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Fear of COVID-19 among employees of large companies and vaccination against COVID-19 - a cross-sectional study (Silesia, Poland)

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Abstract

Introduction and Objective. The COVID-19 pandemic has significantly affected the functioning of the entire globe. By the end of December 2020, the disease had been diagnosed in more than 82 million people worldwide, and nearly 2 million people had died. The main preventive measure was to develop an effective vaccine as soon as possible, which Pfizer/BioNTech, Moderna, AstraZeneca and Gamaleya Center managed to do in late 2020. The first vaccines arrived in Poland after the end of December 2020, but their appearance was not without controversy. The aim of this study was to compare respondents' opinions on COVID-19 vaccination with the results of the assessment of fear of infection. **Material and methods.** The opinions of 300 employees of large companies on COVID-19 vaccination and fear of SARS-CoV-2 (FCV-19S) infection according to Ahorsu were checked. **Results.** It was shown that 54% of the respondents express a willingness to vaccinate whenever possible, while 42% are not interested in vaccinating. In favor of the willingness to vaccinate is the option to return to the standard of living before the COVID-19 pandemic - 72%, and the desire to protect those around them from possible infection - 46%. Among opponents of vaccination, the predominant opinion is that the vaccine has not undergone enough testing and is not safe for health - 68%. **Discussion.** COVID-19 vaccination is one of the major medical successes of recent years and a safe way to prevent SARS-CoV-2 infection. It is worrying that those who opt out of vaccination indicate that they do not have enough information about vaccination (44%), and this is an issue that needs to be changed quickly. **Conclusions.** Those who express a willingness to vaccinate are more likely to have a higher level of fear of SARS-CoV-2 infection than those who have not expressed a willingness to vaccinate. Nearly half of non-vaccinators indicate that there is too little information about vaccination.

Keywords: COVID-19; SARS-CoV-2; immunization; prevention; fear of infection.

1. Introduction

For many years, coronavirus infections were considered harmless, and were associated with mild respiratory symptoms, mainly of the upper respiratory tract [1]. Today, with the emergence of highly infectious strains that pose a real threat to the elderly, immunocompromised patients and chronic diseases, this view has changed [1]. SARS-CoV-2-related infections, which initially occurred only in China, quickly spread to other countries, eventually occurring on all continents. The rapid development of the disease led the World Health Organization to declare COVID-19 a pandemic on March 11, 2020 [2]. By the end of December 2020, COVID-19 had been diagnosed in more than 82 million people worldwide, nearly 2 million people had died, and the worldwide mortality rate is set at 2.5% [3]. SARS-CoV-2 is a pathogen belonging to the coronaviridae family, and is an enveloped virus made up of a single strand of RNA [4]. It is a completely new strain that has not been identified in humans to date [1]. Infection with this type of virus can be mild, with low severity of symptoms, or severe. In some cases, SARS-CoV-2 can lead to severe respiratory failure, resulting in multiple organ failure with possible fatal descent [5]. In a report published by the Chinese Center for Disease Control and Prevention [6], the overall mortality rate for COVID-19 is 2.3%, but in patients aged 70-79 years, it is 8% [7]. The overall mortality rate in Italy is 7.2%, where patients over the age of 70 account for as many as 37.6% of all cases [8]. According to data from the Ministry of Health, from the beginning of the pandemic in March 2020 to the end of June 2022, infection with the coronavirus causing COVID-19 was confirmed in 15.95% of the population of Poland. more than 6 million people became ill, 116,422 thousand people died, which means a mortality rate of 0.019%. The highest mortality rate is observed in the age group of people older than 60 years with post-morbidity [3]. The changes in life brought about by sanitary restrictions, fear of infection and widespread public disinformation have also had a marked impact on the mental health of citizens in many countries [9].

