Role of community participation on covid-19 epidemics: a national-based interventional study

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Research Article

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Abstract

Background

Community participation can be very effective in crisis situations like the Covid-19 pandemic. However, the effectiveness of community engagement in this pandemic is not well studied, particularly in low and middle-income countries.

Objective

To evaluate the role of this community-based intervention on covid-19 epidemics outcomes in Iran.

Methods

Three categories of interventions (supportive, caring, and supervisory) were carried out using volunteer forces, organized in neighborhood-based teams during the Covid-19 epidemic in Iran started in November 2020. The evaluation was conducted 4 months later. Different data resources, including information on outpatients, hospitalizations, and medical care monitoring center (McMc) were employed. The basic reproductive rate ($R_0$) was calculated, and other statistical-epidemiological analyzes such as time series, Regression analysis, and Basic generator size were also used.

Results

Deaths per day declined from 479 to 75 within the study period. $R_0$ decreased from 1.26 to 0.86. PCR tests reached from 661 to 1601 /100000. The incidence rate of the disease reached 0.2 per hundred thousand people to 0.05 per hundred thousand people. The number of hospitalizations from Covid-19 decreased from 3044 to 417 before and after the community-based interventions.

Conclusion

Epidemic management when combined with community participation can be very effective in crisis situations. Strengthening the disease care system and more supervision in the implementation of the strategy and having an effective relationship with the doctors of the private sector to comply with the national protocol, an effective step will be taken towards the control of this disease and finally its elimination.

Introduction
The COVID-19 pandemic influenced the majority of countries over the world with a huge burden. This threatened pandemic has had millions of deaths, hospitalizations, and morbidities plus social and economic difficulties (1). Effects of this pandemic have had more hardships in low and middle-income countries such as Iran (2). Countries are heavily influenced by their political-economic issues in the management of COVID-19. Conditions that can be considered both an advantage and a threat.

The Islamic Republic of Iran is one of the countries that Covid-19 strongly influenced. The first confirmed case occurred on February 18, 2020, in Iran (3). From that time the number of deaths per day for Covid-19 ranked among the top tenth most of the days in the world. Mass vaccination started about 6 months later than in many other countries. Furthermore, because of some economic sanctions the country faced limitations on some required resources (4).

Meanwhile, despite a considerable investment for the epidemics, the budget was mostly devoted to medicine and clinical services. However, on November 20, 2020, Iran experienced 479 deaths ranked 10th in the world.

There was no comprehensive plan to control the epidemics prior to November 2020 in the country and social inequalities, sustained workload among healthcare workers, lack of resources, equipment, a policy for contact tracing and patient flow management, and mental health issues in the community were challenged administration in Iran (5). There was no Interdepartmental cooperation, many deprived families suffered from poverty for both unemployment and Covid-19, and the health system focused only on hospital care, some ordinary protective recommendations, and restrictions such as lockdowns.

Following a two-phase study in Tehran in April and June 2020, the epidemiological pattern of covid-19 was investigated (6). Based on the results of this study and global experiences as well as epidemiology knowledge, a comprehensive (neighborhood-oriented) plan was planned for the management of the Covid-19 epidemic.

This project was a specific example of attracting people's participation, inter-departmental coordination, planning based on the needs of localities, and optimal use of the power of the country's healthcare network system. Undoubtedly, the condition for the success of this plan is to focus on preventing the virus instead of focusing on the hospital and providing active and family-oriented services instead of inactive services. Therefore, the joint plan for the management and control of the Covid-19 epidemic in a neighborhood and family-oriented manner was designed and implemented by the Ministry of Health, Medicine, and Medical Education with the cooperation of other organizations.

Every intervention that is implemented in epidemic management requires a systematic evaluation with an appropriate scientific methodology to determine its effectiveness so that the role of the desired interventions can be distinguished from other measures. This article aims to evaluate the role of this community-based intervention on covid-19 epidemics outcomes such as deaths and hospitalizations in Iran.
Methods

In this national study, the target population includes: People applying for service for Corona who call the 4030 (A national hotline number for Covid-19 information center) system daily, people with symptoms or suspected or positive rapid test from group A people, and high-risk people, screened individuals who should be referred to a convalescent home for care, screened people who need to be quarantined at home for care. People who are transferred to the hospital after screening and people in close contact with the infected persons and during the transmission period, and high-risk people who have been in contact with other suspended cases.

