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Original Article

Community Medicine Section

Protection Provided by Hepatitis B Vaccine in Adult Population of Chaharmahal and Bakhtiari Province, Iran in 2013

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ABSTRACT

Introduction: Hepatitis B vaccination has been integrated into National Expanded Program on Immunization in Iran since the year 1993 and young adult national vaccination project was done in 2008. So we have three subpopulations with vaccination coverage for hepatitis B and different antibody levels. Consisting of Subpopulation 1 born after 1993, subpopulation 2 born between 1989 and 1993 and receiving vaccination under adult national project, and subpopulation 3 born prior to the year 1989.

Aim: The present study was conducted to investigate community protection by hepatitis B vaccine in adult population in an accessible population in Iran and compare vaccination coverage, HBs Ab level, and its effective titration among the three above-mentioned subpopulations.

Materials and Methods: This cross-sectional study was done on a 3000-individual adult population from all seven counties of Chaharmahal and Bakhtiari province enrolled by clustering. After obtaining written consent and filling out a questionnaire of demographic data and history of hepatitis B vaccination by trained interviewers, necessary blood sample was taken and HBs Ab titration was checked. The data were analysed by chi-square in SPSS 19. The level of significance was considered as 0.05 and effective Ab titration as ≥ 10.

Results: The mean age of the participants was 38.4±16.3 years. Of the participants 48.2% had effective titration. For vaccination coverage, 77.4% were unvaccinated, 20% completely vaccinated, and 2.6% incompletely vaccinated with a significant association with effective titration (p<0.001). Eighty six percent of the subpopulation 1 and 79% of the subpopulation 2 were completely vaccinated, with a significant difference in effective titration between them (p<0.001). Vaccination coverage was higher in men and the single but equal in cities and villages. The effective titration was significantly associated with being married and residence place (p=0.003). There was a significant association between effective titration and the time at vaccination (p<0.001).

Conclusion: Protection provided by hepatitis B vaccine in adult population is relatively suitable especially in the youth population; however, catch-up programs of the groups exposed to risk are recommended.

Keywords: Effective titration, HBs Ab level, Vaccination coverage

INTRODUCTION

Hepatitis B disease is a prevalent viral disease in human. Over 500 million people worldwide are suffering from hepatitis B and one million die each year because of the resulting complications, including chronic hepatitis, cirrhosis and hepatocellular carcinoma [1,2]. Infection with hepatitis B virus is an important, serious health problem across the world [1,3]. Iran was previously categorized as a country with moderate (2-8%) prevalence, but currently Iran is considered as a country with low (0.1-2%) prevalence of hepatitis B due to vaccination in the recent years [4-12]. A study obtained hepatitis B prevalence in Chaharmahal and Bakhtiari province, southwest Iran 1.3% [12]. In the regions with low prevalence, common age of infection is adolescence and young adulthood and main routes of transmission are horizontal such as sexual intercourse, blood transfusion and injection addiction with shared syringe. Anti-viral therapies, extensive vaccination projects and healthy ways of injection are the most fundamental routes to decreasing the infection rate and therefore hepatitis B-associated mortality [1]. Therefore, since the rate of permanent response to existing anti-viral medications is low, vaccine-assisted primary prevention and the enhancement of community's immunity are the most important ways of controlling hepatitis B infection [13]. In Iran, hepatitis B vaccination of infants was integrated in Expanded Program on Immunization (EIP) since the year 1993. In addition, the individuals born between the years 1989 and 1993 (young adults) have been vaccinated by national project in the year 2008. Therefore, Iran's community is dealing with three subpopulations with vaccination coverage for hepatitis B and different antibody levels. Subpopulation 1 (born after 1993) was vaccinated within national routine EIP program, subpopulation 2 (born between 1989 and 1993) received vaccination under adult national project, and subpopulation 3 (born prior to 1989), whose data on immunity rate status is helpful for health planning.

AIM

Therefore, the present study was conducted to determine the community protection by hepatitis B vaccine in adult population and compare vaccination coverage, HBs Ab level, and its effective titration among the three above-mentioned subpopulations in an accessible population in Iran.

MATERIALS AND METHODS

The present cross-sectional, analytical, population-based study was conducted within an eight-month period (from July, 2012 to February, 2013). The study population consisted of adults over 15 years in rural and urban Chaharmahal and Bakhtiari. The sample size was decided to include 3000 individuals, according to confidence interval 95%, relative error 25%, 800000-individual population of the province, the number of (672535) individuals over 15-year-old in the province, and the ratio of the province population to the participants (weight: 266). Sampling method was clustering. The clusters were selected from all seven counties of the province per urban and rural population of each county (totally 50 urban and rural 60-individual clusters). Sample taking was initiated by interview team referring houses, showing identification card, and asking about the presence of individuals with inclusion criteria and

then the questionnaire of demographic data and history of hepatitis B vaccination, complete or incomplete vaccination (three times or less), the time at vaccination, and family history of the disease was filled out by trained interviewers after obtaining the participants' consent to enroll into the study. The inclusion criteria were being 15 years and over and consent to participate. We used a valid structured questionnaire with close-ended and some open-ended questions related to the purposes of the study in official Persian language. In case of accessing vaccination card or injection certificate, the card or certificate was examined by the interviewer to remove recalling bias, and if there was no card or certificate, the information elicited from the individuals was relied on. Overall, we had 105 cases of missing data on vaccination history and 30 missing data on HBs Ab titer. The missing data were not analysed and hence were not entered into denominator for calculation of effective vaccine titer and vaccine coverage proportion.

