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OPINIONS OF EMPLOYEES OF THE NATIONAL INSTITUTE OF PUBLIC HEALTH – NATIONAL INSTITUTE OF HYGIENE IN WARSAW ON INFLUENZA VACCINATION*

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ABSTRACT

INTRODUCTION. Improving influenza vaccination coverage is an important action to prevent influenza epidemics and reduce the costs caused by the epidemics. Recognising the motives to be vaccinated or failure to vaccinate, especially among health care workers, is needed.
OBJECTIVES. The aim of presented papers is: 1) recognising the influenza vaccination coverage among NIPH-NIH employees, 2) examining the determinants of decision be vaccinated/not vaccinated, 3) estimating the effectiveness of influenza vaccination in relation to sickness absence due to respiratory infection.
MATERIAL AND METHODS. The study was carried out in NIPH-NIH by e-mail questionnaire. Out of 345 employees, 187 (54,2%) participated in the study. The questionnaire contained information on influenza vaccination and determinants that would potentially affect the decision to vaccinate.
RESULTS. 18,7% of the participants was vaccinated in the previous epidemic season and the half of employees were vaccinated at least one time in the previous 10 seasons. Only every fourth family/occupational doctor encouraged their patients to vaccinate. The NIPH-NIH employees would be more likely to be vaccinated, if the employer has provided free vaccines. The estimation of influenza vaccination effectiveness in decreasing the sickness absence due to respiratory infection amounted 37%.
CONCLUSIONS. Our findings confirmed that influenza vaccination contributes to noticeable decreasing of sickness absence. Providing free vaccination against influenza by employer could increase considerably the coverage.

Key words: *influenza, vaccination, effectiveness, NIPH-NIH employees*

INTRODUCTION

Influenza poses the serious problem in individual as well as social dimension, generating great indirect (treatment) and direct costs (sickness absence, productivity loss) (1). Vaccination against influenza is the primary way to prevent falling ill. In 2003 the World Health Organization (WHO) adopted the resolution on control of influenza pandemics and seasonal epidemics, containing the recommendations to increase influenza vaccination coverage, particularly in the risk groups (2). In every season the WHO specifies recommendations on the composition of influenza vaccines for the nearest season on the basis of the analysis of occurrence and virulence of virus strains in the previous season. Usually they are trivalent and cover two components of type A influenza virus (subtypes A/H1N1/ and A/H3N2/) and one of type B virus (3). The different procedures are adopted for recommendations concerning pandemic influenza. New isolated influenza virus of strong virulence that is expected to cause a pandemic is used to produce a monovalent vaccines, which induce immunity to this virus. Seasonal as well as pandemic vaccines have to meet very restrictive criteria of effi-

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cacy and safety (4). The efforts of the WHO and other institutions and organisations involved in overcoming of influenza are focused on increasing the vaccination coverage in the general population of the member states, particularly among health care workers and risk groups (the elderly, children aged >5 years, individuals with specific chronic diseases and pregnant women) (2). In the European Union the coverage has been very differentiated. In 2011/2012, from 0,4% to 65,7% of general population, from 1,7% to 77,2% of elderly, from 0,1% to 4,5% of children aged 6 months – 18 years, from 29,7% to 73,6% of individuals suffering from specific chronic diseases and from 27,4% to 58,0% of pregnant women were immunised against seasonal influenza (includes only those countries that reported data) (5). The vaccination coverage against pandemic influenza 2009/2010 ranged 0,4% - 59% of general population, 0,3% - 74% of children aged 6 months – 18 years, 8% - 72% of individuals suffering from specific chronic diseases and 0% - 32% of pregnant women (includes only those countries that reported data) (6).

The demonstration of influenza vaccine effectiveness confirms the benefits of influenza vaccination. The efficacy of vaccines measures how well a vaccine works in clinical trials, whereas effectiveness relates to how well it works in routine immunization programmes (7). The most frequently used criterion of influenza vaccine effectiveness is the extent (expressed in percentage) to which they prevent influenza-like illness (ILI), rarely acute respiratory diseases (ACR) (8-12). In the European Union the analyses of influenza vaccine effectiveness have been conducted since 2008 in the frame of Influenza Monitoring Vaccine Effectiveness (I-MOVE), the network covering institutions (usually national reference centres for influenza) that are involved in overcoming of influenza and collaborating with the European Centre for Disease Prevention and Control (ECDC) (13).

