

PREVALENCE OF VIRAL HEPATITIS B AND C AMONG SELECTED GROUP IN THI-QAR:

Dr. Ali Abed Saadon*

ABSTRACT

A seroepidemiological study was carried out in Thi-Qar governorate; Southern Iraq. The aim was to estimate the prevalence of viral hepatitis B, C and HIV among selected group in Thi-Qar Governorate and to identify the risk factors among these infections. The study included 1128 blood donors, 126 cases, 100 healthcare workers and 162 patients with blood disorder group. An Enzyme Linked Immunosorbent Assay {ELISA} was used to estimate HBs antigen, anti HCV antibody and anti HIV antibody. Prevalence of viral hepatitis B and C collectively were (6.73%, 28%, 3%, and 35.2%) for the four groups respectively. The blood disorder group showed a particularly high prevalence of HCV infection (40%). While the prevalence for HIV was zero among all selected groups. Significant independent association was found between the risk of hepatitis B and C infection and the following risk factors: History of hepatitis infection, duration of infection, history of hospitalization, history of contact with jaundice patient, history of drug addiction and history of complication.

INTRODUCTION:

Viral hepatitis represents an important health hazard, since the earlier age at which the infection is acquired the greater risk to develop a serious consequence^(1,2). Viral hepatitis is common worldwide⁽³⁾. It causes millions of deaths among the population of the world yearly⁽⁴⁾. It is estimated that more than 1/3 of the total population of the world has been exposed to hepatitis viruses^(5,6). Worldwide about 350 million persons are suffering from chronic hepatitis B infection⁽⁷⁾, the risk for them to develop hepato-cellular carcinoma is about 100-200 times higher than that for non-chronic carriers. Chronicity occurs in 90% of the patients with perinatal transmission and in 5-10% when HBV acquired during adulthood⁽⁸⁾. While for HCV the number of infected persons, who are considered as chronic carriers is about 2.7 –3.5 million cases world widely^(9,10,11,12). Chronicity occurs in 80-85% of the

infected patients^(13,14,15). HBV kills about 1 million persons each year⁽¹⁶⁾ and 15-25% die prematurely^(9,14). Hepatitis viruses' infections have high prevalence in East Asia.⁽¹⁷⁾ In the United states viral hepatitis, in general ranks third among reportable communicable diseases. Every year more than 600 000 Americans become newly infected with some form of viral hepatitis, yet only 10 % of these cases reported to the health authorities. About 50% of world reported viral hepatitis cases are hepatitis A virus which is the most prevalent among populations that have poor hygiene or are living in crowded condition⁽¹⁸⁾. It is estimated that up to one third of all Americans will be infected with a form of hepatitis in their life times and despite its high prevalence, little is known about the disease⁽¹⁴⁾. About 300 000 persons develop hepatitis B infection every year in the United States, most of them don't know that they have the disease and mistaking it for flue. While for hepatitis C

150 000 Americans yearly infected, it is considered to be the most prevalent transfusion related disease. Despite the importance of this communicable disease, in Iraq, little is known about it. No previous studies were carried out in Thi-Qar governorate or in the southern region to study the prevalence of viral hepatitis infection. The study of the epidemiological, clinical and risk factors of acquiring of the disease consequences of infection, generally support the preventive measures of the disease to decrease it's morbidity and mortality. This initiative study will support researches in the following areas:

* The epidemiology of acquisition and transmission of single and co-occurring blood born infection.

* The relation of the blood transfusion, risky job, hospital admission and the presence of a blood disorder to acquiring acute or chronic viral hepatitis or AIDS.

* Natural history of a single or co-occurring hepatitis B or C infection.

OBJECTIVES OF THE STUDY:

- 1- To estimate the prevalence of viral hepatitis B, C and HIV among selected group in Thi-Qar.
- 2- to identify the risk factors among these infections .
- 3- to study natural history of hepatitis B and C infection.

Methodology:

Study design and sampling: A cross sectional study involving four selected groups of population in Thi-Qar governorate as fallow:

- 1- Blood donors (1128 subjects): this group including all attending the central bank in Al-Jumhori hospital for blood donation. Polycythemic patients

(55 patients) were excluded from the study.

