Risk Perception of the Iranian Healthcare Workers Concerning the Covid-19 Crisis and the Factors Affecting it: A Cross-Sectional Study

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Abstract

Background: The emergent Covid-19 disease with conspicuous prevalence is putting the healthcare workers' job security at risk. The preventive behaviors in every individual have a close relationship with his/her risk perception of the risk factor. Hence the present study has been undertaken aiming at determining the Iranian healthcare workers' risk perception of the Covid-19 disease and the relevant effective factors.

Methods: This anonymous online survey was conducted in March-April, 2020 using targeted snowball sampling among the Iranian healthcare workers. The data was collected via online-social networks using a questionnaire containing demographical specifications (5 questions), risk perceptions (20 questions), with five sub-scales including cognitive, cultural, political, social and emotional factors. Data analysis was performed using SPSS v.16 software.

Results: From 165 participants, the youth (20-49 years of age) with 84% and the females with 60% constituted the majority of participants. The average risk perception score of the healthcare workers was 66.43 ± 8.17 . The Spearman correlation coefficient showed the significant direct relationship between the risk perception score and all the sub-scales at 0.01 significance level. The political and cultural factors had the highest correlation with the personnel risk perception ($r > 0.75$).

Conclusion: Health workers did not have an excellent risk perception of the emergent Covid-19 disease.

Background

The rapid prevalence of Covid-19 pandemic with its high mortalities and implications poses important challenge for the world countries. Despite the development of preparation programs during the past decade against the epidemic of infection diseases, influenza in particular at national and international level, there is a deep gap between the existing educational programs and routine preparation exercises (1).

The 'risk' refers to facing with and vulnerability to the potential of negative consequences arising from the inception of a danger, and the risk perception reflexes the mental judgment of understanding of risks in the society and is considered in the general literature as the suitable behavior when confrontation with the risks. The experts consider the risk perception as the collection, selection and interpretation process of the signals received denoting the uncertain effects of the accidents (2-6). The risk perception is a mental psychological construct that is subject to the cognitional, emotional, socio-cultural, political and personal variabilities (7-9). The individuals' emotions and instincts affects their perception and they acquire this perception through observation, analysis of circumstances and scientific consultation (10); risk perception has its roots in the beliefs, attitudes, cultural sensitivity and personal characteristics like Self-esteem and self-concept (11) and lies in a continuity from no risk to high risk (12) and can affect the decision making positively and negatively. The individual after the awareness and risk perception

evaluates the present conditions (benefit and loss) and pursues the best selection to mitigate the risk to the lowest level possible (13).

To adopt healthy behavior, the individuals must be aware of the disease and see themselves vulnerable to it and believe that they can do something for prevention or treatment of it (14); The preventive behavior of the individuals as the output and their communications as the moderators have influence on lowering the vulnerability and strengthening of their resilience, especially in viral diseases such as Covid-19 can play a key role(15, 16). The importance of such behaviors doubles pertaining to the healthcare workers owing to the direct effects they can bring about for the health of the patients as well as the public health. The health sector personnel, with their perception of the risks, may choose behaviors encompassing the greatest benefit accessible to the society (17). The risk perception can act as a motivation for change of behavior in healthcare workers and play a crucial role in describing the reason, prediction of effects and conduction of their behavior along the line of achieving the objectives (14, 18).

The public behavior responses play a significant role in controlling the prevalence of the emergent diseases (19, 20). The results of studies related to SARS and H1N1 influenza in different cultural environments showed the impact of the severity of perceived disease risk along with cultural differences, general responses and behavioral changes, as well as government intervention in the outbreak stage. These factors varied according to the type of disease and its control method (21-24). The prevention of Covid-19 prevalence requires the cooperation of three groups: cooperation of healthcare workers, the public and the collaboration of the states. For the purpose of prevention and mitigation of the disease, the adoption of sound decisions, correct and prompt control by the healthcare systems of the countries and making attempts for the accomplishment of protection, hygiene and personal measures are necessary in addition to adequate knowledge of this infectious disease(25, 26). The high number of deaths as the consequence of the disease highlights the importance of the risk perception (27).

