

Original Article

Disaster preparedness and education in the population covered by Shahid Beheshti University of Medical Sciences health networks (DART program, 2020-2022)

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Abstract

Background: Disaster management strategies, including prevention, preparedness, response, recovery, effective resource coordination, timely decision-making, and strong communication, are crucial to lessening the effects of disasters and reducing the impact of catastrophic events. This study aims to evaluate the current status and level of preparedness among networks under the DART (Disaster Preparedness Assessment and Education) framework.

Methods: Statistical data for the years 1399–1401 (Persian calendar; approximately March 2020 to March 2023) were extracted from the Integrated Health System (SIB). We analyzed three key indicators: preparedness assessment coverage, education coverage, and average household preparedness for disasters. The data were processed using Excel software.

Results: All indicators showed an upward trend in the networks from 2020 to 2022. On average, 19.3% of households underwent a preparedness assessment, 6.9% received training, and 27.7% demonstrated household-level preparedness. In 2022, the highest level of preparedness was in Damavand (40%), while the lowest was in Qarchak (15%).

Conclusion: Although preparedness and training indicators improved over time, the overall level of preparedness (27.7%), while higher than the national average (12%), remains significantly lower than international benchmarks such as Japan (75%). These findings highlight the need for a thorough review of the guidelines, operational processes, and training content of the DART program to improve its effectiveness and match global standards.

Keywords: Crisis Management; Disaster Preparedness; Hazard; Risk Assessment.

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Introduction

Iran is located in arid and semi-arid regions, and its unique climatic conditions make it highly vulnerable to natural disasters like earthquakes, floods, droughts, and storms. These risks require effective disaster management strategies. The Iranian health system, as the main protector of public health, has increasingly

focused on prevention and preparedness, especially through community involvement. Launched in 2014, the Disaster Preparedness Assessment and Training (DART) Program is a national initiative aimed at empowering local communities to respond effectively to disasters. The program plays a key role in

household-level preparedness by engaging directly with the population. Despite its strategic goal, the DART program has faced challenges, including unclear and unmeasurable evaluation criteria, limited training scope, lack of structural coherence, absence of user-friendly tools, and insufficient alignment with international models. These issues have hindered its effectiveness and require major changes. According to the 2017 Global Risk Analysis Report, Iran is among the high-risk countries with an adaptive capacity deficit index of 80.35% and a vulnerability index of 47.78%, showing medium vulnerability compared to global averages. Iran ranks 28th in the world regarding disaster risk, facing 31 of the 40 known natural hazards. The health system plays a vital role in saving lives and reducing injuries and psychological trauma during such events.

Natural hazards can have severe impacts on communities. The health system plays a vital role in saving lives and reducing injuries and psychological trauma during such events.

Implementing the DART program in health facilities faces several challenges. These include long questionnaires, limited time, and insufficient staff for quality training. There is often a mismatch between the educational content and the literacy or cultural backgrounds of clients. Infrastructure issues, such as outdated systems and internet outages, also create barriers. Additionally, there is an over-focus on numerical indicators and inadequate follow-up with clients. These issues hinder the program's effectiveness and obstruct real community preparedness. This study aims to find out if the DART program meets the needs of communities during natural hazards, crises, and new threats to the health sector. The DART framework is used as a structured approach for quick disaster response in health networks. Its importance lies in the fact that inefficiencies can lead to serious losses.

Delays in relief efforts or poor coordination among agencies can worsen crises and increase suffering. Without a clear strategy like DART—which focuses on education, assessing preparedness, quickly identifying needs, effectively allocating resources, and encouraging international cooperation—communities become more vulnerable to disasters. By emphasizing preparedness, quick responses, and ongoing recovery, DART can lessen the severe impacts of disasters and boost community resilience.

The Disaster Management Policy Council at Medical Universities, led by the university president, is in charge of activating and overseeing the disaster management cycle. The main goals of the DART program include reducing the health sector's vulnerability, increasing the resilience and capacity of personnel and equipment, lowering mortality, injury, disability, and damage to health facilities, and ensuring a quick recovery of health services after disasters. Despite the program's strategic importance, no thorough or comparative analysis has been done on how prepared the populations covered by Shahid Beheshti University health networks are. Therefore, this study will conduct both quantitative and qualitative assessments of disaster preparedness and training in these networks. With the rapid growth of technology and access to data, adopting modern disaster management approaches is crucial. Updating and implementing the DART strategy is not only necessary for operations but also essential for protecting communities and ensuring resilience against increasing threats and crises.

