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Community pharmacists' exposure to COVID-19

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ABSTRACT

Introduction: Since the beginning of the 2020 Sars-CoV-2 Italian outbreak, healthcare workers have been among the most exposed categories. There is little information about community pharmacists' on occupational exposure, symptoms development, and testing practices in the community pharmacist cohort.

Methods: Between April 30th and May 10th, a questionnaire was administered through social media to Italian community pharmacists. From 67000 pharmacists currently working in community pharmacies, 1632 answered the survey.

Results: The survey population reflected the general Italian community pharmacists population in terms of age, gender, and number of co-workers. Protective measures were adopted in up to 99.9% of pharmacies. 624 pharmacists (38.2%) developed at least one COVID-19 related symptom in the period between February 28th and May 10th. Also, 102 pharmacists (6.2%) were tested for COVID-19 and 15, the 15% of the tested population and 0.92% of the whole survey population, resulted positive on nasopharyngeal swab. However, while the number of symptomatic pharmacists decreased, a higher number of tests were performed, thus COVID-19 prevalence among community pharmacists could have been underestimated and is probably intermediate between other healthcare workers and the general population (0.31%).

Conclusion: Community pharmacists have probably been one of the first categories to experience increased contact risk to SARS-CoV-2. COVID-19 prevalence among pharmacists could have been underestimated. In addition, the rates of protection measures adoption might have helped to reduce the spread of COVID-19 among co-workers and the community.

Introduction

During the coronavirus outbreak in Italy between March and April 2020, healthcare workers (HCWs) have been one of the most affected categories, with 23,718 cases over 212,532 total cumulative cases on May 6th.¹ Surveys on HCWs have already been administered in order to assess risk related to Coronavirus Disease 19 (COVID-19) outbreak.² Also, surveys have already been administered to community pharmacists (CPs) in order to assess their awareness on their role in COVID-19 crisis³ and their preparedness and response to pandemic.^{4,5} However, in Italy it is still unknown the impact of the virus outbreak on CPs, given the lack of data disclosed by Italian National Institute of Health

statistics on this particular category of HCWs. Since the beginning of the pandemic, Italian community pharmacies and over-the-counter (OTC) drugstores have been considered as a primary service and therefore did not undergo lockdown,⁶ thus increasing the risk of developing COVID-19. According to these premises, this survey aimed to estimate the occupational risk of exposure among Italian CPs during the 2020 SARS-CoV-2 outbreak in Italy.

Methods

Between April 30th and May 10th, a Google Form questionnaire was administered through social media and instant-messaging platforms

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(Facebook and WhatsApp) to Italian CPs. Eligible participants were certified (i.e., individuals with a degree in Pharmacy or related and Italian Board Certification) CPs currently working in Italian pharmacies or OTC drugstores. The questionnaire was delivered through direct Whatsapp link sent by the authors to certified CPs, through Facebook groups whose access is allowed only to certified CPs after a self-certification statement to the Admins and subject to approval (with number of members ranging from 100 to 35000), and through the newsletter of one of the most popular online category newspaper. Google Form offers the chance to prevent multiple answers from the same Google account, and this option was selected by the Authors. Questionnaire answers were opened on April 30th at 12:00 and closed on May 10th at 12:00.

The first draft of the questionnaire was developed on April 27th by a Medical Doctor and former CP. The development was preceded by a revision of current literature on COVID-19, both on clinical features of infection^{7,8} and on other surveys conducted on HCWs^{2,9} and CPs.^{3,4} A team composed by a former CP, three Medical Doctors of whom two Academics, a Statistician and an Infectious Disease Specialist independently revised the questionnaire. The main purpose was to achieve a scientifically accurate questionnaire that could fit an online survey. Also, a short time to respond to all the items (< 2 min) was considered crucial to achieve a high number of answers and to avoid possible questionnaire interruption. Compilation time and answer understanding was pre-tested during the developing phase by administering the questionnaire to a few subjects (9 CPs). Compilation time was estimated to be less than 2 min and no comprehension issue was reported, as in researchers' purpose. Questionnaire was delivered in Italian, since this is the language of CPs' Italian Board Certification process. The final form was approved by leading research team before its delivery on April 29th.

