

CLINICAL STUDY

The issue of vaccine refusal: study of risky behaviour

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ABSTRACT

BACKGROUND: The aim of this study is to identify the influence of factors that determine the refusal of influenza vaccine among three subjects groups.

METHODS: A survey was conducted amongst three high-risk groups in years 2018–2019 (Moscow, Russia). The survey involved 1,620 parents and pregnant women (group 1), 324 doctors (group 2) and 433 students (group 3). The analysis revealed a poor vaccine uptake among respondents of all three groups.

RESULTS: According to the survey results, only 22.2 % of children and 13.8 % of adults were vaccinated against influenza. The group 2 showed higher rates for vaccinated adults and children, namely 36.7 % and 58.7 % , respectively. The lowest adherence to annual vaccinations was recorded in group 3 (only 17.3 %). There is also a negative correlation between adherence to vaccination and smoking (–0.66), unhealthy diet (–0.73), poor oral hygiene (–0.61) as well as insufficient awareness of the need of influenza vaccine (–0.81).

CONCLUSION: The general lack of vaccination awareness has a fundamental role in forming a negative attitude toward influenza vaccine. It is necessary to conduct research to promote vaccination against influenza to improve vaccine uptake among high-risk groups, particularly in students (Tab. 1, Fig. 1, Ref. 32).

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KEY WORDS: influenza, vaccine, smoking, vaccination awareness, prophylaxis.

Introduction

The global prevalence rate of influenza surpasses those of other infectious diseases and ranks it as the most dominantly spread infectious disease in the world (1). According to the World Health Organization, another feature of influenza is that it occurs as an annual epidemic (2). The spread of influenza is difficult to maintain, since its virus is characterised by high antigenic diversity (3). In addition, influenza is also recognised for its high pathogenicity and transmissiveness. Influenza is also characterised by its poor vaccination effect. The population in the productive age range of 18 to 40 years is particularly susceptible to influenza (4). Influenza is considered hazardous due to the wide variation in the severity of its complications. Pneumonia is the main complication

that occurs in up to 65 % of cases. Various forms of bronchitis occur as well, but with lower frequency ranging from 4 to 8 % (5, 6). Based on medical research, the greatest impact of vaccination lies in the prevention of influenza (7–9). The high-risk groups are the most in need of vaccination as they have higher chances of developing complications. These groups include children, seniors and also people suffering from any chronic diseases. The consequences of complications may even be fatal (10). The positive point of vaccination is that its implementation can provide protection also against other forms of SARS. Despite the long-term practice of vaccination, there is an ambiguous attitude towards influenza vaccine in society (11).

The most common reasons for vaccine refusal are either distrust in the medical system (for religious and other reasons), or lack of awareness of vaccine implementation (12). Due to the fact that influenza and SARS occupy about 90 % of all types of infectious pathologies, the influenza virus has a large genetic diversity, so the spectrum of pathologies is also quite wide. The consequences of influenza can vary from a mild respiratory disease to respiratory failure or acute respiratory distress syndrome (13). High risk groups of the population have a higher chance of a severe course of influenza. Immunosuppression is one of the causes that determine the severity of influenza. The risk of a high severity outcome and death is 4–5 times greater compared to the population groups not included in the high-risk list (14). For instance, recent studies have shown that the mortality rate among pregnant women could reach 20 % in such countries as China, Mexico, New Zealand and

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Canada. The studies were conducted during the pandemic caused by A(H1N1) influenza virus (8, 11, 13, 15). For the other two countries (USA and Australia), the mortality rate was at a lower level, from 1 to 16 % (16). Therefore, prompt vaccination can reduce the risk of severe complications.

