

Face mask use in the community and cutaneous reactions to them during the COVID-19 pandemic: results of a national survey in Italy

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Abstract

To mitigate the outbreak of coronavirus disease 2019 pandemic, many countries have imposed the public use of face masks. We investigated attitudes and skin reactions in the Italian individuals wearing face masks during the pandemic. A cross-sectional survey on a random sample (N=1001) of the Italian adult population was conducted in May 2020 by the Italian Group for Epidemiological Research in Dermatology, and the Gallup International Association. Univariable and multivariable regression analysis were used to estimate the odds ratios and their 95% confidence intervals. Most individuals (72.5%) wore a mask, 56.5% used a surgical mask and 53.0% a disposable mask. One-third changed the mask at least once a day, two-thirds kept a distance of at least one meter from each other, 50% washed their hands before wearing a mask, and 17.6% adopted multiple hygienic behaviors. Twenty percent of individuals reported redness, swelling, itching or erosions in the skin area of mask contact; the risk of this reaction was associated with young age, the use of respirators and a history of pre-existing contact eczema, psoriasis or atopic dermatitis. Health educational programs may improve compliance with combined preventive measures and reduce skin reactions.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has severely affected the general community.¹ As a result, many countries have implemented infection control mea-

asures to prevent disease spread, including universal masking. The public use of face masks has been increasingly recommended by the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC).² In countries with a high population transmission and prevalence of SARS-CoV-2 infection, like Italy, the public use of face masks has been made compulsory, in combination with physical distancing and hand hygiene.

Face masks are personal protective equipment (PPE), which work by providing a physical barrier between the mouth and the nose of the wearer and the surrounding environment.

There is ample evidence that asymptomatic individuals or clinically undetected carriers are the major source of the infection transmission.^{3,4} Experimental studies suggest a role of face masks in both protecting the wearer from contracting^{5,6} or from transmitting infections.⁷ In a re-analysis of two trials, surgical masks and N95 respirators, when worn by healthcare workers, have been documented to be effective in protecting against respiratory infection in a clinical setting.⁸ Community-based randomized clinical trials have yielded less convincing results.⁹⁻¹¹ However, it is largely accepted that surgical masks or even homemade cloth face masks can concur with hand washing and distancing to reduce the spreading of respiratory infection.^{5,12}

Little is known about attitudes related to face mask use.¹³ An incorrect use and disposal of face masks, without following standards of wearing and of sterilizing and cleaning protective equipment, may in principle increase the rate of COVID-19 transmission. In addition, although face masks are generally well tolerated for short periods of time, with prolonged use they can be irritating for the skin and mucous membranes.

The purpose of this study was to evaluate face mask associated attitudes and possible skin reactions to them in a large sample of the general Italian population during the COVID-19 pandemic.

Materials and methods

Study design

This was a survey on a random sample of the Italian adult population conducted in May 2020 by the Italian Group for Epidemiological Research in Dermatology (GISED), in collaboration with the Italian branch of the Gallup International Association (DOXA), and assessed through Computer Assisted Telephone Interviewing

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(CATI).¹⁴ More specifically, a randomized sampling strategy without replacement was adopted with stratification by age, sex and geographical distribution of the Italian adult population.¹⁵ People were contacted by phone and asked to participate in the survey. A target sample of at least 1,000 subjects was planned before starting the study.

Collected variables

The following socio-demographic variables were collected: age, gender, residence area, nationality, educational level, current occupation, marital status and children <18 years. The survey on face mask use during the COVID-19 pandemic included nine different questions: type of face mask mostly used, frequency of use, frequency of change, concomitant hygienic behaviours, modality of face mask storage when not in use, occurrence of skin reactions in the area of face mask use, consultation of a doctor/pharmacist and treatments in case of a reaction.

In addition, the lifetime reported diagnoses of dermatological conditions, including contact eczema, atopic dermatitis, psoriasis or other diagnoses, was collected. The full survey questionnaire is available as an additional online material.

Statistical analysis

For descriptive purposes, data are presented as means with standard deviations (SD) or absolute numbers with percentages, for continuous and nominal variables, respectively. One-sample binomial proportion test and one-sample t-test were used to compare gender and age distribution of participants with known Italian census data.¹⁴

Univariable and multivariable logistic regression analysis, including age, gender, geographic area and educational level as potential confounder factors, was used to assess associations between selected variables and face mask-related skin reactions. The strength of association was expressed in terms of odds ratios (OR) along with their 95% confidence intervals (CI) and p-values. All tests were considered statistically significant at p-value<0.05. Analyses were performed using SPSS software version 26.0 (IBM Corporation, Armonk, NY, USA).

