

**PERCENTAGE AND RISK FACTORS OF HEPATITIS C INFECTION AMONG A
SAMPLE OF EGYPTIAN DENTAL HEALTHCARE CO-WORKERS. AN
OBSERVATIONAL CROSS SECTIONAL STUDY**

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Abstract

Introduction: Hepatitis C Virus (HCV) is a pandemic disease of significant global impact. Developing countries, particularly Egypt has the highest prevalence of HCV worldwide. This work aimed to measure percentage and risk factors of hepatitis C infection among a sample of Egyptian dental health care co-workers.

Subjects and methods: All housekeeping dental health care co-workers at the teaching clinics of Faculty of Oral and Dental Medicine, Cairo University, who were responsible for handling clinical waste, were included. Hepatitis C antibodies were detected afterwards seropositive individuals were retested by Polymerase Chain Reaction as well as odd ratio (OR) for the different risk factors was estimated in HCV positive individuals.

Results: The overall weighted percentage of hepatitis C antibodies was 8.9% according to ELISA method. The study showed that antichistosomal therapy (OR= 537.0), oral surgery (OR = 22.74), absence of HBV vaccination (OR= 20.42), extra-oral surgery (OR= 14.70), and needle stick injury (OR= 10.39), are risk factors for HCV infection. PCR test revealed that 62.5% was HCV positive patients.

Conclusions: Needle stick injury, oral surgery and major surgery are associated with the highest HCV risk factors.

Keywords: Hepatitis C virus, Cross sectional study, Risk factors, Dental healthcare workers, Egypt.

Introduction

Viral hepatitis is a pandemic disease of significant global impact and a major public health problem (**Krasteva, Panov et al. 2008**). The estimated prevalence of hepatitis C virus (HCV) infection in Africa lies at 5.3%, in the Eastern Mediterranean 4.6%, in the Western Pacific 3.9%, in South-East Asia 2.15%, and in Europe 1.03% of the respective population. With the presence of marked variations between countries, Middle East and Africa, particularly Egypt, in which HCV is endemic, has the highest prevalence of HCV worldwide with very high morbidity and mortality rate from decompensated cirrhosis, and hepatocellular carcinoma (Lehman and Wilson 2009).

In Egypt, the major route of exposure appears to be injection therapy, contaminated injection equipment and inadequate infection control practices (**Mezban and Wakil 2006**). HCV is an important occupational hazard for health care workers (HCWs) and one of the most common viruses transmitted from patients to HCWs (**World Health Organization 2003**). HCWs including hospital cleaners, waste collectors, operators of waste treatment equipment, and all whose duties involved in waste handling or, handling of blood-contaminated items are considered workers at high risk of infection (high-risk group) due to unsafe sharps waste collection practices (**World Health Organization 2003, Alam, Ahmad et al. 2007**).

The main goal in avoiding HCV complications remains the prevention of further infection, which should target high-risk groups. The aim of the current study is to measure percentage and risk factors of HCV infection among a sample of Egyptian dental health care workers (DHCWs).

Subjects and methods

Study design

The study was designed as an observational cross-sectional survey and was conducted from December to June 2015.

Study population and setting

The study population was DHCWs at the teaching clinics of Faculty of Oral and Dental Medicine, Cairo University, Egypt. All DHCWs of cleaning staff, who were responsible for handling or transferring clinical waste and who were likely to be exposed to blood-borne pathogens were included.

Data collection tool

A standardized self-administered pre-structured risk factor questionnaire was developed and distributed to the DHCWs at their work place. The purpose, procedure, risks and benefits of the study were explained to the participants and verbal informed consent was obtained. The Ethics Committee and Infection Control Unit of Faculty of Oral and Dental Medicine at Cairo University reviewed and approved the study protocol.

The questionnaire included information on the DHCW's personal identification data, past and present medical history and, past dental history (**Wicker, Cinatl et al. 2008**). Including the following questions:

- Have you been vaccinated against hepatitis B virus?
- Are you born to HCV-positive mother?
- Do you live and share bathroom items with HCV-infected individuals for more than one year now?
- Had you ever been subjected to needle-prick injury in Egypt?
- Had you ever received blood (products) in Egypt?
- Had you ever been subjected to extra-oral surgery? (if yes, please specify)
- Have you ever been subjected to dialysis? If yes, what is the frequency of your dialysis?
- Do you suffer any type of hemophilia?
- Had you ever been subjected to minor oral surgical procedures in Egypt?
- Had you been subjected to parental antischistosomal therapy in the 1960s and 1970s in Egypt?
- Had you ever been injected illegal drugs once or a few multiple times?
- Do you live and share bathroom items with individuals, who inject illegal drugs for >1 year?
- Do you ever suffer from persistently abnormal alanine aminotransferase levels?

