

<https://doi.org/10.48047/AFJBS.6.11.2024.1990-1996>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Prevalence of Hepatitis C Virus HCV and Its Correlation with Liver Diseases among General Population in Swabi, Khyber Pakhtunkhwa

Syed Tehzeeb Shah^{1*}, Dr Jamil Ahmed Siddiqui², Dr Ikram Ullah³, Dr Muhammad Asad⁴,
Dr Mariam Naeem Kakar⁵, Dr Fazal Ur Rehman⁶, Dr Jamshed Khan⁷

¹*Department of Biotechnology, Abasyn University, Peshawar, Pakistan

²Associate Professor, Department of Biochemistry, Loralai Medical College (LMC), Loralai, Balochistan, Pakistan

³Dental Surgeon, Assistant Professor, Loralai Medical College (LMC), Loralai, Balochistan, Pakistan

⁴M. Phil, Department Biochemistry, KMU Peshawar, Pakistan

⁵LMO, BMC Bolan Medical College, Quetta, Pakistan

⁶Assistant Professor, Department of Pathology, Loralai Medical College (LMC), Loralai, Pakistan

⁷Associate Professor, Department of Anatomy, Loralai Medical College (LMC), Loralai, Pakistan

***Corresponding Author:** Syed Tehzeeb Shah,

Department of Biotechnology, Abasyn University, Peshawar, Pakistan

Email: syedtehzeebshah141@gmail.com

Article History

Volume 6, Issue 11, 2024

Received: 29 Sep 2024

Accepted: 15 Nov 2024

Published: 30 Nov 2024

doi:10.48047/AFJBS.6.11.2024.1990-1996

Abstract

Liver-related issues are a major health problem associated with hepatitis C worldwide. Hepatitis C is an infection caused by a positive sense RNA virus that is a member of the Flaviviridae family. Adults and children are equally susceptible to contracting the hepatitis C virus. Investigating the prevalence of Hepatitis C virus (HCV) infection and its relationship to liver disorders in the Swabi KPK, Pakistani population was the purpose of the present investigation. According to the study's findings, 25% of the analyzed blood samples had HCV in Swabi overall, with males reporting a higher frequency than females. It could be caused by a variety of circumstances such as environmental exposure, interaction, drug addiction, and so on. The findings also contribute to a better understanding of the relationship between HCV and chronic liver diseases such as cirrhosis and liver carcinomas, with a 12.8% prevalence, highlighting the importance of HCV screening and prevention strategies in high-risk populations, as well as the need for early detection and treatment of severe liver disorders. As Hepatitis C becomes a serious and noticeable health issue in the Swabi region of KPK, it will have an impact on Pakistan's health-care system. It is critical to detect the impact of HCV on liver disease progression and implement novel therapeutic measures.

Keywords: Hepatitis C Virus; Prevalence; Chronic; Liver diseases; Flaviviridae; PCR.

INTRODUCTION

The Hepatitis C Virus is the infectious agent that causes human hepatitis C, a liver-damaging illness (HCV). Hepatocellular carcinomas are mostly caused by HCV (HCC). Worldwide, HCC is a common tumor and a leading cause of cancer-related fatalities.¹ Inflammation caused by these disorders damages hepatocytes, leading to reproduction and fibrosis. This can progress to HCC and liver cirrhosis.² Cirrhosis can sometimes lead to liver failure and other complications, such as liver cancer.³ Moreover, iron overload, insulin resistance, and steatosis are among the several metabolic dysregulations that chronic HCV carriers frequently exhibit.^{34,35,36} Hepatitis C virus was discovered in 1988.⁴ HCV is the only identified member of the genus Hepacivirus within the Flaviviridae family. Hepatitis C is caused by a plus-sense, single-stranded RNA virus with six major genotypes.⁵ In Pakistan, the most prevalent HCV genotypes are 3a and 3b, 1a, 2a, and untypable genotypes came next (6, 7, 18, and 37). Sindh, Punjab, and Khyber Pakhtunkhwa (KPK) is the most prevalent genotypes are 3a and 3b while most people of Baluchistan are infected with HCV genotype 1a and 2a.³² Chronic liver disease, which is the sixth greatest cause of early mortality in Pakistan, generates a variety of life-threatening consequences, according to the "Burden of Disease Study". It also ranks eleventh among the causes of disability.⁶

