If a vaccine against COVID-19 was available, would you like to be vaccinated? And are you vaccinated against flu and other diseases? A survey among university students during state of emergency

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ABSTRACT

Aim: Achieving sufficient vaccination rate (and herd immunity respectively) is considered to be the most promising strategy for prevention of outbreaks of novel coronavirus disease in future. The main aim of this work was to compare willingness of university students to receive vaccine against COVID-19 with vaccines for adults against other well-known diseases. Another aim was to assess students´ opinion on growing trend of parents refusing to vaccinate children.
Methods: The online questionnaire shared with students consisted of 12 questions. It was distributed via university bulk emails and social media.
Results: 3,133 students responded to our questionnaire. Overall university response rate was 15.9%. Students of our university showed significantly much stronger interest in receiving vaccine against COVID-19 than vaccine against other diseases ($p < 0.0001$). Students also showed strong pro-vaccination attitude to vaccination of children.
Conclusion: The study showed very well sudden change of attitude of university students to vaccination of adults at the time of strong restrictive regulations. Most of university students had pro-vaccination attitude to vaccination of children.

KEY WORDS
vaccination – students – survey – COVID-19

SOUHRN

Sněhota M., Vlčková J., Čížková K., Klásková E., Kolářová H., Kollárová H.: Pokud by byla k dispozici vakcína proti covid-19, chtěli byste být očkováni? A jste očkováni proti chřipce a jiným nemocem? Průzkum mezi studenty vysokých škol v době nouzového stavu

Cíl: Dosažení dostatečné proočkovanosti (respektive kolektivní imunity) je považováno za nejslibnější strategii prevence ohnisek nového onemocnění způsobeného koronaviry v budoucnosti. Hlavním cílem této práce bylo porovnat ochotu vysokoškolských studentů nechat se očkovat proti covid-19 s možnostmi očkovat se proti jiným známým chorobám. Dalším cílem bylo posoudit názor studentů na rostoucí trend rodičů odmítajících očkování dětí.
Metody: Studentům byl rozeslán online dotazník obsahující 12 otázek. Dotazník byl distribuován prostřednictvím univerzitních hromadných e-mailů a sociálních médií.
Výsledky: Na náš dotazník odpovědělo 3 133 studentů. Celková návratnost odpovědí univerzity byla 15,9 %. Studenti naší univerzity projevili významně mnohem větší zájem o očkování proti covid-19 než o vakcíny proti jiným nemocem ($p < 0,0001$). Studenti také prokázali silný proočkovací postoj k očkování dětí.
Závěr: Studie ukázala velmi dobře náhlou změnu postoje studentů vysokých škol k očkování dospělých v době přísných omezujících předpisů. Většina vysokoškolských studentů měla k očkování dětí proočkovací postoj.

KLÍČOVÁ SLOVA
očkování – studenti – průzkum – covid-19

Epidemiol Mikrobiol Imunol, 2021;70(3):147–155

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INTRODUCTION

Edward Jenner is considered to be the first one who performed vaccination. He inoculated 8-years old James Phipps with a material from active cowpox lesion. Then, he exposed James to smallpox and the boy did not develop the disease [1]. Jenner's method became quickly widespread at the beginning of 19th century [2]. However, real development of vaccines began in 20th century with scientific advances in the field of immunology and microbiology [3].

Vaccines against many diseases have been and are still being developed and improved. Even though the only disease that was eradicated by vaccination is smallpox [4], vaccination helps mankind to control incidence of many other diseases very efficiently. Unfortunately, vaccination rates are much lower in adults than in children. Indeed, 350 times more adults die of vaccine-preventable diseases in USA every year (100–300 deaths of children compared to 50000–70000 deaths of adults) [5]. Several institutions try to improve vaccination rates in adults. For example, CDC's (Centers for Disease Control and Prevention) webpage shows a motto: "Attention Adults: You Need Vaccines Too!" [6]. EFIM (European Federation of Internal Medicine) started a campaign ADVICE (Adult Vaccination Campaign in Europe) several years ago to increase awareness and vaccination rates among adults [7]. In USA, there is a Healthy People 2020 initiative with a goal of increasing vaccination rates among adults [8]. Despite huge efforts carried out by these institutions the vaccination rates among adults still remain low [9, 10, 11].

