

ORIGINAL ARTICLE

Nursing Knowledge Level, Are There Room for Improvement in Hepatitis Prevention at Suez Canal Area?

¹Hesham El-Sayed, ²Sohair Mehanna, ¹Adel Hassan, ²Mahmoud Sheded, ³Somaya E. Abu Abdou, ⁴Hanan Abbas, ¹Samar Elfiky, ⁵Nermine Elmaraghy*, ²Zeinab Khedr

¹Department of Infectious and Endemic Diseases, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

²Department of Infectious and Endemic Diseases, Faculty of Medicine, Suez University, Suez, Egypt

³Faculty of Nursing, Suez Canal University, Ismailia, Egypt

⁴Department of Family Medicine, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

⁵Department of Medical Microbiology and Immunology, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

ABSTRACT

Key words:

Nursing, knowledge, viral hepatitis and Suez Canal

*Corresponding Author:

Nermine El Maraghy
Medical Microbiology &
Immunology Department,
Faculty of Medicine, Suez
Canal University; Ismailia,
Egypt.
Tel.: 002/01224117033(Egypt).
nermine76@hotmail.com

Background: Healthcare workers are at increased risk of contracting and spreading hepatitis C virus (HCV), and HBV to others. **Objective:** The aim of study is to evaluate nursing staff and paramedics knowledge, concerning HCV, HBV and its relationship to institutional infection control facilities. **Methodology:** A self-administered questionnaire was distributed at fever hospital, infectious diseases hospital, Suez Canal university hospital, blood center, primary health care centers and hospitals affiliated to ministry of health, with a convenient sample of 479 nursing staff and paramedics in Suez Canal region. A knowledge score was developed about hepatitis B, C source of infections and different domains of infection control facilities and procedures, with a maximum of 17. **Results:** The mean age of the participating nursing staff and paramedics was 29.55 ± 8.31 . Knowledge score about mode of transmission of hepatitis, reveals that the highest level was among the student nurse which was 17.07. Concerning exposure including blood contact, blood spills and needle stick, the nurse was 61 %, while mainly head nurse to be 83% stated receiving training about infection control and care of sharp. **Conclusion:** We can prevent the transmission of infection at the occupational level through standard precautions.

INTRODUCTION

Viral Hepatitis B and C are considered the major health problems that tend to increase globally with an enormous burden on the health-care system and one of the major patient's misery^{1,2}. They are responsible for hepato-cellular carcinoma responsible for increasing both the morbidity and mortality rate for the coming decades³.

It was estimated that more than 170 million people worldwide can be infected with HCV. Health care workers (HCW) are at great risk at some stage in their careers.

HBV virus is considered one of the major cause of infection as the number of infected persons worldwide mount to reach 2 billion persons^{4,5}. The Egyptian Demographic Health Survey (EDHS), conducted a cross sectional survey on HCV biomarkers in 2008. It was found that the prevalence of HCV among the 15 – 59 years age group was 14.7%⁶ and the highest prevalence rate of HCV was in Egypt⁷⁻⁹.

The WHO estimates that one of the most hazardous ways of transmission of HCV was due to unsafe injections, which accounted approximately for 2 million new HCV infections and for HBV the newly infected

persons was 21 million patients by year 2000¹⁰. For the other ways of transmission of infection was due to accidental needle stick exposures that occurs in 2-8% for HCV and (30%) for HBV¹¹.

From all of the above, the occupational exposure from percutaneous injuries is a substantial health hazard among HCWs¹².

In 2001, MOHP started solving this serious problem through assessing the Infection Control (IC) policies and procedures¹³. The Egyptian MOHP has been pursuing a comprehensive IC program since 2002-2003. The primary results of the IC campaign record very successful results. But on the opposite, the implementation of the ICP by time suffer from lack of supplies¹⁴.

Health care-associated infections (HAIs) are considered a major threat due to their direct role in increasing the incidence of mortality among hospitalized patients¹⁵⁻¹⁶.

Despite all the efforts of IC professionals, infections remain a major unwanted side effect, often causing serious harm to patients. The biggest problem facing those is the lack of knowledge, weak effective precautions, applying the IC measures inadequately¹⁷⁻¹⁸.

Previous studies demonstrated that HCWs inconsistencies in attitudes and practices about blood borne viruses exist¹⁹⁻²⁰. Several researches approved the cross link between the knowledge, attitude and behavior of HCW and the IC²¹.

