THE ASSOCIATION OF HEALTH-CARE USE AND HEPATITIS C VIRUS INFECTION IN A RANDOM SAMPLE OF URBAN SLUM COMMUNITY RESIDENTS IN SOUTHERN INDIA

MELISSA A. MARX, K. G. MURUGAVEL, SUDHA SIVARAM, P. BALAKRISHNAN, MARK STEINHOFF, S. ANAND, DAVID L. THOMAS, SUNITI SOLOMON, AND DAVID D. CELENTANO

Johns Hopkins Bloomberg School of Public Health; Y.R. Gaitonde Centre for AIDS Research and Education; Johns Hopkins University School of Medicine

Abstract. To determine whether health-care use was associated with prevalent hepatitis C virus (HCV) infection in Chennai, India, 1,947 adults from 30 slum communities were randomly selected to be interviewed about parenteral and sexual risks for HCV infection and to provide biological specimens for HCV and sexually transmitted infection (STI) testing. Prevalent HCV infection was detected in 2.4% of non-injection drug using (IDU) participants. Controlling for other associated factors, and excluding IDU, men who used informal health-care providers were five times as likely to be HCV infected as those who did not use informal providers (Adjusted Odds Ratio, AOR = 5.83; 95% confidence interval [CI]: 1.57, 21.6), a finding not detected in women. More research is needed to determine the extent to which HCV infection is associated with reuse of contaminated injection equipment in health-care settings in developing countries.

INTRODUCTION

Approximately 3% of the world’s population is infected with hepatitis C virus (HCV), which is known to be transmitted through contact with infected blood. Before implementation of guidelines for universal screening of donated blood products for HCV antibodies in developed countries in the early 1990s, a substantial proportion of recognized infection was linked to exposure to infected blood in health-care settings. As blood screening and adherence to universal blood precautions improved in these regions, the incidence of HCV infection in health-care settings declined dramatically. In recent years, most new HCV infection has been attributed to injection drug use in developed and developing countries. However, data from developing countries regarding HCV epidemiology are sparse.

According to the World Health Organization and Red Cross and Red Crescent societies, as many as two-thirds of developing countries have not mandated screening of donated blood products for HCV antibodies. In Chennai, testing for HCV antibodies in donated blood products for HCV antibodies in developed countries in the early 1990s, a substantial proportion of recognized infection was linked to exposure to infected blood in health-care settings. As blood screening and adherence to universal blood precautions improved in these regions, the incidence of HCV infection in health-care settings declined dramatically. In recent years, most new HCV infection has been attributed to injection drug use in developed and developing countries. However, data from developing countries regarding HCV epidemiology are sparse.

In India, where most health-care visits include one or more therapeutic injections, there is great potential for exposure to infected blood. Individuals seeking health care from providers with little or no training are at particularly high risk when injections are administered with reused, unsterilized needles and syringes. In India, where most health-care visits include one or more therapeutic injections, there is great potential for exposure to infected blood. Individuals seeking health care from providers with little or no training are at particularly high risk when injections are administered with reused, unsterilized needles and syringes.

The city of Chennai (formerly Madras), the site of this study, is located in the southeastern state of Tamil Nadu and has a population of over 6 million. In a recent survey, over two-thirds of the general population reported receiving at least one injection in the past six months, averaging four injections per year. Individuals receiving health care in the context of poor adherence to universal blood precautions are at increased risk of not only HCV infection but also infection with HIV, hepatitis B, and blood-borne parasites.

This study aimed to determine whether use of different types of formal allopathic, informal allopathic, and traditional non-allopathic health-care providers was associated with increased HCV infection in adults living in slum communities in Chennai.

