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REVIEW ARTICLE

A SILENT KILLER HCV (HEPATITIS C VIRUS) IN INDIA: A REVIEW OF PREVALENCE FROM ALL AVAILABLE DATA

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ABSTRACT

This article reviews the prevalence of and factors associated with HCV infection in Indian population. Total 109 different studies were included in this study. Literature search was done by using keywords 'hepatitis C virus prevalence in India', 'HCV and India', 'hepatitis and India' through electronic databases like Pubmed, Google Scholar. Blood donors constituted the largest data of 15,61,371 individuals. The frequency was highest in injecting drug users i.e. 51.22 % (95% CI: 50.80 – 51.64). The frequency in multitransfused thalassemics and haemophiliac cases was 22.78 % (95% CI: 22.00–23.55) and 14.38 %(95% CI: 13.21 – 15.55) respectively. The frequency in pregnant women was 1.07% (95% CI: 0.983 - 1.017). The frequency due to sexual transmission and haemodialyis was 5.82% (95% CI: 5.646 - 5.994) and 4.73% (95% CI: 4.33 – 5.13) respectively. The serofrequency in communities and hospital –based population was 8.03% (95% CI: 7.75 – 8.30) and 0.45% (95% CI : 0.43 – 0.47) respectively. The frequency in liver disease patients was 19.71 (95% CI: 19.24 – 20.18).This study reviewed HCV seroprevalence among different groups from India which would help to identify high prevalence areas and to introduce the most effective measures to prevent its further transmission and the necessary awareness of this silent epidemic.

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INTRODUCTION

Hepatitis C caused by HCV (hepatitis C virus) is a liver disease an emerging health problem in developing countries. Hepatitis C has been called a viral time bomb by WHO (World Health Organisation). HCV infects 3% of the world population and its prevalence in our country is about 1 – 1.5% (Sievert *et al.,* 2011). HCV has been described as a silent killer as it remains asymptomatic for almost 2-3 decades. Approximately 20-30% infected cases automatically resolve the virus and remaining 75-80% of cases lead to chronic hepatitis. The treatment available for hepatitis C is expensive with severe side-effects. Unlike HBV (hepatitis B virus) there is no vaccine available against HCV. The global epidemiology of HCV is well established. The epidemiology of HCV infection in India is ill-defined and has not been studied systematically. In India, mandatory screening of blood for Hepatitis C was made effective in 2001 under the National Blood Policy.

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This review summarizes an overview of HCV as an emerging infection, its transmission pattern and the need to create public awareness to decrease the future burden of HCV infection in India. The risk factors most frequently cited as accounting for the bulk of HCV transmission worldwide are blood transfusions, injection drug use, and unsafe therapeutic injections. Most of the available Indian data on HCV pertains to blood donors probably because for reasons of convenience and lack of awareness. Because of paucity in available data, little attention is given to hepatitis C infection in India. We therefore set out to review available data on HCV in India to determine its prevalence, transmission modes and disease burden. Collection and comparing this data across our country will create awareness and the need to set priorities for its prevention. This will be the first review from India highlighting HCV prevalence in various population groups.

MATERIALS AND METHODS

Search strategy

Articles were searched for by using keywords : hepatitis C virus prevalence in India, HCV and India, hepatitis and India,

HCV in multitransfused Indian population, HCV in injecting drug users (IDUs), HCV in blood donors, sexual transmission of HCV, HCV due to haemodialysis, HCV in pregnant women, HCV in hospital-based population and HCV in liver diseases in India through electronic databases like Pubmed, Google Scholar. Total **109** different articles/abstracts/reports published were included in this study.

Analysis

We have grouped all data in ten categories based on the type of population studied i.e. 1) blood donors, 2) communities, 3) hospital-based population, 4) liver diseases, 5) thalassemia cases 6) haemophilia cases, 7) pregnant women, 8) sexual transmission, 9) haemodialysis cases, 10) Injection drug users. The weighted arithmetic mean of each category was calculated by using the formula:

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i \cdot x_i}{\sum_{i=1}^{n} w_i}.$$

The weights w_i represent the sizes of the different samples. Standard error of mean was calculated by using the formula

$$\mathrm{SE}_{\bar{x}} = \frac{s}{\sqrt{n}}.$$

Results of each population group are presented in the form of mean ± SE with 95% confidence interval.

