

## HEPATITIS INFECTION IN DENTAL PRACTICE; DIAGNOSIS AND PREVENTION

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### ABSTRACT

*Hepatitis infection is a silent epidemic. It has high morbidity and mortality in different countries. It is a public health problem in developing countries with limited resources and health budgets. The aim of this review paper is to revisit the hepatitis infection, its epidemiology, its modes of spread, diagnosis, prevention, especially in relation to Pakistan. Special emphasis is laid on hepatitis infection in the dental, and medical practices. The recommendations have been highlighted in the light of latest developments, understanding of hepatitis infection, treatment modalities and need of cost effective preventive regimens to control the infectious disease. The observance and practice of "Universal Precautions" for infection control has been emphasized. It is hoped that the paper will be of great help to health care professionals, those who are active in rendering their services to improve the quality of life of their patients. Further, it would be helpful to dental practitioners to protect themselves, their team and the patients in general, and may minimize the risk with better understanding of the public health problem.*

**Key words:** Hepatitis, Prevention, Dental-practice, Infection-control, Pakistan

### INTRODUCTION

Hepatitis is a generic term that means inflammation of the liver. Hepatitis can be caused by viral and bacterial infections, by other parasites, or by exposure to chemicals and drugs (such as alcohol). Viral hepatitis may be caused by any of a number of viruses. Out of these viruses three types are especially important in the dental setting which include the hepatitis B and C<sup>1</sup>.

Hepatitis B virus (HBV) has the ability to withstand extreme temperature and humidity which allows it to survive for longer durations in the environment. Hepatitis D virus is dependant on HEV. Hepatitis D occurs as coinfection with HBV or superinfection in persons with chronic HBV infection<sup>1</sup>. Hepatitis C virus (HCV) has been reported as the major cause of chronic liver disease and hepatocellular carcinoma<sup>2</sup>.

It is estimated that approximately 2 billion people in the world have been infected with Hepatitis B virus, 400 million of who are chronic carriers of the virus<sup>3</sup>. The prevalence of Hepatitis B varies with different regions of the world with the highest rate reported in Egypt (19.6%)<sup>4</sup>. Developed countries have demonstrated lower prevalence of HBV<sup>3</sup>. The ratio of male to female

seen among HBV infected individuals is approximately between 1:5 and 2:1<sup>5</sup>. According to the World Health Organization (WHO) 170 million people which are approximately 3% of the world population are chronically infected with HCV<sup>2</sup>. Each year 3-4 million people are newly infected with HCV<sup>6</sup>.

It is estimated that 5-8% of the Pakistan's population is infected with HBV. According to a study, Pakistan has been classified in the intermediate HBV prevalence area with a carrier rate of 3-4%<sup>7</sup>, and the disease is considered endemic in the country<sup>3</sup>. HBV has been classified into 8 different genotypes. These different genotypes show a distinct geographical distribution and among them genotype C is reported to result in a severe disease with higher chances of fibrosis<sup>3</sup>. Genotype C is more prevalent among cirrhotic patients when compared with the genotype B<sup>3</sup>. It was found that the most dominant genotype in Pakistan is the genotype C. A geographical variation in the genotype in each province was reported with Genotype B and C predominant in Punjab and NWFP, and genotype A was found to be predominant in Sindh<sup>8</sup>. It was found that HBV was more prevalent among individuals residing in the rural areas of Pakistan<sup>6</sup>. A high prevalence

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of HBV has been reported among healthy blood donors in Pakistan. Among these 2-10% of the donors were reported to be infected with HBV<sup>3</sup>.

An epidemiological study revealed that the overall prevalence of hepatitis D virus (HDV) in Pakistan is 16.6% and among other factors, the prevalence of HDV has been associated with the high prevalence of hepatitis B<sup>9</sup>. Several factors have been associated with the severity and clinical course of the disease among individuals infected with HBV. These include the genotype of the HBV, age of the individual and host genetic factors.