On the other side, HBV can be prevented by strict adherence to standard microbiological practices in order to prevent infections. Even after this enormous effort to prevent transmission of both viral hepatitis B & C infections, the situation still remains of great concern²².

Because the HCWs remain at a higher risk of infection through the infected skin prick, contaminated needles or through accidental exposure of blood spoilage at theater and dental procedures, the implementation of IC is considered one of the mandatory measures²³⁻²⁵.

However, little is known about HCWs knowledge towards treating people with HCV in Suez Canal region. Therefore, this study has been carried out with a motive to assess the knowledge regarding the hepatitis infection and help in increasing the awareness level for the benefit of the entire medical fraternity.

The aim of this work is to assess nursing staff and paramedics knowledge about hepatitis B&C and awareness about IC measures in the health care facility.

METHODOLOGY

A cross section study was conducted in Suez Canal region. Data used in this study was held on a baseline line survey conducted within the national hepatitis project that consists of 3 phases.

- Phase 1: assessment of hepatitis patient's knowledge, attitude, and practice.
- Phase 2: assessment of physician's attitude and behavior about hepatitis.
- Phase 3: assessment of nursing staff knowledge about hepatitis and infection control practices within their health care facility.

A questionnaire-based study was conducted amongst nursing staff and paramedics at Suez Canal region hospitals. A convenient sample was selected from different departments in hospitals affiliated to ministry of health and Suez Canal university hospitals. Prior permission was taken from heads of relevant departments of the institutions. Permission and clearance was taken from the Suez Canal university ethics committee. Confidentiality of identity was insured to all the HCWs and we obtained a verbal consent prior to filling up of the questionnaire which were tested for validity and reliability.

Questionnaire was designed by team of sociologists, epidemiologists and clinicians who are familiar with the modes of transmission of HCV and its risk factors.

The close-ended self-administered questionnaire containing thirty four questions was distributed among

the respondents. The questionnaire comprised several categories of questions:

- Demographic and occupational characteristics;
- Knowledge about the institutional facilities of IC,
- Source of infection of HBV& HCV, (Source of infections question included options such as blood and blood products, sharps and needles, sexual relationship, transmission by mosquitos, hospital acquired infection as a mode of transmission.
- Exposure to risk of acquiring HBV& HCV (blood contact, splash and needle stick injuries),
- Receiving training about IC and care of sharp, receiving pre-employment medical checkup and annual checkup, and receiving hepatitis vaccination,
- Awareness about presence of hepatitis (treatment and vaccination), and presence of institutional IC committee, personal protective equipment (PPE), IC policy, etc....

Correct answers to each item were based on a review of the available literature as well as policies and national guidelines. The question were categorized into individual level and institutional level.

Knowledge score was considered excellent $\geq 80\%$, good knowledge $\geq 60-80$, poor knowledge < 60 .

The maximum knowledge score was 17. Mean knowledge score was estimated to compare the knowledge between various groups and to correlate the knowledge with the current job.

Time of study:

The questionnaire was distributed to 479 nursing staff and paramedics between December 2017 and September 2018, the study was conducted during a nine-month period, in Suez Canal region hospitals, some of them affiliated to ministry of health (MOH) and 3 to Suez Canal University Hospitals.

The content of the questionnaire was validated with interviews and discussions with other experts in the field, and it was modified where necessary. Final questionnaire content, comprehensibility, clarity, and format were developed and validated on input of a volunteer sample of HCWs in a small pilot-test, to test applicability of the tool, and time consuming.

Statistical analysis

Results obtained were entered into SPSS version 18.0 software for statistical analysis (Chicago IL, USA). These results were statistically analyzed using the Chi-square test, ANOVA test, and Pearson's correlation. The level of significance was set at P value < 0.05 .

RESULTS

For the population profile of the different categories of staff (head nurse, nurse, student nurse and paramedics. The age of the participating nurse staff and paramedics ranges from 18-59 years with a mean of

29.55±8.31, Most of them (86.4%) were female nurses, and 58.3% from academic hospitals affiliated to Suez Canal University Hospital, while (41.7%) were in hospitals affiliated to ministry of health.

Head nurse represents 13.6 %, nurse was (67.4%), student nurse 6.3 %, while paramedics was 12.7 %.

Knowledge score about source of infection with hepatitis head nurse was 15.78 %, nurse was (15.57%), student nurse was (17.07), and paramedics was (15.26%).

Concerning exposure including blood contact, blood spoilage and needle stick, head nurse admit their exposure by 27.7%, nurse (61%), student nurse was (56.7%), while others was (32.8%).