To determine antivirus Ab titration, Delaware kit (common Market) was used and Ab titration equal or higher than 10 was considered as effective. The study protocol holds ethics code of 90-2-6 obtained from the ethics committee of the university.

We analysed the data using descriptive parameters and chi-square in SPSS 19. The level of significance was 0.05.

RESULTS

The mean age of the participants was 38.4±16.3 (15-90) years old, of whom 37% were male and 25% were single. Of the participants, 5.6% were born after 1993 and were already covered by national routine EPI (subpopulation 1), 12% were born between 1989 and 1993 and were already covered by national adult vaccination project (subpopulation 2), and 82.4% were born prior to 1989 (subpopulation 3). For vaccination coverage, 77.4% were unvaccinated, 20% completely vaccinated, and 2.6% incompletely vaccinated. 48.2% (n: 1433) of the participants had titration level of over 10 (effective titration) and the rest had titration of under 10. [Table/Fig-1] shows the relationship between any three subpopulations and vaccination coverage. 86% of the subpopulation 1, 79% of the subpopulation 2, and 7% of the subpopulation 3 were completely vaccinated [Table/Fig-1].

[Table/Fig-2] shows the relationship between any three subpopulations and effective titration. The highest effective titration was obtained in the subpopulation 2 and the least in the subpopulation 3, with a significant difference (p<0.001) [Table/Fig-2]. [Table/Fig-3] shows the relationship between vaccination coverage and effective titration. 69.3% of the completely vaccinated, 56% of the incompletely vaccinated, and 42% of the unvaccinated had effective titration. Chi-square indicated that there was a significant association between Ab titration and vaccination coverage (p<0.001). Complete vaccination coverage was 21% and 19.4% in men and women, 52% and 10.3% in the single and the married, and 19.8% and 19.5% in cities and villages, respectively. There was no significant association between effective titration and gender (48.8% in men vs. 47.9% in women, p>0.05), but the effective titration was significantly associated with marital status (58% in the single vs. 45% in the married, p<0.001). The effective titration was significantly associated with residence place (56% in the rural areas, 46% in the urban areas, and 33% in nomads, p=0.003). There was a significant association between effective titration and the time at vaccination (p<0.001), such that 77% of the participants with less than five years and 62% of those with more than five years passing since their last vaccination had a titration of above 10. There was no significant association between effective titration and contact with the infected individuals, infected first-degree relative, smoking, blood transfusion, and breast feeding (p>0.05).

Vaccination status	Ab < 10	Ab >10	Total number	df	p-value (Chi square test)
Subpopulation 1 (born after 1993)	66(39%)	103(61%)	169	2	0.0001
Subpopulation 2 (born from 1989 till 1993)	54(15.3%)	299(84.7%)	353		
Subpopulation 3 (born prior to 1989)	1408(57.9%)	1026(42.1)	2434		
Total	1528	1428	2956		

[Table/Fig-2]: Relationship between effective titration and three subpopulations of vaccination status.

Vaccination coverage	Ab<10	Ab>10	Total number	df	p-value (Chi square test)
Unvaccinated	1277(57.6%)	940(42.4%)	2217	2	0.0001
Incomplete vaccination	32(43.2%)	42(56.8%)	74		
Complete vaccination	177(30.7%)	399(69.3%)	576		
Total	1486	1381	2867		

