

**ANALYSIS OF CHANGES IN ATTITUDES TOWARDS VACCINATION DURING
THE COVID-19 PANDEMIC IN 2020 TO 2022 IN SLOVAKIA
ON THE OCCASION OF THE WORLD IMMUNIZATION WEEK
ANALÝZA ZMIEN V POSTOJOCH K OČKOVANIU POČAS PANDÉMIE COVID-19
V ROKOCH 2020 AŽ 2022 NA SLOVENSKU PRI PRÍLEŽITOSTI
SVETOVÉHO IMUNIZAČNÉHO TÝŽDŇA**

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ABSTRACT

Background: For a successful implementation of vaccination, a positive approach of the lay population is necessary. In recent years, the relationship to vaccination was affected by the COVID-19 pandemic and rise of the anti-vaccination lobby.

Aim: Analysis of people's attitudes towards vaccination and their changes during the COVID-19 pandemic in Slovakia.

Material and methods: Surveys were conducted during the COVID-19 pandemic from 2020 to 2022 for the occasion of the World Immunization Week. Data collection was carried out through a questionnaire which was distributed electronically by students of public health at Jessenius Faculty of Medicine in Martin.

Results: During the monitored period there were significant changes in opinions and attitudes towards various aspects of vaccination. Fewer people had their physician as a source of information about vaccination, and trust in the information provided by a physician decreased. Fewer people consider vaccination necessary and the share of people who would vaccinate their child against all diseases recommended by a physician also decreased. More people think that vaccination is a risk (from 5.1 % in 2020 to 15.2 % in 2022), that it is only a business of pharmaceutical companies (from 7.2 % to 20.1 %), and that mandatory vaccination should be changed to voluntary (from 6.8 % to 28.0 %).

Conclusion: During the COVID-19 pandemic, there has been a significant change in opinions about vaccination. This represents a major problem for public health, which can have significant negative impacts.

Key words: Vaccination. Attitudes. COVID-19. Pandemic. World Immunization Week.

ABSTRAKT

Východiská: Pre úspešnú realizáciu očkovania je potrebný pozitívny prístup laickej populácie. Vzťah k očkovaniu bol v posledných rokoch ovplyvnený pandémiou COVID-19 a vzostupom antivakcinačnej lobby.

Cieľ: Analýza postojov ľudí k očkovaniu a ich zmien počas pandémie COVID-19 na Slovensku.

Súbor a metódy: Prieskumy sa uskutočnili počas pandémie COVID-19 v rokoch 2020 až 2022 pri príležitosti Svetového týždňa imunizácie. Zber údajov bol realizovaný prostredníctvom dotazníka, ktorý elektronicky distribuovali študenti verejného zdravotníctva Jesseniovej lekárskej fakulty v Martine.

Výsledky: Počas sledovaného obdobia došlo k výrazným zmenám v názoroch a postojoch k rôznym aspektom očkovania. Menej ľudí malo svojho lekára ako zdroj informácií o očkovaní a dôvera v informácie poskytnuté lekárom sa znížila. Menej ľudí považuje očkovanie za potrebné a znížil sa aj podiel ľudí, ktorí by svoje dieťa zaočkovali proti všetkým ochoreniam odporúčaným lekárom. Viac ľudí si myslí, že očkovanie je riziko (z 5,1 % v roku 2020 na 15,2 % v roku 2022), že ide len o biznis farmaceutických firiem (zo 7,2 % na 20,1 %) a že povinné očkovanie by sa malo zmeniť na dobrovoľné (od r. 6,8 % až 28,0 %).

Záver: Počas pandémie COVID-19 došlo k výraznej zmene názorov na očkovanie. To predstavuje veľký problém pre verejné zdravie, ktorý môže mať výrazne negatívne dopady.

Kľúčové slová: Očkovanie. Postoje. COVID-19. pandémie. Svetový imunizačný týždeň.

