Original Article

"HEPATITIS B VACCINATION AND IMMUNITY IN HEALTH CARE WORKERS – A LONG WAY TO ACHIEVE."

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ABSTRACT

Introduction: Health Care Workers (HCW) are at an escalating risk of acquiring blood borne pathogens. Of all, HBV is the one which is vaccine preventable but still sizeable proportion of HCWs never get vaccinated. Further, awareness about HBV and vaccine compliance are poor. The level of immunity after vaccination, in this population is also not known.

AIM: To study the sero prevalence of HBsAg, anti HBs among vaccinated and unvaccinated HCWs.

Materials & Methods: A total of 208 blood samples were collected from HCWs (104 vaccinated and 104 non-vaccinated) from May – July 2011 and tested for anti HBs and HBsAg by ELISA.

Results: Of the 104 vaccinated only 28(27%) had all three doses. Among the vaccinated 61% (17/28 Three doses), 43% (17/40 Two doses) and 47% (17/36 single dose) had >100mIU/mL. Of the 104 non- vaccinated, 10 (10%) had >100mIU/mL. Among the vaccinated, 69% (35/51) of <60 kg wt and 30% (16/53) of > 60 kg had more than 100mIU/mL. Of the 52 male, 14(27%) and among the 52 female, 37(71%) had >100mIU/mL. Among the fully vaccinated, within 5 years of vaccination, 65%(13/20) and 50% of more than 5years of vaccination (4/ 8) had > 100mIU/mL. One incompletely vaccinated and another one in non vaccinated were positive for HBsAg.

Conclusion: This study highlights poor compliance of HBV among HCW. Steps need to be taken to create awareness and the vaccination should be made mandatory for all the persons in health care settings.

Key words: HCW, HBsAg, anti HBs, vaccine compliance, protective level.

INTRODUCTION

Health Care workers (HCW) are at an escalating risk of acquiring blood borne pathogens like hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV) and so on. The prevalence of HBV infection in HCWs depends upon its prevalence in general population. In India, the estimated prevalence rate of HBV in the healthy general population is around 4.7%, which places India in an intermediate endemicity zone. [1,2] HBV has been demonstrated to survive in dried blood, at room temperature, on environmental surface for a long time.[3,4,5] HBV is more infectious than HIV owing to high number of infectious particles / ml of blood, even 0.00001 ml of blood can transmit HBV.[3] The risk of HBV in an unvaccinated person from a single HBV infected needle stick injury ranges from 6-30%.[5] Acute HBV infections are mostly asymptomatic and 6-10% of acute HBV leads on to chronic carrier state which in turn progresses to chronic hepatitis, cirrhosis liver and hepatocellular carcinoma. To cap it all, HDV can superimpose with HBV and increase life threatening complications. [4] Of all the blood borne viruses, HBV is the one which is vaccine preventable but still sizeable proportion of HCWs never get vaccinated. Further awareness about HBV compared to HIV, and vaccine compliance are poor among HCW. The level of immunity after vaccination, in this population is also not known. With this background, we studied the sero prevalence of HBsAg, anti HBs among vaccinated and unvaccinated HCWs.

MATERIALS AND METHODS

A total of 208 blood samples were collected from HCWs (Medical & paramedical students, Interns & laboratory technicians) from May – July 2011 at Govt medical college & hospital. Of this, 104 were vaccinated (3, 2 and single doses) against HBV and another 104 were non-vaccinated. Serum was separated and stored at -20□C. Samples were tested for anti HBs titre by quantitative and HBsAg by qualitative ELISA (Antisurase B and Surase B from General Biologicals, Taiwan respectively). Institutional ethical committee approval, informed

consent and filled in proforma were obtained before blood collection. All statistical analysis was done by using Chi square test.