In all of the preparation programs of bio epidemic programs, the health care and treatment are considered as the backbone and the health workers are deemed as the main players of the responding programs. In the present conditions with no treatment of the Covid-19 disease, the best and most effective solution for the confrontation comprises patient spotting, separation and extensive experimental diagnosis tests. The extreme worry about the virus transmission by the healthcare workers is an unavoidable reality. In addition to the need for the suitable and adequate laboratory equipment, the employment of trained personnel with professional commitment and high risk perception could be the acceptable method of ensuring effective confrontation with the Covid-19 disease (28).The healthcare workers due to the nature of their profession have adequate and appropriate awareness of health promoting behaviors, although they may be short of the advantages for the development of these behaviors due to such factors as hard work, shift work, long monthly working hours, high job stress and lack of a regular care delivery system schedule. Accordingly, the risk perception of the disease can play a particularly more important role (29, 30). Studies have reported that the potential reason of the gap between the knowledge and performance of the healthcare personnel in prevention of the diseases and promoting health lies with the lack of skill,

moderation of the controllable factors, shortage of enough time for maintaining such behaviors and lack of disease risk perception (31).

Measuring the health workers' risk perception of the Covid-19 and the relevant influential factors can provide the service providers, health policy makers as well as the health and hygiene instructors with great insights on facilitation of the behaviors aiming at self-effectiveness in improving the community health and selecting the best solutions for minimizing the risks arising from this disease. The present study thus was conducted with the aim of determining the risk perception status of the healthcare workers of Iran concerning the Covid-19 disease and the factors influential on it.

Methods

This online cross-sectional survey was carried out during 25 Mar-5 Apr, 2020 time span, about 1 month afterwards the official announcement of Covid-19 prevalence in Iran. The target society was all of the healthcare worker members of the social media (Telegram and WhatsApp) groups. Targeted and snowball sampling was implemented and participation was voluntary.

According to our method, the link of the online questionnaire about general risk perception of the Covid-19 disease was pinned in the head of the social groups of which the healthcare colleagues were members, and with the emphasis and encouragement of the group admin, the people were encouraged to complete the questionnaire. At the beginning of the questionnaire, the written consent of the participant was obtained and at the end of the questionnaire, the participants were asked to share the link of the questionnaire in other social groups that they were members of; the snowball sampling method was performed accordingly. Ambiguities and questions of participants were answered in private chat.

Inclusion criteria were being a healthcare staff, being a cyberspace user and willingness to participate in the study; Exclusion criteria were incomplete questionnaire. Participation in the research project was voluntary and the questionnaires were anonymous, thus preserving the identity of the users. The sample could immediately leave the study as soon as he/she pressed the 'Completed' button.

The questionnaire was comprised of two parts: *a*) the demographic specifications including the following (5) questions on: Age, gender, educational qualifications, place of residence, occupation, and *b*) the risk perception questionnaire including 20 items with 5 sub-scales (cognitive, cultural, political, social and emotional factors) with 5-options Likert answers .

Cognitive factors included 4 items of individuals knowledge, awareness and experience of Covid-19 disease, emotional factors including 5 items of the fear and hope for effective preventive measures against the disease, political factors including 3 items on the relationship between government officials and the people, mutual trust and public participation, commitment of officials for risk reduction risk, as well as social factors including 4 items on the social unity, sense of social responsibility and media influence and finally cultural factors encompassing 4 items including cultural background, and religious values and beliefs.

The questionnaire used in this study is a modified version of the Risk Perception Questionnaire whose validity and reliability have recently been confirmed in a study in Iran.(32). English language version of the questionnaire was attached. (Supplementary file 1). The Cornbrash's alpha coefficient of the questionnaire in this study was equal to 0.725 which is confirmed.

The scoring was performed based on the below responses: strongly agree (5 scores), agree (4 scores), no idea (3 scores), disagree (2 scores) and strongly disagree (1 score). The minimum and maximum acquired score of the questionnaire was 20 and 100 respectively. The interpretation of as the scores was as follows: The scores 20-39 denoted the weak risk perception, the scores 40-59 indicated the moderate risk perception, scores 60-79 showed the good and 80-100 was interpreted as showing the excellent or desirable risk perception.

The questionnaire was made available online at the Internet address of the user members of medical staff groups of the Telegram and WhatsApp social networks:
<https://samadi.porseshnameonline.com/form/q2> Excel output was prepared from the questionnaires and the information was entered into SPSS v.16 and the analysis was made.

Result

A total of 165 participants, the youngsters (aged 20-49) constituted 84% while 60% of all the participants were female. Most research units (89%) had a bachelor's degree or higher (Table 1). The distribution of research units included 19 provinces based on the residence; among them, the residents of Tehran province with 25.9% had the highest and residents of Golestan province with 0.6% represented the lowest frequency of participants (Fig 1).

