Check for updates

Original Article

Investigating the Level of Quarantine Compliance among People in Close Contact With a Person Infected With COVID-19 Patients

Elahe Elyasi[1,2] , Manoochehr Karami[3,4] , Zahra Cheraghi[1,5] , Ghodratollah Roshanaei[5,6] , Mohammad Mirzaei[1] , Salman Khazaei[1,7*]

[1]Department of Epidemiology, School of Health, Hamadan University of Medical Sciences, Hamadan, Iran
[2]Student Research Committee, Hamadan University of Medical Sciences, Hamadan, Iran
[3]Environmental and Occupational Hazards Control Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[4]Department of Epidemiology, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Modeling of Noncommunicable Diseases Research Center, Hamadan University of Medical Sciences, Hamadan, Iran
[6]Department of Biostatistics, School of Health, Hamadan University of Medical Sciences, Hamadan, Iran
[7]Research Center for Health Sciences, Hamadan University of Medical Sciences, Hamadan, Iran

Abstract

Background and aims: COVID-19 has emerged as a novel pandemic, emphasizing the crucial role of prevention and quarantine measures. Compliance with these measures becomes particularly important for individuals in close contact with COVID-19-infected individuals. This study aimed to investigate the level of quarantine compliance among individuals who had close contact with COVID-19 patients in Hamadan province, as well as identify predictors associated with compliance.

Methods: This descriptive-analytical, cross-sectional study was conducted between March and July 2022, involving 350 individuals who had close contact with COVID-19 patients in Hamadan province, Iran. A researcher-designed questionnaire was employed to gather participants' demographic and clinical information, as well as their adherence to quarantine principles, through a 7-question assessment. The collected data were statistically analyzed using Stata software, version 16.

Results: The study participants had a mean age of 40.23 ± 12.91 years. The rate of good compliance with quarantine measures among individuals in close contact with COVID-19 patients was found was 58.66%. Adjusted logistic regression analysis revealed that men in close contact with COVID-19 patients had a 1.66 times higher chance of complying with quarantine compared to women (odds ratio [OR] = 1.66, 95% CI = 1.06, 2.56), P = 0.025). Additionally, individuals over the age of 60 who had close contact with COVID-19 patients exhibited a 2.28 times higher chance of non-compliance with quarantine (OR = 2.28, 95% CI = 1.17, 4.45, P = 0.015).

Conclusion: Demographic characteristics could significantly influence compliance with quarantine principles among individuals in close contact with COVID-19 patients. Addressing these factors is crucial for effective health planning and patient education in the country.

Keywords: Close contact, Quarantine, COVID-19

Introduction

The coronavirus pandemic that emerged at the end of 2019 created an unprecedented global situation that led to significant social, political, and economic upheaval. The virus was first reported in Wuhan, China, in 2019 and was officially declared an epidemic in March 2020. Initially, its primary symptom was severe respiratory problems, typically affecting the upper respiratory system, with severe cough and fever being prominent indicators.[1] In Iran, as of August 11, 2023, nearly 7.6 million people have been infected, resulting in 146 318 deaths.[2] Currently, there is no definitive and effective treatment for this disease, and most measures are supportive, aiming at preserving different body functions. Currently, the most vital strategy for combating this pandemic is ensuring full adherence to health protocols and widespread vaccination. This requires increasing awareness and fostering behavioral changes among the population. Given the high infection and transmission rates of this disease, the employed strategies and solutions must be highly effective to swiftly induce desirable health behaviors among individuals.[3]

Implementing appropriate infection control measures

and enforcing quarantine for individuals in close contact with infected individuals are crucial in mitigating the risk of secondary transmission in these settings. Quarantining patients and their direct contacts, along with the consistent use of masks, are essential measures for minimizing the spread and contamination of the virus.[4] Numerous studies have provided evidence that wearing masks during close contact with infected individuals significantly decreases the risk of SARS-CoV-2 infection compared to not wearing masks.[5] Additionally, multiple studies have demonstrated the effectiveness of quarantining and isolating suspected individuals and close contacts in breaking the chain of disease transmission.[6-9] However, adherence to quarantine and isolation protocols varies across countries, with reported compliance levels ranging from 0% to 92.8%.[10] Factors such as job loss, economic circumstances, and limited access to internet-based health instructions from health ministries, as well as age and gender, influence the level of compliance with quarantine measures.[11]

