



HAL
open science

Hcv Reinfection in Active Drug Users from Facts to Explanations and Possible Solutions

Andre-Jean Remy, Jonathan Del-Monte, J. Hervet, H. Bouchkira, S. Djazouli,
A. Happiette, N. Ariza

► **To cite this version:**

Andre-Jean Remy, Jonathan Del-Monte, J. Hervet, H. Bouchkira, S. Djazouli, et al.. Hcv Reinfection in Active Drug Users from Facts to Explanations and Possible Solutions. *Journal of Drugs Addiction & Therapeutics*, 2024, 5 (2), pp.1 - 7. 10.47363/jdat/2024(5)147 . hal-04584675

HAL Id: hal-04584675

<https://hal.science/hal-04584675>

Submitted on 23 May 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Research Article
Open Access

Hcv Reinfection in Active Drug Users from Facts to Explanations and Possible Solutions

Remy AJ*, Del Monte J, Hervet J, Bouchkira H, Djazouli S, Happiette A and Ariza N

Mobile Hepatitis Team, Perpignan Hospital, France

ABSTRACT

Background and Aims: Perpignan (in south of France) was 600 000 people very low-income area. Main sociological characteristics associated, many homeless and drugs users local insecurity therefore low-price cocaine, national attractiveness for consumers and traffickers, overconsumption with these lower price, local manufacture of cannabis and road transport effects redistribution of drugs purchased in Spain. This was the only place where coke rail was sold under 5 dollars, 50% lower than the price in the rest of France. Mobile hepatitis team (MHT) was created in 2013 and cured about 1000 HCV patients in an outreach and test to cure approach. MHT used HCV POCT, HCV real time viral load, liver fibrosis measure by FIBROSCAN and nurse DAA prescription. For 2 years, MHT observed increase of reinfections.

Method: Observational and Sociological Study of HCV Reinfections.

Results: In 2023, MHT (nurses (44%) and hepatologist (56%) prescriptions) treated 89 HCV patients: men 68%, mean age 46 years, reinfection rate 21%. This rate was higher (31%) in patients treated by nurses. They were younger, more often homeless, and active drugs users. A clinical psychological study by patients' interview showed than reinfected patients were younger, lower educational level, more often homeless, with history of psychiatric illnesses and prison. There was no correlation with precariousness score. More the patient thinks that he was responsible for his illness, the more impulsive he was (dimension urgency emotional impulsiveness). More the patient was aware of the consequences of his illness, the more impulsive he was (dimension urgency emotional impulsivity). The more impulsive the patient was (total score, emergency emotional impulsivity dimension), higher the neuroticism score (negativist personality trait). We individualized 2 specific groups of reinfected patients : gypsies in prison and homeless in the city. More the patient participates in harm reduction workshops, the more he feels responsible for his illness and the consequences of his illness, with magical thoughts about his contamination. The paradoxical outcome was people reinfected had more risk and harm reduction sessions after first infection. There was no fear about DAA treatment as HCV interferon and ribavirin treatment. DAA are always well tolerated and efficient, even in reinfection.

Conclusion: Direct-acting antivirals are an effective tool for the treatment of hepatitis C virus, enabling the elimination of the virus. However, some patients who have been successfully treated with direct-acting antivirals are at risk of reinfection. Our findings showed that the risk of reinfection was highest among people with reactive injection drug use. In low-income population exposed to cocaine and other low price drugs, HCV reinfection was a trivialized life event. For reduce it, MHT had set up 3 specific projects: 1. home screening in gypsy women and neighborhood 2. Peers fingersticks HCV screening in homeless people and orientation of HCV positive patients to MHT 3. Prison zero hepatitis program with all HCV inmates same time treatment. Combination of these projects reduced to 22% rate of HCV reinfection in active drugs users during first quarter of their deployment.

*Corresponding author

Remy AJ, Mobile Hepatitis Team, Perpignan Hospital, France.

Received: March 22, 2024; **Accepted:** March 25, 2024; **Published:** April 05, 2024

Keywords: Direct Acting Antiviral Agents, Hcv, Nurse, Gypsy, Reinfection, Drug Users, Prision

- Discussion
- Conclusion

Plan of Article

- General introduction
- State of art of HCV reinfections in literature
- Mobile hepatitis Team summary
- Perpignan area characteristics
- Psychological reinfection study
- Prison zero hepatitis
- Gypsy women screening project HCV screening among the women of gypsy neighborhood
- Peers POCT screening in homeless people and orientation of HCV positive patients to MHT

General Introduction

In 2016, the World Health Organization (WHO) set an ambitious goal to eliminate hepatitis C as a major public health threat by 2030 [1]. Specific targets include increasing sterile needles/syringes distributed from 20 to 200 per person per year for PWID, reducing new hepatitis C infections by 80% and hepatitis C-related deaths by 65%, increasing hepatitis C diagnoses from <20% to 90% and the number of people receiving hepatitis C treatment from less 10% to 80%. Drug injection was main contamination route of hepatitis C virus (HCV) in France and western Europe since 1990 [2]. Although highest European HCV screening rate in France,

