

# Knowledge, Perception, and Implementation of Personal Protective Measures by Citizens during the COVID-19 Outbreak in Northern Cyprus: A Cross-Sectional Survey

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## BACKGROUND/AIMS

Severe acute respiratory syndrome coronavirus 2 has generated over 57 million cases of coronavirus disease 2019 (COVID-19) worldwide and has led to the implementation of strict measures in all countries. The aim of this study was to investigate the knowledge, attitude, and implementation status of personal protective measures (PPMs) by Northern Cyprus citizens and their access to personal protective equipment (PPE) during the COVID-19 outbreak.

## MATERIAL and METHODS

This was a cross-sectional study based on internet-based survey. A total of 406 participants were recruited between May 1, 2020 and May 4, 2020 via authors' networks to complete a questionnaire. Participants were asked to indicate how often they implemented five PPMs recommended by the World Health Organization, their daily frequency of hand hygiene events, COVID-19 knowledge, and the availability of PPE in their hometown.

## RESULTS

The prevalence of five PPMs was 65.0-95.6%, with the highest being hand hygiene and the lowest being avoiding touching the eyes, nose, and mouth. Gloves (86.2%), surgical masks (52.2%), and cloth face masks (47.3%) were the most commonly used PPE in public areas. Majority of responders were aware of the incubation time (90.4%) and indirect route of viral transmission (89.7%), whereas the knowledge of droplet (72.2%) and aerosol transmission (43.6%) was lower. Women washed their hands more frequently than men ( $P = .008$ ), and the 15-54 age group was statistically more knowledgeable about transmission routes compared with >55 age group ( $P = .003$ ). Knowledge was gained mainly through the social media and TV.

## CONCLUSION

Overall, citizens implemented protective measures effectively and were strictly coherent to government-induced curfew and self-isolation measurements with a high public awareness.

**Keywords:** COVID-19, personal protective equipment, personal protective measures, citizens, Northern Cyprus

## INTRODUCTION

Originated from Wuhan, China, in the late 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the etiological agent of the coronavirus disease 2019 (COVID-19), has emerged as a significant threat to public health and has been declared as a pandemic by the World Health Organization (WHO), with over 57.8 million cases and 1.3 million deaths occurred worldwide as of November 22, 2020.<sup>1</sup> While SARS-CoV-2 was initially observed in East Asia, Europe consequently became the center of the pandemic,<sup>2</sup> followed by the United States and Latin America and is currently adversely affecting multiple African countries.

With the rapid surge in the number of people infected with SARS-CoV-2, WHO emphasized the urgent need to coordinate international collaborative efforts to minimize the threat in all affected countries in order to prevent the rapid spread of COVID-19.<sup>3</sup> While the battle against COVID-19 is ongoing, multiple measures have been taken by governments

in an effort to slow down and mitigate the viral transmission of the respiratory virus SARS-CoV-2 in the local population, such as closing down schools; banning public gatherings/events; stopping mass movements via land, sea, and airports; imposing partial/full curfew; implementation of the social distance rules; and compulsory use of face masks. When formulating a health policy, key front-line workers within multidisciplinary teams should be a part of the policy planning to ensure that these policies function effectively. Indeed, government health education messages represent a key source of information for citizens for promoting their self-protective practices against respiratory infectious diseases. These preventive messages generally emphasize improved hygiene, face-mask use, and social distancing measures, including avoiding crowds during epidemics.<sup>4</sup> Although the decision-making and application of such measures by governmental bodies are essential for the control of a pandemic, the level of awareness and adherence of citizens to control measures is also crucial for the successful application of the aforementioned measures.

In the absence of an effective vaccine, public implementation of personal protective measures (PPMs) is fundamental. WHO has recommended five main PPMs against COVID-19: hand hygiene; social distancing measures; avoiding touching the eyes, nose, and mouth; practice of respiratory hygiene; and self-isolation.<sup>5</sup> While government-imposed social distancing measures alone have been estimated to delay a peak of cases, the combination of this intervention with self-imposed prevention measures such as handwashing and mask-wearing has been shown to further delay a large epidemic and buy time for healthcare systems to prepare for an increasing COVID-19 burden.<sup>6</sup> In a case-control study investigating the effectiveness of PPMs against SARS-CoV-2 infection including mask-wearing, handwashing, and social distancing, the consistent use of protective measures was found to be independently associated with lower risk for SARS-CoV-2 infection in the general public.<sup>7</sup> Evidence from the literature indicates that fre-

quent hand-washing would reduce viral transmission risk by 55%,<sup>8</sup> and epidemiological studies have suggested that hand-washing is an effective measure against SARS transmission in health care and community settings.<sup>9</sup> In a separate meta-analysis, regular hand hygiene was detected to have a protective effect against the 2009 influenza pandemic and was recommended as an effective measure to limit the transmission of pandemics.<sup>10</sup> Indeed, recent studies indicate that wearing masks, hand hygiene, and social distancing not only contribute to the prevention of COVID-19 but also lead to the decline of other respiratory infectious diseases such as influenza, enterovirus, and all-cause pneumonia.<sup>11</sup> Mask-wearing and instant hand hygiene together have been proposed to slow down the exponential spread of SARS-CoV-2.<sup>12</sup> While considered an important factor for reducing viral transmission, the incorrect use of face masks has also been reported during the COVID-19 pandemic, and compliance rates have been shown to be low in men and persons with low household incomes.<sup>13</sup> Interestingly, a cross-sectional study revealed that mask wearing was associated with a reduction in face-touching behaviors, particularly touching the nose, mouth, and eyes.<sup>14</sup>

