Presenting A Model and Ranking of Factors Effective on Controlling and Coping with the COVID-19 Pandemic in Babol, Northern Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: COVID-19 virus has affected the health and economy of countries with a widespread epidemic worldwide. Overcoming this situation requires identifying the factors effective on controlling and coping with this epidemic to increase resistance to the virus and contribute to the social, economic and social development of the community. The purpose of this study is to present a model and ranking of factors affecting the counteraction to COVID-19 pandemic in Babol, northern Iran.

METHODS: This cross-sectional study was performed on 280 officials and executive staff involved in COVID-19 control in Babol through simple random sampling method. In order to provide a model and ranking of factors effective on controlling and coping with COVID-19, researcher-made questionnaires including 63 questions and ten factors of public notices and relations, educational factors, organizational factors, cultural factors, social factors, health processes, crisis management, motivation, extracurricular collaborations, and epidemiological and demographic factors were designed based on scores of 1 to 5 in Likert scale, and then the model was tested and the factors were ranked.

FINDINGS: The results show that the model of factors effective on controlling and coping with COVID-19 has a good and strong fit and the ranking of these factors in Babol includes public notices and relations (6.19), educational factors (06.07), organizational factors (06.06), cultural factors (5.89), social factors (5.60), health processes (5.48), crisis management (5.46), motivation (4.85), extracurricular collaborations (4.79) and epidemiological and demographic factors (4.62), respectively.

CONCLUSION: The results of the study showed that these ten factors were effective in counteracting and controlling COVID-19 in Babol, among which, public notices and relations and education had a more effective role.

KEY WORDS: *COVID-19, Effective Factors, Control, Ranking.*

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Introduction

Severe acute respiratory syndrome caused by the new coronavirus (COVID-19) emerged in late 2019 in China. The epidemic of this disease occurred in a short time. The virus has spread to all continents, disrupting people's daily lives and seriously affecting the global economy. According to the latest rapid assessment of the European Centre for Disease Prevention and Control (ECDC), Europe is moving towards non-stop transmission of the virus in the community, control is no longer possible and community control measures are needed (1). Numerous viral infections have emerged so far that have affected global healthcare facilities. Millions of people are at risk of acquiring emerging viral infections through a variety of factors (2).

Human coronaviruses are among the most common human viruses that often have mild and transient symptoms. So far, three groups of human coronaviruses of animal origin have created widespread epidemics and pandemics. The SARS coronavirus was first identified in 2002 in Guangzhou, China, causing many deaths. MERS was the second major coronavirus to cause a significant global public health crisis after SARS, first emerging in 2012 in Saudi Arabia. Cooperation between governmental and non-governmental organizations (such as the CDC and WHO) through risk identification and the publication of health information has helped to counter the spread of these epidemics. Paying attention to actions taken in previous epidemics can be effective in limiting the current epidemic associated with the new coronavirus (COVID-19) (3).

COVID-19 is a virus that is epidemic in nature and affects global health and the global economy. The main limitation for overcoming this problem is the lack of possible vaccines or effective drugs to treat or control the disease. Climatic, social, and biological factors influencing the global spread of the epidemic identified in the outbreak and spread of the disease include stimuli, air temperature, humidity, age, airflow, and ventilation, which are responsible for increasing COVID-19 mortality compared to SARS and MERS, and countries with temperate climates and the elderly are more vulnerable (4).

Mazandaran province officially joined the COVID-19-infected areas on March 2020, after identifying two suspected COVID-19 patients in Babol who came back from Qom. Measures and restrictions considered to break the chain of the disease included: closure of schools, universities and higher education centers along with kindergartens and rehabilitation centers, restrictions in areas such as tourism, bazaar, religious ceremonies, weddings and mourning ceremonies and all group activities, establishment of a provincial headquarters to combat COVID-19 in order to monitor the situation in all parts of the province and make the necessary decisions, the introduction of governors as the head of the COVID-19 countermeasures in the cities and their obligation to implement and monitor provincial approvals, the introduction of special inspectors by the governor to monitor the implementation of approvals and monitoring the needs of each city, including medicine and medical facilities and disinfection of streets and passages, the help of charities, non-governmental organizations, and independent groups to help therapists and meet their needs and vulnerable groups, and the closure of markets and businesses and unnecessary jobs (5).