33% of patients didn't take care of hepatitis C because there were no diagnosed [3]. On 2018, the International Network of Hepatitis in Substance Users (INHSU) published recommendations for good practices about HCV pathway on drug users Emphasizing the treatment of all drug users to minimize contamination and re-infection [4]. Since the release of the first global hepatitis elimination targets in 2016, and until the COVID-19 pandemic started in early 2020, many countries and territories were making progress toward hepatitis C virus (HCV) elimination. This study aims to evaluate HCV burden in 2020, and forecast HCV burden by 2030 given current trends. This analysis includes a literature review, Delphi process, and mathematical modelling to estimate HCV prevalence (viraemic infection, defined as HCV RNA-positive cases) and the cascade of care among people of all ages (age ≥ 0 years from birth) for the period between Jan 1, 2015, and Dec 31, 2030. Epidemiological data were collected from published sources and grey literature (including government reports and personal communications) and were validated among country and territory experts. A Markov model was used to forecast disease burden and cascade of care from 1950 to 2050 for countries and territories with data. Model outcomes were extracted from 2015 to 2030 to calculate population-weighted regional averages, which were used for countries or territories without data. Regional and global estimates of HCV prevalence, cascade of care, and disease burden were calculated based on 235 countries and territories. Models were built for 110 countries or territories: 83 were approved by local experts and 27 were based on published data alone. Using data from these models, plus population-weighted regional averages for countries and territories without models ($n=125$), we estimated a global prevalence of viraemic HCV infection of 0.7% (95% UI 0.7-0.9), corresponding to 56.8 million (95% UI 55.2-67.8) infections, on Jan 1, 2020. This number represents a decrease of 6.8 million viraemic infections from a 2015 (beginning of year) prevalence estimate of 63.6 million (61.8-75.8) infections (0.9% [0.8-1.0] prevalence). By the end of 2020, an estimated 12.9 million (12.5-15.4) people were living with a diagnosed viraemic infection. In 2020, an estimated 641 000 (623 000-765 000) patients initiated treatment. At the beginning of 2020, there were an estimated 56.8 million viraemic HCV infections globally. Although this number represents a decrease from 2015, our forecasts suggest we are not currently on track to achieve global elimination targets by 2030. As countries recover from COVID-19, these findings can help refocus efforts aimed at HCV elimination (4).

Almost 90 per cent of the 57 million people living with hepatitis C live in low- and middle-income countries, but only half of these countries currently provide curative treatments at an accessible cost. The finding is part of a recent analysis which has examined the registration, reimbursement and restrictions for hepatitis C treatments across 160 countries globally [5]. These countries represent approximately 95 per cent of the global population. "Current direct-acting antiviral treatments cure hepatitis C in more than 95 per cent of people, revolutionising the way we manage this condition. But there remains a high cost to the treatment in most countries, which has led to a disparate rollout globally, with many countries placing restrictions both on who can access it and who can prescribe it. Universal access to health coverage means all people should have access to the full range of quality services they need – irrespective of who they are, where they are born, or the nature of their health condition. According to the research, of the 160 countries analysed, 91 per cent have at least one hepatitis C treatment registered, but only two thirds of countries provide their residents with access to reimbursed (subsidised) treatment.

Among low- and middle-income countries, just over half provide reimbursement. Seven countries restrict access based on drug use and five based on alcohol use. "Most people living with hepatitis C globally are marginalised and face multiple challenges to accessing care. If cost is a barrier to seeking cure, they are unlikely to seek treatment, which poses risks for their health, as well as for onward transmission. Another barrier to accessing curative treatment is who can prescribe the medications. The analysis found that in 61 per cent of countries, a specialist (e.g., a liver disease specialist or infectious disease specialist) was required to prescribe the medication. This restriction reduces the proportion of available prescribers and most often requires patients to receive treatment from a specialist centre, often hospital-based. This is a major barrier for marginalised population groups such as people who use or inject drugs – people who are more likely to experience stigma in healthcare settings and avoid attending hospital-based centres. Increasing task sharing of hepatitis C testing and treatment to non-specialised centres such as primary care centres would broaden access. Eliminating viral hepatitis will prevent hundreds of thousands of lives lost to liver cancer and other liver diseases resulting from chronic hepatitis.

State of Art of HCV Reinfections in Literature

Drug users are a reservoir of hepatitis C. Most addictological structures as well as general practitioners involved in addictology have embarked on the race for eradication. The job is done, and today drug addicts are most often cured of their virus. There are many recent studies about reinfection in DAA treatment era [6-12]. The rate of HCV reinfection was 11.5 people year in a cohort of Dutch drug users (6). In addition, risk reduction programmes (opioid treatment and needle exchange) increased by 75 the relative risk of resection [9]. For martinelo et al one challenge to HCV elimination through therapeutic intervention is reinfection [10]. The aim of this analysis was to calculate the incidence of HCV reinfection among both HIV-positive and HIV-negative individuals treated for recent HCV infection (estimated infection duration <18 months). Individuals with recent HCV infection who achieved an end-of-treatment response in four open-label studies between 2004 and 2015 in Australia and New Zealand were assessed for HCV reinfection, confirmed by sequencing of the Core-E2 and/or NS5B regions. Reinfection incidence was calculated using person-time of observation. Exact Poisson regression analysis was used to assess factors associated with HCV reinfection. The cohort at risk for reinfection ($n=120$; 83% male; median age 36 years) was composed of HIV-positive men-who-have-sex-with-men (53%) and people who inject drugs (current 49%, ever 69%). Total follow-up time at risk was 135 person-years (median 1.08 years, range 0.17, 2.53). Ten cases of HCV reinfection were identified, for an incidence of 7.4 per 100 py (95% CI 4.0, 13.8). Reinfection incidence was significantly higher among participants who reported injection drug use at end of or post-treatment, irrespective of HIV status (15.5 per 100 py, 95% CI 7.8, 31.1). In adjusted analysis, factors associated with reinfection were older age (aIRR 5.3, 95% CI 1.15, 51.5, $P=.042$) and injection drug use at end of or post-treatment (aIRR 7.9, 95% CI 1.6, 77.2, $P=.008$). High reinfection incidence following treatment for recent HCV infection in individuals with ongoing risk behaviour emphasizes the need for post-treatment surveillance, harm reduction strategies and education in at-risk populations. All these studies show that in this community, there is 3 to 5% relapse and recontamination, so they must be treated quickly by increasing access to RDRD devices, otherwise a new wave of hepatitis C epidemics will flare up. But can we do better than that overall figure 1 of 3% to 5%? What is the profile of these patients? And how to find