MATERIALS AND METHODS

Data for this cross-sectional study were collected in Chennai from March–June 2001. Investigators identified approximately 1,000 self-contained urban residential areas (“slums”) in Chennai that have been designated by the Tamil Nadu Slum Clearance Board as sites for future permanent housing structures. Thirty slums that housed 100 to 300 families and had discrete boundaries with major separating barriers were chosen as sites for this study. Residents of these slums were enumerated in a private census, and one adult aged 18–40 was randomly selected from each of 65 randomly selected for participation. All community residents were invited to health camps planned in their slum communities, and those selected for the study were given coded cards so they would be recognized as study participants.

Each health camp was held in a community for 6–7 hours on a single day. Those who attended received physical examinations, laboratory testing, and prescription drugs, as needed. Those selected were informed of the risks and benefits of participation, advised of their rights as study participants, and given copies of the informed consent form to read and sign (or mark an “X”). All study methods, procedures, and consent forms were approved by the Johns Hopkins University Bloomberg School of Public Health and YR Gaitonde Centre for AIDS Research and Education (YRG-CARE) institutional review boards.

Those who agreed to participate were taken to a private setting in the health camp where same-sex, study-trained staff members interviewed them in the Tamil language regarding health-care use, blood exposures, and sexual risk practices. Participants were then given HIV pre-test counseling and were asked to provide blood and urine specimens for testing. Biological specimens were tested in a dedicated laboratory in Chennai, and samples were tested for quality control at the Johns Hopkins School of Medicine central laboratory. Serum was tested for antibody to HCV using HCV Enzyme-Linked Immunosorbent Assay (ELISA) 4.0 (Abbott Murex Biotech

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258
analyses. Use exposures, these participants were excluded from further
use (OR 71%), about a third (34%) had completed high school, and
although they did not differ from the study population with
respect to marital status, age, education, or health status.
P values were less likely to be male (24 vs. 47%,
and a few had used traditional healers (6%) and other infor-
mal health-care providers (1%) in the past three months.
(Data not shown.)
HCV antibodies were detected in 1.9% of men and 2.8% of
women. Approximately 16% of women and 10% percent of
men were HSV-2 infected; 5% of women and 17% of men
reported having ever had a genital ulcer, and less than 10% of
women and men had evidence of HIV infection or infection
with any other STI. (Data not shown.) Because of effect
modification noted between gender and multiple health-care
use exposure variables, subsequent analyses of the associa-
tions of demographic and health-care use and HCV infection
were stratified and displayed by gender.

Women. Women reported low levels of parenteral risk be-
havior (Table 1). Neither HCV infected (N = 24) nor HCV
uninfected (N = 830) women reported using informal health-
care providers. However, compared with HCV-uninfected
women, HCV-infected women were somewhat less likely to
have gone to a hospital for medical care in the prior six
months (OR = 0.50, P = 0.16), although this association
could have been seen purely chance.
The two groups reported similar health status and demo-
graphic characteristics. However, HCV-infected women were
over three times as likely as HCV-uninfected women to have
reported a genital ulcer (OR = 3.18, P = 0.08). Additionally,
HCV-infected women were slightly more likely than HCV-
uninfected women to report having a tattoo (OR = 1.51, P =
0.21).

When assessing the association of hospital use and HCV
infection, after controlling for having had genital ulcers and
tattoos, those who used a hospital were half as likely to be
HCV-infected as those who did not use a hospital (AOR =
0.45, 95% CI: 0.16, 1.29). This association was not statistically
significant.

Men. As shown in Table 1, although there was little differ-
ence in hospital use by HCV status, HCV-infected men (N =
15) visited informal health-care providers almost nine times
as frequently in the prior six months as HCV-uninfected men
(N = 752; OR = 8.76, P < 0.01).

HCV-infected and -uninfected men did not differ with re-
spect to marital status or age; however, HCV-infected men
were more likely than HCV-uninfected men to report mod-
erate to very bad health status (compared with good and very
good health status; OR= 4.10, P = 0.03). Furthermore,
HCV-infected men were more likely to drink alcohol at least
once a week (OR = 3.76, P < 0.01) than HCV-uninfected
men. More HCV-infected men reported having had genital
ulcers (OR = 1.92, P = 0.24, not statistically significant) and
almost three times as many had HSV-2 (OR = 3.31, P =
0.04) relative to HCV-uninfected men. Moreover, HCV-
infected men were over three times as likely as HCV-
uninfected men to report ever having had sex with a man
(OR = 3.66, P = 0.06).