The questionnaire consisted of three sections: 1) seven questions on demographic, occupational and clinical data including comorbidities and smoking history; 2) one question about rates of protective measures adoption in community pharmacies and OTC drugstores, as recommended by the Italian government and national health authorities⁶ - these measures included, in the case of community pharmacies: use of personal protective equipment (PPE), placement of plexiglass or glass physical barriers, reduction of customers inputs and/or other social distancing methods; 3) nine questions about COVID-19 related symptoms, nasopharyngeal swab test performing and eventually test result, to identify possible and confirmed COVID-19 cases among respondent CPs, their relatives and co-workers. In particular, and according to the current evidence,^{7,8} research team identified fever, cough, dyspnea, and anosmia/ageusia as highly suggestive for COVID-19 symptoms, while myalgias, asthenia, sore throat, headache, diarrhea, and mental confusion were identified as nonspecific symptoms.

Finally, a complementary search was performed among Italian and international data,^{1,10,11} in order to compare general population, other HCWs' and CPs' prevalence of COVID-19.

Statistical analysis

According to the size of our sample, the Shapiro–Wilk test was performed to verify the normal distribution of continuous variables. Accordingly, individuals' age and number of co-workers were reported as mean (± standard deviation). Discrete variables were reported as the number and proportion of subjects with the characteristic of interest. Between-group comparisons of discrete variables were performed using Pearson's Chi-square test and those of continuous variables using independent sample *t*-Test. For all analyses, two-sided statistical significance was defined as *p* < 0.05. Data were analyzed using SPSS (Statistical Package for Social Science) version 25.0 (IBM SPSS Statistics for MAC OS. Armonk, NY: IBM Corp.).

Table 1

Features of survey population compared to general Italian pharmacist population.

	Italian pharmacists	Survey population
Number	60.000	1.632
Mean age, years	40	40,7
Women, %	80%	79%
Pharmacy owners, %	31%	22%
Co-workers per pharmacy, mean no.	4,4	4,2

Results

Approximately 67,000 pharmacists currently work in the 19.931 private and public pharmacies in Italy, with a mean of 4.40 working individuals per single pharmacy, including co-workers without a degree. About 21,000 are pharmacy owners and/or business partners (31.4%) and 46.000 are certified employees (68,6%). 80% of them are women with a mean age of 40 years.¹⁰ These characteristics follows those of the pharmacists who answered our survey, who had a mean age of 40,6 years, were predominantly women (79.4%), employed (75.2%), who had a mean of 4,22 co-workers (Table 1). Among pharmacists who answered the survey, 1322 (81.3%) reported having no comorbidities, 270 (16.7%) had one comorbidity, 31 (1.9%) had two comorbidities, and only three (0.20%) had three or more comorbidities. Also, 15.6% were active smokers, and 11.8% were former smokers. Demographic and clinical data of responding CPs are summarized in Table 2. According to this data, research team assumed that this survey's population matches the general Italian CPs population, which appears to be a young and healthy professional category with a significant female component.

First, pharmacists were asked if their stores had adopted one or more protective measures as recommended by the Italian government in the “DPCM 11 Marzo 2020” Act.⁶ All but one pharmacy (99.9%) had adopted at least one protective measure. In detail, pharmacists reported a 98.0% PPE adoption rate, an 87.9% protective physical barriers placement rate, an 89.1% of customer input reduction rate, and a 68,8% of

Table 2

Features of survey respondents.

Age (years, %)	< 30	218 (13,4%)
	30–39	702 (43,0%)
	40–49	407 (24,9%)
	50–59	215 (13,2%)
	> 60	90 (5,5%)
Gender (n, %)	Men	336 (20,6%)
	Women	1296 (79,4%)
Role (n, %)	Pharmacy owner	359 (22,0%)
	Pharmacy employee	1277 (75,2%)
	Locum pharmacist	46 (2,8%)
Business area (n, %)	Northern Italy	849 (52,0%)
	of whom Red Area	576 (35,3%)
	Central Italy	225 (13,7%)
	Southern Italy	558 (34,3%)
Number of co-workers (n, %)	0	72 (4,4%)
	1–3	659 (40,4%)
	4–7	659 (40,4%)
	> 8	242 (14,8%)
	Comorbidities (n, %)	No comorbidities
	1 comorbidity	270 (16,7%)
	2 comorbidities	31 (1,9%)
	3 or more comorbidities	3 (0,2%)
Smoking habits (n, %)	Non smokers	1185 (72,6%)
	Formers smokers	193 (11,8%)
	Active smokers	254 (15,6%)

