
بسم الله الرحمن الرحیم

HCV in frequent blood recipients

By Dr Masood Ziaee

Professor *of Infectious Disease*

Hepatitis C in Hemodialysis

- **Patients with ESRD on hemodialysis (HD) are at greater risk of acquiring HCV :**

  - ✓ permanent vascular access
  - ✓ frequent exposure to possibly contaminated medical equipments.

- **Hepatitis C virus is a major cause of liver disease among chronic renal failure patients undergoing maintenance hemodialysis.**

Mostafa Alavi-Moghaddam, MD, MPH, AFSA*

Epidemiology of Hep C in HD

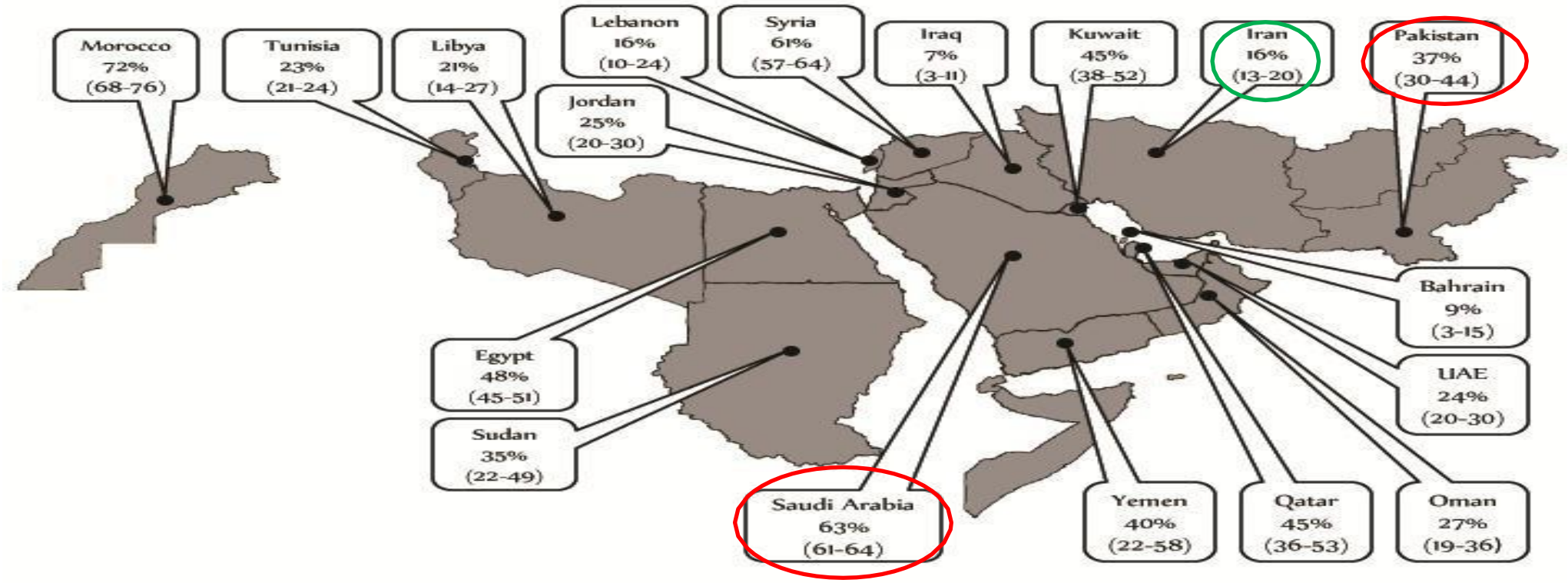
- **The prevalence of HCV infection among dialysis patients varies markedly from country to country**

- Ranging from 3% in North-western Europe (the Netherlands) to more than 76% in South East Asia (Indonesia)

- There is also a wide variation among dialysis centers within a single country.

Mostafa Alavi-Moghaddam, MD, MPH, AFSA*

Epidemiology of HCV Infection among hemodialysis patients in countries of EMRO



Alavian SM, et al. Epidemiology and risk factors of HCV infection among hemodialysis patients in countries of the Eastern Mediterranean Regional Office of WHO (EMRO): a quantitative review of literature. J Public Health (Oxf). 2011.

Epidemiol. Infect., Page 1 of 21.
doi:10.1017/S0950268817002242

Epidemiology of hepatitis C virus among hemodialysis patients in the Middle East and North Africa: systematic syntheses, meta-analyses, and meta-regressions

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. *Pooled mean estimate for hepatitis C virus (HCV) antibody prevalence among hemodialysis patients across countries of the Middle East and North Africa*

	Studies	Samples	HCV Prevalence across studies		Pooled HCV prevalence		Heterogeneity measures		
Country	Total *N*	Total *N*	Range (%)	Median	Mean (%)	95% CI	Q^a (*P*-value)	I^{2b} (95% CI)	Prediction interval[c] (%)
Algeria	3	4101	22·8–42·0	23·8	29·3	17·4–42·7	133·7 ($P < 0·0001$)	98·5 (97·4–99·1)	0·0–100
Egypt	26	4915	10·0–100	69·0	65·5	56·5–74·1	809·1 ($P < 0·0001$)	96·9 (96·2–97·5)	18·9–98·6
Iran	41	15 140	0–31·4	8·5	9·2	5·9–10·8	1076·5 ($P < 0·0001$)	96·3 (95·6–96·9)	0·0–29·4
Iraq	16	1353	0–42·9	14·3	16·6	9·0–25·7	248·2 ($P < 0·0001$)	94·0 (91·6–95·6)	0·0–62·1
Jordan	9	2730	20·5–59·5	32·5	36·1	27·4–45·2	120·7 ($P < 0·0001$)	93·4 (89·5–95·8)	9·0–69·1
Kuwait	3	1597	4·7–40·0	8·2	14·9	2·8–34·1	155·8 ($P < 0·0001$)	98·7 (97·8–99·2)	0·0–100
Lebanon	9	4214	0–27·0	5·6	7·3	3·7–11·7	159·0 ($P < 0·0001$)	95·0 (92·3–96·7)	0·0–27·1
Libya	5	3559	12·0–42·5	21·0	22·5	14·2–31·9	95·1 ($P < 0·0001$)	95·8 (92·7–97·6)	0·6–61·2
Morocco	7	1387	8·0–76·0	49·0	46·4	28·5–64·7	239·4 ($P < 0·0001$)	97·5 (96·3–98·3)	0·2–98·1
Pakistan	7	995	16·4–68·0	28·0	30·4	21·7–39·9	49·4 ($P < 0·0001$)	87·8 (77·3–93·5)	5·7–63·5
Palestine	12	1260	2·9–41·4	8·0	10·3	5·6–16·2	93·8 ($P < 0·0001$)	88·3 (81·4–92·6)	0·0–36·8
Saudi Arabia	39	43 250	18·9–78·2	46·9	47·4	43·7–51·1	998·1 ($P < 0·0001$)	96·2 (95·5–96·8)	26·8–68·4
Sudan	3	635	8·5–34·9	23·7	20·4	7·6–37·2	36·4 ($P < 0·0001$)	94·5 (87·3–97·6)	0·0–100
Syria	5	809	42·4–75·0	53·9	56·6	47·5–65·5	24·2 ($P < 0·0001$)	83·5 (62·6–92·7)	24·7–85·7
Tunisia	14	5602	14·6–46·5	29·8	27·4	22·6–32·5	194·4 ($P < 0·0001$)	93·3 (90·4–95·3)	10·3–48·9
Yemen	3	300	40·0–62·7	40·2	47·4	32·7–62·3	8·6 ($P = 0·010$)	76·8 (24·2–92·9)	0·0–100
Oman	1	102	–	–	26·5	18·2–36·1	–	–	–
Qatar	1	130	–	–	44·6	35·9–53·6	–	–	–
UAE	1	262	–	–	24·4	19·3–30·1	–	–	–
Pooled HCV prevalence stratified by temporal duration									
1989–1998	50	8964	15·7–100	46·5	51·6	46·1–57·1	1235·3 ($P < 0·0001$)	96·0 (95·4–96·6)	16·0–86·3
1999–2008	69	53 500	0·0–78·5	23·8	27·8	23·1–32·8	7325·6 ($P < 0·0001$)	99·1 (99·0–99·1)	0·8–71·6
2009–2016	86	29 877	0·0–94·1	9·7	18·8	14·5–23·5	7941·1 ($P < 0·0001$)	98·9 (98·8–99·0)	0·0–68·8
All countries	205	92 341	0–100	26·5	29·2	25·6–32·8	26 145·8 ($P < 0·0001$)	99·2 (99·2–99·3)	0·0–82·0