them? Other studies shed light on this subject. To understand, we must introduce the concept of patients/years/cured. When talking about 50 patients/years it can mean the follow-up of 5 patients for 10 years, or 10 patients for 5 years, or 25 patients for 2 years. Patient follow-up was divided into 3 groups: group 1, those who no longer had any injection practice; group 2, those who inject less than once a day (they can be described as occasional); group 3: those who inject multiple times per day. In group 1, there is no recontamination. In group 2, recontamination remains exceptional. In group 3, they are the most important.

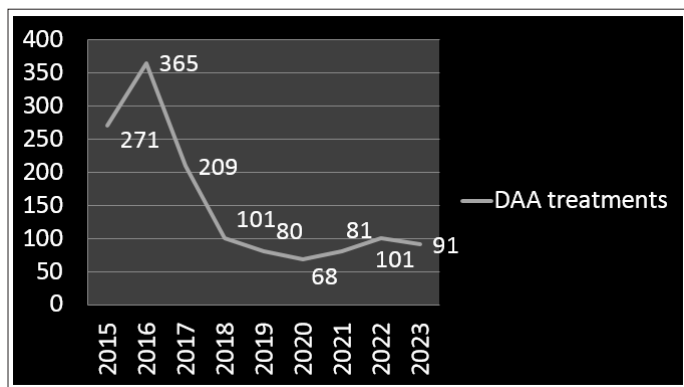


Figure 1: HCV Patients Treated and Reinfected

Other studies tell us that recontamination occurs most often in the first year after recovery. We better understand the robot-portrait of the relapse: «this is the one who resumes injections regularly after his hepatitis C treatment». Yes, but the problem is to identify it? Injection practices are not always disclosed, or even simply admitted [6-7].

For Sacks and al re-infection after successful treatment with direct-acting antivirals is hypothesised to undermine efforts to eliminate hepatitis C virus (HCV) infection among people with HIV [11]. We aimed to assess changes in incidence of HCV re-infection among people with HIV following the introduction of direct-acting antivirals, and the proportion of all incident cases attributable to re-infection. They pooled individual-level data on HCV re-infection in people with HIV after spontaneous or treatment-induced clearance of HCV from six cohorts contributing data to the International Collaboration on Hepatitis C Elimination in HIV Cohorts (InCHEHC) in Australia, Canada, France, the Netherlands, Spain, and Switzerland between Jan 1, 2010, and Dec 31, 2019. Participants were eligible if they had evidence of an HCV infection (HCV antibody or RNA positive test) followed by spontaneous clearance or treatment-induced clearance, with at least one HCV RNA test after clearance enabling measurement of re-infection. We assessed differences in first re-infection incidence between direct-acting antiviral access periods (pre-direct-acting antiviral, limited access [access restricted to people with moderate or severe liver disease and other priority groups], and broad access [access for all patients with chronic HCV]) using Poisson regression. They estimated changes in combined HCV incidence (primary and re-infection) and the relative contribution of infection type by calendar year. Overall, 6144 people with HIV who were at risk of HCV re-infection (median age 49 years [IQR 42-54]; 4989 [81%] male; 2836 [46%] men who have sex with men; 2360 [38%] people who inject drugs) were followed up for 17 303 person-years and were included in this analysis. The incidence of first HCV re-infection was stable during the period before the introduction of direct-acting antivirals (pre-introduction period; 4.1 cases per 100 person-years, 95% CI 2.8-6.0). Compared with