INTRODUCTION

Vaccination is one of the most important and effective ways to prevent infectious diseases. Through vaccination, it has been possible to reduce morbidity and mortality from vaccine-preventable diseases, to prevent the occurrence of epidemics, or even to achieve their elimination or eradication. However, its successful implementation requires a positive attitude of the lay population, which has become more problematic in recent years due to the rise of the anti-vaccination lobby. For this reason, it is important to know the public's views on vaccination. Negative attitudes lead to vaccination hesitancy, lower vaccination rates, which has a significant public health, economic and social impact and affects not only individuals refusing vaccination, but also those who cannot be vaccinated, but are protected by collective immunity [1]. In addition, it is important to continuously monitor the situation to be able to identify changes in people's attitudes and opinions and to adequately adapt the form and content of professional information provided to the lay

public. The resulting goal of these activities is to support the level of vaccination and improve awareness of vaccination against diseases that can be successfully prevented by vaccination and an adequate response to anti-vaccination activities [2].

The COVID-19 pandemic introduced another aspect of vaccination attitudes into public discussion. Emergence of a new disease, which grew into global pandemic was a new experience for many people. Many new information about the disease and its worldwide spread was introduced to people. Soon came discussion about making a vaccine against COVID-19 virus, SARS-CoV-2. People could see rapid development and introduction of the first approved mRNA vaccine for human use, in a way, they have never seen before [3]. With these news and educational information also came disinformation, conspiracy theories, magical cures, and false news in general. For some people, that may lead to information overload and subsequent changes in attitudes [4]. Not only about COVID-19 and vaccination against it.

Since 2010 as part of the World Immunization Week (WIW), which has been announced every year since 2005 by the Office of the World Health Organization for Europe, we have been conducting surveys with students of public health at Jessenius Faculty of Medicine in Martin. The previous surveys were face to face and took place in the streets of city of Martin, or in pediatrics ambulances on selected aspects of the population's opinions on vaccination [5, 6]. After the outbreak of COVID-19, we were unable to use our approach of conducting the surveys in person, due to anti-pandemic measures and lockdown. We didn't want to stop conducting our surveys, therefore we decided to continue with online questionnaires.

The aim of this study was to find out attitudes of people from Slovakia towards vaccination and how these attitudes developed during the COVID-19 pandemic between 2020 and 2022.

MATERIAL AND METHODS

The data were gathered three times by cross-sectional survey for the occasion of the World Immunization Week in years 2020, 2021 and 2022. First survey was conducted on April 27th, 2020, second survey was conducted on March 15th, 2021, and the last survey was conducted on March 16th, 2022. The WIW is during last week of April, but we were doing our surveys in advance, so we had our data

collected and analyzed prior to the WIW. The 2020 survey was also supposed to run in March but was delayed by COVID-19 pandemic.

An online platform (www.docs.google.com/forms) were used to conduct the surveys. Potential participants were approached, via social media and emails and subsequent snowball sampling, with the help of students of public health at Jessenius Faculty of Medicine in Martin as a part of their education.

Self-made questionnaire was used for data collection. The questionnaire included a description of the survey and its objectives, along with an assurance of anonymity. Our questionnaire consists of demographics questions (age, gender, education, residence, educational level, profession, economic activity and how many children do respondents have) and attitudes questions. Those included single and multiple-choice question and three questions with 5-point Likert scale.

Questionnaires were filled out by 278 participants in 2020, 241 participants in 2021, 204 participants in 2022. 723 in total. No participants were excluded in any year, as all forms were correctly filled out.

Chi-Square test was used for calculating statistical significance between years in answers to categorical questions. For Likert-scale questions, statistical significance was calculated with Kruskal-Wallis test with Bonferroni post hoc test. The p-value of less than 0.05 was considered statistically significant.

For calculation of statistical significance in question about the source of information about vaccination, for each option (physician, family and friends, mass media, internet and social networks and promotional materials) we compared participants that choose that option with those, who didn't.

In question about attitudes towards vaccination, we compared participants that choose vaccination-positive answer ("Necessary") to participants that choose any of the other answers ("Harmful", "Useless", "Don't know" and Other").