HCV prevalence in various groups

Blood banks

Blood donors constituted the maximum data and population of this study. Data of 15,61,371 blood donors were gathered. Maximum studies published related to blood bank donors were from Karnataka state. We reviewed 51 published articles on HCV prevalence among blood bank donors across all states of India (Table 1).

Maharashtra

Seven published papers from Maharashtra were reviewed from regions like Marathwada, Pune, Ahmednagar, Nagpur etc. Unfortunately, we did not find any published article of HCV prevalence of blood donors from Mumbai, capital of Maharashtra. The overall frequency of HCV infection was found to be 0.27% (95% CI : 0.268 – 0.272) in 2,24,000 donors (Deshpande *et al.,* 2012; Giri *et al.,* 2012; Bembde *et al.,* 2012; Kumar *et al.,* 2013; Sastry *et al.,* 2014; Dakshayani *et al.,* 2014; Bobde *et al.,* 2015).

Karnataka

Total eleven papers were reviewed from Karnataka state. The frequency of HCV infection in this state was found to be 0.03% (95% CI : 0.029 – 0.031) in 1,70,372 donors (Kumari *et al.,* 2011; Kulkarni *et al.,* 2012; Zulfikar *et al.,* 2012; Das *et al.,* 2012; Lathamani *et al.,* 2013; Begum *et al.,* 2013; Pawale *et al.,* 2013; Bommanahalli *et al.,* 2014; Dheemantha *et al.,* 2014; Patil *et al.,* 2014; Anand *et al.,* 2015).

Table 1. Seroprevalence of HCV among blood donors

S.No	Publication year	Duration of study	Location	Sample size (n)	Anti-HCV (%)	Reference
			Maharashtra			
1.	July-Dec.2012	Jan-2007 to Dec-2011	Marathwada	1,04,925	0.18%	2
2.	2012	Jan-2009 to Dec-2010	Ahmednagar	5,661	0.74%	3
3.	2013	Jan 2007 to Dec-2011	Aurangabad	10,549	25 (0.2%)	4
4.	2013	Jan-2008 to Dec- 2012.	Wardha	28621	0.28%	5
5.	April-2014	Aug -2008 to Aug- 2013.	Medical school, Pune	13,078	1.23 %,	6
6.	2014	Jan-2006 to Dec-2012	Pimpri, Pune	17976	0.2%	7
7.	Jan-2015	Jan- 2010 to June -2014	Nagpur	43190	0.16%	8
		Total		2,24,000	0.27% (95% CI : 0.268– 0.272)	
			Karnataka			
8.	July-2011	Jan 2006 – Dec 2010	Mysore	33,658	0.13%	9
9.	2012	Jan-2005 to Dec 2009	Bellary	19,135	0.35%	10
10.	Dec-2012	Jan- 2008 to Dec- 2011	Mangalore	25633	0.08%	11
11.	2012	Jan-2006 to Dec-2010	Kolar	25,341	0.22%	12
12.	2013	Jan-2008 to March- 2010	Mangalore	14259	0.098%	13
13.	2013	2003 to 2012	Gulbarga	7066	0.21%	14
14.	Dec-2013	Jan 2009- Dec 2010.	Bagalkot	6008	0.366 %	15
15.	2014	Jan-2005 to Dec-2009	Central Karnataka	19,413	0.1%	16
16.	Oct 30, 2014	Jan-2013 to Dec-2013	Bangalore	3910	0%	17
17.	Nov-2014	July 2011 to Dec-2013	Vijaypur	7, 018	0.74%	18
18.	2015	Jan -2008 to March- 2010	Shimoga	8931	0.033%	19
		Total		1,70,372	0.03% (95% CI : 0.029– 0.031)	
			Gujarat			
19.	2012	Jan-2006 to Aug-2011	Baroda	10386	0.16%	20
20.	Feb-2013	Jan- 2002 to Dec -2010	Jamnagar	1,07,560	0.26%	21
21.	May 2013	Jan-2009 to Nov- 2011	Vadodara	27,407	0.21%	22
22.	Dec.13	Jan-2006 to July -2013	Ahmedabad	92,778	0.108%	23
23.	Apr.14	Jan-2013 to Dec-2013.	Rajkot	10,788	0.074%	24
		Total		2,48,919	0.08% (95% CI: 0.08– 0.08)	
			Rajasthan			
24.	2012	2007-2010	Sri Ganganagar, Rajasthan	21,399	0.82%	25
			New Delhi			
25.	Jan-2011	2005-2009	AIIMS	94,716	0.57%	26