the pre-introduction period, the average incidence of re-infection was 4% lower during the period of limited access (incidence rate ratio [IRR] 0.96, 95% CI 0.78-1.19), and 28% lower during the period of broad access (0.72, 0.60-0.86). Between 2015 and 2019, the proportion of incident HCV infections due to re-infection increased, but combined incidence declined by 34%, from 1.02 cases per 100 person-years (95% CI 0.96-1.07) in 2015 to 0.67 cases per 100 person-years (95% CI 0.59-0.75) in 2019. For analyzed data from the British Columbia Hepatitis Testers Cohort which included 1.7 million individuals screened for HCV in British Columbia, Canada [12]. We followed HCV-infected individuals treated with DAAs who achieved a sustained virologic response (SVR) and had ≥ 1 subsequent HCV RNA measurement to April 22nd, 2018. Re-infection was defined as a positive RNA measurement after SVR. PWID were identified using a validated algorithm and classified based on recent (<3 years) or former (≥ 3 years before SVR) use. Crude re-infection rates per 100 person-years (PYs) were calculated. Poisson regression was used to model adjusted incidence rate ratios (IRRs) and 95% CIs. Of 4,114 individuals who met the inclusion criteria, most were male ($n = 2,692$, 65%), born before 1965 ($n = 3,411$, 83%) and were either recent ($n = 875$, 21%) or former PWID ($n = 1,793$, 44%). Opioid-agonist therapy (OAT) was received by 19% of PWID. We identified 40 re-infections during 2,767 PYs. Re-infection rates were higher among recent (3.1/100 PYs; IRR 6.7; 95% CI 1.9-23.5) and former PWID (1.4/100 PYs; IRR 3.7; 95% CI 1.1-12.9) than non-PWID (0.3/100 PYs). Among recent PWID, re-infection rates were higher among individuals born after 1975 (10.2/100 PYs) and those co-infected with HIV (5.7/100 PYs). Only one PWID receiving daily OAT developed re-infection. They could conclude that population-level re-infection rates remain elevated after DAA therapy among PWID because of ongoing exposure risk. Engagement of PWID in harm-reduction and support services is needed to prevent re-infections.

In conclusion, HCV re-infection incidence and combined incidence declined in people with HIV following direct-acting antiviral introduction, suggesting re-infection has not affected elimination efforts among people with HIV in InCHEHC countries. The proportion of incident HCV cases due to re-infection was highest during periods of broad access to direct-acting antivirals, highlighting the importance of reducing ongoing risks and continuing testing in people at risk.

Mobile Hepatitis Team Summary

From 2016 French Health Ministry guidelines and French hepatology association recommendations were to treat all inmates and drug users, even fibrosis level with direct antiviral agents (DAA) [13,14]. Also, HCV treatment for all was effective in France since 2017. Success rate of DAA, one or two pills per day for 8- or 12-weeks therapy, was 95 to 97%. Before that, access of HCV screening, care and treatment in drugs users, prisoners and homeless was low in France. They were considered as difficult to treat populations. All these patients need support especially psycho-educative interventions. Perpignan (in south of France) is very low-income area of 600 000 people. There were many active drugs users. Main characteristics associated local insecurity therefore low-price cocaine, national attractiveness for consumers and traffickers, overconsumption with these lower price, local manufacture of cannabis and road transport effects redistribution of drugs purchased in Spain. This was the only place in France where coke rail was sold between 2 to 5 dollars, 50% lower than the price in the rest of France. There was also high number of homeless including women and children and community migrants.

The Mobile Hepatitis Team (MHT) was set up in 2013, following the publication of a scientific report on reducing risks of infection amongst drugs users in 2011 (2), which recommends screening all drug users for HCV and establishing multidisciplinary clinics with 'all-in-one' screening to treatment and providing medical and social care. MHT main objective was to increase outreach screening care treatment access and cure of our target population. Target population was drugs users, prisoners, homeless, precarious people, migrants and psychiatric patients. MHT was composed of 1 hepatologist, 3 nurses, 1 secretary, 1 social worker, one health care worker, for a cross-disciplinary approach. Resources include two specific cars, on van, serology point-of-care testing (POCT), and two mobile FIBROSCAN®. Forty-two different medical and social units were partners: low and high threshold drug units, retention and detention center medical units, outside psychiatric units, emergency and homeless food/hosting units. We proposed part or all of our services to our medical and social partners. There were 15 services for half million people area in south of France. All services were free for patients and for partners. Services were organized in 4 successive steps:

For Early Detection and Primary Prevention

- On-sites screening by serology Point of Care Testing PDBS (dried blood test) for HIV HBV HCV
- Green thread: outside dried blood test (DBS) and FIBROSCAN® in specific converted truck in outdoor sites.
- BOUSSOLE, an outreach open center 5 days a week for reception, orientation information and support of vulnerable people
- Prevention information sessions toward drug users in day-care or housing structures
- Free blood tests in primary care for patients without social insurance
- Training of socio-medical institutions staff with trimestral days of exchange or on-demand and on-premises.

For Linkage to Care and Fibrosis Assessment

- Social screening and diagnosis (by using EPICES, specific social score)
- On-premises mobile FIBROSCAN® for indirect measurement of liver fibrosis in site
- Advanced on-site liver specialist consultations.

For Access to Treatment

- Easy and rapid access to pre-treatment commission with hepatologists, nurses, pharmacist, social worker, GP, psychiatric and/or addictologist
- DAA nurse prescription
- Low cost mobile phones lending to patients to keep in touch with MHT
- For follow up during and after treatment
- Individual sessions of therapeutic education inside an ARS (Regional Health Agency) authorized program.
- Collective educative workshops (nurse, psychologist, sophrologist, nutritionist, pharmacist).
- Dedicated cirrhotic patients one day hospitalizations

Mobile hepatitis team (MHT) cured more than 1000 HCV patients in 10 years in an outreach and test to cure approach with using HCV POCT, HCV real time viral load by GENEXPERT system, liver fibrosis measure by FIBROSCAN and nurse DAA prescription, specially in prisons, drugs centers, pharmacies, homeless shelters [14-23].

