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Prevention and Control of HCV Infection and HCV Related Chronic Disease

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ABSTRACT

Background: Hepatitis C virus is an RNA virus that cause acute and chronic infection. The chronic infection can cause progression to several critical diseases including liver cirrhosis and hepatocellular carcinoma. The prevalence of the virus is increasing and as a result the related diseases and mortality increase. Prevention of the new infections and treating the patients can result in decreasing in number of new cases and avoiding mortality.

Aim: To study the prevention measures for HCV infection and its related chronic diseases.

Methods: Internet was used to search for articles related to the current subject using different keywords and different scientific websites.

Results: There were 7 articles included in this review including both research and review articles.

Conclusion: HCV and its related chronic diseases can be prevented by several available strategies such as increasing knowledge and awareness about HCV, screening of population under high risk and treatment of patients.

Keywords: HCV prevention, HCV risk factors, Saudi Arabia, Recommendation for HCV.

INTRODUCTION

Hepatitis C virus (HCV) is an RNA virus which is a positive strand, it belongs to the family Flaviviridae and Hepacivirus genus [1]. It causes contagious serious and inflammatory diseases which influence the function of the liver and may persist a chronic infection [2,3]. HCV infection is a main cause of mortality and morbidity; also it can cause acute hepatitis and chronic liver diseases including cirrhosis, liver cancer, and chronic kidney disease [4]. It was reported that HCV infection will be the main cause of liver cancer and chronic liver diseases [5,6]. Infection of HCV is the most prevalent chronic blood borne infection [7]. The burden of infection in the world is increasing, although there are improvements in transfusion practices and general health measures for limiting the transmission of the virus [8].

HCV is a global major health problem which affects more than 170 million, with 80 % persistent chronic infection [4]. North Africa and the Middle East are two regions of the highest prevalence of HCV infection [9,10]. The prevalence of HCV in Saudi Arabia differs with different population groups, it was reported to be 4.8%-84.6% among hemodialysis patients, 4.6%-78.6% in multi-transfused patients [11], 4.6% among multi-transfused children [12].

It was found that HCV was prevalent in 34% of Egyptian blood donors in Saudi Arabia [13]. Saudi Arabia is one of the gulf countries that mandated HCV screening before obtaining residency permission [11], however it is still risk HCV infection transmission from migrants of other countries or among Saudi themselves. HCV infected person is a source of infection transmission [7].

Prevention of HCV infection is the best strategy for HCV eradication and decreasing accompanied chronic diseases, the present review is conducted to highlight the prevention strategies for HCV infections.

MATERIALS AND METHODS

We used the internet to search for articles about our present subject, we used several websites including ResearchGate, Google Scholar and Pubmed using different keywords such as HCV Prevention, HCV risk factors, Recommendation for HCV prevention, and HCV in Saudi Arabia. We obtained 22 articles, we included 7 articles with publication date between 2012 and 2017 and we excluded the other articles as they didn't focus on our present subject.

Prevalence of HCV

There is a geographic variation in distribution of HCV infection, a higher prevalence can be seen in the Mediterranean, Latin America, East Asia, certain areas in Africa and Eastern Europe [14]. Reports about HCV prevalence in Saudi Arabia are still inconsistent among different studies as there are wide variations in population included in each study [15]. The prevalence of HCV in Saudi Arabia was reported in a review to be 1.7%. HCV prevalence is varied among different population groups in Saudi Arabia [11], in one study it was found that the prevalence among schistosomiasis patients was 11.8% [16], while it reached to 50% among infected hemodialysis patients [17]. In pregnant women, the HCV prevalence was found to be ranged from 0.1 % to 4.6% [18,19]. In expatriates group living in Saudi Arabia, HCV prevalence was higher than among Saudi nationals. HCV was prevalent in 4.6% - 70% among thalassemics [11]. In people who injected

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drugs, HCV prevalence was found to be 35.6% [20]. Among populations at intermediate risk, the HCV prevalence was found to be 0.2% to 22.5% in hospital attendees and it ranged from 0% to 3.2% among health care workers (HCWs), while higher prevalence was found among special clinical population [11]. Prevalence of HCV is much higher in People Who Inject Drugs (PWID), where it was found that the prevalence was ranging from 40.8% to 74% [21]. Regarding age, it was found that the HCV was prevalent in 11.3% in children with 1-12 years old who were undergoing chemotherapy [22]. The prevalence of HCV is varied also with different regions, it was reported that the southern and southwestern regions were of highest prevalence of HCV, especially Gizan [23,24]. HCV was prevalent in 5.7% of children with age range of 1-10 years old and this rate of prevalence was higher than that of the rest of the country [23]. Another study in Gizan showed that prevalence of HCV was 3.4% among healthy adult controls [24]. There is a variation in HCV genotypes distribution, the most prevalent genotypes are genotypes 1, 2 and 3, while genotype 4 is more prevalent in Central Africa and Middle East, the other genotypes are associated with specific areas [7]. It was reported in several studies in Saudi Arabia that genotype 4 was the most prevalent genotype followed by genotype 1 [25-29].

