

# EFFECT OF HEALTH EDUCATION PROGRAM ABOUT BLOOD BORNE PATHOGENS (BBPS) TRANSMISSION ON PRIMARY HEALTH CARE WORKERS IN ISMAILIA CITY (AN INTERVENTION STUDY)

By

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## **Abstract:**

**Introduction:** Among 35 million Health Care Workers worldwide, about 3 million primary health care workers (PHCWs) experience percutaneous exposures to blood borne pathogens (BBPs) each year, these percutaneous injuries may result in 15000 HCV and 70000 HBV and 1000 HIV infections, which lead to about 1100 deaths and significant disabilities. More than 90% of these infections occur in developing countries. **Aim of Work:** The present study was conducted for prevention of BBPs transmission to HCWs through: determining their base line knowledge, attitude, and practice regarding Blood Borne Infectious Diseases (BBIPs) transmission, prevention and control, preparing and adopting a health education program for primary health care workers safety against BBIPs and evaluation for recommended generalization. **Materials and Methods:** A concise situational analysis was done first, then, an intervention health education program was conducted in all primary health care centers present in Ismailia city (4 centers) aiming to improve knowledge, attitude and practice (KAP) of 170 PHCWs (physicians, nurses and technicians who accepted to participate in this research) about BBPs, related universal precautions (UP) and preventive measures. Evaluation of this intervention was done by assessment of the change in PHCWs KAP regarding BBIDs UP and preventive measures. **Results:** This study showed that (45.9%) of PHCWs had complete courses of HBV vaccination, also 39.4% of PHCWs received at least one

previous training course related to BBIDs. About 41.8% of PHCWs were exposed to needle sticks injuries in the last year, where workers, nurses and laboratory technicians had a higher percentage of exposure more than dentists and physicians. Nearly 34.4% of subjects, who tested, were seropositive for BBIDs. Mean total knowledge score of  $5.23 \pm 2.13$  and  $4.31 \pm 2.17$  About BBIDs and UP respectively with a highly significant difference ( $P < 0.05$ ). Also, PHCWs in Ismailia City have a high significant positive attitude towards UP and preventive measures ( $P < 0.001$ ) while no significant difference was detected regarding their practice to most items of UP whereas (55.3%) have a poor practice of UP for BBIDs. After application of health education program, there was a highly significant improvement ( $P < 0.001$ ) in the PHCWs knowledge regarding blood spells, no two-handed recapping of needles and hand washing after dealing with the patient (improved mean total knowledge score about BBIDs among all PHCWs except the physicians) but no improvement in workers' knowledge about sharp waste disposal.

**Conclusion and Recommendation:** Although health education got a positive impact on PHCWs' safety by improvement of their knowledge and attitude regarding BBIDs and its UP, but still they have poor practice regarding UP of BBIPs. We recommend that HCWS training, to be available for free, complete coverage of vaccinations together with continuous supervision for UP application and post exposure management.

**Keywords:** healthcare workers, safety, blood borne pathogens, needle stick injuries.

### Introduction

The main principles of PHCWs safety are: to reduce their susceptibility to infection, prevent and / or manage occupational exposure to treat the infected ones (Gold et al., 2004).

Healthcare personnel are at risk from occupational exposure to blood borne pathogens including hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV) and others (CDC, 2007). Exposure of health care workers to Blood Borne Infectious Diseases (BBIDs) occur mainly through needle sticks or cuts from other sharp instruments contaminated with an infected patient's blood or through contact of the

eyes, nose, mouth, or skin with patients' blood (CDC, 2007). HCWs working in hospitals are frequently provide care to patients whose hepatitis B virus (HBV) or HIV status is unknown (Mohamed et al, 2006). So, Universal Precautions (UP) and preventive measures as immunization against hepatitis B, provision of personal protection and management of exposure is mandatory (WHO, 2003).

Among the 35 million Health Care Workers worldwide, about 3 million primary health care workers experience percutaneous exposures to blood borne pathogens each year, these injuries may result in 15000 HCV and 70000 HBV and 1000 HIV infections, which lead to about 1100 deaths and significant disabilities.