Factors influencing the control of COVID-19 disease in Taiwan, which is one of the most successful countries in controlling this disease, include: establishment of the National Health Command Center, information on high-risk areas, collection and analysis of reliable data, prompt action, identification of infected people and public education to the people (6). The findings of Yang et al. showed that social factors such as get-together and gatherings accelerated the spread of SARS-CoV-2. The measures taken by the Chinese government are positive and effective, and control will be a difficult task in the future, which seriously requires deep thinking to achieve public health security in China (7).

Fang et al. showed that more stringent government policies were associated with a slower increase in the infected population, and the isolation and use of personal protection methods, optimization of treatment plan and production of specific drugs, ensuring early detection, isolation and treatment, adequate medical equipment, admission to certain hospitals and a comprehensive treatment strategy are effective in controlling the disease (8). The results of a study by Yang et al. showed that both ethical duty and general leadership, as well as their constituent indicators, contributed to collective action to prevent and control COVID-19 (9).

Guner et al. showed that hand hygiene, social distance, quarantine, increasing test capacity to diagnose more COVID-19 positive patients in the community, as well as reducing secondary cases with strict quarantine rules are key to preventing the spread of the disease (10). Gilmore et al. identified six key factors (including local leaders, community and religious organizations, community groups, health

facility committee, key individuals and stakeholders) that contribute to social participation in controlling the COVID-19 (11). The most important and effective factors in controlling the COVID-19 in South Korea include: the cooperation of the people in voluntary home quarantine, the government's rapid response, large-scale COVID-19 testing and, where possible, the announcement of sample results by laboratories in less than 24 hours, an increase in the number of tests, the design of a site that shows the location of the patients while preserving their personal information, and that the person suspected of having the disease has no right to go to the hospital or medical center (12).

Control measures of Isfahan University of Medical Sciences include: active follow-up of family members and cases in contact with a patient with COVID-19, distribution of personal protective equipment in 16-hour centers, coordination with the Tourism Organization to combat the COVID-19 in hotels, presence of doctor and nurse in the telephone centers of the 3113 system, the intensification and monitoring of the implementation of the program against the COVID-19 in the bank branches, the activation of the training and information desk in the offices and the coordination of the police regarding the closure of all game nets (13).

Control measures of Guilan University of Medical Sciences include: holding coordination and executive committees within the department, implementing border and marine health care programs, forming a specialized working group and following up and identifying cases suspected of COVID-19, holding meetings to formulate care strategies, training and public information at the city level, the use of provincial radio and television media for information, holding specialized meetings and prevention and care of COVID-19 patients with the help of infectious disease specialists of the university and holding provincial working group meetings based on the agenda to deal with COVID-19 (14).

Given the nature of COVID-19 pandemic, which can in fact be considered a major social event with many consequences, including many human casualties, negative psychological effects such as stress and economic problems that if not properly dealt with and without effective control will have irreparable consequences, and since it seems that several factors contribute to the management of the COVID-19 and the fight against the virus and the control of this disease in the city of Babol, the identification of these factors and their ranking in terms of importance and role in

controlling and managing the disease to a large extent is effective in successful control of this disease and stopping the transmission and preventing its spread to other areas, and considering that identifying these factors provide similar solutions to deal with and control similar possible future crises, which in fact will be a clear roadmap to help managers control other crises, the present study was conducted with the aim of presenting a model and ranking of effective factors on controlling and coping with COVID-19 in Babol city.

Methods

This cross-sectional study was approved by the ethics committee of Babol University of Medical Sciences with the ethics code IR.MUBABOL.HRI.REC.1399.149 and was carried out on 280 officials and executive personnel involved in COVID-19 control programs in Babol using simple random sampling method.

Data were collected using a researcher-made questionnaire, including 63 questions and ten factors (public notices and relations, educational factors, organizational factors, cultural factors, social factors, health processes, crisis management, motivation, extracurricular collaborations, and epidemiological and demographic factors), which were scored based on 5-point Likert scale. People involved in the management and implementation of COVID-19 control programs, such as members of the city and university crisis headquarters and the health deputy, managers and staff and environmental officials involved in the program, related health and medical personnel, heads and officials of various departments of Babol were included in the study.

Impact score calculation was used for face validity of the questionnaire. Content validity was confirmed using the opinions of experts and the content validity ratio and index were confirmed and they were approved after doing reforms. Cronbach's alpha was used to assess the reliability of the questionnaire. This rate was calculated as follows: for questions of cultural factors ($\alpha=0.744$), social factors ($\alpha=0.808$), public notices and relations ($\alpha=0.811$), educational factors ($\alpha=0.865$), crisis management factors ($\alpha=0.824$), Factors of extracurricular collaborations ($\alpha=0.859$), motivational factors ($\alpha=0.705$), health processes ($\alpha=0.945$), epidemiological and demographic factors ($\alpha=0.895$), and organizational factors ($\alpha=0.911$). Then, the desired model was tested and the rank of effective factors in

controlling and coping with COVID-19 disease was examined. To assess and analyze the data, SPSS 21 and SmartPLS 3 statistical software and Friedman statistical tests and structural equations were used and p<0.001 was considered significant.