Table 1: Frequency distribution of participants based on demographic characteristics

parameters		N (%)
Age, years	18-28	32 (19.2)
	29-40	84 (50.3)
	41-60	51 (30.5)
sex	male	66 (39.5)
	female	99 (59.3)
education	diploma	8 (4.8)
	associate	10 (6.0)
	bachelor	64 (38.3)
	master	43 (25.7)
	Doctoral and more	42 (25.1)

According to the official statistics of Iran on 23 March, 2020, in terms of the prevalence of corona virus disease in different provinces of the country, the areas were divided into very high, high and medium prevalence. 57% of Iran's regions had a high prevalence of the disease, with Tehran province having the highest prevalence in terms of the Covid-19 infection location (Map 1). The ANOVA test results did not represented a significant difference between the workers residence provinces and their risk perception score ($p=0.201$).

Evaluation of the risk perception average score of the participants from different understudy educational units shows no significant difference between the age and gender variables on the one hand and the average risk perception score on the other hand, while the their educational level shows statistically significant difference ($p=0.007$). (Table 2)

Table 2: mean score of risk perception based on demographic characteristics

parameters		Mean	SD	p-value
sex	Female	67.21	8.31	0.158*
	male	65.34	8.00	
Age (years)	18–28	68.80	8.94	0.122**
	29-40	66.48	8.04	
	41-60	64.91	7.71	
education	diploma	73.14	4.98	0.007**
	Associate	69.00	8.17	
	Bachelor	67.88	8.66	
	Master	65.33	6.33	
	Doctoral and more	63.50	8.48	

*T-test, **Anova

The average score of the healthcare workers risk perception was 66.43% (± 8.17) with and maximum score of 43 and 94 respectively. The correlation coefficient of the Spearman showed the relationship of the risk perception score with all the sub-scales direct and significant at 0.02 percent (Table 3).

Table 3: Mean score of risk perception based on sub categories (factors)

SD	Mean	Maximum	Minimum	N	Sub category
1.33	18.97	20.00	14.00	166	Cognitive
3.51	8.87	15.00	3.00	166	political
3.53	13.93	20.00	5.00	165	Cultural
1.90	17.20	20.00	10.00	164	social
3.15	7.68	20.00	5.00	167	affective

The healthcare workers risk perception signified the highest correlation with the political, cultural, social, cognitional and emotional factors respectively.

Table4: Correlation of risk perception score with each sub category

Global score		Sub category
Pvalue	r_s^*	
<0.001	0.363	Cognitive
<0.001	0.787	political
<0.001	0.758	Cultural
<0.001	0.464	social
<0.001	0.336	affective

* Spearman's correlations

Discussion

ICN confirms 1,500 nurses have died from COVID 19 in 44 countries and estimates that healthcare worker COVID 19 fatalities worldwide could be more than 20,000(33). Papoutsis et al., Citing the WHO, 52 countries had reported a total of 22,073 health care workers that had contracted COVID-19(34, 35). In Iran, more than 6,000 health care workers have contracted Covid-19 disease and 150 have died(36).

This study was undertaken with the aim of determining the risk perception status of the healthcare personnel concerning the Covid-19 disease and the relevant effective factors afterwards about 1 month past the prevalence of the disease in Iran. Results indicated that the average score of risk perception of the healthcare workers (66.43 ± 8.17) was at higher level compared with the risk perception of other Iranian groups (9). In the meantime, this could be attributed probably to the time gap of 1 month relative to the previous research during which the stresses may have been eased and the workers' awareness of the emergent Covid-19 disease may have been increased. In any case, it is expected that the risk perception of the healthcare workers about the Covid-19 disease must rest at the excellent and desirable level so that they could provide the best efficiency towards the prevention and treatment of the disease, hence the education and taking measures as to heightening the risk perception level of the healthcare workers seems necessary. The results of studies in other countries are consistent with the fact that health workers, despite having high knowledge, had low risk perception and performance in the prevention of Covid-19 disease. Various reasons for this action have been stated, high workload, lack of protective equipment and lack of access to the guidelines(37, 38).