RESULTS

Of the 208 HCWs, 104 were vaccinated and the remaining 104 were non vaccinated. Among the vaccinated, 28(27%), 40(38%) and 36(35%) had three, two and single dose respectively. Among the vaccinated 61% (17/28 Three doses), 43% (17/40Two doses) and 47% (17/36 single dose) had >100mIU/mL. Of the 104 non vaccinated 10 (10%) had >100mIU/mL. [Table1] The protection level among vaccinated was highly significant compared to non vaccinated group. (p value 0.001) but among the vaccinated, the protection level between the fully vaccinated and incompletely vaccinated was not significant. (p value 0.05)

Of the 104 vaccinated, 51(49%) were <60 kg, and the remaining 53 (51%) were > 60 kg. In this, 69% (35/51) of <60 kg wt and 30% (16/53) of > 60 kg had more than 100mIU/mL. Of the 52 male, 10 (19%) were <60 kg and 42(81%) were > 60 kg. Of this 50% (5/10) of <60 kg and 21% (9/42) of >60 kg had >100mIU/mL. Immune response in HCW < 60 kg was highly significant compared to > 60kg group (p value 0.001). Of the 52 female, 41(79%) were < 60 kg and 11 (21%) were > 60 kg. Among this, 73% (30/41) of <60 kg and 64% (7/11) of >60 kg had >100mIU/mL .Of the 52 male 14(27%) and among the 52 female, 37(71%) had >100mIU/mL. [Table2] The protection level in female was highly significant, compared to male (p value 0.001).

Among the fully vaccinated, 65% (13/20) of within 5 years of vaccination and 50% (4/8) of more than 5years of vaccination had >100mIU/mL. Five years after vaccination, 50% (4/8 Three doses), 36% (4/11Two doses) and 33% (3/9-single dose) had >100mIU/mL. [Table 3] Even among the fully vaccinated group, the protection level significantly decreases after 5 years of vaccination. (p = 0.05)

One incomplete vaccinated and another one in non vaccinated were positive for HBsAg and both had < 10mIU/mL of anti HBs.

No of vaccine recipients	Quantitation of Anti HBsAg titre					
	<10 mIU/m (%)	11-100 mIU/m (%)	101-1000 mIU/Ml (%)	>1000 mIU/mL (%)	Total	Protected >100ml U/mL(%)
3doses (n=28)	08(28)	03 (11)	15(54)	02 (7)	28	17(61)
2 doses (n=40)	20 (50)	03(7)	11(28)	06(15)	40	17(43)
1dose (n=36)	15 (42)	04 (11)	14(39)	03 (8)	36	17(47)
Total vaccinated (n = 104)	43(41)	10 (10)	40 (38)	11(11)	104	51(49)
Non vaccinated (n=104)	92(88)	02(2)	08 (8)	02(2)	104	10(10)

Table 1 : Anti HBs titre with number of doses of HB vaccine in vaccinated and non vaccinated group

Anti HBs (mIU/mL)	<60kg			>60kg			Total		
	M(%)	F(%)	Total (%)	M (%)	F (%)	Total (%)	M	F	Total
<10	4	6	10	30	3	33	34	9	43
10-100	1	5	6	3	1	4	4	6	10
101-1000	4	24	28	6	6	12	10	30	40
>1000	1	6	7	3	1	4	4	7	11
Total	10 (19)	41 (79)	51 (49)	42 (81)	11 (21)	53 (51)	52	52	104
Protected >100 mIU/mL No(%)	05 (50)	30 (73)	35 (69)	09 (21)	07 (64)	16 (30)	14 (27)	37 (71)	51 (49)

Table 2 : Anti HBs titre with sex and body weight among vaccinated group

M- Male F- Female

Vaccinated	<10 mIU/mL		11-100 mIU/mL		101-1000 mIU/mL		>1000ml U/mL		100mIU/mL	
	<5 yr	>5 yr	<5 yr	>5 yr	<5 yr	>5 yr	<5 yr	>5 yr	<5 yr (%)	>5yr (%)
3 doses (n=28)	04	03	03	01	10	03	03	01	13 (65)	04 (50)
2 doses (n=40)	14	06	02	01	08	04	05	00	13 (45)	04 (36)
1 dose (n=36)	10	06	03	00	12	03	02	00	14 (52)	03 (33)
Total	28	15	08	02	30	10	10	01	40 (53)	11 (39)
Protected >100 mIU/mL									40+11= 51	

Table 3 : Anti HBs titre with number of doses and years after vaccination

DISCUSSION

Out of 104, only 28 (27%) had all three doses which shows the compliance of HB vaccination in HCW was poor. The low compliance was also observed by Vinothkumaradithyaa et al at Madurai (45%) and Biju et al (26%) at Mumbai. [7,8] This poor compliance may be attributed to lack of awareness, multiple doses , prolonged duration to complete the course, high cost and personal reasons like movement, pregnancy and other illness.