More than 90% of these infections occur in developing countries (WHO, 2006). In Egypt, a study of 1485 HCWs revealed that, 35.6% were exposed to at least 1 needle stick injury during the past 3 months with an estimated annual number of 4.9 needle stick per worker, while 64% of them disposed of needles unsafely in non puncture proof containers (Talaat et al, 2003).

Egypt is one of the highest countries of sero-prevalence for HCV and HBV (Frank et al., 2000 and Akhtar et al., 2005), while the result of National AIDS Control Program Surveillance revealed that, the prevalence HIV is around 0.03% in general population increasing to 0.05% to 0.56% among people with high risk behaviors (MOHP, 2007). In Egypt, lack of access to information and health education of the precaution guidelines importance also contribute to continued high risk behaviors (Talaat et al., 2003)

### **Aim of Work**

The present study was conducted for prevention of BBIPs transmission to HCWs through: determining their base line knowledge, attitude, and practice regarding BBIPs transmission, prevention and control, preparing and adopting a health education program for primary health care workers safety against BBIPs and evaluation for recommended generalization.

## **Materials and Methods**

### **-Study design, setting and sampling:**

An intervention study was conducted during the period from September 2012 to December 2013 in Ismailia city. The city is divided into four zones (City Council); each zone contains one Primary Health Care (PHC) center, the study was conducted in all the primary health care centers present in the city (El Sabaa Banat, Hie El Salam, El Sheikh Zaid, and El Shohadaa)

### **Study population: Inclusion & exclusion criteria:**

The study includes all PHCWs who are exposed to blood borne infectious diseases and accepted to participate in the study. The study population includes 170 PHCWs: 25 physicians, 15 dentists, 96 nurses, 11 laboratory technicians and 23 workers

### **Tools of the study**

**A) Questionnaires** Data were collected from PHCWs by using a questionnaire which includes four parts:

1. The first part: data about socio-demographic characteristics as age, sex, level of education and occupation. Also it includes data about previous training courses, history of exposure to needle stick injuries in the last year, processes and tools through which exposure to

blood takes place, serological analysis done after exposure and history of vaccination with HB vaccine.

2. The second part: included Knowledge questionnaire according to CDC, (2007) to collect data about BBIDs as regard definition, modes of transmission, high risk groups and UP. The knowledge about BBIDs was measured by 8 statements (score true, false or don't know) with maximum score of 8. The knowledge about UP was measured by 8 statements (score true, false or don't know) with maximum score of 8.
3. The third part: includes Attitude questionnaire according to CDC, (2007) to assess the attitude of PHCWs towards UP and it is measured by 8 questions as sharp disposal, use of protective equipments, hand washing and protection from HBV by special vaccine. The attitude questionnaire was scored agree or disagree with maximum score of 8.
4. The fourth part: includes an observational check list according to WHO, (2003) for evaluation of each participant practice regarding UP in 6 statements as wearing of personal protective equipments as gloves and gowns and ways of dealing with sharps.

5. The check list scored yes or no with maximum score of 6.

#### **B-Health education sessions:**

Spoken messages were given to all PHCWs participated in the study in the form of educational messages.

##### **Message:**

The educational message and major topics addressed in the lecture were:

- What the blood borne infectious diseases is and examples of such diseases.
- Modes of transmission of BBIDs.
- Risky behaviors and occupational practices that predispose to infection with such diseases.
- Consequences and effects of blood borne infections.
- UP and healthy behaviors and safe practices to avoid infection as safe sharp handling, choosing and using sharp containers, and selection of proper protective equipments.
- First aid management and post exposure prophylaxis.

#### **C) Assessment of health education intervention effect:**

Assessment of the effect of the intervention in changing knowledge,

attitude and practice of PHCWs towards BBIDs was done by using the same questionnaires and check list filled before.

