Al-Azhar Med. J. *Vol. 45(4), October 2016, 789-804*
DOI: 10.12816/0034741

HEALTH HAZARDS OF HOSPITAL WASTE AMONG WORKERS AT AL-AZHAR UNIVERSITY HOSPITALS

By

Abdel Razek Ali Awaad El-Shaer, Nabil Ahmed Hafez, Alaa Abd El - Wahed, Ahmed Ezzat Abd El-Aziz and Ismaiel Ewees Ameen*

Departments of Community & Industrial Medicine and Anesthesia & Intensive Care *, Faculty of Medicine, Al- Azhar University

ABSTRACT

Background: Hospital waste is one of the most common health related subject for health care provider. Effective surveillance of hospital waste as regard collection, storage, transportation and incineration in Al-Hussein or crushing and sterilization in Sayed Galal hospitals. The related health education paper is an important tool to increase the awareness of the health care providers and decrease the risk factors of developing blood born hepatitis among them.

Objectives: Identifying the occupational health hazards to which the hospital waste workers were exposed in Al-Azhar University Hospitals, and find out the proportion of hospital waste workers who were infected by blood born hepatitis (B and C), and identifying risk factors of developing infection by blood born hepatitis (B and C).

Subjects and Methods: Four hundred subjects from workers and nurses at different Departments of Al-Hussein and Sayed Galal University Hospitals as exposed group, and another 400 subjects as non exposed (control group) from security, and different administrative departments.

Results: Fifty Six subjects developed hepatitis antibodies at the end of the study period, and 344 subjects were not infected. 52.5% were mainly injured by needle stick, 89.2% were mainly supervised by nurses, 32.5% did periodic medical examination, and 77.5% agreed that safety box easily opened, accessible and evacuated before filling, 90% were using the personal protective equipments and 37.5% were vaccinated against HBV.

There were 46.6% attending and following monthly the health education seminars.There were 74.8% attending and following the training courses seminars. 96.25% were knew and fellow the color coding specification and separation. 40% of the studied group worked less than five years, 30% from five to ten years and 30% more than ten years .70% were satisfied with job.

There were 22.5% of the studied group had excellent knowledge before health education, 25% of the studied group had good knowledge before health education, 27.5 % had fair knowledge before health education, and 25% had poor knowledge before health education and changed after health education to 40%, 36.2, 18.8 and 5.0 respectively. 23.8 % of exposed were hypertensive, but only 11.5% of none exposed were hypertensive. 24.3 % of exposed were diabetics, but only 10.8% of none exposed were diabetic, 16.5 % hade chronic bronchitis and 11.3 % of exposed were asthmatic.

Conclusion: Fourteen of exposed had positive hepatitis Ab. 91.1% had positive PCR for HCV and HBV. 15% were positive hepatitis in Al-Hussein, but only 11% in Sayed Galal. 74.8% were attending and following the training courses seminars. 96.25% knew and fellow the color coding specification and

separation. 40% of the studied group worked less than five years, 30% from five to ten years and 30% more than ten years. 70% were satisfied with job.

Key words: Hospital waste – health hazards - hepatitis.

INTRODUCTION

Hospital waste is materials which are generated during diagnosis, treatment, vaccination, research or in the production or testing of biological products for humans and animals. The term clinical solid waste includes syringes, live vaccines, blood and other waste contaminated with bodily fluids, culture dishes, sharp objects, discarded surgical gloves, discarded surgical instruments, cultures, stocks, swabs used to inoculate cultures, removed body organs and others **(Hossain et al., 2011).**

Agumuth (2010) also defines clinical waste as waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar investigative, treatment care or research practice. Holmes (2009) adds that clinical waste is a healthcare waste that may prove hazardous to those that come into contact with it. Hazardous medical waste management is becoming a serious concern for environmental and health safety authorities. Medical wastes (MW) generated from medical facilities are dangerous if handled, treated or disposed of incorrectly. In Egypt the issue of hazardous wastes management has acquired an increasing interest in the last two decades, as the awareness of their serious health effects has increased on both public and governmental level **(Memish, 2010).**

Currently world cities generate about 1.3 billion tones of solid waste per year. This volume is expected to increase to 2.2 billion tones by 2025. Waste generation rates will more than double over the next twenty years in lower income countries. Globally solid waste management costs will increase from today's annual $205.4 billion to about $375.5 billion in 2025. Cost increases will be most severe in low income countries (more than 5-fold increases) and lower-middle income countries (more than 4-fold increases**) (Daniel and Perinaz, 2015).**

Studies indicated that the clinical solid waste management at healthcare facilities is inadequate in developing countries. In many developing countries the clinical waste is handled and disposed together with non-clinical waste which is creating a vital and even fatal health risk to health care workers and the general public **(Coker et al., 2009).**