HCV, or the hepatitis C virus, is a severe public health issue. and one of the leading causes of liver disease and morbidity, posing a challenge to many countries' health-care systems. Every year, 1.5 (1.3 to 1.8) A million individuals have contracted HCV recently, and 58 (46 to 76) million people have chronic HCV infection, whose frequency is found throughout the world is 0.8% (0.6 to 1.0%).⁷ HCV infection has a significant death rate, with over 350,000 people dying worldwide each year as a result of the virus.⁸ Based on data from the WHO, the illness of HCV infection has a major effect on public health; approximately 170 million people are afflicted with HCV worldwide.⁹

Prior to the implementation of viral deactivation of blood products and blood screening for anti-HCV in 1991, HCV infection was identified in patients who received blood products or organ transplantation.¹⁰ In addition, the pathways of transmission for approximately 30 to 40% of HCV infections were unknown.¹¹ Recent study has revealed that contaminated blood supplies, inappropriate intercourse, infected shaving equipment, tattoos, and body fluids are the primary causes of HCV infection.¹²

Historically, in vein drug misuse including sharing of syringes, blood transplantation, and the use of contaminated medical or non-medical machines are among the primary pathways that lead to HCV infection.¹³ HCV causes acute hepatitis after 40-120 days of incubation after the first infection. Around 20-50% to 80% of acute hepatitis C patients grow chronic Hepatitis infection. Should a persistent HCV infection go untreated with antiviral medication, the infection persists throughout the individual's life, and the person dies from liver damage.¹⁴

According to WHO estimates, the 13th most common HCV infection is transmitted primarily through parental pathways, such as previous blood transfusions, injectable drug misuse involving the sharing of syringes, and the use of unsterilized medical or non-medical devices in 2030, liver cancer will be the leading cause of death.^{15,16} As a result, there is an increased need for HCV detection and prevention because there are no vaccines available, despite the fact that antivirals have a 95% cure rate.¹⁷ Pakistan, a developing country, is experiencing the most serious HCV outbreaks.¹⁸ This deserves special care. Seroprevalence investigations of anti-HCV antibodies in Pakistan's general population found levels ranging from 5.31% to 7.5%.¹⁹ HCV prevalence has been observed to range between 4.1 and 36% in various parts of Pakistan's Khyber Pakhtunkhwa.²⁰

A previous study conducted in the district of Buner found that 13.7% of the population is infected with HCV in that part of Pakistan.²¹ (Amjad Ali et al., 2010) discovered that 3.5% of the persons in District Mansehra are actively infected with HCV, while 7% of the overall population possesses antibodies against HCV in their blood.²² It is worthwhile to investigate the incidence of HCV in Swabi District, KP, Pakistan. The current study intended to evaluate the incidence and risk variables for HCV., as well as its relationships with chronic liver disease and transmission channels among hepatitis C patients in Swabi, KPK, Pakistan.

MATERIALS AND METHODS

Study design.

The goal of the current study was to ascertain the actual prevalence of HCV infection in Swabi region of KPK Pakistan throughout an 11-month period, from March 2023 to February 2024. Blood samples were collected from 236 participants living in nearby regions. Most of the participants were poor and less educated in the present survey.

Study Site

The present study was conducted in Swabi. 73rd largest city of Pakistan and 8th largest in province Khyber Pakhtunkhwa with total area of 1543 km². As per 2023 the total population of Swabi was 1,894,600. Coordinates of the region are 34.1241° N, 72.4613° E.