Methods

This study used a quantitative cross-sectional design to evaluate, compare, and assess the indicators of the DART program in health networks .

Population and sample: The target population included all households covered by health networks affiliated with Shahid

Beheshti University of Medical Sciences. This population consisted of households that had either participated in the DART program or were eligible, with data recorded in the Integrated Health System (SIB) .

Data collection: Data were obtained from annual reports submitted by health centers to the Crisis Management Unit of the University's Health Vice-Chancellor through the SIB system for the years 1399–1401 (Persian calendar; approximately March 2020 to March 2023). The data were extracted into Excel spreadsheets .

Variables and Measurement: Eighteen variables were analyzed. All of these were quantitative and measured on a binary scale (yes/no = 0.1). These variables were gathered from a researcher-made checklist based on the DART program questionnaire .

Data Analysis :

The data were analyzed using Excel software. Three key indicators were calculated :

- Readiness Assessment Coverage Rate: (assessed households/total households)
- Education Coverage Rate: (educated households/total households)
- Average Household Readiness Index: (Total Readiness Score of Assessed Households)/(Number of Assessed Households × 6.7%)

The indicators were calculated for each network and compared across networks. One-year and three-year trend graphs were created and analyzed .

Results

This study analyzed the status of disaster preparedness at the household level, including coverage for assessment, preparedness, and training in health networks affiliated with Shahid Beheshti University of Medical Sciences. The analysis compared these factors over a three-year period from 2020 to 2022 .

Based on three relevant graphs and tables related to preparedness, training, and assessment, a summary of the extracted results is presented. This summary includes minimum and maximum values, trend curves, and interpretations for each graph from the years 1399 to 1401 (2020-2022).

Statistical Summary

Readiness Index (Figure 1) :

- Minimum value: 11% (Qarchak) .
- Maximum value: 61% (Damavand) .
- Annual average: 1399: 25%, 1400: 31%, 1401: 28% .
- Network averages: Highest: Damavand (52.0%), lowest: Qarchak and Varamin (15.3%)
- Figure 1 shows the highest assessment scores in 1400, followed by a slight drop in 1401 .
- Annual trend: The index rose sharply in 1400, likely due to increased assessment efforts, then declined slightly in 1401 .

Network-level trend :

- o Damavand consistently leads with high scores .
- o Qarchak and Varamin remain at the bottom with little improvement .
- o Figure 1 shows a slight upward trend in overall preparedness across networks .

Education Index (Figure 2) :

- Minimum: 2% (North Tehran and Shemiranat)
- Maximum: 12% (Pakdasht, Pardis, Damavand)
- Annual average: 1399: 6%, 1400: 6%, 1401: 8%
- Network average: Highest: Pardis (10.0%), Lowest: Shemiranat (2.0%)
- The index stayed stable between 1399 and 1400 and then increased in 1401, showing improved preparedness efforts .

