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REVIEW

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Factors Influencing the Implementation of Flu Vaccination in Healthcare Professionals: Pros and Cons

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ABSTRACT

Introduction: Vaccination is the best method for microbial and viral infections prevention. Especially for health professionals, flu vaccination is the best method to protect them, and the same applies for the patients and the general population from being infected. One of the most important preventive measure is vaccination and the main types of vaccines available, the limitations and side effects are briefly presented. **Aim:** The aim of this paper is to present the necessity of the healthcare professionals to conceptualize the importance of flu vaccination for themselves and the general population. Healthcare professionals are influenced by their knowledge, attitudes, and beliefs. Epidemiological surveys on this issue are presented for Greece, European Union, and the USA. **Methods:** A broad scope literature review was conducted based on a strict selection process of articles referring to the general population and the healthcare professionals with emphasis on the time period from the fall of 2018 until the spring of 2020 across Greece. The method used in this research obtained information through bibliographical references throughout Europe, USA, and relevant studies in Greece. **Results:** The results of this research indicated that influenza vaccination among healthcare professionals in Greece in the time period 2018-2019 was higher in primary health centers (PHCs) with a percentage of 43.8% than in Hospitals which was 30.6%. In addition, in the time period 2019-2020 flu vaccination among health professionals was higher in PHCs with a percentage of 57.9% rather than in Hospitals with a percentage of 38.8%. Specifically, flu vaccination rate which took place in hospitals was higher among physicians than in other healthcare personnel. Furthermore, the fundamental reasons for recommending flu vaccination in healthcare professionals are presented, and issues related to

denial or acceptance of it are highlighted. Measures and strategies are proposed in order to increase flu vaccination coverage in healthcare facilities in Greece. **Conclusions:** Based on this research review healthcare professionals (HCPs) especially the ones working in ICUs, in ICUs for newborn children, in Departments for acute care infections, in Departments caring of persons with immunodeficiency or Units for transplantation, Oncology and Haematology Departments, and finally, in Emergency Care Units need directly to be vaccinated for the flu virus. Different measures have been undertaken to promote flu vaccination and the percentage of implementation has been highlighted.

Keywords: Flu Vaccination, Healthcare Professionals, Types of Vaccines, Healthcare Facilities.

1. INTRODUCTION

The flu virus is an RNA virus with different antigenic characteristics which differentiate the virus in three types: A, B and C. In the outer part of the virus cell are lying two glycoproteins namely the haemoagglutinin (H) and the neuraminidase (N). In the type A flu virus, there are 16 different types of haemoagglutinin (H_1-H_{16}) and 9 different types of neuraminidase (N_1-N_9) and in the mankind exist the following subtypes of the virus: the H_1N_1 , H_2N_2 , H_3N_2 , H_5N_1 , H_7N_7 , H_9N_2 . From them the H_1N_1 , H_2N_2 and H_3N_2 are the ones encountered more frequently. The subtype H_1N_1 appeared at first in 1957. The H_2N_2 in the year 1968 and nowadays the H_3N_2 is mostly diagnosed. In 1976 the subtype H_1N_1 reappeared and is present until today. Based on WHO (1), the typology of the flu viruses lies on some well-defined criteria:

- The types of the virus A, B, C.
- The principal host.

The geographical region.

The subtype of the virus.

The year of discovery.

The antigenic description of the glycoproteins.

From the year 1404 until the middle of the 19th century 31 flu epidemics occurred and from them 8 were named pandemics. In the 20th century 3 pandemics occurred across the world. It is important to mention that there are groups of people belonging in the vulnerable groups such as: persons with asthma or other chronic respiratory diseases, persons with severe heart problems or immunodeficiency problems genetic or acquired in the course of life, persons with sickle cell anaemia, persons with diabetes mellitus or any other metabolic disease, persons with chronic renal disease or renal failure, persons with neurological or muscular problems, pregnant women, overweight or obese persons and all other persons belonging in closed populations such as army soldiers, persons in psychiatric institutions and finally veterinary doctors and farm workers (2). The most important laboratory flu diagnosed tests to precisely diagnose the flu virus are the following: antigen detection with rapid test (RIDT), antigen detection with direct immunofluorescence (DFA), culture, and rRT-PCR.