Another recommendation by WHO suggests that citizens should follow advice given by their healthcare provider or their national and local public health authorities in order to obtain information from a reliable source. The level of public adherence to control measures is affected by their knowledge, attitudes, and practices toward COVID-19, and it directly impacts the trajectory of the outbreak in a country. This is particularly valid during outbreaks, which, due to their evolving nature and inherent scientific uncertainties, can be associated with considerable fear in the general public, especially if illness or death rates are high. This was a phenomenon observed during the SARS outbreak in 2003, where studies conducted suggest that the level of panic emotions in the population is directly associated with their knowledge and attitudes toward the infectious disease.<sup>15</sup>

The first case of COVID-19 in Northern Cyprus was reported on March 9, 2020.<sup>16</sup> Consequent to the identification of the first case, a wide range of measures have been implemented by the government in order to prevent the spread of the virus. All schools and nonessential workplaces were immediately shut down; country borders were closed to all incoming noncitizen travelers, which was reopened on July 1 with the condition of 10 days of quarantine. Within the COVID-19 restrictions, large gatherings were banned, a full curfew from 21:00 PM to 06:00 AM was temporarily enacted, and mandatory use of face masks in public areas was implemented. As of November 24, 2020, a total of 1,062 cases and five COVID-19-related deaths have been reported in the country.<sup>17</sup> In order to facilitate outbreak management of COVID-19 in Northern Cyprus, there is an urgent need to clarify the public awareness of COVID-19 and their status of the implementation of the protective measures, as well as their access to personal protective equipment (PPE) during the COVID-19 pandemic. The aim of this study is to investigate the knowledge, attitude, and practices of Cypriot citizens toward COVID-19 and to measure their coherence to PPMs during the public health crisis.

## MATERIAL and METHODS

### Ethical Approval

This project was approved by Near East University Institutional Review Board, Project No: YDU/2020/80-III3. Respondent's

### Main Points

- The level of awareness and adherence of citizens to control measures during the pandemic is crucial for the prevention of COVID-19.
- Majority of North Cyprus citizens were aware of the incubation time for COVID-19 (90.4%) and indirect route of viral transmission (89.7%), whereas the knowledge of droplet (72.2%) and aerosol transmission (43.6%) was lower.
- The prevalence of the application of PPMs among citizens was between 65 and 95.6%, highest being hand-washing and lowest being avoiding touching the eyes, nose, and mouth.
- Gloves (86.2%), surgical masks (52.2%), and cloth face masks (47.3%) were the most commonly used personal protective equipment (PPE) in public areas. Availability of PPE remained high during the pandemic in the country.
- North Cyprus citizens effectively implemented protective measures and were strictly coherent to government-induced curfew and self-isolation measurements with a high public awareness.

anonymity and confidentiality were ensured. The submission of the answered survey was considered as a consent to participate in the study.

### Participants and Data Collection

This was a cross-sectional study conducted through an internet-based survey between May 1 and May 4, 2020. Partial curfew from 06:00 to 21:00 in Northern Cyprus began on April 1, 2020 and ended on May 4, 2020, while the implementation of the mandatory mask use in public areas began on April 24, 2020. Therefore, the survey dates represent a reliable time period for data collection on self-isolation and coherence to COVID-19 measures. As of May 1, the total number of reported COVID-19 cases in Northern Cyprus was 108.<sup>18</sup> A total of 406 citizens were randomly included in this study. Participants were recruited via authors' networks with local citizens living in Northern Cyprus. A recruitment poster with a link to the questionnaire was posted to online pages through the local COVID-19-related media as well as Facebook, emails, and WhatsApp, which contained information on the background, objective, voluntary nature of participation, indications of how to fill in the questionnaire, and the declarations of anonymity and confidentiality of participants. Citizens who indicated that they were unable to adhere to curfew measures due to the essentiality of their jobs (eg, fire brigade and policemen) were excluded from the study.

### Measurement

**Survey:** The survey consisted two sections and 26 questions. Section 1 contained eight questions on demographic data, followed by 14 questions regarding the participants' knowledge and attitudes toward PPMs and COVID-19 in section 2. The survey was created by the researchers, and a piloting was performed before the survey was distributed.