Pooled mean estimate for hepatitis C virus (HCV) viremic rate among hemodialysis patients across countries of the Middle East and North Africa. HCV viremic rate is the prevalence of HCV chronic infection (HCV RNA positivity) among antibody-positive persons

Country	Studies Total *N*	Samples Total *N*	HCV RNA prevalence among antibody positive persons		Pooled HCV viremic rate		Heterogeneity measures		
			Range (%)	Median	Mean (%)	95% CI	Q^a (*P*-value)	I^{2b} (95% CI)	Prediction interval[c] (%)
Iran	4	219	48·6–64·3	52·3	51·1	44·3–57·9	1·3 ($P = 0·7$)	0·0 (0·0–65·0)	36·4–68·8
Iraq	2	144	26·1–61·3	43·8	38·9	30·9–47·4	–	–	–
Jordan	1	92	–	–	31·5	22·2–42·0	–	–	–
Lebanon	2	63	30·4–65·0	47·7	39·7	27·6–52·8	–	–	–
Libya	1	32	–	–	72·0	53·2–86·2	–	–	–
Morocco	4	309	48·9–70·0	59·7	57·9	49·2–66·5	5·3 ($P = 0·1$)	43·5 (0·0–81·1)	27·0–85·9
Pakistan	1	25	–	–	28·0	12·1–49·4	–	–	–
Palestine	2	290	19·1–84·1	51·6	29·0	28·8–34·5	–	–	–
Syria	1	56	–	–	87·5	75·9–94·8	–	–	–
Tunisia	13	1942	51·0–93·3	76·2	75·1	69·6–80·2	61·9 ($P < 0·0001$)	80·6 (67·8–88·3)	54·6–91·1
All countries	31	3172	19·1–93·3	65·4	63·0	55·4–70·3	499·9 ($P < 0·0001$)	94·0 (92·4–95·2)	21·7–95·5

HCV, Hepatitis C virus; RNA, Ribonucleic acid.

[a] *Q*: The Cochran's Q statistic is a measure assessing the existence of heterogeneity in effect size.

[b] I^2: A measure that assesses the magnitude of between-study variation that is due to differences in effect size across studies rather than chance.

[c] Prediction interval: A measure that estimates the 95% interval in which the true effect size in a new study will lie.

Frequency, distribution, and Shannon Diversity Index of hepatitis C virus (HCV) genotypes among hemodic
North Africa

Country	Studies Total *N*	Samples Total *N*	Genotype 1 *n* (%)	Genotype 2 *n* (%)	Genotype 3 *n* (%)	Genotype 4 *n* (%)
Bahrain	1	9	5 (55·5%)	3 (33·3%)	–	1 (11·1%)
Egypt	1	62	10 (16·1%)	–	–	52 (83·9%)
Iran	7	269	150 (55·7%)	–	106 (39·4%)	13 (4·8%)
Iraq	2	33	17 (51·5%)	–	1 (3%)	15 (45·4%)
Jordan	1	30	22 (73·3%)	–	–	8 (26·6%)
Lebanon	4	64	18 (28·1%)	16 (25%)	4 (6·2%)	26 (40·6%)
Morocco	2	68	68 (100%)	–	–	–
Pakistan	1	90	20 (22·2%)	12 (13·3%)	56 (62·2%)	2 (2·2%)
Saudi Arabia	1	32	15 (46·8%)	1 (3·1%)	–	16 (50·0%)
Syria	1	28	17 (60·7%)	–	–	11 (39·3%)
Tunisia	10	1529	1182 (77·3%)	181 (11·8%)	10 (1%)	156 (10·0%)
All countries (unweighted)	31	2214[b]	1524 (68·8%)	213 (9·6%)	177 (7·9%)	300 (13·5%)
All countries (weighted by population size)	31	2214[b]	1524 (39·3%)	213 (5·7%)	177 (29·6%)	300 (25·4%)

No data were found for HCV genotypes 5, 6, and 7.

Hepatitis C virus (HCV) epidemiology among hemodialysis (HD)patients in the Middle East and North Africa (MENA).

- **The regional pooled mean estimate was**
  - ✓ 29·2% (95% CI: 25·6–32·8%) for HCV antibody positive prevalence
  - ✓ 63·0% (95% CI: 55·4–70·3%) for the viremic rate.

- **Genotype diversity :**
  - ✓genotype 1 (39·3%)
  - ✓ genotype 2 (5·7%)
  - ✓ genotype 3 (29·6
  - ✓genotype 4 (25·4%).

Prevalence of hepatitis C virus infection among hemodialysis patients in the Middle-East: A systematic review and meta-analysis

