Wien Klin Wochenschr (2017) 129:59–64
DOI 10.1007/s00508-016-1062-1

Wiener klinische Wochenschrift
The Central European Journal of Medicine

Vaccine hesitancy in Austria

A cross-sectional survey

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Received: 27 March 2016 / Accepted: 19 July 2016 / Published online: 26 August 2016

Summary
Background Vaccine hesitancy is an emerging phenomenon particularly in industrialized nations. It has led to repeated epidemic outbreaks of otherwise vaccine-preventable, infectious diseases. Compared to other countries very low rates of influenza and measles vaccination rates have been reported in Austria.
Methods We performed a single-center cross-sectional, questionnaire-based survey. A total of 350 adult patients attending our emergency room participated in this survey. We assessed knowledge and attitudes towards vaccination and the associated infectious diseases.
Results Out of 350 participants 40 (11.4 %) declared that they deliberately refused vaccinations. Most common reasons for non-vaccination were fear of adverse effects (35.9 %), doubt of effectiveness of vaccines (35.9 %) and distrust towards the pharmaceutical industry (23.1 %). Of all 350 participants only 148 (42.3 %) thought themselves to be sufficiently informed about national vaccination recommendations as stated in the Austrian National Vaccination Program (ANVP). General practitioners (GP) were the primary source of healthcare-related information for 256 (73.1 %) participants. Furthermore, GPs as well as hospital-based physicians achieved the highest level of trust in this study population.
Conclusions The results of our study underline the necessity of comprehensive informational campaigns on the merits of vaccination. A lack of knowledge about the benefits of vaccination, uncertainty and unfounded fears seem to prevent the achievement of recommended vaccination rates. Family GPs enjoyed the highest levels of trust in our study population. We believe that additional information communicated by GPs could help boost the low vaccination rates. This study underlines the important role of primary care practitioners in informing patients about vaccines and healthcare topics.

Keywords Vaccine hesitancy · Measles outbreaks · Vaccination · Influenza vaccination · Measles vaccination

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Introduction

Immunization by vaccination prevents 2–3 million deaths worldwide from diphtheria, tetanus, pertussis and measles annually [1]. Due to measles vaccination there has been a 75 % drop in measles-associated deaths between 2000 and 2013 worldwide; nevertheless, in 2013, there were still 145,700 recorded worldwide deaths due to measles infection [2]. A herd immunity threshold of 92–94 % is necessary to prevent sustained spread [3].

Another vaccine-preventable disease that causes even more deaths globally is influenza. Worldwide, annual epidemics are estimated to result in approximately 3–5 million cases of severe illness and 250,000–500,000 deaths [4]. In Austria, between 350,000–400,000 cases of influenza and influenza-like illnesses are reported each year [5]. The influenza

