COVID-19 Vaccine Hesitancy in People With Migratory Backgrounds: A Cross-Sectional Study Among Turkish- and German-Speaking Citizens in Munich

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Abstract

Background

This study aimed to investigate the knowledge, attitudes, behaviors, and vaccine hesitancy of people with migratory backgrounds among Turkish- and German-speaking patients in Munich regarding the COVID-19 pandemic.

Methods

Primary outcomes were the intention to get vaccinated for COVID-19 and COVID-19 knowledge levels (25 true/false items). Other variables included demographics, attitudes to COVID-19 and vaccination (7 items), and behaviors regarding COVID-19 (7 items). The attitude and behavior questions had 5-point Likert scales. Of the 10 Turkish-speaking family physicians in Munich, 6 agreed to administer Turkish or German questionnaires to consecutive patients during February 2021. Participants with either citizenship, country of origin, native language, or place of birth being non-German were categorized as "Having a migratory background." Data from 420 respondents were analyzed.

Results

Women constituted 41.4% (n=174), the mean age was 42.2±15.5 years, 245 (58.3%) preferred the Turkish questionnaire, 348 (82.9%) had a migratory background, and 197 (47.9%) intended to be vaccinated. The mean knowledge, attitude, and behavior scores were 21.5±3.2 (max=25), 3.7±0.8 (max=5), and 4.0±0.5 (max=5). While 42.3% (n=145) of the participants with a migratory background considered getting vaccinated, this proportion was 76.5% (n=52) for non-immigrant Germans (Chi-square=26.818, p<0.001). Non-migratory background (Odds Ratio (OR): 3.082), high attitude scores (OR: 2.877), male sex (OR: 2.185), years of schooling (OR: 1.064), and age (OR: 1.022) were positively associated with vaccination intention.

Conclusions

We suggest initiating or supporting projects run by persons or groups from inside the immigrants targeting to elaborate and change their vaccination attitudes.

Introduction

COVID-19 is an emerging condition that has affected globally 69.3 million people by the 10th December, 2020 (1). As of the 11th of January 2021, a total of 1 921 024 patients in Germany were recorded as COVID-19 positive (2). Although Germany succeeded in keeping the first wave of the pandemic under control, the effects of the second wave continued, and arguably the third wave has begun when the study was conducted (3–5).

Europe has received many immigrants over the centuries. While factory workers constituted the majority earlier, the recent influx is mostly by asylum seekers escaping from war-torn countries such as Syria, Afghanistan, and Iraq. As of 2019, 21.8 million (4.9 %) of the people living in the European Union (EU) were non-EU citizens (6).

Among the EU countries, Germany has become the number one immigrant receiver, the majority being composed of Turkish origin citizens. In 2018, around three million people with a migration background in Germany had family or religious roots in Turkey (7). Furthermore, the number of asylum seekers from Turkey increased substantially after the coup attempt in 2016. The total number of 1 767 asylum seekers from Turkey in 2015 increased to 5 742, 8 483, 10 655, and 11 423 during the upcoming years, making Turkey the fourth biggest defector exporter to Germany (8).

The dramatic increase of immigrants from different origins has become a significant public health concern in Europe (9). Although some studies have demonstrated a healthy immigrant effect (10,11), others have shown poorer health status among immigrants compared to natives in many European countries (12,13), which suggests that the immigrants are comparatively healthier initially on entrance but get disadvantaged with time.

In spite of the now half-century history of work-related migration, migrant populations still face particular social, economic, and health problems. This also applies to the former Turkish "guest workers" and their families in Germany. Studies are reporting that Turkish migrants in Germany require special public health attention (14). Health service satisfaction (15) and disparities (16) are some of the reported concerns. At our Munich location, there are around 40 thousand people of Turkish origin (17), but there is no data available concerning the status of this subgroup of persons regarding COVID-19.

Objectives

This study aimed to investigate the knowledge, attitudes, behaviors, and vaccine hesitancy of people with migratory backgrounds among Turkish- and German-speaking patients of Turkish-speaking family doctors in Munich regarding the COVID-19 pandemic.

Methods
Study Design

An anonymous survey was conducted in a cross-sectional design. Study reporting was done per the STROBE guideline (18).