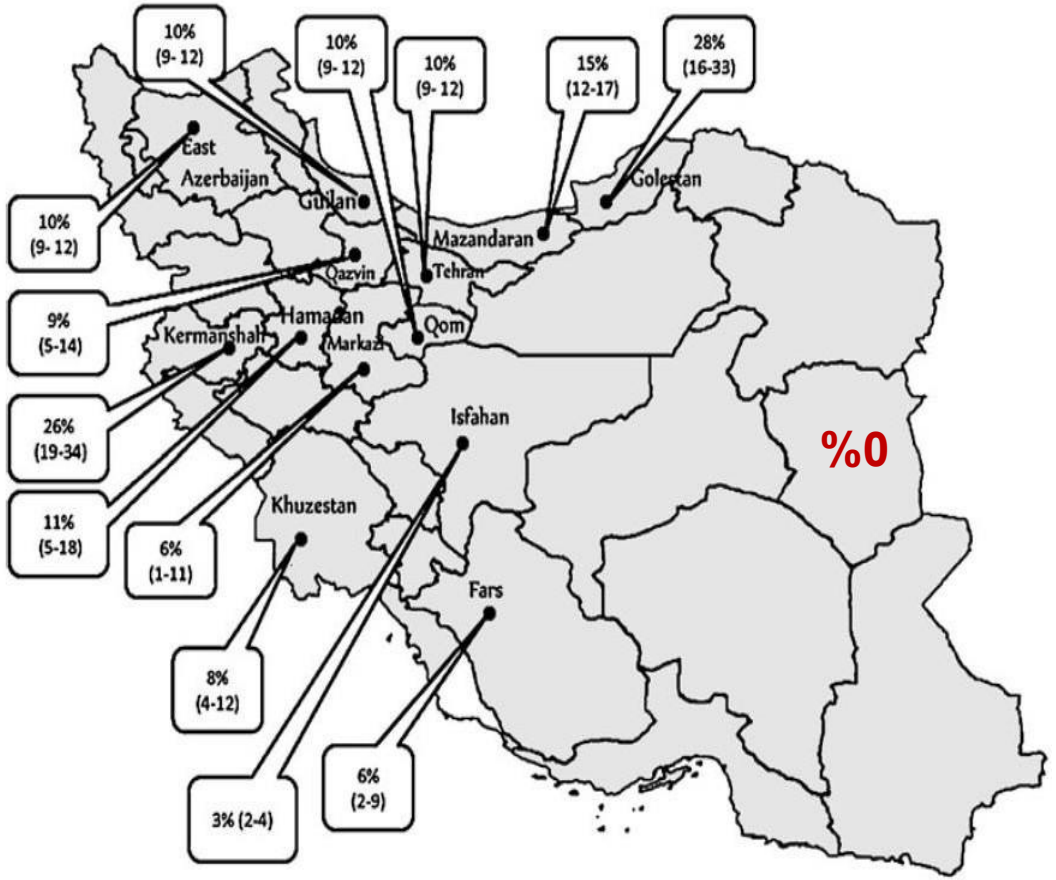
World J Gastroenterol. 2017 Jan 7; 23(1): 151–166

Soheil Ashkani-Esfahani, Seyed Moayed Alavian, and Mohammad Salehi-Marzijarani

- The overall HCV infection prevalence among hemodialysis patients in the region was reported to be 25.3%
- *Egypt-50%* and *Syria -54%* had the highest reported rates while *Iran -12%* and *Lebanon -9%* had the lowest.

The prevalence of HCV infection among different HD patients among Iranian population

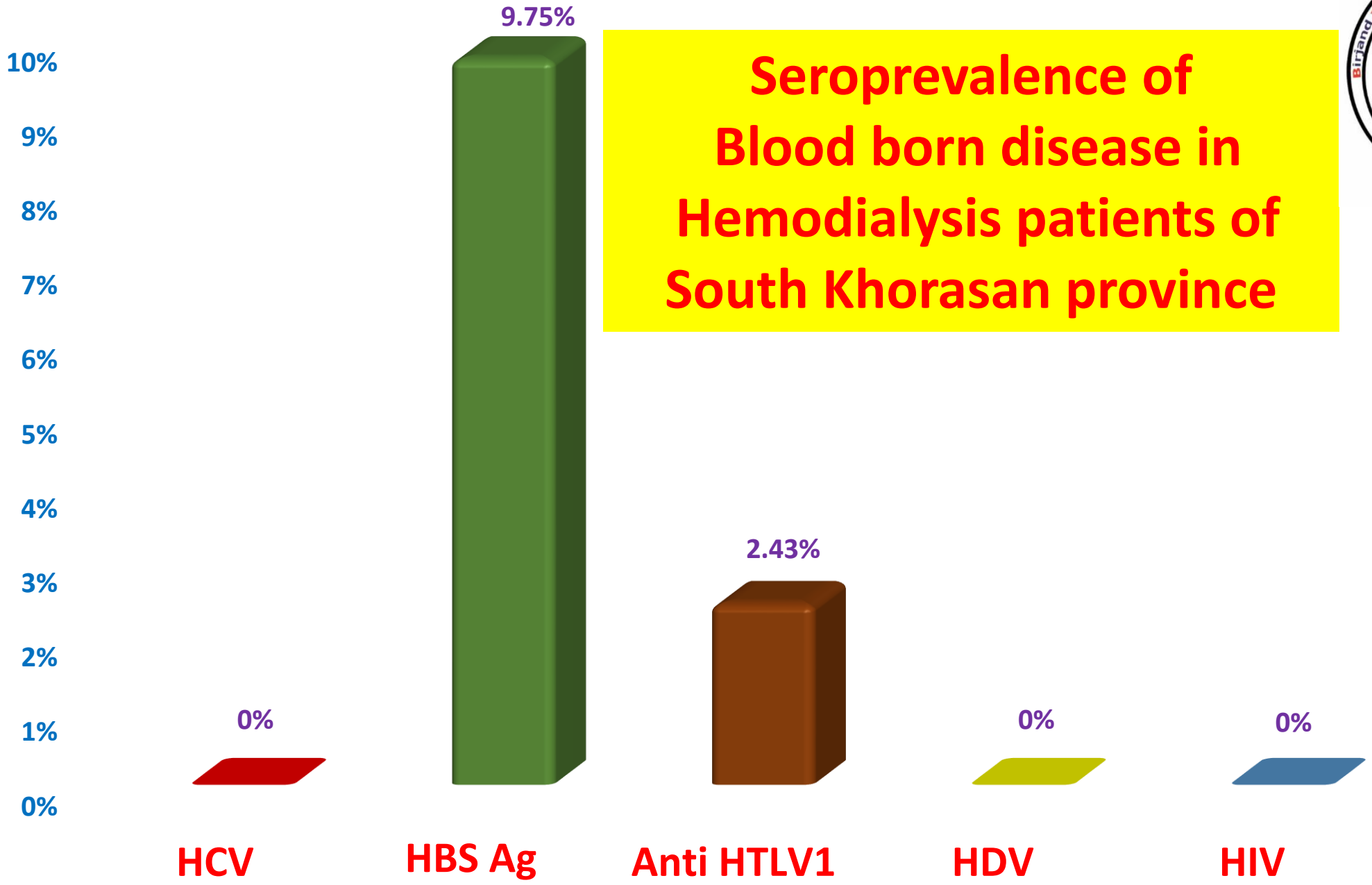
Fig. 2 Geographical distribution of HCV infection in hemodialysis patients in Iran



HCV infection varies widely between 5.5% and 24% among different HD patients

Alavian SM,et al . J Public Health. .2010

Seroprevalence of Blood born disease in Hemodialysis patients of South Khorasan province



Bangladesh Journal of Medical Science Vol. 13 No. 01 January'14

Original article:

Prevalence of HCV Infection in Hemodialysis Patients of South Khorasan in Comparison With HBV, HDV, HTLV I/II, And HIV Infection

*Ziaee M[1], Azizee R[2], Namaei MH[3]**

Abstract:

Background and objective: This study was performed to evaluate the prevalence of Hepatitis C virus (HCV) infection as well as HBV, HDV, HTLV I/II, and HIV infection in hemodialysis patients in our district.

Methods: The subjects of this study involved 41 hemodialysis patients admitted to hemodialysis ward, Vali- Asr hospital. HBV, HDV, HIV, and HTLV1/2 infections were evaluated by enzyme-linked immunosorbent assay (ELISA) technique. Serum anti- HCV anti-body was measured using the 3rd generation of ELISA kit. HCV Viremia was evaluated in all patients using RT-PCR technique.

