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Research Article

Risk Factors Evaluation and Antiviral Eradication Therapies Among HCV Infected Family Members of Northern Regions, Pakistan

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Abstract: Hepatitis C virus (HCV) poses a global health threat, often transmitted intra-familial. This study aims to assess HCV transmission within Pakistani households and identify associated risk factors. To analyze 125 household subjects for HCV infection prevalence, demographics, genotypes, and risk factors. We conducted a comprehensive analysis of 125 household subjects to determine HCV prevalence. Demographics, genotypes, and risk factors were carefully examined through rigorous data collection and statistical analysis. Of the 125 households surveyed, 57 tested positive for HCV, indicating a high prevalence rate. Within these households, 121 individuals were infected, with a slightly higher proportion of females (59.5%). The distribution of infections varied across regions, with Islamabad showing the highest prevalence at 56.14%. Among the infected individuals, offspring were significantly affected (42.1%), followed by spouses (29.8%) and siblings (28%). Genotype 3a emerged as the most prevalent strain. Risk factors contributing to intra-familial transmission included major surgeries, dental procedures, hospitalizations, and blood transfusions. Furthermore, sharing personal items such as blades and towels also posed significant risks. Intra-familial transmission is a key driver of HCV spread within Pakistani households. The study's findings underscore the urgent need for targeted interventions to control and prevent HCV transmission within familial settings. Strategies should focus on raising awareness about risk factors and promoting preventive practices. Additionally, The most effective outcomes in the current study were observed with the combination therapy of Sofosbuvir and Ribavirin, achieving an End of Treatment Response (ETR) of 73% and a Sustained Virologic Response (SVR) of 72%.

Keywords: Intrafamilial Transmission, Household Subjects, Genotype, Therapeutic Regimens.

1. INTRODUCTION

Hepatitis is the inflammation of the liver, caused by HCV which was a non-A/non-B virus that was first discovered in the year 1989 and termed as Hepatitis C virus [1]. According to microbial taxonomy, HCV is categorized into the family *Flaviviridae* while its genera are *Hepacivirus*. It is a positive sense, single-strand RNA, enveloped virus. The size of the genome of this virus is about 9.6 kb which can encode only one protein after transcription, having the size of about 3000 amino acids. Both the necessary proteins for this virus, i.e., structural and nonstructural are present in this same protein which separated from each other after the translation process. Hepatitis virus C is further

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divided into six genotypes, with subtypes such as HCV 1(a) and (b) existing within each genotype [2]. Single protein that is encoded after the translation of the genome of this virus is cut into 10 different parts with the help of enzymes known as proteases. HCV contains protease enzymes for this purpose and also this virus takes the help of proteases from its host. The genome of this virus is translated in form "5UTR- C, E1, E2, P7, NS2, NS3, NS4A, NS4B, NS5A, and NS5B-3UTR". NS5B and NS2 stand for the non-structure proteins for this virus which helps in replication while E1, E2, and core-C are structural proteins. E1 and E2 proteins are present in the envelope of this virus [3, 4]. These structural and non-structural proteins are cleaved by peptides present in this virus which are named p7 [5]. Currently, there are 6main genotypes of the Hepatitis C Virus including several subtypes that have also been reported [6]. Geno-types are important that contribute to epidemiology, development of the vaccine, and diagnostic organization of chronic Hepatitis C disease [7]. Moreover, Hepatitis C genotypes are an important factor in the disease prediction for the constant response of virology [8]. These genotypes are significantly important that has a major influence on the course of infection and also on interferon therapy, as subject infected with different genotypes respond inversely to therapy.

The rate of prevalence of HCV in the whole world is in millions i.e. estimated about 170 M of people carry hepatitis, while the permanent carriers among them are 70 to 80 percent [9, 10].WHO has been reported that the prevalence rate of hepatitis C virus is 3 percent worldwide. Positive cases of hepatitis C are 170 million people around the world out of which the incident rate per year is 3 to 4 million while about 10 million HCV-positive cases are from our country [11]. Previous investigations reported the frequency rate of Hepatitis C with 1.6-1.8 percent and 1-2.3 percent in developed nations like America and Europe [12].