The influenza epidemic is seasonal, so each epidemic causes serious damage to public health annually. Hence, mortality may also seasonally increase worldwide. Complications are mainly determined by influenza viruses of types A(H1N1), A(H3N2) and B (11). Other population groups with influenza complications include pregnant women, children under 5 years of age, and people with weakened immunity. Moreover, this group also includes medical workers. They are more likely to be infected through either interacting with a patient or visiting people from high-risk groups (4). According to the results of numerous studies, vaccination reduces the morbidity rates of influenza (5–9, 13). Beside high-risk groups, vaccination is also important for people who interact or live with individuals from high-risk groups. Some studies show that vaccination for a period of a season or several years can cover a proportion of population as high as 40%. However, there are population groups with a high level of vaccination refusal (17). This is facilitated not only by religious or personal beliefs, but also as a result of propaganda of total vaccine refusal (18). This statement refers to influenza and other respiratory diseases, for example, there is a significant protest movement against Covid-19 vaccination. As a result, the number of vaccine refusals increases significantly. This includes influenza vaccine as well (5). The influenza vaccine is a planned annual practice. According to WHO recommendations, annual vaccination should primarily be provided among high-risk groups, which include pregnant women, children aged six months to 5 years, elderly people over 65 years, doctors and people with chronic diseases (2). The current tendency of vaccination refusal has not been sufficiently investigated, while it is necessary to specify factors that can influence the decision to refuse vaccination. Risky behaviour as a characteristic of some groups of the population can be the reason for vaccine refusal (3). Existing studies usually cover solely one group of the population, mostly without taking into account the features of any other group (4, 6). The mentioned problem has determined the relevance of this study.

The aim of this study is to identify and evaluate the factors determining the vaccination refusal among three groups of respondents (doctors, students, parents, and pregnant women). The objectives of the study are to assess the awareness of the issues associated with influenza prophylaxis through vaccination (a); study the factors contributing to the vaccination refusal (b); and suggest approaches that can increase adherence to influenza vaccination. (c) The authors state that negative factors may be associated with poor awareness of vaccination mechanisms and bad habits such as smoking, poor oral hygiene, unhealthy diet.

Materials and methods

The sample

The study analysed a period of November 2018 – January 2019 in Moscow (Russia). According to its aim, a survey was

done among three groups of people. The first group consisted of parents of children who regularly visited a paediatrician or were treated in an in-patient care setting. Besides, this group included pregnant women who were in their third trimester and under the care of an antenatal clinic. The number of people interviewed amounted to 1,620. The second group included doctors of different medical specialties. The number of respondents in the second group amounted to 324. Lastly, the third group consisted of medical university students, the number of which reached 433. The students were of three different medical majors, however, in order to maintain anonymity, their specific majors are not disclosed. Therefore, the division is as follows: 119 students of the first medical major in their 4th or 6th year of study, 153 students of the second major in their 4th or 5th year and 161 students of the third major in the 1st, 5th or 6th year of study.

Ethical statement

This study was conducted in accordance with international standards of ethics and morality (Helsinki Declaration). All participants were guaranteed anonymity and confidentiality of information conveyed. Names, workplace or place and year of study are not disclosed. This was stipulated in the contract with each of the participants. The study was approved at a meeting of the Ethics Committee of (BLINDED) University (Protocol No. 4591).

Research design

The preselected groups of respondents are in some manner related to risk groups. Both doctors and pregnant women constitute risk groups directly, whereas parents can also be attributed there, since their children often contract SARS and other infectious diseases in kindergartens and then infect parents or other family members. Medical students may become doctors, which also means that they are going to become part of the risk group at a time point in the future. The study did not include people with chronic diseases, as well as those who refused to sign an informed consent that guaranteed the anonymity of the data conveyed, and also those thoroughly informed on the nature of the study. A comparison of three groups of respondents may indicate the difference in the effect of various negative factors occurring within these groups. The respondents were selected randomly.