Results

Study population

From a total of 1,803 people contacted, 1,001 participants (55% of the total; 51.8% women, mean age 50.4±16.8 years) completed the phone survey. Most people worked as employees (27.8%) or were retired (15.7%), had upper secondary (48.4%) or university degree (36.5%), were married or in a domestic partnership (66.7%). 28.9% of the interviewed people had children (Table 1).

The gender distribution of participants was similar to the Italian adult population census data (51.8%, p=0.98), although the

mean age of our sample was slightly lower compared to the general population (51.8 years, p=0.01).

The modalities of face mask use during the COVID-19 pandemic are shown in Table 2. Most subjects wore a face mask either every time when out (72.5%) or only in the presence of other people (23.3%). Among those who used a mask, 56.5% mainly wore a surgical mask, while 24.5% a respirator (N95 or FFP2-FFP3 mask type). More than half of people (53.0%) used a disposable mask, and most participants changed the mask at least once a day (28.7%), 2-3 times a week (26.0%) or at least once a week (26.0%). Most subjects also kept a distance of at least one meter from other people (66.5%) and regularly washed their hands before wearing a mask (50.5%). However only 17.6% of participants adopted multiple concomitant hygienic behaviors including hand washing plus social distance plus avoidance of touching the external surface of the mask with hands, or at least hand washing plus social distance (11.6%). The most common modality of mask storage when not in use was in a cabinet or shelf, inside (34.5%) or not inside

(31.2%) an envelope.

Table 3 reports the occurrence of skin reactions related to face mask use; 5.7% of people declared to always have skin reactions like redness, swelling, itching or small erosions in the area of mask contact, while 12.7% only occasionally. Among these subjects, 17.5% consulted a doctor or a pharmacist for the reaction, 14.2% used local medications and 16.4% protective cosmetics in the area of reaction.

Risk factors for skin reactions to face mask use are shown in Table 4. Overall, 5.1% of participants reported a lifetime diagnosis of contact eczema, 8.0% a diagnosis of atopic dermatitis and 6.5% a diagnosis of psoriasis. Any investigated dermatological conditions, including contact eczema (adjusted OR=3.91, 95% CI: 2.13-7.17), psoriasis (adjusted OR=3.61, 95% CI: 2.10-6.21) and atopic dermatitis (adjusted OR=2.34, 95% CI: 1.41-3.88) were associated with an increased risk of skin reactions in the area of mask use. Participants with no reported history of dermatological conditions were significantly protected against skin reactions compared with those who reported a history of any dermatologi-

Table 1. Sociodemographic information of the study population.

		N	%
Gender	Men	482	48.2
	Women	519	51.8
Age (years)	Mean, SD	50.4	16.8
	18-35	209	20.9
	35-49	260	26.0
	50-64	262	26.2
	65+	270	27.0
Geographic area	Northern Italy	456	45.6
	Central Italy	194	19.4
	Southern Italy / Islands	351	35.1
Educational level	Master / PhD	64	6.4
	Associate / bachelor	301	30.1
	Upper secondary school	484	48.4
	Lower secondary school	140	14.0
	Elementary school / none	12	1.2
Current occupation	Business owner / manager	87	8.7
	Freelancer / trader	97	9.7
	Teacher	31	3.1
	Employee	278	27.8
	Worker / labourer	49	4.9
	Housewife	99	9.9
	Retired	157	15.7
	Unemployed	52	5.2
	Student	72	7.2
	Other	79	7.9
Marital status	Unmarried	233	23.3
	Married / domestic partner	668	66.7
	Widow(er)	38	3.8
	Divorced	62	6.2
Children <18 years	Yes	289	28.9
	No	712	71.1

SD: standard deviation.

cal condition (adjusted OR=0.28, 95% CI: 0.20-0.40). Notably, compared to surgical masks, the use of respirators was linked with a moderate increased risk of skin reactions (adjusted OR=1.62 95% CI: 1.11-2.37).

Discussion

Our study shows that, during the first

wave of the COVID-19 pandemic, the majority (>70%) of Italian people showed a positive attitude towards the use of face masks, while in public, and around 18.4% of individuals reported adverse skin reactions to mask use, with the risk of such a reaction being associated with age, type of mask used and, strongly, with a pre-existing dermatological condition. Overall, participants showed a low level of compliance regarding the adoption of multiple combined preventive measures.

In spite of their large promotion and use, data are still limited concerning face mask related attitudes and skin problems in the general population during the COVID-19 pandemic. In line with our results, another interview-based study, in a cohort of 1,070 Turkish people representative of the general population, found similar positive attitudes towards using masks, during the COVID-19 pandemic.¹³ We found a higher proportion of individuals wearing a face mask in public settings (72.5%) compared

Table 2. Modalities of face mask use during COVID-19 pandemic in the study population.

