Revista Brasileira de Enfermagem
REBEn

RESEARCH

Factors associated with immunization against Hepatitis B among workers of the Family Health Strategy Program

Andréa Maria Eleutério de Barros Lima Martins[I], Fernanda Marques da Costa[II], Raquel Conceição Ferreira[III], Pedro Eleutério dos Santos-Neto[IV], Tatiana Almeida de Magalhaes[V], Maria Aparecida Barbosa de Sá[VI], Isabela Almeida Pordeus[VII]

[I] Universidade Estadual de Montes Claros, Basic Sciences and Health Center, Departament of Dentistry. Montes Claros-MG, Brazil.
[II] Universidade Estadual de Montes Claros, Graduate Program in Health Sciences. Montes Claros-MG, Brazil.
[III] Universidade Federal de Minas Gerais, College of Dentistry, Department of Social and Preventive Dentistry. Belo Horizonte-MG, Brazil.
[IV] Universidade Estadual de Montes Claros, Basic Sciences and Health Center, Departament of Pathophysiology. Montes Claros-MG, Brazil.
[V] Faculdades Integradas Pitágoras. Montes Claros-MG. Brazil
[VI] Faculdades Unidas do Norte de Minas, Dentistry Course. Montes Claros-MG. Brazil.
[VII] Universidade Federal de Minas Gerais, College of Dentistry, Departament of Pediatric Dentistry and Orthodontics. Belo Horizonte-MG, Brazil.

Submitted: 30-11-2014 **Approved:** 19-12-2014

ABSTRACT

Cross-sectional study conducted among workers of the Family Health Strategy Montes Claros. **Objective:** to investigate the report of vaccination against Hepatitis B, verification of immunization and the factors associated with dosages of anti-HBs. **Method:** we collected blood samples from those reported that they had one or more doses of the vaccine. We evaluated the association of the dosage of anti- HBs with sociodemographic conditions, occupational and behavioral. The associations were verified by Mann Whitney and Kruskal Wallis and correlation Spermann by linear regression using SPSS® 17.0. **Results:** among the 761 respondents, 504 (66.1%) were vaccinated, 52.5 % received three doses, 30.4 % verified immunization. Of the 397 evaluated for the determination of anti-Hbs, 16.4% were immune. **Conclusion:** it was found that longer duration of work was associated with higher levels of anti-HBs, while levels of smoking were inversely associated with anti-HBs. These workers need for vaccination campaigns.

Key words: Family Health; Vaccines Against Hepatitis B; Occupational Exposure; Hepatitis B; Epidemiology.

CORRESPONDING AUTHOR **Fernanda Marques Costa** E-mail: fernandafjjf@yahoo.com.br

INTRODUCTION

Hepatitis B (HB) is a public health problem, there are chronic carriers of Hepatitis B virus (HBV) infection in the world. Such aggravations have high impact on public health and in the national health systems of countries[1]. A national survey showed that Brazilian regions have variations and present epidemiological differences. It was estimated that at least 15% of the population has already across HBV at some point and chronic cases of HB affects about 1.0% of the population, constituting an important link in the chain of transmission of the disease[2-4].

Within the Brazilian population vulnerability, we highlight health workers, who are more vulnerable to HBV when compared to the general population. HB is considered an occupational disease, related to the degree of exposure of these professionals in their workplaces, through their direct relation when handling blood and other body fluids of patients infected with HBV and the possible transmission of HBV to their patients. Thus, health workers are part of HBV directly transmission chain. The risk of HBV contamination is high after accidents with sharp instruments contaminated with positive HB and Ag patients. A study of clinical pathology professionals showed that 22.6% of these professionals had indicative of serology prior contact with HBV[2-4]. In this context, the risk of health workers deserves special attention with preventive measures against HBV, and vaccination is the best form of protection. It is one of the most important health interventions, due to its collective character thus ensuring breaking the chains of transmission. Vaccination of health care workers can reduce the incidence of HBV infection in up to 95%[4].

