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Systematic Review

Prevalence of hepatitis C virus infection in India: a systematic review

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ABSTRACT

HIV/AIDS, malaria, and tuberculosis are the three major infectious diseases that are equivalent to viral hepatitis. The existing research distinguishes between states within the Indian region to study the spread of hepatitis C. The factors that lead to the spread of the hepatitis C virus (HCV) and community-based complex interventions in public health are strongly correlated in this review. The main purpose of this study was to summarize the prevalence of the HCV in India from original research articles published from January 2004 to March 2024. We conducted a systematic search on Web of Science, Science Direct, PubMed, Scopus, Google Scholar, Medline, and other open-access journals. We evaluated all relevant papers that investigated the prevalence of the HCV. Finally, 20 studies on viral hepatitis published from January 2004 to March 2024 have been selected. Twenty full text publications were obtained and evaluated consisting of 117,661 research participants. Out of 117,661 participants, 3,811 were positive for HCV. Prevalence of hepatitis C was found 3.23%. Most of the male participants were affected by HCV as compared to Females. Blood transfusion, history of intravenous drugs, hospital admission, heterosexual contact, and history of surgeries, were the most common ways for people to contract HCV. To reduce the incidence of viral hepatitis and eradicate the illness, effective public health initiatives are desperately needed. The review's recommendations include creating a uniform public health framework for primary care professionals serving both urban and rural populations, preventing the spread of infectious blood, and appropriately screening high-risk individuals.

Keywords: Hepatitis C virus, Prevalence of hepatitis C in India, Summary of previous studies transmission in different Indian states

INTRODUCTION

Hepatitis C was first time detected in 1989 using molecular biology techniques after extensive testing of serum from experimentally infected animals.[1] It was later characterized to be an RNA virus that belongs to the *Flaviviridae* family and genus *Hepacivirus*. The HCV genome is comprised of a single-stranded positive-sense RNA with a single opening reading frame of 9.6 kb length encoding for a single polyprotein precursor of approximately 3000 residues flanked by an untranslated region. An important feature of the HCV genome is its high degree of genetic variability.[2,3]

HCV infection is one of the most common problems worlds with community health. About 3% of the world's population is infected with the virus, putting 170 million people at risk of liver cirrhosis and hepatocellular cancer. According to estimates from the WHO, there are 10-24 million people in India who are actively infected with HCV, and the country's seroprevalence of HCV infection is between 0.09 to 2.02% among the healthy population.[4] In developing nations in Asia and Africa, HCV is the primary cause of chronic necro-inflammatory and neoplastic liver disease; this infection is becoming more and more prevalent and needs to be taken seriously.[5]

Two-thirds of developing nations have not followed the protocol of screening given blood and blood products for the presence of HCV, according to the WHO, Red Cross, and Red Crescent societies.[6]

Medical injections were widely seen as a standard service given during doctor visits until they were spread throughout the community by individuals and healthcare professionals, including unlicensed practitioners, pharmacists, and even some doctors. Since voluntary and paid blood donors have supplied blood to South Asian nations, including India, the incidence of active HCV infection in some of these transfusion sites was as high as 81%.[7,8] The prevalence of HCV infection varies greatly between nations, most likely because of social customs and cultural elements that affect HCV transmission. Transfusion-related infections are a serious issue related to blood transfusion procedures.[9] Numerous studies have found that the main risk factors for HCV infection are blood transfusions, intravenous drug misuse, having multiple sexual partners, and homosexuality.[10] In rural India, there is a correlation between the usage of glass syringes and HIV transmission. Additionally, most primary healthcare professionals in these regions are untrained persons. In both industrialized and developing nations, injection drug use has been linked to most new HCV infections in recent years. In Chennai, more than two-thirds of the public reported getting at least one injection in the previous six months, or four injections annually. Several non-specific symptoms, such as colds, exhaustion, light-headedness, myofascial pain, diarrhea, stomach ache, and fever.[11] According to a five-year study conducted in Delhi by Garg et al 88% of women reported having 2% of their hepatitis C symptoms be related to gynaecological morbidity; most cases are from vertical transmission or early childhood infection.[12] It has been noted that viral hepatitis during pregnancy carries a significant risk of difficulties for the mother and is the primary cause of maternal death in the community.[13] In this research, we also examined the prevalence and causes of transmission in community-based public health HCV infections. Health education to the public regarding these modes of the virus may show to be beneficial preventive interventions in these developing countries.[14]

Objectives

The objectives were to determine the overall prevalence of the HCV in India from various original research articles, published from January 2004 to December 2024; and to review the determinant factors of the HCV in the Indian region with the included article.