Perpignan Area Characteristics

Perpignan (in south of France) is the center of 600 000 people very low-income area. There were many active drugs users. Main sociological characteristics associated local insecurity therefore low-price cocaine, national attractiveness for consumers and traffickers, overconsumption with these lower price, local manufacture of cannabis and road transport effects redistribution of drugs purchased in Spain. This was the only place in France where coke rail was sold between 2 to 5 dollars, 50% lower than the price in the rest of France. There was also high number of homeless including women and children and community migrants. For 2 years, MHT observed increase of reinfections from 12% to 37% of treated patients. These patients were younger and more often homeless and active drugs users. For reduce it, MHT had set up 3 specific projects: 1. home screening in gypsy women and neighborhood 2. Peer POCT screening in homeless people and orientation of HCV positive patients to MHT 3. Prison zero hepatitis program with all HCV inmates same time treatment. Combination of these projects reduced 22% rate of HCV reinfection in active drugs users during first trimester.

Psychological Reinfection Study

Prevalence of hepatitis C virus reinfection remains extremely high among drug users 2 to 10.5/100 persons per year. Literature recurrent HCV viremia interval (12/24 weeks) role in reinfection rate especially in populations with risky behaviors. No research has evaluated psychological vulnerability factors (cognitive, emotional and personality traits) that increase the risk of reinfection in these populations. Evidence of vulnerability factors maximizes the effectiveness of relapse prevention groups by detecting populations most at risk. Our objectives were to propose offer patients different questionnaires and scales allowing the evaluation of cognitive and emotional processes and personality traits. Number of HCV reinfections was also quantified by quantifying the C viral load. Secondary objective was to evaluate the influence of the patients' level of knowledge concerning the risk factors of contamination as well as the level of beliefs related to health. The used methodology was self-administration of a document including the EPICES precariousness score, cognitive tests, an impulsivity questionnaire (UPPS), a personality questionnaire (BIG 5), a questionnaire on the level of knowledge of risk factors for contamination and a questionnaire on health-related beliefs. There were 3 groups: patients, primary infected without reinfection, patients reinfected and people without HCV infection and drug use. It was realized during the initial diagnostic phase or post-treatment surveillance phase. It was a multi-site approach (low and high level drug centers, prison, homeless shelters) used to maximize recruitment. The estimated completion time between 30 and 45 minutes. In same time, we made collection of medico-social data from individuals carried out in parallel by a nurse from our team Thirty patients cured without reinfection, 16 patients reinfected by drug use and 31 controls ; 85% male, average age 42 years. Re-infected patients compared with patients without reinfection are younger, lower educational level, more often homeless and more often with history of psychiatric illnesses and prison. There was no correlation with the EPICES precariousness score. The re-infected patients analysis data showed that more the patient thinks that he is responsible for his illness, the more impulsive he is (dimension urgency emotional impulsiveness). More the patient is aware of the consequences of his illness, the more impulsive he is (dimension urgency emotional impulsivity). The more impulsive the patient is (total score + emergency emotional impulsivity dimension), the higher the neuroticism score (negativist personality trait). More neurotic and less extroverted that no reinfected patients and controls. We individualized two specific groups of patients

: gypsies in prison and homeless. And also the less the patient expresses the personality trait “awareness”, the more he/she shows a lack of perseverance in his/her behaviors (cognitive impulsivity). The more the patient expresses the “openness” personality trait, the more he/she sets up impulsive behaviors such as sensation seeking. The more the patient participates in harm reduction workshops, the more he feels responsible for his illness and the consequences of his illness - magical thoughts about his contamination (example item: “the simple fact of seeing someone who is ill is enough to make me ill too”). Beliefs about good health (being healthy, no pain, no discomfort) X 2.11 the risk of reinfection. Agreeableness” personality trait (sociability, gullible and manipulative behaviour) X 1.39 risk of reinfection. More higher the patients score, more frequent they are reinfected by HCV and increased X 9.11 the risk of reinfection. The paradoxical outcome is that people reinfected had more risk and harm reduction sessions after first infection so we could ask for Ineffectiveness of the harm reduction sessions. In fact, more sessions = more infections (max 7 HCV infections for same patient). In 2016 HVB study prevention sessions reduced HBV transmission not HCV transmission : « The HBsAg-positive rate decreased significantly after implementation of recently introduced HBV control programs in China. However, the anti-HCV–positive rate showed only a slight decrease, indicating that programs for the prevention and control of hepatitis viruses require continued strengthening [24]. In conclusion of this study, there are psychological and social vulnerability factors that increase HCV reinfection through active drug use. Targeted actions on the most at-risk patients are essential to contribute to the elimination of HCV in France and another countries.

In summary, this clinical psychological study by patients’ interview showed that reinfected patients were younger, lower educational level, more often homeless and with history of psychiatric illnesses and prison. There was no correlation with the EPICES precariousness score. More the patient thinks that he was responsible for his illness, the more impulsive he was (dimension urgency emotional impulsiveness). More the patient was aware of the consequences of his illness, the more impulsive he was (dimension urgency emotional impulsivity). The more impulsive the patient was (total score + emergency emotional impulsivity dimension), the higher the neuroticism score (negativist personality trait). We individualized 2 specific groups of reinfected patients : gypsies in prison and homeless in the city. The more the patient participates in harm reduction workshops, the more he feels responsible for his illness and the consequences of his illness, with magical thoughts about his contamination. The paradoxical outcome was people reinfected had more risk and harm reduction sessions after first infection. There was no fear about DAA treatment as “old” HCV treatment including interferon and ribavirin. DAA are well tolerated and efficient, even in reinfection with same regimen. In conclusion, in low-income population exposed to cocaine and other drugs low price, HCV reinfection was a trivialized life event.