Prevention of infection diseases, including influenza, is an important part of activity of the National Institute of Public Health – National Institute of Hygiene (NIPH-NIH). Department of Influenza Research, the National Reference Centre for Influenza, acting as reference agency for SENTINEL influenza surveillance system in Poland, operates within NIPH-NIH (14). In NIPH-NIH the work on Countrywide Programme of Influenza Preventing was undertaken in 2013. The employees of NIPH-HIH have collaborated with international programmes of influenza prevention, i.a. European Influenza Surveillance Network (EISN) (15), Vaccine European New Integrated Collaboration Effort (VENICE) (6), Influenza Monitoring Vaccine Effectiveness (I-MOVE) (13). The wide campaign on influenza vaccination has been also conducted (16). Therefore, the employees of NIPH-NIH are expected to be particularly responsible for active involvement in all activities focusing on decrease of influenza prevalence, including vaccination against influenza.

The aim of presented papers is: 1) recognising the influenza vaccination coverage among NIPH-NIH employees, 2) examining the determinants of decision be vaccinated/not vaccinated, 3) estimating the effectiveness of influenza vaccine in relation to sickness absence due to respiratory infection.

Table I. NIPH-NIH employee participation in the survey of influenza vaccination, January 2013

Employee groups	All employed in NIPH-NIH		Survey participants		Statistical significance p[1]	Participation %
	n	(%)	n	(%)		
Total	345	(100,0)	187	(100,0)		54,2
Gender					0,678	
male	92	(26,7)	53	(28,3)		57,6
female	253	(73,3)	134	(71,7)		53,0
Age					0,338	
24-39	143	(44,6)	91	(49,2)		63,6
40-59	140	(41,6)	67	(36,3)		47,8
60 or more	53	(15,8)	27	(14,6)		50,9
Education					0,003	
high	260	(75,4)	164	(87,7)		63,1
secondary	78	(22,6)	21	(11,2)		26,9
vocational/elementary	7	(2,0)	2	(1,1)		28,6
Professional position					0,008	
researchers	103	(30,2)	77	(41,2)		74,8
technicians	158	(46,3)	62	(33,2)		39,2
administrative staff	80	(23,5)	48	(25,7)		60,0

[1] chi-square test

MATERIAL AND METHODS

The survey was carried on between 15 and 22 January 2013. The questionnaire prepared in NIPH-NIH was sent to all employees of NIPH-NIH by e-mail. Participation was voluntary and complete anonymity of the respondents was ensured. Out of 345 employees, 187 (54,2%) returned completed questionnaire. The differentiation of NIPH-NIH employees participation in the study by gender, age, education and professional position was presented in Table I. Significantly more researchers, and significantly less workers with secondary or lower education and employed in technical positions participated in the study.

Apart from information about gender, age, education and professional position, the questionnaire included questions concerning 1) influenza vaccination in the last season, 2) frequency of influenza vaccination in the last 10 seasons, 3) causes of failure to vaccinate, 4) opinions of providing free vaccines by the employer, 5) opinions regarding mandatory influenza vaccination among staff involving in population health, 6) encouraging close persons to vaccinate against influenza, 7) being encouraged by family/occupational doctor to be vaccinated against influenza, 8) awareness of influenza complications, 9) frequency of being on sick leave due to respiratory infection during the last season, 10) duration of the longest period of absence due to this infection, 11) fear of influenza infected, 12) fear of influenza infection of close persons.

Epi Info programme was applied to establish the database and statistical analysis. Differences between the groups were measured by the chi-square test. Quantitative data (age) were converted to categorized scale (24-39, 40-59 and over 59). The probability of influenza vaccination in season 2012/2013 due to vaccination during the past 10 seasons were calculated by odds ratio (OR). The influenza vaccine effectiveness in relation to frequency of sickness absence due to respiratory infection was estimated according to the formula (1-OR)x100% (11, 12). The statistical significance was assumed at the level $p<0,05$.