Risk factors of HCV and transmission:

The variation of HCV prevalence between different regions in Saudi Arabia made it critical to determine the specific risk factors and mode of transmission [11]. Specific methods for HCV exposure weren't clear, however it was thought that the folk blood-letting practices ('Hijama') was a mode of HCV transmission and increase the risk of infection in Gizan region [30]. There were no studies on the HCV risk factors in Saudi Arabia, so the risk factors known for HCV infection can be applied in Saudi Arabia and should be investigated in the Saudi population. Several risk factors were determined as independent risk factors of HCV infection [31]. In the recent guideline of WHO, it was reported that the main risk factor for HCV in the East is unsafe therapeutic injections [14]. HCV is primarily transmitted via percutaneous exposure [14].

HCV risk factors include intravenous drug use (IVDU) and contact with infected blood products, which are the main mode of transmission in developed countries[7] including US and Australia tattooing, skin piercing and high-risk sexual activity are other risk factors . Mother-to-infant transmission has been reported, but transmission of hepatitis C is rare ' the rate was estimated to be 2.7%-8.4% throughout prenatal transmission, while the rate increases in case of HIV/HCV co-infected mother [36]. Blood transfusion from HCV patient can cause HCV infection for patient who received the blood, this occurs when blood is transfused without screening [37]. Transmission to HCWs may occurs during work by needle stick injury which is unusual way of HCV spreading with attack rates as low as 0.3% [30].

HCV Natural History

The incubation period of the virus ranges from 14 to 180 days [14]. HCV infection ranges in severity from acute mild illness, which lasts for few weeks to persistent chronic infection [14]. In acute infection only 25% to 35% become symptomatic with non-specific mild symptoms [7] such as jaundice which occurs in 20%-30% of patients, hence it is rare to diagnose acute infection [6]. The rate of spontaneous resolution of infection is higher among infected young women, children and few patients with community-acquired hepatitis C, with a rate between 42% and 45% [39].

Persistence or spontaneous resolution of hepatitis virus is dependent on the appearance of virus-specific T-cell. Poor response to IFN-g and ineffective innate response permits sustained viral replication [31]. Also there are predictors for chronicity in HCV infection including age > 25 years at moment of infection, male gender, asymptomatic acute infection, HIV infection and immune-suppression [29]. Chronic infection of HCV represent high rate ranged between 60% to 80% among infected patients, this chronic infection can progress to fibrosis, cirrhosis, liver steatosis and hepatocellular carcinoma (HCC).

There are several risk factors responsible for rate of progression of hepatitis C to chronic liver disease and HCC, these factors are either host or environmental factors and they include gender, immunity level, age and environmental healthcare . After 20 years of chronic infection, cirrhosis is developed [39], it was demonstrated that over periods of 25-30 years, the risk of developing cirrhosis ranges from 5%-25% while hepatocellular carcinomas (HCC) develops in HCV patients after 30 years in a rate of 1% to 3%. HCC onset depends on the fibrosis stage as its occurrence increases with liver fibrosis stage. Almost 4–9% of cirrhotic patients will annually develop progressive liver failure (decompensation), with annual risk of developing primary HCC reaches 1–4% [27].

Prevention of HCV and its chronic diseases:

There is no effective vaccination for HCV as there is genetic diversity of the virus and there are several means of HCV persistence . There are several

strategies can be applied for eradication of HCV infection including, education of prevention methods, delivery of effective care and treatment to withdraw the source of infection, clinical and population screening as well as development of update health policy regarding distribution of HCV in the community. Detection of HCV patients among private offices and in the clinics as well as screening for high risk population is a useful strategy to eradicate HCV [7]. Prevention of new cases can be performed by detection of asymptomatic patients, education of households and relatives and delivering the effective therapeutic care for patients [28]. Prevention of new cases occurrence should be established regarding all levels of prevention activities and this involves primary prevention to reduce the risk of HCV transmission and secondary prevention to decrease the risk of chronic liver diseases in HCV patients [7].

Knowledge and awareness of HCV

Educating individuals to avoid risk factors is a primary prevention activity [7]. It was found that low level of knowledge and awareness about HCV was a big challenge for HCV prevention and care**.** Many HCWs lack basic information about screening recommendations or risk factors associated with HCV [29]. It was reported in several studies that physician had limited knowledge about HCV prevalence and natural history **,** also general population had limited knowledge about HCV [31]. Risk-reduction programs and consultation should be established and introduced to people, especially those with high risk, this will help in decreasing the incidence of hepatitis C. This activity includes: informing individuals that maintenance of infection-control practices, such as removal and disinfection of the contaminated surface and following aseptic procedures to prevent HCV spreading [17]. Informing persons about ways to avoid HCV transmission in their daily life such as avoiding sharing of household items which may contaminated with blood (nail clippers, razors, toothbrushes and snorting straws), stop using alcohol and adhering to medication [7]. Barbers, tattooists and foot/hand care workers should be educated about the ways to minimize blood contamination [14].

