Relationship between type of hand hygiene method and incidence of skin problems during Covid-19 pandemic in Ahvaz; Iran

Poorandokht Afshari
Ahvaz Jundishapur University of Medical Sciences: Ahvaz Jondishapour University of Medical Sciences

Mohammad Javad Mohammadi
Ahvaz Jundishapur University of Medical Sciences: Ahvaz Jondishapour University of Medical Sciences

Maryam Beheshti Nasab
Ahvaz Jundishapur University of Medical Sciences: Ahvaz Jondishapour University of Medical Sciences

Elham Maraghi
Ahvaz Jundishapur University of Medical Sciences: Ahvaz Jondishapour University of Medical Sciences

Maria Cheraghi (✉ sahar.g.m1234@gmail.com)
Ahvaz Jundishapur University of Medical Sciences: Ahvaz Jondishapour University of Medical Sciences
https://orcid.org/0000-0002-0640-9005

Research

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Abstract

Background: During the Coronavirus disease 2019 (COVID-19) outbreak, there was an increase in human activities in relation to hygiene, especially hand hygiene. The purpose of this study was to investigate the hand hygiene among volunteers during the COVID-19 pandemic in Ahvaz, southwest Iran during 2020.

Methods: Data validation was performed using WHO criteria. A web-based prospective cross-sectional descriptive study which conducted during 2020 in Ahvaz city, southwest Iran. The data collection was based on completion of the volunteer questionnaire. In our study, WhatsApp software was used.

Results: The number of participants in our study were 1000 persons. Based on result this study, the mean ages (mean ± SD) participants were 32.84±10.74 years for women and 33.06±11.08 years for men. According finding this study, there was no relationship between age of participants and hand-skin’s health scores (p>0.05).

Conclusions: It was concluded that during the COVID-19 pandemic all the assessed hand hygiene behaviors of Iranian were improved, compared with those before, but hand hygiene education is still necessary.

Therefore, the results of this study may be useful for health policymaker in order to cope with the emerging disease.

1. Background

COVID-19 pandemic has taken a heavy toll on the healthcare fraternity worldwide, and despite setting up added facilities to augment the number of beds and ventilators, the limited number of healthcare workers is a limiting factor. In 2019, a new unprecedented coronavirus called SARS-CoV-2 emerged in Wuhan, Chain, rapidly spreads from country to country, and became a global crisis, impacting every aspect of human life, economic devastation and social anxiety around the world [1, 2].

Confirmed COVID-19 cases have been reported in more than 212 countries and territories around the world. Based on reported the World Health Organization (WHO) declared COVID-19 is an ongoing global pandemic [3]. In the early stage of the outbreak in Wuhan, due to the high viral load of the upper respiratory tract and the close contact between the otolaryngologist and the patient's upper respiratory tract mucosa, the otolaryngologist had the highest hospital transmission rate [4]. The most common symptoms at onset of COVID-19 disease are dry cough, fever, shortness of breath fatigue, and headache, and fatigue [5-11]. Medical care is the famous section of daily life that has impacted due to respiratory pandemic COVID-19 [12].

Health care-related infections are serious problems that influence patient's safety settings. Hand hygiene is the most effective method for preventing these infections [13]. One of the best ways to destroy
microorganisms is using alcohol-based hand hygiene gel [14]. For the prevention of nosocomial infections, hand hygiene is very important [14]. However, Hand washing is one of the most important factors in prevention of nosocomial infections, researches finding show that hand washing compliance in health care workers was not satisfying. The concept of compliance is effective hand hygiene in any opportunities for that. Other countries researches indicate that hand rubbing with alcohol-based solution adherence hand hygiene compliance [15]. The WHO recommended confirmed that two alcohol-based hand rub formulations (ethanol 70–95% and 2-propanol 70–100%) had an efficient virucidal activity in less than 60 s by more and equal 4 log10 (≥ 99.99) approximately and could be used for disinfection in public health and health-care facilities [16].

The purpose of this study was to assess of hand hygiene among volunteers during the Covid-19 pandemic in Ahvaz, southwest Iran during 2020.

2. Material And Methods

2.1. The study area

The study was carried out in the Ahvaz city of Khuzestan metropolis in southwestern of Iran, with a citizen count of ~1.3 million and is situated on (31°19′13″N and 48°40′09″E) (Figure 1). The temperature sometimes exceeds 50 °C during summers and the humidity in some days reaches more than 90%.