RESULTS

The differences of selected factors concerning influenza vaccination in relation to gender, age, education and professional position were presented in Table II. Almost 19% of the sample was vaccinated in the previous season. It should be taken into account that among employees, who do not participate in the study, the percentage of vaccinated probably was lower, and also it is possible that none of them was vaccinated. Therefore, it seems reasonable to state that the percentage of influenza vaccinated employees of NIPH-NIH ranged 10%-19%. Significantly higher percentage of men and researchers was vaccinated, while lower percentage was found among respondents aged 24-30 and technicians.

The half of all employees were vaccinated against influenza at least one time in the previous 10 seasons. The significantly lower percentage of vaccinated was found among 24-39 years old participants.

Failure of influenza vaccination was caused mostly by lack of knowledge of the consequences of influenza infection and hence influenza complications, not only in terms of health, but also the financial implications. Respondents further pointed to immunization costs (repayment) and fear of side effects. They rarely declared belief in manipulation by pharmaceutical companies and lack of awareness about importance of influenza vaccination.

Almost 40% of participants would get vaccinated if the employer has provided influenza vaccines. This option was significantly less chosen by employees aged 24-39 years. Over 40% of respondents supported the introduction of free mandatory influenza vaccination among staff involving in population health. Although statistically significant differences did not found, nevertheless, it is worth nothing that this option was more often chosen by secondary or less educated persons and administrative staff, while compared to men, almost twice higher percentage of women was opposed to vaccination.

Also 40% of respondents encouraged their family and friends to influenza vaccination. The younger employees did it significantly rarely. Statistically significant differences in relation to gender, education and professional position were not found, nevertheless, it is worth nothing that relatively more women than men and administrative staff than other groups of employees urged their close persons to vaccine.

Considerably more of the participants never met with encouragement from family/occupational doctor to vaccine against influenza. The doctor encouraged to vaccination significantly more often men. The higher percentage of the elderly and administrative staff, and lower of technicians declared they were invited by doctor to vaccinate, but significance of this differences was slightly above the accepted level.

Majority of the employees was aware of complications from influenza. Significantly higher percentage (almost all) was found in researchers.

Every fourth of NIPH-NIH employees was absent due to respiratory infection one time, and every tenth more than one time in the last season. Unexpectedly, persons aged 24-39 years significantly more often suffered from respiratory infection, and the oldest group

Table II. NIPH-NIH employee opinions on influenza vaccination in relation to gender, age, education and professional position

