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BMJ Open Identification of factors associated with non-adherence to recommended COVID-19 preventive behaviours: a cross-sectional study based on a survey among 1004 French primary care professionals

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ABSTRACT

Objectives Since the beginning of the COVID-19 pandemic, adherence to preventive behaviours to limit virus spread has been a major issue. The study objective was to identify factors associated with non-adherence to preventive behaviours among general practitioners (GPs) during the COVID-19 pandemic using data from a questionnaire completed during the French National Congress of General Medicine in June 2021.

Design This descriptive study relied on data collected with a questionnaire during the national congress on general medicine in Bordeaux, France, from 16–18 June 2021.

Setting The study was conducted in primary care in France.

Participants Out of a total of 1004 GPs and GP trainees, 755 completed the questionnaire during conferences and 249 were contacted by mail.

Results The questionnaire included questions on sociodemographic characteristics and COVID-19 related preventive behaviours, beliefs and experiences. Answers to questions that explored the Health Belief Model components were selected and then compared among participants who reported appropriate preventive behaviours (wearing face masks and social distancing) and participants who reported non-adherence. Analysis was based on multivariate logistic regression.

The responders' mean age was 35.8 years; 61.64% were women, 61.9% were practising GPs and 37.2% were GP trainees. Moreover, 96.6% of participants had completed the COVID-19 vaccination schedule. Non-adherence (reported by 72/1004 participants) was more frequent among smokers (OR=2.57, 95% CI 1.29 to 4.83, $p=0.005$) and younger participants (OR=0.95, 95% CI 0.92 to 0.98, $p=0.005$). Complete COVID-19 vaccination or a previous infection was not associated with non-adherence and has been poorly described.

Conclusion More studies are needed to confirm the factors involved in the adoption of COVID-19 preventive behaviours by healthcare professionals and to explore the beliefs and barriers to the adoption of these behaviours.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study explored the determinants of COVID-19 preventive behaviours based on a cross-sectional sample of 1004 survey respondents.
- ⇒ The response rate was high, with 755 (58%) initial respondents among 1300 conference participants.
- ⇒ The survey referred to the health belief model, which has proven validity in the analysis of health behaviours.
- ⇒ The questionnaire used to analyse non-adherence to preventive behaviours was not specifically designed to address all aspects of the health belief model.
- ⇒ This study concerned non-adherence to preventive measures, and some participants may have minimised or not reported non-adherence.

INTRODUCTION

In March 2020, the WHO declared that the SARS-CoV-2 outbreak was a pandemic. In 2021, France reported more than 7 million confirmed cases and several thousand deaths.¹ To limit virus spread, many preventive recommendations have been issued by governments,^{2 3} such as hand washing, mask wearing, physical distancing, frequent ventilation, vaccination and limiting gatherings. However, since their implementation, adherence to such preventive behaviours has not been complete in the general population^{4 5} or within the medical community (eg, not respecting barrier gestures and not promoting the vaccination). Controlling the epidemic among healthcare professionals is a major issue, as they could infect vulnerable patients and more often be infected themselves. Health professionals also play a central role in health promotion as role models,

thus influencing the adherence of patients to preventive behaviours.^{6,7}

The main objective of the study was to identify factors associated with the non-adherence of general practitioners (GPs) to the preventive behaviours recommended by the French government during the COVID-19 pandemic (barrier gestures and vaccination). The health belief model, a behavioural theory developed by Rosenstock to predict the adoption/change of health behaviours,⁸ was used as a framework to interpret the results of our study.

METHODS

Study design and setting

This descriptive study relied on data collected with a questionnaire during a national congress on general medicine in Bordeaux, France, from 16–18 June 2021. This was the first face-to-face congress after the lifting of the COVID-19 related restrictions. Participants (~1300 GPs and GP trainees) came from all over France. An invitation to complete the questionnaire was sent by email to all congress participants. The questionnaire was completed anonymously.

The study was carried out following the Commission Nationale de l'Informatique et des Libertés (CNIL) methodology MR-004 for the use of personal data for research. According to French regulations, this study did not require approval by an ethics committee. Respondents gave their informed and written consent at the beginning of the online questionnaire.

The questionnaire

The study relied on data collected with a questionnaire prepared by the national team of the French National College of Teaching General Practitioners (online supplemental file), which was based on a questionnaire created by Santé Publique France to study the characteristics of congress participants and to determine the infection incidence during a general medicine conference after the lifting of restrictions.^{9,10}

The 46-item questionnaire was divided into three parts: (1) a 'general' section on the respondents' sociodemographic and lifestyle characteristics; (2) a section on respondent adherence to preventive behaviours to limit the spread of the virus and the level of exposure to the virus; and (3) a section on the respondents' personal experiences with and beliefs regarding COVID-19.