In Egypt the technologies applied for medical waste (MW) treatment are incineration, steam sterilization (with or without shredding), and chemical sterilization with shredding. Incineration represents the most common method applied in Egypt **(Abou-Elseoud, 2008).**

Most of the waste (about 80%-90%) generated in the hospital is general waste which is similar to the waste generated in house and offices. This waste is non toxic and non infectious, and comprises of paper, leftover food articles, peels of fruits, disposable and paper containers for tea/coffee etc, These general wastes should be put into black colored polythene bags and are deposited at the municipal. It is subsequently collected by the local

municipal authorities for disposal every day **(Busch, 2008).**

Generation of healthcare waste differs not only from country to country but also within the country. Waste generation depends on numerous factors such as established waste management methods, type of healthcare establishment, hospital specialization, proportion of reusable or disposable medical devices employed in healthcare, occupancy rate and proportion of patients treated on daily basis and the degree of regulation enforcement at national and local levels, definitions of medical waste, training of medical waste management and medical waste treatment and disposal policy type **(Jang et al. 2015).**

Muluken et al. (2016): found that 58.8% of participants had infectious by hepatitis C However, 31.2% of the respondents were not infected by hepatitis C .

Aim of the study:

- To identify the occupational health hazards to which the hospital waste workers were exposed in Al-Azhar University Hospitals.
- To find out the proportion of hospital waste workers who were infected by blood born hepatitis (B and C).
- To identify risk factors of developing infection by blood born hepatitis (B and C) among the studied hospital waste workers in Al-Azhar University Hospitals.

SUBJECTS AND METHODS

The target population was workers and nurses in different hospitals departments as exposed group to hospital waste and administrative and security personnel as non exposed group. The study included 300 persons exposed to hospital waste from Al-Hussein, and 100 persons exposed to hospital waste from Sayed Galal hospital. They were exposed to interview sheet to define the health hazard to which hospital waste workers are exposed, and define the risk factors for infection. A health education paper was given for all subjects to increase their awareness toward hospital waste. Another 400 persons were chosen as a control group (non exposed group): 300 from Al-Hussein Hospital and100 from Sayed Galal Hospital.

All exposed and non exposed persons were examined clinically and investigated for Hepatitis C Virus Ab and Hepatitis B virus Ag. And 45 subjects from the positive (56 subject which) equal 80.4% were investigated by PCR for Hepatitis C Virus and Hepatitis B virus on their own cost. The sample (400 persons) was chosen by simple random technique from all workers and nurses exposed to hospital waste through the duration of the study and agreed to participate in the study.

The study was conducted at different departments at two hospitals (Al Hussein and Sayed Galal hospitals), The study took twenty four months duration from the First of July 2014 till the end of June 2016. Before starting the practical phase, a pilot study was conducted for about two month (11 &12 / 2014). It included 10% of the study sample (40 subjects chosen randomly). Data collection and scoring phase lasts about 12 months (from first of January to the end of December 2015). Data were collected using the previously constructed interview sheet. Each inter-

view session lasted about 30 minutes on the average and about 5 to 7 cases at each visit which done day after day at average 70 cases per month. The researcher had visited the research setting about three visits per week at different hours of the day to ensure meeting the entire subject at different shifts. Data management and reporting phase took six months (between first of January to the end of June 2016).Data entry and statistical analysis was accomplished with the aid of computer using SPSS program version 18. The results were represented in tabular and diagrammatic forms, then interpreted. Chi ^{2} test was made for comparison. P value < 0.05 was considered significant. Oral consent was taken from all participants, and who refuse share in the work was excluded.

RESULTS

Most of the exposed group (46.25%) worked at surgical departments, followed by medical departments (31.25%), and intensive care (22.5% Table 1).

Table (1): Distribution of the exposed group according to department of work.

Groups / Departments	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total = 400*	
	Nurses =200		*Workers =100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Medical	**50**	**25.0**	**35**	**35.0**	**30**	**42.9**	**10**	**33.3**	**125**	**31.25**
Surgical	**95**	**47.5**	**45**	**45.0**	**35**	**50.0**	**10**	**33.3**	**185**	**46.25**
I.C.U.	**55**	**27.5**	**20**	**20.0**	**5**	**7.1**	**10**	**33.34**	**90**	**22.5**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X²	**18.808**									
P-value	**0.045**									

Most of the exposed group were nurses *67.5%*. 18.5% worked at collection and storage, 8.5% worked at transportation, and 5.5% worked at incineration (Table 2).

Table (2): Distribution of the exposed group according to stages of work.

