

# A Study of Clinicians' Views on Medical Gloves Size in Iran: A Challenge and Solutions

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## Abstract

**Aims:** Glove fitting is an essential factor that affects health-care workers' performance. This study aimed to evaluate health-care workers' opinion about medical gloves fitting. **Materials and Methods:** This study was conducted on 525 health-care workers in the hospitals of five cities in Iran (response rate was 95.45%). The Medical Gloves Assessment Tool was used for collecting the required data. The data were analyzed using the SPSS 22 software. **Results:** The results showed that the health-care workers were not satisfied with the size of medical gloves in different areas of fingertips, between fingers, and the wrist. Accordingly, more than 70% of the participants were <50% satisfied with medical gloves fitting. **Conclusion:** Due to the importance of medical gloves fitting and the lack of sufficient information in this field, it is necessary to check the compatibility of hand dimensions of the Iranian health-care workers with the existing glove size systems. If necessary, a glove sizing system should be developed based on the anthropometric dimensions of health-care workers in Iran.

**Keywords:** Fitting, health-care workers, medical glove, size

## INTRODUCTION

An essential glove design feature that affects performance is fitting to hand dimensions.<sup>[1-3]</sup> The undesirable size of protective gloves not only reduces the performance of this equipment in protecting the user but it may also cause the person to reduce or even eliminate its use. The large size and width of the glove are one of the most common problems in designing gloves in delicate jobs.<sup>[4]</sup> If the glove is large or loose, the person may experience a decrease in hand skills and grasping ability.<sup>[5,6]</sup> Not wearing gloves is as important as wearing gloves for safety. Evidence has indicated that 70% of hand injuries reported by industrial workers occurred when gloves were not used.<sup>[6]</sup> Nonfitting of gloves may encourage people not to use them.

Glove sizing systems (GSS) are used to determine the appropriate glove size based on hand dimensions obtained

from large anthropometric studies.<sup>[7]</sup> For example, Kwon *et al.* identified hand length and hand circumference as the key dimensions for glove-sizing systems.<sup>[8]</sup> Lee *et al.* also used these two dimensions in their proposal to improve the coverage rate of a glove-sizing system.<sup>[9]</sup> In fact, manufacturers typically use one or at most two dimensions among hand length, hand circumference, and handbreadth,<sup>[9]</sup> and hand length and breadth are the most usual dimensions employed as the relevant metrics for designing gloves.<sup>[10]</sup>

European standards,<sup>[11]</sup> International Organization for Standardization (ISO) standard for medical examination gloves (ISO 11193-1), and American Society for Testing and

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Materials (D 3578) have provided dimensions for different glove sizes.<sup>[12,13]</sup> In Iran, the dimensions presented in the ISO standard have been accepted as the standard ones.<sup>[14]</sup> However, no study has examined whether these dimensions are suitable for the Iranian society or not. Due to the importance of the issue and the lack of reviews on the size of gloves available in Iranian hospitals, the present study aims to explore health-care workers' opinions about the size of medical gloves.

## MATERIALS AND METHODS

### Study design and participants

This is a cross-sectional study that was conducted in five cities of Iran including Shiraz, Tehran, Isfahan, Tabriz, and Ahwaz. Using convenience sampling, 550 health-care workers were selected from 10 hospitals. As the study instrument was an electronic questionnaire, the nurses responded to the questionnaire if they had access to the electronic platform. Furthermore, the incomplete questionnaires were excluded from the study.

To prevent the COVID-19 outbreak through droplets and contact, online software was used to design an electronic web-based questionnaire for collecting the data. The questionnaire was available to the participants through social media. The questionnaire was divided into two different parts, the first of which included the participants' demographic data (sex, age, education level, and work experience). The Medical Glove Assessment Tool developed by Zare *et al.* was used for evaluating health-care workers' opinions regarding the size of medical gloves in the second part of the survey.<sup>[15]</sup> This tool has six domains including tactile sensation, dexterity, grip strength, fitting, reliability, and hand hygiene. The Cronbach's alpha coefficient was 0.82. The fitting domain of the tool was used for this study. The participants were asked to present their opinions on a five-point Likert scale receiving 0, 1, 2, 3, or 4 scores (0 means 0% and 4 means 100% satisfaction). It should be noted that the participants were asked to answer questions about the most appropriate size of the gloves they used.

Participation in this study was voluntary. The consent we obtained from study participants was written. The consent was placed at the beginning of the web-based questionnaire. If the participants chose the "I agree" option, they would enter the first part of the questionnaire.

### Data analysis

The data were analyzed using the SPSS 22 software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Descriptive statistics were used to describe the quantitative and categorical variables. Continuous variables were expressed as mean ± standard deviation (SD). The data set was checked for normality using the Shapiro–Wilk test. Then, ANOVA and *t*-test at the 0.05 significance level were used to compare differences between the study groups.

## RESULTS

Out of 550 questionnaires sent to the participants, 525 questionnaires were completed (the response rate was 95.45%).