Non-adherence to preventive behaviours and associated factors using the health belief model

Non-adherence to preventive behaviours was defined as (1) 'never wearing a mask, when mandatory, or less than half of the time' and (2) 'often or always shaking hands or hugging'. These two behaviours seemed to be the most important, notably for a population of health professionals, which is why we selected these behaviours as a marker of non-adherence.

Then, the questions to investigate the different components of the health belief model were selected (table 1) to identify factors associated with non-adherence to preventive behaviours. The health belief model is the most current theory used in the literature to explore preventive behaviours. In the context of COVID-19, it has been used in many studies,^{11,12} and a systematic review confirmed its good predictive ability.¹³

Data analysis

First, a bivariate analysis was carried out to compare the characteristics of participants who reported appropriate preventive behaviours and those who reported non-adherence. Student's t-test was used to compare quantitative variables (presented as the means with SD), and the χ^2 test was used for qualitative variables.

For the multivariate logistic regression analysis, only clinically relevant variables with $p < 0.15$ in the bivariate analyses were included. Then, using a threshold of $p < 0.05$, variables were selected step by step using the Bayesian information criterion to keep only the relevant and significant variables in the final logistic model.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Population

Among the 1300 conference participants, 755 (58%) directly completed the questionnaire. In addition, 249 GPs and GP trainees who were contacted by mail also completed the questionnaire. In total, data from 1004 questionnaires (one questionnaire/person) could be analysed. The participants' mean and median ages were 35.8 and 32 years, respectively (range: 21–71 years); 617 were women (61.64%), 622 (61.96%) were practising GPs and 357 (37.2%) were GP trainees (online supplemental table 1). Participants lived mainly in freestanding houses (52.15%) or in flats (42.64%). Only 5.51% of participants lived in shared accommodations. Moreover, 52.49% of participants had children or students in the living in the household, and 25.27% had school-age children (from nursery to high school).

Participants who reported non-adherence to preventive behaviours

Overall, 72 participants (7.2%) reported non-adherence to preventive behaviours (ie, never or rarely wearing a mask when required and/or often or always hugging/shaking hands) (online supplemental table 2). In this group, non-adherence to the following preventive behaviours was more frequent than in the other group of respondents: not respecting physical distancing in their personal life (38.89%, 95% CI 28.45 to 50.45 vs 16.27%, 95% CI 13.99 to 18.85, $p < 0.001$) and not wearing

Table 1 Questions addressing components of the health belief model

Health belief model component	Item of the questionnaire
Modifying factors	1. How old are you? 2. Are you a man/a woman/other? 8. What is your current professional status?
Perceived susceptibility	15. Are you a smoker? 16. Have you had a positive test for COVID-19 in the past? 20. Have you been vaccinated against COVID-19? 38. Do you think that COVID-19 is a disease?
Perceived barriers	/*
Perceived severity	12. What is your height? 13. What is your weight? 14. Do you have a comorbidity that increases the risk of a severe form of COVID-19?
Perceived benefits	37. What leisure activities have you restarted in the last 15 days?
Cues to action	4. How many people live in your house? 5. Among the adults living in your house, how many are vaccinated against COVID-19, including you? 19. In the last 15 days, have you had suspicious symptoms/have you been in close contact with an infected person/have you taken a COVID-19 screening test? 31. Have you used the TousAntiCovid† application in the last 2 weeks? 39. Among your family and friends, is there somebody with a comorbidity who is at risk of a severe form of COVID-19? 40. Among your family and friends, is there somebody who had COVID-19? 41. Severity of COVID-19 among your patients?

*There was no question of the questionnaire specifically exploring this item.

†Application for smartphones that allows contact tracing and uploading a COVID-19 pass (vaccination status and test results).

a mask in the presence of family or friends (69.44%; 95% CI 58.00 to 78.92 vs 39.62%; 95% CI 36.46 to 42.87, $p < 0.001$). They also downloaded the AllAntiCovid application less frequently (37.5%; 95% CI 0.27 to 0.49 vs 50.06%; 95% CI 0.48 to 0.53, $p = 0.054$) and resumed the following non-essential activities more frequently after restrictions were lifted: eating out (88.89%; 95% CI 79.33 to 94.61 vs 73.73%; 95% CI 70.72 to 76.52, $p = 0.007$) and non-essential shopping (73.61%; 95% CI 62.36 to 82.47 vs 56.74%; 95% CI 53.45 to 59.97, $p = 0.008$).

