

## VACCINATION AND IMMUNIZATION STATUS AGAINST VACCINE-PREVENTABLE DISEASES IN AN ITALIAN SAMPLE OF HEALTH-CARE WORKERS OPERATING IN GYNAECOLOGY AND OBSTETRICS HOSPITAL DEPARTMENTS.

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### ABSTRACT

Healthcare workers (HCWs) are an important group of professionals exposed to infectious diseases transmitted through several ways. Nevertheless, vaccination coverages of HCWs are often lower than standards recommended by international Public Health authorities. Recently, the Italian Ministry of Health has issued the guidelines for recommended vaccination during pregnancy, child-bearing age and feeding-time. This study aimed at investigating knowledge, attitudes, practices and immunization status in a sample of Italian HCWs employed in gynaecology and obstetrics departments. A survey was conducted between November 2017 and February 2018 throughout an online self-administered questionnaire, previously validated. A total of 155 subjects responded to the survey. The immunization status was reported to be higher for DTP, MMRV and HBV vaccines and lower for influenza vaccination. A general lack of risk perception to contract vaccine preventable infectious diseases emerged from the study.

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## 1. Introduction

Healthcare workers (HCWs) are an important group of professionals exposed to infectious diseases transmitted through several ways (parenteral, oral, airborne, topical, etc.) (1). The close contact with patients, fomites and other HCWs represents the main reason of transmission (1). Only vaccines can prevent the spread of several infectious diseases among health-care workers (2,3). Nevertheless, vaccination coverages of HCWs are often lower than standards recommended by international Public Health authorities (4-8). Moreover, vaccine preventable diseases can infect HCWs earlier than general population and HCWs could transmit the infection to the patients (9).

In Italy, the immunization practices among HCWs is regulated by the Legislative Decree n. 81/08 (regarding workplace security) and the 2017-2019 National Vaccination Plan (NPV) (10, 11).

Recently, the Italian Ministry of Health has issued the guidelines for recommended vaccination during pregnancy, child-bearing age and feeding-time, since several vaccine preventable disease (such as influenza, pertussis, rubeola or measles) produce a disproportionate morbidity and mortality among pregnant women and newborns, with the possibility of the infection transmission from HCWs working in Gynaecology and Obstetrics departments (12-14).

Obstetrician and gynaecologists should play a key role in vaccination recommendation with regard to general population (15). Moreover, the active immunization of this category of health professionals could not only confere individual protection but also guarantee patients, general population and health staff's safety (16).

The present study aimed at investigating knowledge, attitudes and practices in a sample of Italian HCWs (midwives, nurses, doctors and other professionals) employed in gynaecology and obstetrics (G&O) hospital departments with regard to vaccination and vaccine-preventable diseases issues. In particular, vaccination status or susceptibility to vaccine preventable diseases were analysed in depth.

## 2. Methods

### Data collection

A survey was conducted between November 2017 and February 2018 through an online and anonymous questionnaire, administered to a convenience sample of healthcare professionals working at Italian public and private hospital departments of gynaecology and obstetrics.

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HCWs were invited to respond to the questionnaire in the social media pages dedicated to midwives, nurses, medical doctors and other professionals working in G&O hospital Departments. The social media pages had a diffusion on national scale and healthcare professionals working in 16 out of 22 Italian administrative Regions participated to the survey.

An informative letter explaining aims and objectives of the study was used to introduce the questionnaire. An online informed consent form was requested to be filled in advance.

The self-administered questionnaire, previously validated and derived from other surveys conducted by the research group of the Department of Science for Health Promotion and Mother to Child Care "G. D'Alessandro" of the University of Palermo, consisted of 19 closed-ended questions and was accessible throughout any device or IP connected to the web (5, 17-19).