On 11th March 2020 WHO (World Health Organization) declared COVID-19 to be a pandemic [12]. COVID-19 first appeared in China, Wuhan at the end of 2019 and since then it spread worldwide [13] and became great global public health concern [14]. A patient suffering from COVID-19 usually presents with symptoms of respiratory tract infection such as dry cough, fever and dyspnea [15]. However, the course of COVID-19 can range from completely asymptomatic state to very severe condition requiring hospitalization at intensive care unit. Risk factors such as higher age or presence of other comorbidities may potentiate severe course of the disease [16]. On the other hand, young and healthy adults are also at certain, but lower risk of developing severe condition [17]. The most effective long-term strategy for prevention of future outbreaks of the novel coronavirus disease would be the development of a vaccine providing protective immunity since no other therapies have been shown really effective to date [18].

Aim

The main aim of this work is to assess (and point out to) the eventual change of university students´ attitude to vaccination of adults at the time of strong restrictive regulations implemented due to emerging COVID-19 pandemic. The main point of this work is to compare students´ attitude to vaccination of adults against "well-known" diseases such as flu or tick-borne encephalitis with attitude to potential vaccine against COVID-19. We would also like to slightly touch the problematics of anti-vax movement and health literacy.

METHODS

Participants

A cross-sectional survey was conducted from 16th April to 31st May 2020 at Palacký University Olomouc (Czech Republic). The state of emergency in Czech Republic was declared from 13th March to 17th May 2020. Our cohort consisted of students of Palacký University Olomouc. Students of all 8 faculties (Sts Cyril and Methodius Faculty of Theology, Faculty of Medicine and Dentistry, Faculty of Arts, Faculty of Science, Faculty of Education, Faculty of Physical Culture, Faculty of Law and Faculty of Health Sciences) were kindly asked to respond to our online survey. The total number of students at Palacký University was 20042 at the time of distribution of questionnaire.

We shared our kind request with students via university bulk emails (with help of IT centres of particular faculties) and social media (facebook). The purpose of survey was briefly explained to students when sharing the invitation for participation. The questionnaire was available at online server www.survio.com which automatically saves the answers in digital form. The questionnaire was completely anonymous. All students filled the questionnaire in at voluntary basis since they received neither any credit nor any other type of reward. It was not possible to fill the questionnaire in from the device of same IP address twice.

Questionnaire

To assess change of students' attention to vaccination of adults at the time of strict restrictive regulations we introduced a structured questionnaire that comprised of 12 questions. It was possible to fill the questionnaire in either in Czech or in English. The questionnaire consisted of 4 main parts.

In the first section (5 questions) we asked the students to state their gender, year of birth, faculty they attended, type of study programme (bachelor, follow-up master, master and Ph.D.) and type of study (full-time or part time). It was not possible to submit the survey unless all these questions were answered.

In the following section (4 questions) we asked the students if they received any extra vaccines apart from the compulsory ones during childhood. In case of positive answer, the student was asked to state which vaccines and the reason for vaccination. In this section we also asked the students if they planned to receive any extra vaccinations. Information concerning reason and type of vaccine were also collected.

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Table 1. Total number of students, the portion of respondents and response rate at different faculties

	Total number of students	Total number of respondents	Response rate
Sts Cyril and Methodius Faculty of Theology	913	125	13.7%
Faculty of Medicine and Dentistry	2311	403	17.4%
Faculty of Arts	4735	814	17.2%
Faculty of Science	3389	607	17.9%
Faculty of Education	4729	756	16.0%
Faculty of Physical Culture	1682	178	10.6%
Faculty of Law	1454	160	11.0%
Faculty of Health Sciences	829	147	17.7%
Palacký University Olomouc (total)	20042	3190	15.9%

The third section consisted of a single question monitoring if a student would like to voluntarily receive a vaccine against COVID-19 if it was available.