		N	%
Frequency of mask use	Every time when out	726	72.5
	Every time when out, but only if other people are present	233	23.3
	Not always, it depends on the availability at the moment	28	2.8
	Almost never when out	6	0.6
	Never	8	0.8
For those who used face mask (n=993)			
Main type of mask	Surgical mask	561	56.5
	Respirator	243	24.5
	Cloth mask	144	14.5
	Other	15	1.5
	Unknown / no answer	30	3.0
Use of disposable mask	Yes	526	53.0
	No	394	39.7
	Unknown	73	7.4
Frequency of mask change	Every day, several times a day	80	8.1
	Every day, once a day	205	20.6
	2-3 times a week	258	26.0
	At least once a week	258	26.0
	Less than once a week	192	19.3
Concomitant hygienic behaviours*	Hand washing or hand disinfection before wearing a mask	501	50.5
	Avoidance of touching the external surface of the mask with hands	370	37.3
	Keep a distance of at least one meter from other people when wearing a mask	660	66.5
	None of these behaviours	22	2.2
Combination of different hygienic behaviours	Hand washing + avoidance of touching mask + distance	175	17.6
	Hand washing + avoidance of touching mask	16	1.6
	Hand washing + distance	115	11.6
	Avoidance of touching mask + distance	79	8.0
Modality of mask conservation when not in use	In a cabinet or a shelf inside an envelope	343	34.5
	In a cabinet or a shelf not inside an envelope	310	31.2
	In a pocket or bag, backpack, etc, inside an envelope	102	10.3
	In a pocket or bag, backpack, etc, not inside an envelope	43	4.3
	Nowhere because it is a disposable mask	125	12.6
	Other	70	7.0

*Multiple responses were possible.

Table 3. Occurrence of skin reactions related to face mask use and lifetime reported diagnoses of dermatological conditions in the study population.

		N	%
Skin reactions like redness, swelling, itching, small erosions in the area of mask contact**	Always	57	5.7
	Occasionally	126	12.7
	Never	810	81.6
If yes*	Consultation of a doctor for the reaction	9	4.9
	Consultation of a pharmacist for the reaction	23	12.6
	Local drugs application for the reaction	26	14.2
	Protective cosmetics application for the reaction	30	16.4
	No consultation or treatment performed	106	57.9

*Multiple responses were possible. **This mainly includes acne and skin cancer.

with the rate of approximately 40% reported in that study. This may probably be due to the earlier adoption of most of the preventing measures in our country compared with Turkey and other European countries.¹³

One concern during the first wave of the Italian epidemic in late February and early March 2020, was that face mask use in the community could divert supplies from individuals at higher risk of infection like healthcare workers (HCW), and people in the community were increasingly asked to ration and reuse masks. Based on our study, reusable face masks were adopted by nearly 40% of individuals. While community use of face coverings has increased substantially, some have raised concerns that homemade face masks may be inferior compared with commercially manufactured masks. Cloth face coverings can limit forward dispersion of exhaled air, containing potentially infectious respiratory particles in the 1- to 10-micrometer range, and household textiles' performance has acceptable efficiency and breathability.¹⁶

As for any other community-wide inter-

ventions, face-masking in public spaces, even when properly used, cannot afford complete protection from infection, and other basic measures such as hand hygiene in addition to physical distancing are still needed. In our study we found that two-third of people kept a social distancing of at least one-meter, and around fifty per cent people regularly washed their hands before wearing a mask; however, a minority of individuals adopted multiple hygienic behaviors such as hand washing plus social distance plus avoidance of touching the external surface of the mask with hands (17.6%), or at least hand washing plus social distance (11.6%).

Little is known about the most prevalent types of skin damage in face mask users.¹⁷ These may include irritant or allergic contact dermatitis, pressure-related skin conditions such as pressure urticaria, friction dermatitis, abrasions, or aggravation of underlying skin diseases, such as acne.¹⁸ Although iatrogenic dermatitis in HCWs in time of COVID-19 pandemic has been described, mask-induced dermatitis at the

population level is a relatively unexplored phenomenon.¹⁹ In our study we found that around 18.4% of individuals wearing masks in the community had a persistent or occasional skin reaction, including redness, swelling, itching, and erosions in the area of mask contact. In line with the results reported in another survey that investigated the prevalence, intensity and clinical characteristics of itch related to the use of face masks,¹⁹ we found that individuals with sensitive skin and atopic predisposition, and those with pre-existing dermatoses such as contact eczema, psoriasis or atopic dermatitis, were at a significantly higher risk of such skin reactions. As for itching-scratching, the presence of these dermatological conditions can lead to incorrect use of face masks, resulting in a reduced protection.

To the best of our knowledge, this is the first study to evaluate both attitudes and dermatological conditions in response to the use of face masks during the COVID-19 pandemic in the Italian population.

