INFLUENZA AND INFLUENZA VACCINATION FROM THE PERSPECTIVE OF CZECH PRE-SERVICE TEACHERS: KNOWLEDGE AND ATTITUDES

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SUMMARY

Objectives: Influenza is a widespread respiratory disease with a potentially risky course. Vaccination is considered the most effective method of prevention. However, only a small portion of the population is vaccinated. Teachers work in a high-risk environment and they have a significant impact on the population through student education. Therefore, the aim of this study was to find out the knowledge and attitudes of pre-service teachers about influenza and vaccination.

Methods: A questionnaire survey was conducted to find out what knowledge, attitudes and behaviour pre-service teachers (N = 373) show in relation to influenza and influenza vaccination. It was statistically tested whether there were differences between students with respect to their field of study.

Results: The majority of pre-service teachers have a good knowledge of influenza symptoms, however, they often mistaken it for other respiratory diseases. The field of study plays only a partial role in the knowledge. The respondents perceive influenza as an easily spread disease, but they have negative attitudes towards vaccination, and most pre-service teachers think that its disadvantages outweigh the advantages. This was stated primarily by pre-services science teachers. These attitudes are also reflected in the low vaccination rate of the sample (6%).

Conclusions: Relatively good knowledge of teachers is not reflected in their attitudes and behaviour. Negative attitudes towards vaccination are most held by pre-service teachers, whose field primarily includes teaching this topic. It can have a significant effect on students' attitudes not only toward influenza vaccines but also to other vaccinations.

INTRODUCTION

Influenza is a serious viral disease which annually affects millions of people. Although vaccination is considered the most effective method of prevention (1), the influenza vaccination rate has been very low for a long period of time in many countries (2, 3). In the Czech Republic, state health insurance covers influenza vaccination only for those over 65 and high-risk groups. Therefore, the main tool for increasing vaccination coverage is to influence target groups. However, a significant increase in vaccination coverage (currently around 5%) has not been successful in the long run in the Czech Republic (4) as can be observed also in other countries (3, 5–7).

A typical way to promote vaccination is using knowledge-based information materials. However, longer-term effects on attitudes and behaviour cannot be achieved with a single exposure (6). It is therefore necessary to work comprehensively on the development of health literacy. School teaching plays a key role in its development. Most secondary school students acquire information about influenza and vaccination predominantly from school (8). But knowledge is not the main determiner for getting vaccinated against influenza (9). While both controlled and au-

tonomous motivation support the university students' intention to get vaccinated, it is only intrinsic motivation that directly supports the behaviour leading to vaccination (9). Similarly, incentives in vaccine campaigns do not lead to vaccines in students (10). Thus, it is essential not only to choose the educational content, but also to influence the pupils' attitudes. The central role is played by the teacher who mediates not only the subject knowledge, but also influences the pupils' attitudes and a model of behaviour. The knowledge, attitudes and behaviour of the teacher can have a fundamental influence on these parameters in pupils (11, 12). Moreover, the teachers' behaviour also has a significant effect on the protection of health of other teachers and pupils who meet them (7). Although human health issues are an integral part of education, so far, no systematic attention has been paid to teachers' knowledge and attitudes regarding influenza and vaccination (6).

The topic has become especially important now that respiratory diseases and protection against them are a key issue worldwide due to the Covid-19 pandemic. The views of pre-service teachers before the Covid-19 pandemic that we examined in this study may provide deeper insight, especially into the reasons for their non-vaccination against influenza. The results can also help to understand the reasons for reluctance to be vaccinated and may

be taken into account in the promotion of optional vaccination against other diseases including Covid-19.

The aim of the research was to find out what knowledge, attitudes, and behaviours the pre-service teachers show in relation to influenza and influenza vaccination. Whether or not there are differences among the students in relation to their study programme was also researched. With regard to the second part of the goal, two hypotheses were tested:

- There is a statistically significant relationship between the field of study of pre-service teachers and their knowledge of influenza and influenza vaccination.
- There is a statistically significant difference in the attitudes of pre-service teachers to influenza and influenza vaccination depending on the field of study.