Results: HCV infection was not observed in none of patients by ELISA technique; however RT-PCR technique demonstrated HCV viremia in one (2.43%) patient. HBsAg was detected in 4(9.75%) patients, and one (2.43%) was Anti HTLV 1/2 positive; none of patients were HDV or HIV positive.

Conclusion: HCV infection is less common than HBV infection in our patients. ELISA technique can not demonstrate all hemodialysis patients with HCV infection, For this reason it is requirement to evaluate this group of patients for HCV infection using RT-PC technique.

Keywords: Hemodialysis, Hepatitis C, Hepatitis B, HIV Infections, HTLV I/II Infections

DOI: http://dx.doi.org/10.3329/bjms.v13i1.13903
Bangladesh Journal of Medical Science Vol. 13 No. 01 January '14 Page 36-39

Risk factors for acquiring HCV infection among patients undergoing HD

- 1-long hemodialysis duration
- 2-Three or more HD sessions per week
- 3-Male gender
- 4-Old age
- 5 -Previous blood transfusion

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Patients with Renal Impairment

- HCV is independently associated with the development of chronic kidney disease (CKD) (Rogal, 2016);

➢ **A meta-analysis published in 2015 demonstrated that chronic HCV infection was associated with**

✓51% increase in the risk of proteinuria

✓43% increase in the incidence of CKD (Fabrizi, 2015).

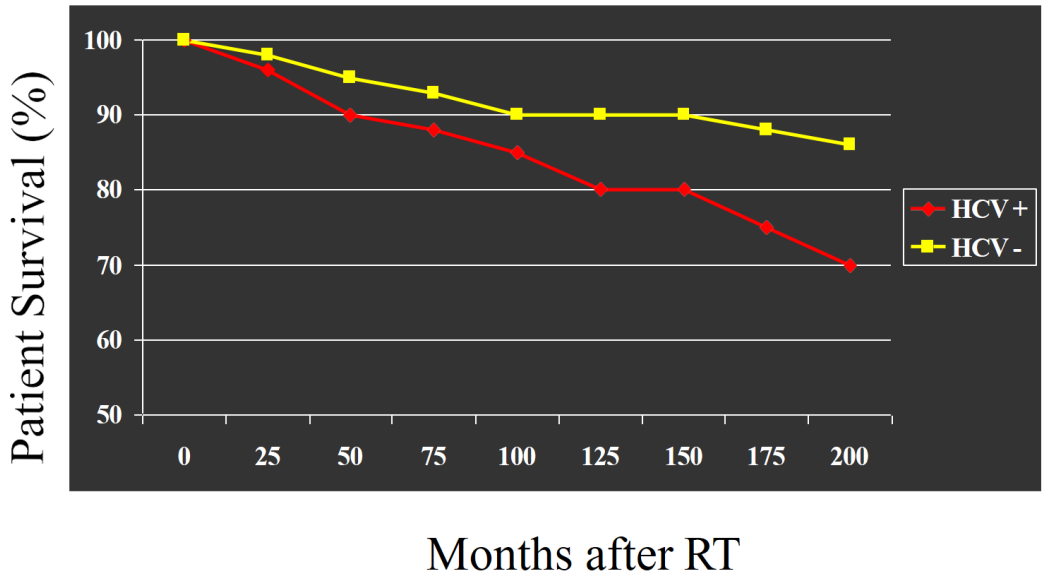
✓ There is also a higher risk of progression to end-stage renal disease (ESRD) in persons with chronic HCV and CKD,

✓Increased risk of all-cause mortality in persons on dialysis (Lee, 2014); (Fabrizi, 2012).

Harmful long-term impact of hepatitis C virus inf in kidney transplant recipients

Most renal transplant recipients (RTRs) have acquired HCV infection prior totransplantation

Romero E, et al. Transplant Proc. 2008;40(9):2933-5



Legendre C, et al. *Transplantation* 1998 Mar 15;65(5):667-70

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Five Strategies to reduce the Burden of HCV in Hemodialysis Patients in Iran

1-Implementing more sensitive screening methods to detect HCV;

2-Treatment of all hemodialysis patients with HCV infection

3-Reducing the duration of the hemodialysis period by early transplantation.

4-Education of nurses in HD Centers: Infection Control -policies

5-Minimizing transfusion requirements by the judicious use of erythropoietin.

Alavian SM., CRF Control is Possible! Hepat Mon. 2006;6(2

Mostafa Alavi-Moghaddam, MD, MPH, AFSA*

Treatment of HCV infection in Hemodialysis

RATIONALE FOR ANTIVIRAL TREATMENT

- **The main reason for antiviral treatment in patients with chronic HCV infection is :**

✓ prevent ***liver complications***(liver-associated morbidity and mortality)

✓In the patient with kidney ***transplant candidate,prevent*** kidney transplant-related complications specific to HCV infection.

✓ In the less common scenario of ***HCV related vasculitis*** and/or glomerulonephritis (such as mixed cryoglobulinemia),

REGIMEN SELECTION

Major progress has been made over the last 2 decades.

- **Sustained viral response (SVR) rates increased progressively:**

✓7 to 10% with interferon alone,

✓25% with interferon and ribavirin,

✓40-50% with peginterferon and ribavirin.

✓to >95% with the current direct-acting antiviral agents (DAAs).

Direct-acting antiviral agents

- **Among the currently approved DAAs, *sofosbuvir* is the only one that has significant renal elimination.**

- **The other currently approved DAAs –**

- ✓ **simeprevir,**
- ✓ **ledipasvir,**
- ✓ **daclatasvir,**
- ✓ **paritaprevir/ritonavir,**
- ✓ **ombitasvir,**
- ✓ **dasabuvir,**
- ✓ **Grazoprevir**
- ✓ **elbasvir**

- - Are not eliminated by the kidneys and thus do not need dose adjustment, even in severe CKD or in hemodialysis (HD) patients .

The decision to treat HCV in patients with renal impairment

- **Made on a case by case basis.**

- **Treat HCV based on the potential benefits and risks of therapy, including:**
  - ✓ Life expectancy
  - ✓ Candidacy for kidney transplantation
  - ✓ Comorbidities such as cardiovascular disease

- **Multiple host factors contribute to this decision, including :**

✓ Extent of renal impairment,

✓ The extent of liver disease

✓ The presence of comorbidities that affect the potential toxicity of antiviral therapy.

✓ The genotype,

✓ History of past antiviral treatment.

Renal function estimation of CrCl or GFR

Based on the estimated CrCl or GFR value, patients with renal impairment are classified as having

- ✓ **Mild (50 to 80 mL/min)**
- ✓ **Moderate (30 to 50 mL/min)**
- ✓ **Severe (less than 30 mL/min)**

For patients with mild renal impairment(50 to 80 mL/min)

- **No dose adjustments are needed**

for any of the medications used to treat HCV.

Treatment of Hepatitis C in Patients with Renal Impairment

For patients with moderate renal impairment(30 to 50 mL/min)

- **Standard doses are recommended for the direct-acting antiviral agents and peg interferon alfa-2a.**

- ✓Peginterferon alfa-2b requires a 25%
- ✓Dose reduction :Ribavirin doses should be reduced to a schedule of 200 mg alternating with 400 mg every other day.