The HB vaccine was introduced in high prevalence settings in 1989, culminating in the universal vaccination in children's agenda from 1998. The Brazilian Ministry of Health has expanded the age group to be immunized, which was 0-19 years in 1998, rising to 0-29 years in 2012. The access to this vaccine is public and its distribution is free of charge to users of the Brazilian Unified Health System[2]. In Brazil, it is recommended that vaccination should be made within three (3) doses at 0, 30 and 180 days. For health workers, the recommendation is that after the administration of the last dose against HB, serological tests are carried out to control antibody titers (anti-HBs)[1]. After administration of the complete scheme, the vaccine can induce high degree of immunity, but about 5%-10% of vaccines do not reach the protective antibody titers. Revaccination is made in case of failure of immunization (protective titers < of 10mIU/ml)[1].

Despite the availability of HB vaccine in SUS services[4], it appears that the vaccination status of professionals at all levels of health care show the problems associated with adherence to vaccination and occupational health precautions[5-6]. There is also sub-notification or not informed data regarding vaccination coverage among workers in primary healthcare. Studies were identified[7-8] which addressed the issue of primary health care workers, where there is a large contingent of health workers with the most diverse backgrounds and with different peculiarities in relation to other health workers.

Thus, we highlight the importance of knowing the aspects related to HB vaccination in the context of the Family Health Strategy (FHS). The reporting prevalence of HB vaccination, post-vaccination immunity verification, the prevalence of HB immunity of FHS workers in the city of Montes Claros, MG.

METODOLOGY

A cross-sectional study conducted between August and December 2011, which included all 762 workers of Primary Health Care of all 59 FHS teams of Montes Claros (MG): physicians, nurses, dentists, nursing technicians and assistants, oral health technicians and assistants, and community health workers. Data collection occurred in two phases. At first, all employees were asked to answer a semi-structured questionnaire, previously tested among workers not considered for the study. In the second phase, workers who reported having received at least one dose of HB vaccine were selected, from these, we selected the sample. To define the sample size, we considered a 95% confidence interval, a 50% proportion of the event and a 2.0% error, totaling 417 professionals. Blood samples were collected from these participants who reported receiving one dose of HB vaccine, which were randomly selected and agreed to participate in this phase of the study. A calibrated technician verified the anti-HBs dosage, the titer considered protective was ≥ 10 mIU/ml, lower amounts are referred to as latent immunity or no immunity.

The prevalence of reported vaccination was assessed with the question: Have you taken the Hepatitis B vaccine? If the answer is YES, how many doses have you taken (yes, three doses; yes two doses, yes, one dose; yes, I do not know how many doses; no, I do not know/I do not remember). The prevalence of post-vaccination immunity was assessed with the question: If you have been vaccinated, have you made a blood test to check if you were immune to Hepatitis B? If the answer is YES, what was the result (the test was done and I'm immune, the test was done and I'm not immune; I did not do the test; I have not been vaccinated; I do not know/I do not remember).

In the evaluation of immunity, we considered workers who reported receiving at least one dose of HB vaccine. The workers were characterized by the variables investigated. For the analysis, we considered the titer of anti-HBs as the dependent variable. We evaluated the association of anti-HBs dosage with sociodemographic conditions, occupational aspects of the general health and health-related behaviors. Associations between the dependent variable, titer of anti-HBs were identified by the Mann Whitney, Kruskal Wallis test and Spearman correlation, followed by linear regression with previous tests assumptions. Statistical analyzes were performed using the SPSS software version 17.0. The independent variables were grouped as follows:

- Socioeconomic and demographic conditions: gender; years of age; education in years of study; marital status and monthly income per capita in reais (Brazilian currency).

- Occupational aspects: function in the FHS; working time in the profession in months; working time in the FHS in months; working contract; presence of other professional relationships; update on workers' health in the last two years; contact with a sharp instrument; contact with biological material in actual practice; history of occupational accident with

biological material; job satisfaction. The function in the FHS was categorized into three levels: Higher education level (physicians, dentists and nurses), technician or assistant (oral health care technicians and nursing technicians) and high school level (community health workers).