The questionnaire was divided into the following sections:

- socio-demographic data: age, gender;
- working activity data: type of health-care professional, working place, typology of setting;
- vaccination status and/or immunization status against vaccine preventable diseases: diphtheria, tetanus, pertussis, poliovirus, hepatitis B, mumps, rubella, varicella, seasonal influenza 2017/2018;
- knowledge, perceptions and attitudes on influenza infection and vaccination: perspective on spreading influenza among patients, vaccination uptake within the previous five-year period (categorized as "regularly", "rarely", "never"), adherence to influenza vaccination of the unit staff (categorized as "Yes/Yes, the majority", "Yes, a minority", "No/No"), close contact with patients with comorbidities, informative sources of seasonal influenza vaccination offer for health-care workers in the workplace (categorized as "department policy", "official website of the hospital", "social network", "colleagues referral"), suggested strategies for increasing immunization rates among HCWs (categorized as "multidisciplinary courses", "mandatory vaccination", "promotion of vaccination", "specific university training on influenza vaccination"), place for vaccination in your working place (categorized as "dedicated vaccination unit", "hospital units", "occupational physician ambulatory").

#### Statistical analysis

All the information collected through the questionnaire was entered in an electronic database created by Excel 5.0 software. Data analysis was performed using EpiInfo 3.5.1 software.

Quantitative variables were normally distributed and summarized as means with their standard deviations. Absolute and relative frequencies were calculated for qualitative variables. Categorical variables for socio-demographic, working characteristics and the differences in percentage of immunization and vaccination coverages between subjects younger than 30 years old ( $\leq 30$ ) and older than 30 years old ( $> 30$ ) were tested by the Fisher Exact Test or Chi-squared test when appropriate. Differences in means were compared with the Student t-test for paired sample. The significance level chosen was p-value:  $< 0.05$  (two-tailed).

### 3. Results

A total of 155 HCWs (96.7% female) working in gynaecology and obstetrics departments were recruited in the survey (Table 1). All the enrolled subjects were employed in 16 out of 22 Italian administrative Regions. Most of them were working in Lombardy (23%), Sicily (15%), Piedmont (10%), Tuscany (10%) and Emilia Romagna (11%) (data not shown in table).

Of the respondents, 92.1% were midwives and nurses, 1.9% medical doctors and 6% other healthcare personnel. The most represented age category was 20-30 years old (68%), while HCWs aged between 31 and 40 were 20%, followed by age groups 41-50 (7%) and  $> 50$  years (5%).

The majority of respondents worked in public healthcare facilities (69.8%), followed by self-employed (16.7%). Attitudes regarding vaccination recommended by the Italian NVP 2017-2019 were largely favorable (65.8%) or partially favorable (31%) (Table 1).

In Table 2 is showed the immunization status self-reported by the sample of HCWs with regard to vaccinations included and recommended in the NVP. Almost 91% of the sample declared to be immunized against diphtheria, tetanus and pertussis (DTP). However, while the 55.4% of the respondents reported to have had a DTP vaccination booster every 10 years, 38.4% declared to have received a vaccination cycle only, during lifetime, while 6.2% answered to have been affected by at least one of the previous vaccine preventable diseases in the past (not specifying when and what type of disease).

	n =155	n (%)
<b>Gender</b>		
- female		150 (96.7)
- male		5 (3.3)
<b>Age groups in years</b>		
- 20-30		105 (67.7)
- 31-40		31 (20)
- 41-50		11 (7.1)
- $> 50$		8 (5.2)
<b>Working status</b>		
- private healthcare facilities		15 (9.7)
- public healthcare facilities		108 (69.8)
- self-employed		26 (16.7)
- unemployed		6 (3.8)
<b>Type of health-care professional</b>		
- midwives/ nurses		143 (92.1)
- medical doctor		3 (1.9)
- other health care personnel		9 (6)
<b>Attitudes towards recommended vaccinations of HCWs</b>		
- favorable		102 (65.8)
- partially favorable		48 (31)
- indifferent		2 (1.3)
- not favorable		3 (1.9)