Parameters / Stages of work	Exposed group (400)		Hospital			
			Al-Hussein Hospital (300)		*Sayed Galal hospital* (100)	
	N.	%	N	%	N	%
Separation at the source	**270**	**67.5**	**200**	**66.7**	**70**	**70**
Collection and Storage	**74**	**18.5**	**59**	**19.7**	**15**	**15**
Transportation	**34**	**8.5**	**26**	**8.6**	**8**	**8**
Incineration and crushing	**22**	**5.5**	**15**	**5**	**7**	**7**
Total	**400**	**100.00**	**300**	**100**	**100**	**100**

47% of injuries occurred due to needle sticks and blood products .Most injuries occurred by needle sticks (52.5%) during uses of syringes, and 15 % during recapping (Table 3).

Table (3): Distribution of the exposed group according to needle sticks injury during their work

Parameters / Needle sticks injury during	Exposed group (400)		Hospital		X^2	P
	N.	%	*Al-Hussein Hospital*	*Sayed Galal hospital*	405.89	<0.0001
Uses of syringes	**210**	**52.5**	**165**	**45**		
Recapping	**60**	**15.0**	**38**	**22**		
Needle disposal	**60**	**15.0**	**44**	**16**		
Final disposal	**70**	**17.5**	**53**	**17**		
Total	**400**	**100.00**	**300**	**100**		

The generation rate was 2.1kg /bed in Al Hussein hospital, and 1.9 kg /bed in Sayed Galal hospital**.** At Al-Hussein hospital, there were special vehicles but not in Sayed Galal hospital (Table 4).

Table (4): Waste management from both hospitals at 2015

Hospital / Parameters		*Al-Hussein Hospital*	*Sayed Galal hospital*
Number of beds		**430 - beds**	**380 - beds**
Generation /kg/bed		**2.1kg /bed**	**1.9 kg /bed**
Daily HW /kg/hospital/day		**903 kg/day**	**722 kg/day**
Type of HW	**Non medical**	**1.4 kg/bed = 602 kg /day**	**1.2 kg/bed = 456kg /day**
	medical	**0.5 kg /bed = 215kg/ day**	**0.5 kg /bed = 190 kg/ day**
	Sharp instruments	**0.2 kg /bed = 86 kg/ day**	**0.2 kg /bed = 76 kg/ day**
Transport	**Special vehicle**	**Special vehicle**	**---**
	Paid daily	**---**	**Paid daily vehicle**
Time of final transportation	**daily**	**daily**	**daily**
Disposal of hospital waste		**incineration**	**Crushing and sterilization**

There were 22.5% of the studied group had excellent knowledge before health education, 25% had good knowledge before health education, 27.5 % had fair knowledge before health education, and 25% had poor knowledge before health education (Table 5).

Table (5): Distribution of the exposed groups according to knowledge before health education.

Exposed groups / *Knowledge before health education*	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total = 400*	
	Nurses =200		*Workers = 100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Excellent >85%	**50**	**25.0**	**10**	**10.0**	**25**	**35.7**	**5**	**16.7**	**90**	**22.5**
Good > 75%	**60**	**30.0**	**10**	**10.0**	**25**	**35.7**	**5**	**16.7**	**100**	**25.0**
Fair >60%	**45**	**22.5**	**40**	**40.0**	**15**	**21.4**	**10**	**33.3**	**110**	**27.5**
Poor <60 %	**45**	**22.5**	**40**	**40.0**	**5**	**7.2**	**10**	**33.3**	**100**	**25.0**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X^2	**56.5053**									
P-value	**< 0.0001**									

There were 40% of the studied group had excellent knowledge before health education, 36.2% had good knowledge before health education, 18.8 % had fair knowledge before health education, and 5% had poor knowledge before health education (Table 6)**.**

Table (6): Distribution of the exposed groups according to knowledge after health education.

Exposed groups / *Knowledge after health education*	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total = 400*	
	Nurses =200		*Workers=100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Excellent >85%	**90**	**45.0**	**25**	**25.0**	**35**	**50.0**	**10**	**33.3**	**160**	**40.0**
Good> 75%	**85**	**42.5**	**20**	**20.0**	**30**	**42.9**	**10**	**33.3**	**145**	**36.2**
Fair >60%	**17**	**8.5**	**48**	**48.0**	**3**	**4.2**	**7**	**23.4**	**75**	**18.8**
Poor <60 %	**8**	**4.0**	**7**	**7.0**	**2**	**2.9**	**3**	**10.0**	**20**	**5.0**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X^2	**87.6377**									
P-value	**0.0001**									

There were 96.25% of the studied group, know and follow the color coding specification, and separation in relation to only 3.75% of the studied group who did not know nor follow the color coding specification and separation (Table 7).

Table (7): Knowledge of color coding among exposed groups.

