

Determinants of the decision to be vaccinated against COVID-19 as exemplified by employees of a long-term health care centre

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ABSTRACT

Introduction Health care professionals cover the front line in the battle against infectious diseases. Vaccination of healthcare workers represents a vital element of the strategy for enhancing epidemic safety and improving the quality of health care, inter alia, by limiting microorganism transmission, and reducing patient morbidity and mortality.

Method The study group consisted of all employees of the long-term health care centre in Lublin, Poland. Participants were requested to complete a questionnaire prepared for the purpose of the study, along with a mandatory COVID-19 vaccination interview questionnaire.

Results The vaccination coverage rate for the group of medical workers was 77.3% and of non-medical 86%. The most frequently indicated sources of information on vaccination were the mass media. Males more often than females used the press as a source of information on vaccination. Scientific articles were the most common source of information for both people with higher education and medical professionals. The most common motive for vaccination for females is concern for the health of one's family, and for HCWs and people with at least secondary education-concern for the health of patients.

Conclusion At least one assessed factor influences the decision to be vaccinated. The mass media are of the greatest importance in obtaining information about vaccination.

Keywords mental health, migration, behavior

Introduction

Vaccinations are one of the most prominent achievements in medicine. Understanding the principles behind it has permitted the development of vaccines and control of infectious diseases.¹ Vaccinations have enabled eradication, reduction of incidence and reduction of infectious disease mortality.²

Health care professionals comprise the front line in the battle against infectious diseases, although depending on the health care sector, exposure to direct contact with the pathogen varies. Undoubtedly, the risk of infection is high in the wake of the ongoing COVID-19 pandemic, also due to the susceptibility of the SARS-CoV-2 coronavirus to mutations and the rapid spread of its various genetic variants.³ Hence, vaccination of healthcare workers (HCWs) represents a vital element of the strategy for enhancing epidemic safety and

bettering the quality of health care, inter alia, by limiting microorganism transmission, and reducing patient morbidity and mortality.⁴ This holds particularly true for long-term care units, as the elderly are at a higher risk of infection and related complications compared to other age groups.⁵ The protection of health workers plays a vital role in combating the pandemic. In Poland, this strategy was reflected in the COVID-19 National Vaccination Programme.⁶

The point of reference for the authors of this study is data on the vaccination of medical personnel against the flu. There is a high likelihood that healthcare professionals will be

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recommended annual COVID-19 vaccinations, similar to the case of influenza (voluntary vaccination in most countries).⁷ Despite certain limitations, vaccinations are important for both employees and health care unit managers and patients.⁸ It is presumed that the vaccination coverage rate (VCR) for protecting patients is around 90% for the flu virus. Depending on the source, it is indicated that the global immunization rate of medical workers ranges from 2–44% to 60%, in Europe is below 40%.⁹ A literature review (PubMed search engine) published between January 2000 and June 2020 (of the 177 articles, 37 original papers and 13 reviews from Europe, Asia, Australia, and North America were finally analyzed) indicated that the average VCR covering 20 years of analysis for the 17 countries, which had provided data for at least one influenza season is 26.9%.¹⁰ The location where health services are provided may affect influenza vaccination. It has been shown that employees of units providing outpatient health services get vaccinated more often than hospital staff.¹¹

VCR diversification among health care professionals is a universal problem. Studies confirm a statistically significant correlation between VCR and medical profession: positive for medical personnel and negative for nurses.¹² The VCR against influenza among doctors in European countries is: 22.3–72%; Asian countries: 6.9–86.9% and North American countries: 13–93.3%, and among nurses, respectively: 10.6–45%; 13–93.3%, and 1.3–93.3%.¹⁰ The lower level of knowledge and VCR also applies to representatives of other medical professions.¹³ Contrary to Europe, in the USA, the percentage of HCW immunization is systematically increasing.¹⁴ This situation is primarily due to the introduction of the possibility for employers to enforce the flu vaccination requirement.¹⁵

There is ample evidence for a positive correlation between vaccination of staff and health safety, including mortality in long-term care recipients. In the USA, VCR among long-term care workers was 67.4%, in France 20%,¹⁶ while in Belgium 45.3%.¹⁷

The aim of the work was to determine the VCR among employees of a long-term care unit with a psychiatric profile and to analyze the motives and factors influencing the decision to be vaccinated against COVID-19.