**Table 1 - Sociodemographic and occupational data of the sample of HCWs respondent to the questionnaire (n=155).**

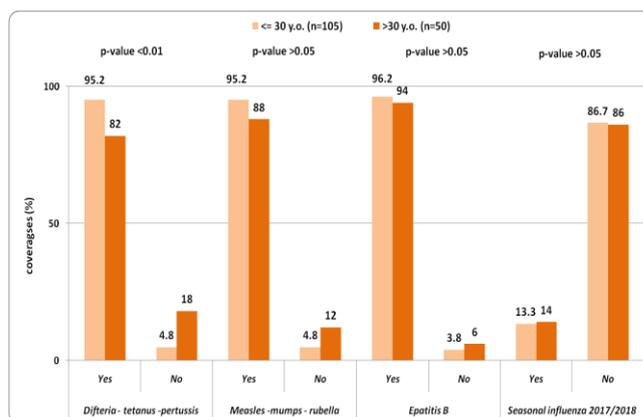
As further reported in Table 2, 92.9% of the participants were immune against measles, mumps, rubella and varicella. In particular, 43.8% of the sample self-reported a natural infection with at least one of these vaccine preventable diseases. Moreover, 35% of the sample declared to have received at least two doses of this vaccination, while 21.2% reported the administration of one vaccine dose only. Of interest, 95.5% of the respondents were vaccinated or naturally immune against hepatitis B (Table 2).

During the last influenza season (2017/2018), the large majority of HCWs sampled declared not to have been vaccinated (86.4%) (Table 2). In the same direction, during the last five influenza season, 8.4% of the respondents were regularly vaccinated against influenza (from 3 to 5 times), 11% were occasionally vaccinated (1 or 2 times) and 80.6% systematically refused influenza vaccine administration (Table 2).

	n =155	n (%)
<b>Immunization status against diphtheria, tetanus and pertussis</b>		
- immune	141	(90.9)
- unknown	5	(3.2)
- not immune	9	(5.9)
<b>Type of immunization against diphtheria, tetanus and pertussis</b>		
- regularly booster vaccination (every 10 years)	81	(55.4)
- contracted the diseases	9	(6.2)
- vaccinated once in my life		(38.4)
<b>Immunization status against measles, mumps, rubella and chicken pox</b>		
- immune	144	(92.9)
- unknown	4	(2.6)
- not immune	7	(4.5)
<b>Type of immunization against measles, mumps, rubella and chicken pox</b>		
- completed the vaccination cycle (two vaccines)	64	(43.8)
- contracted the diseases	51	(35)
- vaccinated once time	31	(21.2)
<b>Immunization status against hepatitis B</b>		
- immune (vaccinated or naturally immunized)	148	(95.5)
- unknown	3	(1.9)
- not immune	4	(2.6)
<b>Adherence to seasonal influenza vaccination during the last five seasons</b>		
- never vaccinated	125	(80.6)
- rarely (1-2 times)	17	(11)
- regularly (3-5 times)	13	(8.4)
<b>Influenza vaccination administration during the last influenza season (2017/2018)</b>		
- yes	21	(13.6)
- no	134	(86.4)

**Table 2 - Self-reported immunization status of HCWs working in Gynaecology and Obstetric Departments adherent to the survey conducted (n=155).**

Figure 1 represents the comparison by age groups of DTP immunization status in the recruited HCWs. A statistically significant difference (p-value: <0.001) was highlighted between HCWs younger than 30 years old (95.2%) and older than 30 years old (82.0%), while no statistically significant difference was reported for measles, mumps, rubella and varicella, hepatitis B and seasonal influenza vaccination (Figure 1).



**Figure 1 - Immunization rates (natural or artificial) against vaccine-preventable diseases among the n.155 G&O health-care professionals enrolled in the study, by age groups (<=30 years old versus >30 years old).**

At least 75% of the respondents reported the awareness about the risk of transmitting influenza to patients (23.4% completely; 50.6% partially). The main source of information regarding influenza vaccination of HCWs was the word of mouth among colleagues (38.5%) and in 49% of cases the administration of influenza vaccine was provided by dedicated vaccination units. About one third of interviewed HCWs (35.5%) did not know the influenza vaccination adherence of their colleagues. According to HCWs' opinion, the organization of multidisciplinary courses on influenza vaccination resulted the best strategy to increase the future vaccination coverages (51%) (Table 3). Lastly, attitudes and behaviors regarding influenza vaccination during last season (2017/2018) were compared between acceptance and refusal groups (Table 3).