Factors	All %	Gender		Age			Education		Professional position		
		M %	W %	24-39 %	40-59 %	>59 %	High %	Sec %	Res %	Tech %	Adm %
Vaccinated against influenza											
yes (n=35)	18,7	28,3	14,9	11,0	25,4	29,6	19,5	13,0	28,6	8,1	16,7
no (n=152)	81,3	71,7	85,3	89,0	74,6	70,4	80,0	87,0	71,4	91,9	83,3
p[1]		0,034			0,022		0,456			0,007	
Number of vaccination in the previous 10 seasons											
0 (n=90)	48,6	46,9	49,3	60,4	34,3	44,4	50,0	40,0	42,4	53,6	50,0
1-10 (n=95)	51,4	53,1	50,7	39,6	65,7	55,6	50,0	60,0	57,6	46,4	50,0
P[1]		0,780			0,004		0,352			0,418	
Reason for failure to vaccinate											
Inefficacy (n=35)	18,7	18,9	18,7	22,0	10,4	25,9	17,7	26,1	16,9	17,7	22,9
Side effects (n=14)	12,3	11,3	12,7	12,1	13,4	11,1	12,8	8,7	10,4	12,9	14,6
Financial reason (n=23)	14,4	3,8	17,2	13,2	19,4	0,0	11,6	26,1	6,5	17,7	18,8
Manipulation (n=11)	5,9	5,7	6,0	5,5	4,5	11,1	5,5	8,7	3,9	8,1	6,3
Lack of know (n=10)	5,3	5,7	5,2	7,7	3,0	3,7	5,5	4,3	7,8	4,8	2,1
Other (n=48)	25,7	26,4	25,4	27,5	25,4	18,5	26,8	17,4	26,0	29,0	20,8
P[1]		0,184			0,118		0,347			0,171	
Opinion on free vaccination provided by employer											
yes (n=81)	43,3	41,5	44,0	36,3	50,7	48,1	43,9	39,2	44,2	45,2	39,6
no (n=50)	26,7	24,5	27,6	25,3	22,4	40,7	26,2	30,4	22,1	25,8	35,4
no opinion (n=56)	29,9	34,0	28,4	38,5	26,9	11,1	29,9	30,4	33,7	29,0	25,0
p[1]		0,744			0,038		0,886			0,581	
Opinion on free mandatory influenza vaccination											
proponents (n=82)	43,9	45,3	43,3	42,9	44,8	48,2	42,6	52,2	39,0	43,5	52,1
opponents (n=51)	27,3	17,0	31,3	26,4	26,9	25,9	28,7	17,4	26,0	30,6	25,0
no opinion (n=54)	28,9	37,7	25,4	30,8	28,4	25,9	28,7	30,4	35,1	25,8	22,9
p[1]		0,085			0,987		0,503			0,497	
Encouraging close persons to vaccination											
yes (n=78)	41,7	34,0	44,8	29,7	56,7	44,4	41,5	43,5	44,2	48,4	29,2
no (n=142)	58,3	66,0	55,2	70,3	43,3	55,6	58,5	56,5	55,8	51,6	70,8
p[1]		0,176			0,002		0,854			0,109	
Encouragement by family/occupational doctor											
yes (n=45)	24,1	37,7	18,7	17,6	28,4	33,3	23,8	26,1	23,4	16,1	35,4
no (n=142)	75,9	62,3	81,3	82,4	71,6	66,7	76,2	73,9	76,6	83,9	64,2
p[1]		0,006			0,131		0,808			0,062	
Awareness of complications											
yes (n=162)	86,6	92,5	84,3	83,5	89,6	88,9	87,2	82,6	97,4	74,2	85,4
no (n=25)	13,4	7,5	15,7	16,5	10,4	11,1	12,8	17,4	2,6	25,8	14,6
p[1]		0,141			0,506		0,545			0,001	
Sickness absence during the last season due to respiratory infection											
newer (n=118)	63,1	71,7	59,7	53,7	64,2	88,9	64,0	56,5	66,2	61,3	60,4
1 time (n=49)	26,2	15,1	30,6	35,2	20,9	11,1	25,0	34,8	19,5	29,0	33,3
over 1 time (n=20)	10,7	13,2	9,7	11,1	14,9	0,0	11,0	8,7	14,3	9,7	6,3
p[1]		0,091			0,007		0,602			0,339	
Duration of the longest absence due to respiratory infection											
1-7 days (n=59)	90,8	90,4	92,3	95,0	82,6	100,0	89,1	95,0	89,5	90,0	93,8
over 7 days (n=6)	9,2	9,7	7,7	5,0	17,4	0,0	10,9	5,0	10,5	10,0	6,3
P[1]		0,830			0,236		0,272			0,891	
Fear of influenza infection – respondent											
yes (n=36)	19,3	18,9	19,4	16,5	22,4	22,2	17,7	30,4	14,3	25,8	18,8
no (n=60)	32,1	32,1	32,1	34,1	25,4	40,8	34,8	13,0	37,7	29,0	27,1
do not think (n=91)	48,7	49,1	48,5	39,4	52,2	37,0	47,6	56,5	48,1	45,2	54,2
p[1]		0,996			0,486		0,082			0,387	
Fear of influenza infection – close persons											
yes (n=71)	38,0	51,5	36,6	24,2	52,3	51,9	36,0	52,2	35,1	41,9	37,5
no (n=40)	21,4	20,8	21,6	26,4	13,4	22,2	23,2	8,7	26,0	17,7	18,8
do not think (n=76)	40,6	37,7	41,8	49,4	34,3	25,9	40,9	39,1	38,9	40,3	43,8
p[1]		0,814			0,002		0,184			0,754	

[1] chi-square test

rarely. Compared to men, the percentage of suffering women was higher, but this difference was insignificant.