Finally, when compared with HCV-uninfected men, HCV-
infected men were more likely to have had a tattoo (OR =
Differences in demographic and injection-related risk factors in HCV-infected and -uninfected women and men

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th></th>
<th></th>
<th>Men</th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td>HCV+</td>
<td>HCV−</td>
<td>OR¹</td>
<td>p value</td>
<td>HCV+</td>
<td>HCV−</td>
</tr>
<tr>
<td>ALL (N)</td>
<td>24</td>
<td>830</td>
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<td></td>
<td>15</td>
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<td>Percentage</td>
<td>3</td>
<td>97</td>
<td>&lt; 0.01²</td>
<td></td>
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<td>98</td>
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<td>Health-care use</td>
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<td></td>
<td></td>
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<tr>
<td>Used informal health care⁴,⁵</td>
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<td>1</td>
<td>nc⁶</td>
<td>nc</td>
<td>13</td>
<td>2</td>
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<tr>
<td>Used a hospital⁵</td>
<td>46</td>
<td>63</td>
<td>0.50</td>
<td>0.16</td>
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<td>51</td>
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<tr>
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<tr>
<td>Married</td>
<td>79</td>
<td>78</td>
<td>1.11</td>
<td>0.87</td>
<td>67</td>
<td>63</td>
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<tr>
<td>Age (mean)</td>
<td>27.6</td>
<td>28.3</td>
<td>0.99</td>
<td>0.60</td>
<td>29.1</td>
<td>28.6</td>
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<tr>
<td>Bad health status⁷</td>
<td>58</td>
<td>59</td>
<td>1.01</td>
<td>0.98</td>
<td>85</td>
<td>59</td>
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<td>More than weekly alcohol use</td>
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<td>0</td>
<td>nc⁸</td>
<td>nc</td>
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<td>41</td>
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<td>Sex-based blood exposure</td>
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<td>Self-reported genital ulcer</td>
<td>13</td>
<td>5</td>
<td>3.18</td>
<td>0.08</td>
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<td>17</td>
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<tr>
<td>HSV-2 antibody positive</td>
<td>17</td>
<td>16</td>
<td>1.09</td>
<td>0.89</td>
<td>27</td>
<td>10</td>
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<tr>
<td>Had sex with a man</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>20</td>
<td>5</td>
</tr>
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<tr>
<td>Ever had a tattoo</td>
<td>29</td>
<td>21</td>
<td>1.51</td>
<td>0.21</td>
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<td>39</td>
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<tr>
<td>Ever been circumcised</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>14</td>
<td>8</td>
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</tbody>
</table>

¹ logistic regression modeling using generalized estimating equations  
² P values from χ² test of a single proportion  
³ all numbers given are percentages unless otherwise noted  
⁴ explicitly not including practitioners at health posts/dispensaries, hospitals, pharmacies, traditional healers  
⁵ behaviors reported in the six months before the interview  
⁶ nc, could not be calculated  
⁷ self-reported “moderate” and “very bad” health compared with “very good” and “good” health  
⁸ more likely, or had more, of each of these providers  

As shown in Table 2, after controlling for health status, frequency of alcohol use, HSV-2 infection, having had sex with a man, and having had a tattoo, men who used informal health-care providers were more than five times as likely to be HCV-infected compared with men not reporting using informal providers (AOR = 5.83, CI: 1.57, 21.6).

DISCUSSION

In this study, recent use of informal health-care providers was associated with a 5-fold increase in risk of HCV infection in men, but no women reported using informal health-care providers.