Influenza appears to have high mortality rates among elderly people. There are different types of flu vaccines. The trivalent (TIV), the quadrivalent (QIV) and the LAIV. Nevertheless, the most usual, common and systematic adverse effects of the flu vaccines are appearing in mature persons and they are the following: local adverse effects, which include pain, cough, sore throat, nasal discharge, nasal congestion, and systematic adverse effects, which include tiredness, muscular pain, headache, fever and discomfort (3).

The influenza season 2019-2020 had an early onset with an overall shorter duration compared to previous seasons, which was influenced by the COVID-19 pandemic and the related lockdown and high impact on influenza monitoring actions in various countries (4). On 28 February 2020, WHO published recommendations for the components of influenza vaccines for use in the 2020-21 northern hemisphere influenza season (5). In Greece in the time period 2018-2019 they have been isolated 388 severe cases and from them 374 were hospitalized in ICU. Especially, 226 were men and 148 were women with a mean age group 62 years of age in a range of 1-90 years of life. 370 (98,9%) were of type A and 4 (1,1%) of type B. 54 (17,1%) belonged to the subtype A (H₃N₂) and 262 (82,9%) belonged to the subtype H₁N₁. It is worthwhile to mention that 56 (15%) have been vaccinated against the flu virus. Meanwhile the 287 (76,7%) belonged to vulnerable groups for influenza according to the Ministry of Health, as it appears in Figure 1 (6).

In a European level regarding the epidemiological data the percentage of positive specimens reached the 62% the 7th week of 2019: From the 16.472 positive specimens the 99% were of type A and the 1% were of type B. From 11.890 A subtypes, 55% were of the subtype A (H₁N₁) and 45% were of the subtype A (H₃N₂). From the 62 B type flu virus, the 79% were B/Yamagata and 21% were B/Victoria (7).

Influenza A(H₁N₁), A(H₃N₂) and B viruses were co-circulating in Europe between September 2019 and January

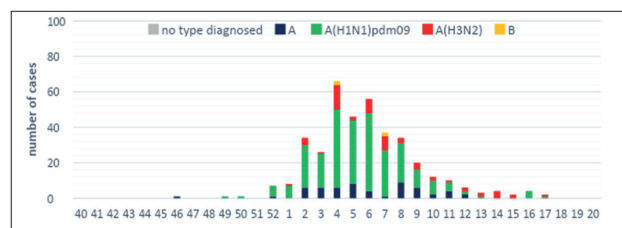


Figure 1. Number of cases in ICU per week in patients with positively diagnosed influenza. Total number of cases in Greece per week 40/2018 till week 20/2019 (13–19 May 2019). Total number of declared cases until the week 20/2019: 374 (6).

2020. Six European studies, covering 10 countries and both primary care and hospital settings, were conducted to prove interim influenza vaccine effectiveness (VE): 31.537 patients were being studied across six surveys. Different patterns of dominant type and subtype were observed across the countries. Influenza A(H₁), A(H₃) and B/Victoria circulated, with more type A than type B flu viruses detected in hospitalized patients. ICU cases were mainly due to type A virus and occurred in people aged 40 years and older. Nevertheless, the estimates indicated 62-83% effectiveness of the vaccine against influenza B (8). In 2005 the Society for Healthcare Epidemiology of America (SHEA) published an article denoting that all healthcare professionals should be vaccinated against the influenza virus. Five years later the SHEA proposed the obligatory vaccination for all healthcare personnel in order to be able to get hired to work in health institutions. Both, the Advisory Committee on Immunization Practices and National Quality Forum firmly proposed the vaccination against the flu virus (9). There are some crucial problems related to the flu vaccination of the healthcare personnel. One of them is related to the risk of transmitting the disease to the patients receiving care in health institutions from non-vaccinated health professionals. Another problem is the one called “presenteeism” meaning the fact that ill healthcare personnel having influenza continuous to work and as a result there is an inherent great risk to infect other patients. This phenomenon appears to be related to a strong feeling of duty of the health professionals towards patients and other collaborators (10). In a meta-analysis research undertaken by Ahmed et al (2014) it has been found a considerable reduction of mortality due to other causes than influenza, in healthcare institutions in which the health personnel were vaccinated against the flu virus. It has been noted also a reduction of influenza type A in patients which took part in the above research (11). In the period 2009-2011 in the Netherlands 6 acute care hospitals were used in a randomized control trial to evaluate the usefulness of the flu vaccination in health personnel. Three out of the six acute care hospitals performed the flu vaccination in the healthcare personnel working there and in the remaining hospitals no flu vaccination of the healthcare personnel has taken place. Since the flu vaccination was not obligatory in hospitals, only 33% of the healthcare professionals have taken the flu vaccine. The results showed that there was a reduction of 50% of the influenza disease, as well as of other complications such as pneumonia. There was no difference in the rates of occurrence of the influenza disease and of pneumonia for children