2.2. Sample size and Sampling method

A web-based prospective cross-sectional descriptive study which conducted during 2020 in Ahvaz city, southwest Iran. The data collection was based on completion of the volunteer questionnaire. To determine the minimum sample size, the ratio estimation formula was used for estimating a volunteer. For this purpose, α= 0.05, p=0.5, d=0.05 and a design effect equal to 1.5 were considered. A minimum sample size of 570 estimated for each district. Regarding to the unequal size of the districts and using a proportional to size sampling method, the final sample size needed for this study was estimated 1000 volunteers (people between 12 and 60 years old). People with known skin conditions or daily use of corticosteroids and skin medications were excluded from the study before the onset of the Covid-19 pandemic. In total, different work groups, family, NGO and student who were active in WhatsApp were selected and the questionnaire link was sent to the group members in coordination with the admin. Data collection tools were the standard self-assessment questionnaire of the skin of the hand attached to the three World Health Organizations (WHO) and the self-report questionnaire of demographic characteristics of the participants. The who skin self-assessment tool consists of four sections (hand skin appearance, integrity, moisture and hand skin sensation) with a score of 7-1, prepared by the World Health Organization. The validity of the skin self-assessment form has been confirmed by the World Health Organization.

2.3. Data Analysis
The spreadsheet subsequently obtained in family, NGO and student who were active in WhatsApp by the participants was extracted into Microsoft Excel version 2019 for Windows, and data refining was done. The data was subsequently coded and analyzed using SPSS.

2.4. Statistical analysis

Continuous variables are presented as mean±SD or median with range. Categorical data are expressed as number (percentage). Descriptive analysis was used to determine the frequencies and proportion of responses. The normality of continuous variables was examined using the Shapiro-Wilk’s W-test. Mann-Whitney U test was used to compare different continuous variables among two independent groups. The Spearman correlation coefficient was applied to evaluate the relationship between quantitative variables. Statistical analysis was performed using the statistical software SPSS 18.0.0. (SPSS Inc. Chicago, IL, USA).

2.5. Ethical Consideration

Participation was voluntary without any coercion or deception. Ethics License of the present study was acquired from the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (Code of ethics: IR.AJUMS.REC.1399.406). According to the national guidelines, studies such as this do not require individual consent.

3. Results

Of the 1000 participants in our study, 676 (67.6%) were female and 324 (32.4%) were male. The mean ages (mean ± SD) were 32.84±10.74 years for women and 33.06±11.08 years for men. Demographic characteristics of the participants presented in Table 1.
| Participants' characteristics                  | Statistics                  |
|-----------------------------------------------|-----------------------------|
| Gender; n (%)                                  |                             |
| Female                                        | 676 (67.6)                  |
| Male                                          | 324 (32.4)                  |
| Age (y); Mean ± SD (Min-Max)                   |                             |
| Female                                        | 32.84±10.74 (11-70)         |
| Male                                          | 33.06±11.08 (10-69)         |
| Total                                         | 32.92±10.85 (10-70)         |
| Occupation; n (%)                              |                             |
| Jobless                                       | 114 (11.4)                  |
| Student                                       | 232 (23.2)                  |
| Teacher                                       | 75 (7.5)                    |
| Healthcare worker                             | 207 (20.7)                  |
| Housewife                                     | 48 (4.8)                    |
| Clerk                                         | 245 (24.5)                  |
| Worker                                        | 79 (7.9)                    |
| Education; n (%)                               |                             |
| Reading and writing skills                     | 53 (5.3)                    |
| High school                                   | 75 (7.5)                    |
| Diploma                                       | 212 (21.2)                  |
| University                                    | 660 (66.0)                  |
The overall liquid soap with rate of 24.47 % (275) and Alcoholic spray 46.87 % (793) were highest score between hand hygiene material’s type. The observed compliance rates of the distribution of at work/ home equipment and hand hygiene material's type and their percent are presented in Table 2.