A volume of three ml venous blood was withdrawn aseptically from all individuals taken part in the study. Serum was separated from the blood to detect anti-HCV antibodies via ELISA test (BIOKIT Bioelisa HCV 4.0, BIOKIT Company, S.A- 08186 Lliçà d'Amunt-Barcelona -Spain) and was stored at -20 °C until used. This serological test was performed in the main Laboratory of Clinical Pathology Department, Faculty of Medicine, Cairo University, Egypt.

Statistical analysis

Descriptive statistics was used to represent the results of the present study, which included the basic parameters of DHCWs (presented as categorical qualitative data) and the frequency of occurrence of risk factors. Statistical analysis was performed using the SPSS (Statistical Package for Scientific Studies, SPSS Version16.0, Inc., Chicago, IL, USA) for Windows. Odds ratio (OR) and 95% Confidence interval (CI) were for the different risk factors in HCV positive individuals. If OR was > 1 the individual non-exposed (to the risk factor) is better than the exposed one. If the OR was < 1 the individual exposed (to the risk factor) is better than non-exposed.

Results

Basic Parameters

The study included 90 DHCWs, with 65 females (72.2%), and 25 males (27.8%). Middle age (41-60 years) group constituted the largest percentage (48.9%), followed by the adult (31-40 years) group (35.6%), then the young adult (18-30 years) group (15.6%). 60% of DHCWs were from Lower Egypt, while 40% were from Upper Egypt.

Risk factors

Infected needle stick injury was the most common risk factor for HCV infection, seen in 65.6% of the study population. Extra-oral surgery was the second common risk factor (57.8% of the individuals), followed by oral surgery (47.8% of the individuals), (**Table 1, Fig 1**).

HCV antibodies

Eight patients (8.9%) of the DHCWs in the study had HCV antibodies, according to the ELISA results. Females and middle age group constituted 75% of the cases. Five cases (62.5%) were from Upper Egypt (**Table 2**).

Regarding the associated risk factors, all positive cases had history of extra and intra oral surgeries and infected needle stick injury. Three cases (37.5%) had altered ALT levels, two (25%) haven't received HBV vaccination and one (12.5%) received antischistosomal therapy. Testing the OR for each risk factor, revealed the greatest values in patients with altered ALT levels, followed by those who received antischistosomal therapy, whereas the lowest OR was related to infected needle stick injury (**Table 3**). Further RT-PCR test revealed that only five of eight positive HCV patients (62.5%) had an active HCV infection.

Discussion

Screening is an important tool in disease detection, particularly in diseases with few or no symptoms. Early detection and intervention may improve health-care outcomes and often thereby save downstream costs, including the prevention of end-stage liver disease in case of HCV (Kaur, Rybicki et al. 1996). The optimal methods of detecting HCV infection remain to screen populations and to test selected individuals with an identifiable risk factor (Alter 2002).

Housekeepers HCWs, although not enough educated in occupational blood borne hazards and lacking information's about the most effective measures to control exposure and infection, mostly clean and collect waste without sufficient or available protective equipment and hence are at high risk of injury exposure (Hanafi, Mohamed et al. 2011).

The housekeeping category of DHCWs in the Faculty of Oral and Dental Medicine Cairo University were included in the current study. In this regards, a study demonstrated that the most injuries among HCWs occurred in the wards in the job categories of the nurses, technicians and housekeepers (Abu-Gad and Al-Turki 2001).

In the present study ELISA was used in the screening of housekeeping category of DHCWs in the Faculty of Oral and Dental Medicine, Cairo University after a self-administered questionnaire was used. Results revealed that eight out of 90 individuals (8.9%) had HCV antibodies.

HCWs' risk of infection assessment in the present study depended on several factors, such as needle-stick injury (NSI), extra-oral surgery, oral surgery, absence of HBV vaccination, history of been born to a HCV positive mother, HCV household contact, antichistosomal therapy and altered ALT level. On the other hand, NSI, general surgery and oral surgery were found to be the main risk factors with percentage of 65.6%, 57.8% and 47.8% respectively. Gaeta et al. proved that surgical procedures is an independent predictor of HCV infection (Gaeta, Stroffolini et al. 1999). Indeed, major surgeries in the present study were a strong risk factor (OR=14.7079) for HCWs, being present in 100% of Anti-HCV positive cases. This finding coordinated with hemodialysis, blood transfusion patients (Sypsa, Psychogiou et al. 2005) and, iatrogenic injuries caused from unsafe injection practices as shown from injectable treatment for schistosomiasis, or contaminated equipment during general surgery due to non-maintainability of safety standards (Reker and Islam 2014).