**Assessment of Sociodemographic Characteristics:** The first part of the questionnaire consisted of the assessment of socio-demographic attributes, in which participants responded to demographic variables including gender, age, education status, occupation, current district of residency, smoking (smoker/non-smoker), chronic disease (present/nonpresent), and seasonal influenza vaccination history (vaccinated/nonvaccinated).

**Assessment of Knowledge on COVID-19:** Participants were asked to answer questions regarding the transmission routes of SARS-CoV-2 among choices, including droplet, aerosol, and indirect transmission (touching contaminated surfaces and touching eyes, mouth, and nose) routes or indicate if they did not know the transmission route of infection. Participants also responded to a question on the incubation period for SARS-CoV-2. Among the choices 1-2 days, 2-4 days, 2-14 days, 27 days, and "I do not know the incubation period" were present.

**Assesment of WHO Recommended Personal Protective Control Measures:** Participants were asked to indicate which of the personal protective control measures including hand hygiene; social distance; avoiding touching nose, mouth, and eyes; and use of face mask they implemented during the pandemic and the frequency of implementation for each measure. For each option, the scale was designed as always, sometimes, rarely, and never. Participants also responded to a question which assessed their coherence to the curfew imposed by the

local government, outside of their working hours, with a scale of always, generally, rarely, and never.

The application of PPE by ordinary citizens was evaluated. Individuals were asked to indicate which PPE they used in public areas such as supermarkets, with choices including gloves, surgical masks, vented masks, cloth masks, wrap/scarf, face shield, goggles, and "I do not use any PPE." Participants were also assessed if they applied hand hygiene before and after the PPE use and if they adhered to social-distancing rules while wearing face masks.

**Assessment of Hand Hygiene Events per Day:** Questions were designed to evaluate the hand hygiene measures applied by citizens. Individuals were initially asked which products they use when they apply hand hygiene and selected from various options including water, soap and water, alcohol-based hand sanitizer, pure alcohol, cologne with at least 70% alcohol content, wet tissues, or "I do not use any products." The number of hand hygiene events per day was also evaluated. Participants reported the mean number hand hygiene events based on soap and water and alcohol-based hand sanitizers per day.

**Assessment of The Availability of PPE During The Pandemic:** As the use of PPE and application of hand sanitation can be affected by their availability in a local town or city, participants were asked to report their access to these products during the pandemic. Participants responded to questions for the availability of masks, gloves, and hand sanitizers with a scale of always, generally, rarely, and never for each product.

**Assessment of The Attitude Toward Healthcare Facilities During The Pandemic:** The citizens were asked if, during the pandemic, they felt any reservation from visiting hospitals or any healthcare facility where they responded as yes or no. Additionally, participants were asked if they would go for a COVID-19 test in a mobile test center in a hospital carpark without leaving their car for which they responded as yes or no.

**Assessment on The Source of COVID-19-Related Information:** In this survey, the use of reliable source of personal protective procedures and the source of COVID-19-related updates by participants were evaluated. Individuals were asked to choose among WHO, Turkish Republic of Northern Cyprus Ministry of Health, Turkish Republic of Northern Cyprus Medical Association, newspapers, TV, and social media for the most commonly used source of personal protective procedures. Citizens also indicated the most commonly used sources of COVID-19-related updates among scientific articles, TV, radio, internet sites, newspapers, brochures/flyers, social media, family/friends/relatives, and WhatsApp group.

### Statistical Analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 23 (IBM SPSS Corp.; Armonk, NY, USA). Knowledge and attitudes and practices of different individuals according to demographic characteristics were compared using independent samples t test or Chi-square test as appropriate. Binary logistic regression analysis using demographic variables as independent variables and knowledge or practices as the outcome variable were conducted to identify factors associated with attitudes and practices. *P* value of .05 or less was considered as significant.

TABLE I. Demographic Characteristics of Participants

Participant characteristics		Number of participants, n (%)
Gender	Male	191 (47)
	Female	215 (53)
Age group (years)	15-20	8 (2)
	21-34	151 (37.2)
	35-44	99 (24.4)
	45-54	38 (9.4)
	55-64	86 (21.2)
	65+	24 (5.9)
Residential area	Kyrenia	71 (17.5)
	Nicosia	210 (51.7)
	Famagusta	63 (15.5)
	Trikomo	16 (3.9)
	Morphou	20 (4.9)
	Lefka	26 (6.4)
Education	Primary school	9 (2.2)
	Secondary school	22 (5.4)
	High school	72 (17.7)
	Bachelor's degree	202 (49.8)
	Master's degree or above	101 (24.9)
Smoking	Smoker	116 (28.6)
	Nonsmoker	290 (71.4)
Chronic disease	Yes	68 (16.7)
	No	338 (83.3)
Seasonal influenza vaccination	Yes	26 (6.4)
	No	380 (93.6)

## RESULTS

A total of 406 participants (53% females) completed the survey questionnaire. The demographic characteristics of participants are shown in Table I. Participants belonged to a broad distribution of age range, residential areas across the country, and educational backgrounds. A large majority of the responders had a Bachelor's degree (49.8%) or higher (24.9%), 71.4% were nonsmokers, and 83.3% did not have any chronic disease.