Setting

The study was conducted within February 2021 in Munich. Participants were German- and Turkish-speaking patients of Turkish-speaking family physicians. Munich is a city with 1.472 million citizens (19), of which around 40 thousand are of Turkish origin (17).

Participants

A list of the 612 family physicians working in Munich was obtained from the The Bavarian Association of Statutory Health Insurance Physicians "Kassenärztliche Vereinigung Bayerns (KVB)," which was reviewed for Turkish names. Additionally, an internet search and snowball inquiry by contacting the Turkish-speaking family physicians was made, which returned a list of 10 such physicians. All targeted family doctors were visited by the principal investigator in their offices and inquired about their willingness to support the study. Six family physicians agreed to distribute the study questionnaires to their patients. Inclusion criteria were being aged 18 and above, having sufficient knowledge of the German or Turkish language, and volunteering to participate. Participants who did not disclose their demographic information or had more than 50% missing items in the questionnaire were excluded from the analysis. A flow diagram of physician and patient participation is given in Figure 1.

Variables

The primary outcome measures of the study were COVID-19 knowledge scores and intention to get vaccinated for COVID-19. Other study variables were related to attitudes and behaviors regarding COVID-19 and demographic information.

Citizenship/nationality, native language, and place of birth were considered as additional variables for subgroups to take the complex construct of a "migration background" into account. Participants with either citizenship/nationality, country of origin, native language, or place of birth being non-German were categorized as "Having a migratory background."

Construction of the Questionnaire

The study questionnaire was developed by the researchers after reviewing the literature for common knowledge and guideline recommendations related to COVID-19. Two team meetings were conducted to refine the questionnaire items. A pilot test on five Turkish and five German-speaking participants was conducted to further modify the questionnaire. The final questionnaire consisted of a demographic information section (6 questions) and three subdomains, including items on knowledge, attitudes, and behaviors concerning COVID-19.

The knowledge domain contained 25 items, which were scored as true or false. Hence, the COVID-19 knowledge scores were calculated by summing up the correct answers, providing a score of minimum 0 and a maximum of 25.

The attitude and behavior domains included both 7 items arranged in a 5-point Likert scale (1=disagree/never, thru 5=agree/very frequent). Items number 2, 3, 5, and 6 in the attitude domain and items 4, 5, 6, and 7 in the behavior domain were reversely coded. Attitude and behavior scores were calculated by adding the scores of each item and dividing by 7 (the total number of items), which revealed the minimum and maximum possible scores of 1 and 5. Greater scores indicated more sensitive attitudes and behaviors.

The two-page paper questionnaire was made available in German and Turkish.

Data sources/ Measurement

For recruitment, the practice personnel was asked to consecutively approach patients speaking German or Turkish and invite them to participate in the questionnaire survey.

All interested individuals were given the patient information letter and the study questionnaire. If the individual either spoke Turkish or German (or one language much better than the other), he/she received the material in the appropriate language. If the individual spoke both languages, he/she was asked for his/her preference. Questionnaires were self-administered in a silent place and collected after completion by the practice personnel or the primary author.

Data Quality and Bias

Each participant was asked to fill in the questionnaire alone without interference by others. After digitalizing the data, error checking and debugging were done to eliminate questionnaires with missing data or conflicting information. An effort was given to minimize selection bias by recruiting concomitant patients. However, although the principal investigator spent time in the practices reassuring data collection according to the protocol, this was not always possible due to the local conditions and the rules and regulations discouraging prolonged stay of patients in practice and accommodating multiple patients at a time.

Sample Size

A sample size of n=400 in the cross-sectional study was determined to be sufficient for consistent estimation of the coefficients of a multiple logistic regression model, including the factor variable 'group' and the demographic variables for adjustment. Further, the sample size is efficient for subgroup analyses, e.g., by vaccination hesitancy, migratory background, etc. (20).