A relatively high percentage of NSI incidents were observed among the study populations. Nearly 65.6% (OR=10.39) from the all DHCWs had experienced NSI involved in handling of

infectious waste. This observation is comparable to the results of another study performed previously in Egypt, where 35.6% of the respondents reported at least one NSI during the study period (Talaat, Kandeel et al. 2003).

In agreement with previous reports (Wicker, Cinatl et al. 2008, Yang, Kim et al. 2011), a similarly common potential risk factor (OR=22.74) was receiving a dental treatment particularly oral surgery, due to the possibility of infection, lack of appropriate education and practicing infection control.

Prevalence of HCV infection further increased by age (El-Zanaty and Way 2009). In the present study, age was identified as an important associate in HCV positive cases as 75% were in middle age group rather than 12.5% in young adult and 12.5% in adult age group. This result is consistent with previous studies having identified relationship between age and being HCV positive, due to a higher risk of NSI incidents with increasing age (Fredrich, Nsubuga et al. 2005, Gholami, Borji et al. 2013).

Regarding vaccination against HBV in the present study, 78.9% individuals were vaccinated and the remaining 21.1% had not received immunization against hepatitis B. However 2 out of 8 anti-HCV positive HCWs (25%) did not received HBV vaccine (OR=20.42). However an annual screening of HBs Ag and Anti-HCV is still undertaken for all housekeepers DHCWs in the faculty of Oral and Dental Medicine, Cairo University. Hence many staff was either unprotected or unaware of their serological status being at risk to themselves or to patients.

The current study revealed that females HCWs were more likely prone to risk factors than males, demonstrating higher levels of HCV antibodies with the history of seeking more surgical and medical treatments (Saleh, Shebl et al. 2008). In contrast other study showed that HCWs sex independently associated with HCV transmission, with an increased risk of transmission for men (Yazdanpanah, De Carli et al. 2005) as males more frequently have schistosomiasis than females (Nafeh, Medhat et al. 2000). The present study revealed that a weak risk factor (1.1% - OR=537.00) of antischistosomal therapy was present among the DHCWs population with 12.5% among male anti-HCV positive subjects.

Frank et al. described that one of the reasons for a geographic variation in prevalence of HCV infection in Egypt could be the difference in the intensity and duration of intravenous antischistomiasis control programs in Upper and Lower Egypt. Programs in Lower Egypt affecting a larger proportion of the population over a longer period of time and administering a greater number of doses resulted in a large reservoir of infection among adults (Frank, Mohamed et al. 2000). In the present study 62.5% of Anti-HCV positive cases were from

Upper Egypt which was much higher than cases from Lower Egypt (37.5%). In contrast other study showed that the prevalence in rural communities in Upper Egypt was approximately 10%, which was much lower than in inhabitants of villages in Lower Egypt (Nafeh, Medhat et al. 2000)

Although intra-familial transmission of HCV was previously reported (Mohamed, Abdel-Hamid et al. 2005), the present study did not demonstrate this mode of transmission with an absence of HCV antibodies in individuals born from positive HCV mothers or sharing household with HCV infected subjects.

In the current study only 3.3% reported elevated ALT as possible risk factors (OR=1225.00) among all study population compared with 37.5% present in Anti-HCV positive cases. This supported previous findings that ALT levels are correlated with severe liver damage, as mild or stable HCV carriers have normal ALT levels (Puoti 2004) . However, some patients with normal ALT too may have advanced liver disease (Dor-Mohammadi, Daryani et al. 2005).

Conclusions

The present study (within its limitations) rings a bell and offers an opportunity to calculate the individual risk of exposure for infection with blood-borne viruses in a hospital setting. Knowledge among health care workers regarding risks and hazards associated with NSI is inadequate. However, this study finding's regarding risk behaviors associated with HCV infection showed that there is still room for improving strategies to reduce transmission among housekeeper HCWs. HBV vaccinations are important for each DHCW to avoid co-infections might occur.