Material and methods

Participation in the study was anonymous and voluntary. The study group consisted of all employees of the Psychiatric Health Care Centre in Celejów (long-term health care centre in east Poland) employed at the unit in the period 25 October 2020–14 February 2021. Each participant was asked to com-

plete a questionnaire created for the purpose of the study, along with a mandatory COVID-19 vaccination interview questionnaire, which included preliminary and health-related questions. Questions included: having a positive genetic or antigen test for SARS-CoV-2 in the past 3 months; contact or residence in the past 14 days with a person who has tested positive for the SARS-CoV-2 virus genetic or antigen test or has had symptoms of COVID-19 during that time; in the last 14 days of: increased body temperature, fever, cough or increased chronic cough due to a recognized chronic disease, loss of smell or taste; having received any vaccinations in the last 14 days and having had a cold, or diarrhoea or vomiting. Questions concerned: well-being on the day of vaccination; a severe adverse reaction after vaccination and allergy to polyethylene glycol, polysorbate or other substances contained in the vaccine, anaphylactic shock after administration of medicine, food or insect bites; current exacerbation of a chronic disease, taking medications: suppressing immunity, anti-cancer or biological medications for the treatment of arthritis, inflammatory bowel disease or psoriasis; being treated for haemophilia or other serious bleeding disorders; diagnosis of heparin-induced thrombocytopenia or cerebral vein thrombosis. The women were additionally asked to answer questions about pregnancy and breastfeeding. The questionnaire created for the purpose of the study contained questions about sociodemographic data (age, sex, place of residence, education, occupation) and the source of information concerning vaccination against COVID-19 and the reasons for vaccination against COVID-19. The respondent could indicate any number of reasons that allowed him to decide about vaccination. Initially, just after the registration of the first COVID-19 vaccine preparations (October 2020),¹⁸ 15 (8%) people declared that they would be ready to apply primary prevention against the SARS-CoV-2. Educational and informational activities undertaken by the management staff and nursing staff with epidemiological specialization resulted in 174 (92%) employees of the unit willing to be vaccinated on the day of starting vaccinations.

Study group characteristics

Ultimately, 150 out of 189 (79.4%) employees were vaccinated: 115 females (76.7%) and 35 males (23.3%). The competent physician to perform qualification for vaccination postponed the administration of the first dose of COVID-19 vaccination in some volunteers for various reasons, e.g., condition after viral or bacterial infection, pregnancy. Some employees (2 doctors, 1 psychologist) got vaccinated in other health care units. Among the vaccinated personnel: 4 (2.7%) people were aged below 30, 15 (10.2%) people were

Table 1 Analysis of sources of information influencing the decision to vaccinate against COVID-19

Source of information on COVID-19 vaccination		Scientific article	Internet	Doctor	Nursing staff	Press	Family	TV	Collaborator	Total
Answers	<i>N</i>	28	41	50	36	26	4	66	15	266
	%	10.5	15.4	18.8	13.5	9.8	1.5	24.8	5.6	100

aged 31–40; 79 (53.7%) were aged 41–50, 33 (22.5%) were aged 51–60 and 16 (10.9%) were aged at least 61.33 (22.4%) respondents were city residents, and the remaining 114 (77.6%) were rural residents. Higher education was held by 44 (29.9%) people, secondary by 62 (42.2%) people and vocational by 41 (27.9%) people.

For the purposes of the analysis, the research problems of the project participants were divided into two groups depending on profession. The first group was medical profession: doctors, nursing staff, psychologists, physiotherapists, occupational therapists, medical caregivers and auxiliary staff (orderlies), and the second group consisted of administration workers and maintenance staff, including kitchen and laundry staff.

Statistical analysis

The statistical analysis of results was performed in Statistica 13.3. The analysis made use test Chi-2 test to check for a statistically significant relationship between nominal (dependent) and ordinal (independent) variables. The tables illustrate: *N*—quantities, %—percentages, Chi-2—statistics of the Chi-2 test and the key value of '*P*'. If $P < 0.05$, then the relationship is statistically significant (*), and if $P < 0.01$, then the relationship is highly statistically significant (**).

Results

The VCR for the group of medical versus non-medical workers was 77.3% versus 86%. In individual professional groups of medical personnel, the VCR amounted to 91% of physicians; nursing staff—81% (38 vaccinated people out of 47 employees); medical caregivers—94% (16 vaccinated people out of 17 employees); support staff (clerks)—93% (38 vaccinated people out of 41 employees); 100% psychologists (4 employees); occupational therapists—71% (5 people vaccinated out of 7 employees); physiotherapists—33% (1 person vaccinated per every 3 employed); business workers—81% (26 vaccinated people out of 32 employees) and adminis-

tration employees—92% (23 vaccinated people out of 25 employees).

