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COMPLIANCE WITH VACCINATION AS AN OCCUPATIONAL SAFETY MEASURE AMONG HEALTH CARE WORKERS AT AIN SHAMS UNIVERSITY HOSPITALS, CAIRO, EGYPT.

By

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Abstract

Introduction: Occupational safety and health is a multidisciplinary field concerned with the health, safety and welfare of people at work. Health care workers are at risk of exposure to vaccine preventable diseases. Employers and health care workers have a shared responsibility of preventing occupationally acquired infections and avoiding causing harm to patients by taking reasonable precautions to prevent transmission of diseases that could be prevented by vaccines. Vaccination programs are hence essential in infection prevention and control of diseases among health care workers. **Aim of work:** To identify the percentage of vaccinated health care workers in our study population and describe the factors associated with compliance to vaccination as an occupational safety measure. **Materials and methods:** This is a cross sectional study including 320 health care workers; 100 physicians, 154 nurses and 66 cleaning services from Ain Shams University Hospitals, Cairo, Egypt. All subjects filled an interview questionnaire including socio-demographic and occupational background questions, history of vaccination, attitude towards the importance of vaccines and causes for taking or not taking recommended vaccines. Health education materials in the form of poster and brochures were distributed on a day assigned for visiting the hospital for that purpose including a message on the importance of taking recommended vaccines, easy accessibility to areas offering the vaccines and possible complications of not taking the vaccines. Statistical analysis was done using frequency tables and chi square test. Informed consent was obtained from participants. **Results:** Most of the study

participants were females, nurses, from Internal Medicine department with mean work duration of 14 years. About half of the sample reported that they took recommended vaccines on time. The most common vaccines received by study population were hepatitis B and meningococcal vaccines. Most participants had a positive attitude towards vaccination as regards its importance and effectiveness. Job nature, level of education, positive history of needle stick injuries and attendance of training courses on vaccine importance are significantly associated with positive history of receiving recommended vaccines on time. **Conclusion:** Raising the awareness of health care workers on the importance of taking recommended vaccines for the safety of themselves and their patients is highly needed.

Keywords: Vaccines, Health care workers, Medical staff, Recommended vaccines and Medical education.

Introduction

Vaccination is a minor medical procedure that aims at minimizing or removing the risk of contracting a targeted disease. A vaccine can also reduce the risk of disease in people with whom the vaccinated person comes in contact. Over the past hundred years, vaccination had the benefit of preventing more illness and death over the past hundred years than any other medical intervention (CDC, 2009).

No one is at greater risk of contracting infectious diseases and of transmitting them to their contacts than health care workers. Those working in hospitals meet patients daily as part of their jobs. Pathogens can easily pass from patients to health care staff and then back to other patients. The consequence will be health care workers who are sick and unable to carry on their job duties as well as a group of patients who contract new diseases that they did not have when they first entered the hospital (Robert, 2009). There are numerous techniques which are undertaken by hospitals to increase voluntary immunization among their health care workers such as: using roving carts to bring vaccines to nursing stations or to other staff members and also to ask those who refuse to take vaccines to sign statements acknowledging the risk they are bringing to themselves and their patients by refusing to be vaccinated. However, unfortunately while all these efforts are being made, vaccination rates were below 50% for flu vaccine in one study in New York (Mc Neil and Zraick, 2009).

Experiences from other countries show that nurses' unions usually encourage their members to comply with vaccination; however they believe

that each health care worker should be entitled to make his or her own decision and hence they oppose vaccine mandates. It is believed that all vaccines can pose risks. Even without the presence of personal allergic history, hazards may lie in additives as thimerosal, a mercury based preservative used in some vaccines (Cox, 2009). Moreover, a vaccine injection may produce long term risks, as swine flu vaccine which was produced in 1976 and was linked to an increased risk of Guillain Barre syndrome (Schonberger et al., 1979).

Vaccination of health care workers as recommended by CDC (Centers for Disease Control and Prevention) include hepatitis B, influenza, parotitis, measles, rubella, varicella, tetanus and diphtheria (CDC, 1988).

Outbreaks of diseases that could be prevented by vaccines occur within the health care facilities among health care workers and patients with associated morbidity and medical costs from diagnosis and treatment (Pratot et al., 2010). Vaccination of health care workers at risk constitutes a main infection control measure and it is justified in order to protect them and also their patients (Maltezou et al., 2012).

Aim of work

To identify the percentage of vaccinated health care workers in our study population and to describe the factors associated with compliance with vaccination as an occupational safety measure.