Further research should be carried out to investigate the emerging risks of transmission including other HCWs categories at risk, including laboratory technicians, nursing aids, traditional health professionals, waste workers, medical students and emergency response personnel. Organizational measures such as training sessions, educational talks should promoted. A hospital-wide hepatitis B immunization program should also been completed for each HCW with assessing the seroconversion status after vaccination. HCW who have experienced occupational exposure to HCV should receive follow-up counseling, post-exposure prophylaxis, and medical evaluation. Sterilization and infection control measures should be adequate to prevent high rates of transmission so stop increasing the reservoir of chronic HCV infection resulting from past parenteral antischistosomal therapy.

Conflicts of interest: None.

References

1. Abu-Gad, H. A. and K. A. Al-Turki (2001). "Some epidemiological aspects of needle stick injuries among the hospital health care workers: Eastern Province, Saudi Arabia." *Europ J Epidemiol.* **17**: 401–407.
2. Alam, S., N. Ahmad, M. Khan, G. Mustafa, A. Al-Mamun and G. Mashud (2007). "Seroprevalence of Hepatitis C Virus Infection Among Health Care Workers.." *J Bangladesh Coll Phys Surg.* **25**(3): 126-129.
3. Alter, M. J. (2002). "Prevention of spread of hepatitis C." *Hepatology.* **36**: S93-S98.
4. Dor-Mohammadi, T., N. E. Daryani, M. Bashashati, A. Hashtrudi, B. Haghpanah, A. Sayyah and M. Shakiba (2005). "Relationship between serum alanine aminotransferase levels and liver histology in chronic hepatitis C-infected patients." *Indian J Gastroenterol.* **24**: 49-51.
5. El-Zanaty, F. and A. Way (2009). "Egypt Demographic and Health Survey, 2008. Cairo, Egypt: Ministry of Health and Population, El-Zanaty and Associates, and Macro International.."
6. Frank, C., M. K. Mohamed, G. T. Strickland, D. Lavanchy, R. R. Arthur, L. S. Magder, T. El Khoby, Y. Abdel-Wahab, E. A. Ohn, W. Anwar and I. Sallam (2000). "The role of parenteral antischistosomal therapy in the spread of hepatitis C virus in Egypt." *Lancet.* **355**: 887–891.
7. Fredrich, M., F. M. Nsubuga and M. S. Jaakkola (2005). "Needlestick injuries among nurses in sub-Saharan Africa." *Trop Med Int Health.* **10**(8): 773-778.
8. Gaeta, G. B., T. Stroffolini, G. Taliani, F. M. Ippolito, G. Giusti and C. D. Bat (1999). "Surgical procedures as a major risk factor for chronic hepatitis C virus infection in Italy: evidence from a case-control study." *Int J Infect Dis.* **3**: 207-210.
9. Gholami, A., A. Borji, P. Lotfabadi and A. Asghari (2013). "Risk factors of needlestick and sharps injuries among healthcare workers." *Int J Hosp Res.* **2**(1): 31-38.
10. Hanafi, M. I., A. M. Mohamed, M. S. Kassem and M. Shawki (2011). "Needlestick injuries among health care workers of University of Alexandria hospitals." *East Medit Health J.* **17**(1): 26-35.
11. Kaur, S., L. Rybicki, B. R. Bacon, J. L. Gollan, V. K. Rustgi and W. D. Carey (1996). "Performance characteristics and results of a large-scale screening program for viral hepatitis and risk factors associated with exposure to viral hepatitis B and C: results of the national hepatitis screening survey." *Hepatology.* **24**: 979-986.
12. Krasteva, A., V. E. Panov, M. Garova, R. Velikova, A. Kisselova and Z. Krastev (2008). "Hepatitis B and C in dentistry." *J IMAB.* **14**(2): 38-40.
13. Lehman, E. M. and M. L. Wilson (2009). "Epidemic hepatitis C virus infection in Egypt: estimates of past incidence and future morbidity and mortality." *J Viral Hepat.* **16**(9): 650–658.
14. Mezban, Z. D. and A. E. Wakil (2006). "Hepatitis C in Egypt." *HCV Advocate.*: Available at: http://hcvadvocate.org/hcsp/hcsp_pdf/Egypt_06.pdf.
15. Mohamed, M. K., M. Abdel-Hamid, N. Mikhail, F. Abdel-Aziz, A. Medhat, L. S. Magder, A. D. Fix and G. T. Strickland (2005). "Intrafamilial transmission of hepatitis C in Egypt." *Hepatology.* **42**: 683-687.
16. Nafeh, M. A., A. Medhat, M. Shehata, N. N. H. Mikhail, Y. Swifee, M. Abdel-Hamid, S. Watts, A. D. Fix, G. T. Strickland, W. Anwar and I. Sallam (2000). "Hepatitis C in a community in Upper Egypt. Cross-sectional survey." *Am J Trop Med Hyg.* **63**: 236–241.
17. Puoti, C. (2004). "HCV carriers with persistently normal ALT Levels: not too much healthy, not true patients." *Rom J Gastroenterol.* **13**(4): 329-332.
18. Reker, C. and K. M. Islam (2014). "Risk factors associated with high prevalence rates of hepatitis C infection in Egypt." *Int J Infect Dis.*: e1–e3.
19. Saleh, D. A., F. Shebl, M. Abdel-Hamid, S. Narooz, N. Mikhail, M. El-Batanony, S. El-Kafrawy, M. El-Daly, S. Sharaf, M. Hashem, S. El-Kamary, L. S. Magder, S. K. Stoszek and G. T. Strickland (2008). "Incidence and risk factors for hepatitis C infection in a cohort of women in rural Egypt." *Trans R Soc Trop Med Hyg.* **102**(9): 921-928.
20. Sypsa, V., M. Psychogiou, A. Katsoulidou, G. Skoutelis, S. Moutafis, V. Hadjiconstantinou, J. Kakavas, V. Kalapothaki, J. Boletis and A. Hatzakis (2005). "Incidence and patterns of hepatitis C virus seroconversion in a cohort of hemodialysis patients." *American J Kidn Dis.* **45**(2): 334-343.
21. Talaat, M., A. Kandeel, W. El-Shoubary, C. Bodenschatz, I. Khairy, S. Oun and F. J. Mahoney (2003). "Occupational exposure to needlestick injuries and hepatitis B vaccination coverage among health care workers in Egypt." *Am J Infect Control.* **31**(8): 469-474.
22. Wicker, S., J. Cinatl, A. Berger, H. W. Doerr, R. Gottschalk and H. F. Rabenau (2008). "Determination of risk of infection with blood-borne pathogens following a needlestick injury in hospital workers." *Ann Occup Hyg.* **52**(7): 615–622.
23. World Health Organization, W. (2003). "Aide-memoire for a national strategy for the safe and appropriate use of injections." **WHO/BCT/03.11.**