In the transmission of HCV to healthy individuals, some of them can eliminate the virus from the body while in the majority (from 30 to 60 percent), this virus leads to severe type of liver disorders like cancer and cirrhosis[13]**.** Some studies reported that transmission of HCV in the same family members mostly occurs through sexual contact between couple [14]. Some other studies also revealed other routes of transmission of HCV in family members like the use of the same materials used in the house such as utensils for food, towel, etc., [15, 16]. Still, the data regarded to the transmission of HCV in families is not sufficient to investigate the risk factors for intrafamilial clustering. Though transmission among families is not well investigated, various investigation indicates that perinatal and sexual transmission and close contacts as sources of contamination [17].

The diagnosis of HCV infection is carried out through serological assay and molecular assay [18]**.** The serological assay is involved in the identification of anti-HCV antibodies while the molecular assay is involved in the identification of HCV RNA in blood serum or plasma [19, 20]. Today certain antiviral drugs have been discovered to eradicate HCV infection, which are given in double or triple combinations. Drugs used in the double combinations are Peg-INFα + Ribavirin, Sofosbuvir + Ribavirin, Daclatasvir + Sofosbuvir, and Ledipasvir and Sofosbuvir. Ledipasvir and Sofosbuvir are also termed as harvoni therapy. These double combinations are given for 6 month time period. While the drugs in the triple combinations used for the treatment are Sofosbuvir + Peg-INFα + Ribavirin and Sofosbuvir + Daclatasvir + Ribavirin for the period of 3 months. Peg-Interferon alpha is given in the form of an injection to the patients to increase the immune response of the host against the virus present in the body by enhancing the activities of anti-inflammation and immune modulation. About one dose of 180 mg/ml of this injection is given in 7 days [21, 22].

2. MATERIAL AND METHODS

2.1. Samples and Data Collection

A total number of 125 families patients were enrolled having symptoms like pain in muscles and joints, dark urine, jaundice, fatigue, fever, abdominal pain, nausea, vomiting, and loss of appetite at the Department of Gastroenterology, PIMS, Islamabad, after diagnosed by a gastroenterologist. Before enrolment, they were also asked for any other HCV-positive patient in their family.

2.1.1. Inclusion criteria

Patients chronically infected with HCV have elevated Alanine aminotransferase (ALT) level in

the past six months 1.2 times greater than normal value, patient has positive anti-HCV antibodies result and positive PCR result for HCV RNA. The main focus of this was to enroll intrafamilial infected members.

2.1.2. Exclusion criteria

From the current study patients such as Patients ≤ 18 years, pregnant women, co-infected patients with HBV and HIV, breastfeeding mothers, liver cancer, and those patients who have already taken treatment for HCV infection were omitted.

2.1.3. Questionnaire

For obtaining patient history, the Questionnaire form was filled from patients at the Department of Gastroenterology, PIMS, and Islamabad. The questionnaire contains personal information such as monthly income, number of people in the family, gender, age, education, contact number, and number of rooms and also asked for family members infected with HCV. Patients having symptoms like abdominal pain, fatigue, fever, nausea, pain in joints and muscles, dark urine, jaundice, vomiting, and loss of appetite were enrolled in the current study. Furthermore, patients were asked for HCV transmission-related risk factors which include piercing through an instrument, IV cannulas, dental procedure, blood transfusion, surgical procedure, abscess treatment, five or more injections, endoscopy, colonoscopy, catheterization, sharing (blades, towel, toothbrush), shaving by barber, liver transplant, angiography, lithotripsy, exposure to HCV infected person and invasive process. Some additional questions such as abortion, five or more delivery, and traumatic delivery were asked from female patients in this study.

2.2. Antiviral Treatment for HCV

The patients were treated with a combination of five separate triple and double antiviral regimens after confirmation and detection of HCV genotype and viral load. Antiviral regimens such as 1. Sofosbuvir + Ribavirin 2.PegINF-α + Ribavirin 3.Sofosbuvir + Daclatasvir + Ribavirin 4.Sofosbuvir + Peg INF-α + Ribavirin and 5. Sofosbuvir + Daclatasvir. For HCV-infected patients, 180 mg/ml of injection (Peg-INFα) is advised once in seven days. Tablet Ribavirin (400 or 600 mg) recommend twice daily. Mechanism of action of ribavirin which is a guanine nucleotide analog that causes induce error during viral replication, inhibition of (IMPDH, immunomodulation) and direct inhibition of hepatitis C virus replication [23].