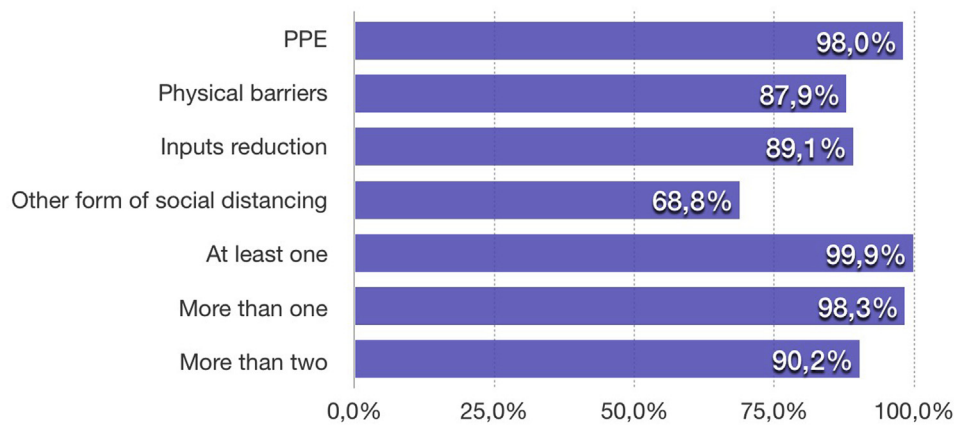


Fig. 1. Rate of protective measures adoption among community pharmacies and OTC drugstores.

