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Short Communication

SARS-CoV-2 infections in migrant populations in Germany: results from the COVID-19 snapshot monitoring survey

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ABSTRACT

Objectives: Research shows that there is an increased risk of SARS-CoV-2 infection in migrants and ethnic minorities. However, increasing evidence indicates that socio-economic factors, such as employment, education and income, contribute to the association between migrant status and SARS-CoV-2 infection. This study aimed to examine the association between migrant status and the risk of SARS-CoV-2 infection in Germany and to discuss potential explanations for these associations.
Study design: This was a cross-sectional study.
Methods: Data from the German COVID-19 Snapshot Monitoring online survey were analysed, and hierarchical multiple linear regression models were used to calculate the probabilities of self-reported SARS-CoV-2 infection. Predictor variables were integrated in a stepwise method as follows: (1) migrant status (defined by own or parental country of birth other than Germany); (2) gender, age and education; (3) household size; (4) household language; and (5) occupation in the health sector, including an interaction term of migrant status (yes) and occupation in the health sector (yes).
Results: Of 45,858 participants, 3.5% reported a SARS-CoV-2 infection, and 16% were migrants. Migrants, participants in large households, those speaking a language other than German in their household and those working in the health sector were more likely to report SARS-CoV-2 infection. The probability of reporting SARS-CoV-2 infection was 3.95 percentage points higher for migrants than non-migrants; this probability decreased when integrating further predictor variables. The strongest association of reporting a SARS-CoV-2 infection was observed for migrants working in the health sector.
Conclusions: Migrants and health sector employees, and especially migrant health workers, are at an increased risk of SARS-CoV-2 infection. The results show that the risk of SARS-CoV-2 infection is determined by living and working conditions rather than migrant status.

Introduction

In 2020, approximately 27% of the population in Germany were defined as having a statistically defined migrant background (i.e. the individual or at least one of their parents was born without German citizenship).[1] In total, 17% of the population self-migrated to Germany.[1]

International research describes a higher risk of SARS-CoV-2 infection among migrants and ethnic minorities and increased risks of severe COVID-19 disease progression, hospitalisation and death.[2] In Germany, migrants more often live below the poverty level, with an average income that is lower than that of the general population. Poverty and low socio-economic position are associated with higher rates of chronic preconditions[3] that are relevant for the severity of COVID-19 progression. In addition, factors such as crowded accommodation, limited access to health information and

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care and working in specific frontline sectors have been shown to be associated with increased risks of SARS-CoV-2 infection.[2] Migrants in Germany are often employed in low-wage, precarious jobs or jobs that are hazardous to health.[4] Furthermore, migrants frequently work and are disproportionally represented, in frontline jobs, such as those in the health care, cleaning, logistics and transportation sectors. Access to healthcare is often limited for migrants and ethnic minorities due to legal restrictions,[5] information and language barriers.[6]

The objective of this study was to examine the association between migrant status and the risk of SARS-CoV-2 infection in Germany and to discuss potential explanations for these associations.

Methods

Data collection and participants

Data from the German cross-sectional COVID-19 Snapshot Monitoring (COSMO) online survey, which started in early March 2020 and has been repeated on a weekly or bi-weekly basis, were analysed.[7] Each wave of the survey included approximately 1000 participants. Data from wave four (24 March 2020, migrant status not included before) to wave 52 (22 September 2021) were analysed.

Measures

Outcome variable

Self-reported infection status was determined by response to the following question: "Have you been infected with the novel corona virus?" coded as a dichotomous variable ('Yes', 'Yes, confirmed' and 'Yes, but already recovered' coded as yes [=1]; or 'Yes, not yet confirmed', 'I don't know' and 'No' coded as no [=0]).

Predictor variables

Migrant status was defined by own or parental country of birth (not Germany). Age groups were '18–29 years', '30–45 years', '46–60 years' and 'older than 60 years'. School education was summarised as 'Up to nine years of formal education' and 'At least 10 years of formal education (without university qualification)' vs. 'At least 10 years of formal education (with university qualification)'. Household size described the number of people permanently living in participants' households ('only me', 'two persons', 'three to four persons' or 'more than four persons'). Household language described the language mainly spoken in participants' households ('German' vs 'other'). Occupation in the health sector was always included in interviews (response options: 'yes' or 'no'); in wave 29 in-depth questions on occupational status were asked, but the differentiation in health sector yes/no was possible.

Control variables

Municipality size was categorised as '<20,000 inhabitants', '20,000 to <100,000 inhabitants' and '≥100,000 inhabitants'. Federal states were separated into regions as follows: East (federal states of the former German Democratic Republic including Berlin) and West (federal states of the former Federal Republic of Germany).