Recommendations for Patients With CKD Stage[a] 1, 2, or 3

RECOMMENDED
No dose adjustment is required when using: • Daclatasvir (60 mg)[b] • Daily fixed-dose combination of elbasvir (50 mg)/grazoprevir (100 mg) • Daily fixed-dose combination of glecaprevir (300 mg)/pibrentasvir (120 mg)[c] • Fixed-dose combination of ledipasvir (90 mg)/sofosbuvir (400 mg) • Fixed-dose combination of sofosbuvir (400 mg)/velpatasvir (100 mg) • Simeprevir (150 mg) • Fixed-dose combination of sofosbuvir (400 mg)/velpatasvir (100 mg)/ voxilaprevir (100 mg) • Sofosbuvir (400 mg)

For patients with severe renal impairment(less than 30 mL/min)

- Although DAA-based regimens are feasible for many patients with severe renal impairment

- ***HCV antiviral therapy to those who are most likely to benefit from it in the short term.***

✓These include patients with ***advanced fibrosis or cirrhosis,***

✓patients who are ***renal transplant candidates,***

✓ Those with significant HCV related kidney disease from ***mixed cryoglobulinemic vasculitis, and HCV-related glomerulonephritis.***

✓ For patients with vasculitis and/or glomerulonephritis that warrant ***immunosuppressive therapy***

UpToDate® **2017**

The choice of the regimen

➢**The choice of the regimen should be based on :**

✓HCV Genotype (and subtype),

✓viral load,

✓Concomitant medications,

✓kidney function,

✓ transplant candidacy,

✓comorbidities.

Review - Advances in CKD 2017
Hepatitis C Treatment in Chronic Kidney Disease Patients:

For patients with severe renal impairment

- **Data on the safety direct-acting antivirals (DAAs) in the setting of severe renal impairment or dialysis (hemodialysis or peritoneal dialysis) are evolving.**
- Given the significant potential for ***adverse effects*** with the combination of peginterferon and ribavirin,
- We favor utilizing an ***interferon-free***, combination DAA-based regimen in these patients. For all patients with severe renal impairment,
- decisions to provide these patients with HCV treatment should be undertaken on a case-by-case basis.
- We prefer the pangenotypic DAA regimen of ***Glecaprevir-Pibrentasvir***

UpToDate® **2017**

Duration of Treatment

- The duration of ***Glecaprevir-Pibrentasvir*** for patients with renal impairment is the same for those with normal renal function and depends on the presence of ***cirrhosis*** and ***treatment history.***

- For treatment-naïve patients of any genotype, it is given for ***8 weeks*** for those without cirrhosis and ***12 weeks*** for those with compensated cirrhosis.

  - ***Glecaprevir-Pibrentasvir*** is contraindicated in patients with decompensated cirrhosis (Child Pugh class B or C).

UpToDate® **2017**

Recommended regimens listed by evidence level and alphabetically for:

Patients With CKD Stage[a] 4 or 5 (eGFR <30 mL/min or End-Stage Renal Disease)

RECOMMENDED	GENOTYPE	DURATION	RATING
Daily fixed-dose combination of elbasvir (50 mg)/grazoprevir (100 mg)	1a, 1b, 4	12 weeks	I, B
Daily fixed-dose combination of glecaprevir (300 mg)/pibrentasvir (120 mg)[b]	1, 2, 3, 4, 5, 6	8 to 16 weeks[c]	I, B[c]

For patients with severe renal impairment

- **Including those with end-stage renal disease,**

✓The peginterferon alfa-2a dose should be reduced to 135 mcg per week;

✓ The peginterferon alfa-2b requires a 50% dose reduction .

✓ Adjustments are needed for any of the medications used to treat HCV.

✓ The recommended ribavirin dose is 200 mg/day

✓Caution should be exerted when using ribavirin in patients with renal failure because of the risk of ***severe hemolysis***.

✓ Ribavirin should be ***discontinued*** if the hemoglobin level decreases by more than ***2 g/dL despite*** the use of erythropoietin.

➢**For patients with acute vasculitic manifestations associated with HCV infection:**

✓Immunosuppressive therapy first and delay antiviral therapy for one to four months.

➢**For patients who are expected to require kidney transplant and are candidates for antiviral therapy**:

✓We initiate antiviral therapy so that it is completed prior to kidney transplantation if possible.

- ***However, kidney transplantation should not be prohibited in untreated HCV-infected patients without advanced fibrosis, as patients can receive effective interferon-free HCV treatment post transplantation*.**

Hepatitis C in Hemophililic patients

Epidemiology of HCV Infection in Hemophilia in Iran

- **Seroprevalence of HCV infection among hemophilia patients in Iran:**
- ✓ Varies from **13.3% to 80.5 %**
- ✓ The pooled estimation was **48.07%.**

- The lowest rate: **Fasa** with **13.3%**
- The highest rate : **Isfahan** with **80.5%**
- ***South Khorasan province*: 20%**

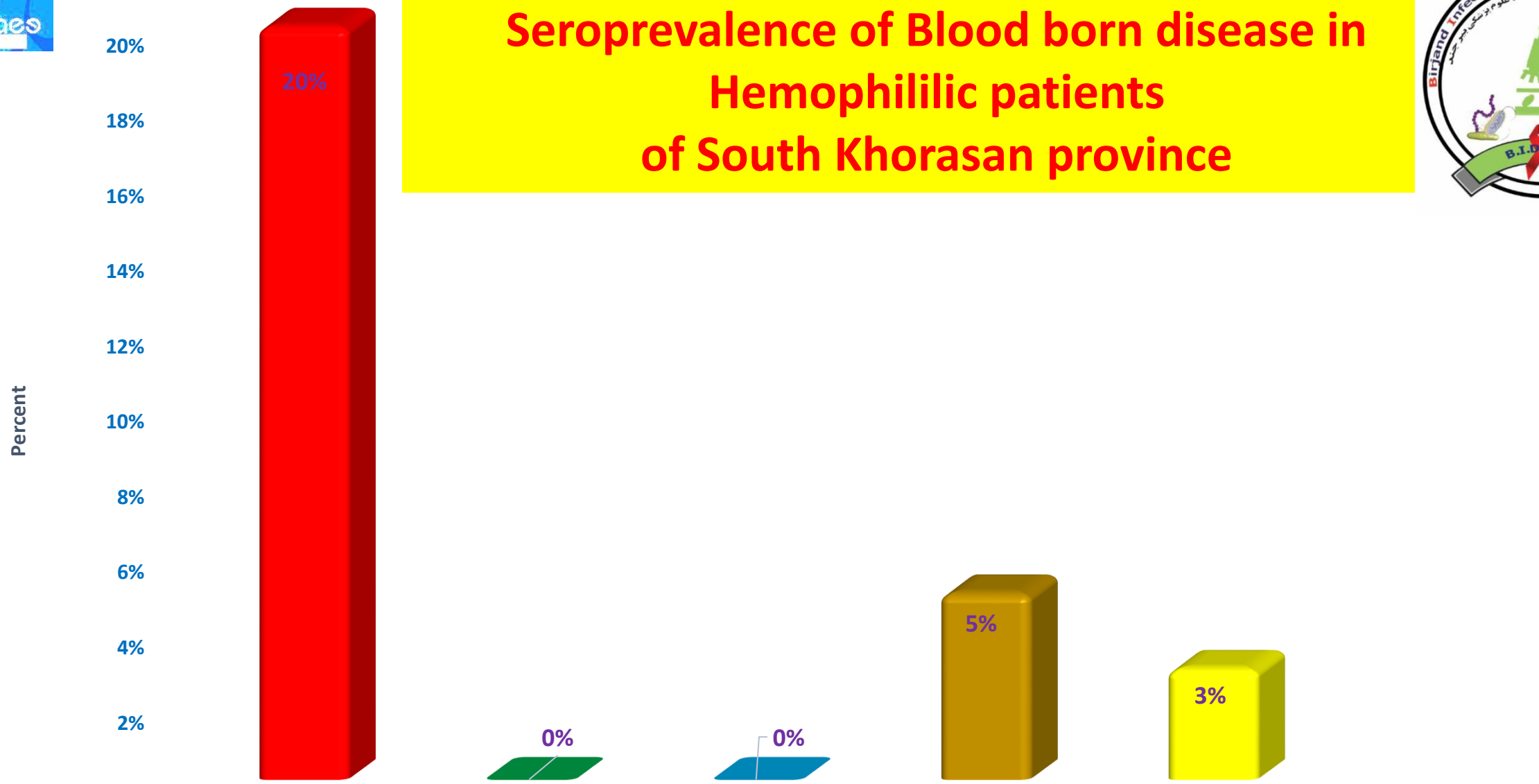
- ***We found that prevalence of HCV infection among hemophilia patients is significantly lower in south of Iran versus north and central parts of Iran***