In regard training about infection control and care of sharp, head nurse as 83.1%, nurse was 69%, student nurse was 56.7%, while paramedics was 52.5%

Knowledge of prevention including lack of HCV vaccination and presence of HBV vaccination, head nurse awareness was 53.3 %, nurse was 36.5 %, 60 % among nurse student, and 50 % among paramedics.

Knowledge of presence of HBV treatment was 35.4% among high nurse, 39.9 % among nurses, while it was 30% among students nurse, and 42.6 % among paramedics.

Knowledge of IC policy including existence of IC committee, evaluation of the institution, existence of approved policy and procedures, existence of policy of reporting needle stick and spoilage, reveals that knowledge among head nurse was 72.3%, 46.4 % in nurse, 30 % in student nurse, and 32.8 % in paramedics

Institutional IC facilities including unit cleaning, instrument sterilization, hand washing basin, latex gloves, hand disinfectant, red bags, safety boxes, and personal protective equipment, reveal that knowledge level in head nurse was 61.5%, while nurse was 46.4 %, student nurse as 33.3 %, and paramedics was 42.6 % .

Institutional IC personal procedures including (preventive measures in case of needle stick or spoilage, pre- employment medical checkup yearly and periodical medical checkup, receiving HBV vaccination) was 15.4% in head nurse, 12.4 % in nurse, 3.3% in student nurses, and 13.1% in paramedics as shown in table (1).

Table 1: Level of knowledge about IC facilities within the institution

Less than 60%e (poor)	60 to 80% (good)	More than 80% (excellent)
Existence of HCV vaccine	Existence of HBV vaccine	Existence of IC committee
Treatment of HCV	Existence of institutional evaluation	Unit cleaning
Treatment of HBV	Existence of approved policy	Instrument sterilization
Policy for reporting spoilage and needle stick	Pre-employment check up	Hand wash basin
PPE		Hand disinfectant
Prevention in case of needle stick		Latex gloves
Periodic check up		Red bags
Received vaccine		Safety boxes

Logistic regression was done and reveals that being a student nurse, receiving a pre-employment medical checkup, receiving training course on sharp care and awareness of presence of HCV vaccination, awareness of existence of IC committee, were positively associated

with high level of knowledge score, while exposure to needle stick negatively associated with low-level knowledge score. Pearson correlation found to have direct positive correlation ($r = 0.55$, $P < 0.01$ showing significance) as shown in table (2).

Table 2: Regression Coefficient

Model	Un-standardized coefficient		Standardized coefficients	t	P value
	B	Std Error	Beta		
Student nurse	2.102	0.666	.170	3.157	.002
Exposure to needle stick	-1.204	.311	-.198	-3.873	.000
Pre-employment Medical check up	1.247	0.334	0.181	3.730	.000
Awareness of existence IC committee	0.951	0.494	.094	1.927	.055
Safe sharp disposal training	1.167	0.452	0.126	0.581	0.010
Presence of HBV vaccination	1.100	0.333	0.163	3.304	.001

P value ≤ 0.05 is statistically significant

DISCUSSION

Egypt is considered one of the biggest countries with high prevalence rate of HCV worldwide with an estimated percentage of 14.7% nationally.²⁶ In the present study, the average age was 29.5 years old, mostly females 86.4 % from academic institution Suez Canal university hospital 58.3 %. While the mean age by a study conducted by Setia et al.²⁷, among the nursing staff was 22.2 years.

For the Knowledge score of hepatitis viral infection among head nurse was 15.78 %, nurse was 15.57%, student nurse was 17.07, and paramedics was 15.26%. Suchitra et al.²⁸ discovered that the least knowledge score was among Nursing staff who were more likely to show negative attitudes towards IC precautions.

Concerning exposure including blood contact, blood spoilage and needle stick, head nurse admit their exposure by 27.7 %, nurse 61%, student nurse was 56.7%, while others was 32.8%. It was mentioned by Suchitra et al.²⁸ that the results of lack of IC was in convince with our results. While Yamini et al.²⁹ found that (11.7%) of the workers have already been exposed to infectious blood samples, but Hsieh et al.³⁰ found that nurses had the highest percentage (60.6%) of blood borne infections exposures . This difference in exposure rate could be because of lack of the necessary protection, insufficient education and not having information about various blood-borne viral diseases.