The level of compliance with quarantine principles depends on public awareness of the disease. A study conducted in Bangladesh in late 2020 revealed that the distribution of surgical or fabric masks tripled mask usage.[12] In general, the virus exhibits high transmission rates, especially among individuals in close contact with COVID-19 patients. Recent analyses indicate a transmission rate between 5% and 6% among individuals in close contact with infected persons.[13,14] Among family members, the virus transmission rate can reach 10%, underscoring the importance of adhering to quarantine principles for close contacts of COVID-19 patients.[15]

Estimating the extent of quarantine compliance in different societies serves two purposes. Firstly, it facilitates documented and detailed health planning tailored to the culture and conditions of each society. Secondly, it prepares the country's health system to effectively address, contain, and prevent future infectious diseases.

Given the significance of wearing masks and observing quarantine measures, we have undertaken an evaluation of quarantine compliance among individuals in close contact with COVID-19 patients in Hamadan province, Iran.

Materials and Methods

The current descriptive-analytical cross-sectional study was conducted in Hamadan province from March to July 2022. The study population consisted of 358 individuals who had close contact with COVID-19 patients. The inclusion criteria comprised individuals in close contact with confirmed COVID-19 cases, diagnosed through a definitive polymerase chain reaction test during the fifth wave of the epidemic in the province, and who were not hospitalized for COVID-19. On the other hand, the exclusion criteria encompassed disabled patients with mental disorders and individuals who declined to participate in the study. The study results of Rubin et al, where 25% of patients adhered to the national guideline of staying at home, were utilized to calculate the sample size. Therefore, considering this parameter, a type I error level of 0.05, a power of 0.80, and a precision of 0.05, the sample size was determined to be 288 individuals using the following formula. A total of 358 individuals in close contact with the COVID-19 patients were examined, taking into account the potential presence of distorted questionnaires. Multi-stage sampling was used to choose the participants. First, through stratified sampling, the sample size was allocated proportionally to the number of patients in each county. Subsequently, the number of patients assigned to each county was selected by employing a simple random sampling method. Contact was then established with them through telephone communication. Two questionnaires were utilized in this study.

1. Demographic factors: They included age, gender of the participants and the patient himself, marital status, education, underlying and chronic diseases, vaccination status of COVID-19, and age group of the person in close contact with the patient.
2. The questionnaire on adherence to quarantine among individuals in close contact with a COVID-19 patient includes the following questions:
1) Did you wear a mask when leaving the house?
2) Did you maintain a two-meter distance from the other people?
3) Did you avoid public places such as mosques, stores, schools, gyms, and the like?
4) Did you refrain from visiting the houses of your relatives or having them visit your house?
5) Did you not leave home for unnecessary purchases?
6) Did you regularly wash your hands with soap and water or disinfect them with alcohol if you came into contact with the patient's personal belongings?

The questions in the questionnaire were formulated based on the guidelines outlined by the Ministry of Health, and their validity was confirmed by a panel of experts. Each individual's total score for the quarantine questionnaire was calculated by summing the scores of each question. Compliance with quarantine principles was categorized into good and poor groups. "Good compliance" was related to patients who did not adhere to a maximum of three questions, with a total score between 4 and 6, and "poor compliance" represented patients who did not adhere to more than three questions, with a total score between 0 and 3.