RESULTS

The respondents of the surveys were mostly females (81.3 % in 2020, 72.6 % in 2021 and 70.1 % in 2022). The median age of participants was 22 years. Majority of the respondents finished secondary education (about 70 % in all three surveys) and minority of them were parents (16.9 % in 2020, 28.6 % in 2021 and 21.1 % in 2022) (Table 1).

Table 1 Demographics of surveys carried out in 2020-2022 (n = 723)

Variable	2020 (n = 278)		2021 (n = 241)		2022 (n = 204)	
	n	%	n	%	n	%
Gender						
Male	52	19 %	66	27 %	61	30 %
Female	226	81 %	175	73 %	143	70 %
Age						
Median [IQR]	22	[21 – 27]	22	[21 – 38]	22	[21 – 26]
Parents (have children)						
Yes	47	17 %	69	29 %	43	21 %
No	231	83 %	172	71 %	161	79 %
Education						
Primary	13	5 %	12	5 %	21	10 %
Secondary	197	71 %	176	73 %	143	70 %
Tertiary	68	24 %	53	22 %	40	20 %

Notes: IQR - interquartile range

Table 2 Responses of the participants to surveys in 2020-2022 (n = 723)

Variable	2020		2021		2022		p-value
	(n = 278)		(n = 241)		(n = 204)		Chi square test
Source of information about vaccination							
Physician	206	74.1 %	95	39.4 %	107	52.5 %	< 0.001
Family and friends	77	27.7 %	69	28.6 %	84	41.2 %	0.003
Mass media	90	32.4 %	130	53.9 %	78	38.2 %	< 0.001
Internet and social networks	156	56.1 %	166	68.9 %	131	64.2 %	0.009
Promotional materials	75	27.0 %	60	24.9 %	40	19.6 %	NS
Trust in physician about information about vaccination							
Yes	268	96.4 %	233	96.7 %	180	88.2 %	< 0.001
No	10	3.6 %	18	7.5 %	24	11.8 %	
Attitude towards vaccination							
Necessary	261	93.9 %	209	86.7 %	156	76.5 %	< 0.001
Other (useless, harmful, don't know, other)	17	6.1 %	32	13.3 %	48	23.5 %	
Attitude towards mandatory children vaccination if it was changed to voluntary							
Would vaccinate against all recommended diseases	225	80.9 %	189	78.4 %	136	66.7 %	< 0.001
Would vaccinate only against some diseases	52	18.7 %	48	19.9 %	54	26.5 %	
Would not vaccinate at all	1	0.4 %	4	1.7 %	14	6.9 %	

In 2020 physicians were the most common sources of information about vaccination. But in 2021 there was a significant sharp decline from 74.1 % to 39.4 % and even with a significant rise in 2022 ($p < 0.001$), overall, about 20 % less respondents between 2020 and 2022 considered their physician as a main source. Family and friend were for the first two surveys source of information for about 28 % of respondents, with significant increase to 41.2 % in 2022, ($p = 0.003$). Mass media also rose sharply, this time in 2021, from 32.4 % in 2020 to 53.9 %. But then almost as sharply fell in 2022, to 38.2 %, ($p < 0.001$). During this period, there was also rise of internet and social media as a source of vaccination information, from 56.1 % in 2020 to

68.9 % in 2021, followed by small decline to 64.2 % in 2022, ($p = 0.009$). In 2021 the internet and social media overtook physicians as the main source of information about vaccination. Promotional materials were in each year the least common source, their proportion also fell each year, but not significantly (Table 2).

In Table 2 we can also see that the trust of participants in information about vaccination, that were given to them by physician declined each year, from 96.4 % in 2020 to 88.2 % in 2022, ($p < 0.001$). When asked about their attitude towards vaccination 93.9 % of participants in 2020 answered that they consider it necessary with continual decrease to 76.5 % in 2022 ($p < 0.001$). Table 2 also shows decline of