24. Yang, J. D., W. R. Kim, R. Coelho, T. A. Mettler, J. T. Benson, S. O. Sanderson, T. M. Therneau, B. Kim and L. R. Roberts (2011). "Cirrhosis is present in most patients with hepatitis B and hepatocellular carcinoma." *Clin Gastroenterol Hepatol.* **9**: 64–70.
25. Yazdanpanah, Y., G. De Carli, B. Miguere, F. Lot, M. Campins, C. Colombo, T. Thomas, S. Deuffic-Burban, M. H. Prevot, M. Domart, A. Tarantola, D. Abiteboul, P. Deny, S. Pol, J. C. Desenclos, V. Puro and E. Bouvet (2005). "Risk factors for hepatitis C virus transmission to health care workers after occupational exposure: a European case-control study." *Clin Infect Dis.* **41**(10): 1423-1430.

Table 1: Frequency of risk factor in DHCWs included in the study.

Risk Factor	Frequency	Percentage
1- Blood transfusion	0	0
2- Extra-Oral Surgery	52	57.8
3- Oral Surgery	43	47.8
4- Absence of HBV vaccination	19	21.1
5- Infected needle stick	59	65.6
6- Antichistosomal therapy	1	1.1
7- Altered ALT level	3	3.3
8- HCV positive mother	6	6.7
9- HCV household contact	5	5.6

Table 2: Basic parameters of HCV antibody positive individuals included in the study.

Parameter		Frequency	Percent
Gender	Females	6	75.0
	Males	2	25.0
Age group	Adult	1	12.5
	Middle age	6	75.0
	Young adult	1	12.5
Birth place	Lower Egypt	3	37.5
	Upper Egypt	5	62.5

Table 3: Frequency of risk factor in HCV antibody positive individuals included in the study

Risk	Frequency	Percent	Odd ratio	95% confidence interval	
				Lower limit	Upper limit
Extra-Oral Surgery	8	100.0	14.70	0.82	263.23
Oral Surgery	8	100.0	22.74	1.27	407.31
Absence of HBV vaccination	2	25	20.42	0.93	444.97
needle stick injury	8	100.0	10.39	0.57	186.43
Antichistoso-mal therapy	1	12.5	537.00	7.743	37240.33
Altered ALT level	3	37.5	1225.00	21.06	71231.33
HCV positive mother	0	0	-----	-----	-----
HCV household contact	0	0	-----	-----	-----

Figure.1: Bar chart showing frequency of risk factors in the study population.