Before the assessment of the implementation of PPMs by citizens, participants were asked two questions regarding the transmission routes and incubation time of COVID-19 in order to measure their level of knowledge of the disease, which may

also affect their inclination to properly apply protective measures and PPE use. A striking 89.7% of the individuals responded with indirect transmission route for the disease, whereas 72.2 and 43.6% were aware of droplet and aerosol transmission routes, respectively (Figure 1a). There were no statistical differences between men and women in terms of their knowledge of all the three disease transmission routes ( $P = .089$ ). When the age groups and their knowledge on transmission routes were analyzed, a statistically significant association was found in the age group 15-34 and 34-54 compared with the 55 and above ( $P = .046$ ). This suggests that younger citizens were more knowledgeable about disease transmission compared with the elderly. Regarding the incubation time for COVID-19, a vast majority (90.4%) were aware of the 2-14 days of incubation time (Figure 1b). There was no statistically significant association between gender or age groups in terms of knowledge of disease incubation time. Binary logistic regression analysis showed that education levels of individuals and COVID-19 incubation time knowledge were not significantly associated ( $P = .915$ ), suggesting that individuals at all education levels were knowledgeable about COVID-19, and that this knowledge was gained through educatory channels during the pandemic. However, there was a statistically significant difference between education level and transmission routes of the disease ( $P = .000$ ), in which individuals with a bachelor degree or above had better knowledge and had a higher frequency of correct answers (Table 2). There were no statistical differences between individuals from different cities in terms of their knowledge of the incubation time ( $P = .997$ ) or the transmission routes of COVID-19 ( $P = .427$ ).

Figure 2a shows the prevalence of the application of WHO recommended PPMs against COVID-19 by the citizens. Data suggest that participants always implemented hand hygiene and social distancing in public areas with a prevalence of 96.5 and 82.6%, respectively, during the pandemic. Alternatively, 72.6 and 65.8% of individuals always implemented the use of face masks and avoided touching the nose, mouth, and eyes, respectively. Among all PPMs, hand washing was statistically the most applied measure ( $P = .001$ ). In terms of PPE use, the mostly used equipment was gloves (86.2%), followed by face masks (52.2% surgical masks and 47.3% cloth masks). Types of

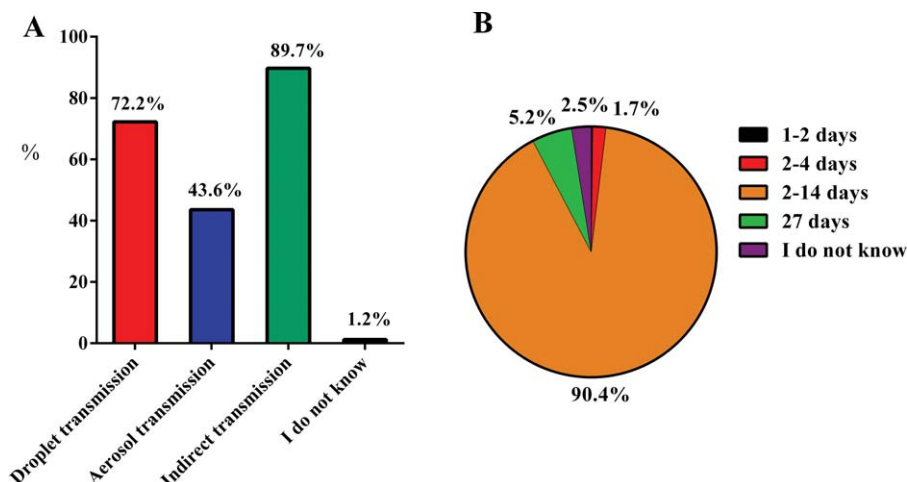
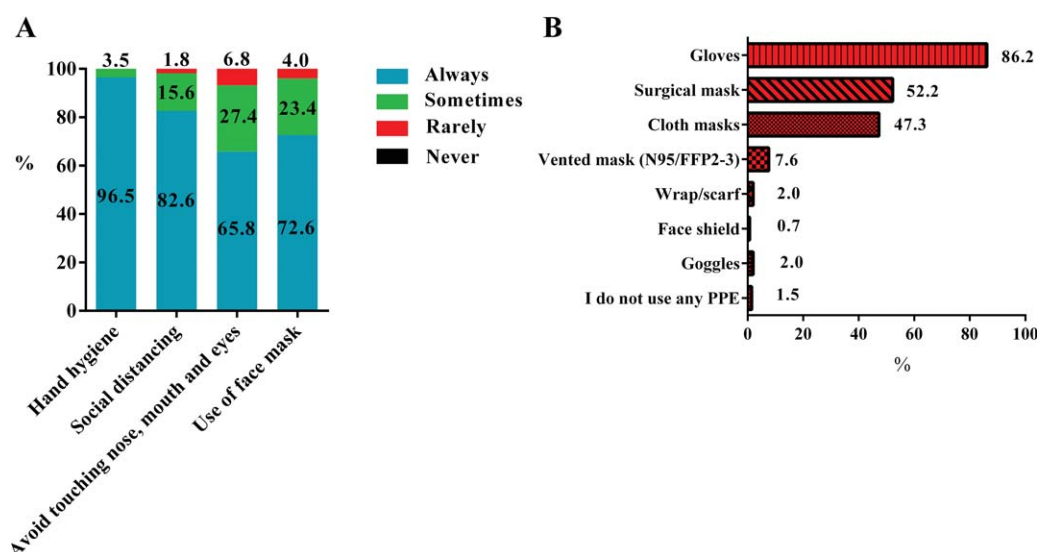