The last section comprised of 2 free answer questions. The first one asked students about their opinion on growing trend of parents refusing to vaccinate their children. Even though this is a little bit off-topic question, we decided to implement it since this trend has been one of big health issues recently. The answers were classified by 2 independent reviewers to 5 categories: 1) The student disagreed with the trend, 2) The student supported the trend, 3) The student believed vaccination of children should be parents' decision, 4) The student was either undecided or did not have enough information and 5) The student gave answer which was not relevant to question. The cases with different evaluation received by the 2 reviewers were went through and a consent was made in all of these cases. The last question gave students space for any further comments.

Statistical analysis

The contingency table chi-square test at level of significance $p < 0.05$ was used to compare differences in students' attitude to vaccination against other diseases and against COVID-19. All calculations were performed in GraphPad Prism 8 (GraphPad Software, San Diego, USA). For these calculations, the answers "Yes" and "Rather yes" to question 10 were assessed together as "Yes". The same approach was applied to "No" and "Rather no" answers. The answer "I do not know" to question 10 was not included in the evaluation. This approach was adopted for statistical comparison because students could either answer to question 8 "No" or they could choose particular disease(s) they intend to be vaccinated against. Students' answers to question 11 (attitude to vaccination of children) were classified to 5 main categories (see above). Same software and statistical test were used for data analysis.

RESULTS

Response rates

The total number of students who completed the online survey was 3133. 88.4% of respondents managed to complete the survey within less than 10 minutes. 3044 students (97.2%) completed the survey in Czech and 89 students (2.8%) completed the survey in English (59 of them come from Faculty of Medicine and Dentistry). Total number of students, the portion of respondents and response rate at faculties are shown in Table 1. Overall Palacký University response rate was 15.9%. Please note that the total sum of respondents 3190 (out of 20042) is caused by the fact that some students study at two or more faculties of Palacký University Olomouc.

Students' data

Out of 3133 respondents 2397 (76.5%) students were women and 736 (23.5%) students were men.

405 students (12.9%) were born before 1990, 711 students (22.7%) were born from 1990 to 1995 and 2017 students (64.4%) were born after 1995.

1628 students (52.0%) studied bachelor, 640 students (20.4%) studied follow-up master, 673 students (21.5%) studied master and 216 students (6.9%) studied Ph.D. study programme.

Most of the students (2545, i.e. 81.2%) chose to study in full-time form.

Table 2 shows answers to 6th question "Did you receive (or got re-vaccinated) any other vaccine apart from the ones which are compulsory for children in your country?" 763 students (24.4%) reported they did not receive any extra vaccination. Vaccination against 4 diseases showed vaccination rates above 30% (namely hepatitis B – 1298 students, 41.4%; tick-borne encephalitis – 1163 students, 37.1%; hepatitis A – 1053, 33.6% and HPV – 952 students, 30.4%).

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Table 2. Vaccination rates against different diseases preventable by voluntary vaccination in the Czech Republic

	Count
No	763 (24.4%)
Flu	460 (14.7%)
Pertussis	688 (22.0%)
Measles	775 (24.7%)
HPV	952 (30.4%)
Hepatitis A	1053 (33.6%)
Hepatitis B	1298 (41.4%)
Tick-borne encephalitis	1163 (37.1%)
Meningococcus	522 (16.7%)
Pneumococcus	309 (9.9%)
Other	251 (8.0%)

Most of the students who did not answer "No" to 6th question (2,370, i.e. 75.6%) reported that the reason for vaccination had been prevention (2019, i.e. 85.2%).

