Factors associated with self-perceived knowledge of COVID-19: a study among women from the NINFEA birth cohort

Fattori associati alla conoscenza autopercepita sul COVID-19: uno studio condotto tra le donne appartenenti alla coorte di nascita NINFEA

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ABSTRACT

BACKGROUND: health literacy may contribute to the strategies to control the Coronavirus disease 2019 (COVID-19), as individuals need to acquire promptly new health information, understand the reasons behind recommendations, and adapt their behaviour accordingly.

OBJECTIVES: to investigate sociodemographic and disease-related factors that can influence self-perceived knowledge (poor/medium vs high) about COVID-19 in women of the Italian NINFEA birth cohort.

DESIGN: cross-sectional study.

SETTING AND PARTICIPANTS: a web-based anonymous survey on COVID-19 was sent in April 2020 to women participating in the NINFEA cohort. A total of 3,129 women were included in the study.

MAIN OUTCOME MEASURES: using multiple weighted logistic regression models, self-perceived knowledge level was analysed in relation with the following variables: age, education level, family size, cumulative incidence of severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) cases until 7 April 2020 by province, presence of COVID-19-like symptoms, SARS-CoV-2 testing, and COVID-19 diagnosis.

RESULTS: the prevalence of self-perceived poor/medium knowledge was 57%. In multivariable logistic regression analyses, the odds ratio (OR) of self-perceived poor/medium COVID-19 knowledge level was increased for low/medium compared with high education level (OR 1.57; 95%CI 1.34-1.84), and decreased for SARS-CoV-2 testing (OR 0.25; 95%CI 0.16-0.39) and COVID-19 diagnosis (OR 0.20; 95%CI 0.07-0.60). There was no evidence of association between the other analysed variables and self-perceived knowledge level.

CONCLUSIONS: the findings of this study suggest that low educational level is a determinant of low self-perceived knowledge on COVID-19 in middle-aged women.

Keywords: COVID-19, self-perceived knowledge, health literacy, Italy, NINFEA

WHAT IS ALREADY KNOWN

■ Health literacy is important for the comprehension of the recommendations and their translation into adequate preventive behaviours.
■ The objective COVID-19 knowledge level has been reported to be positively associated with compliance to recommended preventive practices against the virus.

WHAT THIS PAPER ADDS

■ Education level, having been tested for SARS-CoV-2, and having been diagnosed for COVID-19 are important determinants of self-perceived knowledge in women from the NINFEA birth cohort.
■ The magnitude of the outbreak and the presence of COVID-19-like symptoms were not associated with the perceived knowledge on COVID-19.

RIASSUNTO

INTRODUZIONE: l'alfabetizzazione sanitaria può favorire le strategie messe in atto per controllare la diffusione della malattia da Coronavirus 2019 (COVID-19), poiché la popolazione necessita di acquisire tempestivamente le nuove informazioni sulla salute, comprendere le ragioni alla base delle raccomandazioni e adattare di conseguenza il proprio comportamento.

OBIETTIVI: sono stati studiati i fattori sociodemografici e relativi alla malattia che potrebbero influenzare la conoscenza autopercepita (medio/bassa vs alta) sul COVID-19 tra le donne appartenenti alla coorte di nascita NINFEA (Nascita e Infanzia: gli Effetti dell'Ambiente).

DISEGNO: studio trasversale.

SETTING E PARTECIPANTI: nell'aprile 2020, è stato somministrato via web un questionario anonimo contenente domande sul COVID-19 rivolte alle donne partecipanti alla coorte di nascita NINFEA. In totale, sono state incluse nello studio 3.129 donne.

PRINCIPALI MISURE DI OUTCOME: sono stati utilizzati modelli di regressione logistica mutivariata pesata per analizzare il livello di conoscenza autopercepita (medio/basso vs alto) in relazione alle seguenti variabili: età, livello di istruzione, dimensione del nucleo familiare, incidenza cumulativa dei casi di sindrome respiratoria acuta da Coronavirus 2 (SARS-CoV-2) per provincia al 7 aprile 2020, presenza di sintomi tipici del COVID-19, esposizione a test per SARS-CoV-2 e aver ricevuto diagnosi di COVID-19.