Figure 1. a,b. Participant knowledge on COVID-19 characteristics. (a) Participant knowledge on COVID-19 transmission routes (b) Participant knowledge on COVID-19 incubation time

**TABLE 2.** Association of Participant Education Level and Disease Knowledge / Adherence to PPMs

	Primary school	Secondary school	High school	Bachelor's degree	Master's degree or above	P value
<b>Hand washing frequency</b>						
0-6 times	3/9 (33.3%)	8/22 (36.4%)	16/72 (22.2%)	58/202 (28.7%)	16/101 (15.8%)	.085
>6 times	6/9 (66.7%)	14/22 (63.6%)	56/72 (77.8%)	144/202 (71.3%)	85/101 (84.2%)	
<b>Antiseptic use frequency</b>						
0-6 times	7/9 (77.8%)	15/22 (68.2%)	52/72 (72.2%)	159/202 (78.7%)	73/101 (72.3%)	.599
>6 times	2/9 (22.2%)	7/22 (31.8%)	20/72 (27.8%)	43/202 (21.3%)	28/101 (27.7%)	
<b>Knowledge of transmission route</b>						
Correct	0/9 (0%)	2/22 (9.1%)	12/72 (16.7%)	69/202 (34.2%)	51/101 (50.5%)	<.05
Incorrect	9/9 (100%)	20/22 (90.9%)	60/72 (83.3%)	133/202 (65.8%)	50/101 (49.5%)	
<b>Knowledge of incubation time</b>						
Correct	8/9 (88.9%)	19/22 (86.4%)	64/72 (88.9%)	183/202 (90.6%)	93/101 (92.1%)	.915
Incorrect	1/9 (11.1%)	3/22 (13.6%)	8/72 (11.1%)	19/202 (9.4%)	8/101 (7.9%)	
<b>Use of face masks</b>						
Yes	9/9 (100%)	22/22 (100%)	71/72 (98.6%)	198/202 (98.0%)	98/101 (97.0%)	.866
No	0/9 (0%)	0/22 (0%)	1/72 (1.4%)	4/202 (2.0%)	3/101 (3.0%)	

**Figure 2. a,b.** (a) Application frequency of personal protective measures recommended by WHO, (b) Use of personal protective equipment by participants**TABLE 3.** Participant Coherence to Curfew Imposed by the Local Government

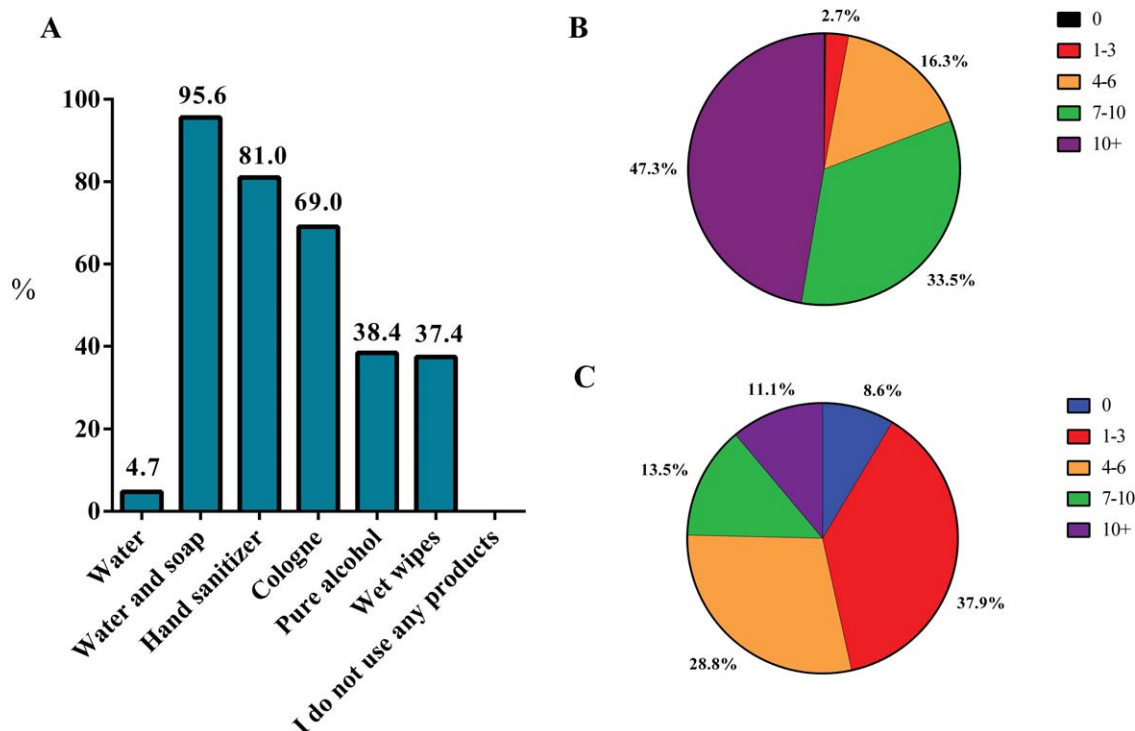
	Always, n (%)	Usually, n (%)	Rarely, n (%)	Never, n (%)
Coherence to curfew—self-isolation measures	323 (79.5)	79 (19.5)	2 (0.5)	2 (0.5)