- General health and health-related behaviors: self-perception of health (excellent and good/fair, poor and very poor); smoking (nonsmoker, smoker/ex-smoker), physical activity (active/inactive); presence of systemic disease diagnosed by a physician (yes/no) and use of prescription drugs by a physician (no/yes). The level of physical activity was measured by the International Physical Activity Questionnaire (IPAQ) and analyzed according to the guidelines of the Study Center of the Physical Fitness Laboratory of Sao Caetano do Sul, classifying workers in very active, active, irregularly active and sedentary, variable later categorized as active (very active, active, irregularly active) and sedentary[9]. The duration of the smoking habit was not considered, since the number of smoking workers was low, making it impossible to categorize them.

The study followed the ethical principles of the National Health Council (CNS) No 196/96 and it was approved by the Research Ethics Committee (CEP/ SOEBRAS No 208/08). Among 762 professionals invited to participate in the study, 761 (99.9%) agreed and signed the consent form.

RESULTS

Results from the first phase, in which 762 professionals were investigated, showed that 761 professionals answered the question regarding reported vaccination (response rate of 99.9%). Among the 761 participants, 504 (66.1%) were vaccinated and, of these, 400 (52.5%) received one dose of the vaccine, 57 (7.4%) two doses and 47 (6.2%) three doses of the vaccine.

Among the 504 professionals who received at least one dose of the vaccine, 153 (30.4%) reported they had performed post-vaccination immunity verification, at least once. In the second phase, 397 participated (TR = 95.2%) and were randomly selected among the 504 vaccinated, from simple random sample (n estimated = 417). Of the 397 who participated in the collection of blood for the immune response verification, 65 (16.4%) were immune.

Workers who were evaluated for immune status (n = 397) had ages ranging 18-59 years, mean age of 32.42 years and standard deviation (SD) of 8.3; education ranged from 3-27 years, mean age of 13.02, SD = 3.06 (n = 385); income in minimum wages[1] ranging from 0.78- 21.57, with an average of 2.13 and SD = 2.37 minimum wages (n = 385). The working time experience ranged from 1-420 months (35 years), with an average of 63.85 months, SD = 65.88 (n = 395). The working time experience in health ranged from 1-240 months (20 years), with mean of 44.70 months, SD = 39.14 (n = 395). In the immune status verification, considering the anti-HBs among 397 workers, we observed a mean level of anti-HBs of 3.8492 mIU/ml, SD = 4.65, the values of anti-HBs ranged from 0,00-20.50 mIU/ ml.

The characterization of the professionals who were evaluated for Hepatitis B immune status was stratified according to sociodemographic, occupational, and behavior aspects as well as general health (Table 1).

Quadro 1- Characterization of FHS workers regarding vaccination and post-vaccination immunity verification regarding the dosage of anti HBs, Montes Claros-Minas Gerais, 2011

Foram convidados a participar todos os 762 trabalhadores da ESF								
Reported Vaccination			**Verification report of post-vaccination immunity**			**Immunity HB/ Dosing Anti-HBs/ cutoff point 10mIU**		
Census = 762 n = 761 TR = 99.9%			Census of vaccinated n = 504 n = 504			Sampling N = 504 Estimated number = 417 n = 397 TR = 95.2%		
3 doses	400	52.5%	Yes. immune	126	25.0%	Parameters of calculated sample N = 504 p = 0.50 q = 0.50 Error = 2.0 z = 1.96		
2 doses	57	7.4%	Yes. not immune	12	2.4%			
1 dose	47	6.2%	Did it. without result	15	3.0%			
Do not know	122	16.2%	Not verified	351	69.6%			
No vaccination	135	17.7%						
Three doses	400	52.5%	Verified	153	30.4%	Imumne	65	16.4%
No vaccination	361	47.5%	Not verified	351	69.6%	Not imumne	332	83.6%

1 The minimum wage in Brazil corresponds to R$ 788,00 reais or U$ 273,42 dollars according to the Central Bank of Brazil on February 26th, 2015

Table 1 - Characteristics of FHS workers that were evaluated for Hepatitis B immune status (n = 397), Montes Claros-Minas Gerais, 2011