Among those, who suffered from respiratory infection during the previous season, the majority were absent not longer than 7 days, and every tenth was ill more than one week. Any statistically significant difference was noted due to the small number of sufferers, nevertheless, it is worth noting that none of employees of the oldest group was absent more than 7 days.

One from fifth participants admitted to fear of influenza infection. Differences by gender, age, education and professional position were insignificant, nevertheless, it is worthy to note that the fear of infection was more prevalent among those having secondary or lower education and technicians, and less prevalent in the youngest group. Respondents more worried about the influenza infection by their close persons (twice higher percentage compared with the fear of their own illness). The younger employees significantly less frequently were concerned about infection of relatives. It should be also noted that relatively more men and secondary or lower educated employees declared fear about infection of close persons, but that differences were insignificant.

Vaccination against influenza at least one time in the previous ten seasons greatly increased (fifteen times) the likelihood of influenza vaccination in 2012/2013 (Table III). Nevertheless, it should be noted that the most persons (two-thirds), who were vaccinated against influenza at least one time in the previous ten seasons, were not vaccinated in 2012/2013.

Table III. Influence of NIZP-NIH employee vaccination in the previous 10 seasons on influenza vaccination in 2012/2013

	Vaccinated at least 1 time in the previous 10 seasons		Unvaccinated in the previous 10 seasons	
	n	%	n	%
Vaccinated in 2012/2013	31	33,7	3	3,2
Unvaccinated in 2012/2013	61	66,3	90	96,8
p[1]	>0,001			
OR = 15,3 (4,2-65,6)				

[1] chi-square test
OR – odds ratio

The associations between influenza vaccination and selected factors related to influenza were presented in Table IV. The statistically significant differences between vaccinated and unvaccinated were found in opinions of providing free vaccines by the employer, opinions regarding mandatory influenza vaccination among staff involving in population health, encouraging close persons to vaccinate against influenza and being encourage by family/occupational doctor to be vaccinated. Compare to unvaccinated, the percentage of those who were vaccinated was three times higher among proponents of free vaccination providing by employer, twice higher among proponents of free mandatory vaccination among staff involving in population health, over twice higher among persons encouraging their relatives to vaccinate and twice higher among those who were invited by family/occupational doctor to vaccinate. Slightly more vaccinated declared awareness of complications from influenza, but this difference was insignificant. Contrary to expectation, the significant difference between vaccinated and un-

Table IV. Determinants of NIHP-NIH employee vaccination against influenza in 2012/2013

Factors	Vaccination in the last season		
	Yes	No	p[1]
Opinion of free vaccination provided by employer			
yes (n=81)	91,4	32,2	
no (n=50)	0,0	32,9	>0,001
no opinion (n=56)	8,6	4,9	
Opinion on free mandatory vaccination			
proponents (n=82)	62,9	39,5	
opponents (n=51)	22,9	28,3	0,029
no opinion (n=54)	14,3	32,2	
Encouraging close persons to vaccination			
yes (n=78)	82,9	32,2	
no (n=142)	17,1	67,8	>0,001
Encouragement by family/occupational doctor			
yes (n=45)	40,0	20,4	
no (n=142)	60,0	79,6	0,014
Awareness of complications			
yes (n=71)	91,4	85,5	
no (n=25)	8,6	14,5	0,354
Sickness absence during the last season due to respiratory infection			
never (n=118)	71,4	61,2	
1 time (n=49)	17,1	28,3	0,397
over 1 time (n=20)	11,4	10,5	
Duration of the longest absence due to respiratory infection			
1-7 days (n=59)	100,0	89,5	
over 7 days (n=6)	0,0	10,5	0,439
Fear of influenza infection – respondent			
yes (n=36)	17,1	19,7	
no (n=60)	42,9	29,6	0,313
do not think (n=91)	40,0	50,7	
Fear of influenza infection – close persons			
yes (n=71)	48,6	35,5	
no (n=40)	22,9	21,1	0,239
do not think (n=76)	28,6	43,4	