Inclusion and exclusion criteria

In the present study all the participant both males and females with the age of 10 years and above up to 70 years were eligible to participate. All the participants were from Swabi, and regions close to Swabi.

Sample collection

Each participant provided a venous blood sample of approximately 10-20 mL and stored in deep freezer until use. All personal information such as medical history was collected through questioner form includes variables that increase the likelihood of contracting HCV infection include age, gender, location, and risk factors include blood transfusions, dialysis, IV drug misuse, tattoos, domestic contacts, and jobs in healthcare that involve blood contact. HCV RNA was examined in all of the samples. using polymerase chain reaction (PCR) and then all the HCV positive Additionally, routine biochemical tests for liver function, including bilirubin, alkaline phosphatase, aspartate aminotransferase, and alanine aminotransferase (ALT), were performed on the samples. and for liver function Prothrombin Time (PT) was checked.

RNA Isolation and Real Time PCR.

Manual RNA extraction was carried out from 200ul of serum from all the samples by using RUN MEI RNA extraction kit according to the procedure motioned in the kit protocol. The complementary DNA (cDNA) was synthesized at 50°C for 30 minutes and was then subjected to real time PCR (polymerase chain reaction) to confirm the presence of HCV in the samples. PCR protocol for the reaction is shown in Table1.

Table 1: Rt-PCR protocol for HCV RNA test.

Steps		Temperature	Time	Number of Cycles
1	Reverse transcription	50° C	30 minutes	1
2	Pre-denaturation	95° C	5 minutes	1
	Denaturation	95° C	10s	45
	Annealing, extension, and fluorescence detection	60° C	40s	

RESULTS AND DISCUSSION

In the current study 236 samples were collected from participants. Among these 59 (25%) were HCV RNA positive and 177 (75%) were normal. In gender wise distribution HCV ratio was reported higher in males n=43/236 (18.2%) than females which was n= 16/236 (6.7%). Figure 1.

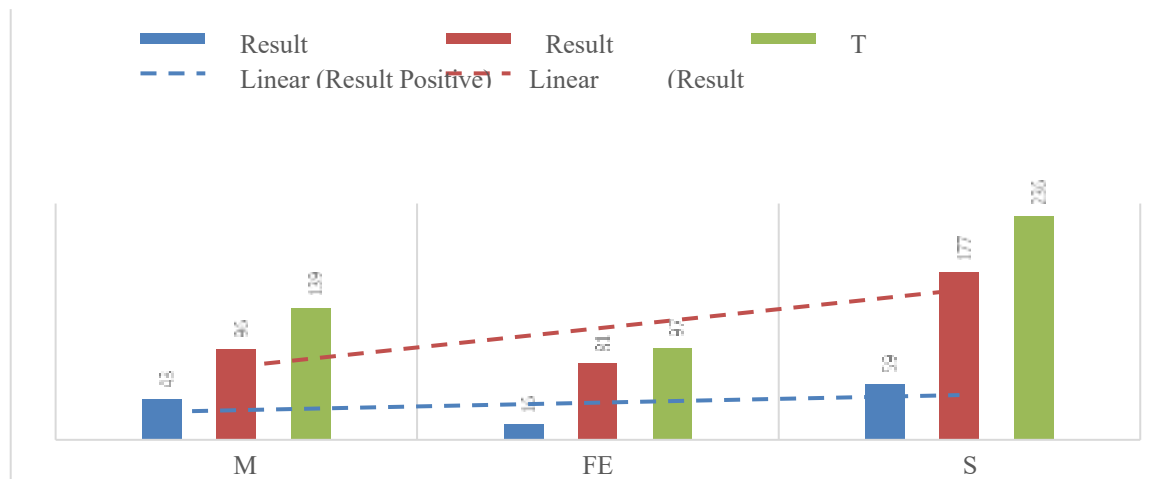


Figure 1: Analysis of Data Gender Wisely out of 236 Cases.