PPE used by participants and their usage prevalence are shown in Figure 2b. When participants from different cities were evaluated in terms of the use of masks in public areas, the prevalence of citizens who applied all types of masks was found to be 94.4-100% in all cities with no statistical differences among them ( $P = .084$ ). Similarly, no statistical association was found between education level and the use of masks ( $P = .866$ ) (Table 2).

Of all the participants, adherence to hand hygiene before and after mask and glove use was 90.1 and 93.8%, respectively, indicated to practice 2-m social distancing while in public places

using masks. Overall, citizens were coherent to curfew imposed by the local government (Table 3).

When participants were asked to indicate which hand hygiene products they used, majority indicated to use soap and water (95.6%), followed by hand sanitizer (81%) and cologne with at least 70% alcohol content (69%) (Figure 3a). Figure 3b and c shows the total number of hand hygiene events per day. A high proportion of citizens (47.3%) responded to wash their hands more than 10 times a day, while a high prevalence was observed for the application of hand sanitizer 1-3 times a day (37.9%) (Figure 3c). There was a statistically significant



**Figure 3. a-c.** (a) The proportion of participants applying hand hygiene products, (b) Frequency of daily hand washing events, (c) Frequency of daily hand sanitation events

difference between age groups and hand washing frequency ( $P = .046$ ), where individuals in age group 35-54 had a higher hand washing frequency (7 or more) compared with other groups. On the contrary, there was no statistically significant difference between age groups and frequency of hand sanitation application ( $P = .159$ ). Interestingly, when the gender of the participants was analyzed, a statistically significant difference was observed in terms of hand-washing frequency, where women washed their hands (>6 times a day) more frequently than men ( $P = 0.008$ ). There was no statistically significant association between gender and application of hand sanitizers ( $P = .652$ ). In terms of demographics, our analysis showed that the distribution of individuals who had a hand washing frequency >6 times a day was 87.5% in Trikomo, 79.5% in Nicosia, 75.0% in Morphou, 70.4% in Kyrenia, 66.7% in Famagusta, and 65.4% in Lefka. Similarly, the distribution of antiseptic use frequency >6 times a day was 31.3% in Trikomo, 30.8% in Lefka, 28.2% in Kyrenia, 25.4% in Famagusta, 22.4% in Nicosia, and 20.0% in Morphou. There were no statistically significant differences between different cities in terms of hand hygiene events as shown in Table 4 (hand washing,  $P = .153$ ; antiseptic use,  $P = .820$ ).

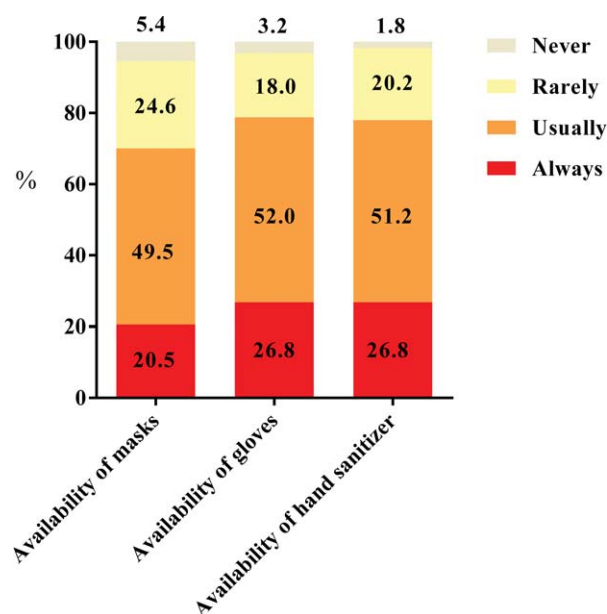
When the local availability of PPE for the participants was assessed, masks, gloves, and hand sanitizer were found accessible to public use at a large extend. However, although less than 25%, some of the participants were rarely or never able to find these PPE products available at the pharmacies or supermarkets during the pandemic (Figure 4).