Research methods

Surveys were used as a method of gathering data. Respondents were inquired to fill out questionnaires distributed in the form of Office documents in the public domain. A questionnaire for parents and pregnant women included 15 questions. All questionnaires were developed by the authors of this study. The questions for the first group of respondents included: questions about demography (age) (a); questions about social status (education, marital status) (b); degree of awareness of the need for annual prevention against influenza (c); questions about the respondents' level of commitment to vaccination in general, and particularly to vaccination against influenza (d). The questionnaire for the doctors from the second group consisted of 12 questions. In addition to data on demographic and social factors, and awareness

of vaccinations, these included professional opinion on questions associated with the need of immunoprophylaxis for patients. The questions were also aimed to find out how committed the doctors are to influenza vaccination and whether doctors and their children are vaccinated against influenza. The 12 questions addressing the respondents of the third group set out to examine the students' awareness of the need to vaccinate against influenza. There were two possible options given to survey participants: either to select one of the provided answers in response to a question or to provide their own answer in their own words. In order to maintain the representativeness of the third group's sample, only 10–30 % of the total number of students of different majors were included. Only fully filled out questionnaires with correctly displayed answers were taken into account for the analysis. There was an additional block of questions, namely on the regimen, nutrition, smoking and frequency of oral hygiene.

Statistical analysis

All the answers received were entered into the Excel 2016 database (Microsoft Corp., USA). Further analyses were performed using the Statistics 10 program (Statsoft Inc., USA). The data given in the article are absolute and relative values. The minimum significance level is $p \leq 0.05$, i.e. with a confidence interval of 95%. In order to estimate the statistical significance between different groups, the criterion χ^2 was used. Correlations were used to evaluate the relationship between the fact of vaccination refusal and presence of any factor (smoking, unhealthy diet, insufficient awareness of the need for vaccination, low level of oral hygiene).

Results

In Group 1 it was found that a significant part of the group is represented by age in range of 21 to 40 years, which is 84.3 % (or 1,367 parents). A majority of the respondents are female (1,145 people or 70.6 %). Respondents with higher education (928 people or 57.2 %) composed a majority of respondents, and those with secondary professional education (479 people or 29.5 %) followed. Almost all parents (98 %, or 1,590 respondents) had their children vaccinated. Most of the children receive a full vaccination program, according to the vaccination schedule (1,479 people or 93 %). The majority of respondents indicate that paediatricians determine the quality of information about the prevention of influenza by means of vaccination. It was also found that parents who vaccinate their children against influenza have a higher motivation to increase their awareness of vaccinations (72 %, $p < 0.001$). Responses to the issue of influenza vaccine were received in 94.5 % of cases (1,532 respondents). A proportion of 22.2 % of respondents (309 people) vaccinate solely their children (and no other family members), a slightly larger number of respondents (512 people or 33.4 %) vaccinate all family members. The least number of respondents (212 people or 13.8 %) vaccinate only adult family members. As a result, 499 people (or 32.5 %) remain not vaccinated against influenza.

In Group 2 almost one-half of the doctors surveyed (49 % or 159 doctors) was composed of paediatricians. A 77.5 % proportion of all doctors (251 people) were aged in range of 21–50

years. More than one-half of them (53 % or 171 people) worked in polyclinics. A 60 % proportion of doctors (191 people) not only supported vaccinations included in the vaccination schedule, but also considered vaccination against other common epidemiological diseases as compulsory. This was typical for the majority of paediatricians (70 % or 108 out of 159 people), as well as for doctors of such medical specialty as neonatologists (26 out of 41 or 63 %). The lowest rate of 16 % (2 people out of 12) was recorded among therapists. Doctors' opinions about the level of knowledge regarding the preventive value of vaccination were divided nearly equally, with 51 % of doctors (or 165 people) admitting that their knowledge was low, and the remaining 49 % (159 people) claimed that their awareness was at an adequate level. At the same time, sufficient knowledge was significantly more common among paediatricians (89 people out of 159 doctors, or 56 %, $\chi^2 = 5.98$, $p < 0.05$), as well as among neurologists (19 people out of 27 specialists, or 70 %, $\chi^2 = 4.52$, $p < 0.05$). It is worth of noting that there were also tendencies to admitting an insufficient level of knowledge among doctors of certain professions such as in 67 % of gynaecologists (28 people out of 42, $\chi^2 = 4.81$, $p \leq 0.05$), and 100 % of resuscitators (18 doctors, $\chi^2 = 18.46$, $p \leq 0.001$). One-third of doctors administer vaccinations set out in the vaccination schedule, including influenza vaccine (119 people or 37 %). Taking into account doctors of all medical specialties, it was revealed that more than one-third of paediatricians showed their adherence to regular vaccinations (59 out of 159, or 37 %), as well as approximately the same proportion of gynaecologists (16 out of 42 doctors, or 38 %), and a slightly larger proportion of anesthesiologists (19 out of 41, or 46 %). There were not any statistically significant differences found in relation to medical specialties. The majority of doctors (80 % or 262 people) had families with children, while 64 % (or 167 people) vaccinated their children according to the National Schedule of Preventive Vaccinations. Based on the responses given by these 167 people, it was found that 58 % of the doctors (98 people) gave flu shots to their children, including 44 % of paediatricians, 36 % of gynaecologists and 65 % of anesthesiologists. The majority of doctors (212 people or 62 %) tried to convince parents of their patients