In age-wise distribution we carefully divided the volunteers into different age groups. The ratio of HCV was reported higher in the age group of 20-30 $n=15/236$ (6.3%) followed by 60-70 (5%) and 50-60 (4.6%) respectively. In the current study we observed that the males in the age group of 20-30 were in high risk of HCV infection (50%). Figure 2

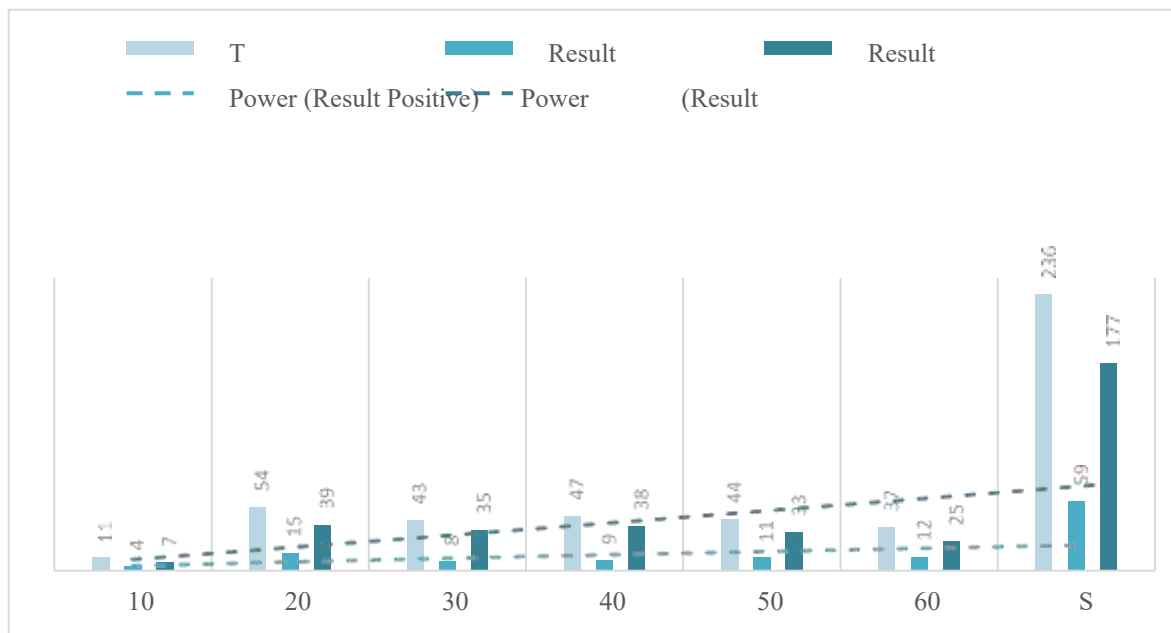


Figure 2: Age wise Analysis of total 236 cases.

In the current study a total of 236 participants were tested for HCV RNA by Real-time PCR. All personal information was collected such as their medical history, their health conditions geographical regions and risk factors for HCV was collected through questionnaire. This was done very carefully, and special care was taken to ensure that the information given in the form is correct. Out of these 236, total of 59 samples tested positive for HCV RNA. Routine biochemical liver tests were performed for the HCV positive patients such as bilirubin, alkaline phosphatase, aspartate aminotransferase (AST), and alanine aminotransferase (ALT). Out of which 9 (12.8%) the result shows significant increase in all the tested enzymes and as well as in the bilirubin level in 9(12.8%) out of 59 HCV positive. The prothrombin time was also checked to see if the liver is functioning well or not, but the results show a serious increase in their PT timing it took 15 to 17 seconds for their blood to clot. Which indicates that these participants were dealing with liver related cirrhosis. In the present study we concluded that HCV lies in one of the main reasons for liver diseases in Swabi region of Pakistan. Figure 3.