For data analysis, independent t-tests were employed to compare quantitative variables between adherent and non-adherent patients, considering quarantine and mask-wearing. Qualitative variables between the two groups were compared using the Chi-square test. A logistic regression model was utilized to simultaneously predict and examine factors relating to quarantine compliance (good compliance with quarantine principles: Code 0, and low compliance with quarantine principles: Code 1). The adjusted model was built using the Hosmer-Lemeshow approach, and variables with a P value < 0.2 in the crude model were included in the adjusted model. The data were

analyzed using Stata version (16 software), and a statistical significance level of less than 0.05 was considered in this study.

Results

A total of 358 individuals who were relatives of patients with COVID-19 were included in this study. The participants had an average age of 40.23 ± 12.21 years. The age range of the participants varied from 18 to 77 years. Detailed demographic information of the participants in close contact with COVID-19 patients and their relationship with quarantine adherence is presented in Table 1. Among the participants, the most common age group was between 35 and 59.9 years old (53.91%), and 199 (55.59%) were males. About 78.49% of individuals in close contact with COVID-19 patients were married. In terms of education, 155 individuals (43.3%) had completed undergraduate studies, and 42 individuals (11.76%) had underlying health conditions. Additionally, 312 individuals (87.15%) had received a COVID-19 vaccination. Nearly 41.34%

of individuals in close contact with COVID-19 patients exhibited poor adherence to quarantine principles. The rates of complying with wearing a mask when leaving the home, maintaining a two-meter distance from other people, avoiding presence in public places, refraining from visiting the houses of his/her relatives, not leaving home for unnecessary purchases, and regularly washing his/her hands with soap and water were 85.66%, 56.98%, 21.23%, 10.89%, 15.64%, and 80.73%, respectively.

With regard to the relationship between demographic and clinical variables and the level of quarantine compliance, the data analysis revealed a statistically significant association between the level of quarantine compliance and the gender of the COVID-19 patients, as well as the age group and gender of the participants ($P < 0.05$).

In the crude regression model, it was found that having male gender (odds ratio [OR] = 1.74, 95% confidence interval [CI] = 1.13, 2.68), being in the age group of 35–59.9 years old (OR = 1.70, 95% CI = 1.00, 2.90), and

Table 1. The Relationship Between Demographic and Clinical Variables and the Level of Quarantine Compliance

Variable		Total	Compliance Status		P Value
			Poor No. (%)	Good No. (%)	
Relative to the patient	Child	89 (24.86)	32 (35.96)	57 (60.04)	0.038
	Spouse	163 (44.53)	73 (44.79)	90 (55.21)	
	Brother	13 (3.63)	4 (30.77)	9 (69.23)	
	Father	19 (5.31)	5 (26.32)	14 (73.68)	
	Mother	49 (13.69)	5 (26.32)	14 (73.68)	
	Sister	13 (3.63)	4 (30.77)	9 (69.23)	
	Other	12 (3.35)	6 (50)	6 (50)	
Gender of relatives	Male	199 (55.59)	94 (47.24)	105 (52.76)	0.011
	Female	159 (44.41)	54 (33.96)	105 (66.04)	
Gender of the patient	Male	172 (48.04)	62 (36.05)	110 (63.95)	0.05
	Female	186 (51.96)	86 (46.24)	100 (53.76)	
Marital status of relatives	Single	77 (21.51)	27 (35.06)	50 (64.94)	0.207
	Married	281 (78.49)	121 (43.06)	160 (56.94)	
Marital status of patient	Single	94 (26.26)	38 (40.43)	56 (59.57)	0.834
	Married	264 (73.74)	110 (41.67)	154 (58.33)	
Education of relatives	High school	155 (43.30)	69 (44.52)	86 (55.48)	0.562
	Diploma	73 (20.39)	28 (38.36)	45 (61.64)	
	University	130 (36.31)	51 (39.23)	79 (60.77)	
Education of patient	High school	155 (43.3)	66 (40)	99 (60)	0.168
	Diploma	73 (20.39)	27 (34.62)	51 (65.38)	
	University	130 (36.31)	55 (47.83)	60 (52.17)	
Chronic disease in relatives	Yes	42 (11.76)	16 (38.10)	26 (61.90)	0.666
	No	315 (88.24)	131 (41.59)	184 (58.41)	
Vaccination status of relatives	Receive	312 (87.15)	132 (42.31)	180 (57.69)	0.333
	No receive	46 (12.85)	16 (34.78)	30 (65.22)	
Age group of relatives	15-34.9	108 (30.17)	36 (33.33)	72 (66.67)	0.032
	15-34.9	193 (53.91)	81 (41.97)	12 (5.03)	
	≥60	57 (15.92)	31 (54.39)	26 (45.61)	