patients. Another important issue that emerged from this research was the event that a higher percentage of absenteeism appeared, due to the illness of health professionals. From other research studies has also evolved the issue that the cost of the influenza disease in hospitals could be high due to the fact that more healthcare services should be provided and more diagnostic tests should be performed, and finally, a longer hospital stay is needed (12). In March 2019, the European Commission published a report which assessed (see Table 3) the overall state of confidence in vaccines among the general population in all 28 Member States and among general practitioners in 10 Member States. This report highlighted the attitudes of the European population towards vaccination. It is worthwhile to pinpoint that the confidence levels vary for any different vaccine and that the general public is overall influenced by the attitudes and beliefs of the health practitioners regarding the flu vaccination. In the survey were participated 27.524 persons belonging to different social and demographic groups. The focus of this research was not only to highlight the beliefs of the EU citizens about the vaccines, but also to investigate the levels of knowledge and the patterns of behavior of the European population. Based on the results, the proportion of EU citizens who have been vaccinated varied considerably between countries. It is also important to mention that a third of the European population believes that there is no need to get vaccinated. Another crucial point to mention is the lack of precise information about the safety, efficacy, and effectiveness of the vaccines, as well as about the possible contraindications. 79% of the respondents mentioned that before getting any vaccination, they would like to consult a doctor. Apart of medical practitioners, all other sources of information have been cited by only a few of EU citizens (13). In Europe, compulsory vaccinations of health personnel are applied in 13 countries, but mandatory vaccination policies are relatively flexible, as is the case of Greece. Nevertheless, in most cases, the healthcare personnel who denies compulsory vaccination is usually transferred to a low-risk position. Meanwhile, there is a first possibility to impose a fine, to revoke employment for healthcare professionals or to refuse the clinical practice if students are concerned (14). In the USA the obligatory flu vaccination is imposed, leading to a high percentage of vaccination among healthcare professionals (HCPs). CDC, the Advisory Committee on Immunization Practices (ACIP), and the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommend that all U.S. healthcare workers should be vaccinated annually against influenza (15). Based on CDC data the flu vaccination in US for health professionals reached the percentage of 81.1% during 2018-2019. Influenza vaccination coverage in the 2018-19 season was highest among HCPs working in hospital settings (95.2%). The flu vaccination percentages were 96.7% for medical doctors, 91.8% for nurses, 91.5% for pharmacists and 91% for medical and nursing assistants. Meanwhile, the flu vaccination among other clinical HCPs was low, reaching the percentage of 85.8% in contrast to the administrative personnel in which the vaccination percentage reached the 75.5%. Influenza vaccination coverage in the 2019-20 season among HCPs was approximately 80.6% similar to

the one found in 2018-2019. The flu vaccination coverage was highest among medical doctors with a percentage of 98.0%, 92.0% for nurses, 90.6% for pharmacists and 88% for medical and nursing assistants. Flu vaccination coverage among other clinical HCPs was low, reaching the percentage of 81.7% and the corresponding percentage of the administrative personnel was found to be 76.7% (16). Regarding the flu vaccines, the available vaccines in the USA for the period 2019-2020 are presented in Table 1.

2. AIM

The aim of this paper is to investigate the level of knowledge, the attitudes and the beliefs of the general population in Greece and especially the healthcare professionals towards flu vaccination. Different measures and strategies are proposed to promote flu vaccination in healthcare personnel and an attempt to implement and evaluate some of them has been accomplished.