Determinants of factors associated with non-adherence to preventive behaviours according to the health belief model

Based on univariate analysis, we selected the following factors as potentially being associated with non-adherence (online supplemental table 3): younger age (31.8 years, 95% CI 29.41 to 34.13 vs 36.1 years, 95% CI 35.41 to 36.84, $p < 0.001$), female sex (72.22%, 95% CI 60.89 to 81.30 vs 60.82%, 95% CI 57.64 to 63.9, $p = 0.073$), fewer persons living in the household (2.36 persons per household, 95% CI 2.05 to 2.66 vs 2.88, 95% CI 2.76 to 2.99; $p = 0.002$), the presence of children or students in the household (29.17%, 95% CI 19.89 to 40.56 vs 54.29%, 95% CI 51.25 to 57.64, $p < 0.001$), the presence of school-age children in the household (12.50%, 95% CI 6.50 to 22.30 vs 26.26%, 95% CI 23.54 to 29.19, $p = 0.014$) and GP internship status (59.09%, 95% CI 42.74 to 65.17 vs 35.22%, 95% CI 30.52 to 36.57, $p = 0.002$).

Among the factors that influenced perceived risk/susceptibility, smoking was selected as a factor potentially

being associated with non-adherence (18%, 95% CI 10.73 to 28.62 vs 7.42%–95% CI 5.88 to 9.32, $p = 0.003$) (online supplemental table 4). Obesity, comorbidities that increase the risk of severe COVID-19, vaccination, personal history of COVID-19 infection and the perceived severity of COVID-19 infection were not associated with non-adherence to preventive behaviours.

Non-adherence to preventive behaviours was potentially associated with the following cues to action (online supplemental table 5): a lower percentage of contacts with suspected COVID-19 persons (1.39%, 95% CI 0.01 to 8.18 vs 7.74%, 95% CI 6.17 to 9.68, $p = 0.078$) or confirmed persons (1.39%, 95% CI 0.01 to 8.18 vs 6.42%, 95% CI 4.99 to 8.22, $p = 0.118$) in the 15 days before the conference, a higher percentage of screening tests (23.61%, 95% CI 15.21 to 34.69 vs 12.83%, 95% CI 10.80 to 15.18, $p = 0.017$), more benign forms of COVID-19 among relatives (67.61%, 95% CI 56.02 to 77.38 vs 52.96%, 95% CI 49.62 to 56.28, $p = 0.024$) and a lower percentage of COVID-19 related deaths among patients (35.21%, 95% CI 25.10 to 46.84 vs 45.88%, 95% CI 42.57 to 49.22, $p = 0.107$).

Multivariate analysis ($n = 963$, 41 participants who did not answer the questions about adherence to preventive behaviours were excluded from the analysis) showed that non-adherence to preventive behaviours remained associated with younger age (OR 0.95, 95% CI 0.92 to 0.98, $p = 0.002$) and current smoking (OR 2.57, 95% CI 1.29 to 4.83, $p = 0.005$).



DISCUSSION

In our survey of 1004 GPs, 7.2% reported non-adherence to the recommended preventive behaviours. Non-adherence was associated with smoking (OR=2.72, $p=0.005$) and younger age (OR=0.95, $p=0.005$) but not with factors that could decrease (eg, personal history of COVID-19 infection and vaccination) or increase (eg, comorbidities and sex) perceived susceptibility. This study is original because it focused on healthcare professionals. We did not find any study on the determinants of adherence to preventive behaviours by healthcare professionals in the context of the COVID-19 pandemic.

Non-adherence to preventive behaviours was reported by 7.2% of respondents, but this rate might have been underestimated due to reporting bias. Indeed, it has been shown that the observed adherence to preventive measures tends to be significantly lower than the rate estimated by self-reporting.¹⁴ For instance, in the same period, in the French CoviPrev study on adherence to preventive measures,¹⁵ approximately 35% of participants from the general population reported behaviours that were inconsistent with the recommendations. In 2022, an international meta-analysis found that 78.8% of healthcare workers had good practices in terms of adherence to COVID-19 infection control measures.¹⁶ Concerning preventive behaviours outside of the workplace, a study found significantly less frequent adherence by physicians and students than by other health professionals.¹⁷

In our study, smoking was significantly associated with non-adherence to preventive behaviours. The effect of smoking on COVID-19 infection has been extensively studied, with contradictory findings.¹⁸ At the beginning of the pandemic, smoking was considered a protective factor against infection. Indeed, compared with the general population, the percentage of smokers was lower among COVID-19 and SARS-CoV-2 positive patients and in COVID-19 patients in intensive care units.^{19,20} However, subsequent studies showed that COVID-19 related mortality is higher in smokers and that active smoking is an important factor in the severity and adverse outcomes of SARS-CoV-2 infection.²¹⁻²⁴ Although smokers are generally well informed about the risk of smoking, they often underestimate its real danger and the associated health risks.²⁵ Similarly, in the context of a pandemic, they may underestimate the associated risks. In addition, smoking is not compatible with mask wearing.