| At work/ home equipment and hand hygiene material’s type | N (%) |
|----------------------------------------------------------|-------|
| **At work equipment**                                    |       |
| Face mask                                                | 170 (15.12) |
| Solid soap                                               | 24 (2.14) |
| Liquid soap                                              | 275 (24.47) |
| Disposable gloves                                        | 173 (15.39) |
| Sterilizing surfaces by janitor                          | 13 (1.16) |
| Hand- sterilize liquid                                   | 99 (8.81) |
| Alcohol for surfaces                                     | 228 (20.28) |
| All                                                      | 85 (7.56) |
| None                                                     | 57 (5.07) |
| Total                                                    | 1124 (100) |
| **Hand hygiene material outside of the home**            |       |
| Solid soap                                               | 149 (8.81) |
| Liquid soap                                              | 252 (14.89) |
| Antibacterial soap                                       | 19 (1.12) |
| Hand washing gel without water                           | 219 (12.94) |
| Alcoholic spray                                          | 793 (46.87) |
| Water                                                    | 238 (14.07) |
| None                                                     | 22 (1.30) |
| Total                                                    | 1692 (100) |
| **Hand hygiene material at home**                        |       |
| Solid soap                                               | 81 (3.64) |
| Liquid soap                                              | 906 (40.70) |
| Antibacterial soap                                       | 4 (0.18) |
| Hand washing gel without water                           | 56 (2.52) |
| Alcoholic spray                                          | 503 (22.60) |
|     |       |               |
|-----|-------|---------------|
| Water | 672   | (30.19)       |
| None  | 4     | (0.18)        |
| Total |       | 2226          |
Among a total of 1000 completions of the volunteer questionnaire, the distribution of preventive health behaviors from COVID-19 in participants shows in Table 3. Wearing a mask, hand hygiene, and social distancing were the highest level of observance among study participants.

Table 3 The distribution of preventive health behaviors from COVID-19 in participants

| Preventive health behaviors | Statistics       |
|-----------------------------|------------------|
| Individual behaviors; n (%) |                  |
| Wearing a mask              | 370 (16.73)      |
| Hand hygiene                | 576 (26.05)      |
| Social distancing           | 439 (19.86)      |
| Washing shopping and groceries | 283 (12.80)    |
| Using disposable gloves     | 234 (10.58)      |
| Incense                     | 2 (0.09)         |
| None                        | 91 (4.12)        |
| All                         | 216 (9.77)       |
| Total                       | 2211 (100)       |

Number of hand hygiene outside of the home; Median: Q₁-Q₃ (Min-Max)

|         |         |         |
|---------|---------|---------|
| Female  | 5: 3-9  | (0-30)  |
| Male    | 4: 2-7  | (0-20)  |
| Total   | 5: 3-8  | (0-30)  |

Number of hand hygiene at home; Median: Q₁-Q₃ (Min-Max)

|        |         |         |
|--------|---------|---------|
| Female | 9: 5-11 | (1-30)  |
| Male   | 7: 4-10 | (1-30)  |
| Total  | 8: 5-10 | (1-30)  |

Using alcoholic gel after hand hygiene; n (%)

|    |         |
|----|---------|
| Yes| 361 (36.1) |
| No | 639 (63.9) |

Number of alcoholic gel after hand hygiene; Median: Q₁Q₃ (Min-Max)

|       |         |         |
|------|---------|---------|
| Female  | 3: 2-4  | (1-7)  |
| Male    | 3: 2-4  | (1-7)  |
| Total   | 3: 2-4  | (1-7)  |
The relationship between hand-skin conditions, gender, occupation in participants and $P^\£$ are presented in Table 4 and 5. The highest rate of observance of relationship between hand-skin conditions and gender in participants was seen skin's hydration and the lowest was seen pain, 0.059 and 0.448, respectively ($p<0.001$) (Table 4). Based on result Table 5 Skin's health and Skin appearance with 0.141 and 0.796 were the highest and the lowest relationship between hand-skin conditions and occupation in participants ($p<0.001$)

| Table 4 | The relationship between hand-skin conditions and gender in participants |
|---------|------------------------------------------------|
| hand-skin conditions | Total | Female | Male | $P^\£$ |
| Skin appearance | | | | |
| Mean±SD | 2.56±2.56 | 2.60±2.56 | 2.48±2.57 | 0.349 |
| Skin's health | | | | |
| Mean±SD | 3.39±2.22 | 3.44±2.25 | 3.28±2.14 | 0.377 |
| Skin's Hydration | | | | |
| Mean±SD | 2.65±2.16 | 2.73±2.16 | 2.47±2.16 | 0.059 |
| Pain | | | | |
| Mean±SD | 2.52±2.00 | 2.55±1.99 | 2.47±2.02 | 0.448 |

$^\£$ Mann-Whitney test.