When asked about the sources of information on vaccination against COVID-19 that helped them to decide whether to be vaccinated, respondents most often indicated more than one source (Table 1): 26 (17.7%) people provided two sources, 22 (15%) people—three, 8 (5.4%) people—four, 5 (3.4%) people—five sources.

The most frequently indicated sources of information on vaccination were mass media (81.2%): TV broadcast (45.5%), internet (15.4%), a scientific article (10.5%) and the press (9.8%). Other sources were messages from doctor (18.8%), colleague (5.6%) and family (1.5%).

Men (30.3%) used the press as a source of information on vaccination against COVID-19 significantly more often (Chi-2 = 4.024; $P = 0.045^*$) compared to the female population (14.4%). There were no statistically significant differences between age groups or place of residence in terms of sources of information on vaccinations against COVID-19. Compared to people with vocational education, those with at least secondary education indicated the Internet much more often as a source of information about vaccination. Scientific articles were the most common source of information for people with higher education (37.8%) compared to people with secondary (13.6%) or vocational (7.7%) education, as in the case of medical professionals (29.2%) compared to non-medical workers (9.2%) (Chi-2 = 9.516, $P = 0.002^{**}$) (Table 2b). Additionally, compared to non-medical workers (16.9%), medical professionals (37.5%) indicated the Internet as a source of information on vaccines significantly more often (Chi-2 = 8.287, $P = 0.004^{**}$) (Table 2).

For the greatest number of people, the reason for getting vaccinated against COVID-19 was fear for one's own health (36.2%) or one's family's health (34.3%). Almost every fifth person was guided by the patient's welfare (18.1%), every tenth person was vaccinated due to the recommendation of their superior (10.6%), and two people felt pressure from their colleagues (0.8%) (Table 3).

Significantly more often (Chi-2 = 3.911, $P = 0.048^*$) in the case of women (62.3%) than men (44.1%), the reason

Table 2 Analysis of the relationship between socio-demographic variables (sex, age, place of residence) of the study group and sources of information influencing the decision to vaccinate against COVID-19

Source of information on vaccination against COVID-19		Scientific Article	Internet	Doctor	Nursing Staff	Press	TV broadcast	Collaborator	
Sex	Female	<i>N</i>	24	35	40	30	16	48	13
		%	21.6	31.5	36.0	27.0	14.4	43.2	11.7
	Men	<i>N</i>	4	6	10	6	10	17	2
		%	12.1	18.2	30.3	18.2	30.3	51.5	6.1
Test Chi-2		Chi-2	1.575	2.387	0.466	1.177	4.024	0.510	0.932
		<i>P</i>	0.209	0.122	0.495	0.278	0.045*	0.475	0.334
V Cramera						0.164			
Age	≤40 years	<i>N</i>	2	6	8	7	4	8	4
		%	10.5	31.6	42.1	36.8	21.1	42.1	21.1
	41–50 years	<i>N</i>	17	23	24	19	13	31	8
		%	23.0	31.1	32.4	25.7	17.6	41.9	10.8
	>50 years	<i>N</i>	8	10	18	8	6	23	3
		%	17.0	21.3	38.3	17.0	12.8	48.9	6.4
Test Chi-2		Chi-2	1.517	1.531	1.075	3.333	0.906	0.639	3.311
		<i>P</i>	0.468	0.465	0.584	0.189	0.636	0.727	0.191
Place of residence	City	<i>N</i>	10	11	14	5	9	13	3
		%	30.3	33.3	42.4	15.2	27.3	39.4	9.1
	Village	<i>N</i>	17	26	34	26	14	45	11
		%	17.0	26.0	34.0	26.0	14.0	45.0	11.0
Test Chi-2		Chi-2	3.084	0.882	1.042	1.388	3.421	0.154	0.060
		<i>P</i>	0.079	0.348	0.307	0.239	0.064	0.695	0.806
Education	Vocational	<i>N</i>	3	4	8	12	5	18	5
		%	7.7	10.3	20.5	30.8	12.8	46.2	12.8
	Secondary	<i>N</i>	8	19	23	17	10	30	4
		%	13.6	32.2	39.0	28.8	16.9	50.8	6.8
	Higher	<i>N</i>	17	17	19	5	11	18	6
		%	37.8	37.8	42.2	11.1	24.4	40.0	13.3
Test Chi-2		Chi-2	15.773	9.611	5.830	5.037	2.500	0.792	1.582
		<i>P</i>	<0.001**	0.008*	0.054	0.081	0.287	0.673	0.453
V Cramera			0.325	0.254					
Profession	Medical	<i>N</i>	21	27	26	21	16	31	6
		%	29.2	37.5	36.1	29.2	22.2	43.1	8.3
	Non-medical	<i>N</i>	6	11	23	13	10	33	8
		%	9.2	16.9	35.4	20.0	15.4	50.8	12.3
Test Chi-2		Chi-2	9.516	8.287	0.121	2.050	1.399	0.316	0.417
		<i>P</i>	0.002*	0.004*	0.728	0.152	0.237	0.574	0.519
V Cramera			0.258	0.241					