being over 60 years old among the participants (people in contact with a person infected with COVID-19; OR = 2.38, 95% CI = 1.24, 4.60) were significantly associated with an increased chance of non-compliance with quarantine ($P < 0.05$). After adjusting for other variables, the results of the adjusted model indicated that men in close contact with a person with COVID-19 had a 1.66 times higher chance of non-compliance with quarantine compared to women (OR = 1.66, 95% CI = 1.06, 2.56, $P = 0.025$). This implies that women were more likely to comply with quarantine measures than men when in close contact with a person infected with COVID-19. Furthermore, individuals in close contact with a person infected with COVID-19 who were over 60 years old had a 2.28 times higher chance of non-compliance with quarantine compared to those aged

15–35 (OR = 2.28, 95% CI = 1.17, 4.45, $P = 0.015$; Table 2).

Discussion

This cross-sectional study sought to evaluate the level of compliance with quarantine measures among individuals in close contact with COVID-19 patients in Hamadan province.

COVID-19 is an epidemic disease that has affected numerous countries in the past three years, necessitating diagnosis and treatment. Following the emergence and announcement of this disease, health organizations and institutions, particularly the WHO, swiftly issued recommendations regarding isolation, masking, and quarantine to prevent its spread. Given the rapid transmission of COVID-19 and its respiratory nature,

Table 2. Crude and Adjusted Regression Models Regarding the Predictors of Non-compliance With Quarantine Among Individuals in Close Contact With Patients With COVID-19

Variable		Crude Model		Adjusted Model	
		OR (95% CI)	*P* value	OR (95% CI)	*P* value
Relative to the patient	Father	1	-		
	Child	1.58 (0.52, 4.77)	0.424		
	Spouse	2.28 (0.79, 6.6)	0.132		
	Brother	1.24 (0.26, 5.92)	0.783		
	Mother	2.69 (0.84, 8.61)	0.096		
	Sister	1.24 (0.26, 5.92)	0.783		
	Other	2.8 (0.61, 12.85)	0.186		
Gender of relatives	Female	1	-	1	-
	Male	1.74 (1.13, 2.68)	0.012	1.66 (1.06, 2.56)	0.025
Education of relatives	Diploma	1	-		
	High school	1.29 (0.73, 2.27)	0.381		
	University	1.04 (0.58, 1.87)	0.902		
Education of patient	Diploma	1	-		
	High school	1.26 (0.72, 2.20)	0.421		
	University	1.73 (0.96, 3.13)	0.070		
Age group of patients	15-34.9	1	-		
	<15	1.62 (0.59, 4.51)	0.352		
	35-59.9	1.70 (1.00, 2.90)	0.049		
	≥60	3.96 (0.83, 2.71)	0.179		
Age group of relatives	15-34.9	1	-	1	-
	35-59.9	1.45 (0.88, 2.36)	0.141	1.42 (0.87, 2.34)	0.162
	≥60	2.38 (1.24, 4.60)	0.010	2.28 (1.17, 4.45)	0.015
Marital status of relatives	Single	1	-		
	Married	1.40 (0.83, 2.36)	0.208		
Marital status of patient	Single	1	-		
	Married	1.05 (0.65, 1.70)	0.834		
Gender of the patient	Male	1	-		
	Female	1.52 (0.99, 2.33)	0.051		
Vaccination status of relatives	No	1	-	1	-
	Yes	1.37 (0.60, 2.62)	0.666	1.27 (0.64, 2.49)	0.487
Chronic disease in relatives	Yes	1	-		
	No	1.16 (0.60, 2.24)	0.666		