Alavian SM, et al. Lack of Knowledge About Hepatitis C Infection Rates Among Patients With Inherited Coagulation Disorders in Countries Under the Eastern Mediterranean Region Office of WHO (EMRO): A Meta-Analysis. Hepat Mon. 2012

The prevalence of HTLV-1 and its Co-Infection withHCV, HBV and HIV in Hemophilic patients

Masoud Ziaee, Mohammad Hassan Namaei, Ghodseh Azarkar

Seroprevalence of Blood born disease in Hemophililic patients of South Khorasan province



	Anti HCV	HBS Ag	HIV	HGV	Anti-HTLV1	OBI
Series1	20%	0%	0%	5%	3%	9.30%

PAKISTAN JOURNAL OF MEDICAL SCIENCES
Bi-Monthly

The prevalence of HTLV-1 and its Co-Infection withHCV, HBV and HIV in Hemophilic patients

Masoud Ziaee, Mohammad Hassan Namaei, Ghodseh Azarkar

Abstract

Background and Objective: Blood-borne infections, such as the HIV virus and hepatitis B and C, are major problems in patients receiving blood products. Here we examined the prevalence of HTLV-1, HCV, HBV, and HIV in hemophilic patients.

Methods: A cross-sectional study on 108 hemophilic patients (101 males and 7 females) involved detection of HBV, HCV, HIV and HTLV-1 infections using immunoassays for HBsAg, hepatitis B core antibodies (anti-HBc), hepatitis C antibodies (anti-HCV), HIV antibodies (anti-HIV) and Anti-HTLV-1. Real-time PCR was used to measure HCV RNA, and HCV genotyping was performed by direct sequencing of the 5′ noncoding region.

Results: Hemophilia A was reported in 93 (86%) patients with severe symptoms in 8 cases. The seroprevalence of anti-HCV and anti-HTLV-1 antibodies was 20% and 3% respectively. One patient with severe hemophilia had a HCV/HTLV-1 co-infection. HCV-RNA was detected in 82% of patients. In terms of genotyping prevalence was 56% HCV genotype 3a, 39% HCV genotype 1a, and 6% HCV genotype2. Anti HIV and HBsAg were not detected in any patient. HTLV1 prevalence was higher, HCV lower in South Khorasan than other regions in Iran or elsewhere.

Conclusion: Management of transfusion of blood and blood products should account for the underlying prevalence of infectious agents.

doi: http://dx.doi.org/10.12669/pjms.315.7888

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Liver International ISSN 1478-3223

CLINICAL STUDIES

Peginterferon α-2a and ribavirin treatment of patients with haemophilia and hepatitis C virus infection: a single-centre study of 367 cases

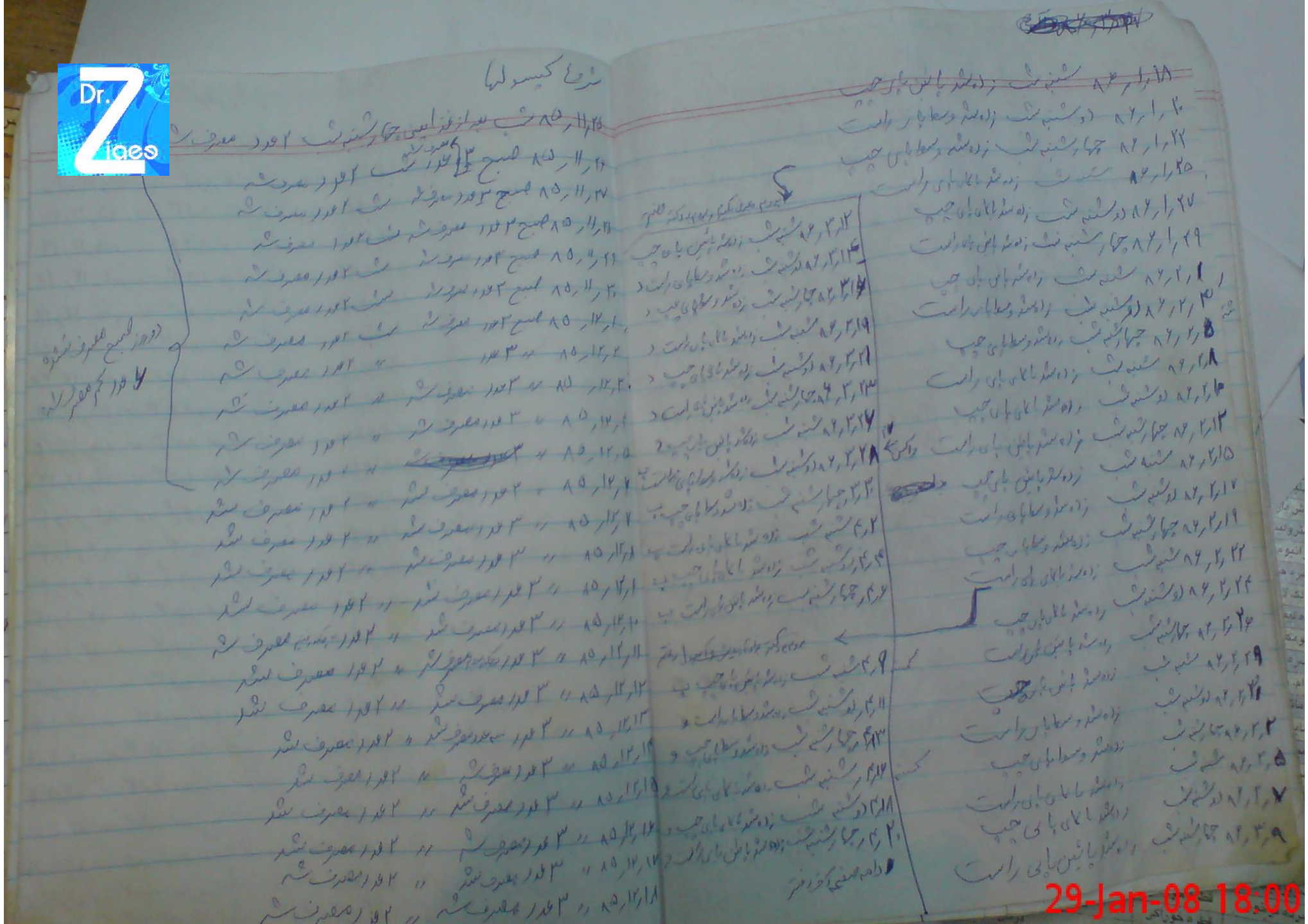
Seyed-Moayed Alavian[1], Seyed Vahid Tabatabaei[1], Maryam Keshvari[2], Bita Behnava[1], Seyyed Mohammad Miri[1], Pegah Karimi Elizee[2] and Kamran Bagheri Lankarani[3]