Results

305 questionnaires were provided to the research samples, but 280 people completed and returned the questionnaire. Out of 280 subjects, 130 (46.46%) were female and 150 (53.54%) were male. 7 people (2.36%) had a high school diploma, 4 people (1.57%) had an associate degree, 132 people (47.25%) had a bachelor's degree, 121 people (43.31%) had a master's degree, 16 people (51.1%) had specialized doctoral and clinical degrees. 29 people (10.3%) were 30 years and younger, 73 people (26.2%) were 31-40 years

old, 111 people were (39.7%) 41-50 years old, and 66 people (23.8%) were 51 years old and higher. To measure fit in a general model, only one criterion called GOF is used. Three values of 0.01, 0.25, 0.36 have been introduced as weak, medium and strong values for GOF (15). The test results of the structural equation model showed that the calculated GOF values greater than 0.36 indicate a suitable and strong fit of the model of factors affecting the control and coping with COVID-19 disease (Table 1 and Figure 1).

Findings show that from the perspective of officials and executive personnel involved in controlling and counteracting COVID-19, the factor of public notices and relations (6.19) has the highest rank while the epidemiological and demographic factor (4.62) has the lowest rank in countering COVID-19 disease in the city of Babol (Table 2).

Table 1. Results of path analysis findings and index commonalities (Structural Equation Model Test)

| Factors	Determination coefficient	R^2	t-statistic	Commonalities (Q^2)
cultural factors	0.232	0.482	5.97	0.160
social factors	0.423	0.650	14.21	0.197
public notices and relations	0.573	0.757	20.94	0.295
educational factors	0.550	0.741	14.17	0.408
crisis management	0.573	0.757	22.31	0.315
extracurricular collaborations	0.735	0.857	42.53	0.343
motivation	0.495	0.704	14.48	0.290
health processes	0.878	0.937	87.53	0.407
epidemiological and demographic factors	0.736	0.858	34.71	0.484
organizational factors	0.751	0.866	36.17	0.431
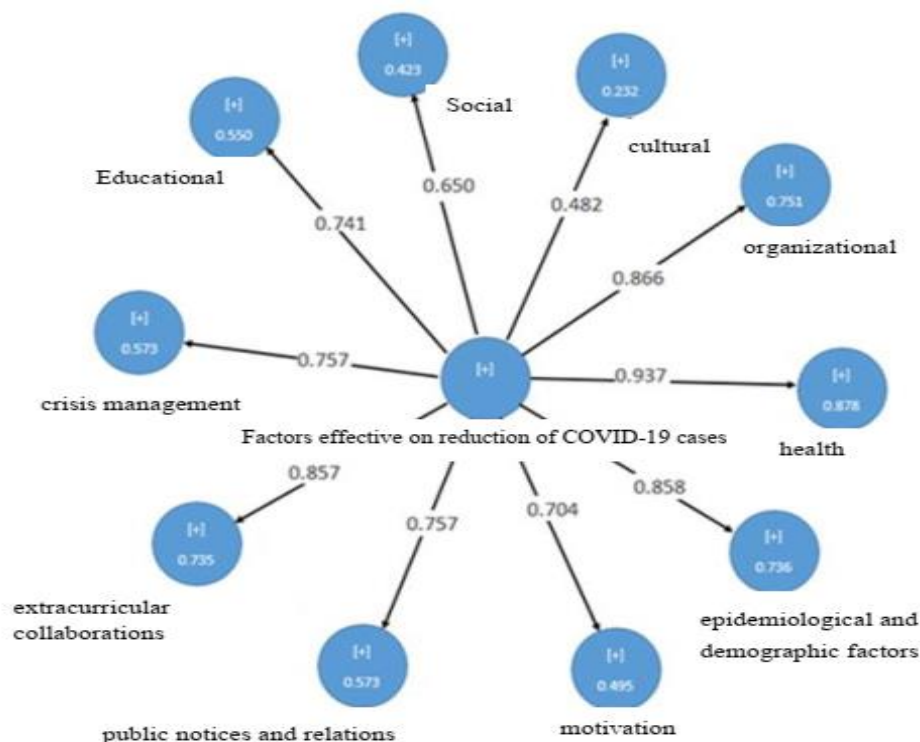
Figure 1. Estimation of the effect of variables based on standardized coefficients in the structural model