Majority of citizens (82%) indicated that during the pandemic, they felt reservation from visiting hospitals or healthcare facilities. Additionally, 84.2% of the participants responded that they would be comfortable with going for a COVID-19 test in a

mobile test center in a hospital carpark without leaving their car. Binary logistic regression analysis showed that education levels of individuals and having a COVID-19 test in a mobile test center were not significantly associated ( $P = .266$ ),

**TABLE 4.** Association of Demographics and Participant Hand Hygiene Events

	0-6 times	>6 times	P value
Hand washing frequency			
15-34	47/159 (29.6%)	112/159 (70.4%)	<.05
35-54	24/137 (17.5%)	113/137 (82.5%)	
>55	30/110 (23.7%)	80/110 (72.5%)	
Male	59/191 (30.9%)	132/191 (69.1%)	<.01
Female	42/215 (19.5%)	173/215 (80.5%)	
Kyrenia	21/71 (29.6%)	50/71 (70.4%)	.153
Nicosia	43/210 (20.5%)	167/210 (79.5%)	
Famagusta	21/63 (33.3%)	42/63 (66.7%)	
Trikomo	2/16 (12.5%)	14/16 (87.5%)	
Morphou	5/20 (25.0%)	15/20 (75.0%)	
Lefka	9/26 (34.6%)	17/26 (65.4%)	
Antiseptic use frequency			
15-34	114/159 (71.7%)	45/159 (28.3%)	.159
35-54	102/137 (74.5%)	35/137 (25.5%)	
>55	90/110 (81.8%)	20/110 (18.2%)	
Male	142/191 (74.3%)	49/191 (25.7%)	.652
Female	164/215 (76.3%)	51/215 (23.7%)	
Kyrenia	51/71 (71.8%)	20/71 (28.2%)	.820
Nicosia	163/210 (77.6%)	47/210 (22.4%)	
Famagusta	47/63 (74.6%)	16/63 (25.4%)	
Trikomo	11/16 (68.8%)	5/16 (31.3%)	
Morphou	16/20 (80.0%)	4/20 (20.0%)	
Lefka	18/26 (69.2%)	8/26 (30.8%)	



**Figure 4.** The prevalence of personal protective equipment availability

suggesting that individuals at all education levels were comfortable with having a COVID-19 test in a mobile test center.

Based on the responses, the mostly used source of COVID-19-related information was social media (71.4%) and TV (70.9%), while only a minority of citizens used newspapers, scientific articles, and brochures/flyers. The same pattern was also observed for information on personal protective procedures (social media 73.6% and TV 55.2%), followed by more reliable sources such as WHO, T.R.N.C. Ministry of Health, and T.R.N.C. Medical Association used at a lesser extend (Table 5).

## DISCUSSION

In the course of a pandemic, the implementation of PPMs represents an important factor for the control of the outbreak and has been shown to have significant protective effects associated.<sup>10</sup> This study was designed to assess the knowledge, attitudes, and implementation status of PPMs by the citizens in Northern Cyprus between May 1 and May 4, 2020. The survey period covers an important time period amid COVID-19 pandemic in which all preventive measures enforced by the local government in Northern Cyprus were in place, and the curfew was still ongoing and, therefore, provides a timely assessment. Overall, 70-90% of the individuals surveyed were knowledgeable about the droplet and indirect transmission routes of disease transmission, whereas the citizens were aware of the more recently described aerosol route of transmission<sup>19</sup> at a lesser extent, approximately 44%. The survey responders also demonstrated a 90% knowledge of the incubation period for COVID-19, demonstrating a high comprehension of disease characteristics during the pandemic. In a different study conducted among in Cyprus, healthcare workers were found to have a satisfactory level of knowledge of the virus.<sup>20</sup> Interestingly, in our study, younger citizens were statistically more knowledgeable about the disease transmission routes compared with the elderly population above age 55. Recent sur-

**TABLE 5.** The Source of COVID-19-Related Information and Personal Protective Measures

Source of personal protective procedures	n (%)
Social media	299 (73.6)
TV	224 (55.2)
T.R.N.C. Ministry of Health	195 (48.0)
World Health Organization	174 (42.9)
T.R.N.C Medical Association	102 (25.1)
Newspaper	21 (5.2)
Source of COVID-19 information	n (%)
Social media	290 (71.4)
TV	288 (70.9)
Internet sites	278 (68.5)
Scientific articles	83 (20.4)
Newspaper	40 (9.9)
Family/friends/relatives	40 (9.9)
WhatsApp group	23 (5.7)
Radio	16 (3.9)
Brochures/flyers	4 (1)

veys on public knowledge on COVID-19 in China, where the pandemic has emerged, demonstrated an overall 90% correct rate on a COVID-19 knowledge test, which included questions on main clinical symptoms, viral transmission, observation period, and age groups affected.<sup>21</sup> In a separate study, where the responders were asked question regarding the origin, common signs and symptoms, sources of infection of COVID-19, and awareness of any other pandemic viral infection, the knowledge level of individuals varied according to the profession.<sup>22</sup> Cross-sectional studies from various countries have showed that there are regional disparities in the attitude toward preventive measures and knowledge of COVID-19.<sup>23-27</sup>