- 2- Patients with blood disorders (162 patients): include all registered cases of Thalasemia and sickle cell anaemia that were attending the maternity and children hospital in two days per a week only. Those patients are considered as a high-risk group since they generally require frequent blood transfusion.
- 3- Health care workers (100 subjects): include medical, paramedical, nurses and domestic workers in two general hospitals (Al-Hussain teaching, Al-Jumhori general hospital). The blood sample was collected during 2weeks.
- 4- Patient with viral hepatitis (126 patients): include all patients who were clinically diagnosed as acute viral hepatitis (referred by physician).

The study objectives were explained to the all participants and a verbal consent was obtained from all. Refusal rate was zero percent for the three main group, while was 20% for the health care worker group.

Collection of data:

Preparing of questionnaire: tow forma of questionnaire was prepared for the purpose of the study, which was discussed with specialist physician and community medicine specialist.

Both forma of questionnaire covered the following information:

- 1- Personal information,
- 2- status of respondent,
- 3- history of jaundice.
- 4- present medical history.
- 5- past medical history.
- 6- history of drug abuse.
- 7- history of hepatitis B vaccination.
- 8- history of close contact with a case of acute viral hepatitis.

While for those with haemoglobiopathy:

- 1- type as follow: A-Thalassaemia and its type (major or minor). B-Sickle cell anaemia and its type (SS or AS). C- Other blood disorders such as sickle - thalassaemia, haemophilia, and other blood disorders requiring frequent blood transfusion.
- 2- Date of diagnosis of the blood disorder: this was used to calculate the duration of the illness.
- 3- History of Jaundice: If positive, associated symptoms and signs, and whether the condition required medical attention, If so what was the diagnosis.
- 4- History of blood transfusion and its frequency
- 5- History of hepatitis B vaccination and the number of doses received. The details about this vaccine were obtained directly from the patient's records, which were available in the Thalassaemia unit in the maternity and children hospital.
- 6- Family history of acute viral hepatitis, or blood disorders

Most of the information for this group (group II) were mainly collected from patients' records. While that for the other three groups were obtained directly from the respondents through direct interview by the investigator.

Blood sampling:

After completing the interview, a blood sample was drawn from each individual included in the study. About 5 ml of blood was obtained either by venipuncture or from the blood bag, which contains the donated blood. The blood was drawn immediately after donation. The blood was collected in EDTA anticoagulated tube. A code number labeled each tube. These code numbers were identical to those kept in the central bank records for these persons. The blood samples, which were collected before 11 a.m., were transferred to the

central bank's laboratories to be processed within four hours after the collection of the blood sample. While blood samples collected after 11 a.m. were kept in the central bank refrigerator to be processed in the next morning. On average 8-15 blood samples were collected per day.

Blood tests:

Three serological tests were done for each blood sample as follows:

- 1- ELISA for detection of hepatitis B surface antigen.
- 2- ELISA for detection of hepatitis C viral antibody
- 3- ELISA for detection of HIV antibody:

Definition of variables:

- 1- Age: age at last birthday .For the purpose of analysis age was grouped into five groups as follows: Less than 20 years, 20 - 29 years, 30 - 39 years, 40 - 49 years, and Equal or more than 50 years
- 2- Marital status: this variable was divided into two groups: Ever married including currently married, widows, divorced, and never married (single).
- 3- Place of residence: the study population were divided according to their place of residence into five groups as follows: City center, Suq-Al-sheyokh district, Al- Chibayish district, AL-Shatrah district, and AL-Rifae district.
- 4- Respondent's occupation: this was divided into two groups as follows: Risky jobs and Non risky jobs.
- 5- Educational status: this variable was divided into four group: Equal or below 6-years of schooling, 7 -9 years of schooling, 10-12 years of schooling and 13 and more years of schooling.
- 6- History of acute viral hepatitis with or without jaundice. The study population were divided into 3 groups as follows: Those with history of icteric hepatitis,