METHODS

Study design and setting

Data basis were serched for original research articles, published across the india. (Estern, Western, Northern, Southern, and Central).

Study period

Studies published from January 2004 to March 2024 were considered for original research articles.

Study participants

In the present study, we included all original studies, such as general population, community based, hospitals and blood banks studies, children, pregnant women, and voluntary blood donors, general hospital patients (OPD/IPD).

Study selection/information source

Original research article were searched in key databases such as Research Gate, Web of Science, Science Direct, PubMed, Scopus, Google Scholar, Medline, and other open access journals.

Data collection

Every relevant paper that determined the prevalence of HCV and was published in India was carefully examined. The scientific database yielded the titles and abstracts of relevant study papers, and numerous independent researchers conducted onscreen searches. Studies that were theoretically significant were chosen. The following lists the inclusion and exclusion criteria. Whenever possible, the entire text paper was gathered, including from the open access journal.

Inclusion criteria of the studies

Inclusion criteria included studies that studied the magnitude of HCV infection and were published in the English language from the Indian states or region. Studies that were published from January 2004 to March 2024 were considered.

In the study, only original research articles were included. The current review did not have any restrictions on age and type of population. After the screening process, we reviewed the full papers and extracted the data for meta analysis.

Exclusion criteria of the studies

Other language articles, other country articles, conference papers, case reports, COHORT study, abstracts, review papers and preprints, were excluded. The studies that did not meet the inclusion criteria were excluded from this study.

The electronic databases utilized for this search must pull content from all publications published before March 2024 that were related to tropical medicine, infectious public health, family physicians, hepatology, infectious diseases, STIs, and infectious diseases. This range of research topics necessitated the use of four

interdisciplinary databases for the search strategy: the National Centre for Biotechnology Information's PubMed database and Google Scholar. The articles included in this evaluation were found and documented by current database searches as of March 2024.

RESULTS

This systematic review followed to the PRISMA standards, and the corresponding flowchart is shown in Table 1. A total of 1153 Indian articles with an English-language publication date range of January 2000 to March 2024 were found during the initial search on PubMed, Scopus, Google Scholar, Embase, Scientific scholar, Research Gate. Out of the total articles, 511 Records were removed before screening which included 302 Duplicate records, and 209 articles were removed for other reasons. Now from 614 remained, 312 were excluded, leaving 332 reports sought for retrieval. However, 132 reports could not be retrieved, leaving behind 200 article papers. Further exclusion criteria were applied, resulting in the removal of 112 reviews, 23 reports with incorrect outcomes, 31 reports lacking full text availability, and 14 reports where the method of testing was not specified. And ultimately 20 studies were included in the review.

Out of 20 research articles, 117,661 participants included. Out of 117,661 participant 3,811 were positive for HCV. Overall different-different geographical area of India, Prevalence of hepatitis C virus was recorded 3.23% (Table 1).

Out of 20 research articles included, gender wise distribution of HCV was reported in 8 articles (Table 3). Which included 60,053 patients, out of which 710 (1.18%) were positive for HCV. The analysis of data from the above-mentioned articles showed highly infection of HCV in males (0.88%) as compared to females (0.29).