Approximately 10 million people which are approximately 6% of the population are infected with HCV in Pakistan<sup>2</sup> and a prevalence rate of 7-10% has been reported<sup>10</sup>. A study demonstrated a male predominance in adults for the presence of anti-HCV antibodies<sup>11</sup>. HCV Genotype 3 is the most predominant genotype found in Pakistan (75-90%)<sup>2</sup>. Determination of the genotype is critical to the treatment of hepatitis C as the response with interferon on different genotypes vary<sup>2</sup>. Also, steatosis in patients with viral hepatitis C is specifically related to the genotype 3<sup>12</sup>. In a study, 3351 serum samples were tested in HCV RNA positive patients by specific genotyping assay and genotype 3a and 3b were the predominant subtypes identified with 3a being the most common<sup>13</sup>. Table 1 enlists various studies and their findings in Pakistan to evaluate the prevalence of Hepatitis C.

In a randomized epidemiological study to assess the prevalence of the Hepatitis B and C virus in Islamabad, Pakistan, it was found that individuals positive for anti-HCV (5.31%) were approximately twice compared to individuals who were found positive for HBsAg<sup>17</sup>. Other studies have also demonstrated a significantly higher number of blood donors infected with HCV compared to the HBV<sup>6</sup>. These results reflect a higher prevalence of HCV as compared to HBV in Pakistan.

Patients diagnosed with hepatocellular carcinoma (HCC) were tested for HCV in a study. It was found that hepatitis C antibody was found positive in 67% of the patients tested, thus demonstrating the strong relation of HCC with hepatitis infection<sup>18</sup>. Antibodies against HCV were found more often than hepatitis B surface antigen (HBsAg) among individuals with hepatocellular carcinoma in Pakistan<sup>19</sup>. Chronic liver disease as a result of HCV or HBV infection or a combination of both resulted as a major cause of mortality in Pakistan<sup>20</sup>.

Due to the high prevalence rate and subsequent threat to the population from the hepatitis B and C, experts have called these infections "the HIV/AIDS of Pakistan"<sup>10</sup>.

## MODES OF TRANSMISSION/SPREAD

Several factors have been associated with the spread of hepatitis B and C in Pakistan. The importance of various modes of transmission varies in different regions of the world<sup>21</sup>. In the underdeveloped countries, HBV infection may be transmitted most commonly through sexual activity, injection-drug use, occupational exposure, intravenous drug use and needle stick injuries<sup>3</sup>.

### *Body Fluids and Blood Borne Infection*

HBV is transmitted primarily by percutaneous and the exposure of the mucous membrane to blood and infectious body fluids<sup>21</sup>. Hepatitis B carriers vary in their infectivity with HBsAg from less than 10 to more than 10<sup>8</sup> virions/mL of plasma and HBeAg having a higher infectivity of approximately 10<sup>6</sup> virions/mL of plasma<sup>5</sup>. The HBV viral particles may remain infectious for a week in dried blood at room temperature<sup>22</sup>. Blood and body fluids are the primary vehicles of transmission but the hepatitis B virus can also be transmitted by contact with body secretions such as semen, saliva, sweat, tears, breast, milk and pathologic effusions<sup>23</sup>. The amounts of HBsAg in urine,

TABLE 1: PREVALENCE OF ANTI-HCV ANTIBODIES REPORTED AMONG VARIOUS STUDY GROUPS

Refernce	Year of Publication	Province	Sample Size	Population Groups	Anti-HCV antibodies (%)
Khattak <sup>15</sup>	2008	NWFP	1131	Volunteer blood donors	4.1
Idrees <sup>11</sup>	2008	Punjab	6817	General population	14.63
Jafri <sup>7</sup>	2006	Karachi	3533	Low to middle socioeconomic children	1.6
Muhammad <sup>16</sup>	2005	Buner	16400	Outdoor patients in a medical OPD	4.57
Khokhar <sup>17</sup>	2004	Islamabad	47538	Pre-employment medical evaluation	5.31
Akhtar <sup>14</sup>	2004	Karachi	351309	Male volunteer blood donors	1.8

breast milk, vaginal secretions, cerebrospinal fluid, sweat, tears, bile and faeces are extremely low<sup>5</sup>.

Risk groups for hepatitis C include intravenous drug users, hemophiliacs, thalassaemics, hemodialysis patients, prisoners, alcoholics, HIV-positive individuals, patients with history of blood transfusions, tattooed individuals, health-care professionals (exposed by needlesticks), people with disabilities/institutionalized individuals, prostitutes, homosexuals, heterosexual partners of HCV carriers and children born to HCV-infected mothers<sup>5</sup>.