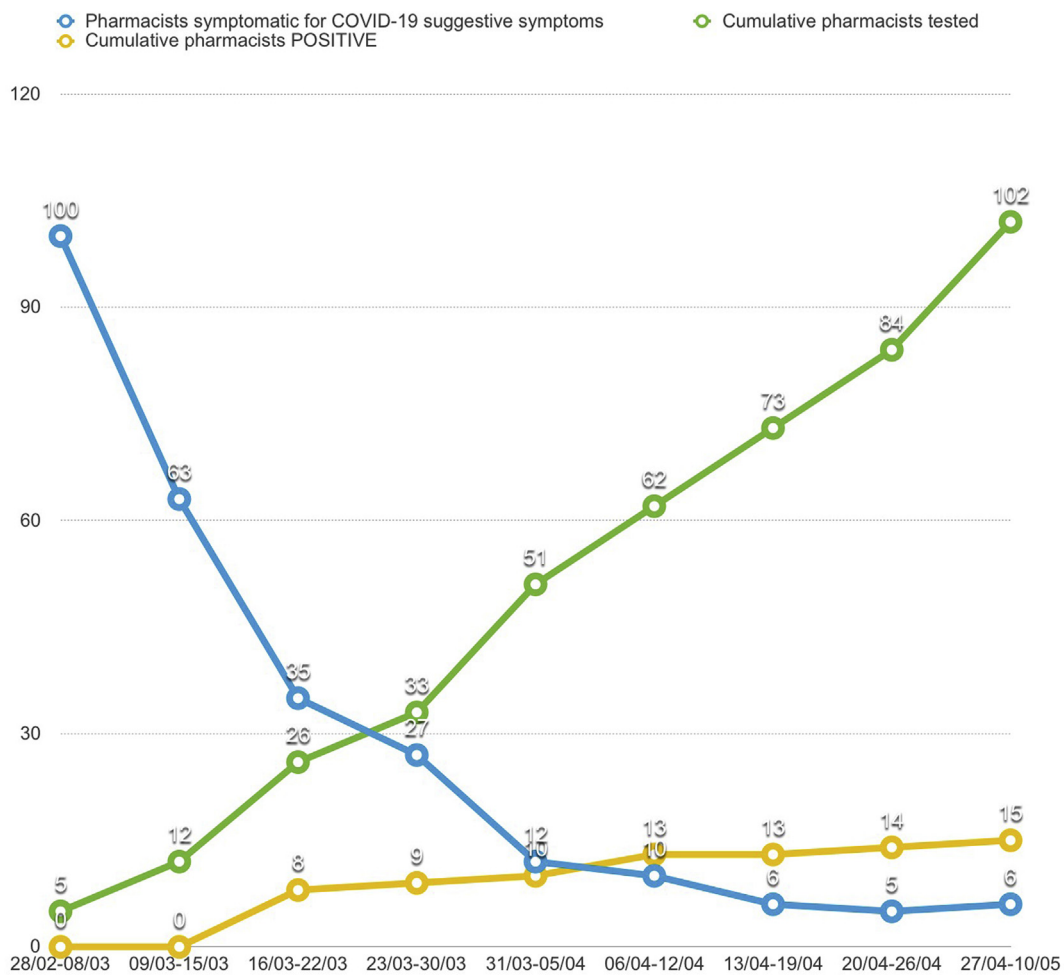


Fig. 2. Number of symptomatic pharmacists per period versus cumulative number of tests performed and cumulative number of positive tests.

other social distancing arrangements. Besides, 98.3% of pharmacies adopted two or more of the previous and 90,2% adopted three or more of the previous as shown in Fig. 1.

Afterward, research team investigated possible cases of COVID-19 among CPs in the period of study. Symptoms suggestive for COVID-19 infection included fever, cough, dyspnea, anosmia/ageusia, asthenia, diarrhea, myalgias, sore throat, headache, and mental confusion. Pharmacists were asked if during the period between February 28th and May 10th, they had developed one or more of these symptoms, and 624 pharmacists reported at least one. Fever, cough, dyspnea and anosmia/

ageusia, were considered as highly suggestive symptoms, according to epidemiological data,^{7,8} and 269 pharmacists reported at least one. One hundred twenty-eight pharmacists reported fever, 137 reported cough, 53 reported dyspnea and 51 reported anosmia/ageusia. Also, 355 reported at least one nonspecific symptoms but no COVID-19 specific symptoms. The period with the highest number of symptomatic for highly suggestive symptoms pharmacists was February 28th to March 8th (Fig. 2), then the number of symptomatic pharmacists progressively decreased.

In the period of study, 102 CPs (6.2%) were tested for COVID-19

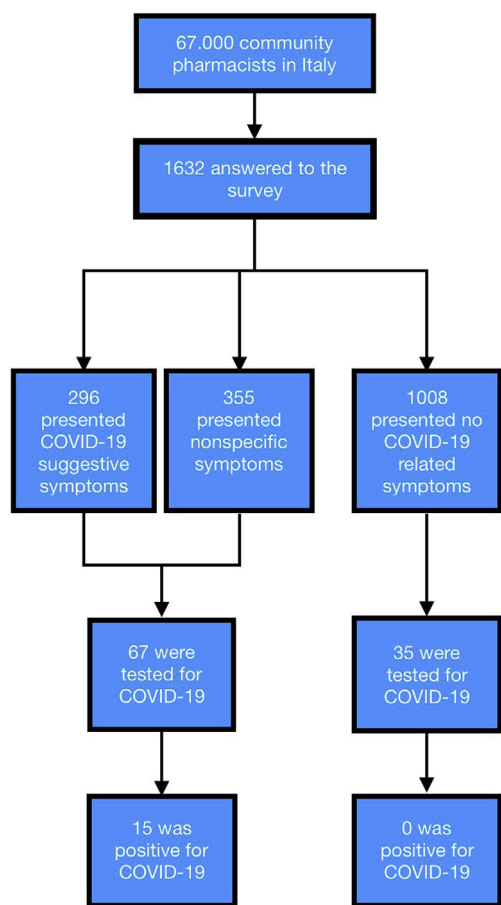


Fig. 3. Symptomatic, tested and positive pharmacists.