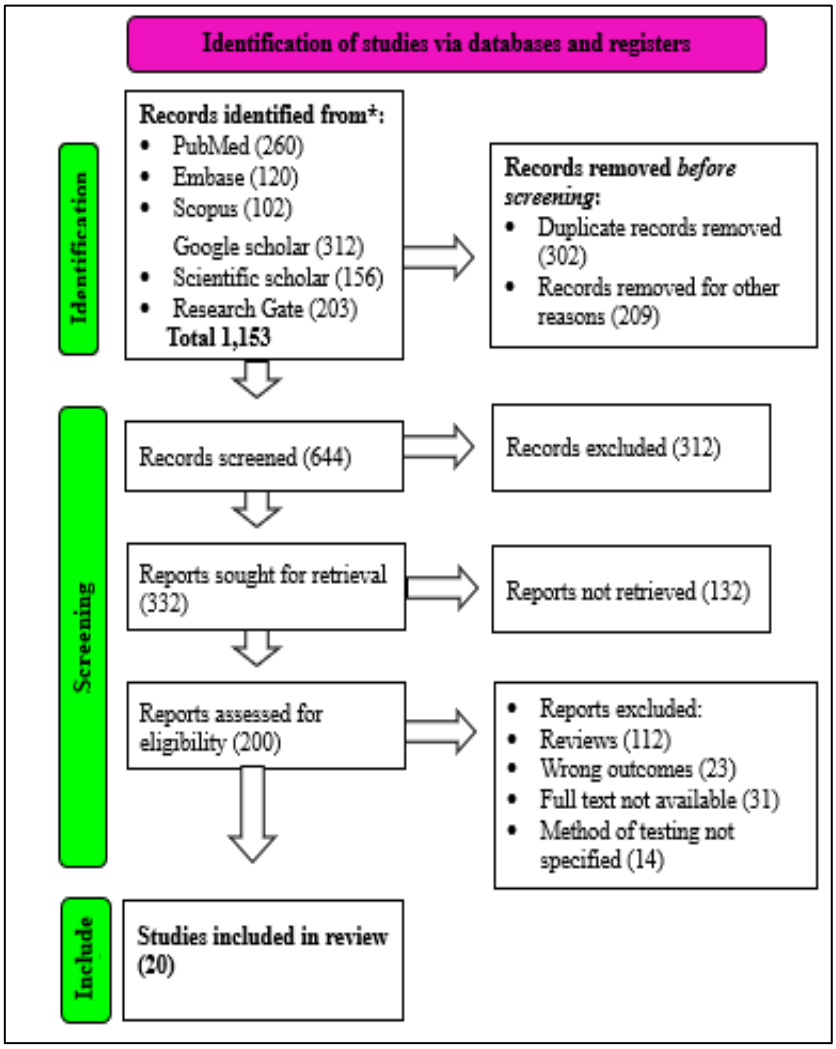

Figure 1: Flow diagram of data collection for systematic reviews followed PRISMA guideline.

Table 1: Prevalence of HCV in India.

Studies	Year	Hospital/community	Samples recruited	State	Total HCV positive	Prevalence of HCV (%)
Santosh et al[15]	2023	Hospital	472	Maharashtra	59	12.5
Roopa et al[16]	2022	Hospital	20,934	Telangana	53	0.25
Clipman et al[17]	2021	Community	4,994	5 Cities of India	63	1.3
Malhotra et al[18]	2020	Hospital	2,291	Haryana	119	5.18
Kumar et al[19]	2019	Hospital	16,495	Rajasthan	34	0.20
Kar et al[20]	2019	Hospital	1765	Odisha	127	7.19
Kumar et al[21]	2019	Hospital	9,340	Uttar Pradesh	217	2.3
Ahmad et al[22]	2018	Hospital	100	J&K	2	2.0
Sood et al[23]	2018	Community	5,543	Punjab	200	3.6
Ramya et al[24]	2018	Hospital	372	Tamil Nadu	19	5.10
Singh et al[25]	2018	Hospital	829	Punjab	35	4.22
Mukherjee et al[26]	2017	Hospital	207	Wast Bengal	51	24.6
Patel et al[27]	2017	Hospital	7,089	Gujrat	20	0.28
Malhotra et a[l28]	2016	Hospital	262	Punjab	88	33.5
Kundu et al[29]	2015	Hospital	50	Haryana	9	18.0
Verma et al[30]	2014	Community	7,533	Haryana	1,912	25.3
Rajani et al[31]	2014	Hospital	600	Delhi	33	5.5
Chaudhary et al[32]	2014	Hospital	28,395	Uttar Pradesh	550	1.93
Mittal et al[33]	2013	Hospital	495	Uttarakhand	9	1.8
Kumar et al[34]	2007	Hospital	8,130	Odisha	84	1.03
Total			117,661		3,811	3.23

Table 2: Numbers of population group-wise.