We started elimination of HCV in hemophilia 10 years ago!!

Two hundred and twenty-five subjects **61%** achieved SVR, 66 patients relapsed and 30 subjects did not respond and nine patients developed breakthrough during treatment.

Peg interferon alpha-2a in combination with weight-based ribavirin has SVR rate of **51%** for genotype 1 and **71%** for genotype non-1 infections in hemophilia patients.

Alavian SM, Tabatabaei SV, Keshvari M, Behnava B, Miri SM, Elizee PK, et al. Peginterferon alpha-2a and ribavirin treatment of patients with haemophilia and hepatitis C virus infection: a single-centre study of 367 cases. Liver Int. 2010;30(8):1173-80.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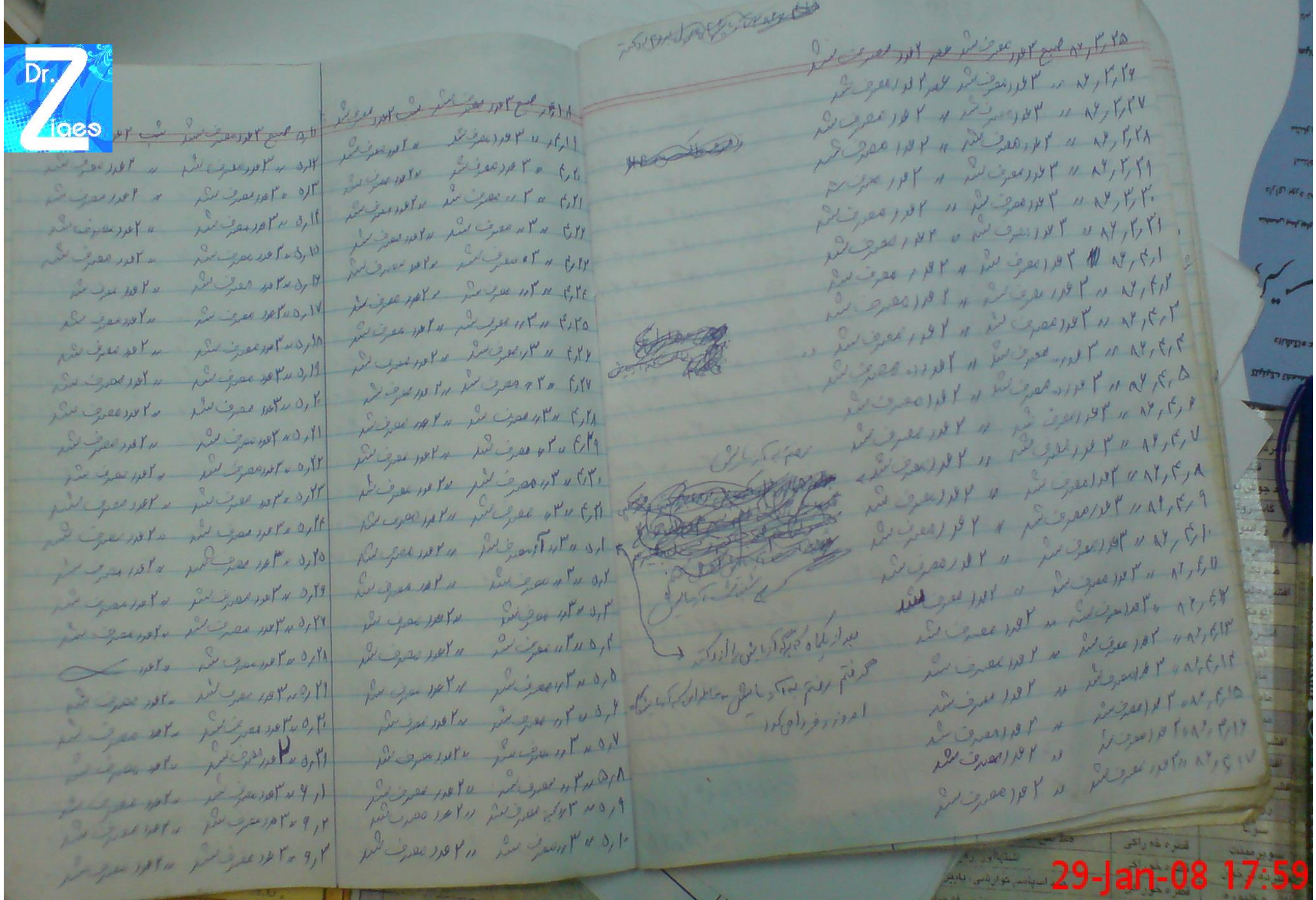
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EASL Recommendations on Treatment of Hepatitis C 2016☆

- **Progression to end-stage liver disease** in patients with haemophilia is similar to HCV positive individuals in the general population.
- Death from liver failure in HCV positive individuals is among the commonest causes of death in patients with inherited bleeding disorders.
- **The management of chronic hepatitis C in haemophilia** is similar to the non-haemophilic population and HCV DAAs are applicable to patients with hemophilia.

Hepatitis C in Thalassemia patients

Introduction

- Patients with thalassemia or other hemoglobinopathies were at greater risk of acquiring HCV infection as a consequence of repeated transfusions of blood, respectively, before the introduction of blood donor screening for hepatitis C.