### **study conduct:**

**A) Pilot study:** Before work starting, a pilot study was done during January 2010 on 20 PHCWs taken randomly from all Primary Health Care Centers (PHCCs) to test the feasibility and response to different items of the questionnaires where some modifications were done to be more suitable and simple :

### **B) Data collection and health education intervention:**

Data collection and conduction of awareness raising sessions were done between March and September 2010, with an average of five months lapse between pre and post test. Each PHC Center was visited as follow:

**First visit:** To inform the PHC directors and key leaders about the aim of the study and intended methodology to ensure their commitment, support and time allocation. This visit has always ended by scheduling appointments for the new visits.

**Second visit:** includes an interview of all PHCWs to fill the questionnaires, while the observational check list was filled by the researcher for every person through observing their practice. Health education

intervention: where, the participants were invited to attend interpersonal health education sessions that were held in each PHC center and for each participant alone. Key health education messages that were conveyed were characterized by being simple, clear, easily understood and communicated in slang Arabic language.

At the end of the sessions, participants were given a pout copy with an awareness message titled “10 key steps to protect yourself”. Posters illustrating “10 steps:

Application of UP at all patients.-  
Application of UP on blood and other body fluids-No two-handed recapping of needles-Safe disposal of sharp objects in special containers-Wearing protective equipment when blood splashes are expected-Wearing gloves when dealing with the patients-Hand washing after any direct contact with the patients-Blood spills should be cleaned up with Na hydrochloride.

The previous items were classified into true = 1 and false or do not know = 0

The total score was 8 points.

### **Data management:**

#### **Score of knowledge about( Blood Borne Infectious Diseases ( BBIDs):**

This score include the following items:  
Definition of blood borne pathogens,

High risk groups , Modes of transmission of BBPs. Preventive measures against infection with BBPs, HBV can be prevented by special vaccine, Post exposure actions.

The previous items were classified into true =1 and false or do not know = 0. The total score = 8 points.

#### **Score for knowledge about Universal Precautions(UP):**

This score include the following items: Using new syringe with every injection-safe disposal of sharp objects-No two-handed recapping of needles-Using gloves when dealing with sharp objects-Dealing with every patient as a probable source of infection-Following safety precautions for protection from BBIDs-Hand washing after any direct contact with the patients-Protection from HBV by special vaccine. The previous items were classified into agree = 1 and disagree = 0 . The total score = 8 points.

A cut point of 50%was considered to verify between adequate or inadequate knowledge or attitude

**Score for attitude towards application to protect yourself"** message were hanged in the centers for faster communication, continuity and to enhance easy recall of information received. Third visit: where previous respondents were invited to

respond to the same questionnaires and the same check list was done.

#### **Score for practice regarding application of UP:**

This score include the following items: Hand washing after dealing with the patients-Wearing gloves and protective equipments-Gloves used only one time-Safe disposal of sharps and needles-No two-handed recapping of needles-Using new syringe with every injection.

The previous items were classified into true = 1 and false = 0. The total score was 6 points.

A cut point of 50% was considered to verify between good or bad practice

#### **Statistical analysis:**

Data collected were statistically analyzed using SPSS (Statistical Package of Social Analysis) version 16.

Frequencies, means and standard deviations were used to summarize data. Categorical data were compared by using Chi-square test (X), Fisher exact test was used when expected cell was less than 5. McNemar and paired t tests were used to compare matched pairs. Quantitative data were compared by using t-test. Probability was considered significant if P- value is equal to or less than 0.

### Results

This study was conducted to assess the effect of health education on PHCWs' safety regarding BBIDs by assessment the change in their knowledge, attitude and practice towards these diseases.

The study was conducted in all primary health care centers in Ismailia City on 170 PHCWs, most of them are females

(81.8%) and nurses (56.5%) that have diploma of nursing (53.5%). Physicians and dentists constitute 14.7% and 8.8% of PHCWs respectively. Workers represent 13.5% of the study group; most of them were illiterates (11.2% of the sample), while laboratory technicians form the least percentage of the sample (6.5%). The mean age of PHCWs in this study is  $33.9 \pm 8.05$  years.