Continue……

26.	August-2014	Jan -2009 to June -2012	Safdarjung Hospital	95,185	0.7%	27
		Total		1,89,901	0.64% (95% CI:0.64– 0.64)	
			Punjab & Haryana			
27.	March 2002	-	Ludhiana	21014	1.5%	28
28.	2004	Jan- 2001 to Oct- 2003	Ludhiana	44064	1.09%	29
29.	2006	June -2001 to Jan 2002	Chandigarh	16,250	0.44%	30
30.	2010	Oct-2002 to April -2006	Southern Haryana	5849	1%	31
31.	Aug-2012	Jan-2005 to June 2011	Vallah, Amritsar,	35793	1.38%	32
		Total		1,22,970	1.15% (95% CI: 1.148–1.152)	
			Uttar Pradesh & Uttarakhand			
32.	Mar 2008	1997-2005	Kanpur	115073	0.4%	33
33.	2013	2008 to 2012	Kumaon region of Uttarakhand	27125	0.64%	34
34.	Jan 2014	Jan-2008 to Dec- 2012	Lucknow	192,348	1.43%	35
35.	Jan 2014	Jan- 2007 to Dec-2011	Srinagar, Uttarakhand	7884	0.2%	36
36.	Aug-2014	Jan- 2013 to Dec -2013	western Uttar Pradesh	28,395	1.02%	37
		Total		3,70,825	0.995% (95% CI: 0.993– 0.997)	
			Chhattisgarh			
37.	2014	Nov- 2009 to May- 2011	Jagdalpur, Chhattisgarh	10,582	0.20%	38
			Madhya Pradesh			
38.	2015	Jan- 2010 to Dec- 2014	Rewa	29, 540	0.33%	39
			Jammu			
39.	2013	Jan- 2008 to Dec	Jammu	96,705	0.19%	40
			Kerala			
40.	2002	1994-1999	Trivandrum	31942	1.4%	41
41.	2012	Nov to Dec-2010	Thiruvananthapuram	5 004	0.4%	42
		Total		36,946	0.18% (95% CI : 0.17– 0.19)	
			Sikkim			
42.	January 2010	2001-2008	Gangtok, Sikkim	3735	0.27%	43
			Andhra Pradesh & Telangana			
43.	2010	Jan 2004 to Dec 2009	Amalapuram, Andhra Pradesh.	8067	0.84%	44
44.	2012	2004 to 2010	Bommakal,Telangana	6939	0.14%	45
45.	July 2014	Jan-2009 to Dec-2013	Secunderabad	39780	0.51%	46
		Total		54,786	0.51% (95% CI: 0.507– 0.513)	
			Tamil Nadu			
46.	2000	-	Madurai			47
47.	April-2012	-	Vellore			48
		Total		5,139	0.59% (95% CI: 0.58– 0.6)	
			Orissa			
48.	2002	-	Cuttack	141	2.12%	49
49.	2008	June to Dec-2005	Cuttack	3623	1.98%	50
		Total		3,764	1.99% (95% CI: 1.987– 1.993)	
			West Bengal			
50.	2012	01.01.2007 to 31.12.2008	Kolkata	44,173	1.62%	51
51.	2014	Jan- 2011 to Dec- 2011	Kolkata	24320	0.59%	52
		Total		68,493	1.25% (95% CI : 1.245-1.255)	

Gujarat

Five papers reviewed from this state showed the overall HCV infection frequency of 0.08% (95% CI) in 2,48,919 blood donors (Jasani *et al.,* 2012; Mehta *et al.,* 2013; Patel *et al.,* 2013; Shah *et al.,* 2013; Dhruva *et al.,* 2014).

Rajasthan

One study from Sri Ganganagar, Rajasthan showed HCV prevalence of 0.82% in 21,399 blood donors (Sabharwal *et al.,* 2012).

New Delhi

Two papers reviewed from this region showed the frequency of about 0.64% (95% CI : 0.64 – 0.64) in 1,89,901 blood bank donors (Meena *et al.,* 2011; Dogra *et al.,* 2014)

Punjab and Haryana

Five published papers showed the overall serofrequency of 1.15% (95% CI: 1.148 – 1.152) among 1,22,970 blood donors (Gupta *et al.,* 2002; Gupta *et al.,* 2004; Thakral *et al.,* 2006; Arora *et al.,* 2010; Kaur *et al.,* 2012).