Local staff members suggest that informal health-care providers were interpreted to be practitioners working from storefronts and market stands, also non-disparagingly known as “quacks.” The term used on the questionnaire for these providers explicitly excluded trained allopathic providers (specifically: health posts/dispensaries, hospitals, and pharmacies) and non-allopathic providers (specifically: traditional healers). Anecdotal reports suggest that quacks are visited primarily to obtain inexpensive, expedient remedies for common ailments, and that these providers typically offer therapeutic and vitamin injections usually administered with reused or unsterilized equipment. Quacks are ubiquitous in southern India, as in many developing countries. If respondents interpreted informal providers to be quacks, it would not be surprising to find an association between using a quack and being HCV-infected.

As in some other developing countries, there is widespread use of injections in Chennai. In a recent rapid assessment of injection-related health risk there, 63% of respondents reported having had at least one injection, and a median of three, in the prior six months. In that study, vitamin, therapeutic, and antibiotic injections were given for a variety of ailments including asthma, fever, and “old age.” During that assessment, approximately 20% of injections observed were administered with unsterilized needles and syringes, and only 8% of injection prescribers, 5% of injection providers, and 0.02% of the general population were aware that the hepatitis C virus could be transmitted through injections.²⁹

Why are injections in such high demand? Anthropologic studies have given some insight into the attraction of injections. Reeler suggested that worldwide demand stems from perceptions that injections are fast-acting, highly effective, and more “western” than other therapies, although the author notes that rationales vary somewhat according to culture.¹⁷ According to Reeler, practitioners are increasingly compelled to provide injections to maintain credibility in their communities,¹⁸ and even those practicing traditional and ayurvedic medicine typically offer injectable medications.¹⁷ Furthermore, reporting on a study in nearby Vellore, India, Lakshman and Nitcher offered insights into injection practices of registered medical practitioners (RMPs), providers who are registered by the government as having some health-care training. According to the authors, the training experience of these providers is minimal and, like informal health-
care providers (as designated in this analysis), injections are typically administered by RMPs for non-specific ailments such as “weakness” and body pain, as well as for fever, headache, and cough.  

We could not detect an association between use of informal health-care providers and HCV infection in women because neither HCV-infected nor HCV-uninfected women reported using informal health-care providers. It was surprising to find no women reporting such use, and ethnographic research is needed to determine whether these women failed to report use, had reduced access to use, or did not choose to use informal providers.  

Although the association was not statistically significant, we were surprised that HCV-infected women sought health care from a local hospital less often in the prior six months than HCV-uninfected women. This finding was contrary to results from a 1995 study in Sweden, where significantly more HCV-infected blood donors reported having been hospitalized compared with HCV-uninfected blood donors.  

It is possible that in a culture that holds women to very high standards of morality, riskier, HCV-infected women were reluctant to access conventional health care, including hospitals. However, more research is needed to assess the reliability of these results and describe these associations in social and cultural contexts.  

Results should be interpreted while acknowledging study limitations. First, we examined the association of HCV and exposure to informal health-care providers or “quacks” instead of exploring the association of HCV infection and injection exposures directly. Although we asked about therapeutic injections in the interviews, we believe that the validity of responses to those questions was adversely affected by imperfect translations unwittingly linking licit to illicit injection, and by undesirable placement between questions on sex behavior and illicit injection drug use. In our study, less than one percent (0.06%) reported receiving any injection in the prior three months. These results differ starkly from those found in other studies, and particularly an assessment of injection risk in the general population of Chennai in which over half of the population reported having received a therapeutic injection in the prior six months.  

Though exposure to quacks may have been an imperfect surrogate marker for exposure to therapeutic injections, because of the absence of stigma attached to use of health care, we felt that the validity of responses to these questions was superior to that of questions about injection exposure. Moreover, the link between use of informal health-care providers and unsafe injections in the developing world has been established previously.  