**Table (1): Distribution of primary health care workers in Ismailia City according to their past history related to BBPs, serological results and previous training courses regarding BBIDs.**

Variable	PHCWs (n= 170)	
	N	%
<b>State of HBV vaccination:</b>		
- Vaccinated	78	45.9
- Still taking the course	20	11.8
- Not vaccinated	72	42.3
<b>Results of serological analysis of BBIDs:</b>		
- HCV positive	19	0.127
- HBV positive	5	0028
- Negative	21	65.6
<b>Previous training courses related to BBIDs</b>	67	39.4

**Table (2): Processes and tools through which blood exposure happened and distribution of the last year needle stick injuries among primary health care workers in Ismailia City:**

Processes and tools	Exposed PHCWs (n=71)	
	N	%
<b>Processes at which exposure happened:</b>		
- Needle two-handed recapping	16	22.5
- Injection	15	21.2
- Sharp disposal	6	8.5
- Wound suture	7	9.9
- Cap fall after wrong recapping	6	8.5
- Tools fall on the ground	6	8.5
- Cut wound	4	5.6
- Sample drawing	4	5.6
- Cleaning of tools	4	5.6
- Sharp protrude from container	3	4.2
<b>Tools that cause exposure:</b>		
- Syringe	31	43.7
- Suture needle	7	9.9
- Canula	6	8.5
- Sample needle	5	7.1
- Blade	5	7.1
- Lancet	4	5.6
- Glass slide	3	4.2
- Glass tub	2	2.8
- Others	8	11.3
<b>PHCWs exposed to needle stick injuries:</b>		
- physicians	7	28.0
- Dentists	5	33.3
- Laboratory technicians	5	45.5
- Nurses	41	47.5
- Workers	13	56.5



**Table 3: Effect of health education (HE) on primary health care workers' knowledge about blood borne infectious diseases .**

Blood borne infectious diseases	Knowledge of PHCWs (n=156)**					
	Before HE		After HE		McNemar test	P value
	N	%	N	%		
1. Definition of blood borne infectious diseases.	113	72.4	141	90.4	Fisher exact	0.000*
2. High risk groups include those frequently need blood transfusion	110	70.5	141	90.4	Fisher exact	0.000*
3. High risk groups include health care workers	104	66.7	135	86.5	48.5	0.000*
4. High risk groups include injection drug abusers	110	70.5	137	87.8	51.37	0.000*
5. Modes of transmission of blood borne pathogens.	98	62.8	140	89.7	30.112	0.000*
6. Preventive measures against blood borne pathogens.	105	67.3	134	85.9	39.44	0.000*
7. HBV can be prevented by special vaccine.	85	54.5	125	80.1	46.32	0.000*
8. Post exposure action.	94	60.3	130	83.3	47.30	0.000*
<b>Total knowledge score : Mean ± SD</b>	5.23±2.1		6.97±1.4		t- test 14.93	0.000*

\*: Statistically significant.

\*\*156 PHCWs due to drop out group of 14 participants out of 170 (8.2%) was not completed the post test.

**Table 4: Effect of health education (HE) on knowledge about BBPs' universal precautions and preventive measures among primary health care workers in Ismailia City:**

Universal Precautions	Knowledge of PHCWs (n=156)**					
	Before HE		After HE		McNemar test	P value
	N	%	N	%		
1-Application of UP at all patients	80	51.3	116	74.4	56.62	0.000*
2-Application of UP on blood and other body fluids	79	50.6	120	76.9	48.02	0.000*
	91	58.3	124	79.5	56.36	0.000*
3-No two-handed recapping of needles	98	62.8	129	82.7	57.49	0.000*
4-Safe disposal of sharp objects	86	55.1	120	76.9	57.49	0.000*
5-Wearing protective equipments when blood splashes is expected	79	52.6	121	77.6	50.00	0.000*
	79	50.6	118	75.6	51.54	0.000*
6-Wearing gloves when dealing with the patients	73	46.8	120	76.9	50.63	0.000*
7-Hand washing after dealing with the patient						
8-Blood spills should be cleaned up with Na hydrochloride						
<b>Total knowledge score : Mean ± SD</b>	4.3±2.17		6.23±1.43		t test 14.65	0.000*

\*: Statistically significant

\*\*156 PHCWs due to drop out group of 14 participants out of 170 (8.2%) was not completed the post test.