* $P < 0.05$ then the relationship is statistically significant

** $P < 0.01$ then the relationship is highly statistically significant

for vaccinating against COVID-19 was concern for the health of one's family. Age and place of residence were not found to influence reasons for vaccinating against COVID-19. Compared to people with vocational education (11.9%), people with higher education (36.4%) and secondary education (39.3%) much more often (Chi-2 = 9.411,

$P = 0.009^{**}$) indicated concerns for the health of patients as a factor determining the decisions to be vaccinated. The group of medical personnel (43.1%), as opposed to the remaining personnel (18.8%), much more often (Chi-2 = 9.578, $P = 0.002^{**}$) indicated concern for patients' health as the reason for vaccinating against COVID-19 (Table 4).

Table 3 Analysis of reasons influencing the decision to vaccinate against COVID-19

Reason to be vaccinated against COVID-19		Health score			Recommendations from your supervisor	Co-worker pressure	Total
		Own	Family	Patients			
Answers	N	92	87	46	27	2	254
	%	36.2	34.3	18.1	10.6	0.8	100

Table 4. Analysis of the relationship between socio-demographic variables (education, occupation) in the study group and the motives behind the decision is to be vaccinated against COVID-19.

Discussion

The decision to be vaccinated is influenced by: confidence (in the effectiveness of the vaccine, security and necessity, and in the system that provides it), complacency (perceiving the disease as low risk), limitations (psychological and related to the availability or affordability of the vaccine), calculation (commitment to information search) and a sense of collective responsibility (willingness to be vaccinated to protect others by creating herd immunity).¹⁹

The discussion referred to data on influenza vaccination due to the restricted amount of literature data regarding the motivation and correlation between individual characteristics of HCWs and VCR against the SARS-CoV-2. Our results confirm that the fundamental motives for vaccination against COVID-19 in the HCWs group are universal and include the desire to protect oneself and one's family. The most common factor motivating medical personnel to be vaccinated is willingness to protect oneself (in Greek—75.9%, Israeli and German—92.5%) and one's family (Greek—63.5%), less often the desire to protect patients (in Greek—46.7%; German—54.7%). In the USA (2009/2010 season), the VCR among medical workers was 93.8% and non-medical workers—83%. The willingness to protect oneself or one's family/friends or patients was declared by: 83.5, 72.9 and 78.3% of HCWs, and 88.1, 71.3 and 55% of non-medical workers. Individual characteristics that correlated positively with the level of influenza vaccination among HCWs identified in quantitative studies include: age between 40 and 55, male gender, medical profession, a higher level of knowledge about pathogen, belief in vaccine effectiveness, belief in the importance of vaccination, prior influenza vaccination and longer work experience.^{10,20} According to another study, 66% of nurses consider influenza vaccination as an ethical duty. The most frequent factors

motivating nursing staff to be vaccinated against influenza are as follows: fear of disease and post-infection complications (97%), and free workplace vaccinations (87%).¹¹ According to 72.8% of the respondents, the elderly should be vaccinated as medical recommendation (78.7%) and other reasons included the desire to prevent infection (74.7%), protect others (62.2%), stay fit for longer (58.3%) or reduce the risk of complications (55.3%). Motivating vaccination factors include doctor (71.4%), concern for health (39.8%) and suggestions from one's family (31.6%).²¹

Fear of adverse effects of vaccinations is a major barrier reported by HCWs, although in the case of influenza vaccination, a review of the Cochrane literature did not provide evidence of an association between this vaccination and serious adverse events in healthy adults.²² Other barriers to vaccination are lack of time, misconceptions about vaccination, doubts about vaccine effectiveness, a belief that there is no risk associated with the pathogen against which the vaccination is aimed (no need for vaccination), fear of injection or organizational issues (e.g., availability of vaccines, payment). The demotivating factors most often include: payment for vaccination (75%), lack of conviction about vaccine effectiveness (54%),¹¹ lack of knowledge (69.5%) and lack of interest in vaccination (67.8%).²¹ Learning about the barriers or reasons for abandoning vaccination against a highly infectious disease, including against COVID-19, requires more in-depth research. The literature indicates that a part (38%) of HCWs refuse immunization, even if they are responsible for organizing and carrying out universal immunization themselves (81% of paediatricians and 19% of family medicine physicians).²³ In Mexico, however, 5.5% (30 people) of HCWs would not consent to vaccination due to misinformation regarding vaccination against COVID-19.²⁴ In a Greek study on 461 HCWs (mean age \pm SD: 44.2 \pm 10.78 years; 74% of the respondents were females), 43% declared their willingness to be vaccinated against SARS-CoV-2, including 47.5% of nurses, 30.5% of doctors and 19% of paramedics (19%).²⁵