Statistical Methods

The data were entered into the IBM SPSS Statistics spreadsheets (IBM Corp, Armonk, NY). The data distribution was described within and across the study groups by frequencies, percentages, means, and standard deviations (SD), as appropriate. Cronbach's alpha was computed to assess the reliability of the items belonging to the knowledge, attitude, and behavior domains. Corresponding hypothesis testing of univariable group differences was performed by Chi-squared tests, Fisher's exact tests (or Fisher-Freeman-Halton test), and independent samples t-tests or Mann-Whitney-U tests. Multiple binary logistic regression models were fit to the data to adjust the effect estimation of group differences by potential predefined confounders, such as demographics. Significant variables affecting vaccination intention in the univariate analyses were included in the model. Hypothesis testing was performed at exploratory two-sided 5% significance levels.

Results

Participants and Migratory Backgrounds

Of the invited patients, 452 agreed to participate. Questionnaires with missing demographic data (n=2) were excluded. Also excluded were a total of 27 participants with more than 50% missing items in the knowledge (n=9), attitude (n=23), or behavior (n=20) domains and 3 participants with missing migratory background information. Data of 420 participants were analyzed (women: 41.4% (n=174), mean age: 42.2±15.5 years) (Figure 1).

Of the participants, 245 (58.3%) preferred the Turkish questionnaire. In addition to these 245 people, 103 participants (58.8%) from the 175 preferring the German questionnaire had a migratory background, making a total of 348 (82.8%). There were 72 (17.1%) German participants without migratory background. Of the 348 patients with migratory history, 90 (25.8%) had a German nationality. From the 71 participants with a migratory background who were born in Germany, only 42 (59.1%) had a German nationality. Regarding migratory background, there were significant differences concerning age, sex, and preferred language. Among the participants with migratory backgrounds, prominent countries of origin were Turkey, Bulgaria, and Irak, while Turkish, Bulgarian, Kurdish, and Arabic were the commonly spoken native languages (Table 1).

Table 1: Sociodemographic characteristics

		Migratory Background					
		Yes		No			
		n/Mean	%/SD	n/Mean	%/SD	Test	p
Sex	Female	130	37.4	44	61.1	13.542#	**0.001**
	Male	216	62.1	28	38.9		
	Other	2	0.6	0	0		
Age (years)		39.3	12.6	56	20.2	6.476$	**<0.001**
Total years of schooling		13.1	4.5	12.6	3.4	1.411$	0.158
Was infected with COVID-19	Yes	59	18.7	8	12.5	1.395*	0.237
	No	257	81.3	56	87.5		
Preferred language	Turkish	245	70.4	0	0	121.655*	**<0.001**
	German	103	29.6	72	100		
Nationality	Turkish	197	57.9				
	German	90	26.5	72	100		
	Bulgarian	26	7.6				
	Other	27	7.9				
Country of origin	Turkey	263	76.5				
	Germany	12	3.5	72	100		
	Bulgaria	28	8.1				
	Other	41	11.9				
Native language	Turkish	263	77.8				
	German	19	5.6	72	100		
	Bulgarian	12	3.6				
	Kurdish	13	3.8				
	Arabic	8	2.4				
	Other	23	6.8				
Place of birth	Turkey	207	60.7				
	Germany	71	20.8	72	100		
	Bulgaria	25	7.3				
	Irak	9	2.6				
	Other	29	8.5				

#Fisher's exact test, *Chi-square, $Mann-Whitney U test, SD: Standard Deviation

Descriptive Findings and Outcomes

Responses to the scale items are summarized in Table 2. On the average, the knowledge regarding COVID-19 was high. Regarding attitudes, there was a relatively low fear of death due to COVID-19. Also, very few participants thought that faith would play a role in protection from the disease. Behavior scores on the other hand, were comparatively higher (Table 2). Cronbach's alpha reliability coefficients for the knowledge, attitude, and behavior domains were 0.732, 0.695, and 0.716, respectively.