vaccine has also been proven to decrease morbidity and mortality during seasonal influenza epidemics and is the cheapest and most effective way to battle influenza [6]. In Austria, vaccination coverage against these diseases does not reach the levels recommended by the World Health Organization (WHO) [7]. During recent years the reported annual influenza vaccination rates of the general population ranged between 10 and 21 % [5, 8, 9]. While in third world countries successful vaccination programs are predominantly hindered by limited resources and infrastructure, in industrialized countries other factors contribute to the low vaccination rates. Over the last decades, vaccine hesitancy and even complete vaccination refusal has become a major health concern in industrialized countries. Non-medical reasons for immunization exemptions (e.g. religous or personal beliefs) have been associated with multiple outbreaks of communicable diseases such as measles and pertussis [10]. The WHO defines vaccine hesitancy as a delay in acceptance or utter refusal of vaccines despite availability of vaccine services. Several motives contribute to vaccine hesitancy. The subjective perception of risk to acquire a specific disease is directly correlated with the disease incidence; therefore, a low disease incidence leads to a false sense of individual safety and correspondingly it makes possible side effects of vaccinations seem more dangerous than the disease itself [11]. Therefore, the low incidence of communicable diseases, such as measles and pertussis, achieved by vigorous vaccination campaigns in the past has in turn led to decreasing vaccination numbers [12]. Other contributing factors are misconceptions about the disease's seriousness (e.g. "children's diseases"), the subjective high price of vaccines, the belief that natural immunity is more effective than using vaccines and vaccine refusal simply on principle [6, 13, 14]. As a result growing apprehension about the risks of vaccines and subsequent low vaccination rates have recently led to a number of outbreaks of vaccine-preventable diseases [14]. In the United States there were 62 measles cases per year on average between 2000 and 2007 [15]. In later years the numbers increased and in 2014 they exploded to a total of more than 600 cases [16]. In Europe measles has resurged on an even bigger scale. In the year 2014 more than 22,000 cases were reported [17]. In 1997 Austria began to implement the new Austrian National Vaccination Program (ANVP), a free vaccination program for all children up to the age of 15 years. Among others, measles vaccination in the form of a trivalent immunization (measles, rubella and mumps) is recommended in this program. The first dose is administered at the age of 11 months followed by a second dose 4 weeks later [18]. Furthermore, catch-up immunization is recommended without age limitations and as a result of current measles epidemics is also free of charge. Influenza vaccination is also recommended for all persons starting at the age of 7 months; however, Austrian vaccination coverage for both measles and influenza is significantly below WHO-recommended levels, at 83 % and 10–21 %, respectively [3, 15, 19]. Recent data from the Organisation for Economic Co-operation and Development (OECD) put low measles coverage in Austria further into perspective. In 2013, the average measles vaccination coverage rate among 34 evaluated countries was 94 %. Austria's rate in that year as well as in the years before was 83 % [19]. In the year 2015 the Austrian Ministry of Health reported a total of 309 cases of measles, which was the highest number since 2008 [20]. Furthermore, in the years 2003–2007 Austria had a 12× higher measles incidence than the USA [16, 20, 21].

As was already reported by Colzani et al. there is a negative correlation between vaccination coverage and disease burden in measles. Each increase in the percentage of national vaccination coverage leads to a significant reduction of overall disease burden [22]. With this study we aimed to gather more specific information on the phenomenon of vaccine hesitancy in Austria.

Patients, materials and methods

We conducted a single-center cross-sectional questionnaire-based survey at a university hospital in Austria. In the period September 2014 to December 2014 we distributed a total of 400 questionnaires at the on-site emergency department and 350 patients agreed to participate and adequately completed the questionnaire. This emergency department registers approximately 30,000 patient contacts per year and services an urban as well as a rural area of 80,000–100,000 inhabitants. After initial presentation and triage by a registered nurse, patients deemed as non-critical were asked by the emergency room personnel to take the time to complete the questionnaire, while waiting for laboratory results or other non-critical procedures. Included were all non-critical patients >18 years. Excluded were all clinically unstable patients as well as all neurologically impaired patients. The questionnaire included a total of 18 polar and multiple choice questions. Categories comprised age, gender, socioeconomic background, participants knowledge and attitudes towards specific vaccinations and the corresponding infectious diseases. Furthermore, participants were asked to gauge their own level of trust in several healthcare providers as well as different media. The goal was to acquire 350 questionnaires for analysis. As not every participant completely answered the questionnaire to 100 %, we decided to include all questionnaires that consisted of at least full demographic data, as well as a completion rate of >75 %; therefore, the number of answers for each question depends on the number of completed samples. An English translation of the questionnaire can be found in the appendix.

Table 1 Demographics of the three defined cohorts

Views on vaccination	Complete trust (Cohort A)	Some reservations (Cohort B)	No trust (Cohort C)	*p*-value
Total	*n* = 174 (49.7 %)	*n* = 136 (38.9 %)	*n* = 40 (11.4 %)	–
Mean age (years)	45.6 (SD 18.4)	46.2 (SD 16.6)	50.2 (SD 17.1)	–
Sex male	76 (43.7 %)	65 (47.8 %)	16 (40 %)	$p = 0.621$
Education				
Basic	113 (66.9 %)	81 (60.4 %)	32 (82 %)	$p = 0.059$
High school graduation	42 (24.9 %)	31 (23.1 %)	4 (10.3 %)	$p = 0.144$
University degree or equivalent	14 (8.3 %)	22 (16.4 %)	3 (7.7 %)	$p = 0.058$

A statistical analysis was performed using the IBM SPSS statistics program version 21. We used the χ^2-test or Fisher's exact test to evaluate associations between different demographic characteristics. Statistical significance was defined as $p < 0.05$.