2.2.1. Adverse effects of antiviral therapies

Side effects of anti-viral therapies during the course of three to six months of treatment were noticed such as respiratory problems, thyroid dysfunction, gastrointestinal disorders, hematological, fatigue, depression, nausea, headache, and weight loss.

2.3. Diagnosis of HCV Infection

The ELISA-positive samples were further processed for RNA extraction and PCR analysis. Some samples were analyzed in accurate labs, RAWALPINDI while other samples were analyzed in the different laboratories of Islamabad.

2.3.1. Detection of viral load

In the present study, the load of HCV was categorized into different groups i.e., low, medium, marked, and positive. Patients with a load of < 100000 IU/ml were considered as low, while > 100000–500000 IU/ml and > 500000 were considered as medium and marked respectively.

2.3.2. RNA extraction

Total genomic RNA from a 150µL sample was extracted via viral nucleic acid extraction kit abott m2000sp (Abott Laboratories, USA) according to manufacturer protocol.

2.3.3. Reverse transcription PCR

For the detection of HCV's RNA in the specimen, initially through RT PCR the extracted RNA was reverse transcribed into cDNA using MMLV reverse transcriptase enzyme (Fermantas).

2.3.4. HCV genotyping

For genotyping, the virus was first amplified which requires 20 µl of the reaction mixture. This mixture also contained 10 µl of Green GO Taq Master Mix, 4 µl of cDNA, and forward and reverse primers in the quantity of 25 *p* mole. The process was completed in

40 cycles. These cycles were carried out at different temperatures, i.e., Denaturation was performed at 95 °C for 10 min, 95 °C for 1 min, annealing temperature was 55 °C for 1 min, amplification was performed at 72 °C for 1 min, and final refinement was performed on 72 °C for 10 min (Table 1) on GenAmpTM PCR system 9700 Applied Biosystems for amplification. Then gel electrophoresis was performed for the detection of PCR amplified product. Reverse and Forward primers such as KY80 = 5-GCAGAAAGCGTCTAGCCATGGCGT-3 and KY78 = 5-CTCGCAAGCACCCTA TCAGGC AGT-3 (Macrogen, South Korea) were used for both reverse transcription and PCR amplification in this study.

3. RESULTS

3.1. Prevalence of HCV

The prevalence of HCV among HCV-infected family members was detected as 45.6%. Prevalence of HCV-positive family members enrolled in this study was the resident of Islamabad 56.14%, KPK 14.03%, Punjab 28.07%, and AJK 1.75% as shown in Table 2.

3.2. Prevalence of HCV Infection In HCV-infected Families

The main focus of this study was to observe HCV infection among infected families. Family members were divided into three groups: (i) Parent's offspring, (ii) Spouses, and (iii) Siblings. High HCV infection was found in parent-offspring whose frequency was (42.11%), while in spouses (29.8%) and in siblings (28.07%) as shown in Figure 1.

3.3. Demographics' Socioeconomic and Education Level of HCV Infected Families Members

In this study, HCV-positive family-infected members were categorized into three age groups, ≥ 18-30, 31-50, and 51-80. The highest frequency of HCV was observed at 75.6% in 51-80 and 68.7% in 31-50 age group as compared to 44.9% in ≥ 18-30 group of HCV-infected familial HCV positive patients with a significance difference $p = 0.009$. The frequency of HCV among illiterates was high 56.5% as compared to literates 32.2% with a significant difference of $p = 0.007$. Prevalence of HCV among family members was observed in the low family income group (54.7%, 5000-20000) as compared to (25.7%, 21000-50000) and (25.0%, 51000-90000). A high prevalence of HCV among HCV-positive family members was observed in female patients at 61.5% as compared to male patients at 88.1% listed in the Supplementary Table 1. Mostly (39.4%, 6-10) number of patients enrolled in this study were living together in a (75.0%, 5-8) room home. Gender-wise HCV distribution is shown in Table 2.