SOCIOECONOMIC AND DEMOGRAPHIC ASPECTS		
Gender	n	%
Male	66	16.6
Female	331	83.4
Marital status		
With partner	208	52.4
Without partner	189	47.6
OCUPATIONAL ASPECTS		
FHS function		
Higher education level	74	18.6
Technician or assistant	73	18.4
High school level	250	63.0
Work contract		
Contract	187	47.0
Fixed term	210	53.0
Presence of other professional employment		
No	342	86.1
Yes	55	13.9
Update courses on workers' health field		
Yes	184	46.3
No	213	53.7
Contact with sharp instruments		
No	163	41.1
Yes	234	58.9
Contact with biological material		
No	152	38.1
Yes	245	61.9
History of accidents with biological material		
No	352	88.7
Yes	45	11.3
Job satisfaction		
Satisfied	320	80.6
Unsatisfied	77	19.4
GENERAL HEALTH/ HEALTH-RELATED BEHAVIOUR		
Self-perception of health		
Positive	360	90.6
Negative	37	9.4
Smoking		
Non-smoker	371	93.5
Smoker/ex-smoker	26	6.5
Physical activity		
Active	319	80.4
Sedentary	78	19.6
Presence of systemic disease		
No	257	64.7
Yes	140	35.3
Use of medication		
No	280	70.5
Yes	117	28.5

Table 2 - Bivariate analysis between the anti-HBs antibodies dosage and categorical independent variables (median, interquartile range), r* Spearman correlation between anti-HBs antibodies dosage and quantitative independent variables among workers of Primary Health Care, Montes Claros (n = 397), Minas Gerais, 2011

VARIABLES SOCIODEMOGRAPHIC ASPECTS	Median, Interquartile Range	Count of Anti-HBs r*	p-value
Gender			
Male	1.69 (4.90)		0.141
Female	2.29 (5.93)		
Age (years)		0.012	0.815
Education (years of study)		0.044	0.393
Marital status			0.589
With partner	1.81 (5.58)		
Without partner	2.13 (6.23)		
Per capita income (in Reais)		-0.051	0.320
OCCUPATIONAL ASPECTS			
FHS function			0.734
Higher education level	2.29 (6.71)		
Technician and assistant	1.96 (5.70)		
High school level			
Working time (in months)		0.093	0.066
Working time in FHS (in months)		0.107	0.034
Work contract			0.245
Contract	2.38 (5.93)		
Fixed term	1.65 (5.87)		

To be continued

Table 2 (cont.)

VARIABLES SOCIODEMOGRAPHIC ASPECTS	Median, Interquartile Range	Count of Anti-HBs r*	p-value
Presence of other professional employments			0.927
No	2.15 (5.93)		
Yes	1.74 (5.78)		
Update courses on workers' health field			0.846
Yes	2.18 (5.96)		
No	1.96 (5.87)		
Contact with sharp instruments			0.842
No	1.78 (5.87)		
Yes	2.18 (5.94)		
Contact with biological material			0.809
No	1.76 (5.87)		
Yes	2.15 (5.93)		
History of accidents with biological material			
No			
Yes			
Job satisfaction			0.586
Extremely satisfied	2.11 (6.32)		
Moderately satisfied	1.78 (5.77)		
Unsatisfied	2.46 (5.95)		
GENERAL HEALTH/ HEALTH-RELATED BEHAVIOUR			
Smoking			0.066
Non-smoker	2.11 (5.95)		
Smoker/ex-smoker	1.44 (2.88)		
Physical activity			0.284
Active	1.82 (5.87)		
Sedentary	2.43 (6.26)		
Presence of systemic disease			0.580
No	2.05 (5.88)		
Yes	2.06 (6.01)		
Use of medication			0.775
No	2.05 (5.89)		
Yes	1.79 (5.93)		

In the bivariate analysis, we evaluated the association between anti-HBs antibodies dosages and the independent variables through the median and interquartile range. To evaluate the association between anti-HBs dosages and quantitative independent variables we used the Spearman correlation (Table 2).