- Those with history of anicteric hepatitis and Those with no history of hepatitis.
- 7- History of hepatitis B vaccination: This was divided into: Vaccinated, Partially vaccinated, and Unvaccinated.
 - 8- Complications of the disease: as follows: Those who had complications and Those did not have complications.
 - 9- Duration of illness for those with previous or current history of hepatitis. This was divided into: <or equal to 14 days, 15 -30 days, 31 days and over.
 - 10- History of each of the following variables: blood transfusion, injecting drug addiction, close contact with acute viral hepatitis patients, haemodialysis, and history of hospital admission.
 - 11- History of blood disorders, as follows: Those with positive history and Those with negative history.
 - 12- Living in known hepatitis endemic area: as follows: Those who lived or currently living in highly endemic area and Those who never lived in highly endemic area.
 - 13- Results of serological tests (HBsAg, Anti HCV, Anti HIV tests): The study population, were divided into 5 groups as follows: Those with HBsAg positive test, Those with Anti HCV positive test, Those with sAg and Anti HCV positive tests, and Those with Anti HIV positive test.
 - 14- Special variables related to the blood disorders group:
 - A- Type of blood disorder: Thalassaemia major, Thalassaemia minor, Sickle cell anaemia SS type, Sickle cell anaemia AS Type and Other blood disorders such as sickle thalassaemia, haernophilia ..etc.
 - B- Duration of illness: as follows: < or equal to 5 years, 6-10 years, 11 years or more.

- C- A family history of blood disorders: Those with positive family history of blood disorders and Those with negative family history of blood disorders.
- D- Frequency of blood transfusion: as follows: Less than 5 units I year, 2-5-10 units I year, and More than 10 units/ year.

Analysis of data:

Statistical analysis:

Data are expressed as numbers and percentages. The program which was installed in the computer and used for data analysis is the SPSS for windows Version 10 (Statistical Package for Social Sciences). X² test (chi square test) was used to examine the associations between the different variables and probability of less than 0.05 was considered as significant. Fisher Exact test was also used in some statistical analysis. Logistic regression analysis was used to find out the independent associations.

Epidmiological analysis:

Prevalence of hepatitis B and C viral infection or AIDS = no. of positive cases (new and old) * 1000 / total number of the population studied.

RESULTS

See tables below

DISCUSSION:

HB and C viruses are among the world's most wide spread infectious agent causing millions of hepatitis cases and deaths each year⁽⁴⁾. Large percentage of the infected individuals develop chronic sequels⁽¹⁹⁻²¹⁾. HCV is the etiology of 40% of the patients with chronic liver disease⁽¹⁹⁻²²⁾. In the united states, chronic HCV infection account for 8000-10000 related death

annually⁽¹⁹⁻²¹⁾. It became the leading cause of liver transplantation, accounting for 30% of all liver transplants⁽¹⁹⁾. Comprehensive understanding of the epidemiology and ecology of viral hepatitis is important for devising successful control measures of the disease. Thus, this seroepidemiological study was carried out in Thi-Qar governorate in order to determine the prevalence of hepatitis B and C hepatitis markers in selected groups of Thi-Qar population. Thi-Qar was chosen because hepatitis is one of the major health problems in this governorate and no similar previous study was carried out in this population. It is convenient to the researcher (living there).

Prevalence of hepatitis B and C infection:

The prevalence of hepatitis B and C infection among blood donors in Thi-Qar governorate was found to be 6.7%, which is higher than that reported for the blood donors in developed countries. In Mexico 0.16% of blood donors were found to be HBs Ag positive, 0.47% Anti HCV positive, while the prevalence for blood donors in United States of America was reported at 1997,1998(2.8%)⁽²³⁻²⁷⁾. This prevalence indicates that Thi-Qar is highly endemic area for hepatitis infection. The high prevalence of hepatitis B and C infection may be partly due to previous economic blockade, poor supplement of the health equipment, unavailability of the vaccine, low educational level, especially at the health level and absence of the health education program, leading to poor control of the infectious diseases including hepatitis infection. The high prevalence is an indication of poor environmental condition of people and infection preventive measures. Estimation of the prevalence of hepatitis B and C infection among patients with blood disorder showed that these patients had a