HCV Primary prevention

Primary prevention of HCV involves the prevention of disease occurrence and this strategy includes activities to decrease the risk factors and eliminate or reduce transmission of HCV to vulnerable persons [7]**.** The guideline of WHO summarize prevention of HCV transmission for individuals by covering any bleeding wound or cuts of infected persons and apply disinfectants immediately to keep the blood away from others, blood and organ donation is prevented for infected persons, body secretions and vomit of HCV patient should be disposed of with disinfectant [14]. Prevention of HCV in community involves screening for HCV for all blood donors [14]**.** Blood, plasma, organs and plasma are sources of HCV transmission, so screening tests are now performed all over the world. Individuals who have history of intravenous drug abuse are rejected to donate and also inactivation of plasma-derived products in blood banks should be performed [7]. Transmission of HCV via injecting drug use is increasing and those who receive dental or surgical treatment can be at risk of acquiring HCV infection [14]**.** In case of using syringes, they should be new and sterile and after use they should be disposed. The injection site as well as the equipment should be cleaned by alcohol swab **.** Rigorous precautions should be taken in hemodialysis center more than traditional precautions. The use of gloves is recommended when patients or hemodialysis equipment is touched, even if there is no secretion, blood or contaminated fluid. Each patient should have his own instruments, supplies and medications and they shouldn't be shared with others**.** Healthcare workers can transfer HCV infection among patients and vice-versa. There is no actual role for preventing HCWs from delivery of exposure-prone procedures [7]. however recommendations are established according to the level of risk for blood borne pathogen transmission. The levels of risk involves 3 categories; Category I involves the procedures with de minimize risk of blood borne virus transmission; Category II: includes procedures in which the transmission of blood borne virus is theoretically possible but unlikely; Category III indicates to the procedures with definite risk of blood borne virus transmission or the procedures that have been classified previously as "exposure-prone" **.** It was recommended by Society for Healthcare Epidemiology of America (SHEA) that HCWs with circulating HCV viral of more than or equal to HCV v10^4 GE/mL (genome equivalents per milliliter) should regularly use double-gloving for all contact with mucous membranes or non intact skin, for all invasive procedures and for all cases in patient care for which gloving is routinely suggested**.** In Category III applying proper infection control procedures is critically advised, also SHEA recommends that an HCV-infected HWCs with a viral burden of less than 10^4 GE/mL shouldn't be excluded from any aspect of patient care, including the performance of Category III procedures [30]**.** Cosmetic procedures which include penetration of the skin barrier like body

piercing and tattooing, should be performed by sterile instruments and proper infection-control activities should be followed in a verified center [7].

HCV Secondary prevention

Secondary prevention includes both diagnosis and treatment of the disease in its early stages before it causes significant morbidity [7].

HCV screening

The Centers for Disease Control and Prevention (CDC) in 1998 recommended testing for HCV routinely for persons who were most likely to be infected with HCV. The persons should first be asked about the risk of exposure to HCV**.** The persons at risk are classified into several categories and they include group at high risk of HCV (intravenous drug abusers), group at intermediate risk of HCV (Long-term hemodialysis, patients with unexplained elevated aminotransferase levels and infants born to infected mothers) and group at low risk of HCV (health care workers exposed to HCV by needle stick)**.** HCV screening isn't routinely recommended in pregnant women, HCWs and general population, but screening is performed for them in individual cases such as exposure with blood of infected persons or having risk factors [26]**.**

HCV treatment:

Antiviral treatment for HCV when results in Sustained Virologic Response (SVR) leads to increasing in survival rate for patients and chronic diseases and mortality can be reduced **,** improved fibrosis and inflammation scores can obtained with reduction in incidence of HCC, and prolonged life expectancy**.** Patients with SVR have greatest impact on slowing progression, this impact however is less in relapsed patients and equivocal in non-responders**.** The rates of SVR and virological cure have been increased across all HCV genotypes by the recent approval of direct-acting antivirals (DAAs) [25]**.** It was demonstrated that 57-94 % of patients showed marked improvements in their necro-inflammation and fibrosis scores following a SVR [28,29]**,** while 1-14% of patients demonstrated fibrosis progression following a SVR [40]. HCV cirrhotic patients who achieved SVR had reduction in their portal pressure measurements compared with non responders [31].

CONCLUSION

The prevalence of HCV is increasing as there is a transmission from infected patients to healthy individuals. Prevention is the best option to decrease the burden of the disease as well as its complications as there is no vaccination available. Prevention can be performed by several strategies including increasing the knowledge among individuals and HCWs about the route of transmissions and how to protect themselves and others, screening for population who are under high risk for HCV for early diagnosis and treatment and finally treatment of patients to avoid the adverse outcome and the chronic diseases related to HCV infection as well as mortality related to HCV.

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