Exposed groups / *Knowledge-of Color coding*	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total= 400*	
	Nurses =200		*Workers =100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Know & follow Color coding	**197**	**98.5**	**90**	**90.0**	**70**	**100.0**	**28**	**93.3**	**385**	**96.25**
Not know, Nor follow color coding	**3**	**1.5**	**10**	**10.0**	**0**	**0.0**	**2**	**6.7**	**15**	**3.75**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X^2	**17.062**									
P-value	**<0.001***									

There were 90% of the studied group used the personal protective equipments in relation to only 10% of the studied group who did not use the personal protective equipments (Table 8).

Table (8): Distribution of the exposed groups according to usage of personal protective equipments.

Exposed groups / **Usage of personal protective equipments**	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total = 400*	
	Nurses =200		*Workers =100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Use *personal protective equipments*	**185**	**92.5**	**85**	**85.0**	**65**	**92.9**	**25**	**83.3**	**360**	**90.0**
Not use Personal *Protective Equipments*	**15**	**7.5**	**15**	**15.0**	**5**	**7.1**	**5**	**16.7**	**40**	**10.0**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X^2	**6.281**									
P-value	**<0.099**									

67.5% of the exposed group did not do periodic medical examination, and 32.5% did periodic medical examination (Table 9).

Table (9): Distribution of the exposed groups according to periodic medical examination we noted that

Exposed groups / *Periodic medical examination*	*Al-Hussein Hospital*				*Sayed Galal hospital*				*Total= 400*	
	Nurses =200		*Workers =100*		*Nurses =70*		*Workers =30*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Done every year	**70**	**35.5**	**9**	**9.0**	**45**	**64.3**	**6**	**20.0**	**130**	**32.5**
Not done	**130**	**65.0**	**91**	**91.0**	**25**	**35.7**	**24**	**80.0**	**270**	**67.5**
Total	**200**	**100.0**	**100**	**100.0**	**70**	**100.0**	**30**	**100.0**	**400**	**100.0**
X^2	**60.119**									
P-value	**<0.001***									

There were 16.5 % of the exposed had chronic bronchitis, and only 6% of none exposed had chronic bronchitis. As regards bronchial asthma, there were 11.3 % of exposed were asthmatic and only 3.2% of none exposed not asthmatic. As regards allergic sinusitis, there were 11.5 % of the exposed had allergic sinusitis and 24 (6%) of none exposed are had no allergic sinusitis (Table 10) .

Table (10): Distribution of exposed and non exposed groups as regard chronic bronchitis, bronchial asthma and allergic sinusitis.

Groups / **Parameters**	**Exposed group (400)**		**Non exposed group (400)**		**X2**	**P-value**
	N.	**%**	**N.**	**%**		
Chronic bronchitis	**66**	**16.5**	**24**	**6.0**	**22.08**	**<0.001**
Bronchial asthma	**45**	**11.3**	**13**	**3.25**	**14.04**	**<0.001**
Allergic sinusitis	**46**	**11.5**	**24**	**6.0**	**7.577**	**<0.006**

There were 9.8 % of the exposed had eczema, and only 17 (4.3%) of none exposed had eczema. 15.8 % of the exposed had dermatitis, and only 2.3% of none exposed had no dermatitis (Table 11).

Table (11): Distribution of exposed and non exposed groups as regard eczema and dermatitis.

Groups / **Parameters**	**Exposed (400)**		**Non exposed (400)**		**X2**	**P-value**
	N.	**%**	**N.**	**%**		
Eczema	**39**	**9.8**	**17**	**4.3**	**9.293**	**0.002**
dermatitis	**63**	**15.8**	**9**	**2.3**	**44.506**	**<0.001**

In exposed, there were 10.5 % have positive hepatitis C and 3.5 % have positive hepatitis (B). In non exposed, there were only 3.75% have positive hepatitis C and 0.75% positive hepatitis B (Table 12).

Table (12): Prevalence of hepatitis(C & B) at Al-Hussein and Sayed Galal Hospitals.

Hepatitis(C & B) / *Groups*		*Negative*		*Positive B*		*Positive C*		*Total*	
		N.	*%*	*N.*	*%*	*N.*	*%*	*N*	*%*
Exposed (400)		344	86.0	14	3.5	42	10.5	56	14
Non exposed(400)		382	95.5	3	0.75	15	3.75	18	4.5
Chi-square	X^2	21.896							
	P-value	<0.0001							

There were 13 have positive hepatitis B and not vaccinated in relation to only 1 has positive hepatitis B and vaccinated from 150 vaccinated and 250 not vaccinated, but in non exposed only 3 have positive hepatitis B and not vaccinated in relation to no one infected in vaccinated from 20 vaccinated and 380 not vaccinated (Table 13).

Table (13): Relation of hepatitis (B) vaccination & infection by hepatitis BV.

