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Major article

Attitudes toward mandatory occupational vaccinations and vaccination coverage against vaccine-preventable diseases of health care workers in primary health care centers

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Background: The aim of this study was to assess the attitudes regarding mandatory occupational vaccinations and the vaccination coverage against vaccine-preventable diseases among health care workers (HCWs) working in primary health care centers in Greece.

Methods: A standardized questionnaire was distributed to HCWs working in all primary health care centers in Greece (n = 185).

Results: A total of 2,055 of 5,639 HCWs (36.4% response rate) from 152 primary health care centers participated. The self-reported completed vaccination rates were 23.3% against measles, 23.3% against mumps, 29.8% against rubella, 3% against varicella, 5.8% against hepatitis A, 55.7% against hepatitis B, and 47.3% against tetanus-diphtheria; corresponding susceptibility rates were 17%, 25%, 18.6%, 16.7%, 87.5%, 35%, and 52.6%. Mandatory vaccinations were supported by 65.1% of 1,807 respondents, with wide differences by disease. Multiple logistic regression analysis revealed higher rates of acceptance of mandatory vaccination in physicians compared with other HCW categories.

Conclusions: Despite the fact that two-thirds of HCWs working in primary health care centers in Greece support mandatory vaccination for HCWs, completed vaccination rates against vaccine-preventable diseases are suboptimal.

Transmission of vaccine-preventable diseases and outbreaks continue to occur in various health care settings, possibly putting susceptible patients and health care workers (HCWs) at risk for serious morbidity or even mortality.[1-4] Numerous outbreaks of influenza,[1] rubella,[5] varicella,[6-8] pertussis,[9-11] hepatitis A,[12] and hepatitis B[13] have been traced to HCWs. The onset and evolution of such outbreaks is facilitated by the fact that many vaccine-preventable diseases spread rapidly within closed settings and before the onset of symptoms, are considered childhood diseases, and may manifest with atypical symptoms and thus often are not suspected early. HCW vaccination is a principle measure to promote safety within health care facilities for both HCWs and patients; however, inadequate coverage of HCWs against vaccine-preventable diseases is a global problem.[1,14-17]

In Greece, the Ministry of Health recommends annual vaccination of all HCWs against hepatitis B and seasonal influenza and vaccination of pediatricians and infectious disease specialists against hepatitis A. Each year in October and November, a nationwide campaign promotes vaccination against seasonal influenza. Primary health care centers provide the first-line response for almost all health issues for the majority of the Greek population. The aim of the present study was to assess attitudes regarding mandatory vaccination and self-reported immunity against vaccine-preventable diseases in HCWs working in primary health care centers in Greece.

METHODS

Data collection

In October and November 2010, a standardized, self-answered, anonymous questionnaire was distributed to HCWs working in all

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185 primary health care centers in Greece. The questionnaire elicited demographic and professional data, data on immunity against vaccine-preventable diseases, knowledge regarding recommended vaccines, and attitudes regarding mandatory vaccination for HCWs.

Definitions

HCWs were defined as all persons employed in a health care facility with or without involvement in direct patient care and regardless of employment status (ie, permanent, temporary, or contract staff). Immunity against vaccine-preventable diseases was defined as a history of natural infection resulting in permanent immunity (with pertussis, tetanus, and diphtheria excluded from this definition because disease does not confer permanent immunity) or a history of completed up-to-date vaccination. A history of completed up-to-date vaccination was defined as 1 shot for rubella, 2 shots for measles, mumps, varicella, or hepatitis A, and 3 shots for hepatitis B (all shots within the appropriate dose scheme for each disease), and 1 booster dose against tetanus-diphteria within the last 10 years. Susceptibility was defined as lack of immunity and estimated as (1−immunity) × 100%. Susceptibility against pertussis was not assessed, given that a recommendation for a booster shot in adolescents was recently introduced in Greece's routine vaccination program.

Statistical analysis

The χ^2 test was applied to test the associations between age and vaccination coverage and between age and susceptibility rates. The χ^2 test also was used to test the association of previous influenza vaccination with completed vaccination against other vaccine-preventable diseases. Multiple logistic regression analysis (forward selection) was applied to investigate factors significantly associated with HCWs' knowledge and attitudes regarding recommended vaccines. A P value $\leq$.05 was considered statistically significant. SPSS version 13 (IBM, Armonk, NY) was used for all statistical analyses.