(Fig. 3): 65 were symptomatic for highly suggestive or aspecific COVID-related symptoms, and 37 were asymptomatic. Among the 65 symptomatic pharmacists, 25 were tested due to symptom development (of whom nine turned out positive), eight because of contacts with positive colleagues (three positives), six because of contacts with positive relatives (two positives), nine with positive customers (no positives) and 17 for other epidemiological or surveillance issues (one positive). A total amount of 15 pharmacists turned out positive on nasopharyngeal swab. No positive cases were observed among asymptomatic pharmacists, who were tested for contacts with known COVID-19 positive colleagues (4), relatives (1), customers (3), or for other epidemiological and surveillance issues (29). Of notice, the number of performed tests increased during the period of study (Fig. 2), while number of symptomatic pharmacists was progressively decreasing. In particular, five tests were performed in the period February 28th to March 8th, where 100 pharmacists reported to be symptomatic (one-to-twenty symptomatics-to-test ratio), while 18 tests were performed in the period April 26th to May 10th, where only six pharmacists reported to be symptomatic (three-to-one symptomatics-to-test ratio). The period with the highest number of positive cases was between March 16th and March 22nd (8).

Features of the whole survey population, symptomatic for specific symptoms, symptomatic for only nonspecific symptoms and asymptomatic pharmacists are summarized in Table 3, while features of COVID-19 tested, COVID-19 positive and COVID-19 negative CPs are summarized in Table 4. The so-called “red area” designates the four regions with the highest number of cumulative cases on May 6th: Lombardia, Emilia-Romagna, Piemonte and Veneto¹. Symptomatic pharmacists had a greater likelihood to come from red area than asymptomatic (50.2% vs 31%, $p < 0.001$) or with only nonspecific symptoms pharmacists

(50.2% vs 35.0%, $p < 0.001$). No differences were found among asymptomatic pharmacists and symptomatic for nonspecific symptoms in terms of the business location area. Women were more often symptomatic than men both for highly suggestive (84% vs. 77%, $p = 0.012$) and for nonspecific symptoms (82.9% vs 77%, $p < 0.001$). Pharmacy owners were less often symptomatic than employed pharmacists both for specific (15.2% vs. 25.5%, $p < 0.01$) and for nonspecific symptoms (17.2% vs. 25.5%, $p < 0.001$). However, a greater likelihood to being positive on COVID-19 testing was not observed among women, neither among pharmacy employees. Among tested CPs, Sars-CoV-2 positive pharmacists presented more frequently specific symptoms than those negative (80% vs 36.1%, $p < 0.01$), and Sars-CoV-2 negative pharmacists had greater chances to be asymptomatic (44.6% vs 0%, $p < 0.01$) than presenting specific symptoms. Nonspecific symptoms alone were present in both positive and negative pharmacists with no statistically significant difference. A greater number of tested for COVID-19 colleagues (66.7 vs. 18.1%, $p < 0.001$) and positive colleagues (46.7% vs. 8.4%, $p < 0.001$) was reported among positive pharmacists. A greater number of positive relatives was reported among positive pharmacists (40.0% vs. 4.8%, $p < 0.001$).

Regards to COVID-19 prevalence among CPs, overall cumulative COVID-19 confirmed cases rate in the survey population is 15 over 1632, indicating a 0.92% prevalence. In Italy, during the same period, a cumulative number of 122,850 cases have been recorded in the 20–69 aged general population on May 7th, accounting for a 0.31% prevalence. To date, 23,718 cumulative cases have been reported in Italy among HCWs.¹ According to Eurostat approximately 241,512 medical doctors were practising in Italy in 2017.¹¹ In the same period, 991,316 nurses and other HCW were employed.¹² Hence, it is possible to estimate that about 1,2 million HCW are employed in Italian national healthcare service, which means that the cumulative rate of COVID-19 confirmed case among HCW is about 1,98%.

Discussion

The current study has some limitations related to its online nature. The diversified access to social media and instant-messaging led to the enrollment of 2.4% of the active CPs population. There could be a demographic bias due to the online nature of the survey, however demographic features of respondents to this surveys match those of Italian general CPs' population, as shown in Table 1. Besides, rate between respondents and whole active CPs are similar to other surveys conducted among CPs³ but inferior to others.⁵ There is a lack of information, since Google Form does not allow to know the mean compilation time and the rate of interruptions during compilation, nor the authors could obtain data about the overall rate of response. However, the authors' purpose was to develop a brief and easy-to-compile questionnaire in order to obtain a large number of answers and avoid compiling interruption, and this objective has been achieved. Also, authors could not include data from hospital registers, which lead to the omission of information from hospitalized critically ill pharmacists. That being said, this is the largest survey conducted so far on COVID-19 prevalence among CPs, and its results may support following assumptions.