MATERIALS AND METHODS

Research Tool

The research tool was an electronic questionnaire. Knowledge and attitude part was based on the research conducted on pre-service teachers in the USA (6). The tool was translated, and partial changes were made in relation to the validity for the Czech Republic. The accuracy of the data was checked according to the data of the National Institute of Public Health (13).

The knowledge-oriented part of the tool consisted of 11 questions for which the respondents decided on the truth on a scale (Table 1) and 10 questions with a choice of one correct answer variant from four. To find out the attitudes, 9 items were included, which the respondents evaluated using a seven-point Likert scale (Table 3). The third part of the questionnaire contained closed questions related to the students' behaviour, i.e. the respondents' vaccination against influenza in the present and in the past and the intention to get vaccinated against influenza. An open question providing space for explanation was included. The compiled research tool was subjected to content validation through a five-member expert panel made up of expert biologists and didactics of natural sciences.

Research Sample and Administration of the Questionnaire

The research was conducted among students studying teaching programmes at the Faculty of Education, Charles University in Prague, Czech Republic. The data collection was done in complete anonymity during May and June 2019 (i.e. before Covid-19 pandemic). The questionnaire was sent to all students of the fields and years of study listed below; 373 responses were submitted which corresponds to a return rate of 37.5%. This return can be considered sufficient (14). All responses were complete, and none were excluded from the evaluation. The students were from the five-year master's study programme "Teacher training for primary schools" in 4th year and higher (n=100), and the students of the two-year follow-up master's study programme (post-bachelor) "Teacher training for secondary schools" of science-oriented fields (biology, chemistry and health education, n=127) as well as the non-science oriented fields (n=146). Topics dedicated to human health, viral diseases and prevention are represented in the field of study of all respondents referred to here as "pre-service science teachers".

Data Processing

The obtained data were unified and adjusted for statistical evaluation purposes. The MS Excel program was used for the evaluation. The data were descriptively processed, and a confirmatory analysis was performed with respect to the research objectives. Pearson's chi-squared test of independence was used to assess the validity of the hypotheses containing only nominal variables, i.e. hypotheses related to the relationship between the field of study of the respondents and knowledge. Cramér's V coefficient (15) was used to assess the effect size. For the interpretation, Cohen values (16) were used. The Kruskal-Wallis H test (17) was used to verify hypotheses related to the evaluation of respondents' attitudes to influenza and vaccination according to their field of study. The coefficient ε^2 (18) was used to assess the effect size. Since this coefficient is equivalent to the adjusted r^2 (19), the squared values of the coefficient R according to Rea and Parker (20) were used for interpretation. The results of the open questions were evaluated qualitatively and supported by direct quotations of the students' statements.

RESULTS

Pre-service Teachers' Knowledge of Influenza and Vaccination

The respondents achieved high accuracy in assessing the veracity of the statements (Table 1). Quite exceptional was the question about the period in which it is possible to become infected with influenza (only 2% correctness). A statistically significant relationship between the answers and the field of study of the respondents was found in 4 questions. Regarding whether the influenza vaccine contains an active virus, a statistically significant relationship of large effect was found between the responses and the field of study of the respondents (p<0.001, V=0.227). This statement was correctly described as untrue by 59% of pre-service science teachers, but only 44% of non-science pre-service teachers and 35% of pre-service primary school teachers.

In three other questions, a statistically significant relationship of medium effect was found between the answers and the field of study of the respondents. The statement that "the influenza virus is genetically stable and has remained the same over the years" was statistically significantly more correctly marked as untrue by the pre-service science teachers (p=0.001; V=0.173). This statement was described as untrue by 98% of these students (μ=95%), who are significantly more confident in their answer. In the statement that "influenza can be cured with antibiotics", the statistically significant relationship of medium effect found in the field of study of the respondents (p=0.004; V=0.159) was manifested mainly in the degree of certainty with the correct answer. While 12% of pre-service science teachers rated the statement as 'rather untrue' and 74% 'definitely untrue', 30% of non-science pre-service teachers said the statement was 'rather untrue' whereas 54% marked it as 'definitely untrue'. The opposite trend in the statistically significant relationship of medium effect was found