Table 2: Domains and descriptive statistics of the survey items

Subscale 1: COVID-19 Knowledge	Correct n (%)	False n (%)
1. The cause of the Corona-infection a virus	353 (87.4)	51 (12.6)
2. How COVID-19 spreads is not known	287 (69.5)	126 (30.5)
3. COVID-19 can spread through the air in enclosed spaces	388 (93.3)	28 (6.7)
4. COVID-19 can spread through close contact (e.g. hugging)	394 (93.8)	26 (6.2)
5. COVID-19 can spread through sexual contact	242 (59.9)	162 (40.1)
6. COVID-19 is often transmitted through food	333 (80.2)	82 (19.8)
Which of the following measures can reduce the risk of transmitting COVID-19?	408 (96.5)	15 (3.5)
7. Washing hands after touching potentially infected surfaces	412 (97.4)	11 (2.6)
8. Wearing a face mask when entering crowds	368 (90.2)	40 (9.8)
9. Taking antibiotics	335 (80.5)	81 (19.5)
10. Drinking vinegar	363 (87.5)	52 (12.5)
11. Drinking carrot juice	405 (96)	17 (4)
12. Keeping a distance of 1.5 meters from people	400 (95.7)	18 (4.3)
13. Lubricate butter in the nostrils	311 (75.1)	103 (24.9)
14. Eating garlic	222 (54.8)	183 (45.2)
15. The use of the Corona app	401 (94.8)	22 (5.2)
16. Frequent ventilation when in the same room with others	374 (88.6)	48 (11.4)
17. Avoiding closed rooms with strangers	397 (94.3)	24 (5.7)
18. Avoiding crowds	382 (91)	38 (9)
19. Drinking holy water	394 (94.3)	24 (5.7)
Which of the following symptoms are common in COVID-19?	407 (96.9)	13 (3.1)
20. Cough	363 (89.4)	43 (10.6)
21. Fever	395 (96.8)	13 (3.2)
22. Dysuria	387 (95.3)	19 (4.7)
23. Increased appetite	391 (93.8)	26 (6.2)
24. Weight gain	287 (69.5)	126 (30.5)
25. Loss of taste and smell	388 (93.3)	28 (6.7)
Subscale 2: COVID-19 Attitude	**Mean**	**SD**
5-Agree, 4-Partially agree, 3-Not sure, 2-Partially disagree, 1-Disagree		
1. COVID-19 is dangerous	4.47	1.04
2. In reality, COVID-19 does not exist	1.63	1.24
3. The danger of COVID-19 is exaggerated	2.42	1.52
4. I am afraid of dying if I should get COVID-19	2.50	1.45
5. Believers are protected from COVID-19	1.47	1.12
6. COVID-19 was created purposely to control the world	2.47	1.50
7. Vaccination against COVID-19 is safe	3.19	1.29
Subscale 3: COVID-19 Behavior	**Mean**	**SD**
1-Never, 2-Very rare, 3-Off and on, 4-Frequent, 5-Very frequent		
1. How often do you wash your hands?	4.38	0.64
2. How often do you wear a mask when you are outside?	4.19	0.90

		Yes n (%)	No n (%)	Not sure n (%)
3. How much attention do you pay to keeping distance?		4.16	0.88	
4. How often do you accept guests?		2.13	0.88	
5. How often do you go visiting others?		1.82	0.91	
6. How often do you enter crowded places?		2.05	0.91	
7. How often do you use public transport?		2.27	1.23	
Have you already been vaccinated against COVID-19?		23 (5.5)	397 (94.5)	
Will you get vaccinated against COVID-19?		198 (47.8)	77 (18.6)	139 (33.6)
Why? Can you please elaborate? ……………………………………………………………				

A total of 197 participants (47.9%) intended to get vaccinated. There were significant differences in the mean knowledge, attitude, and behavior scores regarding migratory background. Those with a migratory background were mostly not intending to be vaccinated, and had lower scores in all three subscales. However, COVID-19 knowledge scores were relatively high for both groups (Table 3).

Table 3: Descriptive statistics and comparisons between the migratory backgrounds

		Migratory Background							
		Yes (n=348)		No (n=72)		Total (n=420)			
		n	%	n	%	n	%	Test	p
Have you already been vaccinated against COVID-19?	Yes	16	4.6	7	9.7	23	5.5	3.027#	0.091
	No	332	95.4	65	90.3	397	94.5		
Will you get vaccinated against COVID-19?	Yes	145	42.3	52	76.5	197	47.9	26.818*	**<0.001**
	No	70	20.4	7	10.3	77	18.7		
	Not sure	128	37.3	9	13.2	137	33.3		
		Mean	SD	Mean	SD	Mean	SD		
Knowledge score		21.2	3.4	23.3	1.7	21.6	3.2	5.660$	**<0.001**
Attitude score		3.6	0.8	4.2	0.7	3.7	0.8	5.317$	**<0.001**
Behavior score		4.0	0.6	4.3	0.5	4.1	0.6	3.715&	**<0.001**