Parameters / *Vaccination by H B V*		*Exposed(400)*		*total*	*Non exposed (400)*		*total*	*Chi-square*	
		vacci	*Not vaccin*		*vaccina*	*Not vaccinated*		X^2	*P-value*
Infected(17)		**1**	**13**	**14**	**0**	**3**	**3**	**25.118**	**<0.001***
Not infected(783)		**149**	**237**	**386**	**20**	**377**	**397**	**345.43**	**<0.001***
Total(800)		**150**	**250**	**400**	**20**	**380**	**400**		
Chi-square	X^2	**5.704**			**0.159**				
	P-value	**0.017**			**0.69**				

In exposed, there were 3.5% have positive hepatitis B but in non exposed there were only 0.75% (Table 14).

Table (14): Prevalence of hepatitis (B) among the studied group.

Groups / *Hepatitis (B) infection*		Exposed group (400)		Non exposed group (400)		Total	
		N.	*%*	*N.*	*%*	*N*	*%*
Negative B		**386**	**96.5**	**397**	**99.25**	**783**	**97.9**
Positive B		**14**	**3.5**	**3**	**0 0.75**	**17**	**2.1**
Total		**400**	**100%**	**400**	**100%**	**800**	**100.0**
Chi-square	X^2	**7.272**					
	P-value	**0.007**					

In exposed workers (45) with positive antibodies who had PCR was positive for HCV and HBV from the total positive exposed 56 equal (80.4%). There were 41 (91.1%) positive in relation to whom had negative PCR for HCV and HBV 4 (8.9%) (Table 15).

Table (15): Prevalence of HCV Ab and HBV Ag at both Hospitals.

Cases do PCR For HCV&HBV / **Parameters**	**Positive PCR for HCV & HBV**		**Negative PCR for HCV & HBV**	
Total = 45 from total +ve exposed 56	**N**	**%**	**N**	**%**
	41	**91.1**	**4**	**8.9**
X^2	**30.422**			
P value	**<0.001**			

At Al-Hussein hospital 600 persons there were 60 (10%) positive hepatitis, but in Bab ElSharia of 200 persons there were 14 (7%) positive with total positive HCV Abs & HBV Ag were 74 (9.2%) (Table 16).

Table (16): Polymerase chain reaction (PCR) for HCV and HBV among positive exposed group.

Hepatitis / *Hospitals*		Not infected		Infected	
		N.	*%*	*N.*	*%*
El-Hussein (600)		**540**	**90.0**	**60**	**10.0**
Sayed Galal (200)		**186**	**93.0**	**14**	**7.0**
Total (800)		**726**	**90.8**	**74**	**9.2**
Chi-square	X^2	**1.608**			
	P-value	**0.205**			

In exposed, there were 11.1% of nurses, 20% of workers were positive, but in none exposed there were 8 (4.4%) in security workers, and 4.5 % positive in administrative workers *(Table 17).*

Table (17): Job title and infection by Hepatitis (C &B) among exposed and non exposed.

Job title / Hepatitis			Exposed		Non exposed		Chi-square	
			Nurses	workers	security	Administrative	X^2	P-value
Total		800	270	130	180	220	53	<0.001
Infected (9.2%)		+ve (74)	30 = 11.1%	26 =20%	8 =4.4%	10 = 4.5	20.54	<0.01
Non infected (90.8%)		-ve (726)	240 = 88.9	104= 80%	172 =95.6	210 = 95.5	56.92	<0.001*
Total		800	100%	100%	100%	100%		
Chi-square	X^2		5.759		0.0024			
	P-value		0.016		0.961			

DISCUSSION

Concerning department of work, our present study noted that most of the exposed group (46.25%) worked at surgical departments, followed by medical departments (31.25%) and intensive care (22.5%). They were taken randomly from the available departments.

According to the stage of work, our study noted that most of the exposed group were nurses *270 (67.5%).* They worked beside their work at their departments. So, their main work was separation at the source, followed by 18.5% were work at collection and storage, 8.5% work at transportation and 5.5% worked at incineration at Al-Hussein hospital and crushing with sterilization by chemicals as chlorine, formalin and formaldehyde in Sayed Galal hospitals.

Our study showed that 47% of injuries occurred due to needle sticks and blood products and most injuries by needle sticks 52.5% occurred during uses of syringes, and 15 % during recapping. **Bongayi (2013),** in South Africa, reported few cases of injuries to personnel were during handling and collection of clinical waste. Also, **Kermode et al. (2005)** revealed that needle stick injury occur during procedures, while during drawing of blood is 22.6%, recapping is 11%, needle disposal is 10.5%, and garbage disposal is 12.5%. The categories of staff exposed to needle stick injuries are staff nurses (34.6%), interns (15.7%), residents (11.7%), practical nurses (8.5%), and technical staff (6%).