RISULTATI: la prevalenza di un livello di conoscenza autopercepita medio/basso è del 57%. Le analisi condotte con regressione logistica multivariata hanno evidenziato un'associazione fra basso livello di istruzione e livello medio/basso di conoscenza autopercepita su COVID-19 (OR: 1,57; IC95% 1,34-1,84). Inoltre è stata osservata un'associazione inversa fra conoscenza autopercepita medio/bassa ed esposizione a test per SARS-CoV-2 (OR: 0,25; IC95% 0,16-0,39) o diagnosi di COVID-19 (OR: 0,20; IC95% 0,07-0,60). Non vi è associazione tra le altre variabili analizzate e il livello di conoscenza autopercepita.

CONCLUSIONE: i risultati suggeriscono che il basso livello di istruzione sia un determinante del basso livello di conoscenza autopercepita su COVID-19 nelle donne di media età.

Parole chiave: COVID-19, conoscenza autopercepita, alfabetizzazione sanitaria, Italia, NINFEA

INTRODUCTION

It is important to investigate strategies to better control and contain the Coronavirus disease 2019 (COVID-19). Early symptoms detection, timely access to care and preventive practices can slow down and limit the spread of the disease. Health literacy, as defined by World Health Organization (WHO), "implies the achievement of a level of knowledge, personal skills and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions".[1]

Low health literacy is associated with more hospitalizations and use of emergency care, lower adherence to mammography screening, influenza vaccine, and medical prescriptions, poorer ability to interpret labels and health messages, and poorer overall health status and higher mortality rates among elderly people.[2] Various definitions of health literacy available in literature are largely due to different understanding of the relation between health knowledge and health literacy. In health literacy theories, the position of knowledge is variable; health knowledge has been investigated either as an antecedence, as a part of health literacy, or as its direct consequence; though it has been typically treated as an outcome of health literacy. In contrast with actual knowledge, self-perceived knowledge is the personal confidence about acquired capacities to get access to, to understand or to apply health information, hence it is a self-reported perceived capability,[3,4] and this perception can influence personal choices more than the actual knowledge.[3] Given the complex link between health literacy and knowledge in the healthcare context, both are demanding requirements to reach good control and prevention of adverse health outcomes. Health literacy might be especially relevant in the ongoing COVID-19 crisis because, in this context of unprecedented information overload and uncertainty, individuals need to promptly acquire and critically assess new information, filter untrustworthy sources, accordingly change their behaviour, and act in a socially responsible way, beyond personal interests.[5] People who are more susceptible and vulnerable to COVID-19 infection may be also those with lower health literacy.

The level of COVID-19 knowledge has been reported to be positively associated with compliance to recommended preventive practices against the virus, such as wearing masks when going out and avoiding crowded places, in two studies in China and the United States.[6,7]

In this study, the level of self-perceived knowledge about COVID-19 and its relationship with sociodemographic, disease- and pandemic-related factors were investigated using data from a cross-sectional questionnaire sent to the women participating in the Italian birth cohort NINFEA (*Nascita e Infanzia: gli Effetti dell'Ambiente*).

METHODS

The NINFEA study is an Italian Internet-based mother-child cohort that recruited 7,500 pregnant women with-in the 2005-2016 period with the aim of studying the associations between early-life exposures and later childhood and adulthood health outcomes. Women were asked to complete questionnaires during pregnancy, 6 and 18 months after delivery and when the children turned 4, 7, 10, and 13 years. Details on the cohort are available in previous publications.[8,9] The NINFEA study was approved by the Ethical Committee of the San Giovanni Battista Hospital and CTO/CRF/Maria Adelaide Hospital of Turin (project number 45).