Because all behavioral risk data relied on self-reported risk, associations of high-risk behavior and disease may be underestimated across risk behaviors. When answering questions about sensitive behaviors, participants may have given what they perceived to be socially desirable responses. The traditional structure of Indian society, which lends itself to close monitoring and scrutiny of the behavior of women, may lead women to have more of a perceived need to give socially desirable responses than men. While socially desirable responding may explain in part why we could not detect substantial high-risk behavior in women, we see no reason that this bias should be more pronounced in HCV-infected compared with HCV-uninfected male or female participants. As such, this bias should not have adversely affected estimates of associations.  

Secondly, most studies confirm HCV test results with the recombinant immunoblot assay, but in this study, we used repeated positive results on EIA to confirm results. Though some misclassification of HCV test results may have resulted from adoption of this protocol, again, it is expected that this bias would occur without regard to exposure categories, and thus not affect measures of association of exposure and disease.  

Data on exposures and outcome were collected concurrently, so there is no way to know if exposures preceded HCV infection. Longitudinal studies are needed to establish temporality and would help researchers draw causal associations. The associations found in this study should be further explored in cohort studies.  

Finally, the results of this study may have limited generalizability to other cities. Because the participants of this study were randomly selected from the general population living in selected slums, conclusions and recommendations may be applicable only to other slum communities in Chennai, or other similar cities.  

According to these data, the risk of HCV infection in southern India is associated in men with use of informal health-care providers. This excess risk may be associated with exposure to reused needles in these settings.  

Public officials could use the results of this study to initiate development of clear: 1) regulations for screening of all blood products for HCV infection; 2) strategies for oversight of practices of health-care providers; and 3) plans for systematic disposal of contaminated medical waste.  

Furthermore, there is a great need for health educators to disseminate prevention messages regarding blood safety. It is worthwhile noting that no practitioners giving injections who were queried in a study in Karachi, Pakistan, knew that HCV could be transmitted through therapeutic injection, and in a separate study in Chennai, less than a tenth of injection prescribers, injection providers, and the general population knew that HCV could be transmitted through injections. Data from these studies underscore the need to promote awareness of the risks of disease acquisition through contaminated needles among both health-care providers and the public. Billboards and signs have been used widely to raise awareness about unprotected sex and HIV in Indian cities. Although there has been some effort to promote safe needle use to prevent HIV infection in India, advertisement campaigns should be expanded and should specifically encourage the purchase of a disposable needle for each health-care visit.  

More research is needed to determine the extent to which contaminated needles contribute to HCV infection. Studies have repeatedly shown that most Indians with minimal education prefer injections to oral administration of medications. With proper long-term investment, social marketing may be used to encourage the prescription and use of topical and ingestible therapeutics rather than injectables. Reducing the incidence of blood-borne infections due to health-care-related exposures would be an important step in controlling the spread of HCV infection in developing countries such as India.
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Authors’ addresses: Melissa A. Marx, Bureau of Communicable Disease, New York City Department of Health and Mental Hygiene, 125 Worth St., Room 318, New York, NY 10013. K.G. Murugavel, P. Balakrishnan, S. Anand, Suniti Solomon, YR Gaitonde Centre for AIDS Research and Education, 1 Raman St., T. Nagar Chennai, Tamilnadu, India. Sudha Sivaram, Mark Steinhoff, and David Celeniano, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe St., Rm E6136, Baltimore, MD 21205. David L. Thomas, Johns Hopkins University School of Medicine, 424 N. Bond St., Baltimore, MD 21231.

Reprint requests: Melissa A. Marx, Bureau of Communicable Disease, New York City Department of Health and Mental Hygiene, 125 Worth St., Room 318, New York, NY 10013. K.G. Murugavel, P. Balakrishnan, S. Anand, Suniti Solomon, YR Gaitonde Centre for AIDS Research and Education, 1 Raman St., T. Nagar Chennai, Tamilnadu, India. Sudha Sivaram, Mark Steinhoff, and David Celeniano, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe St., Rm E6136, Baltimore, MD 21205. David L. Thomas, Johns Hopkins University School of Medicine, 424 N. Bond St., Baltimore, MD 21231.

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