Table 3 shows answers to 8th question "Do you consider getting vaccinated or re-vaccinated against any disease?" 1810 students (57.8%) do not consider receiving any extra vaccination. Rest of students (1323, i.e. 42.2%) chose at least one disease they wanted to get vaccinated against. The most favourite vaccinations were the ones against tick-borne encephalitis (623 students, i.e. 19.9%) and flu (473 students, i.e. 15.1%). The main reason for receiving extra vaccination was prevention against particular disease (90.5%).

Table 3. Plans of students to receive any extra vaccination

	Count
No	1810 (57.8%)
Flu	473 (15.1%)
Pertussis	70 (2.2%)
Measles	73 (2.3%)
HPV	192 (6.1%)
Hepatitis A	167 (5.3%)
Hepatitis B	153 (4.9%)
Tick-borne encephalitis	623 (19.9%)
Meningococcus	138 (4.4%)
Pneumococcus	78 (2.5%)
Other	133 (4.2%)

Most of students who did not answer "No" to 8th question (1343, i.e. 42.9%) reported that the reason for vaccination was prevention (1216, i.e. 90.5%).

Table 4 shows students' attitude to potential vaccination against COVID-19 and if they would like to be voluntarily vaccinated if a safe vaccine was available. 1757 students (56.7%) reported they would like to receive vaccine against COVID-19 if it was available which is much more than in case of vaccination against any other disease(s) – 1343 students in total (43.3%). Moreover, only 928 students (29.6%) reported they would not voluntarily receive vaccine against COVID-19 which is much less to vaccines against other disease(s) – 1810 students (57.8%).

Table 4. Overall results to question "If a certified vaccine against COVID-19 was available, would you like to be voluntarily vaccinated?"

	Count
Yes	759 (24.2%)
Rather yes	998 (31.9%)
I do not know	448 (14.3%)
Rather no	603 (19.2%)
No	325 (10.4%)

Comparison and statistical analysis of difference between plans of students (divided by sex, faculty, study programme and language of studies) to receive any extra vaccination and their attitude to potential vaccination against COVID-19 is shown in Figure 1. The statistical comparison showed that the change in attitude of students to vaccination against COVID-19 and other diseases was statistically significant with *p* value being mostly below 0.0001. Detailed analysis did not show any outstanding value of *p* when the results were analysed according to sex, faculty, study programme and language of studies.

Comparison and statistical analysis of difference between students´ attitude (divided by sex, faculty, study programme and language of studies) to growing trend of parents refusing to vaccinate children is shown in Table 5. 2417 students (77.1%) answered this voluntary question. Overwhelming majority of them (2179, i.e. 90.2%) were against the trend and supported vaccination in childhood. Some of the answers were strongly expressive. Only 72 students (3.0%) supported the trend and were against vaccination in childhood. Rest of students (166, i.e. 6.9%) either wanted to leave decision up to parents, did not have enough information or wrote off-topic answer. The difference in answers was not statistically significant between men and women ($p = 0.2640$) which was not the case of students of different faculties, study programmes and language of studies ($p = 0.0017$, $p = 0.0361$ and $p = 0.0089$ respectively).