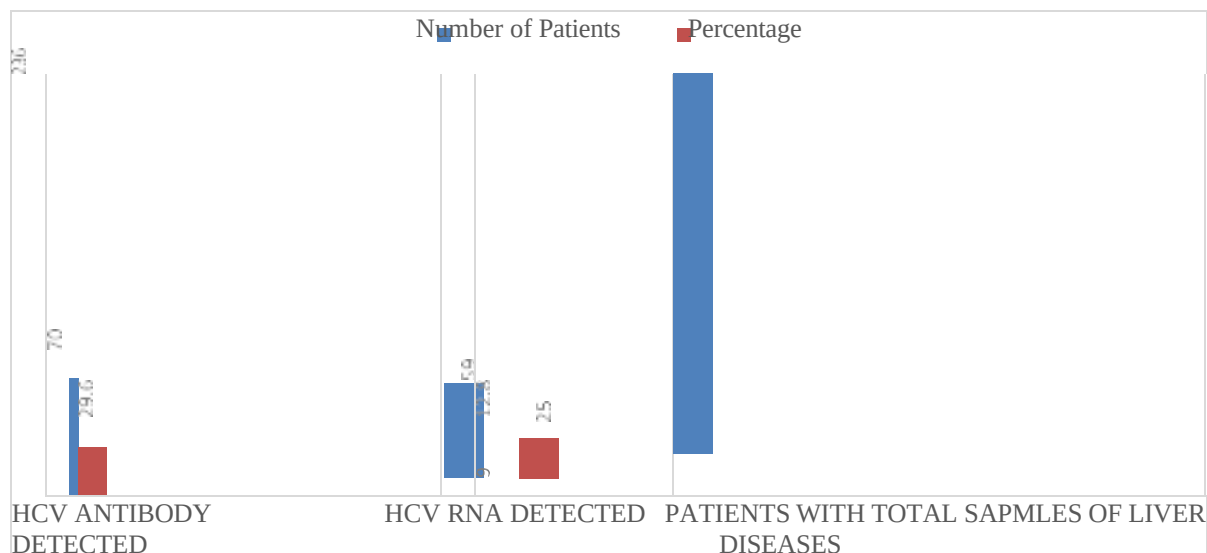


Figure 3: Correlation with liver diseases.

DISCUSSION

HCV infection is one of the major issues affecting the majority of the world's population. As per WHO data, the morbidity of Hepatitis C virus infection has a significant influence on people health, with around 170 million people infected with the virus worldwide.⁹ The Middle East and North Africa (MENA) area is the most impacted by HCV infection, with roughly 15 million individuals chronically infected.³³ Many well-off nations have succeeded in overcoming this difficulty by focusing on vaccination and reducing the risk factors for spread in people. However, numerous developing nations, including Pakistan, remain unable of properly controlling this deadly disease.²³ Globally, viral hepatitis is the primary cause of chronic liver disease. The hepatitis C virus is a tiny, encapsulated RNA virus with a plus-sense SS genome of around 9600 nucleotides. The viral nucleocapsid consists of the core protein and the viral genomic RNA., which are surrounded by a two-glycoprotein bilayer. The HCV genome consists of a single open reading frame bordered at each end by an untranslated region.²⁴ According to estimates, 6% of Pakistan's population has HCV infection.²⁵ Remis states that the incidence of hepatitis is higher during the young and young adult years.²⁶ A previous study carried out in district Buner found that 13.7% of the general population have been infected with the HCV. in that region of Pakistan.²¹ The recent study conducted by (Amjad Ali et al., 2010) shows that in district Mansehra the ratio of active HCV was 3.5% while in general 7% of individuals possesses anti-HCV antibodies in their bloodstream. 7% of individuals possesses anti-HCV antibodies in their bloodstream.²² The study conducted in Punjab by (Muhammad IDRESS et al., 2008) show that Males had considerably higher rates of anti-HCV antibodies (15.09%) compared to females (12.3%). The current study conducted in the Swabi region of Pakistan the higher predominance of Hepatitis C was in the age of 20-30 n=15/236 (6.3%). In the present study the HCV RNA ratio was same for the participants in age of below and above 40. Figure 2