Concerning the generation rate of hospital waste, our study described that the generation rate was 2.1kg /bed in Al Hussein hospital, and 1.9 kg /bed in Sayed Galal hospital.This agreed with the study of **Artiola (2010)** who revealed that an average amount of waste generated in developing countries, including India, ranges from approximately 1 to 4.5 kg per bed per day and estimates of clinical waste generated can be made from a number of beds in any facility and an average amount of waste generated per bed. The range varies widely per bed generation and method of estimate used. On the other hand, we disagreed with **Nemathaga et *al.* (2008)** who reported that the generation rate for Canada and USA were reported to range from 4.3 to

5.8 kg per day which was more than that generated at our study. This may be attributed to the classification of countries according to income.

Our study noted that there were 22.5% of the studied group had excellent knowledge before health education, 25% of the studied group had good knowledge before health education, 27.5 % had fair knowledge before health education, and 25% had poor knowledge before health education and changed after health education to 40%, 36.2, 18.8 and 5.0 respectively. This may be due to different level of education and response of the studied group after health education leading to improvement in knowledge. **Abd El-Salam (2010)** reported that one of the main reasons on the mismanagement of clinical solid waste is the lack of awareness of the waste handlers regarding the infectious risk of clinical solid waste as 14% of the studied sample has very poor awareness, 26% of the studied sample has poor awareness, and 30% has good awareness, and 30% excellent.

Our study noted that there were 96.25% of the studied group, know and follow the color coding specification, and separation in relation to only 3.75% of the studied group did not Know nor follow the color coding specification and separation. Among persons knew and fellow color coding, there were 12.7 % infected. In subjects who did not know and fellow color coding, there were 46.7 % infected. This agreed with the study done on assessment of biomedical waste management in Ludhiana, India in which 95.8% HCWs know classification of healthcare waste, and color coding system is known by 93.7% **(Mathew et al., 2011).**

Our study approved that 67.5% had not do periodic medical examination, 32.5% had periodic medical examination. This may be attributed to that it was not obligatory.

Our present study showed that there were 90% of the studied group used the personal protective equipments in relation to only 10% of the studied group did not use the personal protective equipments. This may be attributed to that the usage of personal protective equipments was obligatory and had a financial punish if not followed .We agreed with the study done in Gondar town, Northwest Ethiopia which showed that majority of the respondents (93.1%) in used gloves during handling of healthcare wastes **(Muluken et al., 2013).** On the other hand this disagreed with the study reported by **Mochungong (2010),** where 77% of clinical waste handlers in surveyed healthcare facilities lacked protective equipments. Gloves, overall gowns and masks to protect workers are not provided in studied healthcare facilities in the Northwest region of Cameroon.

Our present study reported that 37.5 % were vaccinated, and 62.5% were not vaccinated, among exposed group. This rate of vaccination was unsatisfactory from our point of view. Also, among vaccinated persons there were 23.3% infected. In non vaccinated, there were 76.8% infected. Among exposed, there were 13 positive (B) and not vaccinated in relation to only 1 positive (B) and vaccinated from 150 vaccinated and 250 not vaccinated but among non exposed group only 3 positive (B) and not vaccina-

ted in relation to no one infected in vaccinated from 20 vaccinated and 380 not vaccinated.

Our present study showed that there were hypertension (23.8%), diabetes mellitus (24.3%) ,chronic bronchitis (16.5%) and skin lesions (9.8%) were most common, in addition to 14% hepatitis had positive (HCV 10.5% &HBV 3.5%).The exposed workers with positive antibodies had PCR positive for HCV and HBV from the total positive exposed 80.4%. There were 91.1% positive in relation to whom had negative PCR for HCV & HBV 8.9%.

In our study, the prevalence of HBV Ag positivity were 3.5% in exposed, and only 0.75% in non exposed. This agreed with the study of **Dounias (2006)** who reported that the prevalence of HBs Ag was higher in hospital waste collectors (11.3%) than in non-exposed group (4.5%), with no significant difference between them. On the other hand, our work disagreed with the study of **Rachiotis et al. (2012)** who found that there was a higher prevalence of HBV Ag of waste collector workers in central Greece .The prevalence of HBV infection was 23%.

CONCLUSION

Fourteen of exposed had positive hepatitis Ab from them 91.1% had positive PCR for HCV &HBV. 15% were positive hepatitis in El-Hussein but only 11% in Sayed Galal. Further studies are needed to continuously upgrade hazards of hospital waste in (Al Hussein and Sayed Galal Hospitals) and other hospitals as well. 46.6% were attending & following monthly the health education seminars. 74.8% were attending & following the training courses seminars. 96.25% were Knowing & following the color coding specification and separation.40% of the studied group worked less than five years, 30% from five to ten years and 30% more than ten years and 70% were satisfied with job. Establishment of an organized hospital waste surveillance program in (Al Hussein and Sayed Galal Hospitals), implementing administrative regulations to reduce the health hazards of Hospital waste and reducing the prevalence of hepatitis, mass immunization of all workers and employee of the hospitals against hepatitis B and generalization of premployment and periodic medical examination.