Since the beginning of the pandemic, the main activity that many countries have focused on has been the development of an effective vaccine against COVID-19. In the second half of 2020, news circulated the world that an effective vaccine for the disease caused by SARS-CoV-2 had been developed [10]. Pfizer/BioNTech [11], Moderna [12] and AstraZeneca [13], as well as the Sputnik V formulation produced in Russia [14], released their vaccines. Thus announcing that these formulations have more than 90 percent efficacy [15]. At the end of December 2020, the first doses of Pfizer/BioNTech's Comirnaty vaccine arrived in Poland, which will be administered in accordance with the state-approved vaccination program [10].

Modern genetic sequencing techniques combined with epidemiological data are allowing real-time knowledge of new SARS-CoV-2 variants and their biology. The new variants, first detected in the UK, South America, Brazil and the Republic of India, are more infectious than the original strain due to mutations that have modified the interaction of the virus' spike proteins with ACE2 receptors on human cells and are spreading in many countries (including Poland). Other mutations reduce the neutralizing activity of anti-SARS-CoV-2 antibodies, which can reduce the effectiveness of vaccines. All current COVID-19 vaccines based on mRNA technologies, adenoviral vectors, recombinant proteins or inactivated viruses can protect us from hospitalization or death. Vaccination on a global scale can prevent further selection of viruses that "escape" the immune response [16]. The development of the vaccine and its release on the market was not without controversy, with Poles divided into two camps - those who want to be vaccinated and those who oppose vaccination. The total number of vaccine doses used in Poland since the beginning of the coronavirus epidemic is 54600779. The number of vaccinations performed in the country on June 30, 2022 is exactly 2868. The percentage of vaccinations performed for every 100 inhabitants of the country in Poland is currently 142.36. The number of people vaccinated with at least one dose of Covid-19 vaccine since the beginning of the pandemic is 22735503. The number of people who received both doses or vaccinated with the single-dose Johnson&Johnson formulation is 19703066. This means that the percentage of those vaccinated with at least one dose of Coronavirus vaccine is 59.28% in Poland. The fully vaccinated account for 51.37% of the total population. As reported by the Ministry of Health, the number of doses of vaccine delivered to Poland is 107707090. The total number of doses distributed to vaccination points was 55974230 [16]. Despite this, one in three Poles (32%) between the ages of 18 and 65 admit that they do not intend to be vaccinated against COVID-19. As many as 27% of respondents declare that nothing will convince them to change their minds, while 5% allow some arguments that could convince them to change their decision [17]. The situation is also not helped by the growing camp of so-called "anti-vaccinationists," who provide misleading information in the media and report on the harms associated with vaccination [18]. The aim of this study was to compare respondents' opinions on COVID-19 vaccination with the results of an assessment of fear of infection based on the FCV-19S scale.

2. Materials and Methods

Study area

The survey included 300 employees of large companies who are not professionally related to health care. Data was collected among Polish respondents using an electronic survey module.

Characteristics of the study group

The survey included 300 respondents, the average age of respondents was 38±6 years. Nearly 60% of the respondents were women. All respondents resided in cities with more than 10,000 residents in the Silesian province. Material status was defined as average, about PLN 1,500 per person in the household.

Inclusion criteria for the study

The main criterion for the study was age ≥ 18 years. Participation in the study was anonymous, voluntary and without monetary compensation. Before completing the questionnaire, participants read the instructions describing the purpose of the study. Data were obtained only from participants who gave informed written consent by participating in the study. The basic inclusion criterion was the patient's written consent, made through participation in the questionnaire. Participation in the study was anonymous and entirely voluntary. The study complies with the provisions of the Helsinki Declaration. The project of the study in the light of the Act of December 5, 1996 on the professions of doctor and dentist (Journal of Laws of 2011, No. 277, item 1634, as amended) is not a medical experiment. The study received a positive opinion of the Bioethics Committee of the Medical University of Silesia in Katowice (ID: PCN/0022/KB/211/20).