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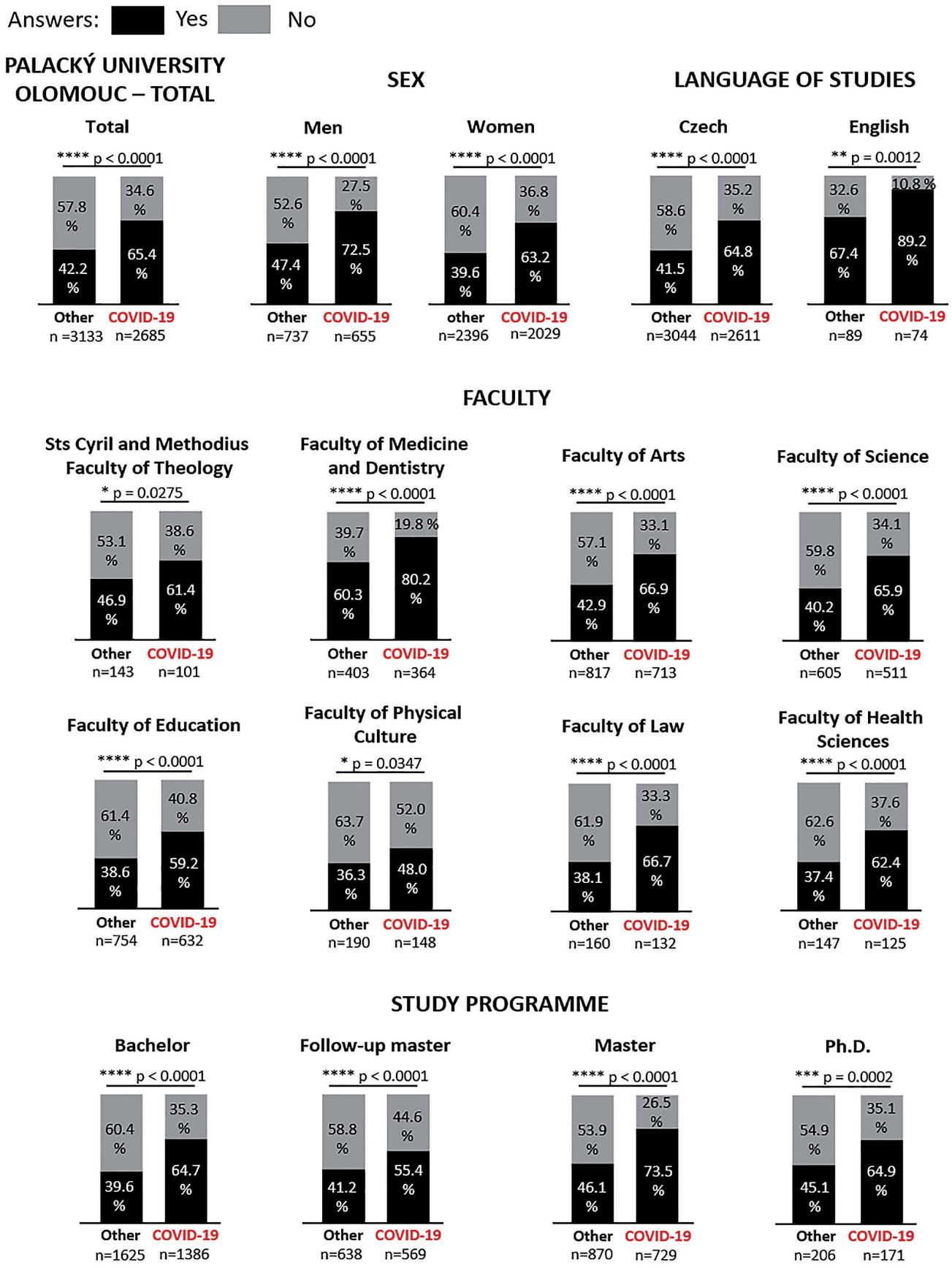


Figure 1. Change of students' attitude to "regular" vaccination of adults and attitude to potential vaccination against COVID-19 (divided by sex, faculty, study programme and language of studies)
The results were evaluated by contingency table chi-square test.
NS – non-significant, *p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001

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Table 5. Students' attitude (divided by sex, faculty, study programme and language of studies) to growing trend of parents refusing to vaccinate children