REFERENCES

1. **Abd El-Salam MM (2010):** Hospital waste management in El Beheira Governorate Egypt. *Journal of Environmental Management,* 91: 618-629.

2. **Abou-El Seoud, N (2008):** Arab Environment: Future Challenges Arab Forum for Environment and Development (AFED) Report CH Cross section study Journal of Waste Management, 123 -28.

3. **Agumuth P (2010):** Waste management in developing Asia: Can trade and cooperation help The Journal of Environment and Development, 17, 1: 1-25.

4. **Artiola FJ (2010):** *Clinical waste management in Malaysia: A case study at Teluk Intan Hospital.* Canada: Prentice Hall J. Waste Management, 14, 2:27-29.

5. **Bongayi K (2013**): Evaluation of clinical waste management in Gaborone city council health care facilities. environmental management, University of South Africa, Journal of infection control 6, 2:18-20.

6. **Busch G. (2008):** Fundamental of Solid Waste Management Cottbus council University of technology/Chair of waste management. J. Waste Management, 2,34-37.

7. Clarke J (2008): Clinical waste in developing countries. Journal of Nepal Health Research Council, 28, 1; 44-67.

8. Coker A, Sangodoyin A, Sridhar M, Booth C and Olomolaiye P (2009): Medical waste management in Ibadan, Nigeria: obstacles and prospects. Journal of Waste Management, 29: 804-811.

9. Crick N (2012): Waste management in South Africa, Journal of Environment Watch of Botswana, 16, 12-15.

10. Daniel H & Perinaz B (2015): What a waste resistance outbreaks across bacterial species in the intensive care unit, J.Clin. Infect. Dis., 57(1): 65-76.

11. Dounias MG (2006): The contributions of hepatitis B virus and hepatitis C virus infections to cirrhosis and primary liver cancer worldwide. Journal of Hepatology, 45:529-38.

12. Holmes JR (2009): Managing waste in developing countries. Pbl. New York: Wiley Journal of waste managment26, 323 -27.

13. Hossain M.S, Santhanam A, Nik Norulaini N.A and Mohd Omar A.K (2011): Clinical solid waste management practices and its impact on human health and environment, A review. Journal of Waste Manageme, 31: 754-766.

14. Jang YC, Lee C, Yoon OS and Kim H (2015): Medical waste management in Korea. Journal of Waste Management, 80: 107-115.

15. Kermode M, Jolley D, Langkham B, Thomas MS and Crofts N (2005): Occupational exposure to blood and risk of bloodborne virus infection among health care workers in rural north Indian health care settings**.** J Infect Control 33(1):34-41.

16. Kishore J, Goyal P, Sagar B and Joshi TK (2007): Awareness about biomedical waste management and infection control among dentist of a teaching hospital in New Delhi, India. J Dent Res: 11(4):157–61.

17. Mathew SS, Benjamin AI and Sengupa P (2011): Assessment of biomedical waste management practices in a tertiary care teaching hospital in Ludhiana. *Healthline* 2: 28-30.

18. Memish ZA (2010): Egyptian Environmental Policy Program of Solid Waste Management, Privatization Procedural Manual, Solid Waste Technical Assistance Program, Ch 11, Medical waste collection, treatment and disposal by Memish USA , pp: 1-54.

19. Mochungong PIK (2010): The plight of clinical waste pickers: Evidence from North West region Cameroon. Journal of Occupational Health, 52: 142-145.

20. Nemathaga F, Maringa S and Chimuka W (2008): Hospital solid waste management practices in Limpopo province South Africa: A case study of two hospitals. Journal of Waste Management, 28, 1236-1245.

21. Muluken A, Haimanot G and Solomon M (2016): A cross sectional study on factors affecting nosocomial infection. Journal of Infection Control, 16 (2) : 212 - 14.

22. Muluken, Gebrehiwot Haimanot, Azage M and Mesafint M. (2013): Healthcare waste management practices among healthcare workers in healthcare facilities of Gondar town, Northwest Ethiopia Health Science Journal, 7 16 -19.

23. Rachiotis G, Papagiannis D, Markas D, Thanasias E and Dounias G (2012): Hepatitis B virus infection and waste collection: prevalence, risk factors, and infection pathway. Am J Ind Med., 55: 650-655.

24. Ramokate T and Basu D (2009): Healthcare waste management at an academic hospital: knowledge and practices of doctors and nurse. South African Medical Journal, 99(6): 444-450.

25. Squeri R, La Fauci V, Sindoni L, Cannav? G and Ventura Spagnolo E (2006): Studyon hepatitis B and C serologic status among municipal solid waste workers inMessina (Italy). J Prev Med Hyg 47: 110-113.