**Table 5: Effect of health education (HE) on the mean score of knowledge about blood borne infectious diseases and UP & preventive measures among primary health care workers in Ismailia City:**

Group	Mean $\pm$ SD before HE for BBIDs knowledge	Mean $\pm$ SD after HE for BBIDs knowledge	T test	P value	Mean $\pm$ SD before HE for UP knowledge	Mean $\pm$ SD after HE for UP knowledge	T test	P value
Physicians	7.91 $\pm$ 0.29	8.00 $\pm$ 0.00	1.44	0.162	6.77 $\pm$ 1.07	7.64 $\pm$ 0.85	4.09	0.001*
Dentists	7.00 $\pm$ 0.96	8.00 $\pm$ 0.00	3.89	0.020	5.86 $\pm$ 1.09	7.64 $\pm$ 0.69	4.18	0.001*
Lab.technicians	5.70 $\pm$ 1.63	7.10 $\pm$ 0.99	4.58	0.010	3.80 $\pm$ 1.48	5.80 $\pm$ 0.79	4.74	0.001*
Nurses	4.82 $\pm$ 1.70	6.84 $\pm$ 1.37	14.49	0.000	3.93 $\pm$ 2.08	6.10 $\pm$ 1.35	11.70	0.000*
Workers	2.65 $\pm$ 1.69	5.65 $\pm$ 1.69	8.81	0.000	2.50 $\pm$ 1.36	4.80 $\pm$ 1.36	6.40	0.000*

\*: Statistically significant

**Table 6: Effect of health education (HE) on the primary health care workers' Attitude towards application of universal precautions and preventive measures of BBIDs:**

Universal Precautions	Attitude of PHCWs (n=156)**					
	Before HE		After HE		McNemar test	P- value
	N	%	N	%		
1-Using of new syringe every injection	124	79.1	144	92.3	Fisher exact	0.000*
2- Safe disposal of sharp objects	94	60.3	139	89.1	28.63	0.000*
3- No recapping of needles	98	62.8	139	89.1	32.24	0.000*
4- Using gloves when dealing with sharp objects	94	60.3	134	85.9	32.59	0.000*
	90	57.7	134	85.9	29.64	0.000*
5- Dealing with every patient as a probable source of infection	91	58.3	133	85.3	37.79	0.000*
6- Following safety precautions for protect-ion from blood borne diseases	100	64.1	131	84.0	46.73	0.000*
7- Hand washing after any direct contact with the patients	86	55.1	130	83.3	38.82	0.000*
8- Protection from HBV by special vaccination						
Total attitude score	4.12 $\pm$ 2.98		6.94 $\pm$ 1.92		t- test	0.000*
Mean $\pm$ SD					12.21	

\*: Statistically significant

\*\*156 PHCWs due to drop out group of 14 participants out of 170 (8.2%) was not completed the post test.

**Table 7: Effect of health education (HE) on the primary health care workers' Practice of universal precautions and preventive measures in Ismailia City:**

Universal Precautions	Practice of PHCWs (n=156)**					
	Before HE		After HE		McNemar test	P- value
	N	%	N	%		
1- Hand washing after dealing with the patient	54	34.6	106	67.9	38.96	0.000*
	63	40.4	106	67.9	44.85	0.000*
2- Wearing gloves and protective equipment	78	50.0	109	69.9	51.1	0.000*
	86	55.1	123	78.8	51.4	0.000*
3- Gloves used only one time	84	53.8	123	78.8	43.48	0.000*
4- Safe disposal of sharps and needles	128	82.1	144	92.3	Fisher exact	0.000*
5- No two-handed recapping of needles						
6- Using of new syringe with every injection						
Total practice score Mean $\pm$ SD	2.51 $\pm$ 1.96		4.13 $\pm$ 1.68		t- test 12.96	0.000*

\*: Statistically significant

\*\*156 PHCWs due to drop out group of 14 participants out of 170 (8.2%) was not completed the post test.