The study was conducted using official information, including information on outpatients, hospitalizations in normal and special corona wards, medical care monitoring center (McMc), and other available sources.

This community-based interventional study was carried out in 2020–2021 for 4 months and had three levels of care intervention including health care workers, nurses, and doctors; There was support for providing the livelihood of the needy people by the popular forces of the neighborhoods and supervision for the supervision of service centers, provision, and distribution of food and trade unions, etc.

To achieve the intensification of monitoring of health protocols and law enforcement, extensive, targeted and intelligent testing, active disease detection, quarantine, and intelligent detection, education and information and culture building, protection of vulnerable groups including the elderly and people with underlying diseases, intelligent determination and notification and the limitations and process of outpatient treatment and the maximum reduction of hospitalized cases were considered. The implementers of the plan of health forces, volunteers of neighborhoods and mosques, Red Crescent, and other popular forces have been. The implementation of the plan in the country was managed by the Ministry of Health and the mobilization of the medical community at the provincial level, including the governor, the president of the Mother University of Medical Sciences, and the commander of the provincial army, as well as the corresponding officials at the city and district levels. Project services were carried out in a neighborhood-oriented manner. Executive activities were carried out at 3 levels: basic measures by trained nurses/volunteers, expert measures by nurses/home health care workers, and measures by doctors according to the assigned duties.

In this study, 3 phases of input (interventions carried out such as the number of volunteer forces, the number of neighborhood-based teams, the number of support packages, etc.), processes (such as monitoring, intervention population for each department), and output (such as cases of death and hospitalization) were investigated. The evaluation was conducted 4 months after the start of the interventions.

Using SPSS Inc. Chicago, IL; version 16.0 statistical methods using Pearson's correlation method and multi-step regression analysis were employed. The basic reproductive rate \( R_0 \) was calculated, and other
statistical-epidemiological analyzes such as time series, Regression analysis, and Basic generator size were also used.

**Results**

The number of people exposed to close contact and intercepted included 34801984 from the country's population. Overall, 269,234 people of 82,000 households were covered by protective measures. The average number of active teams in the project for each province was 7310 teams, of which 843 teams were related to monitoring patients and suspicious people in the community, 194 care teams, 774 support teams, and 272 monitoring teams, and the rest were health ambassador teams.

PCR tests reached from 661 to 1601 per hundred thousand people. The incidence rate of the disease reached 0.2 per hundred thousand people to 0.05 per hundred thousand people. The number of death declined from 479 to 75 within the study period (Fig. 1).

In this intervention study, 34801984 people were traced. The number of quick tests performed by the detection teams was 106,070,322 tests and the number of people cared for by in-home care teams was 269,234 patients. With the increase in the number of elderly people, the amount of oxygen therapy, referrals to the hospital, the number of emergency missions, and the number of day hospitalizations also increased. The basic reproductive rate \( (R_0) \) decreased from 1.26 at the beginning of the study to 0.86. Table 1 shows the changes in the bi-weekly adjustment of the basic productive amount from the beginning to two weeks after 4 months. The number of hospitalizations from Covid-19 decreased from 3044 to 417 before and after the community-based interventions.
Table 1
Value changes in basic reproductive rate ($R_0$) and 95% confidence interval for $R_0$ during the study period