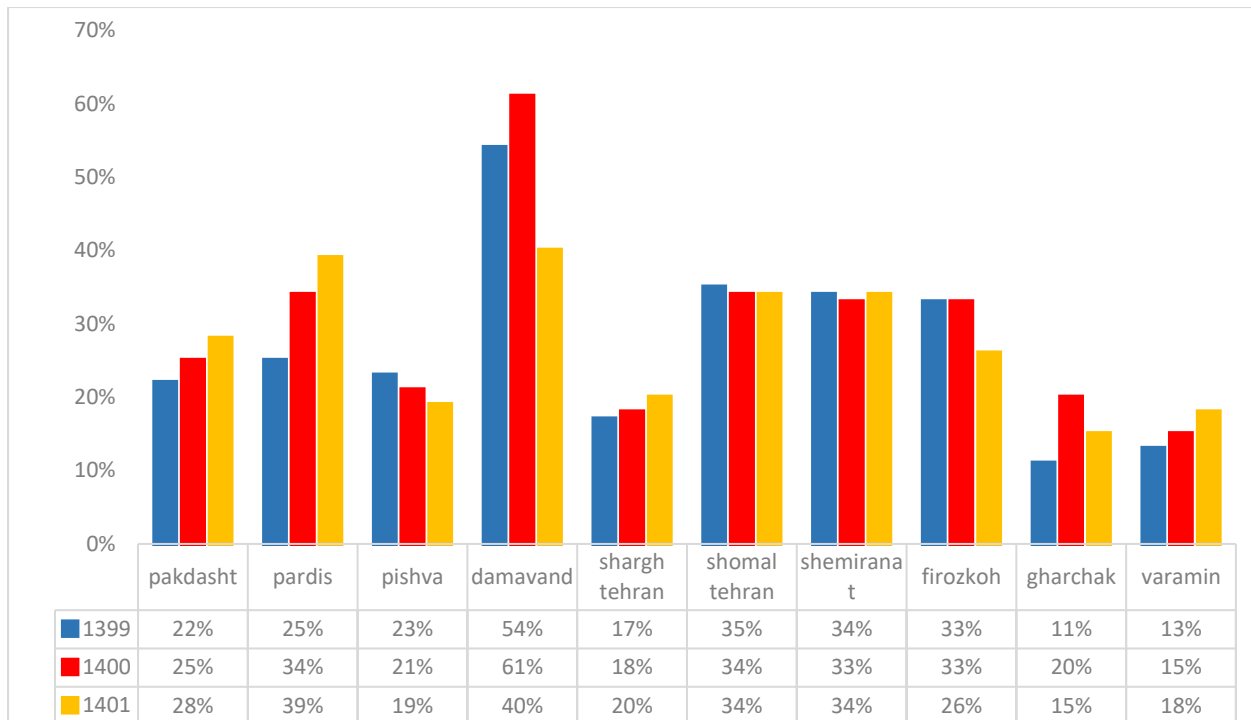


Fig. 1: Disaster readiness indices in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

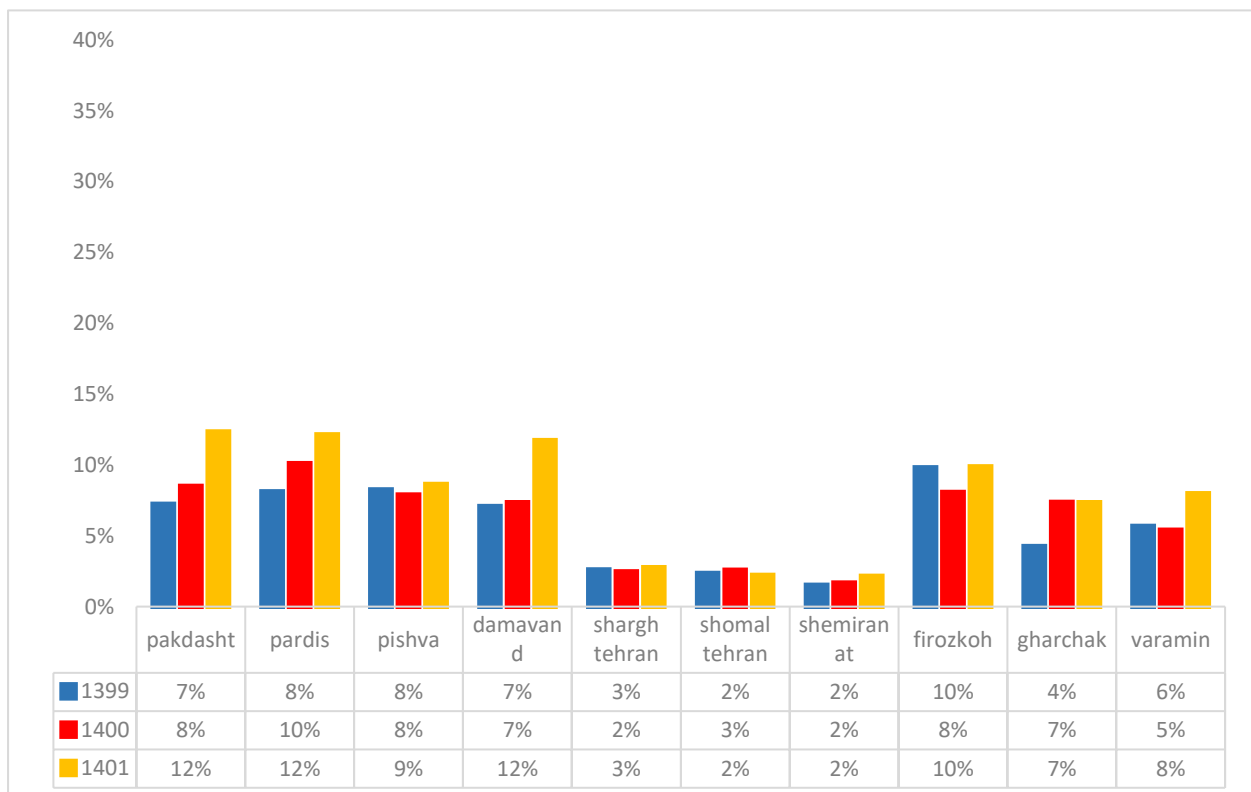


Fig. 2: Disaster education indices in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