particularly high prevalence of HCV infection (40%). Of the 162 blood disorders group 69(52.6%) were Thalassaemic. The majority (73%) of them were infected with HCV (one patient was infected with both HBV, HCV). Only one patient was infected with HBV alone (1.4%). None of the patients suffering from sickle cell anaemia was infected with hepatitis B or C viral infection, while 4 (10.0%) of patients with other blood disorders (sickle-thalassaemia, hemophilia and others) , were infected with hepatitis C viral infection and none was infected with HBV. This might be due to the fact that the main mode of transmission of HCV is blood transfusion. The overall prevalence of hepatitis B viral infection among blood disorder group was 1.23%, which is lower than that reported by other studies⁽²⁸⁾. While the prevalence of hepatitis C viral infection (40%) is higher than that reported by other studies⁽²⁸⁾. In a previous study carried out in Basrah the prevalence of HCV infection among patients with haemoglobinopathies was found to be 7.3%⁽²⁹⁾. Similarly, in India the prevalence of HCV infection among blood disorders group was as follow: 11%, 14.3%, and 17.5% in three repeated studies⁽³⁰⁻³²⁾, they believed that the cause of this increment was related to commercial blood donors. The frequency of blood transfusion was one of the major independent risk factors associated with the prevalence of hepatitis. Frequency of blood transfusion was the main determinant of the prevalence of HCV infection. Defective screening program for HBV and HCV among blood donors particularly during the years of economic embargo, which was mainly due to deficiency in the biokits and other major materials, may have contributed to the high prevalence of HCV infection among the blood disorder patients in the present

Prevalence Of Viral Hepatitis B And C Among Selected Group In Thi-Qar

study. High prevalence rates of HCV infection were reported among thalassaemic patients in Egypt (44%)⁽²⁹⁾, and in China (34%)⁽³³⁾. Lower rates were reported in other countries such as Nigeria⁽³²⁾ and USA⁽³⁴⁾. Hepatitis C viral infection among health care workers has been generally documented following percutaneous exposure to blood⁽³⁵⁻³⁹⁾. The overall HCV seroprevalence among hospital staff in Al-Nasseriah was 0%, which is lower than that documented in Basrah General Hospital (11.8%) and close to the prevalence in Africa⁽³⁸⁾ and Japan⁽³⁹⁾. It is also lower than that documented among hospital staff in USA (6%)⁽⁴⁰⁾ and in France (0.9%)⁽⁴¹⁾. Similar findings were reported in other studies⁽³⁶⁻⁴²⁾. The prevalence of hepatitis B viral infection among health care workers was 3%, which is again lower than that reported for the worker in Basrah General Hospital. Investigation of HB based on HbsAg detection mostly, HCV mainly based on HCV-Ab, and this detects prevalence of HCV (recent and old), so the indication of higher HCV infection is more valid. The cases of hepatitis were mostly of B type than C, in contrast to other studies in which the prevalence of hepatitis C is more than that of B⁽¹⁰⁸⁾. The highest percentage among cases were of forty years of age and above, which was similar to other studies^(27,33). Female with higher prevalence than male, in contrast to other studies in which the prevalence is similar^(25,27). Most of the risk factors contributed to the transmission of hepatitis except drug addiction, which is not a common Problem in our community. Sero-prevalence and other variables among cases and suspected cases of viral hepatitis

Conclusion:

1- Prevalence of hepatitis B and/ or C infection among the blood donors in

Thi-Qar governorate was relatively high.

- 2- It was the first time in Thi-Qar governorate to assess the prevalence of hepatitis B and C and AIDS, which, result in intermediate prevalence of hepatitis B and C infection and zero prevalence of AIDS. Prevalence of hepatitis B and C was higher than most of the other studies world wide among the blood donors group and blood disorder group, while in the health care workers the prevalence was lower than other studies.
- 3- females showing higher incidence than male in most of the studied group.
- 4- Hepatitis B was more common than hepatitis C in the entire selected group except for the blood disorder group. While, the prevalence of AIDS was 0% in all groups, which was lower than other reported studies.
- 5- thalassaemic patients was founded to be with higher prevalence of HCV infection than that worldwide.
- 6- the hepatitis B vaccine has a good rule in the prevention of the occurrence of hepatitis B infection. So, the enhancement of vaccination program will decrease the chance of infection with hepatitis B virus.
- 7- most of the cases with positive serology was with previous history of hepatitis and had symptoms of hepatitis viral infection this suggests that most cases were symptomatic.
- 8- the prevalence was higher among those who had history of hospital admission
- 9- The prevalence was with variable degree in different regions of living.
- 10- The most important risk factor for the blood disorder group is blood transfusion, while the other group is the history of contact.