First of all, it is likely that CPs have been one of the first category of workers to get contact with SARS-CoV-2. COVID-19 outbreak started its spread in Italy on February 18th in the town of Codogno (Lombardia). Until March 8th less than 2,000 new cases were reported daily,¹ and only with the “DPCM 11 Marzo 2020” Act a general lockdown was established and protection measures enforced.⁶ Until then, in a context of less perception of danger, it is likely that a considerable number of people with respiratory symptoms referred for advice to CPs, who are the most accessible healthcare professionals to the general public, thus promoting virus transmission.^{13,14} This hypothesis is supported by the greater number of symptomatics for highly suggestive symptoms pharmacists in the period February 28th to March 8th ($n = 100$, 33.8%

Table 3
Features of survey population, symptomatic pharmacists (group A), pharmacists with nonspecific symptoms (group B) and asymptomatic pharmacists (group C).

	Survey population n = 1632	Group A Symptomatic pharmacists n = 269	Group B Nonspecific Symptoms n = 355	Group C Asymptomatic Pharmacists n = 1008	Significance
Business Located in a Red Area, n (%)	576 (35,3%)	135 (50,2%)	127 (35,9%)	312 (31,0%)	Group A vs, B P < 0,0003 Group A vs, C P < 0,00001 Group B vs, C NS
Age, years	40,7 (±10)	39,6 (±8,9)	39 (±9,4)	41,5 (±10,4)	Group A vs, B NS Group A vs, C p = 0,038 Group B vs, C p = 0,020
Gender, Women, n (%)	1289 (79%)	226 (84%)	294 (82,8%)	776 (77%)	Group A vs, B NS Group A vs, C p = 0,012 Group B vs, C p < 0,00001
Presence of ≥1 Comorbidities, n (%)	269 (16,5%)	52 (19,3%)	82 (23,1%)	162 (16,1%)	Group A vs, B NS Group A vs, C NS Group B vs, C p = 0,003
Number of Pharmacy Owner, n (%)	359 (22%)	41 (15,2%)	61 (17,2%)	257 (25,5%)	Group A vs, B NS Group A vs, C p = 0,0004 Group B vs, C p = 0,001
Number of Co-workers	4,2 (2,6)	4,4 (±2,7)	4,2 (±2,6)	4,2 (2±,6)	Group A vs, B NS Group A vs, C NS Group B vs, C NS
SARS-Cov-2 Tested Colleagues, n (%)	142 (8,7%)	41 (15,2%)	37 (10,4)	64 (6,3%)	Group A vs, B NS Group A vs, C p < 0,00001 Group B vs, C p < 0,00001
SARS-Cov-2 Positive Co-Workers, n (%)	53 (3,2%)	23 (8,6%)	11 (3,1%)	19 (1,9%)	Group A vs, B p = 0,0029 Group A vs, C p < 0,00001 Group B vs, C NS
SARS-Cov-2 Positive Relatives, n (%)	33 (2,0%)	20 (7,4%)	5 (1,4%)	8 (0,8%)	Group A vs, B p = 0,0001 Group A vs, C p < 0,00001 Group B vs, C NS

Table 4
Features of Sars-CoV-2 tested, Sars-CoV-2 positive and Sars-CoV-2 negative pharmacists.