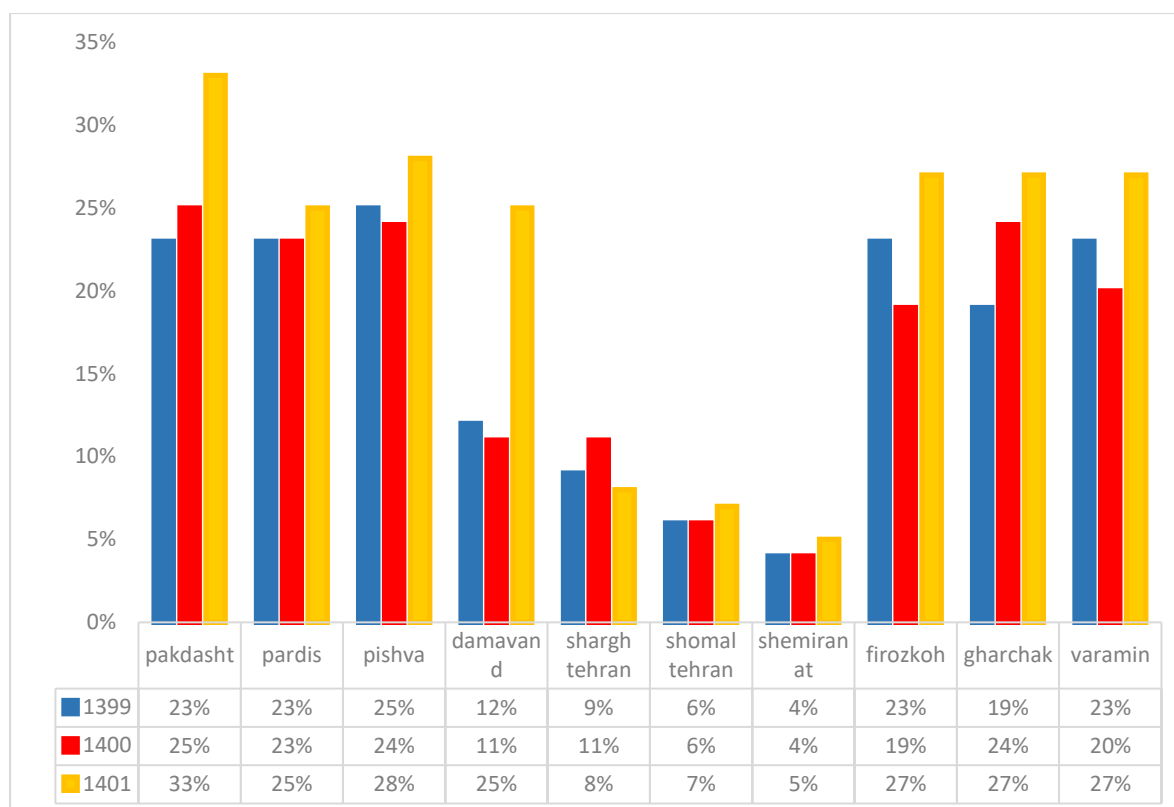


Fig. 3: Disaster assessment indices in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

Network-level trend :

- o Pakdasht, Pardis, and Damavand show ongoing growth .
- o East and North Tehran remain low and stable, suggesting little change .

Assessment Index (Figure 3) :

- Minimum: 4% (Shemiranat) .
- Maximum: 33% (Pakdasht) .
- Annual average: 1399: 19%, 1400: 19%, 1401: 24%
- Network average: Highest: Pakdasht (27.0%), Lowest: Shemiranat (4.3%)
- Figure 2 shows a clear upward trend in educational activities .
- Annual trend: Education stayed stable in 1399 and 1400 and then rose significantly in 1401 .
- Network-level trend :
 - o Pakdasht shows the strongest growth, particularly in 1401 .

o Firouzkouh, Qarchak, and Varamin also show upward movement .

o Shemiranat and North Tehran remain consistently low .

Overall interpretation of Table :(1-3)

•Readiness shows gradual improvement, especially in 1401, but stays low in urban centers like East and North Tehran .