S. no.	Groups of population	No. of studies	Number of populations	Percentage (%)	Author's contribution
1	General hospital	4	29,095	24.72	Santosh et al, Roopa et al, Patel et al, and Rajni et al[15,16,27,31]
2	Blood transfusion	4	45,359	38.55	Kumar et al, Mukherjee et al, Malhotra et al, and Chaudhary et al[19, 26,28,32]
3	Risk behaviour groups	8	27,471	23.34	Clipman et al, Kar et al, Kumar et al, Ahmad et al, Singh et al, Kundu et al, Mittal et al, and Kumar et al[17,20-22,25,29,33,34]
4	Community	4	15,736	13.37	Malhotra et al, Sood et al, Ramya et al, and Verma et al[23,24,28,30]

Table 3: Gender wise distribution of HCV infection in India.

Studies	Year	Hospital/ community	Samples recruited	States	Total HCV positive	Male	Female
						N (%)	N (%)
Roopa et al[16]	2022	Hospital	20934	Telangana	53	30 (0.14)	23 (0.10)
Kumar et al[21]	2019	Hospital	9340	Uttar Pradesh	217	122 (1.3)	95 (1.1))
Ramya et al[24]	2018	Hospital	372	Tamil Nadu	19	5 (1.34)	14 (3.76)
Ahmad et al[22]	2018	Hospital	100	J&K	02	1 (1.0)	1 (1.0)
Malhotra et al[28]	2016	Hospital	262	Punjab	88	60 (22.9)	28 (10.6)
Kundu et al[29]	2015	Hospital	50	Haryana	09	7 (14.0)	2 (4.0)
Rajani et al[31]	2014	Hospital	600	Delhi	33	21 (3.5)	12 (2.0)
Chaudhary et al[32]	2014	Hospital	28395	Uttar Pradesh	289	287 (1.01)	2 (0.15)
Total			60053		710 (1.18)	533 (0.88)	177 (0.29)

Table 4: Summary of studies transmission in different states.

Studies	Study site (year)	Study population	Age group	Conclusion
Santosh et al[15]	Maharashtra (2023)	472	19 to >70	There was high prevalence of HCV among the suspected, genotype 3 being the most common.
Roopa et al[16]	Telangana (2022)	20934	0-100	Seroprevalence for anti- HCV antibodies showed small increase in the pandemic era when compared to the pre-pandemic era. Male predominance was observed for hepatitis C positivity in this study.
Clipman et al[17]	5 cities of India (2021)	4994	All	They observed a low HCV prevalence in this large sample study of MSM despite a high prevalence of known risk factors., reflecting either the need for a threshold of HCV for sexual transmission
Malhotra et al[18]	Haryana (2020)	2291	NA	Haryana, in northern India had become a prominent hub of Hepatitis C.
Kumar et al[21]	Uttar Pradesh (2019)	9340	0 to ≥60	HCV infection preponderantly affects young adults. Infection is roughly equally distributed in each gender.
Kumar et al[19]	Rajasthan (2019)	16495	18-60	Hepatitis C seroprevalence was more in replacement donor as compared to voluntary donors.
Sood et al[23]	Punjab (2018)	5543	5 to >60	HCV infection were more common among those who lacked education, received a blood transfusion, and had their last injection given by a nurse or other medical practitioner as compared to a clinician.
Ramya et al[24]	Tamil Nadu (2018)	372	20-80	The burden of hepatitis C infection among the Irula tribed has reached really at a significant. There was strongly association between HCV infection, observed related to gender and age group.
Singh et al[25]	Punjab (2018)	829	NA	This study shows, 58% rate of perinatal transmission of Hepatitis C virus. This is not an uncommon transmission route in Malwa region of Punjab.
Ahmad et al[22]	J&K (2018)	100	0-16	This study highlights the daunting prevalence of HCV infection in our steps and implicates necessity for raising the awareness and screening of HCV – high risk individuals to decrease mortality and morbidity associated with HCV infection.
Mukherjee et al[26]	Wast Bengal (2017)	207	NA	In the study mean age was significantly ($p<0.05$) higher in patient with HCV positive cases compared to negative results. The mean number of transfused units of packed red blood cell were significantly ($p<0.01$) higher in patients positive with HCV cases as compared to negatives.
Patel et al[27]	Gujrat (2017)	7089	0 to >50	HCV is responsible for emerging infection in India. To prevent transmission of infection, educational program, and screening to target group as well as illiterate people in collaboration with health care provider require.
Malhotra et al[28]	Punjab (2016)	262	0 to <80	Prevalence of HCV infection in haemodialysis patients find 33.5%. coinfection prevalence of HCV & HBV were 0.8%.
Kundu et al[29]	Haryana (2015)	50	0-80	Seroprevalence of HCV among chronic liver disease patients were 18%.