For the multivariate analysis, we used linear regression. Three assumptions of multiple linear analysis were satisfactory (Durbin-Watson = 2.09/ VIF-mean = 1.03/ tolerance = 0.97). The dependent variable did not show Gaussian distribution. In the multivariate analysis, it was found that the longer they worked for FHS, there was a significantly association with higher levels of anti-HBs (p = 0.05). The smoking levels were inversely related to the anti-HBs dose (p = 0.02) (Table 3).

Table 3 - Multiple linear regression between anti-HBs antibodies dosage and quantitative independent variables among workers of Primary Health Care. Montes Claros. Minas Gerais. 2011

Variável	B (EP)	Dosagem de anti-HBs	
		Standard Estimate β	*p*-valor
Intercept	**3.49 (0.35)**		
Working time in FHS (in months)	0.012 (0.006)	0.097	0.05
Smoking	-2.26 (0.95)	-0.120	0.02
R^2 Model	0.02		

DISCUSSION

Among FHS workers, 52.5% (400) reported having received full HB vaccination scheme of three doses. This data is worrisome, considering the determination of 100% of HB vaccination among health workers according to Brazilian Ministry of Health[1]. It is also relevant, since reported vaccination was lower compared to a study among dentists in the same city (Montes Claros-MG), which found that 91.2% reported

vaccination in 2008[10]. The reported vaccination was also lower compared to other studies conducted in Brazil, among Primary Health Care workers, which obtained rates of 93.2% in Divinópolis-MG[11], 64.6% in Florianópolis-SC[5] and other 76.2% in Mato Grosso do Sul[12]. The prevalence among these FHS workers (52.5%) could be even worse if dental surgeons were excluded, since a study with these professionals (dentists) of Montes Claros, who are probably included in the study population in question, reached a value of 91.2%[10].

Studies have shown resistance of health professionals regarding vaccination[7,13]. Among the factors that are barriers to vaccination among health workers are: fear of side effects, lack of perception of risks of infection, lack of information about the transmission, pressure at work, difficulties of access and cost of the vaccine. Access in Brazil is public and the distribution of the vaccine is free of cost to SUS users, however, it is perceived that this information does not have the proper disclosure. Lack of information, lack of training and poor education are the main factors to justify HB non-vaccination[5,7]. Incomplete number of injections of HB vaccination is also a recurrent factor among health workers, possibly due to the unusual arrangement of the first and the third dose since doses must be 180 apart, which makes it easier to forget or induces the mistaken thought that only one or two doses can already reach satisfactory immunity[4].

In this study, among 504 workers, 30.4% reported they had verified their immunization status and 25.0% reported that the test resulted in immunity. Among the 397 that were evaluated for immune status, from anti-HBs dosages, 16.4% were immune. Different results were found in Florianópolis, SC, where 32.98% of PHC workers were verified for immunization and 29.82% reported being immune[5]. In Divinópolis-MG, only 19% of workers in PHC did serologic testing claiming ignorance of the need to check their immune status[11]. In São Paulo, 259 PHC workers verified their immunization status after vaccination and 93.4% had concentration ≥ 10 mIU/l of anti-HBs, indicating HB immunity[14]. Among health workers of a private hospital in Rio de Janeiro-RJ, 66.4% were immune to HBV infection, with anti-HBs dosages greater than 10 mIU/l[15]. Thus, it was found that the number of reports of immunity verification in this study was lower than those reported in prior studies[5,15] and higher than in Divinópolis[11], since the number of immunity reports was lower in this study. The anti HBs dosages reported in this study were much lower than those reported in previous studies[14-15], this worrisome factor suggests the need for up to date informational courses to these workers, evaluating the effectiveness of the city vaccination rooms. It should be noted, however, that the low prevalence of registered immunity may be due to the time elapsed after the last dose of HB vaccine[3].