Women participating in the NINFEA cohort with at least one available follow-up questionnaire were asked to answer an anonymous on-line COVID-19 survey. The questionnaire was launched on 7 April 2020, and remained open for 13 days, during which two reminders were sent. The questionnaire collected information on basic sociodemographic characteristics (gender, education level, region, province and area of residence, year of participation in the NINFEA study), self-perceived knowledge level and sources of information on COVID-19, COVID-19-like symptoms, acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) testing and COVID-19 diagnosis within the household. Results on symptoms, testing and diagnosis are reported in a separate manuscript, in a preprint version at present.[10] Self-perceived knowledge on COVID-19 was assessed using the following question: "How would you rate your knowledge about COVID-19?". The level of self-perceived knowledge was self-rated by the participants using a five-level score: 1= very poor knowledge, 2= poor knowledge, 3=medium knowledge, 4= wide knowledge, 5= very wide knowledge. The aim of this study was to investigate the determinants of poor self-perceived knowledge, which had a rather low prevalence in this study, with only 93 women (3%) reporting very poor and poor COVID-19 knowledge level. Hence, very poor, poor, and medium vs wide and very wide knowledge level were combined to obtain a binary variable of poor/medium vs high self-perceived knowledge level. The survey variables are described in Tables 1 and 2. Information on the population cumulative incidence of SARS-CoV-2 positive cases until 7 April 2020 by province were obtained from the national Surveillance System,[11] and the province population size (all residents as of 1 January 2020) from the Italian National Institute of Statistics.[12] The information on the province of residence of each participant to the survey was then used to assign to each participant the province COVID-19 cumulative incidence per 1,000 inhabitants, which is considered as an indicator of the magnitude of the outbreak to which the participant was exposed to. To adjust for non-response, the respondents were weighted using iterative proportional fitting,[13] allowing the distribution of the survey variables to resemble closely the NINFEA population margins (table S1). The weights were calculated using the following maternal characteristics: age (<35 years, 35-40 years, 40-45 years, 45-50 years, and ≥50 years), education level (low: primary school or less; medium: second-

SOCIODEMOGRAPHIC CHARACTERISTICS	No. or MEDIAN (IQR)	WEIGHTED[a] PERCENTAGE OF POOR/MEDIUM KNOWLEDGE (%)	OR	(95%CI)	OR$_{adj}$[b]	(95%CI)
KNOWLEDGE LEVEL						
Very Low	2	/	/			
Low	91					
Medium	1,674					
High	1,085					
Very high	277					
AGE (YEARS)	42 (7)	–	0.95	(0.88-1.02)[c]	0.97	(0.90-1.04)[c]
MATERNAL EDUCATION						
High	2,097	57.0	1.00 (reference)			
Medium/low	1,032	43.0	1.61	(1.37-1.87)	1.57	(1.34- 1.84)
RESIDENTIAL AREA						
Urban	973	28.5	1.00 (reference)			
Suburban	1,479	49.5	1.23	(1.05-1.46)	1.15	(0.97-1.35)
Rural	677	22.0	1.14	(0.93-1.39)	1.05	(0.86-1.29)
FAMILY SIZE (No. OF MEMBERS)	4 (1)	–	1.03	(0.95-1.11)	1.03	(0.95-1.11)
COVID-19 CUMULATIVE INCIDENCE[d] (PER 1,000 INHABITANTS)	2.8 (0.8)	–	0.97	(0.91-1.03)	0.97	(0.89-1.05)

[a] Weighted using the marginal distribution of all women participating in the NINFEA study / *Pesato utilizzando la distribuzione marginale di tutte le donne che partecipano allo studio NINFEA*
[b] Odds Ratio mutually adjusted for all variables in the table, and for region of residence (Piedmont, Tuscany, other Regions of Northern Italy, Central and Southern Italian Regions) / *Odds ratio reciprocamente aggiustato per tutte le variabili in tabella e per la regione di residenza (Piemonte, Toscana, altre regioni del Nord Italia, regioni del Centro e Sud Italia)*
[c] Odds Ratio per 5-year increase / *Odds ratio per un aumento di 5 anni*
[d] Cumulative incidence of COVID-19 until 7 April 2020 by province was calculated from the daily reported cumulative number of cases by province and province population size / *L'incidenza cumulativa di COVID-19 al 7 aprile 2020 per ogni provincia è stata calcolata dal numero cumulativo giornaliero di casi per provincia e dalla dimensione della popolazione della provincia*

Table 1. Association of sociodemographic characteristics and the contextual magnitude of the outbreak with poor/medium self-perceived knowledge about COVID-19 among 3,129 women participating in the Italian NINFEA birth cohort.
Tabella 1. Associazione tra le caratteristiche sociodemografiche e la dimensione contestuale dell'epidemia con il livello di conoscenza autopercepito medio/basso di COVID-19 tra 3.129 donne partecipanti alla coorte di nascita italiana NINFEA.

ary school; high: university degree or higher), and period of enrolment into the NINFEA study (2005-2008, 2009-2012, 2013-2016). Weighted logistic regression models were used to estimate crude and mutually adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of poor/ medium vs high self-perceived knowledge, for each sociodemographic variable and the province-specific cumulative incidence of COVID-19 per 1,000 inhabitants. Associations of self-perceived knowledge with COVID-19-like symptoms, testing for SARS-CoV-2, and diagnosis of COVID-19 were also analysed, adjusting for maternal age at compilation of the survey and maternal education level. All analyses were conducted using Stata version 15.1 (College Station, Texas, USA).