Table 1. Proportions of answers to knowledge questions to assess veracity (N = 373)

Statement	Definitely true (%)	Rather true (%)	Rather untrue (%)	Definitely untrue (%)	p-value
Only people over the age of 65 need to vaccinate against influenza.	1	17	42*	41*	0.511
Influenza can spread from person to person even before the infected person shows any symptoms.	50*	40*	8	2	0.202
The influenza virus is genetically stable and has remained the same over the years.	1	4	29*	65*	**0.001**
Influenza vaccination can cause you to catch influenza.	4	17	43*	36*	0.328
Vaccination provides the best protection against influenza.	9*	45*	32	14	0.154
The influenza vaccine contains an active virus.	15	38	27*	20*	**<0.001**
People may not catch influenza until December and the following months.	2*	1*	16	82	0.427
People infected with influenza may experience life-threatening complications during the course of the disease.	61*	27*	9	4	0.426
The influenza vaccine is not very effective.	3	26	58*	13*	0.472
It is possible to cure influenza with antibiotics.	6	10	21*	63*	**0.004**
The protective effect of vaccination is increased if someone is vaccinated twice.	3	12	39*	46*	**0.044**

% rounded to whole numbers; proportions of correct answers are marked with asterisk; p-value corresponds to testing the null hypothesis of the absence of statistically significant relationship between the field of study and answers to the question; numbers in bold indicate statistically significant values.

for the statement that "the protective effect of vaccination is increased if someone is vaccinated twice" (p=0.044; V=0.132); 92% of non-science pre-service teachers correctly marked this as untrue compared to 80% of pre-service science teachers and 83% of pre-service primary school teachers.

The multiple-choice questions show that respondents have a good knowledge of the symptoms of influenza, its origin and the ways of infection (Table 2). An exception is the question related to the month with the highest incidence of influenza in the Czech Republic, where only 52% of respondents answered correctly.

Table 2. Proportions of correct answers to knowledge questions with multiple choice (N = 373)

Question – answer variants	Proportion of correct answers (%)	p-value
Influenza is caused by – walking outside without a head covering; not wearing warm clothes; **inhaling droplets from the air**; drinking cold water	98	0.278
Common flu symptoms are – malaise and diarrhoea; **high fever and malaise**; high fever and diarrhoea; vomiting and rash	95	0.058
Influenza pathogens are classified as – bacteria; protozoa; fungi; **viruses**	95	0.409
Complications of influenza include – inflammation of the ears and sinuses, asthma; pneumonia, arrhythmia and dehydration; **pneumonia, ear infections and sinus infections**; none of the above	65	0.327
The month when the incidence of influenza is highest in the Czech Republic is – **January**; March; October; November	52	0.073
Common side effects of the influenza vaccine are – body pain and high fever; high fever; chills and pain at the injection site; **redness or pain at the injection site and fever**; fever or high fever and sore throat	80	**0.027**
Influenza vaccination is recommended – only for people at high risk of serious complications; only for people over 65 years of age; only for people who are in contact with people at high risk of serious complications; **for all people over 6 months of age**	70	0.271
Influenza vaccination is recommended – once in a lifetime; every two years; **every year**; every five years)	58	**0.001**
The best time to get the influenza vaccine is – April to May; any time of the year; **October to November**; August to September	45	0.108
How long after vaccination is influenza protection fully functional – after two days; **after two weeks**; after one month; after five to seven days	44	0.217

% rounded to whole numbers; correct answers marked in bold; p-value corresponds to testing the null hypothesis of no statistically significant relationship between the field of study and answers to the question; numbers in bold indicate statistically significant values.

Significant majority of respondents were able to choose the right side effects of influenza vaccination (80%). In this question, however, a statistically significant relationship was found between the answer and the field studied with a medium effect size (p=0.027; V=0.138). Pre-service science teachers chose the correct answer statistically significantly more often (88%) than non-science pre-service teachers (74%), and pre-service primary school teachers (79%).