**Table 8: Effect of health education (HE) on the mean score of attitude and practice of UP and preventive measures for BBPs among PHCWs in Ismailia City:**

Group	Mean $\pm$ SD before HE for PHCWs attitude for UP	Mean $\pm$ SD after HE for PHCWs attitude for UP	T test	P value	Mean $\pm$ SD before HE PHCWs practice for UP	Mean $\pm$ SD after HE PHCWs practice for UP	T test	P value
Physicians	6.55 $\pm$ 1.01	7.50 $\pm$ 0.80	5.31	0.000	3.45 $\pm$ 1.79	5.00 $\pm$ 1.23	5.42	0.000*
Dentists	5.70 $\pm$ 1.67	7.07 $\pm$ 0.73	3.63	0.030	3.29 $\pm$ 1.59	4.79 $\pm$ 1.25	3.73	0.030*
Lab.technecians	3.60 $\pm$ 2.11	5.60 $\pm$ 1.27	4.05	0.030	2.50 $\pm$ 1.84	4.10 $\pm$ 1.19	4.71	0.001*
Nurses	3.81 $\pm$ 2.53	6.08 $\pm$ 1.75	12.00	0.000	2.40 $\pm$ 2.03	4.01 $\pm$ 1.81	10.88	0.000*
Workers	1.90 $\pm$ 2.05	4.45 $\pm$ 2.23	4.85	0.000	1.40 $\pm$ 1.50	3.30 $\pm$ 1.99	6.19	0.000*

\*: Statistically significant

## Discussion

### A-Situational analysis for PHCWs safety:

#### *1-HBV vaccination state of PHCWs in Ismailia City:*

The present study revealed that 45.9% of the studied PHCWs were vaccinated against HBV (Table 1). The rate is to some extent good in comparison with Durban, Saudi Arabia, where HBV vaccination rate among HCWs was 40.0%, while it is lower than that reported in Berlin, Germany (63.0%) (Ammon et al., 2000), and Italy (85.0%) (Angelillo et al., 2001).

Studies conducted in Egypt reported different rates of HBV vaccination among HCWs, where it was 58.3% among HCWs in haemo-dialysis units in the Nile Delta governorates (Kabbash et al., 2007) and 65.6% among Ain Shams medical personnel (El-Awady (1998), while it was reported to be low in other studies among HCWs in Gharbyia governorate (11.3%) and two governorates in Egypt (Nile Delta and Upper Egypt) (15.8%) (Ismail et al, 2005 and Talaat et al, 2003). This remarkably low rates of HBV vaccination may be attributed to negligence, lack of awareness, low risk perception and could be influenced by absence of legislation for HBV vaccination of clinical staff members

and lack of established regulations, while the cost of the vaccine may be another underlying factor.

#### *2- Serological examination:*

This study showed by serological analysis that, 33.8 % of PHCWs exposed to needle stick injury were seropositive; 19 were positive for HBV and 5 were positive for HCV (table 1). For a susceptible person, the risk from a single needle sticks or cut exposure to HBV-infected blood ranges from 6.0% to 30.0% and depends on the (HBeAg) status, while the average risk for infection after exposure to HCV and HIV infected blood is 1.8% and 0.3% respectively (CDC, 2008).

#### *3- Training courses regarding BBIDs:*

The present study showed that there is lack of training courses regarding infection control of BBIDs; where there is only 39.4% of PHCWs reported at least one previous training course regarding BBIDs (table 1). In Egypt, Ismail et al, (2007) reported that only 3.5% of HCWs in Garbia Governorate had training on infection control, while in Saudi Arabia 17.5% of HCWs reported this (Mahouz et al, 2009). Moreover, fewer than 30% of HCWs In Iran reported prior training in the principles of safe practices and universal precautions (Askarian et al, 2005), this deficient in training courses

may be due to limited resources or mostly not available in these PHCCs and cannot be accessible by workers. In contrast to this study Popesu et al, (2001) reported that 91.0% of HCWs in Romania had attended at least one training session on universal precautions for infection control, including safe injection practice and HCWs who attend this course or its related fields were less likely to experience needle stick injuries and more vaccinated against HBV, whether with one dose or with full dose compared to those who had not attended any training course.