| Table 5 | The relationship between hand-skin conditions and occupation in participants |
|---------|------------------------------------------------|
| hand-skin conditions | Total | HCW | Other jobs | $P^\¥$ |
| Skin appearance | | | | |
| Mean±SD | 2.56±2.56 | 2.64±2.70 | 2.54±2.53 | 0.796 |
| Skin's health | | | | |
| Mean±SD | 3.39±2.22 | 3.60±2.27 | 3.33±2.20 | 0.141 |
| Skin's Hydration | | | | |
| Mean±SD | 2.65±2.16 | 2.70±2.21 | 2.63±2.15 | 0.776 |
| Pain | | | | |
| Mean±SD | 2.52±2.00 | 2.61±2.05 | 2.50±1.98 | 0.541 |

$^\¥$ Mann-Whitney test, HCW: Health Care Worker.
There was no relationship between age of participants and hand-skin's health scores (p>.05). The relationship between hand-skin conditions and the number of hand washing times outside of the home, number of hand washing times outside of the home and number of using alcoholic gel after hand hygiene is presented in Table 6.

| Hand-skin conditions | Number of hand hygiene outside of the home | Number of hand hygiene at home | Number of using alcoholic gel after hand hygiene |
|----------------------|-------------------------------------------|--------------------------------|-----------------------------------------------|
| Skin appearance      | 0.095 (0.035,0.157)                       | 0.079 (0.020,0.140)           | 0.033 (-0.029,0.095)                         |
| Skin's health        | 0.099 (0.039,0.160)                       | 0.102 (0.033,0.167)           | 0.074 (0.014,0.136)                         |
| Skin's Hydration     | 0.111 (0.053,0.166)                       | 0.102 (0.037,0.164)           | 0.069 (0.009,0.130)                         |
| Feeling pain         | 0.067 (0.004,0.131)                       | 0.113 (0.053,0.180)           | 0.045 (-0.018,0.107)                        |

Values are presented as correlation coefficient (Confidence Interval 95%).

4. Discussion

The most agents essential in reducing infection from the oral cavity and transfer to the upper and lower respiratory tract is hand hygiene. Centers for Disease Control recommends hand washing with soap and water can to prevent virus SARS-co-2 transmissions. Hand hygiene products may be effective against alter skin barrier integrity and COVID-19 [20].

According to the recommendations of World Health Organization (WHO) on using alcohol-base formulation for hand hygiene and it got used to among the general public because of the Covid-19 pandemic, this study was done with the aim of relationship between the type of hand hygiene method and the incidence of skin problems of alcohol-based hand rub with antiseptic and plain soap on hands of general public after the Covid-19 pandemic in Ahvaz, southwest Iran during 2020. The risk factors for the development of hand dermatitis, with further focus on the most common agents used among human.

The disease caused by the unprecedented novel coronavirus, spreads from country to country and quickly becomes a global crisis. Although governments have tried to stop or slow the outbreak of the emerging disease through various measures, the victims resulting from this disease are raising. Therefore, Hand hygiene education, Distribution of disinfectants among the people and low-income groups, high production of Hand hygiene, close contact among people should be avoided to reduce COVID-19 transmission [21-24, 9, 25]. Based on result different study, hand hygiene is of utmost importance for the prevention of COVID-19 among HCWs.
Abbasnia et al, in 2016 studied Evaluation of antibacterial effect of hand hygiene gel on different concentrations of bacteria. Based on their result the Hand hygiene gel was not effective when encountered with the highest concentration of bacteria in all four time-tested, and the entire surfaces of the plates were coated with bacteria, and with decreasing concentrations of bacteria and increasing the encounter duration, the number of bacteria reduced [14]. This study showed that basic hand hygiene gel was only effective when the number of bacteria was lower than \( 10^7 \) CFU per milliliter and the exposure time was at least 40 seconds [14].

Araghi et al in 2020 studied hand hygiene among health care workers during COVID-19 Pandemic. They reported that applying alcohol-based hand rubs, washing hands properly with soap and water, and applying other antiseptic agents [26].

Baloochi and Saleh Moghaddam in 2008 the comparison of skin complications of alcohol-based hand rub with antiseptic soap and plain soap on hands of nursing personnel [27]. According to the result of skin complications in groups with four dimensions: appearance, intactness, moisture content and sensation. Among three groups, the alcohol-based hand rub in comparison with plain soap showed less skin complications in intactness (p=0.04) [27].