Analyses

Hierarchical multiple linear regression models were used to calculate adjusted coefficients representing the differences in the probability of self-reporting a SARS-CoV-2 infection and 95% confidence intervals. Estimates of linear probability models (LPM) were provided instead of logit or probit estimates to facilitate tracking of the coefficients' change across multiple nested models. Linear probability models prove viable for binary outcomes and categorical independent variables with interaction effects.[8] In model 1, the probability of migrants reporting an infection was calculated. In model 2, basic sociodemographic variables were integrated. Further possible predictor variables were then integrated in a stepwise manner based on theoretical considerations, as follows: household size (model 3), household language (model 4) and working in the health sector, using an interaction term with migrant status (model 5). All models were adjusted for municipality size and region to account for higher migrant proportions in cities and West Germany. Analyses were performed using Stata version 17 (StataCorp, College Station, TX, USA).

Participants who completed the survey more than once (n = 2232) and those with missing values in the analysed variables (n = 3250) were excluded from the present study, resulting in a final study population of 45,858.

Results

Study population

Among participants, 3.5% reported a SARS-CoV-2 infection, and a total of 16.0% were migrants. The median age of those ever infected was 37 years, and the median age of those never infected was 46 years. The proportion of participants reporting an infection was higher for migrants (6.8%) than non-migrants (2.9%). With increasing household size, the proportion of participants reporting an infection also increased. Participants speaking a language other than German in their household (5.8% vs 2.8%) and those working in the health sector (9.5% vs 2.9%) more often reported an infection with SARS-CoV-2.

Multiple linear regression analyses

Table 1 shows the results from the hierarchical multiple linear regression models. Coefficients for the differences in probabilities are referred to as differences in predicted proportions on a percentage point scale to facilitate interpretation. The proportion of migrants reporting an infection was 3.95 percentage points higher than among non-migrants (model 1, Table 1).

Adding basic sociodemographic variables to the model reduces the difference between migrants and non-migrants by 0.77 percentage points (model 2, Table 1).

Adding the household size variable (model 3) reduces the difference between migrants and non-migrants by a further 0.19 percentage points. Proportions for reporting an infection were higher among participants not living alone (Table 1).

When adding the household language variable (model 4), the difference between migrants and non-migrants is reduced by a further 0.52 percentage points. For participants speaking a language other than German in their household, proportions of reporting an infection were higher (Table 1).

In model 5, occupation in the health sector and an interaction term with migrant status were added. The difference between migrants and non-migrants (only valid for non-healthcare workers in this model) was 1.28 percentage points. The proportion of reporting an infection was 3.82 percentage points higher for non-migrants working in the health sector than among non-migrants in other occupations. However, for migrant workers in the health sector, this proportion was an additional 11.45 percentage points higher (Table 1).

Table 1
Results of multiple linear regression analyses, COVID-19 Snapshot Monitoring survey, Germany, n = 45,858.

Variable	Model 1			Model 2			Model 3			Model 4			Model 5		
	aCoeff	95% CI	*P* value	aCoeff	95% CI	*P* value	aCoeff	95% CI	*P* value	aCoeff	95% CI	*P* value	aCoeff	95% CI	*P* value
Migrant status															
Non-migrant (n = 38,527)	Ref.			Ref			Ref.			Ref.			Ref.		
Migrant (n = 7331)	**0.0395**	**0.0349–0.04410**	**<0.001**	**0.0318**	**0.0271–0.0364**	**<0.001**	**0.0299**	**0.0252–0.0346**	**<0.001**	**0.0247**	**0.0199–0.0295**	**<0.001**	**0.0128**	**0.0078–0.0178**	**<0.001**
Sex															
Female (n = 23,467)				**−0.0096**	**−0.0130 to −0.0063**	**<0.001**	**−0.0096**	**−0.0130 to −0.0063**	**<0.001**	**−0.0092**	**−0.0126 to −0.0059**	**<0.001**	**−0.0119**	**−0.0152 to −0.0086**	**<0.001**
Male (n = 22,391)				Ref.			Ref.			Ref.			Ref.		
Age															
18–29 years (n = 8777)				**0.0464**	**0.0410–0.0518**	**<0.001**	**0.0397**	**0.0340–0.0453**	**<0.001**	**0.0391**	**0.0335– 0.0447**	**<0.001**	**0.0351**	**0.0295–0.0407**	**<0.001**
30–45 years (n = 14,224)				**0.0336**	**0.0289–0.0384**	**<0.001**	**0.0264**	**0.0214–0.0314**	**<0.001**	**0.0257**	**0.0207–0.0307**	**<0.001**	**0.0218**	**0.0168–0.0268**	**<0.001**
46–60 years (n = 12,829)				**0.0139**	**0.0091–0.0186**	**<0.001**	**0.0105**	**0.0056–0.0153**	**<0.001**	**0.0099**	**0.0051–0.0147**	**<0.001**	**0.0076**	**0.0028–0.0125**	**0.002**
>60 years (n = 10,028)				Ref.			Ref.			Ref.			Ref.		
School education															
Up to 9 years/at least 10 years (no university qualification; n = 20,031)				**0.0041**	**0.0006–0.0076**	**0.023**	**0.00480**	**0.0013–0.0083**	**0.008**	**0.0045**	**0.0010– 0.0080**	**0.013**	**0.0037**	**0.0002–0.0072**	**0.038**
At least 10 years (university qualification; n = 25,827)				Ref.			Ref.			Ref.			Ref.		
Household size															
Living alone (n = 11,364)							Ref.			Ref.			Ref.		
2 persons (n = 18,400)							**0.0053**	**0.0010–0.0096**	**0.015**	**0.0051**	**0.0008–0.0093**	**0.020**	**0.0046**	**0.0003–0.0088**	**0.035**
3–4 persons (n = 13,649)							**0.0180**	**0.0132–0.0227**	**<0.001**	**0.0173**	**0.0125–0.0220**	**<0.001**	**0.0155**	**0.0108–0.0202**	**<0.001**
More than four persons (n = 2445)							**0.0346**	**0.0264–0.0427**	**<0.001**	**0.0327**	**0.0245–0.0408**	**<0.001**	**0.0314**	**0.0233–0.0395**	**<0.001**
Household language															
German (n = 35,039)										Ref.			Ref.		
Other language (n = 10,819)										**0.0217**	**0.0176–0.0257**	**<0.001**	**0.0205**	**0.0165–0.0245**	**<0.001**
Occupation in health sector															
No (n = 41,904)													Ref.		
Yes (n = 3954)													**0.0382**	**0.0315–0.0448**	**<0.001**
Interaction															
Migrant (yes) # occupation in health sector (yes; n = 772)													**0.1145**	**0.0995–0.1295**	**<0.001**