Uttar Pradesh and Uttarakhand

Five published papers showed the overall serofrequency of 0.995% (95%CI: 0.993– 0.997) in 3,70,825 donors (Jaiswal *et al.,* 2007; Rawat *et al.,*2013; Chandra *et al.,* 2014; Sethi *et al.,* 2014; Chaudhary *et al.,* 2014).

Chattisgarh

One study showed HCV frequency of 0.20% among 10,582 blood donors (Kumar *et al.,* 2014).

Madhya Pradesh

One study showed HCV frequency of 0.33% among 29,540 blood donors (Singh *et al.,* 2015).

Jammu

One study showed HCV frequency of 0.19% among 96,705 blood donors (Sidhu *et al.,* 2013).

Kerala

Two published papers from this state showed the HCV serofrequency of 0.18% (95% CI: 0.17 – 0.19) among 36,946 blood donors which was the lowest among all other states (Mathai *et al.,* 2002; Anjali *et al.,* 2012).

Sikkim

One study showed HCV frequency of 0.27% among 3,735 blood donors (Adhikari *et al.,* 2010).

Andhra Pradesh and Telangana

Three articles published showed the overall serofrequency of about 0.51% (95% CI: 0.507 – 0.513) among 54,786 blood donors (Bhawani *et al.,* 2010; Leena *et al.,* 2012; Reddy *et al.,* 2014).

Tamil Nadu

Two published papers from Madurai and Vellore were reviewed which showed the HCV serofrequency of 0.59% (95% CI: 0.58– 0.6) in 5,139 donors (Chandrasekaran *et al.,* 2000; Gowri *et al.,* 2012).

Orissa

Two published papers from Orissa showed the maximum HCV serofrequency of 1.99% (95% CI: 1.987– 1.993) among 3,764 blood bank donors (Mishra *et al.,* 2002; Panda *et al.,* 2008).

West Bengal

Two published papers from Kolkata showed the maximum HCV serofrequency of 1.25% (95% CI: 1.245– 1.255) among 68,493 blood bank donors (Sinha *et al.,* 2012; Karmakar *et al.,* 2014).

Seroprevalence of HCV in communities

Only four studies from 2001 to 2014 were found focusing on HCV seroprevalence in different communities covering only 4,967 individuals which shows very limited information is available about HCV prevalence in general population of India(Phukan *et al.,* 2001; Chowdhury *et al.,* 2003; Uppal *et al.,* 2009; Verma *et al.,* 2014). The serofrequency of HCV infection was found to be highest in a community from Haryana i.e 22.3% followed by a study in Changlang district of Arunachal Pradesh (Table 2). The mean serofrequency in this group was 8.03% (95% CI : 7.75 – 8.30).

Seroprevalence of HCV in hospital based population

Seven studies in total were reviewed regarding seroprevalence of HCV in hospital based population spanning a period from 2003 to 2014 (Table 3). These studies covered 31,662 cases and the serofrequency in this group ranged from 0.04% in Andhra Pradesh to 4.8% in Pondicherry (Bhattacharya *et al.,* 2003; Sharma *et al.,* 2007; Sood *et al.,* 2010 ; Ramana *et al.,* 2013; Vani *et al.,* 2014; Patil *et al.,* 2014 ; Rajani *et al.,* 2014). The overall serofrequency in this group was 0.45% (95% CI : 0.43 – 0.47).

Seroprevalence of HCV in Liver Diseases

Four studies dealing with the frequency of HCV among patients with liver diseases were found (Table 4). These studies covered 2,941 patients over a period of 4 years from 2005- 2008 (Chakravarti *et al.,* 2005 ; Chaudhuri *et al.,* 2005 ; Arora *et al.,* 2007; Saravanan *et al.,* 2008). HCV serofrequency in this group ranged from 13-43%, with an overall prevalence of 19.71 (95% CI : 19.24 – 20.18).