The prevalence of HCV varies greatly among different groups within the same community, which are spread across several regions of Pakistan.²⁵ In a study conducted in Islamabad, Pakistan, the HCV prevalence rate was calculated at 5.31% using solely hospital-based data.^{26,27} In district Bannu, the prevalence was calculated to be at the high rate of 53.3% in a single hospital²⁸ In the current study, the prevalence of HCV in Swabi falls somewhat in the middle of these two regions, at 36.8%. Figure 1

Lack of information and unsanitary situations, such as hazardous blood transfusions, barber shop shaving, reuse of contaminated needles, hemodialysis, dental operations, contaminated surgical tools, and blood products, could all be contributing factors to HCV infection.²⁹ However, the most common causes of HCV infection in that region are unsafe blood transfusions, a lack of awareness of HCV in that region, injection drug use, which is one of the leading risk factors for HCV infection because drug addiction is on the rise in that region, and unsafe dental practices, which are also major concerns for HCV transmission. Some risk variables connected with HCV propagation., but many research have showed that excessive injections, infected needles, unsanitary methods in dental surgeries, and unsafe blood transfusions may be the primary source of HCV transmission. According to certain studies, Sexual expose and shaving in barbershops may also contribute to HCV transmission in Pakistan.³⁰

The primary complication of chronic HCV infection is progressive hepatic fibrosis, which causes cirrhosis and accounts for nearly all HCV-related morbidity and mortality.³¹ In the present study we conclude that from the total 59 HCV RNA positive participants (12.8%) of them were also reported with liver diseases n=9/59. The chronic as well as acute outcomes of hepatitis C virus infection are major health concerns in Pakistan. Many chronically infected people are at risk for long-term complications include chronic liver inflammation and primary hepatocellular tumors. The clinical signs of hepatitis C virus infection vary based on the patient's age, infection, immunological status, and stage of disease recognition.

Furthermore, large-scale research is required to clarify the prevalence of HCV infection, and because HCV infection is the most common factor for liver disease, more studies are needed to find a link between liver disease and HCV infection, as well as other risk factors. HCV awareness initiatives should be carried out. To overcome the effects of HCV infection, it is vital to increase access to therapy, educate patients, and provide assistance to improve therapeutic adherence. This necessitates a higher emphasis on early detection, as well as careful, tailored diagnostic assessment and treatment decision-making.

Large-scale study is also needed to understand the prevalence of HCV infection. Since HCV infection is the most common cause of liver disease, more research is needed to determine the relationship between liver disease and HCV infection as well as other risk factors. It is necessary to run HCV awareness efforts. Expanding treatment access, educating the public, and offering support to maximize adherence to medication are all essential to overcoming the consequences of HCV infection. To achieve this, early identification must be prioritized more, and therapeutic decision-making and thorough, tailored diagnostic evaluation are also necessary.

CONCLUSIONS

The overall incidence of active HCV in different ages and sexuality categories demonstrates that it is the same among participants under and over 40 years old. Furthermore, males were more likely to become infected than females. The lowest rate of HCV in females could be attributable to little encounters with HCV associated risks due to the area's male-dominated lifestyle, and the production of estrogen in females is thought to play a role in the natural elimination of HCV infection. The findings of this study call for additional research into the genetic epidemiology of HCV infection in Pakistan, as well as the creation and execution of a successful management and preventive campaign for the entire population.

Recommendations

This study has provided data on prevalence of HCV in the general population of Swabi. It is recommended that healthcare providers should implement routine HCV screening for patients with liver diseases or at high risk of HCV infection. Furthermore, comprehensive, and community-based research is necessary to precisely observe the prevalence of HCV in our population. The study is limited to a single region, so these data suggest requiring further studies to reach final conclusions. Community based education and outreach programs should target high risk population to promote HCV awareness and prevention. By implementing these recommendations, we can work towards reducing burden of HCV and Liver diseases.

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