Table 2. Results of Friedman test for ranking the factors affecting COVID-19 disease control

Factors	Average ranking	rank	number	Degree of freedom	Chi square	p-value
public notices and relations	6.19	1	280	9	42.973	0.000
educational factors	6.07	2		9	42.973	0.000
organizational factors	6.06	3		9	42.973	0.000
cultural factors	5.89	4		9	42.973	0.000
social factors	5.60	5		9	42.973	0.000
health processes	5.48	6		9	42.973	0.000
crisis management	5.46	7		9	42.973	0.000
motivation	4.85	8		9	42.973	0.000
extracurricular collaborations	4.79	9		9	42.973	0.000
epidemiological and demographic factors	4.62	10		9	42.973	0.000

Discussion

The results showed that the public notices and relations factor had the highest rank and the epidemiological and demographic factor had the lowest rank in COVID-19 disease control. The structural equation model test confirmed the fit and robustness of the model. Chang also emphasized the strong impact of public notices on high-risk areas in his research (6). Findings of a study by Barker et al. also showed that community involvement and cooperation in the Ebola virus crisis improved the health system's relationship with the community, increased self-confidence in health officials, and improved planning. These efforts facilitate accountability to the health system and lead to a cycle of self-confidence, improved communication, and significant work continuation (16). The results of research by Guner et al. are also consistent with the findings of this study (10).

Based on the results of this study, basic and integrated measures have been taken to deal with and control COVID-19 disease in Babol city. Identifying these factors as well as ranking the factors has an important role in improving preventive performance and more effective management of this crisis and similar crises. That's because the ability of organizations in a society to manage crises and challenges has a significant impact on the ability of that society to face crises and the quality of recovery from challenges. Medical universities are organizations that provide essential services in times of crisis and play a very important role in the speed of society's return to normal conditions (17). While stable structures and sovereignty and sufficient resources affect the daily resistance, they are not enough to maintain it and the resistance in times of crisis. It seems that enhancing the

power of leaders in any system to review challenges, strengthen common coping strategies, and develop social networks inside and outside the organization and conduct further research can deepen understanding of the situation (18). Crisis management depends on various factors such as the structure of each country's health system, suitable geographical location, the country's past experiences in managing similar crises, the level of development and people's habits (19). The results of Yang et al.'s research also show the helpful effect of management and general leadership of crisis management in COVID-19 control (9).

According to the results of this study, effective management of COVID-19 disease depends on a series of factors that, although experts believe they have different effects on COVID-19 control, all of these factors have been involved in this process. Important factors such as health processes, crisis management, motivational factors and extracurricular collaborations gained lower positions in COVID-19 control based on the perspective of experts. Considering that the mentioned factors are among strategic factors and are important assets of organizations, especially medical universities and the health system, which should play the most important role in improving the performance and achieving the goals of these organizations, a lower ranking in the COVID-19 control programs by these factors may indicate a challenge or weakness in the formation of these factors, and this may lead to temporary and ineffective control or recurrence of the disease. Therefore, rooting out and examining the possible problems and challenges in order to institutionalize effective and sustainable management of this crisis and other similar crises is emphasized.

That's because for highly reliable organizations (HROs) such as medical units and emergencies, resilience is a crucial feature (20).

Undoubtedly, for organizations such as medical universities, the ability to succeed in dealing with crises, especially epidemics, as leading organizations in charge of providing, maintaining and promoting health is very important and necessary. In order to control and deal with COVID-19 more effectively and prevent its spread, the following strategies are suggested:

- Involvement of the community in the development and implementation of care and control programs
- Active exchange of information between health officials and the community
- Training and empowerment of community structures or local institutions to provide change, identify problems and solutions, and implement control and intervention programs
- Adoption of stricter control policies by the government and wider role of other policy makers
- Effective use of organizational capacities and resources, especially during epidemics and resource constraints
- Effective use of resources of other organizations
- Improving the relations between the community and the hospital and the centers providing health services by identifying the challenges and eliminating the possible weaknesses in the provision of services that are created by the spread of the disease.
- Emphasis on self-care and stress management by providing training and counseling in the COVID-19 epidemic crises
- Development of social networks inside and outside the organization, especially for public notices and relations.