In a similar study by Masakini et al. the efficacy of hand washings due to used waterless hand hygiene was investigated in Iran [28]. The findings showed that 30 samples were not grown on EMB medium but 30 samples of Blood agar, before and after washing with soap and liquid hand rub, were grown and applying hand rub alcohol liquid is most effective than washing with soap. Identification of bacteria in manitol salt agar medium and coagulas test revealed %80 were coagulas negative staphylococcus and %20 coagulas positive staphylococcus [28]. In this study washing with soap dose not effect on hand hygiene of nurses but disinfectant with liquid alcohol shows significant correlation in reducing microbial load on personnel’s hand that is revealed alcohol was more effective in reducing pollution [28].

Based on another study, Kampf and Löfflerin in 2003 evaluation of aspects a successful introduction and continuation of alcohol-based hand rubs for hygienic hand disinfection [29]. They showed that hand washing with a solution containing ethanol 80% has a significant reduction on skin microorganisms [29].

Based on the study of Samadipour et al. (2008), in Sabzevar, adherence to hand hygiene practice in internists was 34.4% in the surgical staff 21.3% in the intensive group 15.65% and in doctors 16.59% [30]. Out of 1356 situations of hand hygiene practice only in 306 cases hand hygiene was practiced. In general, the mean percentage for the four groups was 22.6%. According to their result, the hand hygiene practice while taking care of patients is low and unsatisfactory [30].

Keratin and lipids are the A famous component of a healthy skin barrier is the stratum corneum [20]. Alkaline soaps and detergents, friction, dry skin, warm water, cold water, rough paper towels and use repeated glove are the most important cases that can negatively affect skin barrier function [20, 31]. Epidermal atrophy, reduced keratinocyte size, decreased free fatty acids are the most agents that increased infections. In a study performed by Lan et al in 2020 investigated of skin damage among
health care workers managing during the COVID-19 outbreak in Hubei, China. They reported that 66.1% of health care workers washed their hands more than 10 times per day, but only 22.1% applied moisturizers after hand washing [32].

A research conducted by Głąbska et al in 2020 on the influence of the COVID-19 pandemic on hand hygiene behaviors in the Poland indicated that the majority of circumstances of washing hands, including those associated with meals, personal hygiene, leaving home, socializing, health, and household chores, the share of respondents declaring always washing their hands was significantly higher for the period during the COVID-19 pandemic than for the period before (p < 0.0001) [33].

Due to the cultural of Iranian such as visiting, to shake hands, participate in mourning and wedding ceremonies, increases the importance of preventive activity about this disease. Hand dermatitis prevention, products devoid of allergens, using products with added moisturizers and applying moisturizers after hand washing are the main actions that can decrease health skin risks to the people of the region and world. Therefore, continuous education about how correct use of hand washing, products detergent and use of moisturizing skin is a priority.

Limitations and strengths

The major limitations of this study include the limitations of ecological studies which is the use of aggregated data. We only studied hand hygiene factor, but some sites could be related to more than this factor.

5. Conclusion

Ahvaz is the largest metropolitan city in southwest Iran with a desert climate, so the findings of this study can have wide applications for desert cities in the world. Acquiring a proper as well as the correct knowledge about any disease as infective as COVID-19, as a health care worker, is of utmost importance not only to be able to impart effective treatment but also to successfully prevent the transmission from one. Accordingly, as the average numbers of bacteria on hands are far less than this threshold the routine use of hand hygiene gel is recommended, and in case of high pollution hands should be washed first. One of the most way reducing COVID-19 transmission is hand hygiene that can do it with the help of hand hygiene products.

Abbreviations

COVID-19: coronavirus disease 2019

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

WHO: World Health Organization
Declarations

Ethics approval and consent to participate

Participation was voluntary without any coercion or deception. Considering the fact that the data collection method was observation and there were no human participants in the current study, obtaining informed consent is deemed unnecessary according to regulations; Ethics License of the present study was acquired from the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (Code of ethics: IR.AJUMS.REC.1399.406).

Consent for publication

Not applicable.

Availability of data and materials

Upon request, we can offer onsite access to external researchers to the data analyzed at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. To do so, Dr. Maria Cheraghi should be contacted.

Competing interests

The authors declare that they have no competing interests.

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Authors' Contributions

PA, MC and M-JM were principal investigators of the study and drafted the manuscript. PA, M-BN, M-JM, EM and MC were advisors of the study. EM and MC performed the statistical analysis. All authors contributed to the design and data analysis and assisted in the preparation of the final version of the manuscript. All authors read and approved the final version of the manuscript.

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