Continued.

Studies	Study site (year)	Study population	Age group	Conclusion
Verma et al[30]	Haryana	7533	0 to >70	Nil
Rajani et al[31]	Delhi (2014)	600	0 to <40	HCV infection is predominantly a disease of young adults, which is due to cumulative risk of exposure with age.
Chaudhary et al[32]	Uttar Pradesh (2014)	28395	Random	They estimated overall prevalence of Hepatitis C virus 1.02%. Blood is still one of the main sources of transmission of hepatitis C virus in blood banks.
Mittal et al[33]	Uttarakhand (2013)	495	21-65	The results indicate an intermediate level of endemicity of HBV and HCV infection during this region of Uttarakhand. Some freelance risk factors like intromission, interfamilial transmission, and visits to unregistered practitioners were known
Kar et al[20]	Odisha (2009)	1765	0 to ≥60	This study reportable a high prevalence of HCV infection within the primitive social group teams compared with the national situation that wants public health attention.
Kumar et al[34]	Delhi (2007)	8130	17 to>35	Prevalence of hepatitis C in pregnant women was 1.03 per cent. None of the known risk factors was found to be significantly associated with the HCV infection.

DISCUSSION

In this literature review, we include the 2 most relevant studies on the topic from different states of India. All studies have been done on the prevalence of hepatitis C and affected different community in different geographical area of India the overview of hepatitis C infection in Maharashtra, Telangana, Haryana, Rajasthan, Odisha, Uttar Pradesh, J&K, Punjab, Tamil Nadu, Wast Bengal, Gujrat, Haryana, Delhi, Uttarakhand included in this review. The prevalence of HCV infection is known to differ according to different geographical areas and among the general population and specific risk groups Although prevalence and incidence studies of HCV have been carried out among different high-risk behaviour groups such as men sex with men (MSM), blood donors, injection drugs user (IDU), etc. Over the past 10-15 years, there has been a growing trend of single needle reuse among multipurpose rural health workers, IDUs, female commercial sex workers (in major cities like Delhi, Mumbai, Chennai), and tattoo artists to measure the prevalence of HCV infection and the potential for HCV and related risk factors to be transmitted among them. Young women and teenage girls in tribal areas of Odisha receive tattoos with non-disposable metallic needles that are used on several people in a group without any antiseptic use practice, according to observations made by Kar et al study.[20] This review found 3.23% HCV infection prevalence in India. The estimated prevalence of HCV infection worldwide 2-10%.[40] Present study corelated with the study.

CONCLUSION

In India, viral hepatitis is a significant healthcare burden. Maintaining hygienic and sanitary circumstances can assist address the issue of chronic hepatitis, liver disease, and hepatocellular illness, which can result in subsequent issues including the incidence of liver disorders linked to HCV infection in India can be reduced with the development of cirrhosis of the liver, a multifaceted strategy of active screening, appropriate treatment, universal immunization against HCV, and educational counselling. Since most HCV infections are asymptomatic, most infected individuals are ignorant of their HCV status. HCV screening is perhaps the best such indicator and ought to be required for blood donors. This is made feasible by a demanding shift in the healthcare industry, wherein hepatologists are no longer the sole providers of HCV infection diagnosis and treatment; internists and non-specialist physicians handle these tasks. A nationwide initiative to control viral hepatitis has been started by the Indian government.

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