Seroprevalence of HCV in Thalassemia patients

Thirteen studies dealing with seropositivity of HCV in multitransfused thalassemic cases were reviewed spanning a period of 13 years from 2001 to 2013 (Jaiswal *et al.,* 2001;

Table 2. Seroprevalence of HCV in communities

S.No	Author	Year	Place	Sample size (n)	Anti HCV (%)	Reference
1.	Phukan *et al.*	2001	North East India	76	7.89%	53
2.	Chowdhury *et al.*	2003	West Bengal	2973	0.87%	54
3.	Uppal	2009	urban slum of Northern India.	288	1.15%	55
4.	Verma et al.	2014	Haryana	1630	22.3%	56
		Total		4,967	8.03% (95% CI : 7.75 – 8.30)	

Table 3. Seroprevalence of HCV in hospital based population

S. No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Bhattacharya S *et al.*	2003	Pondicherry	661	4.8%	57
2.	Sharma R. *et al*	2007	Jaipur, Rajasthan	4014	1.7%	58
3.	Sood S *et al.*	2010	Jaipur, Rajasthan	1392	0.28%	59
4.	Ramana K *et al.*	2013	Karimnagar, Andhrapradesh	16796	0.04%	60
5.	G. Vani *et al.*	2014	Puducherry	1226	0.16%	61
6.	Patil S *et al.*	2014	Karad, Maharashtra	7373	0.38%	62
7.	Rajani M *et al.*	2014	New Delhi	200	1.5%	63
		Total		31,662	0.45 (95% CI = 0.43 – 0.47)	

Table 4. Seroprevalence of HCV in Liver Disease

S.No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Chakravarti A *et al.*	2005	Delhi	132	25.75%	64
2.	Chaudhuri S *et al.*	2005	Kolkata	2640	19.05%	65
3.	Arora U *et al.*	2007	Amritsar	100	13%	66
4.	Saravanan *et al.*	2008	Chennai	69	43%	67
		Total		2,941	19.71 (95% CI =19.24 – 20.18)	

Mishra *et al.,* 2004; Mathur *et al.,* 2007; Grewal *et al.,* 2007; Shah *et al.,* 2010; Shah *et al.,* 2011; Vidja *et al.,* 2011; Bhavsar *et al.,* 2011; Madhusudhan *et al.,* 2012 ; Oza *et al.,* 2012 ; Jain *et al.,* 2012 ; Makroo *et al.,* 2013; Bandyopadhya *et al.,* 2013). The frequency in this group ranged from 1.90% in West Bengal to 59.4% in Punjab (Table 5). The overall serofrequency in this group was 22.78% (95% CI : 22.00 – 23.55).

Seroprevalence of HCV in haemophilia patients

Only three studies focused on seroprevalence of HCV in haemophilia patients (Table 6). These studies spanned a period of 15 years and covered only 368 haemophilia patients (Ghosh *et al.,* 2000; Mittal *et al.,* 2013; Kobal *et al.,* 2014). The serofrequency in this group ranged from 2% to 23.9% with the overall frequency of 14.38 % (95% CI : 13.21 – 15.55).

Seroprevalence of HCV due to sexual transmission

Only four studies dealing with HCV seroprevalence due to sexual transmission spanning a period of eight years from 2005 to 2013 were reviewed (Table 8). These studies covered only 1,145 cases (Joyee *et al.,* 2005; Anvikar *et al.,* 2009; Barua *et al.,* 2012; Desai *et al.,* 2013). The overall serofrequency in this group was 5.82 % (95% CI: 5.646 -5.994).

Seroprevalence of HCV in Haemodialysis cases

Seven studies focused on prevalence of HCV among patients with chronic kidney failure on haemodialysis (Table 9). These studies spanned a period of 10 years covering 2,429 patients and the seroprevalence in this group ranged from 1.11 to 27.7% (Reddy *et al.,* 2005; Reddy *et al.,* 2005; Jasuja *et al.,* 2009, Dholakia *et al.,* 2013; Kosaraju *et al.,* 2013; Chigurupati *et al.,* 2014; Hegde *et al.,* 2014). Overall serofrequency in this group was 4.73 (95% CI : 4.33 – 5.13).