Epidemiology of HCV in Thalassemia

Iran

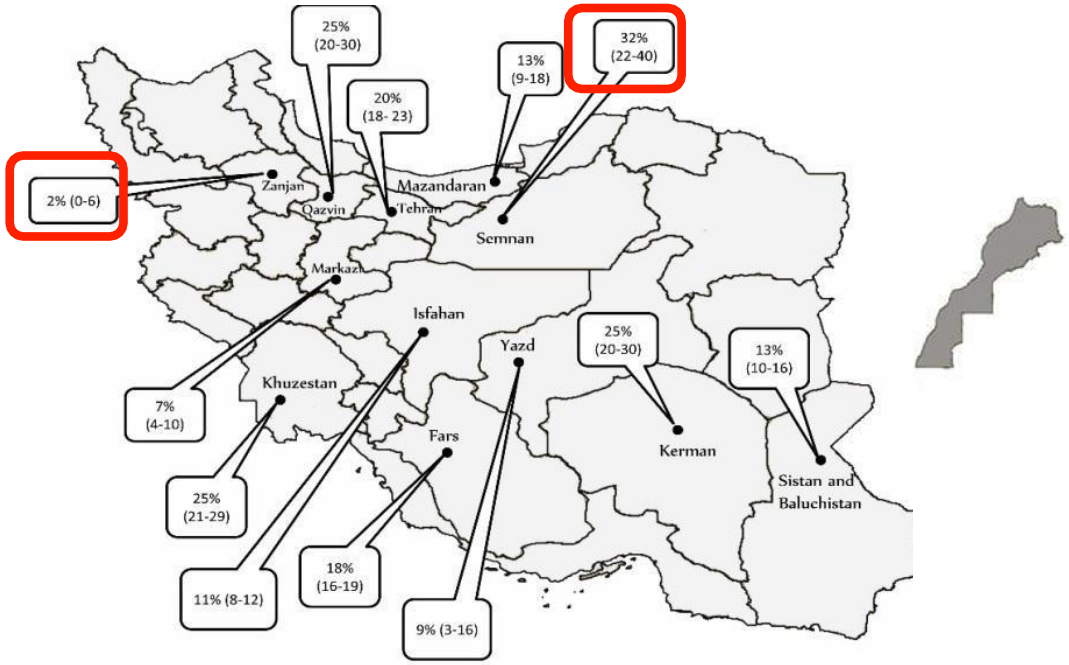
In Iran from a total of 5229 thalassemia subjects

Its Seroepidemiology ranged from 2 to 32%.

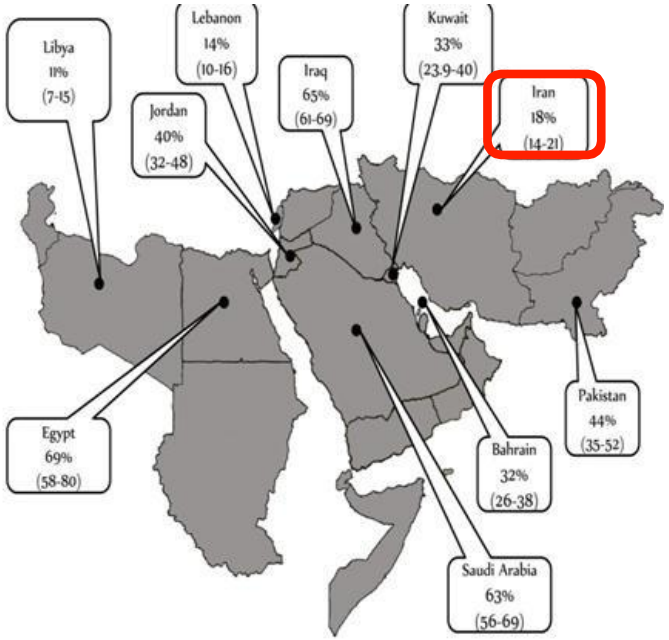
Pooled HCV infection rate was 18%

EMRO

Pooled HCV infection rate was:
45% in Pakistan
63% in Saudi Arabia
69% in Egypt



Hepatitis C in thalassemia in Iran



Hepatitis C in thalassemia in EMRO

In Iran, blood donors screening for HCV infection started in 1996. The pooled OR of HCV infection rate for patients transfused before that date was OR=7.6 and this implies an increase in blood safety and more attention to health precautions in Iran

Alavian SM, et al.. Epidemiology of HCV Infection among Thalassemia Patients in eastern Mediterranean Countries: a Quantitative Review of Literature. Iran Red Cres Med J. 2010

Treatment of hepatitis C virus infection in thalassemia

- The past, the use of Peg-Interferon (Peg-IFN) and ribavirin (RBV) in thalassemia patients with HCV infection was limited by ***both IFN and RBV side effects.***

- In particular, RBV was associated with increase in blood transfusion requirements and consequent iron overload.

We should be aware about cardiac and therapy of HCV with DDAs

- Minimal changes in strain, size, and volume of left ventricle, and size of right ventricle may refer to needing more precise cardiac evaluations in these patients.

- More specialized echocardiographic evaluations are recommended for whom with history of ***cardiac abnormalities***, ***severe cardiac iron load***, and in case of ***any cardiac adverse event*** during DAA therapy in thalassemia patients.

- Available ***Sofosbuvir-based regimens*** for HCV treatment in Iran are safe for our chronic HCV-infected thalassemia patients and cause no permanent cardiac damage.

Khosravi et al in press

Interferon-based regimens

- Interferon-based regimens for chronic hepatitis C (CHC) were ***often deferred*** in patients with β-thalasaemia major (β-TM) due to poor efficacy and tolerance.

EASL Recommendations on Treatment of Hepatitis C 2016☆

- Treatment has often been withheld in these patients because both pegylated IFN-α and ribavirin can ***cause anaemia***.

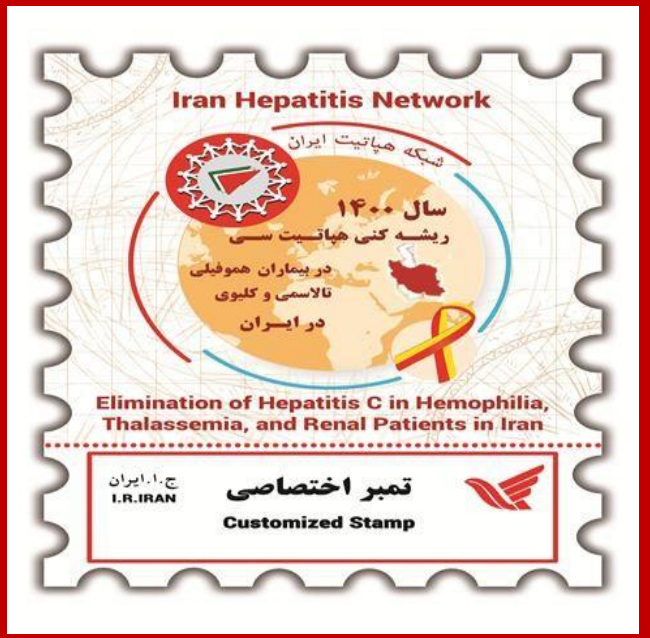
- ***Few trials*** with antiviral therapy have been published in this population, but there is ***no*** reason to consider that HCV DAAs are specifically ***contraindicated.***

- For instance, in the C-EDGE IBLD study, the fixed-dose combination of ***grazoprevir*** and ***elbasvir*** was administered for 12 weeks without ribavirin in patients with haemoglobinopathies infected with genotypes 1a, 1b or 4.

- ***Sofosbuvir-based*** studies in this group are in progress.

Elimination of HCV infection in Iran will be in 2030 but in thalassemia and hemophilia is possible in 2020!

Solution



Work together

More support for therapy

More attention to blood safety

More education the nurses in thalassemia centers Increase the thalassemia patients awareness regarding the issue.

به امید حذف هپاتیت قبل از سال 1410