3.3.1. Association of rrisk factors with HCV infection among HCV-infected families

A significant association of HCV infection was observed among HCV-infected family members

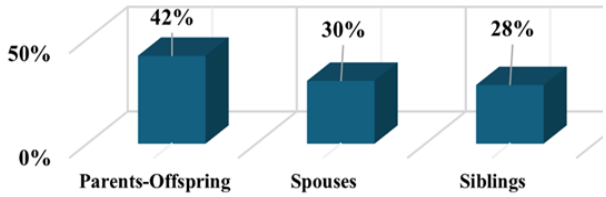

Fig. 1. Frequency of HCV in infected family members.

Table 1. Primers and Temperature for Amplification.

Target region	Product size	Primer Name and Sequence	Temperature
5′UTR	244bp	**Forward primer**	50°C: 2 min
		5-GCAGAAAGCGTCTAGCCATGGCGT-3	95°C:10 min
		Reverse primer	95°C:1 min
		5-CTCGCAAGCACCCTATCAGGCAGT-3	55°C:1 min
			72°C: 1 min
			72°C: 10 min

experienced with 5+ injection users $p = 0.000$, abscess-treated patients $p = 0.007$ and hospitalized patients $p = 0.004$, and insignificant association of HCV infection was observed among HCV-infected family members experienced with surgery $p = 0.510$, stitches $p = 0.459$, IV cannula $p = 0.433$, dental procedure $p = 0.278$, blood transfusion $p = 0.667$, dialysis $p = 0.400$, endoscopy $p = 0.534$, 5+ delivery $p = 0.145$ and traumatic delivery $p = 0.119$ listed in Table 2.

3.3.2. Risk factors associated with sharing of personal items

A significant association was observed between HCV-infected family members and patient exposure from infected persons $p = 0.000$ and facial threading $p = 0.029$. An insignificant association was observed with family members sharing personal items such as shaving by barbers sharing blades $p = 0.370$, sharing personal towels $p = 0.223$, and piercing by instrument $p = 1.170$ listed in Table 2.

3.4. Viral Load and Prevalence of Genotypes in HCV-Infected Family Members

The quantitively HCV RNA viral load was observed in HCV-positive family members and was categorized into three groups such as 10000-100000 IU/ml, 200000 - 500000 IU/ml, and ≥ 600000 IU/ml with 10.5%, 28.0%, and 61.4% respectively (Table 3). In this study, the most prevalent genotype 3a (98.2%) was detected followed by genotype 1 (1.2%) as shown in Supplementary Figure S1.

3.5. End-of-Treatment Response of Antiviral Therapies Among HCV Infection

End-of-treatment response (ETR) is the clearance of HCV virus infection after completion of three or six-month treatment of different combinations of double and triple antiviral regimens. The clearance of HCV virus after completion of antiviral treatment considered that ETR has been achieved. Five different antivirals were used in this study to observe ETR results. ETR was achieved in 02, 33, 1, and 6 HCV-positive family members treated with PegINF-α + Ribavirin, Sofosbuvir + Ribavirin, Sofosbuvir + PegINF-α + Ribavirin, Sofosbuvir + Daclatasvir and Sofosbuvir + Daclatasvir + Ribavirin therapy respectively (Figure 2). No ETR result was achieved in a patient treated with Sofosbuvir + PegINFα + Ribavirin therapy.

3.6. Sustained Virological Response of Antiviral Therapies Among HCV Infection

Sustained virological response (SVR) is defined as a viremia after six months or one year of the end of treatment response. In this study, SVR was achieved in 1, 21, 1, 2, and 4 treated with PegINF-α + Ribavirin, Sofosbuvir + Ribavirin, Sofosbuvir + Peg INF-α Ribavirin, Sofosbuvir + Daclatasvir, and Sofosbuvir+ Daclatasvir + Ribavirin therapy respectively (Figure 3). The most successful eradication regimen observed in this study was the Sofosbuvir + Ribavirin therapy.

3.7. Adverse Effects of Antiviral Therapies

More adverse effects were found in this study with Sofosbuvir+Ribavirin therapy. Side effects were also observed with other antiviral therapies used as discussed below:

3.7.1. Side effects of PegINFα + Ribavirin therapy

Mostly Side effects observed in 2, 1, 1, 1, and 1 HCV-positive patients treated with PegINFα+Ribavirin were hematological, dermatological, respiratory, and GIT disorders respectively.