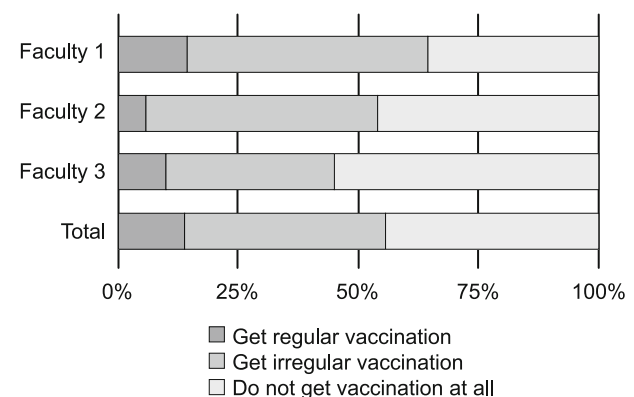


Fig. 1. The results of the survey conducted among the respondents of Group 3 (students).

Tab. 1. Results of the survey conducted among 433 respondents of Group 3.

The questions and answers options	Total number of students (433)		Faculty 1		Faculty 2		Faculty 3	
	number	95% confidence interval	number	95% confidence interval	number	95% confidence interval	number	95% confidence interval
What is the reason for your refusal of annual vaccination?								
It is useless	86	29 (24–34)	21	27 (22–32)	35	29 (23–37)	30	30 (21–40)
Lack of confidence in vaccination	68	23 (18–27)	14	18 (10–26)	28	23 (16–30)	26	26 (18–35)
Possible complications	96	32 (27–38)	34	44 (38–50)	39	50 (42–59)	23	23 (15–31)
Poor awareness of vaccine	44	15 (9–20)	8	10 (4–17)	17	14 (8–20)	19	19 (15–23)
How aware are you about influenza prevention through vaccines?								
Fully aware	276	64 (59–68)	105	65 (61–70)	90	59 (51–66)	81	68 (64–72)
Not aware	75	17 (14–21)	26	16 (11–21)	30	19 (13–25)	19	16 (12–18)
It's hard to answer	82	19 (15–22)	30	18 (13–24)	33	21 (15–28)	19	16 (12–18)

that vaccination was necessary in general, inclusive of the influenza vaccine. Moreover, they informed parents about the possible consequences of vaccination, as well as those associated with influenza itself and its complications.

In Group 3, most of the students indicated that vaccination against influenza is necessary (300 people or 69 %), 30 people or 7 % of students did not give a definite answer, and the remaining 101 students (or 23 %) believed that vaccination against influenza was not necessary. The results are displayed in Figure 1 and Table 1.