In comparison to the other risk areas like the environmental risks, the individuals perception status of the related risks arising from the emergent infectious diseases is relatively limited (39). Since the observation of the health predictive measures is directly effective in prevention of the disease expansion. Therefore, the best part of the programming of the instructions is performed at the society level from the top to the bottom and has a strong focus on the observation of the governments' instructions, all based on the risk perception principles and preparation for countering the epidemic(1).

In examining the factors effective on risk perception of the healthcare workers about the Covid-19 it was determined that: Among the demographic factors, only the level of education was effective on the risk perception. The inverse relationship between education level and risk perception score is a significant finding. Although risk perception score is expected to increase with the increase of education level, but as was mentioned in the definition, the risk perception is a complex and subjective construct, and it is necessarily different from awareness. Studies showing that the increase in knowledge and awareness is associated with a reduction in risk perception often attributed it to a reduction in the risk concerns (24, 40, 41). Also there are reports of increasing the risk perception related to the increased vulnerability (42). This finding seems to indicate the unknown aspects of the relationship between knowledge, understanding and perception which is consistent with the results of the study conducted by Rolison and Hanoch (2015) in the US, confirming that more knowledge was associated with lower risk perception (43).

This study did not reveal any relationship between risk perception on the one hand and age or gender on the other hand, although some studies have reported a relationship between the older ages or female gender and higher risk perception that seems to be related with the type of risk and the understudy population, for which further studies are recommended (18, 41, 42).

Political factors showed the greatest correlation ($r=0.787$) with the personnel risk perception. This relationship may be due to the nature of Covid-19 epidemic and the necessary top-down management of the risk based on which the healthcare workers must act within certain principles and regulations' framework. Policy guidelines are essential for managing all aspects of risk perception and performance of healthcare professionals, especially at the primary health care level (44). When knowledge is limited, trust plays an important role in judging and perceiving the emerging diseases (45, 46).

Also, the medical staff risk perception was directly and significantly related to cultural-religious component ($r = 0.758$). Since more than 98% of Iranians are Muslims, this relationship is not far-fetched. The majority of participants (86.2%) agreed that preventive measures complied with the Islamic religious precepts. But only 42.6% agreed that the cultural affairs authorities' views were complied with the scientists' views. The inconsistency between the political and cultural affairs' authorities is a noteworthy point which was consistent with Chester (2008) study results (47). This component provides new horizon of promoting public perception of the risks threatening society, However, more research is needed.

In this study, the social, cognitive and emotional factors were effective with less correlation in medical staffs' risk perception of the Covid-19 disease. Due to the emergent nature of the disease and the lack of necessary knowledge about it, the cognitive factors low scores are justifiable, but probably because the epidemic has overshadowed all social and professional relationships of the health care workers, social and emotional factors had limited effect on the risk perception scores.

Conclusion

In general, the health care workers, due to the nature of their profession, need a higher perception of the epidemic risk of infectious diseases, but the statistical results showed that despite more exposure

compared with the general population of Iran, they have no greater perception of the risks posed by the emerging Covid-19 disease. Among the 5 factors, knowledge, cultural, emotional, social and political factors affecting the risk perception of Covid-19 disease, political and cultural factors had the highest correlation with the score of Covid-19 disease risk perception of Iranian health workers, followed by social, cognitive and emotional factors being effective with less intensity. Improving cognitive, social, and emotional components can increase the health care workers' risk perceptions of the Covid-19 disease.

Study Limitations: The following items can be mentioned: 1) Due to the time sensitivity of corona virus prevalence conditions, the researchers used online and social group methods to collect data, which may overshadow the generalizability of the results. 2) The small size of the sample relative to the spread of the information acquisition areas is another limitation of this study, which can be justified due to the high occupancy of the health care workers in the present special circumstances. Despite the above limitations, this study has provided a basic knowledge about the risk perception of health care workers from 19 provinces and the factors affecting it. It is hoped that future research on comprehensive interventions at the national level by the Ministry of Health are conducted in order to identifying and promoting the risk perception of the Covid-19 disease by the health care workers of Iran country.

Declarations

- *Ethics approval and consent to participate:* This study was confirmed by the ethics committee of Sabzevar University of Medical Sciences under number IR.MEDSAB.REC.1399.075.

Consent to participate: Informed consent was obtained from all individual participants included in the study.