<table>
<thead>
<tr>
<th>The week that the intervention began</th>
<th>The basic reproductive rate ($R_0$)</th>
<th>95% CI for $R_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower level</td>
</tr>
<tr>
<td>0</td>
<td>1.26</td>
<td>1.23</td>
</tr>
<tr>
<td>2</td>
<td>1.22</td>
<td>1.20</td>
</tr>
<tr>
<td>4</td>
<td>1.18</td>
<td>1.16</td>
</tr>
<tr>
<td>6</td>
<td>1.06</td>
<td>1.05</td>
</tr>
<tr>
<td>8</td>
<td>1.00</td>
<td>0.99</td>
</tr>
<tr>
<td>10</td>
<td>1.01</td>
<td>0.98</td>
</tr>
<tr>
<td>12</td>
<td>1.00</td>
<td>0.98</td>
</tr>
<tr>
<td>14</td>
<td>0.92</td>
<td>0.90</td>
</tr>
<tr>
<td>16</td>
<td>0.86</td>
<td>0.83</td>
</tr>
<tr>
<td>18</td>
<td>1.05</td>
<td>1.02</td>
</tr>
<tr>
<td>2 weeks after the end of the intervention</td>
<td>1.18</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Although the basis of the color classification of Iranian cities to determine the risk level is the number of hospitalizations. Based on this, cities are divided into 4 colors: red (10 and more), orange (6 to 9), yellow (4–5), and, blue (3 and fewer) per 100,000 population. The number of red and orange cities increased from 160 and 208 respectively before the interventions to 7 red cities and 30 orange cities.

Using the Poisson regression statistical model, it was observed that the factors that can affect the number of hospitalization and deaths with positive clinical symptoms or positive tests include the number of health ambassadors, the number of doctors, the number of nurses, the number of beds in residences, a one-week lockdown of 150 cities during the study period (as the most important intervention on epidemic management) and the number of health services for patients (Table 2). The results of the above regression model show that among the effective factors, the effects of the number of doctors and the number of health services provided have a negative regression coefficient, which shows their effect inversely, in other words, with the increase of these factors, the number of cases with clinical symptoms will decrease positively. Table 3 shows the results of the time series analysis for the effect of community-based interventions on the consequences of hospitalization and death of patients with covid-19.
Table 2
Multiple linear regression analysis for deaths and hospitalization from Covid-19 before and after the Community-based interventions.

| Covariates                  | Deaths       |          |          |          |          |          |          |          |
|-----------------------------|--------------|----------|----------|----------|----------|----------|----------|
|                             | Unstandardized Coefficients | t   | Sig.   | Unstandardized Coefficients | t   | Sig.   |
|                             | B            | Std. Error |        |          | B            | Std. Error |        |
| Health ambassador teams(n)  | .032         | .011     | 2.871   | .007     | .170         | .064     | 2.679   | .011     |
| Physicians(n)               | -3.679       | .817     | -4.501  | .000     | - .582       | .138     | -4.228  | .000     |
| Health workers(n)           | .616         | .129     | 4.783   | .000     | .058         | .023     | 2.475   | .018     |
| Hospitalizations(n)         | 2.694        | .775     | 3.477   | .001     | 1.242        | .126     | 9.858   | .000     |
| Health services(n)          | .021         | .010     | 2.109   | .042     | .004         | .002     | 2.766   | .009     |
| Existence of underlying disease | .003        | .001     | 3.529   | .001     | .000         | .000     | -2.883  | .007     |
| Home quarantine(n)          | -.237        | .104     | -2.281  | .029     | -.030        | .016     | -1.878  | .069     |

Table 3
Results of the time series analysis for the effect of community-based interventions on the consequences of hospitalization (a) and death (b) of patients with Covid-19 in Iran. Hospitalization

### a. Hospitalization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard error</th>
<th>z</th>
<th>p.value</th>
<th>Exp. (Est.)</th>
<th>2.5%</th>
<th>97.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>7.285</td>
<td>0.049</td>
<td>148.29</td>
<td>&lt; 0.001</td>
<td>1485.23</td>
<td>1324.37</td>
<td>1605.61</td>
</tr>
<tr>
<td>Time</td>
<td>0.004</td>
<td>0.000</td>
<td>16.329</td>
<td>&lt; 0.001</td>
<td>1.004</td>
<td>1.004</td>
<td>1.004</td>
</tr>
<tr>
<td>Intervention</td>
<td>-0.356</td>
<td>0.076</td>
<td>-4.691</td>
<td>&lt; 0.001</td>
<td>0.700</td>
<td>0.603</td>
<td>0.813</td>
</tr>
<tr>
<td>Time since intervention</td>
<td>-0.010</td>
<td>0.001</td>
<td>-8.577</td>
<td>&lt; 0.001</td>
<td>0.990</td>
<td>0.988</td>
<td>0.993</td>
</tr>
</tbody>
</table>
b. Deaths