It was determined that students from Faculties 1 and 3 had statistically significant differences in their responses. These students were more likely to support the idea of compulsory vaccinations with 128 people or 79 % from Faculty 1, and 78 people or 65 % from Faculty 3, expressing this view. The statistical test showed significant differences between the faculties: for Faculty 1, $\chi^2 = 12.44$ (at $p \leq 0.001$), and for Faculty 3, $\chi^2 = 5.82$, at $p \leq 0.05$. Furthermore, it was found that 14 % of students receive a flu shot annually. Interestingly, there was a significant difference in the vaccination rates between Faculties 1 and 3, favouring Faculty 1, with a vaccination proportion of (33 %, $\chi^2 = 8.68$, $p \leq 0.01$). A negative response was received from 294 students; 32 % (96 people) of those were afraid of possible complications, and the view of vaccination being useless was recorded among 29 % or 86 people. The notion of distrust in any vaccine available was noted in 23 % (68 people) and 15 % were refusing vaccination based on insufficient knowledge about the need for vaccination (44 students). For the majority of respondents from Group 3 (298 people or 69 percent), there was no negative attitude to influenza vaccinations. The idea of refusing vaccination influenced by several factors: bad personal experience (52 people or 12 %) (a), negative opinion of relatives and friends (another 9 % or 42 people) (b), conclusions based on the information received from doctors (23 people or 5 %) (c); information received from media (18 people or 4 %) (d). The absolute majority of respondents from Group 3 indicated that influenza vaccination is effective (340 people or 78 %), 21 % or 93 people stated that vaccination in general is not effective against influenza. The majority of respondents (276 people or 63 %) claimed that they were well-informed in the issue of influenza prevention through vaccination, 75 people or 17 %

believed that they were insufficiently informed (Tab. 1). Most of the students did not find a clear answer to the question associated with the need for vaccination of pregnant women (189 people or 43 %), 93 people (21 %) answered “Yes”, another 151 people (34 %) answered “No”. There was also a correlation observed between the regularity of receiving annual vaccinations (or lack thereof) and the presence (or absence) of particular unfavourable life-style habits, including smoking -0.66 , unhealthy diet (-0.73) , insufficient oral hygiene -0.61 , as well as poor awareness of the need for influenza vaccine -0.81). The obtained results suggest that the participation in annual vaccination against influenza is mainly determined by the awareness of respondents and slightly less by the presence of bad habits.

Discussion

Some studies show that parents are highly adherent to vaccination and follow the age-associated recommendations of the vaccination schedule (19–21). The share of such parents ranges from 98 to 93 % in developed countries such as China, the European Union and the United States (22). The data obtained for Group 1 (parents and pregnant women) has a significantly lower percentage; only 33 % of respondents vaccinate all family members, another 22 % stated that they vaccinate only children, while about a one-third of respondents believe that there is no need for vaccination against influenza. This suggests that the adherence to vaccination in some countries may be very low. It is possible to improve these rates only by increasing public confidence in the issue of vaccination. It is well known that doctors are one of the risk groups in the influenza epidemic (23). In this regard, the majority of respondents from Group 2 (60 % of all doctors who participated in vaccination) believe that it should be compulsory to do both scheduled vaccination and vaccinations not included in the list. About 51 % of doctors admitted that their knowledge was insufficient. The results in Group 2 show that 58 % of children of the respondents are vaccinated against influenza, however there are only 36 % of respondents who reported that they get vaccinated themselves. This proves the fact shown in other studies that doctors are poorly motivated for personal vaccination (24, 25). According to data published, it is known that their refusal is