Acknowledgment

References

1.Eurosurveillance Editorial Team. Updated rapid risk assessment from ECDC on the novel coronavirus disease 2019 (COVID-19) pandemic: increased transmission in the EU/EEA and the UK. Euro Surveill. 2020;25(10):pii=2003121. Available from: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.10.2003121

2.Al-Hazmi A. Challenges presented by MERS corona virus, and SARS corona virus to global health . Saudi J Biol Sci. 2016;23(4):507-11.

3.Lakshmi Priyadarsini S, Suresh M. Factors influencing the epidemiological characteristics of pandemic COVID 19: A TISM approach. Int J Healthc Manag. 2020;13(2):89-98.

4.Peeri NC, Shrestha N, Rahman MS, Zaki R, Tan Z, Bibi S, et al. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned?. Int J Epidemiol. 2020;49(3):717-26.

5.News Agency of the Islamic Republic of Mazandaran. Mazandaran went through a decreasing trend of corona outbreak in the first week. 27 March 2020, News ID: 83729817. [In Persian]. Available from: https://www.irna.ir/news/83729817.

6.Chang W-C. Taiwan's Fight against COVID-19:Constitutionalism, Laws, and the Global Pandemic. Verfassungsblog. 21 March 2020. Available from: https://verfassungsblog.de/taiwans-fight-against-covid-19-constitutionalism-laws-and-the-global-pandemic/

7.Yang HY, Duan GC. Analysis on the epidemic factors for COVID-19. Zhonghua Yu Fang Yi Xue Za Zhi. 2020;54(6):608-13.

8.Fang Y, Nie Y, Penny M. Transmission dynamics of the COVID-19 outbreak and effectiveness of government interventions: A data-driven analysis. J Med Virol. 2020;92(6):645-59.

9.Yang L, Ren Y. Moral Obligation, Public Leadership, and Collective Action for Epidemic Prevention and Control: Evidence from the Corona Virus Disease 2019 (COVID-19) Emergency. Int J Environ Res Public Health. 2020;17(8):2731.

10.Guner R, Hasanoglu I, Aktas F. COVID-19: Prevention and control measures in community. Turk J Med Sci. 2020;50(3):571-7.

11.Gilmore B, Ndejjo R, Tchetchia A, de Claro V, Mago E, Diallo AA, et al. Community engagement for COVID-19 prevention and control: a rapid evidence synthesis. BMJ Glob Health. 2020;5(10):e003188.

12.Shim E, Tariq A, Choi W, Lee Y, Chowell G. Transmission potential and severity of COVID-19 in South Korea. Int J Infect Dis. 2020;93:339-44.

13.Ministry of Health and Medical Education, Deputy Minister of Health, Center for Communicable Diseases Management. A summary of the actions performed. Newsletter COVID-19, No. 13. 2020. p.8. [In Persian] Available from: http://health.sbmu.ac.ir/uploads/22_5261_1606121634822_13.pdf

14.Ministry of Health and Medical Education, Deputy Minister of Health, Center for Communicable Diseases Management. A summary of the actions performed. Newsletter COVID-19, No. 15. 2020. p.8. [In Persian] Available from: http://health.sbmu.ac.ir/uploads/22_5261_1606121634822_15.pdf

15.Davari A, Rezazadeh A. Structural equation modeling with PLS software. Tehran: Jihad Daneshgahi Publishing; 2014. [In Persian] Available from: http://isba.ir/MainPage.aspx?ID=6195&kind=6&bcode=54

16.Barker KM, Ling EJ, Fallah M, VanDeBogert B, Kodl Y, Macauley RJ, et al. Community engagement for health system resilience: evidence from Liberia's Ebola epidemic. Health Policy Plan. 2020;35(4):416-23.

17.Amiri M, olfat L, Feizi K, Salehi Abarquee MA. A Model for Organizational Resilience. Productivity Mangement. 2018;11(44):35-65. [In Persian]

18.Gilson L, Barasa E, Nxumalo N, Cleary S, Goudge J, Molyneux S, et al. Everyday resilience in district health systems: emerging insights from the front lines in Kenya and South Africa. BMJ Glob Health. 2017;2(2):e000224.

19.Mirzaee H. Research on the cultural and social dimensions of the corona virus crisis in Iran. Tehran: Institute for Social and Cultural Studies of the Ministry of Science, Research and Technology; 2020. [In Persian]. Available from: http://opac.nlai.ir/opac-prod/bibliographic/6128041

20.Ishak AW, Williams EA. A dynamic model of organizational resilience: adaptive and anchored approaches. Corp Commun: Int J. 2018;23(2):180-96.