-1.98	0.177
No	19	35.8	1.00		
Prepares or administers medication					
Yes	132	45.3	1.99	1.40-2.85	0.000
No	27	22.6	1.00		
Skill demands at work					
Yes	134	37.7	0.83	0.60-1.14	0.275
No	25	45.4	1.00		
Excessive workload					
Yes	85	41.6	1.15	0.90-1.48	0.232
No	74	35.9	1.00		
Enough time for tasks					
Yes	126	37.8	0.88	0.65-1.18	0.415
No	33	42.8	1.00		
Emotional demands at work					
Yes	96	36.7	0.86	0.68-1.11	0.271
No	63	42.2	1.00		

*PPE: personal protective equipment; a: prevalence ratio; b: 95% confidence interval; c: chi-square test.

of disease, lack of perception of risk and pressure at work and productivity^{10,11}. More than 20 years ago the government's attitude vis-à-vis the difficult situation caused by lack of information on availability of the vaccine for all groups as a recommendable and safe procedure was put into question¹². As to the current situation, outside broad-scope vaccination campaigns targeting children, sensitization campaigns focusing on socialization and expansion of free vaccination as collective preventive instrument among workers are still scarce.

Scientific studies on vaccination among workers conducted in the past 10 years described factors with positive relationship with vaccination, to wit: female sex, age over 38 years old, stable marital status, higher education, permanent employment relationship, income over twice the equivalent of the minimum wage, job position involving direct patient care and biological exposure or handling sharps. Taking such factors as basis, attempts at understanding the social representations on vaccination which influence individual decision making is relevant^{7-10,13-17}.

The relevance of the impact of biological agents present at the workplace on the lives of workers has been long recognized¹⁸. Efforts were made to investigate the rate of vaccination and immune status of different professional categories at health care facilities as a function of their higher exposure to biological hazards.

Although we did not measure anti-HBs antibody levels, the immune status of the participants was assessed based on their reports of having performed serology (anti-HBs antibody) testing after vaccination. Only 32.2% of the sample stated they knew what their immune status relative to hepatitis B was. The low prevalence of confirmatory testing might be due to lack of knowledge about or unavailability of free testing, as well as to lack of a workers' health protocol that ensures investigation within the Unified Health System (Sistema Único de Saúde — SUS) of the immune status given the current recommendation for compulsory vaccination⁹. In addition, one should bear in mind that in the 1990s Ministry of Health did not recommend anti-HBs antibody testing following vaccination for confirmation of the vaccine efficacy.

The factors associated with absence of immune response include male sex, delayed vaccination (>40

years old), obesity, alcoholism, smoking, hemodialysis, chronic lung disease and genetic factors^{5,19}.

The anti-HBs antibody levels might rapidly fall along the first year after vaccination and slower later on. Some studies found that the anti-HBs titer is often (11–63% of cases) much below the ideal 10–15 years after primary vaccination²⁰⁻²². For cases of accidents with biological materials and victims with anti-HBs antibody levels below the expected upon being tested at the time of an accident a booster dose is recommended with reassessment of the immunity status 2 to 4 weeks later. Titers over 10 mIU/ml are considered to be protective^{23,24}.

The results of the present study evidenced variables significantly associated with the outcome of interest, to wit: use of PPE, contact with biological materials, seeking orientation after an accident and preparation of medications. The association between complete hepatitis B vaccination and variables related to occupational exposure were similar among PC and MC health care workers. These findings point to a relationship between degree of exposure at the workplace and interest for vaccination as possible factor of motivation to adopt individual care measures.

Analysis of occupational risk demands previous knowledge of the work process. Consideration of the occupational environment allows for previous adoption of preventive measures against work accidents. Most professionals are not familiar with the routes of transmission of HBV or with the number of vaccine doses needed to achieve immunity²⁵.

In the present study we did not find statistically significant association between accidents involving biological materials and rate of hepatitis B vaccination. The high perception of risk of PPE users might be related with the high rates of vaccination⁷.

The occupational hazards to which workers allocated to urgent and emergency care and surgical departments and intensive care units are exposed are well established⁸. Also workers allocated to PC and MC services must daily deal with situations that demand fast decision making vis-à-vis the risk of exposure, which might contribute to the occurrence of work accidents¹⁵.

Thorough understanding of the factors associated with work accidents involving health care professionals depends on analysis of the work environment of these

workers, their living conditions and the professional-patient-staff relationship²⁶. One study conducted in Piauí found that the odds of sharps injuries was 2.8 times higher for the medium-level compared to the higher level employees; needles stood out among the instruments causative of accidents⁸.

Nationwide surveys found that hepatitis B affects a young population, i.e., 29 to 40 years old, which is precisely the one that has guaranteed protection via vaccination¹. The recently launched National Policy of Workers' Health (Política Nacional de Saúde do Trabalhador e da Trabalhadora — PNSTT)⁶ considered suggestions made by health care professionals and society at large. That fact notwithstanding, difficulties in the actual application of guidelines and problems at the management level for implementation of necessary actions have already been described, in addition to restrictions to the availability of PPE to cut costs. There is a need to further the investigations on situations associated with work accidents²⁷.

Health care workers still exhibit resistance to adhere to prevention measures. Within this context, strategies to incentive vaccination might be enhanced by making room to discussions on the burden to which this population is exposed. Beyond the work environment, these workers need to become aware that even when they do not provide direct care to infected individuals, they might be vulnerable via other routes of infection. Dialogue might be complemented with counseling, access to epidemiological information and safe sex supplies¹³. Priority should be given to orientation on the effectiveness of immunobiologicals and on the relevance of having SUS ensure the development of adequate anti-HBs antibody levels considering the partial efficacy of the vaccine in some groups.

Analysis of some characteristics related to psychosocial factors at work showed that skill demands, a variable that helps measuring control at work, were associated with reported hepatitis B vaccination. This factor might possibly influence the adherence to health protection measures to avoid exposure. Jobs enabling workers to make full use of their skills and achieve considerable control at work have been described as factors that promote health²⁸.

The present study sought to contribute to the knowledge on processes related to hepatitis B vaccination. The prevalence rates found might have been overestimated, as the data were obtained from oral reports, with their inherent risk of recall bias, a situation made even worse by the impossibility to check the participants' immunization record cards. To minimize possible errors, the group that performed data collection was duly trained.

CONCLUSION

Studies on vaccination among health care workers under occupational risk are beginning to extend beyond the hospital setting to include PC and also MC workers.

The control of hepatitis B (and other types of hepatitis) is complex, demanding participation of all the health care levels. Despite differences in work technologies, all hospitals and laboratories share some risks. For this reason measures should be taken to monitor the vaccination status of health care workers at the workplace.

Combat of hepatitis B, as recommended by the Ministry of Health, must keep getting stronger not only through preventive, but above all through educational measures. The present study found that despite free access to vaccines, the vaccination status is still unsatisfactory among health care workers.

Clear educational measures are needed for vaccine non-responders, because they are susceptible to HBV and in case of exposure they should receive hepatitis B immunoglobulin. Plans and policies for workers' health should be formulated in the light of governmental policies set for the overall population.

Specific training related to specific job functions might also reduce the number of infected individuals, and thus also the global magnitude of disease. Within the context of services, individualized education considering the peculiarities of the various professional categories has paramount importance²⁹.

To summarize, the data obtained in the present study reinforce the need for continuous education and sensitization of health care workers in regard to vaccination independently from the type of job they perform.

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