Out of the 525 respondents, 380 (72.38%) were female. The mean (SD) age and work experience of the participants were 36.42 (5.31) and 9.83 (6.17) years, respectively. Concerning the education level, 21 participants (4%) had high school diplomas or lower degrees, more than half of them (71%) had associate's or bachelor's degrees, and 25% had master's degrees.

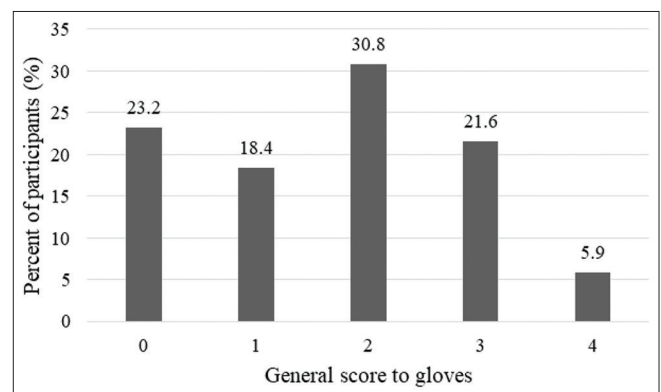
The participants' self-report opinions about the medical gloves size are presented in Table 1. Accordingly, the scores of different aspects of glove size were <2 (<50% satisfaction). More than 55% of the participants did not have access to different sizes and had to choose gloves from a limited number of sizes. The percentage of the participants' general satisfaction with medical gloves size is depicted in Figure 1. As seen, 23.2% of the participants were not satisfied with the size of medical gloves and 72.4% of the scores were <2 (<50% satisfaction).

The results revealed no significant differences between the participants with different education levels ( $P = 0.882$ ), job titles ( $P = 0.778$ ), ages ( $P = 0.061$ ), job experiences ( $P = 0.370$ ), and sexes ( $P = 0.448$ ) regarding satisfaction with gloves size. Therefore, the demographic characteristics of the study population had no confounding effect on the participants' views.

**Table 1: The participant's mean scores to medical gloves size**

Questions	Mean score ± SD	Equivalent percentage
From the management, different sizes of gloves are available to me and I have a variety of options to choose the right size	2.81±1.19	56.2
The size of the gloves on the fingertips fits the size of my hands	1.65±1.14	33
The size of the gloves in the area between the fingers fits the size of my hands	1.58±1.07	31.6
The size of the gloves on my wrist fits the size of my hands	1.61±1.13	32.2
In general, I am satisfied with the size of the gloves	1.69±1.21	33.8

SD: Standard deviation



**Figure 1: The percentage of the participants' general satisfaction with the medical gloves size**

## DISCUSSION

The study results indicated that the Iranian health-care workers were not generally satisfied with the medical gloves fitting in different areas of fingertips, between the fingers, and the wrist. Accordingly, more than 70% of the health-care workers are <50% satisfied with the size of medical gloves. Moreover, almost half of the health-care workers did not have access to different sizes and had to choose gloves from limited sizes, which led to risks associated with unsuitable equipment size and a negative attitude toward the use of personal protective equipment from the public's viewpoint.<sup>[16,17]</sup>

Dissatisfaction with the size of protective gloves has been investigated in limited studies. The National Institute for Occupational Safety and Health conducted a study in 2014 and found that 30% of male and 62% of female American firefighters were dissatisfied with the loose and ill-fitted fire gloves.<sup>[5]</sup> In the present study, however, gender did not have a significant effect on satisfaction with gloves size and males were just as dissatisfied with the unsuitable size of the medical gloves as females, which could be due to the differences in the nature and function of the two types of gloves. In another study by Mylon *et al.*, health-care workers in British hospitals complained about the size of medical gloves. The participants reported that their manual dexterity decreased due to the unsuitable size and that they preferred to remove gloves when performing certain tasks, such as finding a pulse, which could increase the risk of transmission of infection and microbial agents.<sup>[18,19]</sup>

Given the dissatisfaction of a large number of health-care workers with the size of medical gloves, the lack of a complete range of gloves sizes in Iran, and the results of several studies reporting significant differences in anthropometric dimensions of hands in different communities,<sup>[20-22]</sup> it seems that the use of global sizing systems for different societies, including Iran, is not correct. As in some countries such as South Korea,<sup>[8,9]</sup> the United States,<sup>[5,23]</sup> Japan,<sup>[24]</sup> and Spain,<sup>[25]</sup> efforts have been made to develop separate systems for determining the size of gloves.

## CONCLUSION

Based on the findings of the present study, the importance of medical safety gloves fitting with the hand dimensions, and the lack of sufficient information in this regard, it is necessary to examine the compatibility of hand dimensions with the existing GSS in the Iranian clinical community. If necessary, a glove sizing system should be developed based on the anthropometric dimensions of health-care workers in Iran.

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## Conflicts of interest

There are no conflicts of interest.

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