Prison Zero Hepatitis Program with all HCV Inmates Same Time Treatment

Hepatitis C virus (HCV) infection rate was higher among prisoners than general population. Care was difficult because rate of screening was not sufficient. Prison zero hepatitis was an original project to eliminate HCV infection in one prison. Our objective was to increase rate of screening among prisoners and treat every patient to eliminate HCV infection in one prison. One training nurse done weekly session of screening by HCV dried blot test, FIBROSCAN* and measure HCV viral load in real time for prisoners who refused HCV serology at beginning

of incarceration or after 6 and 12 months if initial screening was negative. In 3 years HCV rate of screening HCV increased from 68% to 98%; 93% of viremic patients were treated. Conclusion: The one-step screening, diagnosis and treatment will achieve an increase in diagnosed patients, will increase the access of chronic patient to treatment and will generate cost savings, demonstrating its efficiency in the system in prison. Evolution of HCV testing for 2017 to 2022 were available. With PZH program, 98% of inmates will be tested. Only 2% of prisoners refused HCV DBS. PZH nurse also done 896 HCV DBS to prisoners who had 6 and 12 months incarceration period with negative initial HCV serology. HCV prevalence increased from 6 to 9% between 2018 and 2022: 242 patients had HCV positive serology but only 75 had HCV positive viral load. All these patients had measure of liver fibrosis by FIBROSCAN: 45% had fibrosis level F0F1, 19% F2, 21 F3 and 15% F4. Two patients were negative at entry and positive at six months. Six patients were cured and were re-infected six to twelve months later. Ninety three percent of patients with positive viral load started treatment [18].

Gypsy Women Screening Project HCV Screening Among the Women of Gypsy Neighborhood

There were a few data about gypsy health [25-26]. HCV prevalence was higher in the gypsy population than in the general population in France. UDIV were more frequent in male but also in women. Gypsy women do not trust the usual care circuit. Our mobile hepatitis team (one nurse and one social worker) used to conduct home visits for DAA treatment follow-up. During a home visit in the Gypsy district, we established contacts with a group of gypsy women who had the ability to get together. They expressed interest in home-based HCV screening for women only, outside the presence of their family male members. Our team was helped by a gypsy community association. The nurse and the social worker visited the gypsy district once a week (3 hours on average) to propose HCV fingerstick POCT screening at home. If test was positive, they realize liver fibrosis measure by mobile FIBROSCAN and HCV real time viral load by GENEXPERT system. DAA treatment could be prescribed if necessary by nurse under a medical delegation protocol. Depending on the risk factors, HIV and HBV POCT was proposed. After three months of preparatory meetings with communaux actors, the project began on October 1, 2022 ; 61 HCV tests were carried out, 43 women but also 18 men from their family. Twelve tests were positive with 75% HCV viral load positive. The HCV antibody prevalence was 19,6%. All RNA positive patients were treated with excellent compliance to DAA. All HBV and HIV tests were negative. HCV home screening in a gypsy neighborhood is effective and reaches populations far from care for social and cultural reasons with high prevalence of active HCV infection. Starting with screening women can then screen for men in the community who have never been HCV tested and contribute to increase harm reduction.

Peers POCT Screening in Homeless People and Orientation of HCV Positive Patients to MHT

From 2016 French Health Ministry guidelines and French hepatology association recommendations were to treat all inmates and drug users, even fibrosis level with direct antiviral agents (DAA). Nevertheless, access of HCV screening, care and treatment in drugs users, prisoners and homeless was low in France. The Mobile Hepatitis Team (MHT) was set up in 2013 and already cured almost 1000 HCV patients in 10 years in an outreach and test to cure approach. MHT used HCV POCT, HCV real time viral load by GENEXPERT system, liver fibrosis measure by FIBROSCAN and DAA nurse prescription. Despite all our actions, there persisted drug users not detected and/ or not treated in our 700 000 people

area of operations. We have also highlighted more and more HCV recontaminated patients in our local experience (27% of total HCV treated patients by our team in 2022). Our objective of the study was to find HCV patients who are not screened or treated by a screening action performed by trained peers and refer them to a hepatitis mobile team in a test and cure approach., in the street or drug use spots. After 2 days specific training, we recruited 12 peer patients to perform HCV quick tests by fingersticks with drug users never detected or no longer knowing the result of previous screenings. All patients screened received an information leaflet and gave their consent to participate in the study. The peer patients were remunerated on the number of tests performed, regardless of the HCV result. We have planned to screen 450 drug users in 6 months. We contacted 21 drug users who had agreed to participate in the project but only 12 of them came to do the training. The first screening took place on February 15, 2024. As of February 29, 2024, 50 tests were performed including 9 positives. Six patients were HCV RNA positive and were treated by DAA. Three patients were in a situation of recontamination by drug use. The typical patient of recontamination group was a man, 40 years, drug user and homeless. These preliminary results support the hypothesis that peer HCV screening was simple and effective tool that frees up physician time, enhances nursing work and increased HCV cured patients, who were never been engaged in care process without this peer screening. There are no disadvantages highlighted after one month of operation. The strengths of this study are that the data were comprehensive and there was a large cohort of patients engaged in the screening action.

All the actions implemented by our team, which is in addition to the actions usually carried out, allowed a significant decrease in the HCV re-infection rate, decreased to 22% (figure 2). They confirm the results of previous studies [27-30].