Research tool

The first part of the questionnaire included a metric with basic data such as gender, age, education, place of residence, and material status. In the second part, respondents were asked questions about their opinions on COVID-19 vaccination. The third part used the SARS-CoV-2 Fear of Infection Scale (FCV-19S) according to Ahorsu (in Polish translation) [18,19]. Agreement with the statements (subscales) contained in the scale is scored from 1 to 5, according to the Likert scale, where 1 means disagreement with the statement and 5 means full agreement with the statement. The scale consists of 7 subscales, with a maximum score of 35. The raw score was then multiplied by a factor value of ~ 2.857 to obtain a percentage score, for which the following verbal interpretation was adopted for the purposes of the study: 76-100% high level of fear; 56-75% moderate level of fear; 26-55% low level of fear associated; <25% no fear associated with COVID-19.

Statistical analyses

A Cronbach's α score of 0.89 was obtained for the normalization sample in our study. The resulting data were processed with Statistica 13.0 using the Kruskal-Wallis and Mann-Whitney U tests ($p=0.05$).

3. Results

Respondents were asked whether they had undergone SARS-CoV-2 virus infection in recent months (March-December). Among the respondents, 54% indicated that they had contracted COVID-19 or are presumed to have undergone such an infection.

First of all, the subjects were asked about their attitudes toward COVID-19 vaccination, and it was revealed that 162 subjects (54%) expressed a willingness to vaccinate whenever possible, while 126 subjects (42%) were not interested in vaccinating (Table I). It was observed that 4% of the subjects (12 cases) have no opinion on vaccination, to avoid distortions in the data analysis this group was excluded from further analysis, and the group of vaccinators and non-vaccinators was labeled as VG and NG group, respectively.

Next, respondents answered a multiple-choice question about their opinion of the COVID-19 vaccine. Among the justifications for their decision, those willing to be vaccinated (VG) most often indicate a return to normalcy (standard of living before the COVID-19 pandemic) - 72%, and the desire to protect those around them from possible infection - (46%). They are least likely to point to the course of infection as a justification for their decision to vaccinate (20%). The justifications of the opposite camp of respondents (NG) are dominated by the opinion that the vaccine has not undergone enough testing and is not safe for health - 68%. In addition, nearly 44% of respondents indicate that they do not have the knowledge and enough information that would support vaccination. As in the ShT group here, the mere fact of infection or lack thereof is the least influential factor in the decision to vaccinate - 18% (Table I).

Table I. Distribution of the study group according to attitudes toward COVID-19 vaccination and the rationale for their decision.

Attitudes toward COVID-19 vaccination					
It vaccinates		No opinion	Do not vaccinate		
54% (n=162)		4% (n=12)*	42% (n=126)		
Justification for the decision on COVID-19 vaccination					
Vaccination will allow me to return to normalcy	72% (117)	n.d.	Vaccine has not been sufficiently tested (may be dangerous to health)	68% (86)	
Doesn't want to pose a threat to those around him	46% (75)		I have too little information on vaccinations	44% (56)	
I am convinced of the necessity of vaccination (vaccination is safe for health)	32% (52)		I don't believe in COVID-19 pandemic	38% (48)	
I know people who contracted COVID-19 and went through the infection severely	20% (32)		No one around me has been sick with COVID-19 or has been sick but passed the infection asymptotically	18% (23)	
I believe that vaccination is an important part of the prevention of infectious diseases	10% (16)		I believe that vaccination is not an important part of infectious disease prevention	6% (8)	

On the basis of the COVID-19 fear scale, respondents' answers were evaluated in each subscale (Table II). For the subscale "I am very afraid of SARS-CoV-2," respondents most often chose the answer "I have no opinion," although a difference between the groups is evident - the VG group is more in agreement with the statement than the NG group. In the case of the variant "I feel anxious when I think about coronavirus," the most frequently chosen answers were ex aequo "I have no opinion" and "I rather agree," and here, too, a similar relationship was shown between the groups. The answer "I strongly disagree" in the subscale "my hands sweat when I think about coronavirus" was indicated by 34% of respondents. In the question regarding the fear of loss of life associated with COVID-19, the most frequently selected response was "I have no opinion," but here, too, it was observed that higher agreement with the statement was found in the VG group. The negative impact on life of COVID-19-related information is observed by 17% and 12% of respondents (rather agree and strongly agree with the statement), while 39% have no opinion. In the last two subscales concerning insomnia associated with fear of SARS-CoV-2 and faster heartbeat associated with the new coronavirus, respectively, it was noted that the most common response is "strongly disagree with the statement" (36% vs. 28%).