- *Consent to publish:* Not applicable

- *Availability of data and materials:* The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

- *Competing interests:* The authors declare that they have no competing interests

- *Funding:* Nil

- *Authors' Contributions:* ES has been involved in designing the work, interpreting the results, and was a major contributor in writing the manuscript. FG has been involved in designing the work, interpreting the results, and was a major contributor in writing the manuscript. RZ has participated in data collection and writing articles. FB participated in data collection and EN participated in data analysis. All authors read and approved the final manuscript.

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References

1. Shreve C, Fordham M, Anson S, Watson H, Hagen K, Wadhwa K, et al. Report on risk perception and preparedness. TACTIC project. North Umbria University, 2014.
2. Slovic P, Finucane M, Peters E, MacGregor D. Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk analysis*. 2004;24(2):311-22.
3. Renn O. The role of risk perception for risk management. *Reliability Engineering & System Safety*. 1998;59(1):49-62.
4. Sjoberg L. Risk perception by the public and by experts: A dilemma in risk management. *Hum Ecology Rev*. 1999;6(2):1-9.
5. Sjöberg L, Moen BE, Rundmo T. Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research. 2004;10(2):665-12.
6. Wachinger G, Renn O, Begg C, Kuhlicke C. The risk perception paradox—implications for governance and communication of natural hazards. *Risk analysis*. 2013;33(6):1049-65.
7. Linden Svd. The Social-Psychological Determinants of Climate Change Risk Perceptions: Towards a Comprehensive Model. *Journal of Environmental Psychology*. 2015;41:112-24.
8. Linden Svd. On the Relationship between Personal Experience, Affect and Risk Perception: The Case of Climate Change. *European Journal of Social Psychology*. 2014;44(5):430-40.
9. Samadipour E, Ghardashi F. Factors Influencing Iranians' Risk Perception of Covid-19. *Journal of Military Medicine*. 2020;22(2):122-9. eng.
10. Aakko E. Risk communication, risk perception, and public health. *Wisconsin Medical Journal*. 2004;103(1):25-8.
11. Antonovsky A. Unraveling the mystery of health: How people manage stress and stay well. San Francisco: Jossey-bass; 1987.
12. Kendra M, George V. Defining risk in home visiting. *Public Health Nursing*. 2001;18(2):128-37.
13. Weber E, Blais A, Betz N. A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of behavioral decision making*. 2002;15(4):263-90.
14. Homko C, Santamore W, Zamora L, Shirk G, Gaughan J, Cross R, et al. Cardiovascular disease knowledge and risk perception among underserved individuals at increased risk of cardiovascular disease. *Journal of Cardiovascular Nursing*. 2008;23(4):332-7.
15. Dryhurst S, Schneider C, Kerr J, Freeman A, Recchia G, AM AVDB, et al. Risk perceptions of COVID-19 around the world *Journal of Risk Research*. 2020:1-13.
16. Glik D. Risk communication for public health emergencies. *Annu Rev Public Health*. 2007;28:33-54.
17. Nejat K, Abedi H. Evaluation of health promotion activities in nurses. *Appl Sci*. 2015;4(6):715-20.
18. Kermode M, Holmes W, Langkham B, Thomas M, Gifford S. HIV-related knowledge, attitudes & risk perception amongst nurses, doctors & other healthcare workers in rural India. *Indian Journal of Medical Research*. 2005;122(3):258.