Note. CI: Confidence interval; OR: Odds ratio.

adherence to quarantine measures for both COVID-19 patients and individuals in close proximity to them is of utmost importance. People in close contact with an infected individual can play a significant role in disease transmission, particularly since they often remain asymptomatic and can unknowingly carry the virus to public places, gatherings, and family events. Accurately assessing the level of adherence to quarantine measures among individuals in close contact with COVID-19 patients, as well as identifying associated factors, can provide health authorities with valuable insights into the community's awareness, health knowledge, and compliance with quarantine principles. This information can be utilized by health officials to plan and educate the public, addressing any existing deficiencies.[16,17]

The study findings revealed that the rate of quarantine compliance among individuals in close contact with COVID-19 patients was 41.34% and 58.66% for poor and good compliance, respectively. The extent of adherence to quarantine measures generally depends on a society's cultural levels and socioeconomic conditions. In our country, due to close family ties and frequent family visits, compliance with quarantine measures is often disregarded by individuals in close proximity to COVID-19 patients. This lack of awareness within society leads them to believe that asymptomatic individuals are safe and not contagious. Various studies have reported compliance rates with quarantine principles and current protocols ranging from 0% to 92.8%.[18] Individual and social factors, especially demographic factors, play a crucial role in determining adherence to these principles.[18,19] These factors include employment status,[19] gender, age, and place of residence.[18-20] Additionally, studies have reported the rate of compliance with quarantine among COVID-19 patients, with one study by Kharamin et al demonstrating that approximately 67% of individuals over the age of 75 followed quarantine measures and 72% adhered to health guidelines.[21]

In the present study, it was observed that women exhibited higher compliance with quarantine measures compared to men, and the age group of 35–59 years demonstrated greater adherence compared to other age groups. Nonetheless, close relatives of male COVID-19 patients exhibited significantly higher compliance with quarantine measures compared to those of female patients. Generally, research indicated that compliance with quarantine measures was higher among women than men.[21] This could be attributed to women being more sensitive and displaying different knowledge and attitudes toward infectious diseases. Women tend to prioritize the well-being of their family members and demonstrate greater adherence to hygiene and quarantine principles. On the other hand, men may exhibit lower adherence due to economic and social factors, as well as employment outside the home.[22] Overall, adherence to quarantine measures and compliance with health principles are significantly associated with some demographic variables, such as marital status, gender, place of residence, age, occupation, and education.[21] Women tend to have a higher perception of epidemic risk compared to men and are more likely to adopt health protective behaviors, such as practicing hand hygiene, avoiding public places, and implementing other hygienic measures. These findings are consistent with the results of some studies, demonstrating that women exhibit a greater inclination toward adopting new health protective measures.[22-24] Studies conducted in Hong Kong, for example, reported that women reported higher usage of masks compared to men in mandatory situations.[25,26] Interestingly, in our study, if the COVID-19 patient was male, individuals in close contact with him demonstrated higher compliance with quarantine measures compared to when the patient was female. This could be attributed to the perception that male patients require more attention and care due to their employment and faster recovery, or perhaps it reflects the belief that stricter quarantine and recovery conditions should be imposed on male patients, considering that their disease tends to be more severe and their role in economic and financial matters is often more significant.

Furthermore, younger and middle-aged individuals represented higher compliance with quarantine measures, as they generally displayed greater awareness and adherence to health-related issues. Conversely, older individuals sometimes strive to enhance their adherence to quarantine and protective behaviors while minimizing risky behaviors due to physical vulnerability and weakness.[27,28]

These findings highlight the importance of considering demographic factors when designing interventions and public health campaigns to promote compliance with quarantine measures. Tailoring educational materials and messages to different demographic groups may help improve awareness and adherence to quarantine protocols.