	Overall n (%)	Influenza vaccination 2017/2018 acceptance n (%) (n=21; 15.8%)	Influenza vaccination 2017/2018 refusal n (%) (n=134; 86.4%)	p-value
<b>Risk perception of transmitting influenza to their patients</b>				
- yes	36 (23.4)	12 (57.2)	24 (18.0)	<0.001
- yes, not at all	40 (50.6)	5 (23.8)	35 (26.4)	
- no	78 (26)	4 (19)	74 (55.6)	
<b>Main informative source of seasonal influenza vaccination offer for HCWs</b>				
- recommendations of Ministry of Health	11 (28.2)	4 (20)	7 (36.8)	0.50
- institutional website of the healthcare facility	12 (30.8)	6 (35)	6 (31.6)	
- word of mouth among colleagues	16 (41)	10 (50)	6 (31.6)	
<b>Place for influenza vaccines administration in your Health Institution (%)</b>				
- dedicated vaccination unit	76 (49)	7 (33.3)	69 (51.5)	0.19
- occupational physician ambulatory	49 (31.6)	9 (42.9)	40 (29.9)	
- vaccination "on site" in the hospital units	10 (6.5)	3 (14.3)	7 (5.2)	
- other	20 (12.9)	2 (9.5)	18 (13.4)	
<b>Adherence to influenza vaccination among colleagues (%)</b>				
- yes, a large majority	10 (6.5)	2 (9.5)	8 (6)	0.18
- yes, about in half	54 (34.8)	10 (47.6)	44 (32.8)	
- none of colleagues	36 (23.2)	6 (28.6)	30 (22.4)	
- unknown	55 (35.5)	3 (14.3)	52 (38.8)	
<b>Best strategy for increase influenza immunization rates among HCWs in future (%)</b>				
- promotion of vaccination (e.g. incentives such as paid vacation or meal tickets)	15 (9.7)	1 (4.8)	14 (10.4)	<0.05
- specific university training on influenza vaccination	25 (16.1)	7 (33.3)	18 (13.4)	
- multidisciplinary courses	79 (51)	6 (28.6)	73 (54.5)	
- mandatory vaccination	36 (23.2)	7 (33.3)	29 (21.6)	
- other	10 (6.5)	0	10 (7.4)	

**Table 3 - Attitudes, behaviors and perception regarding seasonal influenza vaccination according to influenza vaccination adherence during 2017/2018 season.**

In particular, HCWs risk perception of transmitting influenza to their patients was statistically significant higher (p-value: <0.001) in the vaccine acceptance group (57.2%) as compared to the refusal one (18.0%). Furthermore, among the acceptance respondent HCWs group the best strategies to increase future influenza vaccination coverages resulted a specific university training on influenza vaccination (33.3%) and mandatory vaccination (33.3%) as compared to the refusal group (p-value: <0.05).

#### 4. Discussion

Even though the large majority of the study sample referred a positive attitude regarding vaccination, in our survey the vaccination coverage self-reported by HCWs resulted not satisfactory and below than recommended values. Despite its obvious benefits for both HCWs and general population, vaccination coverages still remain below the values recommended by national and international guidelines (95% for all vaccines and 75% for influenza vaccination) (11, 20).

In a recent measles outbreak reported in Europe and involving Italy, in 2017 and 2018, about 10% of all cases occurred among health care workers was notified (21). As a consequence, HCWs could represent a reservoir for transmission of infections among patients in health-care settings (22).