•Training in 1401 shows a strong upward trend, indicating a reinvestment in skill building .

•Assessment peaked in 1400, reflecting a temporary boost in assessment activities, with Damavand recognized as a strong performer .

These trends, illustrated in Figures (1-3), reveal changes in disaster readiness and skill building across health networks. The graphs depict the percentage of preparedness activities in the ten networks .

Table 1: Disaster readiness indeces in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

Year / Network	Pakdasht	Pardis	Pishva	Damavand	East Tehran	North Tehran	Shemiranat	Firouzkouh	Gharchak	Varamin	Yearly Avg
1399	22%	25%	19%	40%	17%	34%	33%	26%	11%	13%	25%
1400	25%	39%	25%	61%	20%	35%	34%	33%	20%	18%	31%
1401	28%	23%	21%	55%	18%	34%	34%	33%	15%	15%	28%
Network Avg	25.0%	29.0%	21.7%	52.0%	18.3%	34.3%	33.7%	30.7%	15.3%	15.3%	—

Table 2: Disaster education indeces in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

Year / Network	Pakdasht	Pardis	Pishva	Damavand	East Tehran	North Tehran	Shemiranat	Firouzkouh	Gharchak	Varamin	Yearly Avg
1399	7	8	8	7	3	2	2	10	4	6	6
1400	8	10	8	7	2	3	2	8	7	5	6
1401	12	12	9	12	3	2	2	10	7	8	8
Network Avg	9.0	10.0	8.3	8.7	2.7	2.3	2.0	9.3	6.0	6.3	—

Table 3: Disaster assessment indeces in the population covered by Shahid Beheshti University of Medical Sciences health networks, from 2020 to 2022

Year / Network	Pakdasht	Pardis	Pishva	Damavand	East Tehran	North Tehran	Shemiranat	Firouzkouh	Gharchak	Varamin	Yearly Avg
1399	23%	23%	25%	12%	9%	6%	4%	23%	19%	23%	19%
1400	25%	23%	24%	11%	11%	6%	4%	19%	24%	20%	19%
1401	33%	25%	28%	25%	8%	7%	5%	27%	27%	27%	24%
Network Avg	27.0%	23.7%	25.7%	16.0%	9.3%	6.3%	4.3%	23.0%	23.3%	23.3%	—

Table 4: 2022 Indicator Values per Health Network (Simplified Percentages)

Network	Pakdasht	Pardis	Pishva	Damavand	East Tehran	North Tehran	Shemiranat	Firouzkouh	Qarchak	Varamin	Network Average
Preparedness	33%	25%	28%	25%	8%	7%	5%	27%	27%	27%	21%
Training	12%	12%	9%	12%	3%	2%	2%	10%	7%	8%	8%
Evaluation	28%	39%	19%	40%	20%	34%	34%	26%	15%	18%	27.3%
Overall Average	24%	25%	19%	26%	10%	14%	14%	21%	16%	18%	—

Conclusions from Figures (1-3) and Table :(1-4)

1. Preparedness is improving but unevenly. Suburban networks like Pakdasht and Damavand are progressing, while urban areas are lagging.
2. Training efforts increased in 1401, likely due to post-pandemic recovery or new guidelines. Pakdasht and Firouzkouh lead these changes.

3. The assessment reached its highest level in 1400, with Damavand's exceptional performance showing high achievement in this area.

4. There are inequalities in the indicators across networks. Urban areas (East/North Tehran, Shemiranat) have low preparedness and training, despite high assessment scores.

5. The focus is shifting towards skill building (training) and monitoring

(evaluation), but readiness still needs more extensive efforts.

Discussion

The findings of this study indicate that the disaster preparedness rate in health networks linked to Shahid Beheshti University is 27.7%. This figure is notably higher than the national average of 12% in Iran, reflecting a relative improvement. Compared to other provinces in Iran, this difference is even more evident. For instance, Varzaghan and Khuzestan report a preparedness rate of only 8%, while Bojnourd (North Khorasan) reaches 10%. Fars province performs slightly better at 11%, and Kerman and Isfahan both peak at 15%. Even Tehran province, despite its central location and resources, aligns with the national average of 12%. In this light, Shashi Beheshti's 27.7% not only exceeds all provincial figures but also more than doubles the performance of most regions, making it a model for disaster preparedness.

However, disaster preparedness in health networks connected to Shahid Beheshti University still falls short of international standards. The average household preparedness rate of 27.7% is significantly lower than global benchmarks seen in countries like Japan (75%), the United States (45%), and Canada (55%).