It was observed that those in the VG group had a moderate level of anxiety - 20.8 points. (59.4%), while those in the NG group had a low level of anxiety - 11.2 pts. (32,0%). On the basis of a detailed analysis of the FCV-19S scale results, it was found that those willing to be vaccinated showed a higher level of fear of SARS-CoV-2 infection than those unwilling to be vaccinated ($p < 0.5$) - Table III.

Table II. Distribution of percentages of FCV-19S scale responses among those interested in COVID-19 vaccination (VG) and non-vaccinators (NG).

FCV-19S* scale discriminator.	Group	I strongly disagree (1 point)	I rather disagree (2 points)	I have no opinion (3 points)	I rather agree (4 points)	I definitely agree (5 points)
<i>I'm very afraid of SARS-CoV-2 (coronavirus, colloquially)</i>	VG	8%	12%	24%	36%	20%
	NG	16%	24%	44%	12%	4%
	Total	12%	18%	39%	19%	12%
<i>I feel anxiety when I think about coronavirus</i>	VG	10%	10%	20%	32%	28%
	NG	22%	18%	30%	18%	12%
	Total	16%	14%	25%	25%	20%
<i>My hands sweat when I think of coronavirus</i>	VG	24%	20%	30%	16%	10%
	NG	44%	32%	10%	14%	10%
	Total	34%	26%	20%	15%	10%
<i>I'm afraid of losing my life due to coronavirus</i>	VG	9%	11%	34%	30%	16%
	NG	30%	28%	18%	10%	14%
	Total	20%	20%	26%	20%	15%
<i>When I watch the news and learn about coronavirus-related stories on social media, I get nervous or anxious</i>	VG	10%	12%	24%	34%	20%
	NG	18%	24%	44%	10%	4%
	Total	14%	18%	39%	17%	12%
<i>I can't sleep because I'm worried about getting infected with coronavirus</i>	VG	32%	28%	10%	15%	15%
	NG	40%	32%	20%	8%	0%
	Total	36%	30%	15%	12%	8%
<i>My heart beats rapidly when I think of coronavirus infection</i>	VG	24%	20%	20%	18%	18%
	NG	32%	32%	22%	14%	0%
	Total	28%	26%	21%	16%	9%

Table III. FCV-19S scale results in the group of people interested in COVID-19 vaccination (VG) and non-vaccinators (NG).

FCV-19S* scale discriminator.	Group	X	SD	MIN	MAX	Me	Mo	Level p
<i>I'm very afraid of SARS-CoV-2 (coronavirus, colloquially)</i>	VG	4,2	0,8	1	5	3	4	<0,05
	NG	2,8	0,6	1	5	3	3	
	Total	3,5	0,7	1	5	3	3	
<i>I feel anxiety when I think about coronavirus</i>	VG	3,6	0,4	1	5	3	4	
	NG	2,2	0,6	1	5	3	2	
	Total	2,9	0,6	1	5	3	3	
<i>My hands sweat when I think of coronavirus</i>	VG	2,0	0,8	1	5	3	2	
	NG	1,2	0,8	1	5	3	1	
	Total	1,6	0,8	1	5	3	1	
<i>I'm afraid of losing my life due to coronavirus</i>	VG	2,6	0,6	1	5	3	2	
	NG	1,0	0,4	1	5	3	1	
	Total	1,8	0,6	1	5	3	1	
<i>When I watch the news and learn about coronavirus-related stories on social media, I get nervous or anxious</i>	VG	3,4	0,4	1	5	3	3	
	NG	1,8	0,4	1	5	3	1	
	Total	2,6	0,4	1	5	3	2	
<i>I can't sleep because I'm worried about getting infected with coronavirus</i>	VG	2,6	0,2	1	5	3	3	
	NG	1,2	0,4	1	5	3	1	
	Total	1,9	0,3	1	5	3	2	
<i>My heart beats rapidly when I think of coronavirus infection</i>	VG	2,4	0,8	1	5	3	2	
	NG	1,0	0,4	1	5	3	1	
	Total	1,7	0,6	1	5	3	1	
<i>Raw score (points)</i>	VG	20,8						
	NG	11,2						
	Total	16,0						
<i>Converted result (%)</i>	VG	59,4						
	NG	32,0						
	Total	45,7						
<i>Worded interpretation</i>	VG	Moderate level of anxiety						
	NG	Low anxiety levels						
	Total	Low anxiety levels						