3. METHODS

Methodologically, a systematic review of Greek and English literature was carried out, in order to search for information related to evaluate influenza vaccination in Greece, Europe and the US, as well as to investigate the level of knowledge, the attitudes, beliefs, and the willingness of getting a flu vaccination of both the general population and the healthcare professionals. Various surveys conducted during the previous years regarding influenza in Europe and in the US and some of them were analyzed and compared with similar surveys undertaken in Greece, based on the sample, the age groups, the professional status, the family status and the educational status of the population participated in the above-mentioned research studies undertaken in the same time period as the one conducted by our research group. Data was extracted from the scientific databases of PubMed, Medscape, Scopus, Google Scholar and official websites to compare the impact of the seasonal influenza both in Greece, Europe and in US. Specifically, in Greece have been conducted various surveys to investigate the percentage of flu vaccinated healthcare professionals in Public Hospitals and Primary Healthcare Centers (PHCs) and a number of them were selected for review. Additionally, evaluation of the knowledge, opinions, beliefs, and attitudes towards flu vaccination of both the general population and the healthcare professionals has been analyzed based on surveys undertaken by EU and measures and strategies to promote flu vaccination have been proposed and implemented.

4. RESULTS

In March 2019, a survey was conducted by the European Commission about Europeans' attitudes towards vaccination as mentioned above (12). One of the countries that was analyzed in the survey was Greece. In Greece, the 90% of the respondents believed that vaccines can definitively (54%) or probably (36%) be effective in preventing infection diseases and that a percentage of 87% declared that the flu disease is still causing deaths in the EU nowadays. A majority (52%) in all European countries think that vaccines are effective, but the extent of agreement varies considerably.

Trade Name (Manufacturer)	Presentation	Age Indication
IIV4 – Standard Dose – Egg based		
Afluria Quadrivalent (Seqirus)	0.25mL PFS 0.5mL PFS 5.0mL MDV	6 through 35 mos ≥ 3yrs ≥ 6 mos (needle/syringe) 18 through 64 yrs (jet injector)
Fluarix Quadrivalent (GlaxoSmithKline)	0.5mL PFS	≥ 6 mos
FluLaval Quadrivalent (GlaxoSmithKline)	0.5mL PFS 5.0mL MDV	≥ 6 mos ≥ 6 mos
Fluzone Quadrivalent (Sanofi Pasteur)	0.25mL PFS 0.5mL PFS 0.5mL SDV 5.0mL MDV	6 through 35 mos ≥ 6 mos ≥ 6 mos ≥ 6 mos
IIV4 – Standard Dose – Cell culture based (ccIIV4)		
Flucelvax Quadrivalent (Seqirus)	0.5mL PFS 5.0mL MDV	≥ 4 yrs ≥ 4 yrs
IIV3 – High Dose – Egg based (HD-IIV3)		
Fluzone High Dose (Sanofi Pasteur)	0.5mL PFS	≥ 65 yrs
IIV3 – Standard Dose – Egg based with MF59 adjuvant (aIIV3)		
Fluad (Seqirus)	0.5mL PFS	≥ 65 yrs
RIV4 – Recombinant (HA)		
Flublok Quadrivalent (Sanofi Pasteur)	0.5mL PFS	≥ 18 yrs
LAIV4 – Egg based		
FluMist Quadrivalent (AstraZeneca)	0.2 mL prefilled single-use intranasal sprayer	2 through 49 yrs

Table 1. Flu vaccination in USA for the seasonal influenza (6).

The reason most frequently cited for having vaccination is that it was recommended by a general practitioner, doctor or pediatrician and in Greece the percentage was the highest reaching the 86%, specifically:

Knowledge about vaccination

Most of Europeans know that vaccines are rigorously tested, but they are less well informed about their effects. In Greece 83% of the respondents know that vaccines are rigorously tested before being authorized for use. Additionally, a percentage of 58% answered that vaccines do not weaken the immune system, 56% that vaccines do not cause the disease instead of protect the individual, and 35% that vaccines do not often produce serious side-effects.