The importance of performing anti-HBs dosage after vaccination is recognized as the vaccination response depends on each organism and there is a risk of not achieving protective antibody levels and new booster doses may be required. This situation must be assessed particularly by health workers and the procedures to be followed should be determined by a reference service in occupational health[16]. The literature also shows that the serological test determines the dosages of anti-HBs after contact or HBV vaccination, and this is the only way to monitor the success of vaccination against this disease. Nevertheless, even though recommended, this test is not available for free for the public health network of professionals[17]. Perhaps the low prevalence of verification of immunization through the dosage of anti-HBs among health workers[5] is due to lack of free availability of this exam as part of a health care protocol for healthcare workers. This situation indicates a paradox for the care of these professionals since the recommendation is that 100% of health workers are vaccinated, and the distribution of the vaccine is free to these workers, while the other recommendation, the test for the verification of immunization, is not offered for free at SUS. In addition, many workers claim to ignore the applicability and necessity of serological test for the measurement of anti-HBs dosage[11].

The prevalence of immunity report after anti-HBs post-vaccination verification test in previous studies[5,15] were similar to that reported in this study. These data must be carefully evaluated since after anti-HBs dosage in a sample of workers we found a real prevalence of lower immunity, however, we must consider the time length post-vaccination.

The anti-HBs dosage in this study was lower than previously reported among PHC workers[14-15]. As for the factors associated with the anti-HBs dosage, it was found an association between the amount of time they were working for the FHS and higher levels of anti-HBs ($p = 0.05$), which may be related to the fact that possibly these workers had more opportunities to be vaccinated, perhaps through campaigns or updates, or by perception of need, only after exposure to biological or sharp instruments. On the other hand, there is evidence of greater anti-HBs prevalence in individuals who are older than 40 years and in those who work in the health field for over 15 years, indicating that immunization in many cases may have occurred because of HBV contact[18]. In the present study, we did not evaluate the post-vaccination length of time and it may have a correlation between this time and the working time of these professionals in the FHS. This fact should be taken into consideration since previous studies showed the loss of immunity or reduction of anti-HBs levels among HB vaccinated volunteers.

Regarding the duration of immunity due to vaccination, a longitudinal study carried out in Alaska in order to test the conferred protection by primary immunization found that 60% of the participants had a level of anti-HBs ≥ 10mIU/l after 22 years they had taken the three injections of hepatitis B vaccine. For those with anti-HBs lower than 10mIU/L, a booster dose was given, and of these 87% achieved a protective anti-HBs levels. Thus, it was concluded that the conferred protection by primary immunization from HB vaccine in infancy lasts at least 22 years, whereas booster doses are not required. In cases where vaccination can be confirmed, but the anti-HBs is less than 10mIU/L, possibly the body is in a latent immunity, and after contact with HBV or booster dose, anti-HBs levels rise, conferring immunity in approximately 90% of subjects. The study also showed that 13% of people investigated did not respond to the vaccine booster dose, staying with titers

of anti-HBs less than 10mIU/l probably not immune. This fact is associated with individual factors of each subject[3]. In this context, studies with longitudinal data are crucial for the continuous assessment of public health strategies and vaccination programs are relevant to health professionals, which may explain why so many professionals who had had three injections of hepatitis B vaccine did not present protective titers of anti-HBs on occasional doses, disregarding the vaccination time[3]. Among 1,658 people vaccinated after 10 years, it was concluded that despite not having levels considered protective, a dose of reinforcement due to the possible presence of immune memory would not be necessary, since over 90% of those who received a booster dose responded with increased titer of anti-HBs greater than 10mIU/L[19].

The smoking levels were inversely related to the dose of anti-HBs ($p = 0.02$), that is, highest levels of smoking were associated with lower doses of anti-HBs. This situation can be explained by the fact that unhealthy habits may interfere with all general health status of the individual, including the immune system. Therefore, smokers may be less responsive to stimulation of the immune system. Decreased immunogenicity in relation to HB vaccination in health care workers has been attributed to increasing age, male gender, obesity, smoking and chronic diseases among older adults. In a study conducted among 597 health professionals in India, post-vaccination immunity was more common among women, as from the 597, 96% of women became immune, while only 85% of men became immune. Furthermore, smoking was significantly associated with an unsatisfactory response, and the appearance of protective levels of anti-HBs (greater than 10mIU/l) did not occur in 7 professionals who were smokers, even after the booster dose[18].