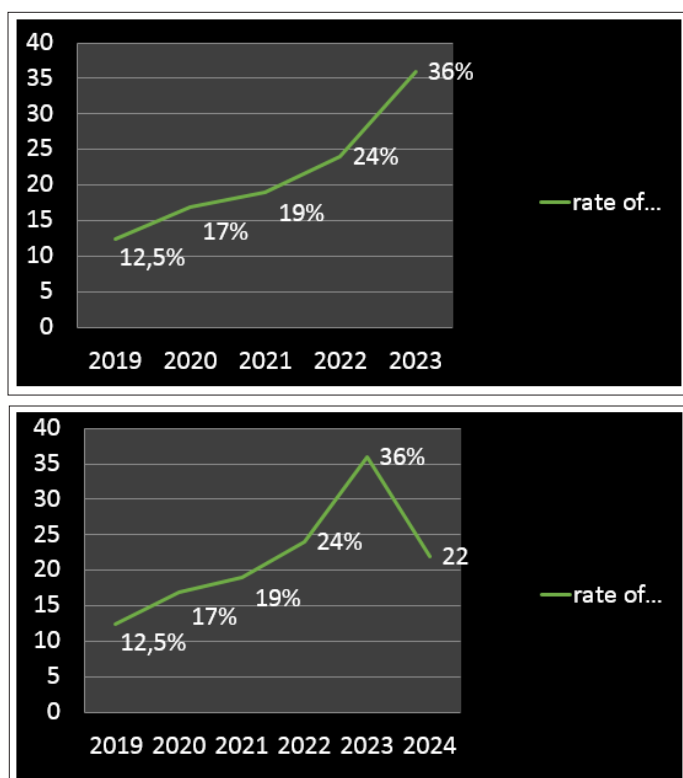


Figure 2: 2024 Rate of HCV Reinfection

Discussion

HCV reinfection in drugs users is most common in DAA era but remains avoidable. So here is our proposal: after treatment, we should make «controls healings». It is known that serology (including TROD) has no interest (it will remain positive after healing). It is therefore necessary to make PCR in direct search of the virus, either by a venous sample, or by capillary sample. Why not make lists of cured patients, with their consent, to offer them to participate in healing control days that would be reserved for them. HCV RNA could then be done in real time (with a GeneXpert on site for example) associated with the evaluation of elastomeric fibrosis (with a FibroScan®). There are those who are virologically cured and who will probably be happy to see their fibrosis regress, but there are also those who will have attacked their liver otherwise (alcohol, weight gain, other viruses) for which there may be another fibrotic liver disease that can lead to cirrhosis. Whatever strategy you use, you need to track down recontamination, not patients. Screening and screening again will be necessary.

Conclusion

We have to explained the importance of maintaining this pivot to patient-centred care – where diagnostic testing takes place where the patient is – but remembering that there is “no one size fits all approach” – every community is different and will require different tests, tools, and approaches. The one thing that remains the same no matter the environment, is that scaling up implementation of point-of care testing methods is about more than just the tests themselves. the emergence of the ‘one-stop-shop’ model which aims to bring hepatitis C diagnosis, treatment and care into the same location to minimise patient drop off. It ‘s a daily team effort. Upskilling people already working in the field, and integrating screening into normal duties, is an important solution to overcome workforce challenges in this setting [31].

Conflicts of Interest: Only the HCV screening peers project was supported par GILEAD Sciences grant.

References

1. (2030) Combating hepatitis B and C to reach elimination by. WHO <https://www.who.int/hepatitis/publications/hep-elimination-by-2030-brief/en/>.
2. (2011) Reducing risks of infection amongst drug users. Inserm 2011 <http://english.inserm.fr/thematiques/public-health/collective-expert-reports>.
3. Pioche C, Pelat C, Larsen C, Desenclos JC, Jauffret-Roustide M, et al. (2011) Estimation of hepatitis c prevalence in the general population metropolitan France. Bull Epidemiol Hebd 13-14: 224-229.
4. Day E, Hellard M, Treloar C, Bruneau J, Martin NK, et al. (2018) Hepatitis C elimination among people who inject drugs: Challenges and recommendations for action within a health systems framework. Liver International 39: 20-30.
5. Polaris Observatory HCV Collaborators (2022) Global change in hepatitis C virus prevalence and cascade of care between 2015 and 2020: a modelling study. Lancet Gastroenterol Hepatol 7: 396-415.
6. Chromy D, Mandorfer M (2024) Are reinfections undermining HCV elimination efforts? Lancet HIV 11: e68-e69.
7. Garvey L, Cooke GS (2022) Engaging with HCV reinfection to advance microelimination. Lancet HIV 9: e372-e374.
8. Platt L, Minozzi S, Reed J, Vickerman P, Hagan H, et al. (2018) Needle and syringe programmes and opioid substitution