Patients infected with HCV in Pakistan show a family history of jaundice<sup>15</sup>, transfusion with blood and blood product donations which are not screened for HCV, ear piercing, administration of non-sterile health care provided by unqualified health care workers<sup>7</sup>. Transfusion associated hepatitis has been held responsible for 90-95% of all cases. Sexual transmission and vertical transmission are infrequent<sup>23</sup>. A history of being shaved by a barber may also be a possible source of exposure to HCV as the delicate skin of the face and armpit are susceptible to microtrauma through a contaminated traditional long-handled razor<sup>2</sup>. Other established sources of the spread of HCV infection including circumcision, tattooing, dialysis and homosexuality may also contribute at varying degrees<sup>2</sup>.

#### *Perinatal Transmission*

Perinatal transmission from mother to infant is considered a major mode of transmission of HBV<sup>21</sup>. Zuberi et al in a study described HBsAg prevalence of 2.5% in pregnant women and out of these 17% were HBeAg and 61% anti HBe positive respectively. It was concluded that vertical transmission in pregnant women makes this mode of transmission less significant in Pakistan<sup>7</sup>. In regions of the country with intermediate prevalence of HBV, horizontal transmission particularly from child to child through minor breaks in the skin or mucous membrane is considered accountable for chronic HBV infection<sup>7</sup>. HVC may also be transmitted to children born to HCV-infected mothers<sup>5</sup>.

#### *Drug Abuse Practices*

Pakistan is a neighboring country of Afghanistan which is one of the highest opium producers in the world. The infiltration of drugs has resulted in a devastating outcome in Pakistan. The Anti-Narcotics Force of Pakistan stated that 2% out of over 4 million drug addicts in the country were injecting the drug and were at high risk of Hepatitis B and C and HIV/AIDS<sup>3</sup>. In another report by the Anti-Narcotics Force the intravenous drugs abuse was reported to be among only 1.5% of the population of Punjab province indicating it to be a minor risk factor<sup>21</sup>.

#### *Medical Waste Mismanagement*

The poor management of the medical waste is also a major source of spread of hepatitis. Used syringes and

needles along with other medical waste are dumped outside the hospital in open rubbish. Rag pickers who are mostly children handle the waste with bare hands and collect these needles. It was estimated that these needles are sold at price of 3-10 Rupees/Kg<sup>25</sup>. It has been reported that used contaminated syringes were being used by farmers in the village of Charsadda, NWFP, Pakistan. They used oxytocin injections immediately before cattle milking to increase the milk production. The main source for such syringes was from local dispenser and health care workers. Handling contaminated needles expose them to risk for bloodborne diseases<sup>26</sup>.

#### *Through Non-Sexual Household Contact*

In a study by Akhtar et al<sup>27</sup>, transmission of HCV through non-sexual household contact has been demonstrated to play a role in the transmission of the infection in the low socioeconomic setup in Karachi, Pakistan. Seventy (20.5%) of the 314 household contacts tested HCV seropositive in the study. Significant independent epidemiological association has been reported between HCV seropositivity among house hold contacts and being bitten by the carrier or sharing a toothbrush with the carrier<sup>27</sup>.

#### *Other Factors*

A smallpox vaccination program at a national level ran from 1964 to 1982 in Pakistan. Results from a study in Lahore, Pakistan demonstrated an association between the spread of hepatitis C and the smallpox vaccine program. The cause suspected for the spread at that time is thought to be below standard of care protocols in the handling of the vaccine and compromised sterilization<sup>24</sup>.

#### *Through Medical Care Practices*

Compromised sterilization and reuse of contaminated medical or dental equipment, poor cross infection control measures, and below the standard of care practices in the health care system play a significant role in the nosocomial transmission of the disease.

Health care is delivered in some regions of the country by unqualified health care workers. These workers lack knowledge of standard sterilization, safe injection practices and management of medical waste<sup>2</sup>. Due to this reason the risk for occupational exposure may increase. The risk of transmission of HCV from an infected patient to a health care personal through needleprick injuries is approximately 1.8%<sup>12</sup>. This risk is primarily related to the duration and frequency of blood contact in the workplace<sup>21</sup>. Various study groups report that the prevalence of HBV among health care personal in the country is 5-9%<sup>3</sup>. Pregnant women are also at risk as they are exposed to the health care facilities in various aspects during the course of their pregnancy<sup>24</sup>.