Beliefs towards vaccination

Most Europeans think that vaccines are important for all, but there is substantial variation between countries regarding the extent of agreement. A majority of the respondents disagree that vaccines are only important for children (69%). In Greece 49% of the respondents believe that the vaccines are important to protect not only themselves, but also others. Additionally, 52% believe that vac-

Reason	Reporting Rate (%)
Not informed about the influenza vaccination program	6.54%
Absence during the influenza vaccination program	7%
Belief that they are at no risk for contracting influenza	44.5%
Belief that the vaccine is not effective	20.79%
Fear of vaccine adverse effects	20.33%
Ignorance that HCPs constitute a target group for influenza vaccination	0.82%

Table 2. Reasons for refusing influenza vaccination among HCPs (18).

	Influenza	
	Season 2018-2019	Season 2017-2018
Total	57%	56%
By sector:		
Public Sector	56%	56.2%
Private Sector	55%	55.4%
By age group (years):		
30-39	35%	30%
40-49	52%	53%
50-59	66%	68%
≥60	74%	68%

Table 3. Vaccination coverage rates of GPs: in total, by sector and by age group (17).

ination of other people is important to protect those who cannot be vaccinated (e.g. newborn children, immunodepressed or very sick people). 47% believe that not getting vaccinated can lead to serious health problems and 35% tend to agree with this opinion. 26% totally disagree that vaccines are important only for children and 41% tend to disagree as well. 61% believe that a vaccination programme should be coordinated by a health authority at a national level, because it is the only central jurisdiction, which can dictate a policy regarding vaccines in all age ranges of the population during a lifetime.

Attitudes towards vaccination

Nearly 8 of 10 Europeans would consult a medical professional if they were looking for information about vaccination. The most relevant source of information in Greece is a general practitioner, doctor or pediatrician in a percentage of 94%. 78% of the respondents pinpointed the medical professionals as being the most trustworthy source of information about vaccines. Greek people also receive a lot of information about vaccines in the media, particularly 78% receive them from the television.

The overall attitudes of Europeans and especially of Greeks towards vaccination is positive. However, knowledge about infection diseases and vaccines varies considerably (12). Vaccination coverage of general practitioners (GPs) is important for their own and for their colleagues' and patients' protection and has been associated with the protection of the general population. Studies have shown that motivated physicians are more likely to effectively promote vaccination of the population and studies have correlated physicians' self-immunization with higher vaccination

coverage of their patients (16). Furthermore, immunization of healthcare professionals is important both for their own protection and for the protection of their patients (16). In contrast, studies have shown that the most commonly cited reason for healthcare professionals regarding flu self-vaccination is the issue of safety. A lack of knowledge regarding the vaccine is also revealed through a number of surveys highlighting the false notion that pregnancy is a contraindication for the influenza vaccine and that the vaccine contains dangerous additives and promote allergies. In addition, a lack of awareness about national guidelines or recommendations was also revealed to be an important reason. The other factor is related to the objection to some types of adjuvants connected to the vaccine and the belief of a certain percentage of health professionals that flu vaccination will not correspondingly benefit patients – a reason which could have been classified under lack of concern or lack of knowledge. Reasons for hesitancy include mistrust in health institutions selected to perform vaccinations (17). In a survey conducted in Greece less than half of HCPs reported that they were vaccinated in order to protect their patients. The main reasons for refusing influenza vaccination pinpointed a strong belief that they are not at risk of contracting influenza, essential doubts about the vaccine effectiveness and finally, fear about the vaccine’s adverse effects (18). The percentages of denying influenza vaccination are reported in the Table 2.

Based on the data indicated in a research which was conducted by Yacub et al (2014) there is misinformation about hospital transmission of influenza, as well as about vaccine effectiveness and safety. Various reasons were

Strategic Actions	Percentage of Implementation
Vaccination at the workplace	86.1%
Free vaccination	80.4%
Organisation of actions for the promotion of vaccination	77.8%
Discussions for the influenza and the flu vaccination	37.6%
Mobile Units used for vaccination	31.6%
Written declaration for refusing vaccination	54.5%
Use of communication media for reminding vaccination	50.4%
Rewarding programs for vaccinated healthcare personnel	15%
Vaccination of chief medical and nursing staff/personnel	66.9%
Support of the vaccination from the central administration of the hospital	49.6%
Leaders vaccination	35.7%
Promotion of the responsibility and safety sensation in the workplace	63.9%
Verbal briefing from the responsible directors of clinics and other sections and laboratories regarding vaccination	80.8%

Table 4. Percentage of implementation (%) of strategic actions aiming at improving the vaccination policy in 266 institutions providing healthcare services in Greece (6).