- 11- This study will be the base line for other similar studies in the future.
- 12- Hepatitis B and C infection represent 24%, and 4% respectively of the acute hepatitis cases.
- 13- Previous history of icteric hepatitis of long duration may predict hepatitis B or C infection.

RECOMMENDATIONS:

Based on the results of the present study, it seems that viral hepatitis is an important public health problem in Thi-Qar governorate. Thus, the following recommendations were made:

- 1- Further seroepidemiological study involving representative samples of Thi-Qar population is highly recommended.
- 2- Further epidemiological studies in the highly endemic areas in Thi-Qar need to be carried out to estimate the magnitude of the problem.
- 3- Provision of drugs and diagnostic equipment for early diagnosis of the cases in order to treat the patients effectively.
- 4- Health education for the risky groups especially thalassaemic patients. Also education about the modes of transmission of hepatitis and AIDS

5- Special emphasis on the importance of HB vaccine as an effective control measure for HBV infection- All infants and the high risky group should receive three doses of vaccine.

6- Free treatment of the hepatitis B and C cases and AIDS in the hospitals, by rehabilitation of infectious unit in the Al-Jumhori hospital, and patients should not discharged till full recovery.

7- Management of the problem of the drug addiction, especially injectable one, by punishing those who, are aiding to enhance this problem, especially the medical personales.

8- Planning for comprehensive integrated programs for control of infectious diseases (including hepatitis and AIDS) at national and regional levels. Such programs are cost effective since many of infectious diseases show similar ecological characteristics

9 - screening program for the blood unites before transfusion aiding to decrease the chance of getting infection with hepatitis and HIV.

TABLES

Table (1): Prevalence of hepatitis B, C, and HIV infection among blood donors

Serology	No.	%
Negative	1052	93.3
HBs antigen positive	69	6.1
HCV antibody positive	7	0.6
HIV Antibody positive	0	0
Total	1128	100.0

Prevalence Of Viral Hepatitis B And C Among Selected Group In Thi-Qar

Table (2): Logistic regression analysis for the blood donor group:

Variables with significant association	B	P value
History of hepatitis	-2.69	0.0019
Duration of infection	0.52	0.0486
History of hospitalization	-0.83	0.00196
History of contact	1.02	0.0051
History of drug addiction	-1.59	0.0019
History of complication	-2.16	0.00
The independent variables with no significant association		
Age, Sex, Place of residence, Marital status, occupation, Education status, Vaccination, History of blood transfusion History of living in endemic area.		P value > 0.05

To find out the independent effects of different risk factors on prevalence of the infection logistic regression analysis was carried out and the factors which were found to be independently effecting the risk of the infection were as in Table (2).

Table (3): The prevalence of hepatitis B, C, and HIV infection among healthcare workers

Serology	No.	%
Negative	97	97.0
HBsAg positive	3	3.0
Anti HCV Positive	0	0.0
HIV Antibody positive	0	0.0
Total	100	10.00

Table (4): Prevalence of hepatitis Band C infection among blood disorder group

Serology	No.	%
Negative	105	64.8
HBsAg positive	1	0.6
Positive HCV antibody	55	34.0
Anti HCV andHBs Ag positive	1	0.6
Anti HIV positive	0	0.0
Total	162	100.0

Table (5): Logistic regression analysis of the blood disorders group:

Variables with significant association	B	P value
Vaccination status	-6.1714	0.0029
History of hepatitis	10.1277	0.0019
Frequency of the blood transfusion	-1651	0.0359
Date of diagnosis	2.4708	0.0422
History of Blood disorder among family	4.3264	0.0348
Type of the blood disorders	-4.6256	0.0085
Independent variables with no significant association		
Age, Sex, Occupation, Education status, History of hospitalization, History of living in endemic area History of contact with hepatitis patient		P value > 0,05

Table (6): The results of hepatitis B and C serology among hepatitis cases:

Serology	Frequency	Percentage
Negative	91	72.0
HBs antigen positive	30	24.0
Anti HCV positive	5	4.0
Total	126	100.0

Table (7): Logistic regression analysis of the cases of hepatitis

Variables with significant association	B	P value
Duration of infection	1.2127	0.021
Place of residence	0.0142	0.0520
Independent variables with no association		
Age, Sex, Education status, Marital status, occupation, Vaccination status, History of contact with jaundice patients, History of living in endemic area, History of hospitalization		P value >0.05

To find out the independent predictors of positive hepatitis B and C serology among hepatitis cases logistic regression analysis was carried out .As a result the only significant independent predictor of positive hepatitis B and C serology among cases of hepatitis is duration of illness Table (7).

REFERENCES:

- 1- Anonymous. Viral hepatitis. Internet [http:// www.medicinenet.com/](http://www.medicinenet.com/) June 9 2004
- 2- Zuckerman J., Banatvala E., Pattison R. Principles and practice of clinical virology. Fourth edition. John Wily and sons Ltd., 2000: 198-217.
- 3- Al-Deeb S M., Yaqub B A. Hepatitis B. Saudi Medical Journal 2001; 22(1): 84-85.
- 4-Bonanni P. Universal hepatitis B immunization: infant and infant plus adolescent immunization. Vaccine 1998;16 suppl: 17-22.
- 5- Kane M. Global program for control of hepatitis B infection. Vaccine 1995; 13: 47-49.
- 6- Omata M. Treatment of chronic hepatitis B infection. N Engl J Med. 1998; 339: 114-115
- 7-Cann A J. Principles of molecular virology 3rd ed. Academic press 2001.
- 8-Lee WM. Hepatitis B virus infection. N Engl J Med.,1997;337:1733-1745.
- 9- Benenson A S. Viral Hepatitis,. Control of Communicable Diseases Manual. 16th edition. Washington. American public health association. 2000;217-233.
- 10- Chu D. Clinical Update of Viral Hepatitis A-G. Common Medical Disease, Viral Hepatitis Update. 2004; 20-24:20-24.
- 11-Hyams KC. Risks and chronicity following acute hepatitis B virus infection: A review. Clin Infect Dis.1995;20:992-1000.
- 12- Alter M J, Kruzon-Moran D, Naian OV ,et al. The prevalence of hepatitis C virus infection in the United states ,1988 through 1994,N Engl J Med. 1999;341:556-568.
- 13-Haslett C, Chilvers E R, Hunter J A et al. Davidson Principle and practice of medicine. Eighteenth edition. Edinburgh. London. New York. Philadelphia. Sydney. Toronto. Churchill Livingstone. 1999:706-707.
- 14-Knauer C M. Silverman S. Elementary tract and liver. In Schroeder SA, Marcus A, Lawrence, et al. eds. of Current medical diagnosis and treatment.USA. Alange.1999: 396-418.
- 15-Association of Medical Microbiologists. Viral hepatitis. [http://www.amm.co.uk/ pubs/fa-hepatitis](http://www.amm.co.uk/pubs/fa-hepatitis) . 1993 (Internet).
- 16- Robinson WS.HBVand HDV .In :Mandell GL,Bennett JE,Dolin R, eds. Principles andpractice of infectious Disease .4th ed. New York. NY: Churchill Livingstone. 1995:1406-1439.
- 17-Chen DS. Viral hepatitis in East Asia. J Formos Med Assoc. 1996;95(1):6-12..
- 18-AcuteViralHepatitis.
http://www.merk.com/mrkshared/mmanual_home2/SEC10/ch137/1995-2004. (Internet)
- 19-Alter MJ, Mast EE. The epidemiology of viral hepatitis in the United state. Gastroenterl Clin North Am.1994;23:437-455.
- 20- National Institutes of Health Consensus Development Conference Panel Statement. Management of hepatitis C. Hepatology. 1997;26(suppl):2-10.
- 21-Hurwitz ES, Neal JJ, Holman RC, et al. Chronic liver disease deaths associated with viral hepatitis in the United States. In: program and abstracts of the seventh national conference on chronic disease prevention and control, Salt Lake City, Utah, 1992. Atlanta, Ga: Puplic Health Service; 1992:85.
- 22-Hoofnagle J H. Hepatitis C: The clinical spectrum of disease. Hepatology. 1997;26:15s-
- 23- Wong J B, McQuillan GM, McHutchison J G. Estimating Future Hepatitis C Morbidity, Mortality and Cost in United State, American Journal of Public Health. October 2000; 90(10):1562-1569...