RESULTS

In total, the respondents to the survey were 3,184, with a 54.2% response proportion. The respondents were similar to the baseline population invited in almost all of the baseline characteristics. Fathers who completed the questionnaire (No. 14), subjects residing abroad (No. 26), and participants who had missing data in any of the analysed variables (No. 15) were excluded. The final sample size was of 3,129 women. Sociodemographic characteristics are reported in table 1, the prevalence of COVID-19-like symptoms, SARS-CoV-2 testing, and COVID-19 diagnosis are shown in table 2.
The overall weighted prevalence of self-perceived poor/medium knowledge was 57%. As reported in table 1, having a lower education level was associated with an increased

odds ratio of self-perceived poor/medium knowledge (OR 1.57; 95%CI 1.34-1.84). In the crude analysis, women living in a suburban or rural residential area compared to an urban area had, respectively, a 23% and a 14% increased risk of poor/medium self-perceived knowledge, but this association was attenuated after adjustment for the other covariates, and in particular for education level. No evidence of association was found between the province cumulative incidence of COVID-19 and self-perceived knowledge of COVID-19 (OR 0.97; 95%CI 0.89-1.05).
Overall, there was a weak or no association between the analysed COVID-19-like symptoms and self-perceived knowledge of COVID-19 (table 2). There was a very low odds ratio of self-perceived low/medium knowledge for being tested vs not tested for SARS-CoV-2 (OR 0.25; 95%CI 0.16-0.39) and for COVID-19 diagnosis (OR 0.20; 95%CI 0.07-0.60).

DISCUSSION

This study aimed at exploring factors associated with self-perceived knowledge on COVID-19 among women participating in the Italian NINFEA birth cohort. An association between education level and self-perceived knowledge was found, while there was a weak or no association for the other sociodemographic factors. The magnitude of the outbreak in the province of residence was not associated with the perceived knowledge, probably because the lockdown in Italy had a national extension and people were indistinctly exposed to COVID-19-related information.

COVID-19-LIKE SYMPTOMS, SARS-COV-2 TESTING AND COVID-19 DIAGNOSIS		SELF-PERCEIVED KNOWLEDGE LEVEL ABOUT COVID-19	
		SYMPTOM PREVALENCE[a] No.	OR$_{adj}$[b] OF POOR/MEDIUM KNOWLEDGE (95%CI)
Nasal congestion	No	2,628	1.00 (reference)
	Yes	501	0.88 (0.72-1.07)
Fever 37-37.5°C	No	2,887	1.00 (reference)
	Yes	242	0.94 (0.72-1.24)
Fever >37.5°C	No	2,934	1.00 (reference)
	Yes	195	0.82 (0.61-1.11)
Sore throat	No	2,566	1.00 (reference)
	Yes	563	0.89 (0.74-1.07)
Cough	No	2,613	1.00 (reference)
	Yes	516	0.86 (0.71-1.04)
Muscle pain	No	2,715	1.00 (reference)
	Yes	414	0.87 (0.71-1.08)
Fatigue	No	2,505	1.00 (reference)
	Yes	624	0.96 (0.80-1.15)
Nausea/Vomiting	No	2,997	1.00 (reference)
	Yes	132	0.82 (0.57-1.18)
Diarrhoea	No	2,852	1.00 (reference)
	Yes	277	0.93 (0.72-1.20)
Anosmia/Dysgeusia[c]	No	1,944	1.00 (reference)
	Yes	59	1.12 (0.66-1.89)
Breathing difficulties[c]	No	1,937	1.00 (reference)
	Yes	66	0.67 (0.41-1.12)
At least one symptom[d]	No	1,801	1.00 (reference)
	Yes	1,328	1.00 (0.87-1.16)
Tested for COVID-19[e]	No	3,015	1.00 (reference)
	Yes	114	0.25 (0.16-0.39)
Positive/COVID-19 diagnosis	No	3,109	1.00 (reference)
	Yes	20	0.20 (0.07-0.60)