Pakistan has one of the highest frequencies of injections in the world and statistics reveal that on an average 9 injections per person per year are reported<sup>13</sup>. The rate of infection following a needleprick injury is greater for cases of Hepatitis B virus (6-30%) than for Hepatitis C virus (0-7%)<sup>27</sup>. Among the general population of Pakistan, false beliefs exist regarding the effectiveness of parenteral route of medication administration rather than the oral route<sup>29</sup>. Patients are also willing to pay more for an injection than a prescribed oral drug<sup>29</sup>. Misuse of the reuse of a syringe by the health care workers and unqualified doctors is done to cut the cost and increase the profit several folds<sup>30</sup>.

The most commonly administered injections include chloroquine and vitamin B complex which in most of the cases are not indicated<sup>10</sup>. Equipment shortage has also been associated to the cause of reuse of syringes<sup>10</sup>. A nationwide survey by the Ministry of Health in 2002 revealed that as many as 72% therapeutic injections and 50% immunization injections in public health-care facilities were unsafe and potentially dangerous. In 2000 alone, unsafe injections were estimated to have resulted in 134, 245 and 932, 971 cases of hepatitis C and hepatitis C and hepatitis B infections, respectively<sup>10</sup>. A study in NWFP, Pakistan revealed that the patients infected with HCV were associated with a history of receiving 1-2 injections or >2 injections in the past year, or 1-5 intravenous (IV) drips or >5 I/V drips in the past 5 years<sup>15</sup>. Allopathic medicine is popular among the rural population of Pakistan and is considered to contribute to the spread of HCV through compromised infection control measures and multiple uses of injections<sup>6</sup>. Excessive and unnecessary use of injections is common in the health care system of Pakistan. The use of unsterilized needles in this situation has led to a higher risk of HCV infection<sup>2</sup>.

### Through Dental Care Practices

Compromised infection control measures in the dental practice may result in the spread of various infectious diseases and blood borne pathogens including HIV and the hepatitis B and C virus. The most common route of transmission of blood borne pathogens in dentistry from patient to the dental team is from percutaneous exposure via needlestick or similar events<sup>22</sup>. Ineffective infection control methods in dental procedures practiced in Pakistan have been held responsible for significantly contributing to the spread of hepatitis C. Further it was found that only 0.25% of dentists in Lahore, Pakistan used a sterilized handpiece for every patient, and related unsterilized dental equipment to the spread of HBV<sup>31</sup>. Beside percutaneous exposure in a dental setup, transmission may occur even when a piece of calculus lands in the assistant's eye or when airborne infections are spread by aerosols generated by a dental handpiece or by a patient's sneeze or cough<sup>22</sup>. Other factors contributing to com-

promised infection control measures are presented in Table 2.

TABLE 2: FACTORS ASSOCIATED WITH THE COMPROMISED INFECTION CONTROL MEASURES IN DENTAL PRACTICES IN PAKISTAN<sup>32</sup>.

- Unqualified dental professionals
- Lack of knowledge and awareness amongst the general masses
- Limited information provided during teaching at dental institutions
- Lack of national cross-infection control guidelines
- Absence of litigation.

The dental health care personnel work in close proximity to the patient and they are exposed to a field of surgery which is awash in saliva often contaminated by blood<sup>22</sup>. Many dental procedures produce aerosolized droplet nuclei, which may linger in the atmosphere for hours creating a possibility of the disease transmission<sup>22</sup>. Surfaces in dental practices most prone to act as sources for cross infection include cabinets, bracket tables, chairs, units, lights and x-rays units<sup>33</sup>.

*Lack of Awareness:* Once infected by HCV or HBV, clinical symptoms of the disease may appear much later. Because of this people are unable to connect the relation between the source and the disease. In a study to estimate the prevalence of hepatitis C in Punjab, Pakistan, it was found that more than 90% of HCV and HCV and 85% of HBsAg positive participants were unaware of the infection in general<sup>11</sup>. Limited awareness among the large proportion of the unqualified dental care practitioners (quacks) also compounds the problem.

### TREATMENT MODALITIES

The objective of treatment of chronic hepatitis is to prevent cirrhosis, hepatic failure and hepatocellular carcinoma. Currently, a variety of therapies are available and approved, including conventional interferon (IFN), pegylated IFN and nucleoside analogs such as lamivudine, adefovir dipivoxil and entecavir. Treatment may be limited by multiple factors including the development of drug resistance and the low efficacy of available agents in fighting the covalently closed circular HBV DNA<sup>1</sup>.