- 24- Alter JM., Moran DK., Nainan OV, et al. The prevalence of hepatitis C in the united states 1988 through 1994. *The New Engl J Med* . 1999;341(8):556-562.
- 25-Focaccia R, Sette H J., Sabine E et al. Estimated prevalence of viral hepatitis in the general population of the Municipality of Saopaulo, measured by a serological survey of stratified, randomized and residence-based population. *Braz J Infect Dis* 1998 Dec; 2 (6):269-284.
- 26-Ayala GJJ, Guerra AFJ, Mora BP, et al. Prevalence for viral markers for Hepatitis B, C, and HIV in volunteers blood donors in North West Mexico. *Rev. Gastroenterology Mex.* 1997; 62(4):250-253.
- 27 -Irshad M, Peter S. Spectrum of viral hepatitis in thalassaemic children receiving multiple blood transfusion.
<http://www.indianigastro.com?article.asp?issn=0254-8860:year>.
- 28-Bahtta Charya DK., Bhattacharjee S D, Mdhahiri P. Prevalence of HCV in transfused dependent Thalassaemics and haemophilics. *Indian J Med* 1991;94:430-432.
- 29- Neumann PW, Weber JM, Jessamine AG, O'shaughnessy MV., ELISA, and HIA test with neutralization test for determination of immune status. *J Clin. Microbiol.*, 1985;22:296-298.
- 30-Amarapwrka DN, Kumar A, Vaidyas, et al. Frequency of hepatitis B, D and HCV in multi transfused thalassaemics. *Indian J.Gastroenterol.* 1992;11:80-81.
- 31-Agarwat MB, Melton GH., Ahave AA. Et al, antibody to HCV in multi transfused Thalassaemics. Indian experience. *J. Assoc. physicians-India* 1993.41:195-197.
- 32-El Nanaway AA, El Azzoceni OF, Soliman AT, et al. Prevalence of HCV antibodies seropositivity in healthy Egyptian children and four high risk group. *J. Trop. Paed.* 1995;41:341-343.
- 33- Mutimer DU, Odomi A,S, Skidmore S, et al. Viral hepatitis in Nigeria sickle cell disease. *Assoc.* 1993. 41:195-197.
- 34-Mitsui T, Iwano K, Masuko K, et al. Hepatitis C in medical personnel after needle-stick accidents. *Hepatology* 1992; 16: 1102-1114.
- 35-Lanphear BP, Linneman CC, Canon CG, et al. Hepatitis C virus infection in health-care workers: risk of exposure and infection. *Infect Control Hospital Epidemiol* 1994; 15: 745-750.
- 36- Kiyosawa K, Sodeyama T, Tamaka F, et al. Hepatitis C in hospital with needle stick injuries. *Ann Intern Medical* 1991;115: 367-369 .
- 37-Lanphaer BP. Trend and pattern in the transmission of the blood born pathogenes to health care workers. *Epidemiol Rev* 1994, 16: 437-450.
- 38-Nakashima K, Kashiwagi S, Hayashi J, et al. Low prevalence of hepatitis C virus infection among hospital staff and acupuncturists in Kyushu, Japan. *J infect* 1993, 26: 17-25.
- 39-Jochen ARB. Occupationally acquired hepatitis C virus infection (Letter). *Lancet* 1992, 330: 304.
- 40- Germmandnd J, Barthes JP, Causse Y. The occupational risk of hepatitis C infection among hospital employees (Letter). *Am J Public Health* 1994, 34:122.
- 41 -Red Book. Report of the Committee on Infectious Disease. Hepatitis C ..American Academy of Paediatrics 24th edition 1997; 260-264.
- 42-Lionis C, Koulentaki M, Biziagos E. et al. Current prevalence of viral hepatitis A., B and C in a well defined area in rural Crete, Greece. *Journal of viral hepatitis.* 1997;4:55.