Greater vaccination prevalence (86.4% and 88.0%, respectively) were reported in those with more active behaviors (participation in leisure activities and physical activity) and among non-smokers (86.4%)[7]. Current smokers had a lower chance of having complete vaccination than nonsmokers. In this sense, smoking can be understood as behavior that may neglect their own health, a situation that seems to repeat, as the worker can also neglect the HB vaccination[5]. It should be noted that health workers are among the main risk groups for HBV infection in Poland, as the infection was observed in 16.4% of the nursing workers[20].

We can verify that the appropriate immune status against HB is closely related to professionals with longer time of education (years), which can possibly be explained by the access to information from the academic life on HB and its prevention. However, this association cannot be proven by this study. It is, therefore, suggested the need for greater general training opportunities to raise awareness on the HBV vaccination and the need to verify immunization within 30 days after the last of the three injections of hepatitis B vaccine.

Limitations of this study are related to the dependent variable that did not show Gaussian distribution and also because the anti-HBs dosage has not been related to vaccination time. It is also important to note that the process that relates the evaluation of immune status and the variables investigated are dynamic. Therefore, causes and effects certainly vary throughout life and, because this is a cross-sectional study, a temporal relationship between the observed associations cannot be establish.

CONCLUSION

The prevalence of reported vaccination, post-vaccination immunity verification and immunity to HB were low and suggest the need for vaccination campaigns among FHS workers, including the importance of completing the immunization scheme and verify the immunization after the HB vaccination. The time of professional experience and health behaviors were associated with anti-HBs plasma dosages of these workers.

REFERENCES

1. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de Vigilância Epidemiológica. Guia de vigilância epidemiológica [Internet]. Brasília (DF): Ministério da Saúde; 2009 [acesso em 30 de junho de 2012]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/guia_vigilancia_epidemiologica_7ed.pdf
2. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de DST, Aids e Hepatites Virais. Hepatites virais no Brasil: situação, ações e agenda [Internet]. Brasília (DF): Ministério da Saúde; 2011 [acesso em 30 de junho de 2012]. Disponível em: http://www.aids.gov.br/sites/default/files/anexos/publicacao/2011/50069/agendahepatites_2011_pdf_19532.pdf
3. McMahon BJ, Dentinger CM, Bruden D, Zanis C, Peters H, Hurlburt D, et al. Antibody levels and protection after hepatitis B vaccine: results of a 22-year follow-up study and response to a booster dose. J Infect Dis. 2009;200(9):1390-6.
4. Ministério da Saúde (BR), Programa Nacional de Hepatites Virais. Avaliação da assistência às hepatites virais no Brasil [Internet]. Brasília (DF): Ministério da Saúde; 2002 [acesso em 30 de junho de 2012]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/avaliacao_da_assistencia_hepatites_virais_no_brasil.pdf
5. Garcia LP, Fachini LA. Vacinação contra hepatite B entre trabalhadores da atenção básica à saúde. Cad. Saúde Publica. 2008;24(5):1130-40.
6. Tipple AFV, Silva EAC, Teles SA, Mendonça KM, Souza ACS, et al. Acidente com material biológico no atendimento pré-hospitalar móvel: realidade para trabalhadores da saúde e não saúde. Rev Bras Enferm [Internet]. 2013 [acesso em 13 de outubro de 2013];66(3):378-84. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71672013000300012&lng=pt
7. Assuncao AA, Araujo TM, Ribeiro RBN, Oliveira SVS. Vacinação contra hepatite B e exposição ocupacional no

setor saúde em Belo Horizonte, Minas Gerais. Rev Saúde Pública [Internet]. 2012 [acesso em 31 de março de 2013];46(4):665-73. Disponível em: http://www.scielo.br/scielo.php?pid=S0034-89102012005000042&script=sci_abstract&tlng=pt

8. Alamillos-Ortega P, Failde-Martinez I. Prevalencia de marcadores serológicos del vírus de la hepatites B en trabajadores de hospital y de atención primaria de salud en la zona de Jerez (Cádiz). Aten Primaria. 1999;23:121-217.