Table 5. Seroprevalence of HCV in thalassemic patients

S. No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Jaiswal *et al.*	2001	Central India	104	21%	68
2	Mishra *et al.*	2004	Delhi	47	13%	69
3	Mathur M *et al.*	2007	Sion, Mumbai	126	43.65%	70
4	Grewal *et al.*	2007	Punjab	116	59.4%	71
5	Shah N *et al.*	2010	Ahmedabad, Gujarat	142	45%	72
6	Shah H *et al.*	2011	Ahmedabad, Gujarat	163	23.31%	73
7	Vidja *et al*	2011	Jamnagar, Gujarat	200	2%	74
8	Bhavsar H *et al.*	2011	Ahmedabad, Gujarat	100	18%	75
9.	Madhusudhan K *et al.*	2012	Chennai	30	32%	76
10.	Oza *et al.*	2012	Saurashtra region	193	7.8%	77
11	Jain R *et al.*	2012	Ahmedabad	96	25%	78
12	Makroo *et al*.	2013	Delhi	462	23.1%	79
13	Bandyopadhyay U *et al.*	2013	Rural West Bengal	124	1.90%	80
		Total		1,903	22.78% (95% CI: 22.00 -23.55)	

Table 6. Seroprevalence of HCV in haemophilia patients

S.No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Ghosh K *et al.*	2000	West India	188	23.9%	81
2.	Mittal M *et al*.	2013	Ahmedabad	80	7.5%	82
3.	Kobal M *et al.*	2014	Jaipur,Rajasthan	100	2%	83
		Total		368	14.38 (95% CI = 13.21 – 15.55)	

Table 7. Seroprevalence of HCV among Pregnant women

S.No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Kumar A *et al* .	2007	North India	8130	1.03%	84
2.	Rudrapathy Parthiban *et al*.	2009	Chennai	3115	0.6%	85
3.	Sood Ajit *et al.*	2012	North India	488	1.6%	86
4.	Mehta *et al*.	2013	Jamnagar ,Gujarat	1038	0.19%	87
5.	Goyal LD *et al.*	2014	Punjab	1412	2.8%	88
		Total		14,183	1.07% (95% CI: 0.983-1.017)	

Pregnant women

Five studies dealing with the serofrequency of HCV among pregnant women were found (Table 7). These studies spanned a period of 7 years from 2007 to 2014 consisting of 14,183 cases (Kumar *et al.,* 2007; Parthiban *et al.,* 2009; Sood *et al.,* 2012; Mehta *et al.,* 2013; Goyal *et al.,* 2014). The frequency in this group ranged from 0.19 in Gujarat to 2.8% in Punjab. Two out of five studies were based on mother to child transmission of HCV showing 25-29% vertical transmission among HCV RNA-positive antenatal women. The overall serofrequency in this group was 1.07% (95% CI : 0.983 - 1.017).

IDUs

Eleven studies were found regarding HCV seroprevalence in Injecting Drug users of our country (Table 10). These studies spanned a period of thirteen years from 2000 to 2013 consisting of 6,645 cases (Eicher *et al.,* 2000; Baveja *et al.,* 2003; Pal *et al.,* 2004; Sarkar *et al.,* 2006; Saraswathi *et al.,* 2007; Chelleng *et al.,* 2008; Solomon *et al.,* 2008; Mahanta *et al.,* 2008; Mehta *et al.,* 2010; Panda *et al.,* 2013; Basu *et al.,* 2013). The overall HCV serofrequency in this group was found to be highest i.e. 51.22% (95% CI: 50.80 – 51.64).

Table 8. Seroprevalence of HCV due to sexual transmission

S.No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	A G Joyee	2005	Chennai	143	4.2%	89
2.	Anupkumar R.	2009	Jabalpur	326	3.9%	90
3.	Barua P. *et al*	2012	Nagaland	426	9.6%	91
4.	Desai P *et al.*	2013	Mumbai	250	2.8%	92
		Total		1,145	5.82%(95% CI : 5.646 -5.994)	

Table 9. Seroprevalence of HCV in Haemodialysis cases

S.No	Author	Year	Place	Sample size (n)	Anti HCV(%)	Reference
1.	Reddy GA *et al*.	2005	Hyderabad, Andhra Pradesh	134	5.9%	93
2.	Reddy A.K. *et al*	2005	Hyderabad, Andhra Pradesh	151	9.93%	94
3.	Jasuja S *et al.*	2009	Delhi	119	27.7%	95
4.	Dholakia P *et al.*	2013	Ahmedabad	100	4%	96
5.	K Kranthi et al	2013	Manipal, Karnataka	1710	1.11%	97
6.	Chigurupati P *et al.*	2014	Eluru, Andhra Pradesh	102	23.5%	98
7.	Hegde R *et al.*	2014	Mangalore, Karnataka	113	10.6%	99
		Total		2,429	4.73 (95% CI: 4.33 – 5.13)	