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard error</th>
<th>z</th>
<th>p.value</th>
<th>Exp. (Est.)</th>
<th>2.5%</th>
<th>97.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.899</td>
<td>0.07</td>
<td>55.927</td>
<td>&lt;0.001</td>
<td>49.371</td>
<td>43.065</td>
<td>56.601</td>
</tr>
<tr>
<td>Time</td>
<td>0.008</td>
<td>0</td>
<td>24.697</td>
<td>&lt;0.001</td>
<td>1.008</td>
<td>1.007</td>
<td>1.008</td>
</tr>
<tr>
<td>Intervention</td>
<td>-0.582</td>
<td>0.09</td>
<td>-6.479</td>
<td>&lt;0.001</td>
<td>0.559</td>
<td>0.469</td>
<td>0.666</td>
</tr>
<tr>
<td>Time since intervention</td>
<td>-0.023</td>
<td>0.02</td>
<td>-14.476</td>
<td>&lt;0.001</td>
<td>0.977</td>
<td>0.974</td>
<td>0.98</td>
</tr>
</tbody>
</table>

**Discussion**

This study showed that during pandemics, epidemic management when combined with community participation can be very effective in crisis situations where there is no vaccine or specific treatment for the infected. This project was carried out in a neighborhood-oriented manner with the participation of popular volunteer groups in Iran. In contrast to the huge budgets that were spent on treatment in hospitals and medical centers, the very little direct budget was allocated by the government, and most of the budget was made through voluntary public support. Community engagement refers to the involvement and participation of individuals, groups, and structures within a parameter of a social boundary or catchment area of a community for decision-making, planning, design, governance, and delivery of services. Barker et al indicated that Community engagement refers to the involvement and participation of individuals, groups, and structures within a parameter of a social boundary or catchment area of a community for decision-making, planning, design, governance, and delivery of services. Their findings provided empirical evidence that community participation aims to improve the resilience of the health system to respond to crises (7). It is mainly emphasized that community engagement is seen as critical in many health initiatives, such as for communicable diseases in low and idle-income countries (8). Community engagement and participation have played a critical role in successful disease control and elimination campaigns in many countries. The role of community engagement in disasters has been addressed in different situations and settings (9–12).

March 21 is the first day of the New Year in the Iranian calendar. Usually, 1 to 2 weeks before the New Year, people prepare for the New Year, and weeks 12 to 14 of the beginning of the intervention can be considered the right time to measure outcomes, including death (with 57 cases). In the week before the New Year, unfortunately, the government canceled restrictions on intercity travel during the New Year holidays, which usually start from the first day of Nowruz (New day). The cancellation of travel restrictions naturally increased exposure and the beginning of the fourth peak of the Covid-19 epidemic in Iran.

The role of social participation has been shown in other studies. Gilmore et al (13) in a rapid evidence synthesis concluded that COVID-19’s global presence and social transmission pathways require social
and community responses. This may be particularly important to reach marginalized populations and to support equity-informed responses. Aligning previous community engagement experience with current COVID-19 community-based strategy recommendations highlights how communities can play important and active roles in prevention and control. Countries worldwide are encouraged to assess existing community engagement structures and use community engagement approaches to support contextually specific, acceptable, and appropriate COVID-19 prevention and control measures.

Many factors influence the effectiveness of community participation in disasters. Factors influencing the effectiveness of community engagement interventions included the extent of population coverage, shared leadership, and community control over outcomes (8).