Conclusion
These findings confirm the significant role of demographic characteristics in determining adherence to quarantine principles among individuals in close contact with COVID-19 patients. It is crucial to consider these factors in public health planning and patient education efforts. By addressing the specific needs and circumstances of different demographic groups, we can improve compliance with quarantine protocols and enhance overall public health outcomes.

Authors' Contribution
Conceptualization: Salman Khazaei, Manoochehr Karami, Elahe

References

1. Sederdahl BK, Williams JV. Epidemiology and clinical characteristics of influenza C virus. Viruses. 2020;12(1):89. doi: 10.3390/v12010089.

2. Renke C, Callow L, Egnor T, Honstain C, Kellogg K, Pollack B, et al. Utilization of pediatric nurse practitioners as adult critical care providers during the COVID-19 pandemic: a novel approach. J Pediatr Health Care. 2020;34(5):490-4. doi: 10.1016/j.pedhc.2020.06.005.

3. Chen L, Xiong J, Bao L, Shi Y. Convalescent plasma as a potential therapy for COVID-19. Lancet Infect Dis. 2020;20(4):398-400. doi: 10.1016/s1473-3099(20)30141-9.

4. El Dib RP, Silva EM, Morais JF, Trevisani VF. Prevalence of high frequency hearing loss consistent with noise exposure among people working with sound systems and general population in Brazil: a cross-sectional study. BMC Public Health. 2008;8:151. doi: 10.1186/1471-2458-8-151.

5. Doung-Ngern P, Suphanchaimat R, Panjangampatthana A, Janekrongtham C, Ruampoom D, Daochaeng N, et al. Case-control study of use of personal protective measures and risk for SARS-CoV 2 infection, Thailand. Emerg Infect Dis. 2020;26(11):2607-16. doi: 10.3201/eid2611.203003.

6. World Health Organization (WHO). Considerations for Quarantine of Contacts of COVID-19 Cases: Interim Guidance. WHO; 2020.

7. Elgendy MO, Abd Elmawla MN, Abdel Hamied AM, El Gendy SO, Abdelrahim MEA. COVID-19 patients and contacted person awareness about home quarantine instructions. Int J Clin Pract. 2021;75(4):e13810. doi: 10.1111/ijcp.13810.

8. Raveendran AV, Jayadevan R. Reverse quarantine and COVID-19. Diabetes Metab Syndr. 2020;14(5):1323-5. doi: 10.1016/j.dsx.2020.07.029.

9. Ryu S, Hwang Y, Yoon H, Chun BC. Self-quarantine noncompliance during the COVID-19 pandemic in South Korea. Disaster Med Public Health Prep. 2022;16(2):464-7. doi: 10.1017/dmp.2020.374.

10. Webster RK, Brooks SK, Smith LE, Woodland L, Wessely S, Rubin GJ. How to improve adherence with quarantine: rapid review of the evidence. Public Health. 2020;182:163-9. doi: 10.1016/j.puhe.2020.03.007.

11. Coetzee BJ, Kagee A. Structural barriers to adhering to health behaviours in the context of the COVID-19 crisis: considerations for low- and middle-income countries. Glob Public Health. 2020;15(8):1093-102. doi: 10.1080/17441692.2020.1779331.

12. Abaluck J, Kwong LH, Styczynski A, Haque A, Kabir MA, Bates-Jefferys E, et al. Impact of community masking on COVID-19: a cluster-randomized trial in Bangladesh. Science. 2022;375(6577):eabi9069. doi: 10.1126/science.abi9069.

13. Bajema KL, Oster AM, McGovern OL, Lindstrom S, Stenger MR, Anderson TC, et al. Persons evaluated for 2019 novel coronavirus - United States, January 2020. MMWR Morb Mortal Wkly Rep. 2020;69(6):166-70. doi: 10.15585/mmwr.mm6906e1.

14. Chen Y, Wang AH, Yi B, Ding KQ, Wang HB, Wang JM, et al. [Epidemiological characteristics of infection in COVID-19 close contacts in Ningbo city]. Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(5):667-71. doi: 10.3760/cma.j.cn112338-20200304-00251. [Chinese].