The study was approved by the local ethics committee and abided by the ethical principles for medical research involving human subjects outlined in the Declaration of Helsinki. All participants gave informed consent prior to the study.

Results

We divided the respondents into three cohorts. Cohort A (n = 174) comprised of those participants who answered that they had trust in vaccines and frequently receive vaccinations. Cohort B (n = 136) included participants who had a mixed view on vaccines, their safety and usefulness and finally, those respondents who claimed to refuse vaccinations on principal were included in cohort C (n = 40).

Demographics of the whole collective (n = 350)

The mean age of all participants was 46.4 years (±SD 16.6 years). The gender distribution was 193 (55.1 %) female to 157 (44.9 %) male. Education levels were basic education 226 (64.6 %), secondary education 77 (22 %) and university degree or equivalent 39 (11.1 %). For reference, the mean age in Austria in 2015 was 43.2 years and the gender distribution was 51.3 % female to 48.7 % male. Education levels for the general population of Austria in 2013 were basic education 72.6 %, secondary education 14.7 % and university degree or equivalent 12.7 % [23, 24]. For full demographic information of the study participants see Table 1.

Reasons for vaccination (cohorts A and B, *n* = 310)

General practitioner recommendations to be vaccinated was selected by 54 participants (32.0 %) of cohort A and 29 (21.6 %) of cohort B. Fear of specific diseases and vaccination-associated protection were answered by 156 (92.3 %) participants in cohort A and 98 (73.1 %) in cohort B ($p = 0.000$). The passive protection of others (e.g. family members) was important for 60 participants (35.5 %) and 34 (25.4 %) in cohorts A and B, respectively. For full information see Table 2.

Table 2 Reasons for vaccination, reasons for refusal and sources of information regarding healthcare

Views on vaccination	Complete trust (Cohort A)	Some reservations (Cohort B)	No trust (Cohort C)	*p*-value
Reasons for immunization				
Doctor's recommendation	54 (32.0 %)	29 (21.6 %)	–	$p = 0.055$
Protection against disease	156 (92.3 %)	98 (73.1 %)	–	**$p < 0.01$**
To protect family and others	60 (35.5 %)	34 (25.4 %)	–	$p = 0.071$
Reasons for refusal				
Afraid of adverse effects	–	14 (10.4 %)	14 (35.9 %)	**$p < 0.01$**
Distrust towards pharm. industry	–	19 (14.2 %)	9 (23.1 %)	$p = 0.195$
Too expensive	–	1 (0.8 %)	2 (5.1 %)	$p = 0.067$
Doubt the effectiveness	–	2 (1.5 %)	14 (35.9 %)	$p = 0.440$
Bad for immune system	–	5 (3.7 %)	4 (10.3 %)	$p = 0.110$
Doctor's recommendation	–	1 (0.8 %)	3 (7.7 %)	$p = 0.587$
Not enough knowledge	–	28 (20.9 %)	8 (20.5 %)	$p = 0.935$
Sources of information				
General practitioner	143 (84.6 %)	95 (70.9 %)	18 (46.2 %)	**$p < 0.01$**
Family/friends	41 (24.3 %)	38 (28.4 %)	8 (20.5 %)	$p = 0.508$
Hospital physician	15 (8.9 %)	4 (3.0 %)	2 (5.1 %)	$p = 0.108$
Print media	25 (14.8 %)	29 (21.6 %)	7 (17.9 %)	$p = 0.277$
Internet	38 (22.5 %)	33 (24.6 %)	11 (28.2 %)	$p = 0.716$
Television program	23 (13.6 %)	28 (20.9 %)	14 (35.9 %)	**$p < 0.01$**

Bold type indicates statistically significant

Table 3 Reasons pro/contra vaccination of the whole collective ($n = 350$)