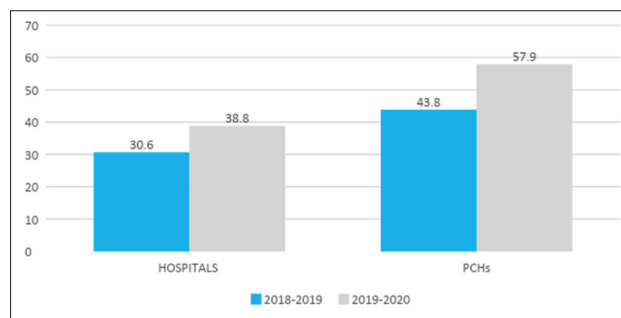


Figure 2. Average number of percentage (%) of vaccinated healthcare professionals in comparison with the totality of healthcare personnel working in Hospitals and Primary Healthcare Centers in the last two periods of influenza in Greece, time periods 2018-2019 and 2019-2020 (6, 21).

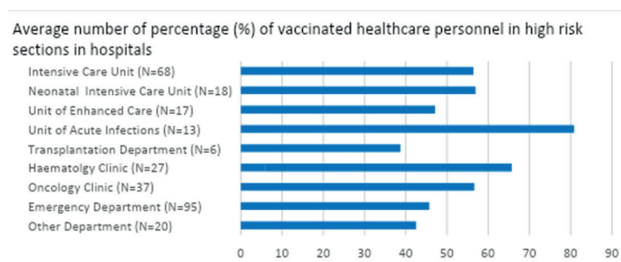


Figure 3. Average number of percentage (%) of vaccinated healthcare personnel in high risk departments in Hospitals in Greece, time period 2019-2020 (21).

underlined for patients or HCPs for not being vaccinated, such as beliefs that vaccination is not important, or concern about the cost of vaccination, or because they believe in homeopathy, or even they have fear of needles, or have other religious reasons for not being vaccinated. The emerged issues are of utmost importance, since there are recent studies showing that similar misconceptions and perceptions apply for seasonal influenza vaccine and pandemic influenza H₁N₁ vaccine (19). In accordance with the previous mentioned reasons, there are strong indicators which lead to increase vaccination rates among HCPs. This fact underlies the added value of continuing influenza vaccination campaigns in combination with sustained educational and administrative support (20).

In a survey conducted in Greece in the time periods 2017-2018 and 2018-2019 by Kalemaki et al (17) was assessed the vaccination coverage and practices for influenza and other diseases and the reasons for non-vaccination for influenza of the general practitioners (GPs). A total of 260 (88% response rate) GPs participated: 204 GPs were from the public sector and 56 GPs were from the private sector. Vaccination rates for influenza (current season) of GPs were 56-57%. The most commonly reported reasons for non-taking the flu vaccine were negligence (47%), perceived low risk (29.6%), fear of side effects (7.8%), unreliable vaccine efficacy (4.3%) and preference of natural immunity (4.3%). This study revealed insufficient vaccination rates and misconceptions among GPs that should be the focus of future evidence-based interventions with the potential to significantly improve vaccination coverage of GPs and indirectly of their patients (14).

Health professionals belong to a front-line and vulnerable group, due to their usual occupational exposure to the

disease, a fact that leads them to the top of the pyramid of all the vulnerable groups that should not deny flu vaccination. Due to the different antigenic characteristics of the influenza virus vaccination should be undertaken every single year. In this research the last two seasonal influenza periods in Greece are presented below:

In 2018-2019 flu vaccination in Greece among health professionals was 30.6% in hospitals and 43.8% in PHCs. Data was extracted from 112 hospitals (100 public hospitals, 9 private hospitals και 3 military hospitals) and 220 PHCs until the 17th May 2019. It has been found that the percentage of flu vaccination among medical doctors in hospitals was 44.8% and 36% in PHCs. The highest percentage of flu vaccination among healthcare professionals has been noted in the 7th healthcare region (6).