[1] chi-square test

Table V. Assessment of influenza vaccination effectiveness of NIPH-NIZ employees

Sickness absence in the last season due to respiratory infection	Vaccinated (n=35) %	Unvaccinated (n=152) %	p[1]	OR (95%CI)	Effectiveness (1-OR)x100% (95%CI)
Do not became ill (n=118)	71,4	61,2	0,257	0,63	37%
Became ill (n=69)	28,6	38,8		(0,26 – 1,51)	(-51% – 74%)

[1] chi-square test
OR – odds ratio

vaccinated regarding frequency of sickness absence due to respiratory infection was not found. It should be noted, however, that vaccinated participants less often remained one time on sick leave for this reason in the last year. The percentages of those suffering more than one time were nearly identical. The difference was also statistically insignificant in length of sickness absence due to respiratory infection, nevertheless, it is worth to noting that none of vaccinated was ill longer than 7 days, while in unvaccinated it was 10%. The fear of his/her own illness, as well as fear of getting sick by close persons did not significantly differentiate the both groups, nevertheless, it should be noted that relatively more vaccinated worried about influenza infection of their close persons.

The estimation of influenza vaccine effectiveness in decreasing the sickness absence due to respiratory infection was presented in Table V. The estimated effectiveness amounted almost 40%. It suggested that vaccinating against influenza all employees could reduce sickness absence due to respiratory infection by nearly 40%. Our analysis, however, should be taken with caution. The small sample and the small number of vaccinated employees made accurate estimation of effectiveness impossible. The confidence interval of effectiveness at 95% indicates that it is probable that vaccination against influenza may have no impact on absenteeism due to respiratory infection. Nevertheless, it should be noted that effectiveness indicators are also considered if they did not show statistical significance, e.g. in I-MOVE reports (9, 11) or as a part of meta-analysis for calculating the pooled effectiveness (17).

DISCUSSION

Our finding showed that approximately 10%-19% employees of NIPH-HIH vaccinated against influenza in 2012/2013 season. Compared to all health care workers in Poland, it is three times higher percentage (18). The review of existing research regarding influenza vaccination coverage among various groups of health care workers indicate that 9%-92% of them were vaccinated against seasonal influenza, and coverage is higher in United States and Canada than in European countries (19). In European Union from 6% (Poland) to 54% (Romania) of health care workers were vaccinated against seasonal influenza 2011/2012 (5), while against pandemic influenza 2009/2010 the coverage was from 3% (Slovakia) to 68% (Hungary) (6).

Preventing influenza infection requires seasonal vaccination due to the high variability of influenza virus (14). The prospective studies found that previous influenza vaccination increases four times the likelihood of vaccination in the next season, and eight times the will to be vaccinated (20). Also our investigations confirm the high probability of influenza vaccination in the next season created by vaccination in the last seasons. Simultaneously, we found that the most of persons vaccinated in the last ten seasons did not decide to be vaccinated in 2012/2013. This is consistent with the general trend of decline of influenza vaccination coverage in Poland in the recent years.

Premature and al., reviewing 27 methodologically reliable studies, established the list of reasons to vaccinate or vaccination failure against the pandemic influenza 2009/2010 by health care workers of various specialisations. The main reasons for vaccination failure were belief that the vaccines are not safety and cause side effects, they are being developed in a great haste, and are inefficacious and ineffective. The perceived benefits of vaccination against pandemic influenza resulted from belief of self-protection and protection of close persons and patients, fear of influenza infection, the earlier immunization against seasonal influenza, and perceived severity of pandemic influenza infection (19). In our research an inefficacy of vaccination, high costs and side effects of vaccines, followed by believing in manipulation of pharmaceutical companies and lack of awareness of influenza severity were most frequently declared causes of failure to vaccinate.