Reasons pro/contra vaccination of the whole collective	
Pro vaccination	
Protection against disease	262 (74.9 %)
To protect family and others	98 (28 %)
Doctor's recommendation	87 (24.9 %)
Contra vaccination	
Not enough knowledge	38 (10.9 %)
Distrust towards pharm. industry	31 (8.9 %)
Afraid of adverse effects	30 (8.6 %)
Bad for immune system	9 (2.6 %)
Too expensive	4 (1.1 %)
Doubt the effectiveness	3 (0.9 %)
Doctor's recommendation	1 (0.3 %)

Reasons against vaccination (cohort C, *n* = 40)

Fear of adverse effects and doubt in vaccine effectiveness were the most common reasons for vaccination refusal (both 35.9 %). Furthermore, general distrust towards the pharmaceutical industry (23.1 %), lack of proper information (20.5 %) and the belief that vaccination is by itself bad for the immune system (10.3 %) were among the most frequently stated reasons.

Reasons for/against vaccination in the whole collective (*n* = 350)

When looking at the whole collective, protection against a specific disease and indirect protection of family and others were the most important reasons for vaccination (74.9 % and 28 %). The most commonly cited reasons against vaccination included lack of specific knowledge (10.9 %), distrust towards the pharmaceutical industry (8.9 %) and the fear of adverse reactions (8.6 %). For full information see Table 3.

Self-perceived knowledge about the Austrian National Vaccination Program (n = 350)

Out of 350 participants 148 (42.3 %) claimed to be properly informed about the ANVP while 202 (57.7 %) respondents felt their knowledge of the contents of Austria's vaccination program was insufficient. In cohorts A, B and C the percentage of respondents who felt properly informed were 52.9 %, 32.4 % and 30 %, respectively.

Levels of trust in different sources of information concerning health care (n = 271)

For the question about the level of trust participants have in different sources regarding healthcare 271 responded. The most trusted sources were GPs as well as hospital physicians. On a scale of 1–10 (1 = no trust, 10 = ultimate trust) GPs and hospital physicians achieved means of 8.35 (SD ±2.24) and 7.98 (SD ±2.27), respectively. Further down in the participant's trust were the World Health Organization (WHO) with 5.96 (SD ±2.59), the Austrian Ministry of Health with 5.58 (SD +2.55), the internet with 3.57 (SD ±2.27) and the pharmaceutical industry with 2.95 (SD ±2.11) (See Fig. 1).

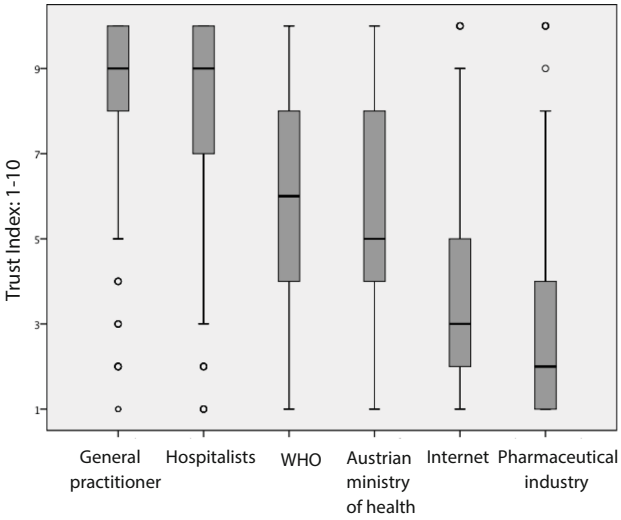

Fig. 1 Level of trust (1 = no trust, 10 = ultimate trust) in different healthcare providers and institutions regarding healthcare ($n = 271$)

Knowledge gaps and vaccination rates

In cohort B 106 respondents (79.1 %) stated that additional information about vaccinations/vaccine-preventable diseases could possibly prompt them to acquire additional vaccinations. In cohort C 22 (55.0 %) respondents stated that additional information could possibly persuade them to get vaccinated in the future while 18 (45.0 %) believed that no amount of additional information would change their decision not to get vaccinated.