3.7.2. Side effects of Sofosbuvir + Ribavirin therapy

More side effects found in HCV-positive individuals, who used Sofosbuvir+Ribavirin therapy for treatment in this study such as fatigue in 13, headache in 17, insomnia in 7, weight loss in 6, dermatological in 1, respiratory in 2 and GIT disorders in 2 patients were observed.

3.7.3. Side effects of Sofosbuvir + PegINF-α + Ribavirin therapy

Side effects observed with Sofosbuvir + PegINF-α + Ribavirin therapy in 1, 1, and 1 patients were headache, insomnia, and hematological disorders respectively.

3.7.4. Side effects of Sofosbuvir + Daclatasvir therapy

Adverse effects were detected when the patient

Table 2. Association of HCV infections with age, gender, surgical, non-surgical, and invasive procedures and sharing of personal items among HCV-infected families.

Risk factors (variables)	Infected family members	HCV infection (%)	OR (95%CI)	(*p*-value)
Gender				
Male	72	49 (68.1)	1.33 (0.71-2.47)	0.365
Female	117	72 (61.5)	1.00 (1.00-1.00)	1.000
Age				0.004
≥18-30	49	22 (44.9)	1.00 (1.00-1.00)	1.000
31-50	99	68 (68.7)	0.37 (0.18-0.75)	0.005
51-80	41	31 (75.6)	0.26 (0.10-0.65)	0.003
Surgery				0.510
Yes	50	29 (58.0)	0.45 (0.20-1.00)	0.510
No	75	28 (37.3)	1.00 (1.00-1.00)	1.000
Stiches				0.495
Yes	40	13 (32.5)	1.00 (1.00-1.00)	1.000
No	85	44 (51.7)	0.59 (0.20-1.00)	0.459
IV cannula				0.433
Yes	61	30 (49.2)	1.32 (0.65-2.68)	0.433
No	64	27 (42.2)	1.00 (1.00-1.00)	1.000
5+injections				0.000
Yes	34	3 (8.8)	1.00 (1.00-1.00)	1.000
No	91	54 (59.3)	0.06 (0.09-0.23)	0.000
Hospitalization				0.004
Yes	57	34 (59.6)	2.89 (1.39-6.00)	0.004
No	68	23 (33.8)	1.00 (1.00-1.00)	1.000
Dental procedure				0.278
Yes	57	29 (50.9)	1.48 (0.72-3.00)	0.278
No	68	28 (41.2)	1.00 (1.00-1.00)	1.000
Blood transfusion				0.667
Yes	24	10 (41.7)	1.00 (1.00-1.00)	1.000
No	101	47 (46.5)	0.82 (0.33-2.02)	0.667
Dialysis				0.400
Yes	4	1 (25.0)	1.00 (1.00-1.00)	1.000
No	121	56 (46.3)	0.38 (0.03-0.82)	0.400
Endoscopy				0.534
Yes	9	5 (55.6)	1.53 (0.39-6.02)	1.000
No	116	52 (44.8)	1.00 (1.00-1.00)	0.534
5+Delivery				0.145
Yes	6	01 (16.7)	1.00 (1.00-1.00	1.000
No	119	56 (47.1)	0.22 (0.02-1.98)	0.145
Traumatic delivery				0.119
Yes	2	2 (100)	0.96 (0.91-0.04)	1.000
No	123	55 (44.7)	1.00 (1.00-1.00	0.119
Shaving by barber sharing blades				0.370
Yes	12	04 (33.3)	1.00 (1.00-1.00)	1.000
No	113	53 (46.9)	0.56 (0.16-1.98)	0.370
Sharing personal towel				0.223
Yes	13	8 (61.5)	2.05 (0.63-6.66)	0.223
No	112	49 (43.8)	1.00 (1.00-1.00)	1.000
Piercing by instrument				1.170
Yes	60	23 (38.3)	1.00 (1.00-1.00	1.000
No	65	34 (52.3)	0.56 (0.27-1.15)	1.170
Facial threading				0.029
Yes	41	13 (31.7)	0.42 (1.93-9.25)	0.029
No	84	44 (22.4)	1.00 (1.00-1.00)	1.000
Exposure from HCV infected person				0.000
Yes	51	51 (100.0)	1.10 (0.04-0.22)	0.000
No	74	06 (8.1)	1.00 (1.00-1.00)	1.000

Table 3. Frequency of HCV viral load among HCV-infected family members.