The WHO places special emphasis to involve the primary health care physicians in campaigns to promote influenza vaccination (21). In Poland, the National Reference Centre for Influenza jointly with the Polish Society of Family Physicians sent in the previous seasons information about importance of influenza vaccination and appeal for physician responsibility for motivating patients to vaccinate (14). Our investigations found that those, who were encouraged by family/occupational doctor, more often decided to be vaccinated. However, only one from four of physician motivated patients to influenza vaccination. It can be assumed that percentage of vaccinated employees of NIPH-NIH would be

higher if physicians encourage patients to vaccination. It should be added that influenza vaccination by physicians themselves increase over eight times the likelihood of recommending vaccination for their patients (22).

Poland is one of the few countries of the European Union, in which the costs of vaccines as well as vaccination administrating for children over 6 month, sufferers from chronic diseases, pregnant women and health care workers were not reimbursed from public funds (5). However, as regards people aged 65 years or over, the costs of influenza vaccination are fund by some local governments, the remaining people themselves bear the costs of vaccination. Although, these costs are not high (20-30 zl i.e. about 5-8 euro) (14), nevertheless, they can be a barrier to vaccination (almost 15% of unvaccinated pointed this reason). The proportion of vaccinated NIPH-NIH employees could be more than double, if employer would provide free vaccinations. A similar proportion of respondents would accept mandatory free influenza vaccination of health care workers of the population health. The high costs of vaccination have been mentioned as one of the main reason for failure to vaccinate against influenza in those countries where vaccination were not reimbursed, e.g. China, USA (23).

The fear of influenza infection is one of the reasons for immunisation (24). It would be expected that those vaccinated would suffer less fear of becoming ill. Our study only partially confirmed this relationship. People who were vaccinated against influenza were more likely to encourage their close persons to be vaccinated, and to a greater extend they were concerned that their relatives get influenza, although this last relationship has not been clearly demonstrated in our study.

The previous studies on effectiveness of influenza vaccination yielded mixed results. The analysis of effectiveness of trivalent vaccines against seasonal influenza made on the basis of 37 studies conducted over 24 years found the effectiveness ranged from 16% to 76%, and the pooled effectiveness was 59% (25). The effectiveness of monovalent vaccines against pandemic influenza 2009/2010 calculated by the different authors ranged between 69%-86% (17, 25). In the European Union countries the effectiveness of influenza vaccination monitoring by I-MOVE network on the basis of the data from the national epidemiological and virological SENTINEL surveillance systems amounted in general population in the seasons: 2008/2009 – 59% (8), 2009/2010 – 9% (seasonal influenza) and 72% (pandemic influenza) (9), 2010/2011 – 52% (10), 2011/2012 – 43% (11), 2012/2013 – 62% (12). The effectiveness of influenza vaccination estimated in our research would be assessed as moderate. Nevertheless, the effectiveness was estimated on the basis of crude odds ratio without considering comorbid factors (age, health status, cigarette smoking). Moreover, the individuals who suffered from respiratory infection were not subjected to testing for the presence of influenza viruses, therefore effectiveness calculating by us may be underestimated. The analysis of effectiveness of influenza vaccination of NIPH-NIH employees, in general, confirmed the undoubtedly benefits of vaccination in individual (illness prevention), as well as for employer (reducing sickness absence).

RECAPITULATION AND CONCLUSIONS

1. Our findings confirmed unfavourable situation in influenza vaccination among health workers. It may be one of the causes of low coverage in general population and risk groups.
2. The research indicates that low percentage of family/occupational doctors encourage their patients to vaccinate, despite physicians were included to campaign to promote influenza vaccination among patients.
3. Persons who have not made vaccination, point to financial problem (repayment) as the main reason of failure to vaccinate. It has no real justification, because the costs of treatment of influenza and its complications are much higher than the cost of immunization. Therefore, it should be taken into considerations that providing free vaccination against influenza by employer could considerably increase the coverage.
4. Our findings confirmed that influenza vaccination contributes to considerable decreasing of sickness absence due to respiratory infection. In view of low sample and low number of vaccinated, the error of estimated effectiveness should be taken into account.

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