In 2019-2020 flu vaccination among health professionals was 38.8% in hospitals and 57.9% in PHCs. This year's flu season data was sent by 138 hospitals (121 public hospitals, 13 private hospitals και 4 military hospitals) and 341 PHCs until the 22nd May 2020 and the percentages of vaccination were approximately in the same levels as the ones found in the previous year with a slight increase. It is also important to mention that during the period 2019-2020 vaccination rate of both healthcare students undergoing their clinical practice in hospitals and in PHCs and other healthcare personnel working in high risk departments was included in the overall flu vaccination percentages (22).

In the following Figure 2 is indicated the flu vaccination coverage of healthcare personnel in hospitals and in PHCs in the aforementioned time periods of influenza (2018-2019 and 2019-2020):

The results of the vaccination of the healthcare personnel in each high-risk departments in Hospitals (N) are displayed in the Figure 3.

Some of the most important reasons for which the flu vaccination is advisable are presented below:

- The risk of contracting the flu disease impending on health professionals working in health institutions in any moment in comparison with other employees working in different locations.
- The health personnel with symptomatic or asymptomatic flu disease continue to work and could therefore transmit the flu virus to others (patients and health workers).
- Health personnel usually provides care to patients with severe complications, a fact which can lead sometimes to death.
- The non-vaccinated health personnel could be the source of dispersion of the flu virus in case of a hospital epidemic.
- The flu vaccination is valid and safe and leads to a reduction of morbidity and mortality of the patients.

5. DISCUSSION

Healthcare professionals working in hospitals and in other healthcare facilities belong to an extremely high-risk group for contracting diseases, which can be prevented by vaccination. Seasonal influenza constitutes the most common viral disease that can be prevented by flu vaccination in all countries.

It is worthwhile to mention that in this research was found that the acceptance of influenza vaccine in health professionals is associated with various factors and one of them is the clear knowledge about the safety, efficacy, and efficiency of the vaccine. The results of this research, also, pinpointed that the main factors that influence the attitudes of the health professionals towards flu vaccination include the following:

- One of the most important factors is the lack of clear and specific knowledge of the health professionals regarding flu vaccination.
- The second in rank reason for renouncing flu vaccination is the fear regarding the adverse effects inherent to the vaccination.
- The disadvantage of the flu vaccine is that every year the flu vaccine has different antigenic characteristics, therefore is a totally different vaccine.
- The skepticism embracing any vaccine not only the flu vaccine.
- The ignorance of the healthcare personnel regarding the absolute necessity of the flu vaccine.
- The carelessness of the healthcare personnel due to their work overload.
- The majority of health professionals think to have a strong immune system and therefore believe to be well protected from the flu infection.
- The last factor as it was emerged from this research is the intention of the central administration of each healthcare institution to support a well-organized programme for implementing the flu vaccination. For this reason, administration has to dictate a policy to perform the flu vaccination right in the workplace. Finally, a crucial role for undertaking flu vaccination will play the positive behavior of the colleagues willing to take the vaccine.

Based on the research's results different measures are proposed to enhance the flu vaccination among health professionals in Greece.

A. Measures to facilitate the intake of the flu vaccine:

- Free intake of the flu vaccine.
- Flu vaccination at the workplace, use of mobile teams to perform vaccination.

B. Measures to give out information for the flu vaccine:

- Posters.
- Personal cards and memos.
- Supporters of the vaccination.

C. Measures to educate the health personnel:

- Discussions.
- Educational meetings.
- Seminars.

D. Triggering and Motivational Measures:

- Organized parties.
- Personal bonus (giving bonus on a vaccination day).
- Group bonus (giving prizes to clinics or hospitals).