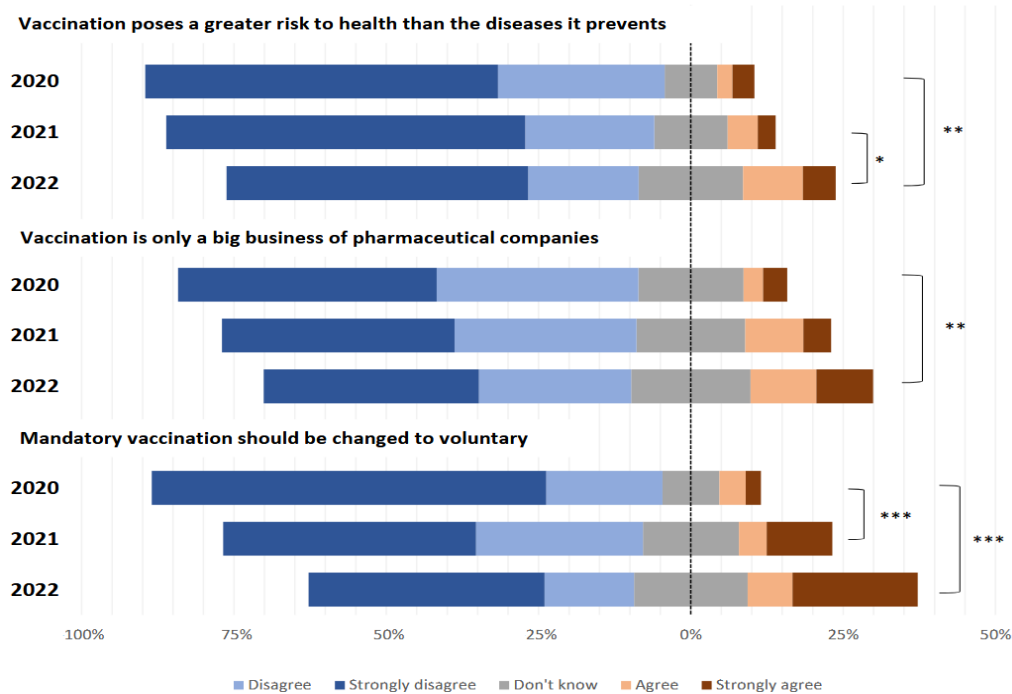


Figure 1 Attitudes of the participants towards statements about vaccination in surveys in 2020-2022 (n = 723) Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

people who would still vaccinate their children if the mandatory vaccination was changed to voluntary (from 80.9 % to 66.7 % between 2020 and 2022, $p < 0.001$). In 2022 almost 7 % of participants would not vaccinate their children at all.

The Figure 1 shows changes in attitudes towards general vaccination between years on Likert scale. Participants were asked to select how much they agree with statement “Vaccination poses a greater risk to health than the diseases it prevents”. Large majority (about 85 %) have disagreed or strongly disagreed with this statement in 2020. But in the year 2022 it was less than 70 % ($p = 0.005$). Similarly, more people in 2022 had agreeable attitude towards statement, that vaccination is only a business of pharmaceutical companies, than in 2020. There, the participants’ disagreement with the statement fell from about 75 % to 60 % ($p = 0.006$). The last statement was “Mandatory vaccination should be changed to voluntary”. In this statement we measured the biggest decline in disagreement during the years of surveys of the three statements. In 2020 almost 85 % of participants had agreeable attitude, but in 2022 it was just above 50 % ($p < 0.001$). Also, there was a sharp increase of people who strongly agreed with this statement, from 2.5 % in 2020, to 20.6 % in 2022.

DISCUSSION

Vaccines are widely recognized by health authorities and the medical community as a major tool for achieving public health successes such as the eradication of smallpox [7, 8]. Nevertheless, for many individuals this is not a sufficient reason to accept vaccination. They doubt the benefits of vaccines, worry about their safety, and question their necessity. Even those who are vaccinated may have reservations about certain aspects of vaccination [9]. Some of it falls to antivaccination movement, that gained traction due to work of British ex-physician, Andrew Wakefield, whose now debunked and retraced study claimed a connection between the measles, mumps, and rubella (MMR) vaccine and development of autism in young children [10]. Confidence in vaccination and positive attitudes towards it are very important, and when people stop vaccinate themselves in can result into outbreak, such as in a case of measles outbreak in Slovakia [11].