Table 10. Seroprevalence of HCV in IDUs

S.No	Author	Year	Place	Sample size (n)	Anti HCV (%)	Reference
1.	Eicher AD *et al.*	2000	Manipur	191	98%	100
2.	Baveja UK *et al.*	2003	Delhi	246	36.45%	101
3	Pal D *et al.*	2004	Kolkata	205	42.92 %	102
4	Sarkar K *et al.*	2004	West Bengal	228	47.7%	103
5	K Saraswathi *et al.*	2007	Mumbai	250	61.2 %	104
6	P.K. Chelleng *et al.*	2008	Mizoram	143	71.2%	105
7	Solomon S *et al*.	2008	Chennai	912	62.1 %	106
8	Mahanta Jagadish *et al.*	2008	3 states: Maharashtra(Mumbai and Thane), Manipur (Bishnupur and Churachandpur), Nagaland (Phek and Wokha)	2054	Mumbai/Thane: 53% Bishnupur :56% Churachandpur :78% Phek : 5% Wokha:17%	107
9	Mehta Shruti *et al.*	2010	Chennai	1158	55%	108
10	Panda S *et al.*	2013	Punjab	1155	49 %	109
11	Basu D *et al.*	2013	North India	103	46 %	110
		Total		6,645	51.22% (95% CI=50.80 – 51.64)	

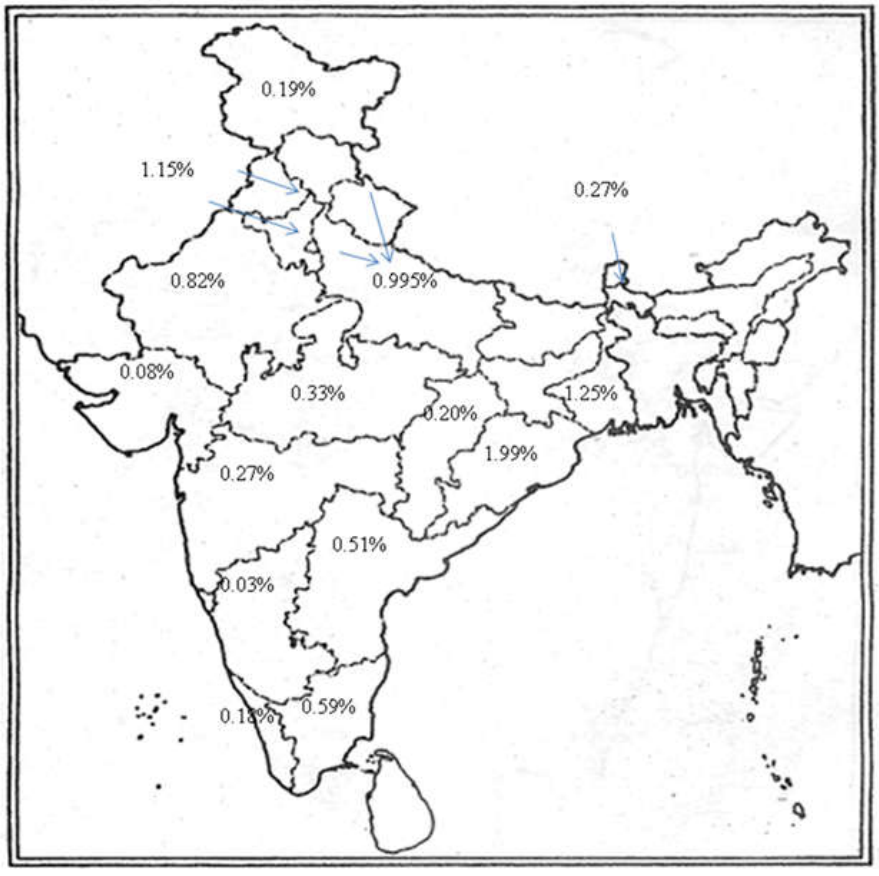

Figure 1: HCV prevalence in blood donors across different states of India

RESULTS

Blood donors constituted the largest data of 15,61,371 individuals. The frequency was highest in injecting drug users i.e. 51.22 % (95% CI: 50.80 – 51.64). The frequency in multitransfused thalassemics and haemophiliac cases was 22.78 % (95% CI: 22.00– 23.55) and 14.38 % (95% CI: 13.21 – 15.55) respectively. The frequency in pregnant women was 1.07% (95% CI : 0.983 - 1.017). The frequency due to sexual transmission and haemodialyis was 5.82% (95% CI : 5.646 - 5.994) and 4.73% (95% CI: 4.33 – 5.13) respectively. The serofrequency in communities and hospital –based population was 8.03% (95% CI: 7.75 – 8.30) and 0.45% (95% CI: 0.43 – 0.47) respectively. The frequency in liver disease patients was 19.71 (95% CI: 19.24 – 20.18).