E. Refusal statements to deny vaccination (declination statements).

F. Obligatory vaccination.

The most important measures are the intake of the flu vaccination for free and the intake of the flu vaccine at the workplace during all the personnel's shifts. It is also im-

portant to select one person (one health professional) with experience to perform flu vaccination. Posters should be hanged in places where everyone can see them. Personal contact, memos, e-mails and sms are good reminders of flu vaccination. The declination statement is also important because many health professionals admit their ignorance and conform finally and get vaccinated. In Greece, at the moment, health professionals that are unwilling to get vaccinated don't receive any penalty. This procedure is called "soft mandated" vaccination. It is worthwhile to mention that some penalty measures imposed upon health professionals who refuse to take flu vaccination are relocation to a workplace without having contact with patients or obligation to wear always a mask. Vaccination is not to be performed if there are medical contraindications (6). The effectiveness of any measure to increase vaccination coverage depends on many factors, such as the cultural context of each country and the specific reasons which underly the hesitancy of the healthcare professionals to avoid or hesitate to be vaccinated. All measures do not work in the same way in all cases. Nevertheless, in any case, the various measures must not be fragmentary and must be part of an integrated strategy to increase influenza vaccination within health facilities. Strong commitment and support of the administration in this effort is also absolutely necessary, due to the fact that without a political and administrative support it is doubtful to achieve adequate vaccination coverage for the staff. In Greece have been proposed various strategic procedures and measures in 266 healthcare places (93 Hospitals and 173 PHCs) and the percentage of implementation for improving the vaccination policy in healthcare institutions is presented in the Table 4:

There is an urgent need of a collective effort by all health service providers to promote vaccination in health professionals with various strategies such as providing knowledge through education and easy access and strategies that emphasize the benefits of the vaccine.

6. CONCLUSIONS

According to the World Health Organization (WHO), the United States Centers for Disease Control and Prevention (CDC) and the recommendations of the European Agency for Safety and Health at Work (EU-OSHA), healthcare personnel is a priority group for vaccination against the flu virus. Despite the recommendations of Public Health Authorities and the fact that vaccination of healthcare professionals has been proven to be an effective measure to prevent influenza in hospitals, influenza vaccination coverage rarely exceeds 40% worldwide and usually ranges from 5% to 42%. The only exception is US hospitals where they have been implementing compulsory flu vaccination programmes for the last decade and maintain high (>95%) vaccination coverage rates (16). Greece has a national immunization programme, with coverage for all vaccinations which exceeds the usual EU coverages. While coverage of older people for the influenza vaccination is higher than the one existing in EU, it is important to mention that this percentage is below the WHO target of 75%. The Ministry of Health collaborated with medical associations to introduce and disseminate clinical guidelines and treatment proto-

cols, which aim to improve the quality of care provided to patients with influenza disease (22). Every winter in Greece, as in all countries, there is an increase of the seasonal influenza disease. The increase in morbidity and mortality caused by seasonal flu varies from one year to another, depending on the characteristics of the virus circulating and the degree of immunity, which the different age groups of the population possesses. The seasonal flu vaccination is the best and safest weapon available for the prevention of the disease and due to its diversifying characteristics, every year flu vaccination should be done, especially in vulnerable groups. Educational strategies should aim in raising awareness about the impact of influenza in health-care settings as well as in presenting the available scientific data regarding the vaccine effectiveness and safety profile in order to limit fears and misconceptions. The Ministries of Health and Education and the National Vaccine Commission can provide the necessary guidance, while health providers, municipalities and school departments can implement the necessary measures. Healthcare professionals especially the ones working in ICUs, in ICUs for newborn children, in Departments for acute care infections, in Departments caring for persons with immunodeficiency, Units for transplantation, Oncology and Haematology Departments, and finally, in Emergency Care Units need directly to be vaccinated for the flu virus. In Greece, it is encouraging to mention that according to recent facts from the Ministry of Health, flu vaccination among health professionals was higher in PHCs as well as hospitals in theyears (2018-2020). This fact could also be related to the new virus called COVID-19. Hopefully this percentage of flu vaccination will be increased in the following years to strengthen the protection of Public Health. Various strategic procedures and measures are being studied for the enhancement of this percentage. It is crucial for health professionals to understand that they must be the example for the general population and take the flu vaccination without any hesitation. Future development of good vaccination practices could be enhanced by more systematic, theory-based intervention design and more detailed reporting of process and outcomes evaluation. Vaccine hesitancy, unfortunately, is prevalent and more policy and research to improve public acceptance should therefore be considered and in the near future.

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