mainly due to distrust in vaccines, doctors do not believe in their full safety (26). In addition, they note that the social effect of vaccination against influenza is quite low, occasionally their knowledge about the influenza is insufficient (22). The studies conducted by a number of scientists show that about 10 % of doctors do not regard the idea of obligatory vaccination of healthcare workers justified, which could have an impact on the epidemic rates (27). Furthermore, it may influence public vaccination rates. According to the recommendations formulated by WHO, at least 75 % of the population should be vaccinated against influenza (2). The list of risk groups also includes students of medical universities, as they come into contact with patients during their internships, particularly in polyclinical settings. This warrants the inclusion of students from medical universities in the risk groups (28). However, since there is an obligation for all medical students to be vaccinated without exception, this situation can become controversial and potentially contribute to a negative attitude towards the influenza vaccine in the future. That was confirmed by the following data collected: the adherence to influenza vaccination amongst medical students is low. A major part of the students participating in the survey were undergraduates (5th–6th year of study) and 69 % of them support the idea of obligatory vaccination, although only 17 % follow this rule. The statistical data on vaccination adherence vary among individual faculties in range of 16 to 33 %. These students are future doctors who are responsible for elevating the adherence to vaccination among parents. Moreover, according to the results of some studies, parents believe that paediatricians have a decisive influence on their choice (29, 30). The prevailing reasons for vaccine refusal, particularly in case of influenza vaccine, are as follows: concerns about possible complications (a), lack of confidence in vaccines (b), and insufficient knowledge of vaccination methods (c). These opinions result from poor knowledge about vaccines and non-vaccination tendency on social networks as well as are impacted by media. Besides, only a fifth of the students (21 %) responded supported the notion of mandatory influenza vaccination for pregnant women. Healthcare workers are responsible for complications occurred because of their incompetence in the matter of vaccination. It is known that some complications of influenzas possibly occurring during embryonic development can be lethal for the embryo. However, according to the results of some studies, up to 73 % of doctors showed low awareness of the possible complications of influenza during pregnancy (22). In addition, about a third of doctors (33 %) believed that influenza vaccine was dangerous, and 13 % of doctors were not aware of influenza vaccine for pregnant women (27, 31, 32). In accordance with WHO recommendations, complications from influenza during pregnancy can be prevented if vaccination is given in a timely manner (2). Therefore, the results of the study combined with the fact that the opinions of medical students are going to impact the adherence of patients to vaccination indicate the need to promote the notion of vaccination against influenza. At the same time, the encouragement of a healthy lifestyle (smoking cessation, proper diet, regular oral hygiene procedures) can also have a positive impact on increasing the public motivation to vaccinate against influenza.

Conclusion

The majority of the respondents of Group 1 (parents, 1,590 people) regularly vaccinated their children, 93% of them (1,479 respondents) stated that their children are fully vaccinated in compliance with the vaccination schedule. All parents admitted that their opinion on the need for vaccinations is influenced by the viewpoint of their local paediatricians. Parents of vaccinated children have a higher motivation level to increase their knowledge of vaccination mechanisms (72%, $p < 0.001$). It was also found that the level of vaccine awareness among doctors (Group 2) depends on their particular medical speciality. For example, high level of knowledge was found in 56 % of paediatricians ($\chi^2 = 5.98$, $p \leq 0.05$) and 70 % of neurologists ($\chi^2 = 4.52$, $p \leq 0.05$). An insufficient level of knowledge about vaccination was revealed in a majority of gynaecologists ($\chi^2 = 4.81$, $p \leq 0.05$) and in all resuscitation specialists ($\chi^2 = 18.46$, $p \leq 0.001$). As for the students, a clear correlation was noticed between the reasons for vaccination refusal and the faculty they studied in. Thus, 79 % of students from Faculty 1 ($\chi^2 = 12.44$ at $p \leq 0.001$) and 65 % of students from Faculty 3 ($\chi^2 = 5.82$ at $p \leq 0.05$) admitted the need for influenza vaccination. At the same time, only 14 % of students received regular flu shots, 32 % of students refused to do so since they considered flu shots dangerous, 29 % believed that vaccinations did not bring any benefits, 23 % of the respondents did not have confidence in vaccines, and lastly, 15 % claimed that their refusal was associated with insufficient knowledge about vaccinations. Negative correlations were found between the adherence to vaccinations and factors such as smoking (–0.66), improperly balanced diet (–0.73), and poor compliance with oral hygiene (–0.61), as well as with low level of vaccination awareness (–0.81).

In order to increase the adherence to regular influenza vaccination, it is necessary to promote a positive attitude towards this issue among students during their studies, since their opinion will directly influence the patients' level of vaccination awareness in the future. In addition, promoting a healthy lifestyle can help increase the adherence to influenza vaccination. In the future, it is necessary to conduct research on identifying the ways to increase adherence to vaccination amongst healthcare workers. The main limitation of this study is that the number of survey participants did not comprise all existing risk groups; further studies should widen the list of investigated risk groups by people with chronic diseases and the elderly.

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