For the IC and care of sharp, the education played an important role as it was very prominent that head nurse accounted the highest level by 83.1%, followed by nurse with 69%, student nurse was 56.7%, while paramedics was 52.5%, this differs from Yamini et al.³¹ which stated that among the hospital staff, 70% (n = 70) have not undergone any training program for IC. In Lewis et al. 2009 achieved a similar response in their study where not many participants agreed that taking courses in IC would help improve IC in hospitals. This could be due to lack of time, lack of resources that could cover all medical personnel.

For the point of vaccination, it was very clear that knowledge of prevention including lack of HCV vaccination and presence of HBV vaccination, head nurse awareness was 53.3%, nurse was 36.5%, 60% among nurse student, and 50% among paramedics. These results were in contrast with Suchitra et al,²⁸ who found that head nurses did not have correct knowledge in all items and therefore it was quite natural that the new recruits did not feel the importance to comply with universal precautions, All nursing staff and paramedics 87.3% (48/55) were aware of the presence of vaccine against HBV. While 65.5% (36/55) of nursing staff and paramedics agreed that the vaccine against HCV exists whereas no such viable vaccine exists at present. The knowledge regarding the existence of HBV vaccine is

mainly acquired by the nursing staff 56.3% (31/55) claim that they became aware of the vaccine against hepatitis B during a mandatory protocol followed to be vaccinated against common transmissible diseases, while they were getting admission in the college.

Lack of knowledge and misconception of existence of HCV vaccine is an issue that deserves serious attention. This finding is however, at variance with another study done in Karachi (Pakistan) where the respondents demonstrated a very low knowledge of hepatitis B infection. In a Knowledge, Attitude and Practice (KAP) study of medical groups with 369 participants in Tehran, Zanjan, and Ahwaz, Iran, 88.1% of studied groups were vaccinated and their knowledge of disease transmission was unsatisfactory³³⁻³⁵.

Knowledge of presence of HCV, HBV treatment was 35.4 % among high nurse, 39.9 % among nurses, while it was 30% among students nurse, and 42.6% among paramedics.

Knowledge of IC policy including existence of IC committee, evaluation of the institution, existence of approved policy and procedures, existence of policy of reporting needle stick and spoilage, reveals that knowledge among head nurse was 72.3%, 46.4% in nurse, 30 % in student nurse, and 32.8% in paramedics, while in Yamini²⁰¹² found that Awareness regarding the Infection Control Committee working in their hospital was poor as only 41.7% (N = 120) were aware of the presence of such a committee.

Institutional IC facilities including unit cleaning, instrument sterilization, hand washing basin, latex gloves, hand disinfectant, red bags, safety boxes, and personal protective equipment, reveals that knowledge level in head nurse was 61.5 %, while nurse was 46,4%, student nurse as 33.3 %, and paramedics was 42.6% .

Institutional IC personal procedures including (preventive measures in case of needle stick or spoilage, pre- employment medical checkup yearly and periodical medical checkup, receiving HBV vaccination) was 15.4 % in head nurse, 12.4% in nurse, 3.3% in student nurses, and 13.1% in paramedics. This differs from Suchitra et al.²⁸ stated that 78.2% (43/55) of nursing staff and paramedics were vaccinated against hepatitis B, while in Yamini et al.³¹, only 80.8% healthcare workers (n = 120) were immunized against Hepatitis B infection, In another study done in Turkey, 72.3% nurses had been vaccinated against Hepatitis B. The possible reasons for not receiving immunization in the present study could be lack of opportunity or cost of the vaccine. perhaps this shows that lack of knowledge was reflected on compliance to vaccination against HBV.

Logistic regression was done and reveals that a significant positive statistical correlation between being a student nurse, receiving a pre-employment medical checkup, receiving training course on sharp care and awareness of presence of HCV vaccination, awareness

of existence of IC committee, and high level of knowledge score, while exposure to needle stick have a statistically negative association with low-level knowledge score. Pearson correlation was ($r=0.55$, $P<0.01$ showing significance). This means that nursing staff with low awareness level had exposure events to needle stick injury. While good knowledge score have positive correlation with being a student nurse, receiving training for sharp care, awareness of existence of HBV vaccination, existence of IC committee and receiving pre-employment medical checkup.

Nursing staff who were weak in knowledge were more likely to show negative attitudes and those who were knowledgeable were more likely to show positive attitudes towards infection control precautions.

In a Knowledge, Attitude and Practice (KAP) study of medical groups with 369 participants in Tehran, Zanjan, and Ahwaz, Iran, 88.1% of studied groups were vaccinated and their knowledge of disease transmission was unsatisfactory³³⁻³⁵.