- therapy for preventing HCV transmission among people who inject drugs: findings from a Cochrane Review and meta-analysis. *Addiction* 113: 545-563.
9. Newsum AM, Matser A, Schinkel J, van der Valk M, Brinkman K, et al. (2021) Incidence of HCV reinfection among HIV-positive MSM and its association with sexual risk behavior: a longitudinal analysis. *Clin Infect Dis* 73: 460-467.
 10. Martinello M, Grebely J, Petoumenos K, Gane E, Hellard M, et al. (2017) HCV reinfection incidence among individuals treated for recent infection. *J Viral Hepat* 24: 359-370.
 11. Sacks-Davis R, Van Santen D, Boyd A, Young J, Stewart A, et al. (2024) Changes in incidence of hepatitis C virus reinfection and access to direct-acting antiviral therapies in people with HIV from six countries, 2010-19: an analysis of data from a consortium of prospective cohort studies. *Lancet HIV* 11: e106-e116.
 12. Rossi C, Butt ZA, Wong S, Buxton JA, Islma N, et al. (2018) Hepatitis C virus reinfection after successful treatment with direct-acting antiviral therapy in a large population-based cohort. *J Hepatol* 69: 1007-1014.
 13. (2016) Treatment and follow up of people infected with HCV: recommendations expert file ANRS AFEF. *EDP Sciences* 1-108.
 14. Remy AJ (2019) Hospital Zero Hepatitis: Easy and Useful. *Acta Scientific Gastrointestinal Disorders* 2: 2-5.
 15. Remy AJ, Ruiz JM, Alarcon P, Gobin C, Guichard JC, et al. (2019) Excellent Completion Rate of 8-Weeks Hepatitis C Treatment in Prison; Results of French National Study. *Journal of Advanced Pharmaceutical Science and Technology* 2: 38-43.
 16. Remy AJ, Bouchkira H, Hervet J, Happiette A, Wenger H (2019) Successful cascade of care and cure HCV in 5382 drugs users how increase HCV treatment by outreach care since screening to treatment. *Journal of Digestive Disorders and Diagnosis* 1: 27-35.
 17. Remy AJ, Bouchkira H, Hervet J, Happiette A, Wenger H (2019) Mobile Hepatitis Team: a new pathway of HCV outreach care since screening to treatment. *Gut and Gastroenterology* 2: 1-6.
 18. Remy AJ, Roy B, Hervet J (2021) The 'Prison Zero Hepatitis' project in France: A new pathway for HCV microelimination. *Heroin Addict Relat Clin Probl* Published Ahead of Print 23: 61-64.
 19. Remy AJ, Bouquie R, Hervet J (2021) Management of Hepatitis C in Psychiatric Settings Review of The Literature and Review of Experiences Over 4 Years in A Psychiatric Hospital. *Gastroint Hepatol Dig Dis* 4: 1-4.
 20. Remy AJ, Bouchkira H, Hervet J (2020) Test to cure increase outreach linkage to care by use of real time HCV viral load EASL liver congress 2019 poster 250 : 10-14.
 21. Remy AJ, Albert O, Puget E, Fontaine S, Bouchira H, et al. (2021) DEPIST`C PHARMA An innovative outreach HCV screening project in pharmacy for general population. *Open Journal of Gastroenterology and Hepatology* 6: 64.
 22. Remy AJ, Bouchkira H, Hervet J, Ariza N (2024) A Nurse Model of All Inclusive Care in The Era of Direct Acting Antiviral Therapy for Hepatitis C Virus Infection One Year First French Experience. *Ann Med Res Pub Health* 3: 1-8.
 23. Remy AJ, Happiette A, Hervet J, Bouchkira H, Courtaud S, (2024) et al. Viral Hepatitis and HIV Screening in Seasonal Mountain Workers Feasibility and Results of a First French Experiment. *J Clin Med Health Care* 1: 1-4.
 24. Vandentorren S, Roingard C (2019) Health effects of environmental determinants in Travellers. *Gypsy Studies* 3: 16-23.
 25. Parry G, Van Cleemput P, Peters J, Walters S, Thomas K, et al. (2007) Health status of Gypsies and Travellers in England. *J Epidemiol Community Health* 61: 198-204.
 26. Goward P, Repper J, Appleton L, Hagan T (2006) Crossing boundaries Identifying and meeting the mental health needs of Gypsies and Travellers. *J Ment Health* 15: 315-27. Cook B, Wayne GF, Valentine A, Lessios A, Yeh E (2013) Revisiting the evidence on health and health care disparities among the Roma A systematic review 2003-2012. *Int J Public Health* 58: 885-911.
 27. Nario S, Reynauld B, Blacklaws H, Boden S, Sud R, et al. (2021) A nurse practitioner model of care in the era of direct acting antiviral therapy for hepatitis C virus infection. *JGH Open* 5: 669-672.
 28. Ortiz-Paredes D, Amoako A, Lessard D, Engler K, Lebouché B Klein (2022) Potential interventions to support HCV treatment uptake among HIV co-infected people in Canada Perceptions of patients and health care providers. *Can Liver J* 5: 14-30.
 29. Grebely J, Tanya L Applegate , Philip Cunningham , Jordan J Feld (2017) Hepatitis C point of care diagnostics in search of a single visit diagnosis. *Expert Rev Mol Diagn* 17: 1109-1115.
 30. Aisyah DN, Shallcross L, Hayward A, Aldridge RW, Hemming S, et al. (2018) among vulnerable populations: A seroprevalence study of homeless, people who inject drugs and prisoners in London. *J Viral Hepat* 25: 1260-1269.
 31. Care of people with HBV or HCV virus recommendations expert file ANRS AFEF http://www.sante.gouv.fr/IMG/pdf/Rapport_Prise_en_charge_Hepatitis_2014.pdf.

Copyright: ©2024 Remy AJ. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.