Palacký University Olomouc – total						
Total/Answer	1	2	3	4	5	
Palacký University – total	2178 (90.3%)	71 (2.9%)	52 (2.2%)	66 (2.7%)	45 (1.9%)	
Sex						
Sex/Answer	1	2	3	4	5	p value
Men	546 (91.5%)	13 (2.2%)	10 (1.7%)	13 (2.2%)	15 (2.5%)	NS 0.2640
Women	1632 (89.9%)	58 (3.2%)	42 (2.3%)	53 (2.9%)	30 (1.7%)	
Faculty						
Faculty/Answer	1	2	3	4	5	p value
Sts Cyril and Methodius Faculty of Theology	96 (92.3%)	3 (2.9%)	2 (1.9%)	1 (1.0%)	2 (1.9%)	** 0.0017
Faculty of Medicine and Dentistry	258 (97.4%)	0 (0.0%)	0 (0.0%)	2 (0.8%)	5 (1.9%)	
Faculty of Arts	567 (88.0%)	20 (3.1%)	21 (3.3%)	24 (3.7%)	12 (1.9%)	
Faculty of Science	421 (91.9%)	15 (3.3%)	6 (1.7%)	10 (2.2%)	4 (0.9%)	
Faculty of Education	509 (86.9%)	23 (3.9%)	17 (2.9%)	21 (3.6%)	16 (2.7%)	
Faculty of Physical Culture	116 (85.9%)	6 (4.4%)	4 (3.0%)	7 (5.2%)	2 (1.5%)	
Faculty of Law	110 (94.8%)	4 (3.4%)	0 (0.0%)	0 (0.0%)	2 (1.7%)	
Faculty of Health Sciences	96 (91.4%)	3 (2.9%)	2 (1.9%)	4 (3.8%)	0 (0.0%)	
Study programme						
Study programme/Answer	1	2	3	4	5	p value
Bachelor	1083 (88.6%)	47 (3.8%)	31 (2.5%)	38 (3.1%)	24 (2.0%)	* 0.0361
Follow-up Master	457 (89.8%)	11 (2.2%)	15 (2.9%)	17 (3.3%)	9 (1.8%)	
Master	486 (93.6%)	13 (2.5%)	4 (0.8%)	5 (1.0%)	11 (2.1%)	
Ph.D.	170 (90.4%)	4 (2.1%)	4 (2.1%)	8 (4.3%)	2 (1.1%)	
Language of studies						
Language of studies/Answer	1	2	3	4	5	p value
Czech	2108 (90.1%)	71 (3.0%)	53 (2.3%)	67 (2.9%)	41 (1.8%)	** 0.0089
English	71 (92.2%)	1 (1.3%)	0 (0.0%)	0 (0.0%)	5 (6.5%)	

Evaluation of answers:
1. The student disagreed with the trend.
2. The student supported the trend.
3. The student believed vaccination of children should be parents' decision.
4. The student was either undecided or did not have enough information.
5. The student gave answer which was not relevant to the question.
NS – non-significant, *p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001

DISCUSSION

Based on Kotrlik and Higgins (2001) and Draugalis and Plaza (2009), the smallest size of a sample from a population of 20000 people to be representative is required to be at least 377 respondents [19, 20]. We collected data from 3190 respondents (out of 20042 students). Thus, results of our survey can be considered as representative of whole Palacký University Olomouc. The response rates at different faculties ranged from 10.6% (Faculty of Physical Culture) to 17.9% (Faculty of Science) with overall university average of 15.9%.

Women are in majority in our cohort of respondents. Palacký University is focused on natural, humanistic and health sciences with lack of engineering and technical field. In these fields of study women tend to predominate [21] which is also the case of our cohort.

Most of students were born after 1990 (87.1%) and studied in full-time form (81.2%). Approximately half of students (52.0%) studied bachelor study programme, 48.0% students attempted for higher academic degree.

Question 6 "Did you receive (or got re-vaccinated) any other vaccine apart from the ones which are compulsory for children in your country?" monitors actual vaccination rates against particular diseases among students of our university. In 2001 the Czech Republic included vaccination against hepatitis B among compulsory vaccinations based on WHO recommendation.