### **B-PHCWs risk for acquiring BBIPs:**

#### *1-PHCWs exposures to needle stick during the last year:*

In the present study, 41.8% of PHCWs reported history of at least one previous exposure to needle stick during the last year (table 2). This rate is much higher than that detected in , Nigeria(27%) (Ajibola et al, 2014), while it was lower than that reported in China where Zhang et al, (2009) found that the total incidence of exposure to blood or body fluids among HCWs was 66.3%.

In Comparison with other Egyptian studies, this rate is lower than that reported by Ismail et al, (2007) who found that the rate of needle sticks injuries was 66.2% among the interviewed HCWs in 25 health

care facilities in Gharbyia governorate, and it was 48.6% among HCWs in 32 health care units in the Nile Delta (Kabbash et al, 2007).

Workers, nurses and laboratory technicians in this study have a higher percentage of exposure to needle sticks injuries in the last year (56.5%, 47.5% and 45.5% respectively) more than dentists and physicians (33.3% and 28% respectively) while, according to Ajibola 2014, the condition was different in Nigeria where dentists and surgeons had much higher rate of needle stick injuries compared to nurses in the last year (100% and 81% and 31% respectively). This may be due to the fact that, in Egypt the majority of drawing blood samples are done by technicians and setting up IV lines & injection processes are done by nurses, while workers are responsible for disposal of all sharps and blood.

In consistency with our results, Singru and Banerjee, (2008) reported that the incidence of accidental exposure to potential infectious materials was the highest among nurses (39.6%), followed by technicians (26.9%) and least among the resident doctors (21.01%). The higher prevalence of blood and body fluids exposure in developing countries among nurses may be due to inadequate supply of personal protective equipments, lack

of availability of safer sharp devices, inadequate information about exposure risks and lack of adherence to standard isolation precautions (Askarian et al, 2008).

*2-Processes and tools that cause blood exposure among exposed health care workers:*

The present study showed that wrong dealing with the syringe during injection as two-handed recapping of needles (22.5%), injection (21.2%) and cap fall after wrong recapping (8.5%) is the most risky process responsible for most cases of blood exposure. This may be due to inadequate knowledge about two handed recapping and absence of facilities for recapping of needles like recapping devices (Table 2).

Singru and Banerjee, (2008) reported that recapping of needles was the most hazardous procedure particularly among interns and staff nurses, while drawing blood samples, setting up IV lines and giving injections were the other hazardous procedures exposing the HCWs to blood borne diseases .

Also this study showed that syringes and suture needles are responsible for most cases of blood exposure (43.7% and 9.9% respectively). This is may be due to excessive use of these tools by PHCWs and absence of safety measures in these tools (Table 2).

CCOHS, 2005 reported that needle stick injuries are by far too common hazard and some hospitals report one third of nursing and laboratory staff suffer such injuries each year. Available statistics probably underestimate the severity of the problem because many workers do not report these injuries and this makes it difficult to know exactly how serious the problem is or how well prevention programs work.

*Change in knowledge of PHCWs in Ismailia City about BBIDs and UP after health education (Table3):*

The study revealed that, after health education there is a highly significant improvement in the PHCWs knowledge about BBIDs as regard definition, high risk groups and modes of transmission  $P < 0.001$  (Table 3). After health education program there is a highly significant improvement in the PHCWs knowledge regarding UP ( $P < 0.001$ ) especially blood spills should be cleaned up with Na hydrochloride from 46.8% to 76.9%, no two-handed recapping of needles from 58.3% to 79.5%, and hand washing after dealing with the patient from 50.6% to 75.6%. The mean score for adequate knowledge about UP has improved significantly from  $4.31 \pm 2.17$  to  $6.23 \pm 1.43$  after intervention (Table 4).

Also the mean of total knowledge score about BBIDs among PHCWs has

significantly improved from  $5.88 \pm 2.99$  to  $8.50 \pm 1.97$  and for UP from  $3.69 \pm 2.38$  to  $6.04 \pm 1.56$  after the intervention (Table 3). These findings are also in agreement with Barth et al, (1992) and Di Clemente et al, (1998) in North America. Also Al-Mazrou et al, (2005) assessed the impact of health education on the knowledge of paramedical students in Saudi Arabia toward HIV/AIDS. The finding indicated that the health education intervention had a significant positive effect on students' knowledge regarding modes of transmission and most of available means of protection. Moreover, Buskin et al. (2002) assessed Chinese health professionals' knowledge about HIV as an example of BBP and revealed significant differences between the pre- and post-lecture level, where most participants became able to correctly identify sexual transmission, blood transfusion and sharing of injection equipment as HIV risky practices.