15. Burke RM, Midgley CM, Dratch A, Fenstersheib M, Haupt T, Holshue M, et al. Active monitoring of persons exposed to patients with confirmed COVID-19 - United States, January-February 2020. MMWR Morb Mortal Wkly Rep. 2020;69(9):245-6. doi: 10.15585/mmwr.mm6909e1.

16. Tseng CW, Roh Y, DeJong C, Kanagusuku LN, Soin KS. Patients' compliance with quarantine requirements for exposure or potential symptoms of COVID-19. Hawaii J Health Soc Welf. 2021;80(11):276-82.

17. Guidance on Quarantine of Close Contacts to COVID-19 Cases and Isolation of COVID-19 Cases, in the Current Epidemiological Situation. January 7, 2022 [Internet]. European Centre for Disease Prevention and Control. Available from: https://www.ecdc.europa.eu/en/covid-19/prevention-and-control/quarantine-and-isolation.

18. Webster RK, Brooks SK, Smith LE, Woodland L, Wessely S, Rubin GJ. How to improve adherence with quarantine: rapid review of the evidence. Public Health. 2020;182:163-9. doi: 10.1016/j.puhe.2020.03.007.

19. Porten K, Faensen D, Krause G. SARS outbreak in Germany 2003: workload of local health departments and their compliance in quarantine measures--implications for outbreak modeling and surge capacity? J Public Health Manag Pract. 2006;12(3):242-7. doi: 10.1097/00124784-200605000-00004.

20. Soud FA, Cortese MM, Curns AT, Edelson PJ, Bitsko RH, Jordan HT, et al. Isolation compliance among university students during a mumps outbreak, Kansas 2006. Epidemiol Infect. 2009;137(1):30-7. doi: 10.1017/s0950268808000629.

21. Kharamin S, Shakibkhah S, Rafiei M, Mohammad Hosseinpour H. Evaluation of adherence to quarantine, health related protocols and some associated factors in COVID-19 pandemic. Armaghane Danesh. 2021;25(0):903-20. doi: 10.52547/armaghanj.25.S1.903. [Persian].

22. Tan J, Yoshida Y, Ma KS, Mauvais-Jarvis F, Lee CC. Gender differences in health protective behaviours and its implications for COVID-19 pandemic in Taiwan: a population-based study. BMC Public Health. 2022;22(1):1900. doi: 10.1186/s12889-022-14288-1.

23. Suen LK, So ZYY, Yeung SK, Lo KYK, Lam SC. Epidemiological investigation on hand hygiene knowledge and behaviour: a cross-sectional study on gender disparity. BMC Public Health.

2019;19(1):401. doi: 10.1186/s12889-019-6705-5.

24. Bish A, Michie S. Demographic and attitudinal determinants of protective behaviours during a pandemic: a review. Br J Health Psychol. 2010;15(Pt 4):797-824. doi: 10.1348/135910710x485826.

25. Lau JT, Griffiths S, Choi KC, Lin C. Prevalence of preventive behaviors and associated factors during early phase of the H1N1 influenza epidemic. Am J Infect Control. 2010;38(5):374-80. doi: 10.1016/j.ajic.2010.03.002.

26. Lee LY, Lam EP, Chan CK, Chan SY, Chiu MK, Chong WH, et al. Practice and technique of using face mask amongst adults in the community: a cross-sectional descriptive study. BMC Public Health. 2020;20(1):948. doi: 10.1186/s12889-020-09087-5.

27. Kim JK, Crimmins EM. How does age affect personal and social reactions to COVID-19: results from the national Understanding America Study. PLoS One. 2020;15(11):e0241950. doi: 10.1371/journal.pone.0241950.

28. Carlucci L, D'Ambrosio I, Balsamo M. Demographic and attitudinal factors of adherence to quarantine guidelines during COVID-19: the Italian model. Front Psychol. 2020;11:559288. doi: 10.3389/fpsyg.2020.559288.