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Moreover, in the same year children that were 12 years of age or younger were vaccinated. Thus, Czech citizens born in 1989 or later should be vaccinated against hepatitis B. Nowadays, vaccine against hepatitis B is a part of hexavalent vaccine. It still remains a question whether completion of vaccination schedule provides lifetime protection [22] however, there is vast amount of literature reporting long-term protection [23, 24] and booster vaccination is not recommended [25]. 2650 out of 3044 Czech students were born in 1990 and later. Out of these 2650 students 1113 (42.0%) reported they received extra vaccination against hepatitis B. This may point out to quite bad knowledge and awareness of vaccination among Palacký University Olomouc students since all 2650 should have received the vaccine against hepatitis B obligatorily. Kucera et al. (2016) showed in their study that 54.1% of Czech adults (above 15 years of age) have quite low health literacy in the field of prevention of diseases when compared to best countries in European Union. However, health literacy improves with increasing level of education [26]. The main reason for receiving extra vaccination was prevention against particular disease (85.2%).

Question 8 "Do you consider getting vaccinated or re-vaccinated against any disease?" monitors the intention of students to get vaccinated against several diseases in future. The intention of 19.9% of students to receive vaccine against tick-borne is coherent with data acquired by Nejezchlebova et al. who reported vaccination rate slightly exceeding 20% among students of Faculty of Science of Masaryk University Brno (Czech Republic) [27]. Quite high interest in vaccination against tick-borne encephalitis may result from the fact that the Czech Republic is highly endemic country for this disease. The results are better than vaccination rates reported in Poland [27] and Slovenia [28] even though these countries are also highly endemic for tick-borne encephalitis. For example, a survey conducted among students in Slovenia reported vaccination rate of 12.4% [28]. 15.1% of students planned to receive flu vaccine which corresponds to vaccination rates reported at other universities. For example, students at Brigham Young University (USA) showed vaccination rate against flu of 12% [29]. Another study carried out at Northern Kentucky University (USA) reported 15.8% of students want to receive vaccine against H1N1 [30]. Students of California State University (USA) reported 20.6% vaccination rate against flu [31].

Our study shows that considerably bigger portion of students plans to receive vaccine against COVID-19 when compared with the rest of diseases (56.7% versus 43.3%). Sudden change of attitude to vaccination of adults of whole cohort of our students is strongly significant ($p < 0.0001$). Further detailed statistical analysis of students´ attitude to vaccination against "well-known" diseases and COVID-19 based on subdivision of students according to sex, faculty, study programme and language of their studies showed to be statistically significant in all groups, with p value being mostly < 0.0001 (see Table 4). Only students of Sts Cyril and Methodius Faculty of Theology and Faculty of Physical Culture showed lower level of statistical significance ($p = 0.0275$ and 0.0347 respectively). Students studying in English also showed slightly lower level of significance however, this level may have arised from small number of English respondents. Change of students´ attitude to vaccination of adults may be caused by psychological impact of a lockdown of Palacký University Olomouc and also by a massive media campaign. There has already been published considerable amount of literature describing increased levels of anxiety and stress among university students based on COVID-19 Fear Scale (FCV-19S) [32]. For instance, Husky et al. reported increased levels of fear and anxiety due to COVID-19 among university students in France [33]. Another study reported moderate level of fear among Spanish university students [34] which is also coherent with data acquired by Reznik et al. in case of university students in Eastern Europe [35]. It's also expected that students' attitudes to vaccine against COVID-19 might change due to possible COVID-19 re-infections that has already been reported in several countries including the Czech Republic [36].

On the other hand, many studies concerning vaccinations of adults against "well-known" diseases showed low level of university students´ interest in receiving the vaccines. Indeed, a survey among university students attending University Health Centre in the US revealed vaccination rate of 28% [37]. A cross-sectional survey conducted among student nurses at University of Nottingham revealed that only 12.2% nurse students (out of 430) received flu vaccine on regular basis and the main reason for not receiving the vaccine was its unnecessity [38]. Moreover, a study among student nurses in Ireland showed that less than 20% of them received flu vaccine in the past [39]. On the other hand Kassianos et al. (2018) reported that there is still room to improve both vaccination acceptance and advocacy rates in European healthcare workers [40]. Healthcare workers are considered as a key element in improving vaccine uptake. Another study reported 33.7% willingness of student nurses to receive vaccination against HPV [41]. However, willingness of students from control group to receive the vaccine was only 13.4% [41]. Moreover, Lee and Park revealed just 5.5% vaccination rate against HPV in Korean university students [42]. All the studies called for increasing vaccination rates.