	SARS-Cov-2 Tested N = 102	SARS-Cov-2 Positive N = 15	SARS-Cov-2 Negative N = 83	Significance
Business Located in a Red Area, n (%)	56 (54,9%)	9 (60%)	44 (53%)	NS
Age, years	41,2 (±10,3)	41,2 (±11,3)	41,2 (±10,2)	NS
Gender, Women, n (%)	81 (79,4%)	10 (66,7%)	67 (80,7%)	NS
Presence of ≥1 Comorbidities, n (%)	26 (25,4%)	3 (20%)	21 (25,3%)	NS
Number of Individuals with Specific Symptoms, n (%)	45 (44,1%)	12 (80%)	30 (36,1%)	p = 0,0023
Number of Individuals with only Aspecific Symptoms, n (%)	20 (19,6%)	3 (20%)	16 (19,3%)	NS
Number of Asymptomatic Individuals, n (%)	37 (36,3%)	0 (0%)	37 (44,6%)	P = 0,0030
Being a Pharmacy Owner, n (%)	23 (22,5%)	2 (13,3%)	21 (25,3%)	NS
Number of Co-workers	4,5 (±2,7)	5 (±2,5)	4,4 (±2,7)	NS
SARS-Cov-2 Tested Colleagues, n (%)	26 (25,5%)	10 (66,7%)	15 (18,1%)	p < 0,00001
SARS-Cov-2 Positive Co-Workers, n (%)	14 (13,7%)	7 (46,7%)	7 (8,4%)	p = 0,00001
SARS-Cov-2 Positive Relatives, n (%)	11 (10,8%)	6 (40%)	4 (4,8%)	p = 0,00003

of total cumulative number of symptomatic pharmacists), when less test were performed (n = 5, 4,9% of total performed tests, 1 test every 20 symptomatic pharmacists).

Besides, it is likely that the prevalence of COVID-19 among CPs,

which appears to be 0.92% in our survey versus 0.31% in 20–69 aged general population and 1.98% among other HCWs, could be underestimated. The time interval with the greater number of positive cases was between March 15th and March 22nd, probably due to the fact that

there was still a certain number of symptomatic pharmacists while tests had started to be performed widely (Fig. 2). A higher number of tests, especially if performed in the first weeks of the pandemic, would have probably discovered a greater number of COVID-19 cases among Italian CPs.

Also, a very high rate of protection measures adoption has been observed in this survey among Italian CPs and OTC drugstores, even more than what had been recommended by national authorities.⁶ PPE use rate among CPs was estimated to be 98%, with 87.9% rate of physical barrier placement, 89.1% rate of reduction of customer inputs and 68.8% rate of other social distancing method adoption. While 99.9% of community pharmacies and OTC drugstores adopted at least one of the previous techniques, 98.3% adopted two or more and 90.2% adopted three or more. Therefore, CPs have clearly acted responsibly by adopting several lines of protective measures, thus limiting the virus spread.¹⁵

In addition, pharmacists may have been exposed to infections by co-workers, since 7 out of 15 (46.7%) positive community pharmacists reported at least one co-worker who tested positive to COVID-19, versus 15 out of 83 (18.1%, $p < 0.01$) in those who tested negative. A higher rate of positive relatives was also observed among positive pharmacists (40% vs 4.8%, $p < 0.001$). This may suggest that their exposure, may have led to higher infection transmission among themselves and their relatives.

Finally, although the sample is too heterogeneous to deduct a conclusive statement, according to data, it is suggestive that the prevalence of infection among CPs (0.92%) resulted intermediate between HCW's (much higher, estimated at 1.98%) and same-aged general population's (lower, estimated at 0.31%).

Conclusion

Prevalence of COVID-19 among CPs is likely intermediate between other HCWs and the 20–69 aged general population. CPs have probably been one of the first category of workers to get in contact with SARS-CoV-2, whose prevalence in this particular population is probably underestimated. However, a very responsible attitude towards the adoption of protective measures has been observed among community pharmacists, helping to reduce the spread of COVID-19.

CRedit authorship contribution statement

Paolo Cabas: Conceptualization, Formal analysis, Data curation, Writing - original draft. **Stefano Di Bella:** Conceptualization, Formal analysis, Data curation, Writing - original draft. **Mauro Giuffrè:** Formal analysis, Data curation, Writing - original draft. **Michele Rizzo:** Conceptualization, Formal analysis, Data curation, Writing - original draft. **Carlo Trombetta:** Formal analysis, Data curation, Writing - original draft. **Roberto Luzzati:** Formal analysis, Data curation, Writing - original draft. **Roberta Maria Antonello:** Formal analysis, Data curation, Writing - original draft. **Ketty Parenzan:** Writing - original draft.

Giovanni Liguori: Formal analysis, Data curation, Writing - original draft.

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