Our study has some drawbacks. It was a phone survey, and although a random sam-

Table 4. Risk factors for skin reactions related to face mask use.

		Skin reaction				Crude OR (95% CI)	P	Adjusted OR (95% CI) ^	P
		Yes N	%	No N	%				
Sex	Male	77	42.1	400	49.4	1		1	
	Female	106	57.9	410	50.6	1.34 (0.97-1.86)	0.07	1.29 (0.92-1.81)	0.14
Age	<35	63	34.4	144	17.8	3.87 (2.36-6.36)	<0.001	3.64 (2.20-6.03)	<0.001
	35-49	48	26.2	211	26.0	2.01 (1.21-3.34)	0.007	2.00 (1.20-3.34)	0.008
	50-64	45	24.6	216	26.7	1.84 (1.11-3.07)	0.02	1.89 (1.13-3.15)	0.01
	65+	27	14.8	239	29.5	1		1	
Educational level	Master/PhD/Bachelor/Associate	79	43.2	282	34.8	1		1	
	Upper secondary	75	41.0	405	50.0	0.66 (0.47-0.94)	0.02	0.69 (0.48-0.99)	0.04
	Lower secondary/elementary/none	29	15.8	123	15.2	0.84 (0.52-1.35)	0.48	0.92 (0.56-1.50)	0.74
Geographic area	North	82	44.8	373	46.0	1		1	
	Center	35	19.1	156	19.3	1.02 (0.66-1.58)	0.93	0.99 (0.63-1.55)	0.97
	South	66	36.1	281	34.7	1.07 (0.75-1.53)	0.72	0.97 (0.67-1.41)	0.88
Type of face mask	Surgical	90	51.1	471	59.8	1		1	
	Respirators	59	33.5	184	23.4	1.68 (1.16-2.43)	0.006	1.62 (1.11-2.37)	0.01
	Homemade	27	15.3	132	16.8	1.07 (0.67-1.71)	0.78	0.98 (0.60-1.59)	0.94
Use of disposable masks?	Yes	97	59.1	429	56.7	1		1	
	No	67	40.9	327	43.3	0.91 (0.64-1.28)	0.57	0.95 (0.67-1.36)	0.79
Frequency of mask change	Every day	67	36.6	218	26.9	1.66 (1.03-2.67)	0.04	1.69 (1.04-2.75)	0.03
	2-3 times a week	51	27.9	207	25.6	1.33 (0.81-2.18)	0.26	1.41 (0.85-2.36)	0.18
	At least once a week	35	19.1	223	27.5	0.85 (0.50-1.44)	0.54	0.95 (0.55-1.62)	0.84
	Less than once a week	30	16.4	162	20.0	1		1	
Lifetime diagnoses of dermatological conditions*									
Contact eczema		22	12.0	27	3.3	3.96 (2.20-7.13)	<0.001	3.91 (2.13-7.17)	<0.001
Atopic dermatitis		28	15.3	52	6.4	2.63 (1.61-4.30)	<0.001	2.34 (1.41-3.88)	0.001
Psoriasis		27	14.8	38	4.7	3.52 (2.08-5.93)	<0.001	3.61 (2.10-6.21)	<0.001
Other**		15	8.2	44	5.4	1.55 (0.84-2.86)	0.16	1.68 (0.89-3.16)	0.11
None		103	56.3	669	82.6	0.27 (0.19-0.38)	<0.001	0.28 (0.20-0.40)	<0.001

CI: confidence interval, OR: odds ratio. *Multiple responses were possible (Yes vs. No). The reference category for each entry was the lack of the condition in all the other participants. **This mainly includes acne and skin cancer. ^Multiple logistic regression models including terms for age, gender, residence area and educational level.

ple of the Italian population was collected, we cannot exclude that some degree of self-selection for participation partly influenced our results. It was, however, reassuring that the distribution of demographic variables in our sample was similar to the distribution in the general Italian population. We did not assess the reliability of self-reported data. however, experienced professional interviewers guided data collection.

Conclusions

In conclusion, our study shows that the Italian population had a positive attitude towards the use of face masks during the first wave of the COVID-19 pandemic, even if the adoption of multiple hygienic behaviors in combination was rather low. In addition, our study documents a relevant frequency of adverse skin reactions to face mask especially in people with pre-existing dermatologic diseases. Our data highlight the need for tailored health educational programs to improve patients' compliance with preventive measures and skin care during the COVID-19 pandemic. In particular, people should be educated on the optimal use of face masks and instructed about the possible onset of skin reactions and best ways to reduce their impact. More studies should be done on materials best suited for use by people experiencing skin reactions and on ways to prevent and treat those reactions.

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