The differences observed among health networks suggest that local factors, such as administrative capacity, socioeconomic conditions, geographic vulnerabilities, and infrastructure readiness, greatly affect program outcomes. For example, networks like Damavand and Pardis consistently outperformed others in preparedness and training coverage, likely due to stronger staffing structures, resource distribution, and better community involvement. In contrast, networks such as Shemiranat and Qarchak showed lower performance, possibly reflecting systemic limitations in outreach, staffing levels, and technological readiness.

Moreover, this gap implies that while local programs like DART can boost performance beyond the national program, broader systemic reforms are needed to meet international standards. These reforms could include formalizing preparedness training, integrating community-based exercises, and increasing public access to emergency resources. Additionally, the uneven distribution of preparedness across Iranian provinces highlights the need for fair policy implementation and resource distribution.

A major limitation of the current DART program is its heavy reliance on quantitative measures that may not fully capture the qualitative aspects of disaster preparedness. While factors such as education coverage and assessment indicators provide useful metrics, they do not adequately reflect behavioral change, community empowerment, or the depth of preparedness at the household level (8). Additionally, the educational content delivered by the program often lacks relevance to the literacy levels, cultural norms, and experiences of the target population, which reduces its effectiveness.

The structural design of the DART framework needs a review. The absence of scalable, user-centered communication tools has made it hard to adapt across different operational contexts. Furthermore, the evaluation measures built into the program are often vague and lack clear ways to measure performance, which makes tracking progress over time and comparing internationally difficult (9). These design issues have led to fragmented implementation and lower trust among stakeholders.

A comparison with other provinces and international case studies shows the importance of integrated disaster risk reduction strategies that combine public education, infrastructure investment, and cross-sector collaboration. Countries with higher preparedness rates usually use multi-layered approaches, including simulation

exercises, community-based risk mapping, and ongoing capacity building. The DART program, in its current form, does not fully incorporate these aspects, which limits its effectiveness in building sustainable resilience (10). Moreover, this study reinforces the important role of health systems in disaster management. As frontline institutions, health networks should provide emergency medical services and also act as platforms for community mobilization, risk communication, and psychosocial support. Improving the DART program within this broader framework requires commitment at the policy level, targeted resource allocation, and collaboration across sectors.

Resilience helps reduce financial losses and mortality in communities that can withstand future crises. These variations are connected to differences in sample size, study design, regional strategies, and administrative capacity. In conclusion, although the DART program has led to measurable improvements in disaster preparedness among the populations served, its current structure still needs updating.

Conclusion

This study gives a thorough look at disaster preparedness and training indicators in health networks linked with Shahid Beheshti University of Medical Sciences, using the DART (Disaster Preparedness Assessment and Training) framework. The findings show that while measurable progress has been made over three years, the overall level of household preparedness remains well below internationally accepted standards.

The average preparedness rate of 27.7%, though higher than the national benchmark of 12%, falls significantly short of the global standards seen in countries like Japan (75%), the United States (45%), and Canada (55%). This gap indicates a significant performance issue and highlights the need for strategic reforms in

program design, implementation, and evaluation methods.

Key issues identified include insufficient training coverage, inconsistent assessment practices, mismatches in training content, infrastructure challenges, and a lack of a strong, measurable, and ongoing evaluation framework. These shortcomings hinder the program's ability to build sustainable community resilience and decrease vulnerability to disasters. To improve the effectiveness and scalability of the DART program, the following actions are recommended:

- Revise the operational guidelines to include modular, user-centered, and culturally relevant training tools.
- Combine qualitative indicators with quantitative metrics to capture behavioral changes and community involvement.
- Strengthen coordination among sectors and engage policy-level support to ensure operational continuity and resource mobilization.
- Align DART program components with international disaster risk reduction frameworks and best practices.

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Authors' contribution

Mahmoudi A: Conceptualization .and Keshavarz A: developed the study concept and design. Mahmoudi A acquired the data. Haghayegh SA and Khorvash M analyzed and interpreted the data, and wrote the first draft of the manuscript. All authors contributed to the intellectual content, manuscript editing and read and approved the final manuscript.

Ethical considerations

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences. All principles of confidentiality and integrity were strictly followed during data collection and analysis. Generative AI (COPILOT) was employed for less than 10% of the manuscript organization and analysis tasks. All scientific interpretations and final revisions were conducted by the authors.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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