WHO and its recommendation of five PPMs against COVID-19, namely, hand hygiene; social distancing measures; avoiding touching the eyes, nose, and mouth; use of face masks; and self-isolation, have been taken as a reference by all countries and were communicated to the citizens via local health authorities in each country. Of these measures, the prevalence of hand hygiene and social distancing was the highest and respiratory etiquette was high, whereas the prevalence of avoiding touching nose, mouth, and eyes was the lowest among Northern Cyprus citizens. Interestingly, our study results indicated that women statistically washed their hands more frequently than men. Compared with a recent a study conducted in Japan, with hand hygiene being the highest with 83.8% and the lowest being avoiding touching eyes, nose, and mouth with 59.8%, the prevalence of PPM application was overall higher in Northern Cyprus.<sup>28</sup> Similarly, in a population survey performed in the United Kingdom with the age group of 18+ individuals, the prevalence of respondents taking the aforementioned measures to protect themselves and others from COVID-19 was comparably much lower with face mask implementation being as low as 3% and hand washing being highest with 83%.<sup>29</sup> Alternatively, in a study conducted in Hong Kong, enhanced personal hygiene practices were adopted by more than 77% of citizens.<sup>30</sup> Medical students, on the other hand, have been shown to adopt social isolation strategies, regular hand washing, and enhanced personal hygiene measures at a rate of more than 80%.<sup>31</sup> To a surprising extend, Machida et al.<sup>32</sup> reported a significant improvement in the implementation of PPMs and social distancing measures in particular, during the

community transmission phase compared to the early phase of the COVID-19 outbreak.

The recommendation on the use of face masks by citizens in public areas has been controversial. In a guidance report dated January 29, 2020, the WHO recommendation was for only individuals with respiratory symptoms to wear a medical mask to avoid unnecessary cost, procurement burden, and false sense of security.<sup>33</sup> WHO additionally published interim guidance report on the rational use of PPE for COVID-19, which recommended the use of vented masks (respirators) only for frontline healthcare workers in order to optimize the PPE availability.<sup>34</sup> However, health authorities in parts of Asia encouraged all citizens to wear masks in public setting, and the Czech Republic applied mandatory use of face masks to prevent viral spread in the community.<sup>35</sup> The Centers for Disease Prevention and Control has also recommended the use of cloth face coverings or cloth masks in public settings with particular risk of community-based transmission.<sup>36</sup> In Northern Cyprus, the mandatory use of face masks was implemented by the local government on April 24, 2020. In the Cypriot community, the practice of surgical mask and cloths mask use was 47-52% and approximately 8% for vented masks, indicating a good adherence to government measures against COVID-19 with some room for improvement. In our study, there were no statistical associations between educational level or geographical regions and the use of face masks. In an online survey conducted in China where the pandemic began, 96.9% of the participants indicated that they use a mask when going to the hospital.<sup>37</sup> In Japan, the prevalence of wearing masks was 80.9%.<sup>13</sup> Indeed, government mandates for face mask use in community has been demonstrated to be associated with a decline in the daily COVID-19 growth rate in the United States.<sup>38</sup>

During the early phase of the pandemic, a major demand of face masks, gloves, and hygiene products arose mainly due to the panic caused by the outbreak, and it has led to the exhaustion of local hygiene products and PPE as well as a steep rise in prices in many countries.<sup>39</sup> A recent study has indicated a correlation between the spread of COVID-19 and the search for PPE and hand hygiene, which can, to a certain extent, show people's concerns, behaviors, and reactions to sanitary problems and protection recommendations.<sup>40</sup> In Northern Cyprus, the shortage of gloves, face masks, and hand sanitizers was reported by 21-30% of the citizen, who indicated they could never find certain PPE types available. In terms of the source of information used by people to gather knowledge about COVID-19, some studies suggested that social media and internet are among the most commonly used sources,<sup>29,41</sup> whereas people also had a tendency of acquiring information and advice from TV and local health authorities which they expressed as more reliable.<sup>30</sup> The Cypriot citizens' choice of COVID-19 information and advice on PPMs were similar to previous studies with TV, social media, and local health authorities such as Ministry of Health and Medical Association being represented on top of the list.

As the current study was based on an online survey, there are certain limitations. There can be differences among participants in terms of their understanding and interpretation of the questions. Furthermore, due to the collection of data at a single point in time with the survey, it is difficult to measure changes in the population over time, for instance, from the beginning of outbreak through the pandemic.

## CONCLUSION

In conclusion, the knowledge of the disease characteristics, the practice of PPMs, and coherence to government-induced protective measures were high in Cyprus citizens. This is believed to have advantageous effects on the control of the outbreak in the country.

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**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

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