The other main result was that non-adherence to preventive behaviours was significantly associated with younger age, as shown in many studies.^{17,26} The results in the literature are variable, with many studies not finding a link between younger age and non-adherence.^{27,28} In the health belief model, age can modify perceived risk and susceptibility. The role of age in the adoption of preventive behaviours has been consistently found in studies showing that young adults are less likely to adopt public health behaviours.^{29,30} In our study, the age difference between groups (adherence vs non-adherence) was too small (31 years vs 36 years) to implicate higher perceived

frailty or vulnerability in older respondents. Indeed, according to the literature, people older than 65 years (or 75 years, depending on the study) are at greater risk of developing severe forms of COVID-19.³¹⁻³³ The age factor may be linked to different lifestyles: students or individuals with children.

The vaccination rate was comparable in participants who reported or did not report non-adherence to preventive behaviours. Several studies have demonstrated the effectiveness of vaccination against COVID-19.³⁴ A study among healthcare professionals showed a reduction in the incidence of COVID-19 infection and hospitalisations, intensive care admissions and deaths among vaccinated workers.³⁵ Therefore, being vaccinated could have contributed to decreased feelings of vulnerability. In our study, 96% of responders were vaccinated compared with ~70% of all healthcare professionals in France in June 2021.³⁶ Our sample was mainly composed of GPs, which may explain the high vaccination rate in this study.³⁵

According to the health belief model, as comorbidities (eg, obesity) are risk factors for COVID-19 related hospitalisation and death,^{21,37} they could have increased the perceived sense of risk, thus promoting adherence to preventive behaviours. However, comorbidities were not associated with better adherence to the preventive behaviour recommendations. Here, again, the feelings of vulnerability or risk perceived by this population might not be sufficient to promote strict adherence to preventive measures. Optimism bias (also known as comparative optimism), in which people tend to believe that positive events are more likely to happen to them than to others and negative events are more likely to happen to others,³⁸ might also be implicated.

In our study, sex was not associated with non-adherence to preventive behaviours. Since the beginning of the pandemic, mortality has been higher among men, and several factors have been proposed to explain this difference (eg, biological differences, pre-existing conditions, type of job, smoking and propensity to seek healthcare).^{39,40} Differences between sexes in how individuals perceive and respond to health risks, regardless of age, education level or even occupational status, have been described.²⁹ Women are more likely to adopt health-protective behaviours during respiratory infection epidemics and pandemics,^{41,42} including during the COVID-19 pandemic, in many countries.^{39,42,43}

Having a personal history of SARS-CoV-2 infection was also not associated with non-adherence to preventive behaviours, although people with previous exposure may feel less vulnerable. Similarly, the presence of COVID-19 symptoms in the 15 days before the conference, having been in close contact with an infected person and having a history of serious COVID-19 or death among family members or patients were not associated with a change in behaviour, although these events could have acted as a trigger for action according to the health belief model. Nevertheless, Smith *et al*²⁷ found that non-adherence was associated with a higher frequency of contact with

patients with COVID-19 and concluded that fatalism about COVID-19 explained some of the behaviours.

In our study of healthcare professionals, cues to action and modifying factors were not associated with non-adherence to preventive behaviours. However, this aspect of the health belief model was not well addressed by our questionnaire. Indeed, the participants' beliefs, political ideas and cultural sensitivities were not investigated. The level of information and communication could also play an important role in encouraging action in the health belief model. However, our study focused on healthcare professionals who should have a good level of knowledge about health and prevention.

Strengths and limitations

To our knowledge, this is the only study on the determinants of adherence to preventive behaviours among GPs. Many studies have focused on the general population. Another strength is that we referred to the health belief model, which has proven validity in the analysis of health behaviours.

However, this study also has some limitations. The questionnaire used was not specifically developed to analyse non-adherence to preventive behaviours. Therefore, some components of the health belief model were not addressed (eg, the perceived barriers to the implementation of measures to prevent the transmission of SARS-CoV-2), whereas others could have been explored in greater depth, particularly modifying factors and cues to action.

As with any survey work, our study may present participation, reporting and social desirability biases. Indeed, as the study concerned non-adherence to preventive measures, some participants may have minimised or not reported non-adherence, although questionnaire anonymisation may have limited this problem.

CONCLUSION

Although healthcare professionals play a central role in promoting prevention measures, 7.2% of participants in this survey reported non-adherence to preventive measures, a behaviour mainly associated with active smoking and age. The factors involved in the adoption of COVID-19 preventive behaviours by healthcare professionals have been poorly described. More studies are needed to confirm and broaden our results and to explore barriers to the adoption of preventive measures by GPs and their beliefs.

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