Materials and methods

- **Study design:** This is a cross sectional study.
- **Place and duration of the study:** Work in this study was carried out at Ain Shams University Hospitals, Cairo, Egypt during the period from June to November 2016.
- **Study sample:** The study sample included 320 health care workers; 100 physicians, 154 nurses and 66 cleaning services workers employed in this career for not less than 2 years. Sample size was calculated by epi-info program version 6, population survey where vaccination coverage among health care workers was less than 50% from references (Mc Neil and Zraick, 2009), the lowest acceptable coverage was 44%, sample size was calculated as 268 subjects with 95% confidence interval. The sample was increased to 320 subjects to include all available individuals.

Study methods:

An interview questionnaire was used to collect data about socio-demographic and occupational characteristics as age, gender, smoking habits, job nature, department, working duration in years, working hours/ day, level of education, marital status, history of chronic diseases, history of needle stick injuries and pre-employment and periodic examinations.

The questionnaire also included a vaccination background of the study participants including an idea on the most common vaccines they received and causes for not taking/taking vaccines.

Attitude of health care workers towards vaccination was also assessed through questions as: if they consider vaccination important and will advise their colleagues to take all recommended vaccines, if they think vaccines should be an integral part of periodic medical examination, and whether the hospital should supply all needed vaccines.

Factors contributing to receiving vaccines were also studied as job nature, education, history of needle stick injuries and attending training courses on the importance of vaccination.

A health education poster was prepared by the study authors carrying a message on the importance of vaccination for health care workers, (Be Wise and Immunize) was its title. An event was held at the hospital to disseminate this message and brochures were distributed to all those who attended the event to remind them why immunization was important to protect themselves and their patients.

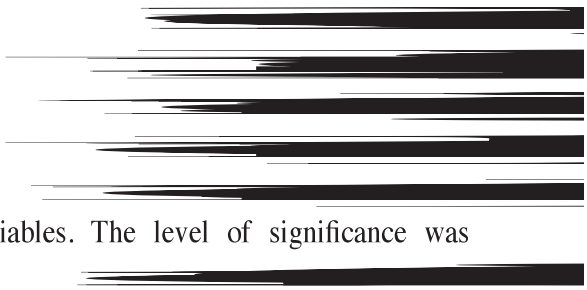
Consent

The purpose of the study was explained to all participants; an oral informed consent was obtained and the survey tool was anonymous.

Ethical approval

The study protocol was approved by the ethical committee of the Department of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

Data management



variables. The level of significance was

Results

Table (1): Characteristics of the study population

Variables	No (%)
Age / years (Mean ± SD)	39.23 ± 11.5
Gender:	
Male	155 (48.4)
Female	165 (51.6)
Job nature:	
Physicians	100 (31.2)
Nurses	154 (48.1)
Cleaning workers	66 (20.6)
Department:	
Internal medicine	154 (48.1)
Pediatrics	68 (21.2)
Obstetrics/gynecology	57 (17.8)
Surgery	41 (12.8)
Education:	
Not read/write	20 (6.2)
Completed secondary education	81 (25.4)
University/postgraduate education	219 (68.4)
Smoking:	
Current smoker	109 (34.1)
Never smoked	151 (47.2)
Ex-smoker	60 (18.8)
History of needle stick injuries (yes)	117 (36.6)
History of chronic diseases* (yes)	85 (26.6)
Work duration / years (Mean ± SD)	14.72 ± 10.8
Working hours / day (Mean ± SD)	11.64 ± 4.96
Pre-employment examination	199 (62.2)
Periodic medical examination	113 (35.3)

* Chronic diseases included in the question were diabetes mellitus, hypertension, renal, hepatic or endocrinal diseases.

Table (1) shows that most of the study population were females with mean age 39.23 years, nurses and from the internal medicine department; the mean work duration of the study participants was 14.72 years and the mean working hours of 11.64 hours/day. Most of the group (68.4%) were university or postgraduates and 27.2% never smoked. Most of the study group received pre-employment examination but only about 35% had periodic medical examination.

Table (2): Vaccination background of the study participants.