19. Bubeck P, Botzen W, Aerts J. A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis: An International Journal*. 2012;32(9):1481-95.
20. Christaki E. New technologies in predicting, preventing and controlling emerging infectious diseases. *Virulence*. 2015;6(6):558-65.
21. Johannes Brug, Aro AR, Oenema A, Zwart Od, Richardus JH, Bishop GD. SARS Risk Perception, Knowledge, Precautions, and Information Sources, the Netherlands. *Emerg Infect Dis*. 2004;10(8):1486-9.
22. Poletti P, Ajelli M, Merler S. The Effect of Risk Perception on the 2009 H1N1 Pandemic Influenza Dynamics. *PLoS ONE*. 2011;6(2):e 16460.
23. Ibuka Y, Chapman GB, Meyers LA, Li M, Galvani AP. The dynamics of risk perceptions and precautionary behavior in response to 2009 (H1N1) pandemic influenza. *BMC Infect Dis*. 2010;10(296).
24. Brug J, Aro A, Richardus J. Risk perceptions and behaviour: towards pandemic control of emerging infectious diseases: Springer; 2009.
25. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *International Journal of Surgery*. 2020;76:71-6.
26. Wang J, Zhou M, Liu F. Reasons for healthcare workers becoming infected with novel coronavirus disease 2019 (COVID-19) in China. *Journal of Hospital Infection*. 2020;105(1):100-1.
27. Bavel J, K KB, PS PB, al e. Using social and behavioural science to support COVID-19 pandemic response. *Nat Hum Behav*. 2020;4:460-71.
28. Oraebosi M, Chia T, Oyeniran O. Preparing the Next Generation of African Healthcare Workers and Scientists: Lessons from Corona Virus Pandemic. *Ethics, Medicine and Public Health*. 2020;100535.
29. Arab M, editor Creating an Organizational Safety Culture: A Strategy to Increase Employee Risk Understanding. 8th Specialized Congress of Standards for Medical Equipment and Materials in the Field of Infection Control and Sterilization; 2019; Tehran: civilica.
30. Fathi E, Beiranvand FM, Varzaneh AH, A AN. Health Care Workers Challenges during Coronavirus Outbreak: The Qualitative Study. *Res Behav Sci*. 2020;18(2):237-48.
31. Zakerimoghadam M, Sanaie N, Ebadi A, M MS. Concept analysis of heart disease risk perception from health professionals perspective: Hybrid model. *Iranian Journal of Cardiovascular Nursing*. 2017;6(3):68-79.
32. Samadipour E, Ghardashi F, Aghaei N. Evaluation of Risk Perception of Covid-19 Disease: A Community-based Participatory study. *Disaster Medicine and Public Health Preparedness*. 2020;2:1-20.
33. International Council of Nurses. 1500 nurses have died covid-19,44-countries. <https://www.icn.ch/news/icn-confirms-1500-nurses-have-died-covid-19-44-countries-and-estimates-healthcare-worker-covid>. Date last accessed: 28 October 2020

34. World Health Organization. Coronavirus disease (COVID-19) situation reports. www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports. Date last accessed: 17 April 2020. Date last updated: 1 June 2020.
35. Papoutsis E, Giannakoulis V, Ntella V, Pappa S, Katsaounou P. Global burden of COVID-19 pandemic on healthcare workers. *ERJ Open Res* 2020;6: 00195-2020.
36. Medical Council of Iran. Infection of more than 6,000 health care workers in Corona. <https://irimc.org/news/articletype/articleview/articleid/44922>. Date last accessed: 12 August 2020. Date last updated: 22 October 2020
37. Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Trop Med Health* 2020;48:72.
38. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z, et al. Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. *J Hosp Infect.* 2020;105(3).
39. De Zwart O, Veldhuijzen IK, Elam G, Aro AR, Abraham T, Bishop GD, et al. Avian influenza risk perception, Europe and Asia. *Emerging Infectious Diseases.* 2007;13(2):290.
40. Kim S, Kim S. Exploring the determinants of perceived risk of Middle East Respiratory Syndrome (MERS) in Korea. *International journal of environmental research and public health.* 2018;15(6):1168.
41. Brug J, Aro AR, Oenema A, De Zwart O, Richardus JH, Bishop GD. SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerging infectious diseases.* 2004;10(8):1486.
42. Seyedin H, Samadipour E, Salmani I. Intervention strategies for improvement of disasters risk perception: Family-centered approach. *Journal of education and health promotion.* 2019;8.
43. Rolison J, Hanoch Y. Knowledge and risk perceptions of the Ebola virus in the United States. *Preventive medicine reports.* 2015;2:262-4.
44. Akinboro A, Adejumo O, Onibokun C, Olowokere E. Community health care workers' risk perception of occupational exposure to HIV in Ibadan, south-west Nigeria. *African Journal of Primary Health Care & Family Medicine.* 2012;4(1):338.
45. Siegrist M, Cvetkovich G. Perception of hazards: The role of social trust and knowledge. *Risk analysis.* 2000;20(5):713-20.
46. Carvalho E, Castro P, León E, Río AD, Crespo F, Trigo L, et al. Multi-professional simulation and risk perception of health care workers caring for Ebola-infected patients. *Nursing in critical care.* 2019;24(5):256-62.
47. Chester DK, Duncan AM, Dibben CJ. The importance of religion in shaping volcanic risk perception in Italy, with special reference to Vesuvius and Etna. *Journal of Volcanology and Geothermal Research.* 2008;172(3):216-28.

Figures

Figure 1

Frequency distribution of participants based on province of resident