9. Craig CL, Marshall AL, Sallis JF, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc [Internet]. 2003 [cited 2013 October 13];35(8):1381-95. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12900694

10. Ferreira RC, Guimarães ALS, Pereira RD, Andrade RM, Xavier RP, Martins AMEBL. Vacinação contra hepatite B e fatores associados entre cirurgiões-dentistas. Rev Bras Epidemiol [Internet]. 2012 [acesso em 13 de outubro de 2013];15(2):315-23. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-790X2012000200009&lng=en

11. Oliveira VC, Guimarães EAZ, Souza DAS, Ricardo RA. Situação vacinal e sorológica para hepatite b em profissionais da estratégia saúde da família. Rev RENE. 2011;12(n.º esp.):960-5.

12. Sanches GBS, Honer MR, Pontes ERJC, Aguiar JI, Ivo ML. Caracterização soroepidemiológica da infecção do vírus da hepatite B em profissionais de saúde da atenção básica no Estado de Mato Grosso do Sul, Brasil. Rev Panam Infectol. 2008;10(2):17-5.

13. Pinheiro J, Zeitoune RCG. O profissional de enfermagem e a realização do teste sorológico para hepatite B. Rev Enferm UERJ [Internet]. 2009 [acesso em 13 de outubro de 2013];17(1):30-4. Disponível em: http://files.bvs.br/upload/S/0104-3552/2009/v17n1/a005.pdf

14. Moreira RC, Saraceni CP, Oba IT, Spina AMM, Pinho JRR, Souza LTM, et al. Soroprevalência da hepatite B e avaliação da resposta imunológica à vacinação contra a hepatite B por via intramuscular e intradérmica em profissionais de um laboratório de saúde pública. J Bras Patol Med Lab. 2007;43(5):313-8.

15. Nazar AN , Bastos AP, Pittella AM, Matos HJ. Análise da soropositividade do anti-HBs em profissionais de saúde. Cad Saúde Colet (Rio J) [Internet]. 2008 [acesso em 13 de outubro de 2013];16(3):421-36. Disponível em: http://bases.bireme.br/cgi-bin/wxislind.exe/iah/online/?IsisScript=iah/iah.xis&src=google&base=LILACS&lang=p&nextAction=lnk&exprSearch=621295&indexSearch=ID

16. Domingues BD, Cota GS, Silva R MM. Avaliação da resposta imunológica à vacinação para hepatite b em profissionais de laboratórios de análises clínicas no município de Timóteo/MG. Farm Ciência [Internet]. 2010 [acesso em 13 de outubro de 2013];1:41-51. Disponível em: http://www.unilestemg.br/farmaciaeciencia/volumes/artigo_4_F_C.pdf

17. Souza ACS, Alves SB, Santos SLV, Tipple AFV, Neves HCC, Barreto RASS. Adesão à vacina contra hepatite B entre recém-formados da área de saúde do município de Goiânia. Ciênc Cuid Saúde. 2008; 7(3):363-9.

18. Thakur V, Pati NT, Gupta RC, Sarin SK. Efficacy of Shanvac-B recombinant DNA hepatitis B vaccine in health care workers of Northern India. Hepatobiliary Pancreat Dis Int [Internet]. 2010 [cited 2013 October 13];9(4):393-7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20688603

19. Zanetti AR, Mariano A, Romano L, D'Amelio R, Chironna M, Coppola RC, et al. Long-term immunogenicity of hepatitis B vaccination and policy for booster: an Italian multicentre study. Lancet 2005;366(9494):1379-84.

20. Ganczak M, Ostrowski M, Szych Z, Korzen M. A complete HBV vaccination coverage among Polish surgical nurses in the light of anti-HBc prevalence: a cross-sectional sero-prevalence study. Vaccine [Internet]. 2010 [cited 2013 October 13];28(23):3972-6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20381644