Interest of students in COVID-19 vaccine at our university may seem lower when compared to surveys conducted in other countries. For example interest of Chinese university students in receiving COVID-19 reached 92% (out of 472 students) [43]. Moreover, Gruner et al. (2020) showed that 84.8% of German university students (out of 1457) were interested in

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vaccination against COVID-19. Surprisingly the interest was lower among students of healthcare sciences [44]. Lower percentage of students of Palacký University Olomouc that were interested in COVID-19 vaccine results from the fact that the answers in the two aforementioned studies were dichotomized to "yes" and "no" possibilities without possibility of "I do not know" answer. However, this is not the case of a study conducted in Italy. 86.1% of students (out of 735) were interested in receiving a vaccine against COVID-19. In this study the students had the possibility of "I do not know answer". On the other hand, the authors of study admit that nearly 60% of students came from Lombardy, at the time of survey one of the most hit regions [45].

There are also several studies monitoring the attitude to COVID-19 vaccination among students of healthcare sciences. For example students of general medicine and dentistry at Jordan University of Science and Technology showed interest in COVID-19 vaccine in 81.6% (out of 483) [46]. Similar value (79.8%) was revealed by Gruner et al. (2020) among 208 students of healthcare sciences at German university [44]. General medicine students reported 77.0% interest in vaccination at university in South Michigan [47]. Students at Faculty of Medicine and Dentistry of our university wanted to get vaccinated against COVID-19 in 80.2%. This result is similar to the ones reported among healthcare students at other universities. Outstanding result was reported among students of general medicine and dentistry and university staff in Malta who showed only 44.2% (out of 825 respondents) interest in receiving a vaccine against COVID-19. Other 25.3% of respondents chose "I do not know answer." [48]. It is estimated that 70% vaccination rate will be necessary for achieving herd immunity threshold in case of COVID-19 [49,50].

Question 11 assessed students' attitude to growing trend of parents refusing to get their children vaccinated. All students of Faculty of Medicine and Dentistry of our university neither supported the trend of vaccination refusal nor wanted to leave the decision up to parents. On the other hand, students of Faculty of Law took a clear position on the problematics as none of them neither wanted to leave the decision up to parents nor felt not having enough information. The highest pro-vaccination attitude was reported among students of Faculty of Medicine and Dentistry (97.4%) and the lowest one was reported among students of Faculty of Physical Culture (85.9%). Least supporters of anti-vax movement were found among students of Faculty of Medicine and Dentistry (0.0%) and most of them were reported in group of students of Faculty of Physical Culture (4.4%). When divided to groups according to study programme, students showed slightly increasing pro-vaccination attitude and slightly decreasing support of anti-vax movements with increasing level of education. This finding corresponds with Kucera's conclusion of increasing health literacy with increasing level of education [26].

Anti-vaccination movements have been implicated in lowered vaccine acceptance rates and in the increase in vaccine-preventable disease outbreaks and epidemics [51]. In 2019 WHO listed vaccine hesitancy as one of the top 10 threats to global health [52]. However, university students usually show strong pro-vaccination attitude [53, 54] which is also confirmed by our work.

Last question gave students room for any further comments. 471 students (15.0%) left a comment. Most of them either wished our work good luck, repeated what was already answered or regretted current bad situation concerning vaccination.

CONCLUSION

Results of our survey are representative. Sudden change of students' attitude to vaccination against "well-known" diseases and to COVID-19 is statistically strongly significant ($p < 0.0001$). The change may result from psychologic impact of strong restrictive regulations, lockdown of the university and unpredictability of COVID-19 situation for future. Students of Palacký University Olomouc also showed strong positive attitude to vaccination of children. It remains an open question whether herd immunity threshold will be achieved by vaccination in case of COVID-19 without necessity of implementing legislative measures.

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Do redakce došlo dne 19. 11. 2020.

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