SEROLOGICAL IMMUNE STATUS OF HEPATITIS-B IN VACCINATED HEALTHY INDIVIDUALS

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ABSTRACT
This study was planned to assess the Hepatitis-B serological immune response in previously vaccinated students and staff members of various faculties of Lahore Medical &, Dental College, Lahore. The objective was to evaluate the effectiveness of hepatitis B vaccination in prevention of hepatitis infection, chronic liver disease and recommendation of booster dose after primary course of vaccination. The study group comprised of 276 volunteers including MBBS/BDS students and 16 staff members of different faculties. Age range among students was 17-25 years whereas staff members were 30-50 years in age. Among 276 volunteers 46% were males and 54% were females. The levels of hepatitis B surface antibodies were assessed in blood / serum by enzyme linked immunosorbant assay (ELISA) technique. Among 276 volunteers 230 (§2%) had detectable antibodies against hepatitis B surface antigen (aHBs) while 46 (18%) showed no detectable level of antibodies against hepatitis B surface antigen (aHBs) in their serum. The titer of antibodies against hepatitis B surface antigen (aHBs) was low among staff members who were in age group of 30-50 years (n4, 0.25%).A decline in titer was observed during adolescence.

INTRODUCTION

Infection by Hepatitis B is a preventable disease. Specific protective practice should be promoted to avoid the risk of transmitting the virus sexually or by contaminated blood. There are two types of immunoprophylaxis available to prevent 'hepatitis B virus. One is passive protection, in which antibodies to hepatitis B surface antigen are given to the individuals. The other is active protection, or vaccination, which stimulates the body to produce its own antibodies.[1-3]

The hepatitis B vaccine is given as a series of three intramuscular injections, the first and second dose being separated by a month each and the third dose given six month after the previous doses. The first two doses usually suffice to initiate the production of anti bodies against hepatitis B surface antigens, here by priming the immune system for a second response. The third dose stimulates the secondary response, resulting in anti-HBs concentration which is higher than the first two doses. A booster dose of vaccine, following the primary course, is recommended by most of the national bodies.[28] Hepatitis B vaccination is regarded as being "sere-protective" if hepatitis B surface antibody level exceeds 10 IU/1.[4,5] It is estimated that about 95% of healthy adults will achieve adequate aHBs levels after three doses of hepatitis B vaccine. The exact proportion depends partly on the definition of non-responsiveness or hypo responsiveness, generally less than 10 IU/1 or 100 IU/1 respectively, against an international antibody standard. Around 5% of fully vaccinated individuals will not produce detectable antibodies to hepatitis B surface antigen (anti-HBs), these people are called "non—responder" and are at the same risk as non-vaccinated individuals of acquiring HBV infection. Non response to hepatitis B vaccination is associated with genetic predisposition.

A further 10% of fully vaccinated individuals who produce low levels of antibodies to hepatitis B surface antigen (aHBs) (10-100 IU/1) are called hyporesponders.[6,7] Between 30—50% of individuals who develop adequate antibody after 3 doses of vaccine will loose detectable antibody within 7 year.[8] There is concern that many children vaccinated as babies will not have measurable levels of antibodies by the time they are 7 year of age. Therefore hepatitis vaccination of babies seems to be of little benefit if immunity wears off while they are still in early childhood. So hepatitis B vaccine give in infancy, without the use of boosters, will still protect people engaged in high-risk activities when they become adult.[9,10]

MATERIAL AND METHODS

In this random study during year 2005, we included all volunteer students and staffs of Lahore Dental College, Lahore (LMDC). According to screening program blood samples were collected by aseptic technique. The study included 276 healthy students from 1st year to final year MBBS and BDS

classes as well as staff members of different faculties. Blood was centrifuged within two hours after the venipuncture to extract the serum. Sera were frozen until analysed. All sera were tested for antibody (anti-HBs) against hepatitis surface antigen (HBsAg) by solid phase enzyme linked immunoassay (ELISA) (Human ELYSIS) technique. The test results were interpreted as positive and protective where anti-HBs titer was 10 IU/I.