Variables	No (%)
Did you receive all recommended vaccines on time? (yes)	156 (48.8)
Did you attend any training program on vaccine importance? (yes)	113 (35.3)
Did you take any of the following vaccines recommended by CDC:	
B.C.G.	65 (20.3)
Hepatitis B vaccine – 3 doses	175 (54.7)
T dap vaccine	53 (16.6)
Influenza vaccine	127 (39.7)
MMR vaccine	105 (32.8)
Chicken pox vaccine	83 (25.9)
Meningococcal vaccine	170 (53.1)
Distribution of hepatitis B vaccine according to job nature:	
Nurses	87 (49.7)
Physicians	54 (30)
Cleaning workers	34 (19.4)
Causes of taking a vaccine:	
- To protect myself from diseases	264 (82.5)
- To protect the patients from being infected	190 (59.4)
- My colleagues recommend taking it	146 (45.6)
- To protect from serious diseases	96 (30)
- Its benefits exceed its risks	185 (57.8)
Causes of not taking a vaccine:	
- I feel worried about its complications	184 (57.5)
- I am afraid from injections	63 (19.7)
- I believe it provides incomplete protection	98 (30.6)
- The disease it protects from is not serious	81 (25.3)
- I feel it is not well preserved	170 (53.1)
- I am very busy and have no time to take vaccines	64 (20)
- My medical condition prevents me from taking vaccines	63 (19.7)
- I follow infection control methods and this is enough	70 (21.9)

Table (2) shows that about half the study sample received one or more vaccines, more commonly hepatitis B vaccine, meningococcal vaccine and influenza vaccine. Hepatitis B was commonly received by nurses. The main causes for being vaccinated were self and patient protection, and because its benefits exceed its risks. The causes for not being vaccinated were commonly being worried about complications, feeling that most vaccines are not well preserved and believing they do not provide full protection.

Table (3): Attitude of the studied group towards vaccination

Questions	Agree No (%)
- Do you think vaccination should be obligatory?	195 (60.9)
- Will you advise your colleagues to take vaccines?	195 (60.9)
- Do you believe the hospital is responsible for providing vaccines to health care workers?	242 (75.6)
- Do you recommend that vaccination should be provided with periodic medical examination?	234 (73.1)
- Do you think that health education is very much effective as a tool for raising awareness regarding importance of vaccines?	230 (71.9)
- Is vaccination very important for disease prevention?	224 (70)
- Are you working in a highly risky working environment?	169 (52.8)
- Are vaccines the main line of disease prevention?	254 (79.4)
- Do you think you have good knowledge on disease transmission?	244 (76.2)
- Do you believe that vaccines have to be taken even if infection control measures are followed	210 (65.6)
- Do you think that all staff must take vaccines even if no direct contact with infective cases?	208 (65)

Table (3) shows that a high percentage of participants had a positive attitude regarding all items included in attitude description such as: believing vaccination of health care workers should be obligatory, intention to advise colleagues to take the recommended vaccines, accepting the idea that the hospital is responsible for providing recommended vaccines and to deliver them as part of periodic medical examination. Most of them agreed that health education could be an effective tool in raising awareness and that vaccines are the main line of prevention.

Table (4): Relationship between some factors and receiving previous vaccination

Variables	Did you receive previous vaccination?		Chi square	p value
	No No (%)	Yes No (%)		
Job nature:				
Physicians	41 (41)	59 (59)		
Nurses	38 (24.7)	116 (75.3)	16.63	< 0.05*
Cleaning workers	34 (51.5)	32 (48.5)		
Education:				
Not read/write	11 (55)	9 (45)		
Completed secondary school	36 (44.4)	45 (55.6)	8.919	< 0.05*
University/postgraduate	66 (30.1)	153 (69.9)		
History of needle stick injuries				
No	103 (50.7)	100 (49.3)	57.842	< 0.05*
Yes	10 (8.5)	107 (91.5)		
Attending training courses on vaccination importance				
No	92 (44.4)	115 (55.6)	21.40	< 0.05*
Yes	21 (18.6)	92 (81.4)		

* = significant

Table (4) shows that job nature, level of education, positive history of needle stick injuries and attendance of training courses on importance of vaccination are significantly associated with previous history of vaccination.

Discussion

The current work looks at the importance of vaccination in the eyes of health care workers and tries to draw attention to its role in reducing the risk of disease.

Our study showed that hepatitis B vaccine was the most common vaccine received by our study population (54.7%) (Table 2) . This agrees with the results of another work where 58.6% of participants were vaccinated against hepatitis B (Saridi et al., 2011). Vaccination against hepatitis B had the highest coverage rate among all health care workers in one study in Saudi Arabia which could be explained by the high risk perception for hepatitis B. The low vaccination rates observed for MMR (Measles, Mumps, Rubella) and varicella vaccines could be attributed to lack of awareness of the hazard of contracting these infections and the subsequent complications (Anwar et al., 2012)

In the current work, only 35.3% of participants received training courses (Table 2). This may explain why only 48.8% of participants indicated that they took the recommended vaccines. This relation between attending courses on vaccination importance and receiving vaccines can be supported by the findings of another study where high immunization rate of technical staff was attributed to training courses (Saridi et al., 2011). The low percentage of staff who attended training courses was either because they did not feel interested in the topic or that their senior staff did not give them the opportunity to have time off work to attend these courses due to high work load.