[Table/Fig-3]: Relationship between vaccination coverage and effective titration

DISCUSSION

Overall, 48.2% of the population had effective HBs Ab titration (above 10). Similar studies have been already conducted in other regions of Iran [14,15]. In a study of Nahavand, west Iran in the year 2006, HBs Ab prevalence was obtained 11.6% in the population above 5 years, and 33.6% in 5- to 10-year-old population with 95% coverage of hepatitis B vaccination [14]. In a study in Amol, north Iran in the year 2011, HBs Ab prevalence was reported 27.9% [15]. In study of Tukat province, Turkey in the year 2009 on a 1098-individual population, 22.8% of the participants had Ab [16]. In a similar study in China in the year 2010, positive Ab prevalence was reported 51%. In China, in addition to routine hepatitis B vaccination in childhood since 1992 and infants' free vaccination since 2001, covering more than 99% of the 1- to 2-year-old infants, a catch-up immunization was also conducted in the year 2009 for the unvaccinated or incompletely vaccinated children under 15 years [17]. In Singapore, immunity level in age group of 18-69 years was obtained 39.7% in the year 1999 and 42% in 2005. In Singapore, a catch-up plan was conducted in the year 2001 for adolescents and youth population [18]. In a study on 1997 adult individuals in the year 2006 in Bangladesh, the immunity level was derived 29% [19]. In Chaharmahal and Bakhtiari province, because of national adult project of hepatitis B vaccination in the year 2008 that covered young adults (15-18 years), partial agreement of this study's results with China and Singapore studies [17,18] and higher figures compared to other studies [14-16] could be explained.

Vaccination coverage	Subpopulation 1 (born after 1993)	Subpopulation 2 (born from 1989 till 1993)	Subpopulation 3 (born prior to 1989)	Total number	df	p-value Chi- square test
Unvaccinated	17(10.4%)	49(15%)	2165(91%)	2231	4	0.0001
Incomplete vaccination	6(3.6%)	21(6%)	46(2%)	73		
Complete vaccination	141(86%)	274(79%)	164(7%)	579		
total	164	344	2375	2883		

[Table/Fig-1]: Relationship between vaccination coverage and three subpopulations of vaccination status.

The results of this study indicated 20% complete vaccination coverage and 2.6% incomplete vaccination coverage of the population under study in Chaharmahal and Bakhtiari province, and that 77.4% of the participants were unvaccinated, most of whom were in age groups that were not covered by routine vaccination program or young adult project. Although 42% of the participants had effective titration, it may be due to the contact with infected individuals. Of the participants 69% with complete vaccination and 57% of those with incomplete vaccination had effective titration. In this regard, no population-based study was found for comparison, but study of healthcare staff of a university-affiliated hospital in Tehran, Iran in 2006 indicated 68% complete vaccination of the staff with 90% suitable immunity response, and 26% incomplete vaccination with 73% suitable immunity response [20]. In study of healthcare staff of the hospitals in Kurdistan, west Iran, 97% had vaccination history, 79.6% were completely vaccinated, and 61% enjoyed suitable immunity [21]. The higher vaccination coverage in these groups was associated with occupation and being at risk, which is inconsistent with the findings of the present study. Other similar studies on the medical students or healthcare personnel in Iran indicate development of suitable immunity response in above 90% of the participants under study after complete vaccination [22-24].

The present study indicated that the highest complete vaccination coverage (86%) was obtained for the subpopulation 1 that was already covered by national routine vaccination program and the highest effective titration (84.7%) was obtained for the subpopulation 2 that was already covered by young adult vaccination project in the year 2008 with 79% complete vaccination coverage.

Since the youngest participants in this study were born in 1996 and the subpopulation 1 had been vaccinated in childhood within the routine plan and at least 15 years passed since their vaccination but at most five years passed since the vaccination of the subpopulation 2, the highest titration obtained for the subpopulation 2 was not an unexpected finding. In the study was done in the year 2009 on the students born in the year 1989 in Shahrekord, sampling was done three months after the third vaccination and suitable immunity response was observed in 95.96% of the students [24]. The results of some studies indicate effective response declines over time, so that the primary response was 95-100% but declined to 82-88% after five years, to 86% after 10 years, and to 68-77% after 15 years [25-28]. Therefore, it seems that time passage has caused the existing difference among the subpopulations and the inconsistency with the study conducted in Shahrekord in 2009. Therefore, Ab level could decrease over time, which has been also confirmed by comparison of the titration between the individuals with more and less than five years passing since their last vaccination in the present study.

The effective titration had no significant association with gender, with no considerable difference in vaccination coverage between the two genders. The results of some studies, consistent with the present study, indicate no significant effect of gender on Ab response [17,20,21,24], but some studies have reported lower response rate in men [22-28]. Effective titration was significantly associated with marital status. Vaccination coverage and effective titration in the single were higher than the married, possibly due to lower age of the single and their coverage in national vaccination project, causing higher effective titration in this subpopulation, which is in agreement with the results of another study [20]. Despite equal vaccination coverage in cities and villages, indicating no difference in offering suitable health services in cities and villages, effective titration was higher in villages than cities, which is consistent with the study in China [17]. However, in study of the students born in 1989 in Shahrekord, the effective titration was not significantly different between villages and cities [24]. In this study, there was no significant association between effective Ab titration and contact with the infected, first-degree relative infected with the virus, smoking, blood transfusion, and breast feeding, which is consistent with the results of other studies [20-24].

CONCLUSION

Based on the results of this study and other studies, vaccination coverage and HBs Ab level are relatively suitable in the youth population of this province; however, catch-up programs and call-out of the groups exposed to risk are recommended to increase coverage.

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