*Chi-square, #Fisher's exact test, &Independent samples t-test, $Mann-Whitney U test, SD: Standard Deviation

Of the 411 patients who indicated their intentions of accepting or refusing vaccination, 253 (61.5%) expressed 1-3 reasons for their thoughts (total 294). After categorization of the free texts, the most common three reasons were self-protection (n=49), concerns about safety or mistrust in vaccines (n=45), and the perception that vaccines were not sufficiently studied (n=25) (Figure 2).

Of the people with a migratory background, 12.6% (n=44) agreed or somewhat agreed that COVID-19 actually did not exist. This proportion was 5.6% (n=4) among the non-immigrant participants (Chi-square=11.623, p=0.020). Also, those believing that the COVID-19 was purposely created to control the world were higher among participants with a migratory background (agree+somewhat agree answers 30.6% (n=106) vs. 5.6% (n=4)) (Chi-square=33.020, p<0.001).

Multivariable Analyzes

Responses to the question "Will you get vaccinated against COVID-19?" were merged into two categories as 'No+Not sure' and 'Yes.' Positive vaccination intentions ranged from 26.9% to 68.5% between different practices.

All investigated variables were related to the vaccination intention. Furthermore, participants with a preference for a German questionnaire had higher intentions compared to those preferring a Turkish questionnaire (n=99/57.9% vs. n=99/40.6%, Chi-square=12.091, p=0.001) and men had higher intentions to get vaccinated compared to women (Table 4).

A multiple logistic regression model was fit to the data to estimate and test the relation of predictors of vaccination intention. Independent predictors of the model included sex (male/female), migratory background (yes/no), age (years), duration of schooling (years), a previous infection (yes/no), knowledge score,

attitude score, and behavior score.

Multivariable analysis changed the significance levels. Age, male sex, years of schooling (borderline significant), migratory background, and high attitude scores positively affected the vaccination intention (Table 3). The most significant variable was the migratory background with an odds ratio (OR) of 3.1, followed by attitude scores (OR 2.9) and sex (OR=2.2).

Table 4: Univariate analyses and multiple logistic regression model concerning the agreement for COVID-19 vaccination

	Univariate Comparisons							95% CI		Multiple Logistic Regression Model				95% CI	
	n/Mean	%/SD	n/Mean	%/SD				Lower	Upper	B	Wald	p	OR	Lower	Up
					Wald	p	OR								
Age (years)	37.7	13.5	46.5	15.8	30.745	<0.001	1.042	1.027	1.057	0.022	4.459	0.035	1.022	1.002	1.0
Sex (male)	112	46.3	130	53.7	8.608	0.003	1.817	1.219	2.707	0.782	8.256	0.004	2.185	1.282	3.7
Total years of schooling	12.3	4.1	13.7	4.5	10.9	0.001	1.086	1.034	1.14	0.062	3.582	0.058	1.064	0.998	1.1
Migratory background (no)	16	23.5	52	76.5	23.705	<0.001	4.438	2.436	8.085	1.125	6.767	0.009	3.082	1.32	1.1
Was infected with COVID-19 (no)	150	48.2	161	51.8	4.446	0.035	1.813	1.043	3.152	0.472	2.003	0.157	1.603	0.834	
Knowledge score	20.9	3.5	22.1	2.8	11.525	0.001	1.121	1.049	1.192	-0.029	0.364	0.546	0.971	0.883	1.0
Attitude score	3.4	0.8	4.1	0.6	62.542	<0.001	3.762	2.709	5.224	1.057	23.393	<0.001	2.877	1.875	4.4
Behavior score	3.9	0.6	4.2	0.4	26.018	<0.001	2.841	1.902	4.243	0.296	1.111	0.292	1.344	0.776	2.3
Constant										-6.117	19.508	<0.001			

SD: Standard deviation, CI: Confidence interval, OR: Odds ratio

Discussion

Key Results

This study found significant differences among patients with and without migratory backgrounds in the studied sample concerning COVID-19. While 82.8% had a migratory background, 42.1% preferred the German questionnaire. While 42.3% of the participants with a migratory background were considering to be vaccinated, this proportion was 76.5% for non-immigrant Germans. On the other hand, the mean knowledge, attitude, and behavior scores in this group were relatively high. After correcting for potential confounders, migratory background, increased attitude scores, male sex, longer schooling, and higher age positively affected the vaccination intention.