Social media are particularly popular, and unlike traditional media, they enable the quick creation and wide spread of

Table 4 Analysis of the relationship between socio-demographic variables (gender, age, place of residence, education, occupation) of the study group and motives for the decision to vaccinate against COVID-19

Reason to be vaccinated against COVID-19			Health score			Recommendations from your supervisor
			Own	Family	Patients	
Sex	Female	<i>N</i>	72	71	36	23
		%		62.3	31.6	20.2
	Men	<i>N</i>	19	15	10	4
		%	55.9	44.1	29.4	11.8
Test Chi-2		Chi-2	0.779	3.911	0.094	1.336
		<i>P</i>	0.377	0.048*	0.759	0.248
V Cramera				0.161		
Age	≤40 years	<i>N</i>	8	11	6	3
		%	42.1	57.9	31.6	15.8
	41–50 years	<i>N</i>	50	46	21	13
		%	64.9	59.7	27.3	16.9
	>50 years	<i>N</i>	32	28	18	9
		%	66.7	58.3	37.5	18.8
Test Chi-2		Chi-2	3.545	0.042	1.365	0.089
		<i>P</i>	0.170	0.979	0.505	0.957
Place of residence	city	<i>N</i>	19	20	12	6
		%	57.6	60.6	36.4	18.2
	Village	<i>N</i>	62	57	30	18
		%	60.8	55.9	29.4	17.6
Test Chi-2		Chi-2	0.043	0.342	0.666	0.013
		<i>P</i>	0.835	0.559	0.414	0.908
Education	Vocational	<i>N</i>	29	19	5	23
		%		45.2	11.9	8
	Secondary	<i>N</i>	34	38	24	19
		%	55.7	62.3	39.3	12
	Higher	<i>N</i>	28	28	16	19.7
		%	63.6	63.6	36.4	7
Test Chi-2		Chi-2	2.162	3.338	9.411	15.9
		<i>P</i>	0.339	0.188	0.009**	0.288
V Cramera						0.251
Profession	Medical	<i>N</i>	45	45	31	
		%	62.5	62.5	43.1	45
	Non-medical	<i>N</i>	43	36	13	62.5
		%	62.3	52.2	18.8	43
Test Chi-2		Chi-2	0.001	1.518	9.578	62.3
		<i>P</i>	0.979	0.218	0.002**	0.001**
V Cramera				0.259		0.979

* $P < 0.05$ then the relationship is statistically significant

** $P < 0.01$ then the relationship is highly statistically significant

unreliable content, without any substantive supervision. Disseminating false information about immunization has had a major impact on VCRs²⁶ and is challenge for public health.²⁷ Fear of the effects of vaccinations, medical contraindications or missed vaccination dates are the main reasons for not getting vaccinated.²⁸

Limitations of our study is the small (147) number of respondents including individual professional groups subject to analysis and a disproportion of the study groups in terms of gender, and the limited area of the study. The main limitation of this study is its single institutional nature, since employees of only one long-term health care centre were

tested. The authors' experience gained from this study will form the basis for planned future studies with further long-term health care centres including also social welfare homes. Another limitation of the study was the self-assessment questionnaire. Although it can be an inexpensive, practical, fast, scalable, comparable, easy to analyse, standardized way of obtaining confidential data, it can also be associated with dishonest, incomplete answers with interpretation and analysis issues, lack of personalization, response inconsistency and survey fatigue.

Conclusions

1. Vaccination coverage rate for medical workers was 77.3% and non-medical ones 86%.
2. The most common motive for vaccination against COVID-19 for females is concern for the health of one's family, and for HCWs and people with at least secondary education—concern for the health of patients.
3. At least one factor influences the decision to be vaccinated against COVID-19. The mass media, including television, are of the greatest importance in obtaining information about vaccination against COVID-19. Moreover, it is internet for HCWs, scientific articles for HCWs and people with higher education, and the press for males.
4. Due to the limitations of the study (a relatively small number of individual professional groups subject to analysis and a disproportion of the study groups in terms of gender), further research is needed.

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