Hepatitis B vaccine is considered best for HBV infections control. There are two different types of hepatitis B vaccines available, plasma-derived and recombinant. Recombinant vaccines are currently used in most countries. Common brand names for the hepatitis B vaccine include Energix-B and Recombivax HB<sup>1</sup>. The vaccine is indicated for all newborns, all children and adolescents not vaccinated at birth and

adult individuals specifically at high risk. The vaccine is a highly purified and modified preparation of the HBsAg. They may be present as monovalent and combination formulations. The combination formulations may protect against other diseases such as diphtheria, tetanus, pertussis.

**Hemophilus Influenza B.** The combination vaccine may be helpful specifically in children and may also reduce the cost of the vaccines when used in combinations. The most common vaccine schedule is 0, 1 and 6-12 months. Three doses are enough to achieve the liters required for protection. The protection may last for approximately 15 years. Booster doses are only required for immunocompromised individuals. Contraindication to the vaccine includes hypersensitivity reactions or a fever above 38.5°C. For population-based immunizations the strategy must aim at high risk groups of hepatitis B infection and/or a universal vaccination program<sup>5</sup>.

Once an individual is identified being infected with chronic HCV, a liver biopsy for histology is essential to classify the stage of the disease. This helps to determine the clinical management of the patient. If antiviral therapy is not indicated, efforts are directed to closely monitor and slow the progression of the disease. Periodic histological and clinical re-evaluation is required to monitor the status of the disease for immediate intervention of factors that can be modified. Interferons (IFN) are a family of cytokines that are produced by eukaryotic cells in response to various stimuli. Interferons possess antiproliferative, antiviral and immunomodulant properties. 50% of the patients treated with the combination of pegylated interferon and ribavirin (RBV) are expected to be cured of the infection. This combination is considered the standard of care for chronic hepatitis C. The objective of this therapy is to eliminate the HCV. Several factors (e.g., genotype of HCV, age, gender, ethnicity etc) may influence the duration and response of the treatment with the therapy. Although all hepatitis C patients are potential candidates for the antiviral treatment but the decision may have multiple influencing factors which are seriously considered before the initiation of the treatment by the patient and the consultant<sup>5</sup>.

## Preventive Regimens

### Infection Control Measures

Dentistry may require consideration in multiple areas to create a barrier for prevention. Infection control measures play a significant role in creating a barrier between the pathogen and the host. Pathogens may be resistant or susceptible to disinfection, but they are all susceptible to current methods of sterilization. The purpose of infection control is to break the chain of cross infection and to especially avoid infection transmission to the people at highest risk in dentistry (Table 3).

TABLE 3: PEOPLE AT HIGHEST RISK IN DENTISTRY DUE TO COMPROMISED INFECTION CONTROL MEASURES<sup>32</sup>

- Patients/Dentists
- Dental students
- Dental surgery assistants, Dental hygienist
- Steri-center personnel Laboratory technicians, Radiology technicians, Secretarial staff
- Cleaning personnel
- Dental engineers

**Universal Precautions:** "Universal Precautions" are the standard infection control protocols which must be established and practiced. These protocols are universal for each and every patient<sup>32</sup>. All patients should be considered as potential source of infection, regardless of the medical history or if a patient is known to have an infection or not<sup>33</sup>. Population at risk of being infected through dental care is not dependant on the age, gender, social class and occupation<sup>34</sup>. Universal precautions have been replaced by the term "Standard precautions". These precautions apply to contact with blood, bodily fluids (except sweat), intact mucous membranes, and non-intact skin<sup>22</sup>.

**Hand Hygiene:** To break the chain of infection, hand hygiene is considered the simplest and one of the most significant control measures. Antibacterial soap such as 4% chlorhexidine or alcohol-based hand rubs may be used as medicated. Hand lotions may be used to prevent dryness as pathogens may harbor in the cracks of hands<sup>22</sup>.

**Personal Protection:** Personal protective equipment must be used during all dental procedures. These include masks, eyewear, face shields, protective clothing and gloves<sup>22</sup>.