Attitudes of Pre-service Teachers towards Influenza and Vaccination

Respondents fully agree that pupils in schools are at risk of getting influenza (Table 3). They also agree that they themselves are at risk of getting influenza and that it is easily spread among people (Me=6). In the case of easy spread of influenza among people, a statistically significant difference was found in the evaluation of the question depending on the field of study of the respondents (p=0.021). However, the magnitude of the effect is weak ($\varepsilon^2 = 0.021$). Pre-service science teachers agree statistically significantly more with this item (Me=7).

The severity of influenza as an infection and public health problem is assessed by respondents at the middle of the scale; 31%, respectively 25% of respondents agree that vaccination against influenza is important for teachers and pupils, but only 17% of respondents agree with its importance for themselves. This corresponds to the perception of the advantages and disadvantages of influenza vaccination, where only 35% of respondents agree that the advantages outweigh the disadvantages (Me = 4). In this item, a statistically significant difference was found depending on the field of study with a small effect size (p=0.003; $\varepsilon^2 = 0.031$). Pre-service science teachers statistically significantly disagree with the predominance of benefits (Me=3). Only 28% of them lean towards the predominance of advantages compared to 45% of non-science pre-service teachers and 40% of pre-service primary school teachers.

Behaviour of Pre-service Teachers in Relation to Influenza Vaccination

Although respondents have relatively good knowledge, only 6% of them were vaccinated against influenza and only half of

Table 3. Median attitude assessment of pre-service teachers on influenza and influenza vaccination

Item	Median	p-value
Influenza is a relatively mild infection.	4	0.194
Influenza is a serious public health problem.	4	0.119
Influenza spreads easily among people.	6	**0.021**
School pupils are at risk of catching influenza.	7	0.106
I am at risk of catching influenza.	6	0.788
It is important that teachers get vaccinated against influenza.	4	0.325
It is important that pupils get vaccinated against influenza.	3	0.424
It is important for me personally to be vaccinated against influenza.	2	0.817
The advantages of influenza vaccination are smaller than its disadvantages.	4	**0.003**

Rated on a scale from 1 – strongly disagree to 7 – strongly agree; p-value corresponds to testing the null hypothesis about the non-existence of a statistically significant difference in the evaluation of a given question depending on the field of study of the respondents; numbers in bold indicate statistically significant values.

Table 4. Reasons for the respondents not vaccinating

Reasons for not vaccinating		Proportion of respondents (%)
Underestimation of the disease	Relying on their immunity and good health	17
	Low probability of catching influenza	11
	Influenza does not pose a great risk	7
	Preference for prevention and non-medicinal treatment	4
Comfort and disinterest	No reason to vaccinate	10
	Lack of time and motivation	8
	The vaccine is not equally effective against all types of viruses	6
	Does not know, does not think about it	5
Refusal of vaccination	Vaccination is risky	9
	Vaccination is an unnecessary burden on the body	6
	Vaccination causes influenza	5
	Vaccination is not effective	4
	Vaccination causes a violent reaction of the organism	2

them are vaccinated regularly; 9% of unvaccinated respondents have been vaccinated in the past and half of them are considering being vaccinated again in the future. Of all the currently unvaccinated respondents, only 26% are considering vaccination in the future; 253 respondents stated the reasons for their vaccine hesitancy (Table 4). Other reasons were not repeated by more than 1% of respondents, including financial reasons or lack of information.

DISCUSSION

The found respondents' knowledge was at a relatively high level. Similar findings were found in the research of students at universities (21) and high schools (22). Insufficient knowledge has been identified in several areas key to vaccination willingness and implementation. A significant proportion of respondents do not seem to distinguish influenza from other respiratory diseases, as they were unable to correctly choose season when they could become infected. This can cause underestimation of influenza, and behaviour leading to low vaccination coverage, including missing a suitable time to vaccinate.

More than half of the respondents believe that the vaccine contains an active virus, which may be a source of concern. A similar knowledge result was recorded among pre-service teachers in the USA (6). Pre-service science teachers showed better knowledge. In contrast, they appear to have misapplied the knowledge of re-vaccination in some diseases, stating that the effect of vaccination would increase in persons vaccinated twice.