This study aims to examine how COVID-19 pandemic may have affected these attitudes. We conducted similar surveys in prior years for an occasion of World Immunization Weeks. In them we asked residents of the city of Martin about their attitudes to vaccination, either in the streets, or in the pediatricians’ ambulances. When pandemic came into

Slovakia, we were unable to continue as before, so we had to change our approach. Instead of asking people in person we made online version of our questionnaire and shared it online. We used the same methods in the next two years, also.

Our 2020 survey was conducted when in Slovakia the first wave of the pandemic was slowing, and a week before (April 20th) Slovak officials announced Easing of Quarantine Regulations [12].

Second survey was conducted, when there was already general population vaccination against COVID-19. According to data from Ministry of Health of the Slovak republic, as of 16th of March 2021, 661 129 people were vaccinated with first dose and 220 863 with second dose [13]. But Slovakia was in the highest level of quarantine regulations (IV. level). At the regional level, 35 districts reached the IV. level of warning and 41 districts were in III. level. Only 3 districts were in II. Level, and none below. From March the 3rd there was night curfew and from March 15th was compulsory use FFP2 face masks in interiors [14, 15].

When we did our third survey, the fourth wave of the pandemic was gradually slowing. New daily cases dropped from about 20 000 in February to 10 000 in March and two days before (March 14th) Slovak government eased another quarantine regulation [16, 17].

The results of our study showed that participants had a significant loss of trust in physician as a source of vaccination information, with only four-tenths of them using them as a source in 2021. This could be caused by the fact that at that time there was a lockdown in Slovakia and people only went to physicians if it was necessary. At the same time, however, more people were getting information from mass media, social networks, and the Internet. This is not necessarily a bad thing, as these resources have been used by health authorities and the government to provide the latest information about the pandemic, its response and information about the vaccination against COVID-19. However, during the pandemic, there were also frequent conspiracy theories about COVID-19 and the vaccine against it [18 - 21].

Because of this conflicting information from the same sources, people may have started developing doubts or even strong opposition against COVID-19 vaccine, which translated into negative attitudes towards all vaccinations.

We can see that in our results, fewer participants in 2021 thought that vaccination is necessary than in 2020, and even fewer in 2022. More people thought that vaccination in general is a bigger risk to health than the diseases themselves, it's only a business for pharmaceutical companies and it should be compulsory. The downward trend of attitudes towards vaccination that continued in 2022 might be explained by COVID-19 fatigue or "pandemic burnout [22 - 24].

Continuously changing lockdown measures, multiple doses of vaccines against SARS-CoV-2 and the length of the pandemic could very easily cause this fatigue, which affected attitudes towards vaccination in general. This poses a great public health risk, because if people have negative attitudes towards the vaccination, which is one of the best, if not the best, preventive measures against infectious diseases, then these attitudes can cause prolonging the fight against these diseases [25].

COVID-19 pandemic also caused disruptions of vaccinations programs in many countries, which can cause risk of resurgence of vaccine-preventable infections [26, 27]. The vaccination hesitancy may impact how fast the recovery would be.

The limitations of our study are the use of a non-standardized questionnaire and distribution via the Internet by students, which may affect the size and scope of the respondent pool. For future surveys we want to continue to monitor vaccination attitudes in a larger cohort using a standardized methodology and a validated questionnaire. For 2023 survey we translated and used Vaccination Attitudes Examination (VAX) Scale questionnaire by Martin and Petrie [28].

At the time of writing, we are working on the article about our validation of the VAX Scale into Slovak language.

Another limitation was the cross-sectional design of the study, that may constrain the evidence about the directions and causality of the relationships.

CONCLUSION

During the COVID-19 pandemic, there has been a significant change in opinions about vaccination in Slovakia. This represents a major problem for public health, which can have significant negative impacts in the future. Better understanding of reasons for the vaccination hesitancy is needed, to

ensure that people will trust the vaccination and are not afraid of it.

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Ethical approval

The study protocol was approved by the Ethics Committee at the Comenius University in Bratislava, Jessenius Faculty of Medicine in Martin (reference no. EK UNM 71/2022)

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