4 Discussion

At present, there are few surveys of public opinion on COVID-19 vaccination. Most of the data made available comes from mass media surveys and the Ministry of Health. However, it is known that the topic of immunization can sometimes be a sensitive and controversial topic in society. Opponents of vaccinations commonly referred to as anti-vaccinationists, are often affiliated with pro-environmental and religious groups and are usually supporters of so-called natural medicine. Anti-vaccinationists see a link between vaccination and the occurrence of negative health phenomena or the desire of state governments to control society [20].

One in ten Poles plans to be vaccinated for COVID-19 in the next six months, while more than half of Poles aged 18-65 are vaccinated. The percentage of those who do not plan to vaccinate is very high at 32%. Among those opposed to vaccination, there are more women (37% of women versus 27% of men), as well as people in the 25-34 age group (41%) and with primary education (41%). By far the least here are those in the oldest age group surveyed (45-65) - 23% and those with a university education - 24%.

In the survey group, 54% of respondents said they were willing to be vaccinated. These findings are reflected in results from an Ipsos survey [21] conducted on behalf of the World Economic Forum among nearly 20,000 adults from 27 countries, even before the vaccine was launched. Poles, along with Russians, are among the most skeptical nations about the new coronavirus vaccine. Some 74% of respondents said they would reach for a vaccine for COVID-19 if it were available. In the case of Poland, the figure was only 56%, and a lower percentage was recorded only in Russia - 54%. In most countries, the number of those expressing a desire to vaccinate is significantly higher than the number of those who do not want to vaccinate (more than 50% in 12 of 27 countries). The main reason for skepticism about vaccination remains concern about its side effects, indicated by about 56% of respondents worldwide (for Poland it is about 65%). The second most common reason for skepticism about the COVID-19 vaccine is doubts about its effectiveness. Globally, this reason was cited by 29% (44% in Poland).

Our own study showed that the group is divided in opinion regarding vaccination against COVID-19. Among those who do not wish to be vaccinated, there are 38% who do not see the need to do so because, in their opinion, there is no real threat to life or health from SARS-CoV-2 infection. It is also clear that the same group indicates the danger of being vaccinated (68%).

It is worrying that people who opt out of vaccination indicate that they do not have enough information about vaccination (44%). It seems important to change this fact and introduce more programs in the public space aimed at providing necessary information on vaccinations in an accessible way. A positive result of the survey is that those who expressed their willingness to vaccinate in the self-report survey are most often motivated by the desire to return to normality as soon as possible, i.e. the standard of living before the pandemic (72%), and also motivate their decision by responsibility for third parties and the desire to interrupt the possibility of transmitting possible infection to those around them (46%).