Table:

Students / Staff n = 276	Age Range	Respondent n = 230 (82%)		Non-Respondent n = 46 (18%)	
		M	F	M	F
MBBS n = 188	17 – 25yr	n = 72	n = 91	n = 13	n = 12
BDS n = 72	17 – 25 yr	n = 23	n = 40	n = 04	n = 05
Staff members n = 16	30 – 50 yr	n = 04	n = 00	n = 10	n = 02
Grand Total		99 (43%)	131 (57%)	27 (57%)	19 (23%)

Total number of cases = 276
Number of females = 150 (54%)
Number of males = 126 (46%)
Individuals with anti-HBs detectable titre < 10 IU/I = 230 (82%)
Individuals with anti-HBS detectable titre > 10 IU/I = 46 (18%)
Age range of students = 17 – 25 years.
Age range of staff members = 30 – 50 years.

RESULTS

The study group comprised of 276 volunteers out of whom 126(46%) were male and 150(54%) were females. Age range was 17—25 years in students whereas 30-50 year age ranged among staff members. Among the 275 volunteers 230 (82%) had detectable anti-HBs while 46 (18%) had no detectable antibodies against surface antigen (HBsAg). The 230 volunteers who had detectable antibodies included 99 (43%) males and 131 (57%) females. In 46 (18%) who had no detectable antibodies, 27 (57%) were males and 19 (23%) were females. There is a decline in detectable antibodies and vaccine efficacy during adolescence.

DISCUSSION

The immunological memory from hepatitis B vaccine is evident from the rapid and large increase in antibodies to hepatitis B surface antigen (anti-HBs), that occured following vaccination. The only preventive strategy to be effective in healthy individuals is active immunization.[11,12] The hepatitis B vaccine is given as a series of three intramuscular injections. More than 95% of children and adolescents, and more than 90% of young people develops adequate antibodies to hepatitis B surface antigen (anti-HBs) in response to the recommended series of three doses. The protective efficacy of vaccine in health care workers has been shown in the previous studies 86-97%.[13,14] The results of our study show immunological protection in 82% that correlates to the results of other studies.

Most persons with normal immune function who respond adequately to three doses of hepatitis B vaccine probably remain protected indefinetly immunological memory persists inspite of non detectable antibodies and can produce an adequate response within days. A lack of response to the hepatitis B vaccine seems to be determined by inherited genes that influence the body's production of certain antibodies. The present study shows 18% individuals had no detectable antibodies to hepatitis B surface antigen (anti-HBs). Various other studies have suggested that immunological memory in children vaccinated as infants would last for 15 years,[15,16] however since infection in Australia occurs in 20-40 year age group it is clear that much longer follow up studies in risk population will need to continue in order to determine how many years of protection via the immunological memory could be expected.[17,18] The protection to last against HBV infection and against chronic carriage in vaccinated group, remained relatively constant between age of 4-9 year being 83% and 94% respectively.[19-21] Inspite of this waning of antibodies, a long term study from Senegal with a large loss to follow up reported efficacy 9-12 yr after vaccination of 63% against infection and 87% against chronic carriage. One small study in China assessed vaccine efficacy after 15 yr of age. In this study, over two third of the 15 year of age had no detectable anti bodies. Several studies have already shown that adolescents and adults vaccinated with two or even one dose, had similar short term antibody response to those vaccinated with three doses.[22-26]

It is **concluded** that hepatitis vaccination provides long term protection, but all do not respond equally. They are protected even when the antibodies to hepatitis B surface antigen (anti-HBs) level in blood, declines slowly over the years, become so low that they are undetectable by the techniques usually used. For this reason, the

future booster doses of vaccine are not recommended in healthy individuals. When anti-HBs levels decline to <10 mIU/mL, annual anti-HBs testing and booster doses should be considered for those with an ongoing risk for exposure. For persons with normal immune status who have been vaccinated, booster doses are not recommended.[27,29]

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