Generally the protective level of anti HBs is considered as >10 mIU/mL, but some countries like UK recommend as >100 mIU/mL.[9,10] A healthy vaccinee who develops an anti-HBs titre of <100 IU/mL is considered to be unprotected and at risk of HBV. A titre of anti-HBs between 10 and 100 IU/mL takes no account of immune memory and cell-mediated immune responses to HBsAg.[11] Since the risk is high we considered >100mIU/mL as protective level for HCW in our study.

Among the vaccinated 61% (17/28 Three doses), 43% (17/40Two doses) and 47% (17/36 single dose) had >100mIU/mL. This shows that even with incomplete vaccination some developed seroprotection which may be due to individual immune response. Initial antibody titre, 2 months after the third dose of vaccination was not known, hence we could not label them as non responders, hyporesponders or who had decreasing antibody titre as years advanced. Different studies have demonstrated that a small proportion of healthy individuals receiving the hepatitis B (HB) vaccine do not produce protective levels of anti-HBs antibody, a phenomenon which could be linked to certain human leukocyte antigen (HLA) class-II alleles or haplotypes. [12]

Of the 104 non-vaccinated, 10 (10%) had >100mIU/mL. Luiz A S et al stated that almost 20% of those who were not vaccinated had already acquired natural immunity through previous contact with HBV, and probably if they continued to be exposed, though at a low intensity this would mean that they would acquire increased immunization instead of infection. [13]

In the vaccinated, 69% (35/51) of <60 kg wt and 30% (16/53) of >60 kg had more than 100mIU/mL. This indicates that obesity results in poor antibody response and immunity maintenance. [14]

Of the 52 male 14(27%) and among the 52 female, 37(71%) had >100mIU/mL. This shows that there was decreased immune response among male gender. Hepatitis B vaccines are highly immunogenic, but have decreased immunogenicity associated with increasing age, obesity, smoking, male gender and presence of chronic disease in older adults. [15]In this study, 41(79%) female were below 60 kg. This shows that the gender and weight play major role in immunogenicity.

Among the fully vaccinated, within 5 years of vaccination 65%(13/20) and 50% (4/8)of more than 5years of vaccination had > 100mIU/mL. But the accumulated data from other studies indicate that protection is dependent on immune memory, rather than declining anti-HBs responses. Following a complete course of vaccination, booster doses are unnecessary if initial antibody response is good. [16]

In the studies to date, the antiHBs is measurable for 7 years or longer. The NHMRC currently recommends that at-risk individuals be revaccinated every 5 years, without a retest for anti-HBS titres. [11] David siebert et al suggested that it may be necessary to revaccinate high-risk hypo-responders more frequently than the currently recommended 5 years interval. Recommendation of booster dose is still under debate. Hence, the practice of any one organisation will be based on the frequency, type and degree of exposure to HBV within the population under its care.

One incomplete vaccinated and another one in non vaccinated were positive for HBsAg. Since HBsAg status before vaccination was not known, we could not confirm whether the infection was acquired before or after vaccination.

CONCLUSION

HBV markers (HBsAg, anti HBs, and anti HBc) need to be tested prior to the vaccination. Two months after the 3rd dose of vaccination anti HBs level should be estimated to assess the immune response. Since 30-50% of the people having anti HBs below the protective level may respond to a second series, they should have a second course and reevaluated for anti HBs level. All non responders even after second series should be educated about the risk, transmission and prophylaxis of HBV. This study highlights poor compliance of HBV among HCW. Steps need to be taken to create awareness and vaccination should be made mandatory for all the persons in health care settings.

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