This is the first ever study conducted through a comprehensive community-based interventional trial to reduce the number of deaths and hospitalizations in Iran. Another positive point of this project was mobilizing people to donate faithfully to needy people and families and to strengthen the sense of social responsibility. People contributed significantly by donating about 450,000 dry food packages, 1.4 million sanitary packages, and one million dollars in addition to voluntary executive assistance during the 4-month implementation of the project. Despite the economic sanctions against the country, these aids played an important role in reducing the burden caused by the epidemic in the more deprived people. Unfortunately, this project did not continue strongly after the government change in Iran. However, nowadays following the pressure and insist of the National Headquarters for Coronavirus Control it is planned to restart the project.

In this study, using statistical models, we tried to control the confounding factors in determining the effectiveness of the desired interventions, however, the before and after experimental studies had their own limitations, and due to ethical considerations, it was not possible to have an independent control group.

The acceptable effectiveness of this project showed that in critical situations such as acute, emerging, threatening and progressive pandemics and other biological threats, the maximum voluntary participation of people can be used, especially in countries with economic and national income restrictions. Moonen et al (14) in Toronto, Canada in a volunteer program involving telephone calls between medical students and older adults showed that after the communication outreach program, medical students’ perceptions were positively influenced by older adults and they were more likely to pursue a career concentrated on older adults. The qualitative analysis revealed older adults valued the program. Timing and consistency of calls were factors identified by this group as having practical importance.

Maybe for some experts and specialists in the field of health, social participation has a negative effect on the quality of services, and special attention should be paid to handing over health services to untrained volunteers. The type of services assigned is dependent on the skills of the volunteers, and if necessary, accompanying them with a trained person should be considered. In this project, a wide range of volunteers, including regular workers and specialist doctors, participated in the support, monitoring, and
care areas according to their skills. Marston and colleagues argued that mechanisms to ensure citizen participation are essential for high-quality, inclusive disaster response and preparedness, and these can be called upon again in future emergencies. Past experiences to engage communities in disaster management should be our guide. For the next phases of this type of participation, the governments should immediately set up and fund specific community engagement taskforces to ensure that community voice is incorporated into the pandemic response. Engagement with such groups is needed to include their voices in local, regional, or national responses to the pandemic.

Previous studies (14–16) indicated that increasing and improving the process of social participation in disasters requires modifying social interactions and relationships, redesigning the structure and functioning of the associated organizations, improving social and psychological behaviors, as well as providing the contexts. Mao et al (17) identified important factors for fostering community engagement and COVID-19 volunteering as well as gaps in the current literature. According to the results of these studies, promoting useful social participation indicators in natural crises is not possible solely through the formulation of administrative guidelines and non-psychological mechanisms without considering sociological considerations. They believe the reason for the discrepancy between the results may be attributed to the profound social and religious differences in some studied communities.

The support of the intermediate managers of the health sector and the allocation of sufficient funds, as well as the detailed planning along with the strengthening of inter-sectoral cooperation and appreciation of the volunteer forces, are effective factors in increasing the effectiveness of these interventions. The health of the volunteer forces and their families is especially important for those who are in direct contact with infected people, and they should receive adequate training, be continuously empowered, and be provided with the necessary personal protective equipment. In order to continue social participation in crises, it is necessary to plan proper organization and by appreciating their efforts and the important role they play in helping to control crises, we expect their continued cooperation. It is important to believe in the authorities for the important role of social participation in biological threats and to consider this role in policies and plans to deal with them. This study also conclude that Future research should be directed towards deepening knowledge on sustaining community engagement, collaboration and community participation over time, during and beyond this pandemic.

Declarations

Declaration of Conflicting Interests:

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval and consent to participate:

This work was approved by the Research Ethics Committees of Shahid Beheshti University of Medical Sciences (IR.SBMU.RETECH.REC.1401.013). Informed consent was obtained from all participants.
I would confirm that all methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication:

Not applicable

Availability of data and materials:

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests:

The author declare that I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding:

Not applicable

Authors' contributions:

Hamid Soori: Designed the project and executed under the plan of Covid-19 National Committee of Epidemiology while I was its director in the Ministry of Health of Iran, data analyses and manuscript writing was done by myself.

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References


**Figures**

![Number of deaths from Covid-19 in Iran](image)

**Figure 1**

*Number of daily deaths from Covid-19 before and after the community-based interventions in Iran.*