CONCLUSION

HBV and HCV infections are serious public health problems and are common causes of occupational diseases, which can be transmitted from patients to health-care professionals and from the professionals to their patients and may also spread to members of their family due to intimate contact. Fortunately, the infection transmission at occupational level can be prevented by following standard precautions.

Limitations of the study:

This study is a self-reported questionnaire based study. Therefore, in the present study, the subjective self-reported information should be carefully evaluated, due to the limitation of the reliability of the questionnaire surveys.

Acknowledgements:

We are grateful for the STD Fund for supporting this work, and the support provided by the Biostatistics, Epidemiology, and social research center at American university of Cairo. The authors are also grateful for the valuable share and effort by the participating nursing staff and paramedics in this work.

Conflict of Interest:

The authors declare no conflict of interest.

Source of Support:

The study was carried out under the Research Grant Agreement (TC/4/Health-2010-hep-3271) between Science and Technology Development Fund (STDF) of Egypt and the Faculty of Medicine, Suez Canal University.

Ethical consideration:

Consent for an interview was taken from each participant, who was assured about the confidentiality of

his/her information. The National and Institutional Ethics Review Committees approved the study protocol.

REFERENCES

1. El-Zanaty F, Way A: Egypt Demographic and Health Survey 2008. Egyptian: Ministry of Health. Cairo: El-Zanaty and Associates, and Macro International; 2009.
2. Lavanchy D: Evolving epidemiology of hepatitis C virus. *Clin Microbiol Infect* 2011, 17(2):107–115.
3. Alter MJ: Epidemiology of hepatitis C virus infection. *World J Gastroenterol.* 2007; 13(17):2436–2441.
4. Shepard CW, Finelli L, Alter MJ: Global epidemiology of hepatitis C virus infection. *Lancet Infect Dis* 2005; 5(9):558–567
5. Pokorski RJ. Cost/benefit of laboratory tests. *J Insur Med.* 2006; 38:31–43.
6. Dominique-Charles Valla, “EASL International Consensus Conference on Hepatitis B (13-14 September 2002, Geneva, Switzerland), *Journal of Hepatology*, 2003; 38:533-540
7. Evans and Kaslow (eds.), “Hepatitis B,” *Viral Infections of Humans* (4th ed.), p.372
8. Wong JB. Hepatitis C: Cost of illness and considerations for the economic evaluation of antiviral therapies. *Pharmacoeconomics.* 2006; 24:661–72.
9. Abdul Mujeeb S, Jamal Q, Khanani R, Iqbal N, Kaher S. Prevalence of hepatitis B surface antigen and HCV antibodies in hepatocellular carcinoma cases in Karachi, Pakistan. *Trop Doct.* 1997;27:45–6.
10. Anja Hauri, Gregory Armstrong, Yvan Hutin, “The global burden of disease attributable to contaminated injections given in health care settings,” *International Journal of STD & AIDS* (Jan. 2004), 15:7-16
11. Thomas and Lemon, “Hepatitis C,” *Principles and Practice of Infect. Dis.*, Mandell (eds.), pp. 1736-1759
12. Mastoi AA, Devrajani BR, Shah SZ, Rohopoto Q, Memon SA, Baloch M, Qureshi GA, Sami W. Metabolic investigations in patients with hepatitis B and C. *World J Gastroenterol.* 2010;16:603-607.
13. Richmond JA, Dunning TL, Desmond PV. Health professionals' attitudes toward caring for people with hepatitis C. *J Viral Hepat.* 2007;14:624-632.
14. Mohammadi N, Allami A, Malek Mohamadi R. Percutaneous exposure incidents in nurses: Knowledge, practice and exposure to hepatitis B infection: Percutaneous exposure incidents in nurses. *Hepat Mon.* 2011;11:186-190.