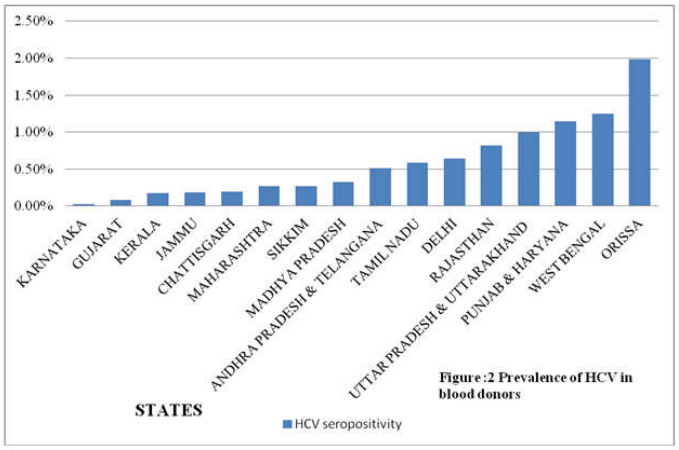

Figure :2 Prevalence of HCV in blood donors

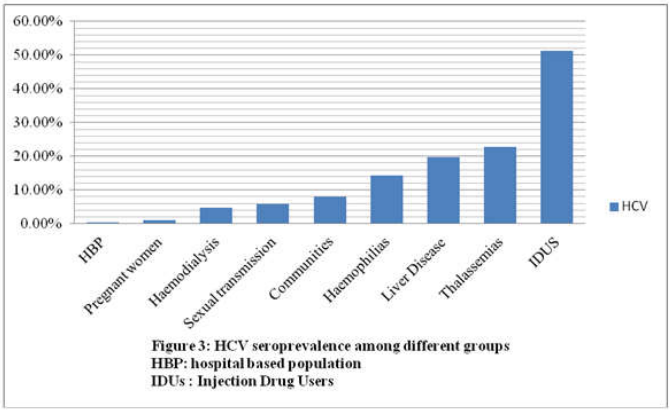

Figure 3: HCV seroprevalence among different groups
HBP: hospital based population
IDUs : Injection Drug Users

DISCUSSION

Blood donors constituted the maximum data. HCV seroprevalence among blood donors showed a varied range from 0.03% in Karnataka to 1.99% in Orissa which is very high of about approximately 70-fold increase in our populated country (Figure 2). Highly different variations in HCV seroprevalence was noted in blood donors across states and even in the same province. A single unit of blood or its components may be given to more than one recipient, will spread the disease rapidly. HCV prevalence studies in blood donors cannot be made generalised across entire population of the country. We could not find any large HCV community based epidemiological study carried out in our country except for four small isolated studies covering only 4,967 individuals. India is the second most populous country in the world, large population based HCV prevalence studies needs to be encouraged.

Highest prevalence was found in Injecting Drug Users followed by multitransfused thalassemic cases suggesting the re-use of needles among IDUs and failure of proper screening of blood transfused to thalassemiacs. Literature suggests HCVis the main cause of morbidity and is more threatening than HBV hepatitis in multi-transfused cases due to greater risk of developing chronicity of liver disease.

Conclusion

This study reviewed HCV seroprevalence among different groups from India. More studies needs to be undertaken regarding HCV prevalence in general population, haemophilia cases. Dialysis units need to re-work on strict measures to prevent transmission of HCV infection in haemodialysis patients. Once a patient is found to have hepatitis C, that patient needs to be counselled to reduce the risk of HCV transmission to others. However, from the scanty data presented, there is no doubt that HCV is a major health problem that requires greater attention in India. Nucleic Acid Test (NAT) should be adopted in blood banks to detect infection in donor window-period like in developed countries The treatment available against hepatitis C is expensive and has several side-effects. There is the necessity of the co-operation of media persons and the non-governmental organizations to fight the problems of HCV. There is need to improve efforts in diagnosis, management and prevention of HCV in India.

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