On comparing the rate of previous vaccination among various job groups, it was found that 75.3% of nurses in our study received vaccinations (Table 4); this percentage was higher than that of a study in a Greek hospital where only 52.2% of the nurses received vaccinations (Noula et al., 2002). In general, vaccination coverage rate in the current study, 48.8% (Table 2), was lower than those in other studies where rates ranged from (71% - 81%) (Manso et al., 2003,Mc Ewan et al., 2005 and King et al., 2006) and was similar to other studies where low percentages were reported (40%-53%) (Fatusi et al., 2000 and Dannetun et al., 2006).

In our study several factors were investigated as possible causes for not taking vaccines. In 57.5% of the sample it was being afraid of vaccines

being unsafe and that they cause complications (Table 2). This may explain why hepatitis B vaccine was the most commonly received vaccine as it is one of the safest vaccines ever developed. Although millions of doses of the vaccine have been administrated, rarely have any serious side effects been reported. Of the very rare side effects are encephalitis and Guillain Barre Syndrome (GBS) (Brotherton et al., 2003 and Mc Philips and Marcuse, 2001). However, the World Health Organization (WHO) considers that the complete data do not indicate a causal relationship between hepatitis B vaccine and GBS (WHO, 2009). Moreover, it was found that 0.1 to 0.8 cases of demyelinating disease per 100 000 vaccine recipients in (Australia, Belgium, Canada, Germany, India, United Kingdom, United States) were reported (WHO, 2012).

The current study reveals that the main causes for being vaccinated were self and patient protection, and because its benefits exceed its risks. The causes for not being vaccinated were commonly being worried about complications, feeling that most vaccines are not well preserved and believing they do not provide full protection (Table 2). In one study, the top motivator for being vaccinated with flu vaccine (93% of participants) was their previous vaccination (Mayo and Cobler, 2004). In a study conducted by Ludwig-Beymer and Gerc, 2002 it was found that 84% of healthcare workers reported their reason for taking the vaccine was “to stay healthy”.

As for other causes which act as barriers for vaccination: a study identified a number of reasons such as: being too busy, inconvenient venue, the side effects of the vaccine and thinking that the vaccine is not protective (Qureshi et al., 2004). Many individuals in another study found that they could protect themselves by other ways which they view are more effective than vaccination and that have fewer potential side effects such as exercising, taking daily multivitamins and increasing antioxidants in their daily diet (Crowe, 2005), additional barriers to flu vaccine were: fear of needles and fear of contracting the flu (Mayo and Cobler, 2004).

On studying several factors and their relation to receiving vaccination status it was found that job nature, level of education, positive history of needle stick injuries and attendance of training

courses on importance of vaccination were significantly associated with previous history of vaccination (Table 4). One study found that vaccination coverage varies across professional groups: physicians (77.3%), technical personnel (68%), nurses (60.4%), administrative/office personnel (15.4%) and cleaning staff (4.5%). Also education was another factor where personnel professionals with primary / secondary education had significantly lower percentages of vaccination coverage than those of higher/university level education. No correlation was detected between vaccination coverage and gender and years of employment (Saridi et al., 2011).

In one Egyptian study, vaccination coverage was highest among professional staff (38%) and lowest among housekeeping staff (3.5%) (Taalat et al., 2003). Similar correlations between vaccination coverage and demographics were also detected by other authors (Dannetun et al., 2006) while others did not find such correlations (Manso et al., 2003).

Our use of health education material was based on the fact that education plays an important role in compliance with vaccination. In one study, an educational campaign was implemented that explained misconceptions about the vaccine and the seriousness of the disease it protects from. (Kimura et al., 2007). The campaign in the current work attracted many staff members at the hospital who appreciated addressing this topic and promised to transfer the message to all their colleagues. Green, 2006 stated that education was very important but peer pressure by co-workers is an added benefit to increase compliance rate.

Conclusion

Vaccination of health care workers is a critical subject for infection control, not only to protect them from disease pathogens, but also to prevent nosocomial transmission of pathogens. Raising their awareness on the importance of this topic is essential.

Recommendations: Hospital health directors should have good knowledge on the importance of vaccinating health care workers as a milestone of hospital risk management. More adequate training including courses on vaccinations is required for occupational health physicians.

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Conflict of interests

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