[a] Unweighted / *Non pesata*
[b] Odds Ratio adjusted for maternal age and educational level, and weighted for baseline population characteristics (95% confidence intervals) / *Odds ratio aggiustato per età materna e livello di istruzione e pesato per le caratteristiche della popolazione al baseline (intervalli di confidenza al 95%)*
[c] Based on 2,003 women / *Basato su 2.003 donne*
[d] Excluding anosmia/dysgeusia and breathing difficulties / *Escludendo anosmia/disgeusia e difficoltà respiratorie*
[e] Nasopharyngeal swab for SARS-CoV-2 testing / *Tampone rinofaringeo per test di SARS-CoV-2*

Table 2. Association of disease-related factors with poor/medium self-perceived knowledge about COVID-19 among 3,129 women participating in the Italian NINFEA birth cohort.
Tabella 2. Associazione tra i fattori relativi alla malattia e conoscenza autopercepita media/bassa di COVID-19 tra 3.129 donne partecipanti alla coorte di nascita italiana NINFEA.

Conversely, SARS-CoV-2 testing and COVID-19 diagnosis were strongly associated with a better perceived knowledge. The latter result is in line with expectation and supports the study validity because people tested for SARS-CoV-2 or diagnosed with COVID-19 were probably informed by the health care personnel and/or more actively engaged in information-seeking behaviours than other participants, that resulted in their higher self-perceived knowledge.

Even if the present study was based on a selected population of women who participate in a birth cohort study with, on average, a high education level, the results are consistent with findings of previous studies,[6,14,15] supporting that education level has a positive and strong effect on prior knowledge and health literacy and suggesting the importance of implementing citizens' education to improve population health literacy.[16] Only self-perceived knowledge was evaluated, and had no information on the actual knowledge. It has been previously shown that the correlation between actual and self-perceived knowledge is moderate[17,18] and that self-perceived knowledge can in-

fluence all phases of the decision making process and information search,[3] even more than the actual knowledge. Factors influencing self-perceived knowledge on COVID-19 are therefore of particular interest, as it has also been shown that self-perceived knowledge may influence perceived benefits of adopting preventative behaviours.[18] Actual and self-perceived knowledge act differently in the decision-making process. The actual knowledge is important to make people aware and to promote informed decision making, while self-perceived knowledge affects the confidence in individuals' knowledge which would translate into correct decisions or seeking for more information.[18,19] It should be considered that knowledge does not necessarily translate into practices, as being aware of the risks and the correct behaviours does not imply following the recommendations. This has been shown also in some studies on COVID-19 carried out in different contexts and different population subgroups.[20-22] Nevertheless, a Chinese study reported that COVID-19 knowledge was associated with a lower likelihood of negative behaviours investi-

gated, such as going to a crowded place and not wearing a mask outside, and, despite optimistic attitudes towards COVID-19, the majority of study participants took necessary precautions to prevent infection.[6]

The main strength of this study is the use of an established birth cohort for the collection of information about COVID-19. This setting minimizes the risk of selection bias due to outcome-driven participation. The response rate was 54.2% that is in line with the response proportion typically seen in follow-up questionnaires of birth cohort studies at 10-15 years after the initial recruitment. Although the population baseline characteristics were similar between respondents and non-respondents, all the estimates for sociodemographic determinants of non-response were weighted, and the reweighting had only a marginal impact on the estimates. One of the limitations of this study is the lack of information about actual knowledge level and about possible factors related to knowledge, like attitudes, practices towards COVID-19 and risk perception, which were found to be positively associated with knowledge level.[6,7,23] Knowledge level, acceptance and implementation of preventive measures and correct behaviours are country-specific, but education is recognized as a strong factor influencing health literacy and correct health behaviours.[24,16,25]

Clear, tailored, and personalised communication resources targeting low health-literacy populations, such as a presentation of only essential information, avoidance of distracting data, graphical and video support, could improve comprehension of health-related information and help development of optimal educational programmes.[26] Therefore, educational and behavioural programmes to fight against COVID-19 could specifically target population subgroups with lower education level, and measures and dissemination for prevention purposes may be personalised on the basis of the a-priori knowledge and country-specific needs.

CONCLUSION

In conclusion, the findings of the present study suggest that low educational level is a determinant of low self-perceived knowledge on COVID-19 in middle-aged women.

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