Estimation of Austrian annual influenza incidence (n = 335)

Participants tended to underestimate the frequency of annual influenza cases in Austria and gave answers of 350, 3500, 35,000, 350,000 and 3,500,000 cases annually while the correct answer was 350,000 cases/year. While 124 (37 %) participants guessed correctly and 7 (2 %) even overestimated the correct number, 61 % underestimated the annual disease burden. Of the participants 120 (36 %) thought the correct number to be 35,000, 67 (20 %) ticked off 3500 and 17 (5 %) thought that only 350 people are infected by influenza each year.

Discussion

In the light of recurring measles epidemics in industrialized countries it is important to understand the

specific reservations against vaccinations and how to best respond to them. In our study the subset of respondents who claimed to categorically decline vaccinations was 11.4 %. Compared to other studies, such as Siddiqui et al. who reported rates of vaccine refusal between 1.5–4.2 % in the USA, these numbers appeared relatively high [25]. Because of the relatively small size of this study and the fact that it was performed at only one site, the results cannot be indiscriminately extrapolated to the population of the country as a whole. Conceivably, nationwide numbers might be lower; however, there have been repeated outbreaks of vaccine-preventable diseases in small communities with staggeringly high numbers of vaccine refusal. Especially in educational institutions based on anthroposophical ideas, there have been multiple epidemics of measles in recent history. As has been shown before, different factors, such as fear of adverse effects, doubt in vaccine effectiveness, the misconception that the innate immune system is better off without vaccinations contribute to vaccine hesitancy [25, 26]. In our study we could confirm these reasons. Due to the overall low number (n = 40) of respondents who claimed to categorically decline vaccinations, an in-depth statistical analyses of this sub-group was statistically not feasible. To further investigate this collective, a larger study would be necessary. Furthermore, we could illustrate that more readily available information on vaccination and infectious diseases could help boost vaccination numbers. When looking at the whole collective the most frequently stated reason for refusing vaccinations was lack of knowledge. Our study underlines that GPs and hospital-based physicians are the most trusted sources regarding healthcare-related topics; therefore, they have to be at the forefront in the battle against vaccine hesitancy and refusal. Almost 71 % of all respondents answered that more information would help them to decide towards additional vaccinations.

There was a reportable difference in levels of education in our three proposed cohorts. The percentage of respondents having only basic education was higher in the cohort of non-vaccinations (cohort C) than in the other two groups. A possibility to more actively interact with this subgroup might be to further utilize the annual medical check-ups by physicians in schools and use them to communicate the benefits of vaccinations to this group of the population. Also we could show that those who tended to undervaccinate, utilized television more as source of healthcare-related information. This may partly explain a previously described Austrian paradox: while influenza vaccination rates are far below recommended levels, vaccination rates against tick-borne encephalitis which is endemic in Austria, are comparably high [27]. A cause of this may be a nationwide televised tick-borne encephalitis informational campaign and as television as a major informational source is predominately used by the population with lower levels of education, this may be a way to also increase their acceptance of other vaccinations. Also, to further improve vaccination rates, knowledge gaps concerning the frequency and seriousness of vaccine-preventable diseases have to be reduced. Furthermore, the lack of information concerning the ANVP has to be addressed. We could show that those who are undervaccinated tend to have less knowledge about recommended vaccinations.

Additionally, to the already reported reasons for vaccination refusal, we hypothesized that underestimation of the numerical reality of the annual influenza epidemics may play a role in the low vaccination numbers; therefore, we asked the participants to try and guess the actual number of yearly influenza cases in Austria. Results showed that 61 % of all respondents in part dramatically underestimated the number of annual influenza cases in Austria. This finding, in combination with the previously discussed points underlines the necessity of an efficient informational policy regarding vaccinations and their proven benefits.

Acknowledgements The authors want to thank Mag. Anna Kulnig for her competent contribution concerning statistical questions. Furtheremore, we want to sincerely thank Dr. Simone Schüller for her support and her invaluable intellectual input.

Compliance with ethical guidelines

Conflict of interest M. J. Sandhofer, O. Robak, H, Frank, and J. Kulnig declare that they have no competing interests.

Ethical standards All studies on humans described in this manuscript were carried out with the approval of the responsible ethics committee and were in accordance with national law and the Helsinki Declaration of 1975 (in its current revised form). Informed consent was obtained from all participants included in the study.

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