A number of studies conducted around the world have shown that the current pandemic may affect mental health due to the prevailing uncertainty, restrictions and social distance. Previous studies have shown increased psychological burden related to stress, anxiety and depression since the beginning of the sanitary restrictions [22]. Brooks et al [23] studied the psychological effects of quarantine during a pandemic, pointing to the psychological burden on those unable to participate in public life. Given the serious global threat and the impact that the COVID-19 pandemic had on various aspects of life, Ahorsu et al. [18] developed a scale to measure fear of COVID-19 (FCV-19S), which was used in their own study. The scale has also been used in many countries [24-31]. In the Polish literature, the utility of the scale was confirmed by authors Pisula and Nowakowska [19]. All of the cited studies showed that the COVID-19 caused worldwide social panic, and the level of anxiety in the mentioned populations ranged from moderate to high. How the level of fear of SARS-CoV-2 infection has changed in the face of the invention and patenting of an effective vaccine has not yet been studied. Our own study showed that those who are more willing to express their willingness to be vaccinated are characterized by higher levels of fear than the other subjects, which can be interpreted to mean that there is a belief among those who have a negative attitude toward vaccination that vaccination is unwarranted and that the threat is downplayed. It is also worth bearing in mind that fear, or fear of infection, is not the only factor influencing the decision to vaccinate.

Immunization is a medical intervention with no competition in terms of action. Vaccine preparations affect both the individual and the entire population. Implementation of vaccinations in accordance with the requirements and recommendations protects not only from the disease itself, but also from its complications. It is important to take both mandatory and recommended vaccinations. In accordance with the prevailing phenomenon of globalization, frequent movement between countries and the high density of the population of different origins, society is exposed to intense transmission of pathogens. Immunization activities and the continuous raising of the population's awareness of infectious diseases and their prevention options, as well as challenging false information propagated by vaccination opponents, are challenges for public health. It is important that education in the field in question is carried out by specialists, with the appropriate qualifications, so that they can reach the public and create a sense of trust.

COVID-19 immunization is one of the major medical successes of recent years and a safe way to prevent SARS-CoV-2 infection [32-36]. As shown by the history of immunization, consistently performed vaccinations have resulted in reduced morbidity, reduced mortality and reduced hospitalizations. They have enabled the eradication of smallpox and progress in implementing global initiatives to eliminate poliomyelitis, measles and rubella cases, including congenital rubella syndrome [37]. Much of the research that has been conducted in the vaccination matter concerns immunization for seasonal influenza or vaccination in the pediatric population [38,39]. Therefore, further research should focus on the controversy surrounding COVID-19 immunization. An effective COVID-19 immunization program can only be built on an understanding of and appropriate response to the beliefs, concerns and expectations of individuals and communities about the vaccine and the disease.

Limitations and strengths of the study

However, the survey is not free of methodological limitations, among them being that the sample consisted of volunteers and may not have been representative of the general population. Volunteers who completed the questionnaire online may have had a high level of motivation and may have been more favorable toward science and scientific research. There is also a risk that those who did not trust science and researchers avoided participating in the survey or abandoned the procedure during the survey. , conducting surveys using the CAWI method does not avoid the common phenomenon of "bot/fakeresponders," which is characterized by surveys made available on an online form basis.

The survey conducted was based on self-report measures and spontaneous reporting, so there is a suspicion that respondents were not fully honest and preferred answers that were more socially acceptable. However, self-reporting methods make it possible to obtain data quickly from large samples. The use of the standardized FCV-19S questionnaire to assess fear of infection also adds value to the study in terms of objective assessment.

5. Conclusions

Based on the study, the following conclusions can be drawn:

1. Among those who are interested in COVID-19 vaccination, the predominant justification for their decision is the return to normalcy after vaccination and the desire to break a possible epidemic chain.
2. Those who are not interested in COVID-19 vaccination most often point to the lack of sufficient data on the safety of COVID-19 vaccination and indicate that it has been insufficiently studied.
3. On the basis of the COVID-19 Fear Scale, it was found that those who express a willingness to be vaccinated are more likely to have higher levels of fear of SARS-CoV-2 infection than those who have not expressed a willingness to be vaccinated.
4. Nearly half of unvaccinated people indicate that there is too little information about vaccination. COVID-19 immunization promotion programs are needed to enrich the population with the necessary information.

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