aCoeff, adjusted regression coefficients; 95% CI, 95% confidence interval. Bold indicates a significance level of P < 0.05.
All models were adjusted for municipality size and region (west/east).
Model 1: the probability of reporting an infection by migrant status.
Model 2: model 1 adjusted for sociodemographic variables (sex, age, school education).
Model 3: model 2 additionally adjusted for household size.
Model 4: model 3 additionally adjusted for household language.
Model 5: model 4 additionally adjusted for working in the health sector, using an interaction term with migrant status.

Discussion

The study shows that migrants in Germany are at higher risk of reporting a SARS-CoV-2 infection. However, according to the results, it is not the migrant status itself but factors such as the living situation, spoken language and workplace that increase the risk of infection. Strong effect modifications were observed for occupation in the health sector and being a migrant, which suggests that migrants working in the health sector are at particularly high risk of infection. This result can be explained by the higher exposure to the virus experienced by migrants because they often work and are disproportionally represented, in low-wage jobs, such as cleaning and individual patient care.[9] Worldwide, reported infection and mortality rates among healthcare workers were strikingly higher than those of the general population.[9]

Large household size increased the risk of infection, which is consistent with previous findings showing that the infection risk is significantly higher when living in crowded conditions.[10] Increased infection is potentially due to higher exposure to aerosols and reduced opportunities for physical distancing and isolation of infected individuals.

Speaking a language other than German at home is associated with a higher infection risk. As most of the official health information in Germany is provided in German, access barriers to reliable information sources might contribute to increased infection. Therefore, tailored risk communication and community engagement strategies are needed (e.g. using translation and interpretation services and involving community organisations).

Specific protection and prevention measures are required to address the intersecting public health risks in the pandemic and beyond. First, public health interventions need to be multilingual and community oriented to reach people in their working and living environments. Second, structural issues, such as precarious working conditions and systematic discrimination, need to be addressed. Further research is required to gain a better understanding of the role and interplay of structural and individual factors that increase infection risks, with the aim of protecting those working in and receiving health care.

Limitations

There is a potential selection bias in this study because survey participation was only available online and in the German language. Participants reported higher levels of education and were younger than the general population; thus, some population groups of interest may not be represented. In addition, own or parental history of migration was the only migration-related factor captured in the survey; therefore, other structural factors potentially affecting the risk of infection, such as legal status or discrimination, were not analysed. The effect of income on infection could not be analysed, as this variable was not included until June 2020. It should also be noted that because this study was based on a cross-sectional sample, explicit causal explanations cannot be derived.

Conclusions

Increasing evidence shows that socio-economic factors, such as employment, education and income, contribute to the association between migrant status and SARS-CoV-2 infection. The results from this study show that in Germany, migrants, health sector employees and in particular migrant health workers, appear to be at a higher risk of SARS-CoV-2 infection. Large households and language barriers also contribute to an increased risk of infection.

Author statements

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Ethical approval

Ethics approval was obtained from the University of Erfurt's IRB (#20200302/20200501).

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Competing interests

All authors declare that there is no conflict of interest.

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