Limitations

This study approached patients of Turkish-speaking general practitioners (GPs) in Munich. Hence, its interpretation should be made remembering this context. Slight differences could be expected if the sample would have been selected from all GPs. As another potential limitation, we may mention that the survey questionnaire was not validated before. However, as described in the methods section, an effort was given to standardizing the items. Furthermore, all three subscales revealed reasonable internal consistency findings.

Interpretation

People originating from Turkey constitute the highest proportion of citizens with foreign origin in Germany, followed by Poland and Syria (21). However, they often find themselves not so highly appreciated and accepted (22,23). Considering the participants' mean age of 42.2 years, attention is needed for those with an immigrant background, who were born in Germany but still did not obtain a German citizenship. The relatively high proportion of this group (40.9%) confirms a lack of successful integration even in the third generation.

Although there is a recent influx of immigrants from Turkey (around 40 000 within 5 years) (8), they constitute a minor proportion; the majority are offsprings of the first immigrants after 1961 (7). Hence, the healthy immigrant effect (10,11) seems to be negligible here. Our study demonstrated significant shortcomings among people with migratory backgrounds concerning the intention to be vaccinated as well as knowledge, attitudes, and behaviors concerning

COVID-19. Thus, interventions are highly required to close the health-related gap in this group of citizens. Besides the efforts of the German state, projects initiated by the Turkish-speaking community may accelerate the integration process (24).

People's acceptability of immunization against COVID-19 was a concern even before the availability of specific vaccines. Especially nursing staff in Germany has been reported to be hesitant against vaccination. Although they are in the highest priority group, only 46.6% have been vaccinated as of April 2021 (25). It is worthwhile to mention that 23.2% of these health care workers have a migratory background (26). Across Germany, 70% of the population is expected to accept the COVID-19 vaccination (27). Disagreements among health professionals and politicians (28) as well as fake news (29) account for a substantial part of the confusion in public. However, research shows a high degree of hesitation rather than direct opposition against COVID-19 vaccination (29), which is also similar in our case: from the 52% intending not to be vaccinated or being not sure, 33.3% were hesitant to make a decision, while 18.7% were refusers. At this point, the reasons for vaccine refusal should be noted. As to our findings regarding the motives for accepting or rejecting vaccination, it can be speculated that the rapid developmental process of the COVID-19 vaccines and the global immunization campaigns without satisfying information transfer to the public contributed to the concerns about safety or mistrust in vaccines and the perception that vaccines were not sufficiently studied.

Our vaccine refusal proportions in the participants with an immigration background were similar to figures reported from Turkey. In a study conducted among 272 women and 156 men, 66.1% considered not getting vaccinated against COVID-19, and women were less likely to be willing to get a vaccine than men (30). Lower vaccination rates of women compared to men are also reported by other researchers (31). Looking at the distributions of the reasons for accepting or rejecting vaccination in our study, negative news, conflicting information, and conspiracy theories rank in third place. Of the people with a migratory background, 12.6% believed that COVID-19 does not exist at all, compared to 5.6% among the non-immigrants. An even higher number of immigrants (30.6%) were assuming that COVID-19 was purposely created to control the world. Combining this information with the integration tardiness, we may deduct that Turkish immigrants in Germany are substantially affected by external negative factors. It was reported that 6.17% of adults in Western Turkey received no lifetime vaccination at all and anticipated a further decline in vaccination rates (32). In fact, vaccine hesitancy proportions in Turkey are growing dramatically. The number of families who signed a vaccine rejection form increased from 183 in 2011 to 12 000 in 2016 and 23 650 in 2017 (33).