Also the study shows an overall low understanding of UP among PHCWs after health education (Table 4), where there are significant improvement in the definition of UP from 37.2% to 73.1%, no two-handed recapping of needles from 47.4% to 77.6%, safe disposal of sharp objects from 59% to 81.4% and hand washing after dealing with the patient from 44.2% to 73.7% (Table 4).

Also there is no improvement in workers' knowledge about sharp waste disposal after health education intervention ( $P > 0.05$ ) (Table 4). This may be due to absence of regular training courses and health education sessions for technicians, nurses & workers for proper handling of blood and body fluid soaked materials and sharp waste (Moon Fai Chan 2008)

#### **Change in PHCWs' attitude towards application of UP and preventive measures of BBIDs after health education:**

After health education there is a significant increase ( $P < 0.001$ ) in the percentage of PHCWs in Ismailia City who are believing about the importance of application of UP and preventive measures of BBIDs and the mean attitude score of PHCWs has significantly improved from  $4.12 \pm 2.57$  to  $6.13 \pm 1.82$  (Table 6).

Also the study revealed that after health education there is a significant improvement in the percentage of PHCWs who agree about, the importance of hand washing from 65% to 67%, no recapping of needles from 62.8% to 89%, safe disposal of sharp objects from 60.3% to 89.1%, and dealing with every patient as a probable source of infection from 57.7% to 85.9% (Table 6).



In China, Buskin et al. 2002 reported that prior to health education lecture, 10% of participants believed that HCW could be selective in adherence to safety precautions but this attitude improved to 4% after lectures.

A good result after health education was significant improvement of the attitude toward HBV vaccination which became positively perceived as an important preventive measure in 75.6% of the subjects (Table 6) especially with perceived efficacy, availability and affordability of the vaccine under supervision of the Egyptian Ministry of Health.

Change in PHCWs' practice after health education:

The study revealed that after health education there is a highly significant improvement in the practice of PHCWs in Ismailia city regarding the application of UP and the mean score of practice among PHCWs in Ismailia City has significantly improved from  $2.51 \pm 1.96$  to  $4.13 \pm 1$  (Table 7)). In Syria, Mantel et al. (2007) studied the effect of a behavior change, communication comprehensive training and health education targeting HCWs with respect to their practice of needle recapping, he found that two-handed recapping was practiced by a significantly smaller proportion of HCWs (7.0%) after health education compared to 37.0% before.

In this study there is significant improvement ( $P < 0.001$ ) in worker's practice regarding sharp waste disposal after health education, where the percentage of workers who are wearing gloves during handling waste, evacuating safety boxes before overflow and perfect closure of safety boxes are increased from 25.0 % to 65.0 %, from 30.0% to 65.0% and from 40.0% to 70.0% respectively .

In a study conducted in Syria, the effect of health education on changing HCWs unsafe waste disposal practices was significant. Sharps waste was found in the area surrounding 37.0% of health facilities, waste disposal considered unsafe in 48.0% of them before the training program was introduced. After education program, sharps were found in smaller areas of the surroundings of health facilities and 64.0% of sharps and infectious waste was either directly incinerated or safely disposed (Mantel et al. 2007).

Lack of awareness and misconception of PHCWs about blood borne infectious diseases might contribute to increased risk of occupational exposure and disease transmission. In addition, lack of access to information and education on the importance of UP also contribute to high-risk behaviors (Michelson et al., 1997)

**Conclusion:** As revealed by the study that, intervention by health education was a key for better understanding and risk consideration between all PHCWs, strongly alarming and encouraging them for ideal dealing with all risk factors of acquiring BBIPs. So, it was expected to detect significant improvement in all parameters of knowledge, attitude and practice that related to this problem.

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