S. No.	Viral load in IU/ml	Frequency	Percentage (%)
1	10000-100000 IU/ml	6	10.5
2	200000-500000 IU/ml	16	28.0
3	≥ 600000 IU/ml	35	61.4

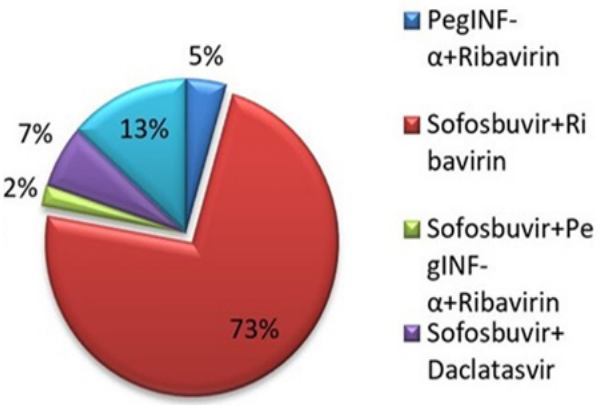

Fig. 2. ETR rates achieved with several antiviral therapies (in %).

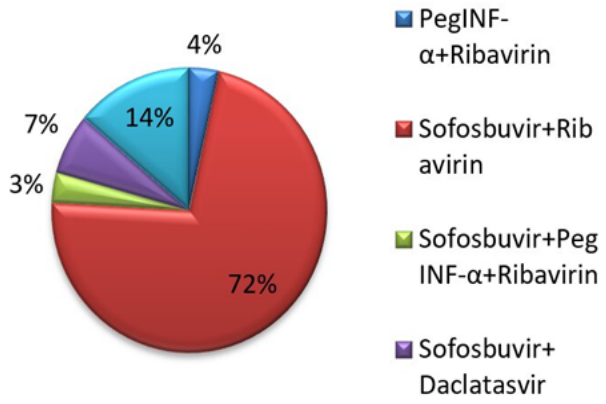

Fig. 3. SVR rates achieved with various antiviral therapies (in %).

treated with Sofosbuvir + Daclatasvir therapy such as fatigue, the headache were observed in 4 HCV-positive patients and insomnia in 1 HCV-infected patient.

3.7.5. Side effects of Sofosbuvir + Daclatasvir + Ribavirin therapy

Mainly observed side effects of Sofosbuvir + Daclatasvir + Ribavirin therapy in this study were Weight loss and dermatological adverse effects were observed in 2, respiratory and GIT disorders in 1, fatigue in 4, and headache in 5 patients.

4. DISCUSSION

HCV infects roughly 200 million individuals worldwide, with around 10 million (constituting 6.0% of the population) in Pakistan, creating a significant public health issue. The transmission of HCV within families affected by HCV has been hardly researched in the Pakistani community [24, 25]. Therefore, we aimed to investigate the specific aspects of HCV transmission, risk factors, anti-HCV treatment efficacy, and associated side effects in infected families who attended the Gastroenterology department at PIMS, Islamabad.

The prevalence of HCV in HCV-infected families (8.0%) was reported in Italy, and 7.0 % in Spain [26, 27]. Another study revealed (16.2%) prevalence of HCV infection in households from Pakistan [28, 29]**.** In this study, a similar prevalence of HCV infection among family members was observed (45.6%) as compared to the previous study which is shown (44.2%) [30]. A high prevalence of HCV infection (56.14%) was observed in the population of Islamabad in this study. A previous study reported that the prevalence of HCV in infected families was (2.8%), (1.8%), (1.7%) and (2.3%) in mothers, fathers, siblings, and offspring respectively [31]**.** In this study, the prevalence of HCV infection was observed in parent-offspring (42.11%), in spouses (29.8%), and in siblings (28.07%). As compared to the previous study high prevalence of HCV among infected families was observed.