Bearing in mind that there was a significant number of participants critical or suspicious against vaccination, the relatively high knowledge scores suggest an informed decision. Participants scored 21.5 points out of a maximum of 25. In other words, those who are against COVID-19 vaccination or have reservations devised their opinions possibly not because of a lack of knowledge but rather due to their attitudes shaped by factors not addressed in our study. A multivariate analysis endorses this conclusion. After correcting for potential confounders, the most significant two variables affecting the decision to be vaccinated were the migratory background (OR 3.1) and attitude scores (OR 2.9). Qualitative studies could ascertain the reasons behind the negative attitudes concerning the COVID-19 vaccination.

Conclusion

Significant differences exist between patients with and without migratory backgrounds of Turkish-speaking family physicians in Munich. We conclude that negative attitudes of people with a migratory background towards COVID-19 contribute to their decisions not to be vaccinated. Vaccination refusal in the studied population depends on intertwined factors, including migratory background, age, sex, educational status, and attitudes towards COVID-19. More effort is needed to integrate and equalize the immigrants in Germany with the native community. Only then, this disadvantaged population group can be protected from unnecessary health risks, which means protecting the whole population via achieving herd immunity by vaccination. Specifically, we suggest initiating or supporting projects run by persons or groups from inside the immigrants. This will hopefully contribute to ownership and success of the interventions. Furthermore, qualitative and mixed-methods studies could shed more light on the issue by in-depth investigation of the relevant factors affecting the negative attitudes.

Declarations

Ethics approval and consent to participate

The study was approved by the ethics committee of the Medical Faculty of the Technical University of Munich (Date: 20th of January, 2021, Number: 37/21 S-EB). By handing over an information letter explaining study details, informed consent was taken from all participants. As approved by approved by the ethics committee of the Medical Faculty of the Technical University of Munich, no written consent was deemed necessary; filling in the questionnaires was interpreted as an agreement to participate. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ZA and AS developed the study idea. ZA, AS, KL, and AH developed the study protocol. ZA and RK collected the study data. ZA and AH performed the computations. AH verified the analytical methods. ZA, KL, and RK drafted the manuscript. AS supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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Figures
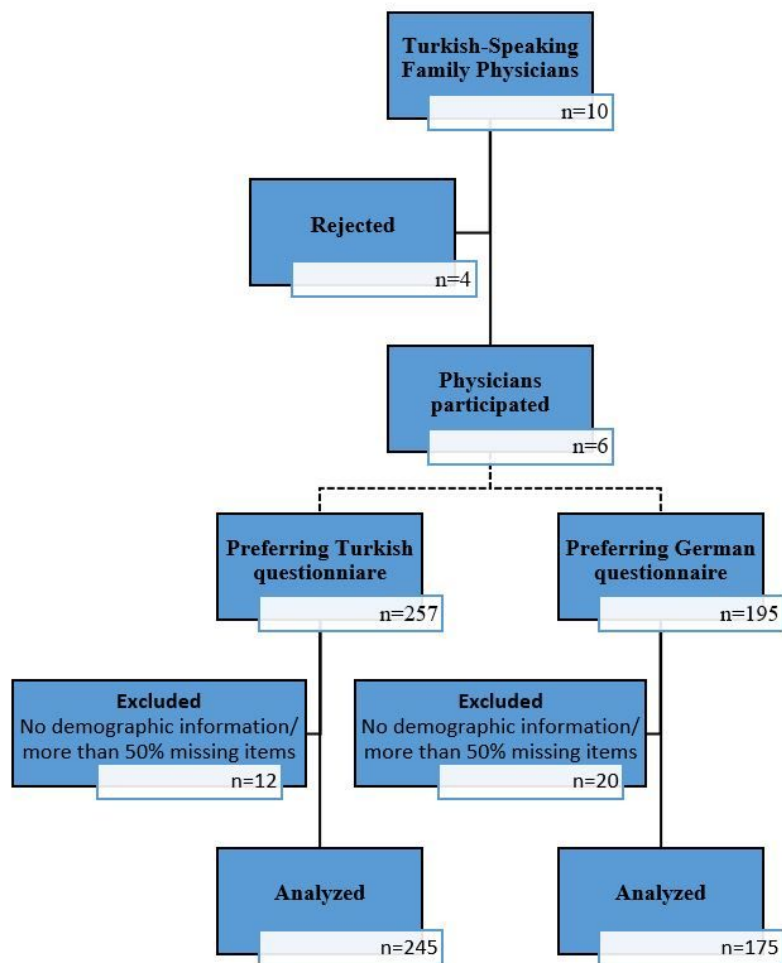
Figure 1