## GENERAL PREVENTIVE STRATEGIES

### Education and General Public Awareness

The dental team must be educated about the potential hazards associated with careless handling of the dental equipment and instruments. They must be trained and explicitly informed about hepatitis and other blood borne pathogens. Patient education at the dental practice may contribute significantly to the prevention of hepatitis in the society at large. They must be educated and advised:

- for hepatitis B screening and immunization by the vaccine
- to have safe sex using a condom with a nonimmune partner
- to cover cuts and skin lesions to prevent the spread of infectious secretions or blood

- to use screened blood and blood products if transfusion required
- to refrain from sharing, household articles like a razor, toothbrush etc with a hepatitis positive patient
- to dispose off medical waste properly
- to seek health care services from a qualified dental practitioner
- to inform their dentist or medical health care provider, if they are infected with hepatitis
- they must also be informed about the misconceptions related to the spread of hepatitis which often create social problems for infected individuals
- Patients must be informed that hepatitis B may hardly spread through breastfeeding, kissing, hugging, coughing, and ingesting food or water, sharing eating utensils or drinking, glasses, or casual touching
- they must be informed not to discriminate any individual infected with hepatitis
- pregnant mothers should be educated, about the beneficial affects of screening for HBV and HCV and must be encouraged for immunization for hepatitis B for themselves and their child at birth.<sup>35</sup>

#### *Role of Professionals*

The dental and medical community must follow the Universal infection control regime at their practices. It is their professional and ethical obligation to prevent the transmission of any infection or disease from one to another. So far the most effective method to control hepatitis infection is to prevent its transmission. It must be the responsibility of the administration of the hospital or practice to provide vaccine for hepatitis B for the entire dental team at their own expense. Dental surgeons must also provide thorough training to the freshly recruited dental assistants and other dental auxiliaries at the practice. As health care workers are at a high risk for exposure to hepatitis infections, it must be ensured that they are adequately trained and immunized. Professionals may display informative material e.g, informative charts of infection control at the dental office along with their credentials display.

#### *Role of General Public Patients*

Patients can also play a significant role in preventing the transmission of hepatitis. They must refrain from being treated by unqualified dentists. Patients must make sure that strict infection control measures are practiced at the clinic, they intend to get treatment from and may ask the dentist about the methods used at the dental practice to prevent cross infection.

#### *Role of Professional bodies*

Pakistan Dental Association (PDA) can significantly contribute at large by increasing the knowledge and awareness of hepatitis among the dentists and general masses. PDA must take the initiative to develop a guideline and policy for infection control. The guidelines must be developed in reflection of the universal precautions. The guidelines must be supported by legislation so that standard of care is implemented and generalized for every individual. Violation of these guidelines must be considered as violation of the law and dealt with serious consequences. The initial step for this process must be to educate and provide awareness of the problem to the dentists and general masses as overnight changes in this regard are impractical<sup>32</sup>. The professional bodies in Pakistan must initiate and encourage research in the area of hepatitis. Several studies have been conducted to evaluate the prevalence of hepatitis, but varying results have been reported due to poor study models. A better understanding of hepatitis may help to provide aimed and effective strategies to manage and treat the disease<sup>2</sup>.

#### **Role of Regulatory Bodies**

An aimed effort with proper strategic planning to control the rapidly spreading hepatitis is the need of the hour. The initial steps by the regulatory bodies may include nationwide surveys, in-depth research and random screening with international standards to assess the current status of hepatitis in the country. Guidelines policies must be developed to control hepatitis in collaboration with Pakistan Medical & Dental Associations.

Recommendations for hepatitis were revised in September 2008 by the Center of Disease Control in USA<sup>35</sup>, which may contribute in this regard. All policies must be implemented at all government and private health facilities. The method for data collection must be improved at all government based hospitals as the statistics from such health care facilities may be a close reflection of the existing situation.

The regulatory bodies have to ensure that all blood and blood products are screened before transfusion. They must also ensure that unsafe and unhealthy practices at barber shops may be dealt with. As major part of the health care in Pakistan is provided by unqualified professionals, it must be ensured that these individuals are educated along with the general public about hepatitis and the various modes of its transmission. Further contribution by unqualified health care workers must be strictly discouraged.

Currently, the Pakistan Medical Research Council (PMRC) has been assigned by the government to collect information regarding hepatitis in Pakistan, but the method of screening does not meet international stan-



dards. At this time the most effective diagnostic assay available for screening is the third generation ELISA<sup>9</sup>.