المخاطر الصحية للمخلفات الطبية بين العاملين بمستشفيات جامعة الأزهر
(دراسة الحالات المرضية المقترنة بحالات ضابطة)

عبد الرازق على عواد الشاعر - نبيل أحمد حافظ - علاء عبد الواحد - أحمد عزت عبد العزيز - إسماعيل عويس أمين*

قسم طب المجتمع وطب الصناعات وقسم التخدير والعناية المركزة * – كلية طب الأزهر

خلفية البحث: أصبح موضوع التخلص من المخلفات الطبية الخطرة من المواضيع الهامة والخطيرة بالنسبة للبيئة ومسئولى الصحة والأمان. فالمخلفات الطبية الناتجة من المنشآت الطبية تصبح خطيرة للغاية إذا تم التعامل معها وعلاجها والتخلص منها بطريقة غير صحيحة.

الهدف من الدراسةِ : معرفة المخاطر الصحية التى يتعرض لها العاملين القائمين على تجميع والتخلص من المخلفات الطبية و معرفة نسبة العاملين المصابين بالفيروسات الكبديه (بى و سى) بمستشفيات جامعة الازهر هذا علاوة علي تحديد عوامل الخطر التى نشا عنها الاصابة بالفيروسات الكبدية بين العمال .

طريقة البحث: تمت الدراسة العملية على مدار عام كامل بواقع يوم بعد يوم أسبوعياً، وبلغ إجمالي عدد العاملين الملتحقين بالدراسة 400 من الذكور والإناث بمستشفيات جامعة الازهر (300 من مستشفى الحسين و 100 من مستشفى سيد جلال) فى الأقسام الإكلينيكية المختلفة لمعرفة المخاطر الصحية التى يتعرض لها العاملين القائمين على تجميع والتخلص من المخلفات ،ولمعرفة نسبة العاملين المصابين بالفيروسات الكبدية التى تنتقل عن طريق الدم (بى و سى). هذا بالإضافة إلى تحديد عوامل الخطر التى نشأ عنها الاصابة بالفيروسات الكبدية بين العمال القائمين على تجميع والتخلص من المخلفات الطبية. كما تم إختيار مجموعة ضابطة (400 آخرين) من العاملين فى الأقسام الخدمية المختلفة كالعاملين فى مجال الامن والموظفين الإداريين من مختلف الأقسام كمجموعة غير معرضة للمخلفات (300 من مستشفى الحسين و 100 من مستشفى السيد جلال).

نتائج الدراسة: أثبتت الدراسة أن 56 من العاملين المعرضين للمخلفات الطبية لديهم أجسام مضادة للفيروس الكبدي (سى و بى) ،344 غير مصابين بالفيروس الكبدى (سى و بى). ولقد أثبتت الدراسة أن 40% يتعرضون لوخز الإبر ،30% يتعرضون لوخز الإبر ومنتجات الدم، وأن 52,5 % ممن يتعرضون لوخز الابر يحدث أثناء إستخدام الحقن ،15% أثناء إعادة تغطيتها. وأوضحت الدراسة أن 90% من العاملين يستخدمون ملابس ومهمات الوقاية الشخصية ، 37,5% تم تطعيمهم ضد فيروس

(بـى). أمـا بالنسـبة لحضـور دورات التثقيـف الصـحى، فقـد وجـد أن 46,6% يحضـرون ويتبعـون إرشادات جلسات التثقيف الصحى الشهرية ، 74,8% يحضرون ويعملون بإرشادات التدريب الميدانى ، 96,25% يعلمون ويتبعون عمليات فصل الأكياس المخصصة للمخلفات الطبية الأحمر والأسود وصندوق الآلات الحادة. فى مستشفى الحسين (600 شخص) ، ووجدنا 60 شخص (10 %) لديهم أجسام مضادة للفيروسات ، بينما فى مستشفى سيد جلال (200 شخص) وجدنا 14 شخص (7 %) لديهم أجسام مضادة للفيروسات، ومجموع الإيجابى فى الجميع كان 74 شخصاً (9,2 %).

الإستنتاج: وجد أن 14% من العاملين العرضين للمخلفات لديهم أجسام مضادة للفيروسات الكبدية (بى ،سى) : منهم 91,1% إيجابى بى سى ار للفيروسات الكبدية (بـى ،سـى) ، 15% إيجـابى فـى مستشـفى الحسين مقابل 11% فقط فى مستشفى سيد جلال، 46,6 % حضروا حلقات التثقيف الصـحي الشـهرية، 74,8% حضـروا الـدورات التدريبيـة، 96,25%كـانوا يعرفـون فصـل الألـوان ، 40% عملـوا أقـل مـن خمس سنوات ، 30% عملوا من خمس إلى عشر سنوات ، 30% عملوا أكثر من 10 سنوات وأن 70% راضين عن عملهم.