Study flow diagram
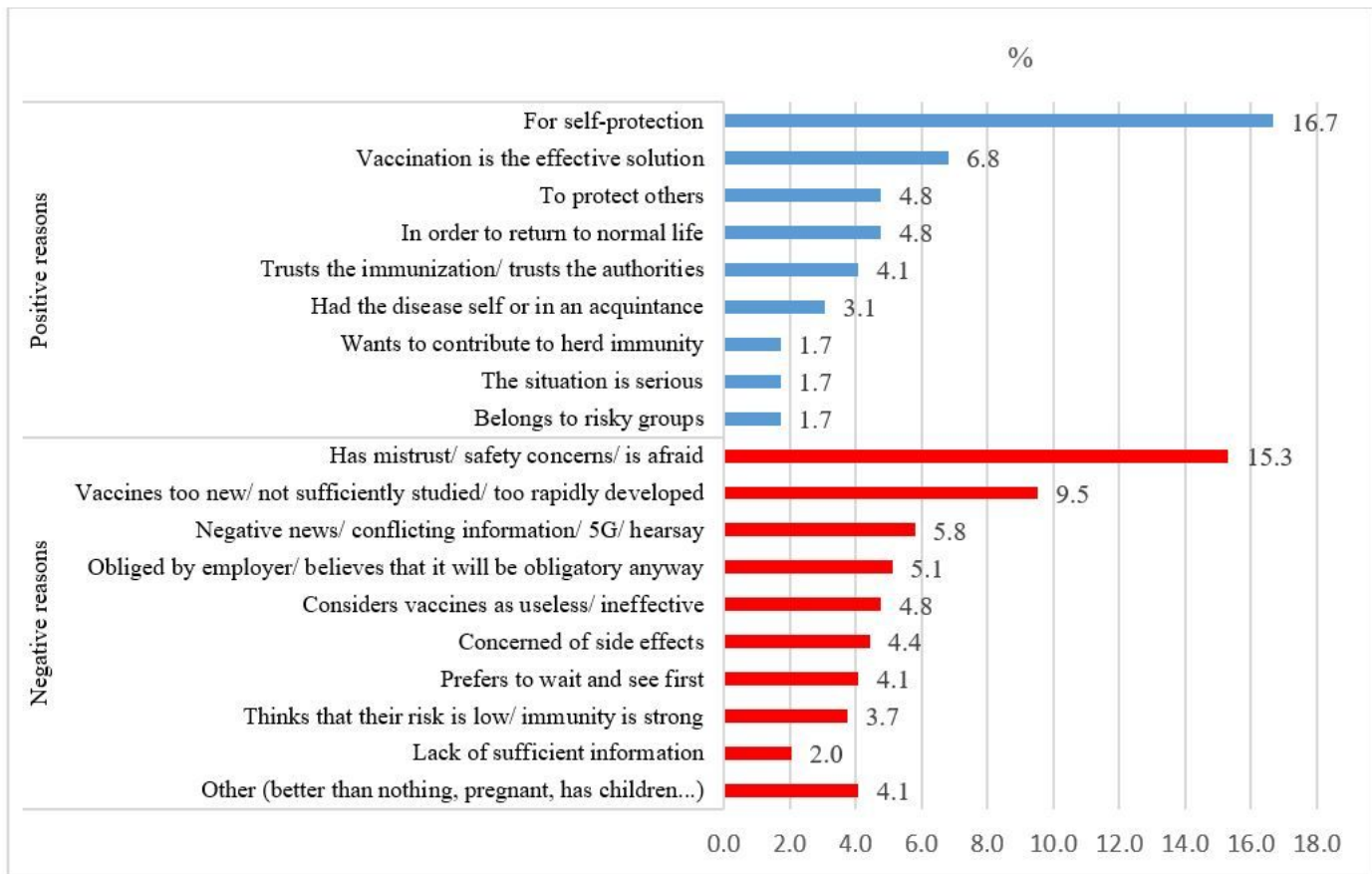
Figure 2

Distribution of the reasons for accepting or rejecting vaccination