There was a difference in the respondents' attitudes between the general assessment of influenza risks and the perception of vaccination. While they acknowledge the risk of influenza infection, they do not consider prevention in the form of vaccination to be so important. Overall, only 17% expressed a favourable opinion, but in the USA, it was 91% of the respondents (6). A similar disagreement was found with Italian healthcare workers as they do not agree that the vaccine is effective and that they should be vaccinated regularly (23). Czech pre-service teachers also tend to agree that the disadvantages of the influenza vaccination outweigh the advantages. Somewhat surprisingly, pre-service science teachers are more statistically significantly inclined towards this attitude. It seems to be crucial especially regarding the future influence on pupils, in which their motivation to be vaccinated cannot be expected (11, 12).

The low vaccination rate of respondents (6%) corresponds to the average vaccination rate of the population in the Czech Republic (4) as well as to surveys of Czech general medicine and public health students (24). At the same time, education workers, as well as public health workers, are one of the groups where influenza vaccination is explicitly recommended, as it can significantly reduce the negative impact of a possible influenza epidemic not only on this group but on the population as a whole (7, 25). A group of 26% of respondents, who are considering the possibility of vaccination in the future, proves to be key as it has the highest possibility of motivation for vaccination.

The given reasons for not vaccinating show that respondents most often underestimate the disease, refuse vaccination and have no active interest in it. Financial costs are probably not the main reason for not vaccinating. Similar reasons were found in further

research. For undergraduate public health students in Southern California, the main reasons for refusing vaccination were safety and underestimation of vaccination (25). The reasons most commonly given for missing immunisation of Italian healthcare workers were disagreement with vaccination, protective efficacy depending on circulating strain and sub-optimal protective efficacy (23). Underestimation of not only seasonal but also pandemic influenza A (H1N1) was found in Czech general medicine and public health students in 2009 (24), in college students in the USA (26), and university students in Australia (21).

The public considers the school (teacher) to be the second most important source of health information for children and young people after the family (12). Teachers are considered by the public to be ready to educate their students about health (12), but at the same time Czech citizens believe that teachers are rather not a healthy lifestyle example for their students. Mere knowledge is not a sufficient factor for pre-service teachers to get vaccinated against influenza as showed also in undergraduate public health students (25). Unfortunately, pre-service science teachers, who will teach the topic in secondary schools in particular, show even more negative attitudes towards vaccination than non-science pre-service teachers and pre-service primary school teachers. This may be a significant factor influencing the low vaccination rate of the population.

The obtained results are limited by the available sample of respondents from one faculty providing study for pre-service teachers. However, as attitudes to respiratory diseases and vaccinations do not affect the admission of students to universities, it can be assumed that the trends identified by the research may be more general. As the data collection took place before the Covid-19 pandemic, possible changes of pre-service teachers' attitudes as a result of this situation require further research.

CONCLUSION

Respondents achieved a high relative number of correct answers in knowledge questions. However, it is not reflected in the respondents' attitudes and subsequent behaviour. The pre-service science teachers show statistically significantly different results in 6 questions out of 21 compared to the non-science pre-service teachers and the pre-service primary school teachers. In five cases, they showed better knowledge, while in one case non-science pre-service teachers showed better knowledge. A lack of differentiating between influenza and other respiratory diseases and the belief that the flu vaccine contains a live virus were found in the significant group of pre-service teachers. The predominant negative attitudes towards influenza vaccination were found. Although pre-service teachers are aware of the possible risk of influenza, most of them think that it is not important for them to be vaccinated and only 6% of respondents were vaccinated at the time of completing the questionnaire. Most of them also believe that the disadvantages of vaccination outweigh the benefits. This is also shown by the stated reasons why they are not vaccinated. These include underestimation of the disease, refusal to vaccinate, and comfort and disinterest.

Adherence to Ethical Standards

All the data analysed in this study were collected at Charles University, Faculty of Education, without collecting any information regarding the identity of individuals. Students gave permission for participation in the study. Data processing was fully anonymous.

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