15. Pittet D, Allegranzi B, Storr J, Bagheri Nejad S, Dziekan G, Leotsakos A, et al: Infection control as a major World Health Organization priority for developing countries. *J Hosp Infect* 2008, 68:285-292.
16. Kesime EB, Uwakwe K, Irekpita E, Dongo A, Bwala KJ, Alegbeleye BJ. Knowledge of Hepatitis B Vaccine among Operating Room Personnel in Nigeria and Their Vaccination Status. *Hepat Res Treat* 2011. 2011 157089.
17. Gammon J, Morgan-Samuel H, Gould D. A review of the evidence for suboptimal compliance of healthcare practitioners to standard/universal infection control precautions. *J Clin Nurs*. 2008;17(2):157-67.
18. Sundaram RO, Parkinson RW: Universal precaution compliance by orthopaedic trauma team members in a major trauma resuscitation scenario. *Ann R Coll Surg Engl* 2007, 89:262-267.
19. National Control Strategy For Viral Hepatitis Egypt (2008-2012). 14. WHO: Hepatitis B Fact Sheet N°. 204. Geneva: WHO; 2008. <http://www.who.int/mediacentre/factsheets/fs204/en/index.html?webcite> [PubMed Abstract](#) | [Publisher Full Text](#)
20. Shimokura G, Chai F, Weber DJ, Samsa GP, Xia GL, Nainan OV, Tobler LH, Busch MP, Alter MJ: Patient-care practices associated with an increased prevalence of hepatitis C virus infection among chronic hemodialysis patients. *Infect Control Hosp Epidemiol* 2011, 32:415-424.
21. Alp E, Ozturk A, Guven M, Celik I, Doganay M, Voss A. Importance of structured training programs and good role models in hand hygiene in developing countries. *J Infect Public Health*. 2011;4(2):80-90.
22. Askarian M, Yadollahi M, Kuochak F, Danaei M, Vakili V, Momeni M. Precautions for health care workers to avoid hepatitis B and C virus infection. *Int J Occup Environ Med*. 2011;2:191-8.
23. Razi A, Rehman R, Naz S, Ghafoor F, Ullah MA. Knowledge attitude and practices of university students regarding hepatitis B and C. *ARPN J Agric Biol Sci*. 2010;5:38-43.
24. Reis C, Heisler M, Amowitz LL, Moreland RS, Mafeni JO, Anyamele C, et al. Discriminatory attitudes and practices by health workers toward patients with HIV/AIDS in Nigeria. *PLoS Med*. 2005;2:e246.
25. D'Souza RF, Glynn MJ, Alstead E, Osonayo C, Foster GR. Knowledge of chronic hepatitis C among East London primary care physicians following the Department of Health's educational campaign. *QJM*. 2004; 97:331-6.
26. Shaheen S, Nighat N, Majid HQ. Knowledge regarding hepatitis B among EPI vaccinators working in district south, Karachi. *Pak J Med Sci*. 2007;23:538-41.
27. Kabir A, Tabatabaei SV, Khaleghi S, Agah S, Faghihi Kashani AH, Moghimi M, et al. Knowledge, attitudes and practice of Iranian medical specialists regarding hepatitis B and C. *Hepat Mon*. 2010;10:176-82.
28. Vaz K, McGrowder D, Alexander-Lindo R, Gordon L, Brown P, Irving R. Knowledge, awareness and compliance with universal precautions among health care workers at the University Hospital of the West Indies, Jamaica. *Int J Occup Environ Med*. 2010;1:171-81.
29. Alam M. Knowledge, attitude and practices among health care workers on needle-stick injuries. *Ann Saudi Med*. 2002;22:396-9.
30. Saleem T, Khalid U, Ishaque S, Zafar A. Knowledge, attitudes and practices of medical students regarding needle stick injuries. *J Pak Med Assoc*. 2010;60:151-6.
31. Setia S, Gambhir RS, Kapoor V, Jindal G, Garg S. Attitudes and Awareness Regarding Hepatitis B and Hepatitis C Amongst Health-care Workers of a Tertiary Hospital in India, *Ann Med Health Sci Res*. 2013; 3(4): 551-558.
32. Suchitra J B, Lakshmi Devi N. 2007, Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections). *Indian J Med Microbiol [serial online]* 2007 [cited 2014 Jul 2];25:181-7. Available from: <http://www.ijmm.org/text.asp?2007/25/3/181/34757>
33. Gunson RN, Shouval D, Roggendorf M, Zaaijer H, Nicholas H, Holzmann H, et al. Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in health care workers (HCWs): Guidelines for prevention of transmission of HBV and HCV from HCW to patients. *J Clin Virol*. 2003;27:213-30.
34. Saffar MJ, Jooyan AR, Mahdavi MR, Khalilian AR. Hepatitis B vaccination status in health-care workers. *Indian J Gastroenterol*. 2005;24:82-3.
35. Yamini, Jain A, Mandelia C, Jayaram Set. Perception and practice regarding infection control measures amongst healthcare workers in district government hospitals of Mangalore, India, *International Journal of Health & Allied Sciences*. 2012; 1(2): 68-73.