RESULTS

A total of 2,055 of 5,639 HCWs (36.4% response rate) from 152 primary health care centers completed the questionnaire. Respondent characteristics are detailed in Table 1. Table 2 summarizes the HCWs' knowledge regarding the vaccines recommended for HCWs by the Ministry of Health. Only 265 HCWs (12.9%) named the 3 recommended vaccines. Multiple logistic regression analysis revealed no associations between knowledge of recommended vaccines and age group, sex, or profession.

Table 3 presents HCWs' completed vaccination rates by target disease. These rates ranged from as low as 3% for varicella to 55.7% for hepatitis B. HCWs aged <31 years had significantly higher completed vaccination rates against measles, mumps, rubella, varicella, hepatitis A, hepatitis B, and tetanus-diphtheria compared with older age groups ($P < .001$ for all comparisons, χ^2 test) (Fig 1). Among physicians, no association was found between rate of completed vaccination against hepatitis A and specialty. Regarding seasonal influenza, 786 of 1,911 HCWs (41.1%) had been vaccinated in the past; of these, 267 (34%) had received only 1 vaccination, 437 (55.6%) received 2-5 vaccinations, and 82 (10.4%) received >5 vaccinations. Older age groups had received more influenza vaccinations than the younger age groups ($P < .001$). HCWs who had received at least 1 previous influenza vaccination were more likely to have completed vaccinations against all diseases; however, this trend was statistically significant only for rubella, hepatitis A, and hepatitis B ($P = .003$, .034, and .004, respectively) (Table 4).

Table 1
Characteristics of participating HCWs (n = 2,055)

Characteristic	HCWs, n (%)*
Age, years	
≤30	208 (10.8)
31-40	509 (26.4)
41-50	735 (38.1)
>50	479 (24.8)
Female sex	1,015 (64.2)
Profession	
Physician	615 (33.7)
Nurse or midwife	538 (29.5)
Paramedical personnel	286 (15.7)
Administrative personnel	245 (13.4)
Technical personnel	141 (7.7)
Specialty†	
Internal medicine	409 (83.7)
Surgeon	58 (11.9)
Microbiologist	22 (4.5)
Department of occupation‡	
Pediatric	59 (7.4)
Surgical	27 (3.4)
Internal medicine	95 (12)
Laboratory	28 (3.5)
Emergency room	176 (22.2)
Other	407 (51.4)

*All HCWs did not answer all questions; thus, denominators may differ among data.
†Physicians only.
‡Physicians and nurses only.

Table 2
HCWs' knowledge of Ministry of Health−recommended vaccines

Vaccine	HCWs ring correctly (N = 2,055), n (%)
Seasonal influenza annually	1,550 (75.4)
Measles	1,896 (92.3)
Mumps	1,931 (94.0)
Rubella	1,897 (92.3)
Varicella	1,899 (92.4)
Hepatitis A	604 (29.4)
Hepatitis B	1,669 (81.2)
Pertussis	1,956 (95.2)
Tetanus-diphtheria	1,616 (78.6)

NOTE. In Greece, the following vaccines are recommended for HCWs: Seasonal influenza (annually), hepatitis B, and hepatitis A.

A history of measles, mumps, rubella, varicella, hepatitis A, hepatitis B, and pertussis was reported by 42.4%, 34.2%, 33.8%, 63.1%, 4.5%, 4.7%, and 20.72% of HCWs, respectively. Table 5 presents the HCWs' susceptibility rates against vaccine-preventable diseases by age group. Compared with older age groups, younger age groups had statistically significantly lower susceptibility rates to mumps (14.7% for age <31 years, 19.9% for age 31-40 years, 29.8% for age 41-50 years, and 27.6% for age >50 years; $P = .002$, χ^2 test), rubella (10.5% for <31 years, 15.5% for 31-40 years, 19.1% for 41-50 years, and 25.6% for >50 years; $P = .005$, χ^2 test), hepatitis B (25% for <31years, 29.2% for 31-40 years, 36.6% for 41-50 years, and 44.4% for >50 years; $P < .001$, χ^2 test), and tetanus-diphtheria (39% for <31 years, 59.7% for 31-40 years, 53% for 41-50 years, and 50% for >50 years; $P < .001$, χ^2 test).

Regarding mandatory vaccination of HCWs, 1,177 of 1,807 responders (65.1%) indicated that vaccinations should be mandatory; however, acceptance rates of mandatory vaccination differed by disease, ranging from 12.8% for pertussis to 87.3% for hepatitis B (Table 6). Higher rates of acceptance of mandatory vaccination were expressed for HCWs caring for immunocompromised patients (1,445 of 1,827 responders; 79.1%). Overall, more HCWs favored mandatory vaccinations against influenza, measles, mumps, rubella, varicella, hepatitis A, and pertussis in HCWs caring for