In particular, for diphtheria, tetanus and pertussis vaccination, 91% of the sample in study reported a previous immunization for these diseases, although just an half of them regularly got vaccinations booster every ten years. The remaining 38.4% of HCWs incorrectly considered themselves immunized against these diseases having only one vaccine shot during their lifetime (3, 23). Moreover, 6.2% of interviewed HCWs considered themselves erroneously immunized having acquired infections, since this does not lead to permanent protection (23, 24). HCWs are a potential vehicle for spreading the diseases, particularly pertussis, especially if they did not investigate the immune status neither confirmed it with vaccines booster (23, 24). As for the study participants, working in G&O departments, the Global Pertussis Initiative recommends to undergo pertussis vaccination or booster if time since the last immunization exceeds 10 years, since infected adults may act as a reservoir of infection and cause severe diseases in newborns and partially immunized infants (25).

As concern for measles, mumps, rubella and varicella (MMRV), about 93% of HCWs stated to be immunized for these diseases. However, also in this circumstance, 21.2% of HCWs considered themselves to be incorrectly immunized, having got only one dose of vaccine. In the recent epidemic of measles in Italy, having had only one vaccination dose of MMRV was associated with at least 6-8% of notified cases (21, 26).

Moreover, especially in G&O departments, HCWs could represent a carrier for measles, mumps, rubella and varicella with possible severe sequelae among pregnant women or newborns (27).

At the same time, only 12.5% of the sample were unaware of their immunization status against hepatitis B. This could be attributable to a lack of controls by occupational medicine units in ascertaining the immune status of HCWs, particularly against the hepatitis B virus (HBV).

Effectively, 35.7% of HCWs interviewed declared not to have been proposed serological screening test to evaluate the protective levels of serum antibody titres against HBV, as required by Italian occupational laws (10).

The lack of controls could imply an increased risk of HBV infections during work activities that expose HCWs to body fluids. Also subjects under 39 years old that were mandatory vaccinated against HBV in Italy, due to a vaccination strategies scheduled at time of birth or at the age of 12 during the school time from 1991 to 2003 and followed by a strategy with vaccination offer at birth from 2003 to date, are potentially at risk if included in 5% proportion of non responders to HBV vaccination (28, 29). Overall, data regarding DTP, MMRV and HBV vaccinations revealed a generally positive immunization status of HCWs responding to the study. The same consideration cannot be transferred with regard to influenza vaccination adherence that actually was not considered a priority for health care workers. The general lack of knowledge regarding influenza complications and transmissibility to patients, as well as the unreasonable doubt on vaccine efficacy and safety, both contributed to low vaccination coverages observed across Europe and Italy (9, 30-32).

Influenza vaccination is strongly recommended for HCWs to prevent transmission of the virus to vulnerable patients and to reduce the possible absenteeism at work during seasonal epidemics (2, 33, 34). Among the study sample, higher vaccination coverages were observed among HCWs that reported a risk perception of transmitting influenza to their patients, data consistent with other previous studies conducted in Italy (35, 36).

Information and training could play a key role in modification of HCWs behaviours and attitudes (37, 38). Among HCWs that identified university and post-graduate training on influenza and influenza vaccination as the best strategies to increase vaccination coverage in future, higher adherence rate were reported. In general, over 75% of interviewed HCWs required a specific training on the topic (multidisciplinary or academic courses) (19, 39).

This study has some limitations. In particular, the small sample recruited was not representative of healthcare personnel working in Italy in G&O hospital departments, but could represent only a convenience sample. At the same time, the geographical distribution of the interviewed HCWs from 16 out of 22 administrative Italian Region could not support a geographical data representativeness among the whole Country. Moreover, the prevalence of the age groups 20-30 years could confirm a selection bias due to the questionnaire administration techniques (social network dedicated pages).

In future, it is necessary to implement an accurate planning of informative and communicative strategies for HCWs (e.g. multidisciplinary courses), in order to improve their knowledge, attitudes and perception regarding recommended vaccination. These strategies should be supported by an appropriate university training on vaccinology during university and post-graduation courses, in line with similar experiences documented for other topics of Public Health concern (40).

The real challenge for the future should be a modification of incorrect attitudes and behaviors and, in particular for HCWs working in gynaecology and obstetrics departments, a direct involvement in vaccination campaigns for general population, especially for pregnant and child-bearing age women.

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