It was found that most of the patients who preferred injections over oral drugs were unaware of the risks associated with the use of unsafe injection<sup>10</sup>. Activities at a national level and at a community level should be initiated to educate and promote awareness among the general masses. This may include formal health education in groups, informal meetings in the community, one to one and door to door health awareness and counseling sessions, announcements at mosques and other gatherings for the general public, distribution of pamphlets, booklets flyers at health and non-health related facilities, health awareness programs in institutions and awareness through mass media. Family physicians may also play a significant role in educating their patients.

### **Continuing Education in Infection control**

Continuing education is essential to keep the dental professionals updated with the possible challenges and knowledge of the current situation. Dental license renewal should require continuing education in infection control. An "Infection-Control Practice Certification" may be issued in result of the continuing education. It must be made mandatory that such certification is displayed at the dental practice. Such rules should not only be applicable on dentists but may also involve the entire dental team at risk from cross infection.

### **Auditing of Practices and Institutions**

Infection control auditing of practices and institutions may develop a sense of accountability among the health professionals. The possibility of litigation may help to contribute beyond the boundaries of the moral and ethical values of the professionals.

### **Waste Management Certification**

The infection control plan at a dental practice must indicate protocols and measures for the waste management. These measures should be monitored by an external organization and a certificate must be issued allowing them to practice if the measures at the dental practice comply with the "Universal Precautions" or guidelines provided by the regulatory bodies.

### **Contribution by the Local Industry**

In an attempt to keep the cost of the dental procedures low infection control measures may be compromised. Limited finances also act as an obstacle in providing an environment free of cross infection risk. Practitioners who practice infection control protocols are at a competitive disadvantage in the marketplace, especially when patients do not understand or value the significance of these measures. The local industry must be encouraged to manufacture certain disposables, sterilization equipment and other related

materials required in controlling infection. The demand may rise if measures concerning infection control are implemented. To address this demand and to reduce the cost the local industry should be encouraged and facilitated by the Government.

### **Infection Control Measures in a Dental Practice**

- Barriers and surface disinfectants must be used for environmental infection control. Surfaces in this case include the handles of the operatory light, the bracket tray/ arm / handpiece console, the armrest of the assistant's stool, and the dental chair.
- Floors, walls and sinks must be cleaned with detergent/water or a disinfectant/detergent on regular basis.
- Treatment areas should be free of extraneous materials to facilitate cleaning, and disinfection. Clustering should be avoided and material not required must be placed in drawers or other storage.
- Prosthesis., orthodontic devices, impressions and occlusal registrations should be thoroughly cleaned and disinfected with a tuberculocidal disinfectant before being sent to the laboratory. Similarly, prosthesis and appliances should be disinfected before delivery to the patient.
- Laboratory equipment must be heat-sterilized or disinfected between patients.
- Avoid the use of multi-dose medication vials whenever possible.
- Appropriate measures must be used to prevent to needle-stick and other sharp instrument injuries (e.g. avoid recapping needles, use impervious containers for disposal of needles).
- All critical and semi-critical dental instruments must be sterilized between patients.
- Instruments must be thoroughly cleaned, disinfected and packed before sterilization.
- Autoclave is the most popular means of sterilising of dental instruments. Effectiveness of the sterilization process must be monitored through mechanical, chemical and biological monitors. The spore test is the most reliable method of monitoring the effectiveness of sterilization
- The method of sterilization is dependent on the type of material to be sterilized. Heat sensitive instruments must be dealt with an alternative method such as dry heat, liquid germicides classified as "sterilants".
- The dental unit waterlines must be disinfected as advised by the manufacturer of the specific dental unit. If no guidance is provided, then the waterlines must be flushed with water for at least 5 minutes.

All devices connected to the dental unit waterlines like handpieces etc must be sterilized between patients and should run for approximately 20-30 seconds to clear the lines to wash out any potentially infected material which may be retracted in the internal lines of the device.

- An infection Control Plan must be provided at every dental practice. The plan must create protocols to safeguard the health and safety of both patients and staff, must provide ongoing training, hazards exposures must be reported and recorded, ongoing quality assurance carried and continuous improvements and regulatory compliance assured.<sup>22</sup>

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