A previous study reported genotype 3a (89.0%) followed by genotype 3b (11.0%) in infected families member [28]. Qazi*et al* reported that genotype 3a (75%-90%) was prevalent in the Pakistani population [31]. In this current study, the most prevalent HCV genotypes in infected families were genotype 3a (98.2%). That is similar to a previous study that strongly declared that genotype 3a is the main source of HCV infection in infected families. In this study, the risk factors that were most significantly found in HCV-infected families were 5+ injection users, hospitalized patients, and abscess-treated patients ($p = <0.05$), due to the reuse of contaminated syringes and needles, unhygienic condition of hospital and malpractices of clinical staff. An insignificant association of HCV infection was observed among HCV-infected family members experienced with surgery, stitches, dental

procedure, blood transfusion, dialysis, IV cannula, endoscopy, 5+Delivery and traumatic delivery (p = > 0.05). In this study sexual intercourse was not significantly important in the transmission of HCV to partners. Previous studies reported sharing of razors and toothbrushes are the main risk factor for the transmission of HCV among families as it is contaminated with a minute amount of blood and infected saliva or maybe from the carrier represents up to 20% of HCV positivity in the families [28].

Prevalence of HCV among family members was observed in the low family income group (54.7 %, 5000-20000) as compared to (25.7%, 21000-50000) and (25.0%, 51000-90000). Mostly HCV-infected families enrolled in this had (54.6%, 11-16) number of people living together in (75.0%, 5-8) rooms home. Unawareness and poverty are the factors of the spread of HCV among HCV-infected families. A previous study reported eradication rate ETR of Sofosbuvir + Ribavirin (99.4%), Sofosbuvir + PegINF-α+Ribavirin (93.3%), Sofosbuvir+ Daclatasvir (100%), Sofosbuvir+ Daclatasvir+ Ribavirin (86.6%) and PegINF-α+Ribavirin (70.0%) was achieved (Attiqullah, 2017). In the present study highly effective eradication (100%) ETR was achieved with each of Sofosbuvir +Ribavirin, Sofosbuvir+ Daclatasvir +Ribavirin, Sofosbuvir + Daclatasvir, and PegINF-α+Ribavirin therapy respectively [3].

In a previous study, SVR rates of 78.9%, 58.3%, and 100% were achieved when the patient treated with PegINF-α + Ribavirin, Sofosbuvir + Ribavirin, and Sofosbuvir +PegINF-α+Ribavirin respectively**,** and Successful SVR rate (95.4%), (100%) and (100%) was achieved with Sofosbuvir + Ribavirin, Sofosbuvir + Daclatasvir + Ribavirin, and Sofosbuvir +Daclatasvir respectively.

A previous study reported side effects observed when the patient treated with PegINF-α + Ribavirin therapy were fever (5.0%), headache (80.0%), fatigue (75.0%), insomnia (25.0%), and nausea (30.0%). In this study, similar adverse effects were detected such as fatigue (40.3%), headache (38.6%), and insomnia (15.8%) except fever (98.2%). In a previous study Patient treated with Sofosbuvir + Ribavirin had side effects of fatigue (75.0%), fever (4.8%), headache (75.7%), insomnia (27.0%), and weight loss (9.6%) **.**In this study side effects of Sofosbuvir + Ribavirin treatment were observed (22.8%), headache (29.8%), insomnia (12.3%), and weight loss (10.5%) [32].

5. CONCLUSIONS

Unawareness about HCV infection and transmission of HCV through sharing personal items, unsterile razors (shavers), toothbrushes, towels, and piercing noses and ears of many persons through contaminated needles or instruments at one time are risk factors for transmission of HCV in infected families. Awareness should be provided to the public for a healthy life. Higher authorities pay attention to overcome the threat of HCV infection through the provision of awareness and easily availability of anti-HCV treatment. Electronic and print media play their role in awareness about HCV infection and transmission. Academia and social media can play role in awareness about HCV infection and its mode of transmission among HCV-infected families.

6. ACKNOWLEDGMENTS

We confess the kind involvmemt of ethical committee and university for piloting this research graft.

7. ETHICAL APPROVAL

This study was conducted in PIMS and was approved by the ethics review board, PIMS, Islamabad, and the advanced study and research board of Abbottabad University of Science and Technology (AUST) KPK, Havelian. Patients were addressed about this study and consent was signed from them according to their well.

8. CONFLICT OF INTEREST

The authors declare no conflict of interest.

9. REFERENCES

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