




Original Article

Conceptual model of resilience of problematic urban fabrics and social factors affecting health with an emphasis on the acupuncture approach and vulnerability in border cities

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Abstract

Background: Uncontrolled population growth, urban sprawl, economic inequality, and unbalanced development have intensified challenges in deteriorated urban areas. Urban acupuncture—a low-cost, localized strategy—targets specific “pressure points” to stimulate broader improvements. By enhancing social, institutional, and infrastructural capacities, it strengthens community participation, governance, and essential services, thereby increasing resilience. In border cities, where vulnerabilities and resource constraints are high, urban acupuncture can effectively promote adaptive capacity and support sustainable urban transformation

Methods: This study is qualitative in nature and follows Morse’s “Parallel Single-Method” typology, chosen because it allows simultaneous exploration of both theoretical constructs and empirical evidence. Data were collected through documentary studies and semi-structured interviews. Analysis was conducted concurrently using meta-synthesis to develop the theoretical framework and content analysis to extract empirical components, supported by NVivo software. This approach enables a comprehensive understanding of the phenomenon by integrating conceptual insights with real-world observations.

Results: Based on qualitative analysis, an initial conceptual model of resilience was developed comprising three core dimensions: “Governance,” “Social Equity,” and “Physical-Historical.” Further content analysis of interviews led to the coding of 528 references, from which 22 primary codes and 8 central categories were identified. According to the results, the final model of resilience of dysfunctional fabrics was presented with an emphasis on the acupuncture approach and vulnerability in border cities, and based on the star seed model.

Conclusion: The urban acupuncture approach presents an effective, targeted, and cost-efficient strategy for enhancing resilience in deteriorated urban fabrics. The proposed model offers practical applicability for urban planners to facilitate site-specific interventions and strengthen resilience capacities in vulnerable urban environments.

Keywords: City Planning; Resilience, Parallel Single-Method; Psychological; Urban Acupuncture; Urban Renewal.

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Introduction

The uncontrolled growth of urbanization, population increase, and unplanned expansion of

settlements in the recent decades have led to the widespread formation of dysfunctional urban fabrics vulnerable to

various natural, social, and economic crises (1, 2). Features such as physical deterioration, weak infrastructure, poverty, unemployment, high crime rate, social instability, and environmental instability have reduced their resilience against changes and threats (3). In this regard, it is necessary to develop new approaches in urban management that can promote social and physical sustainability at a minimum cost and energy. "Urban acupuncture" is one of these new approaches that has attracted the attention of experts in recent years.

Clark (4) proposed this concept first in the context of understanding the damage to the built environment. Later, this approach was expanded by several theorists (5-9). Instead of extensive and costly interventions such as "urban surgery", this approach seeks to gradually restore social and economic life in worn-out fabrics through small-scale, gradual, and strategic interventions in key points of the city by modeling the acupuncture in medicine (3-5).

The focus of urban acupuncture on principles such as minimalism, flexibility, participation, contextualization, attention to the history and identity of the place, and utilization of endogenous capacities distinguishes it from other urban intervention models (10-16). This approach can be used as an effective method in Iran to improve the quality of urban life and create resilience, especially in marginal and deprived areas, such as dysfunctional areas of Zabol City that face challenges such as a lack of transparent policies, weak local governance, and collapse of social ties. This concept is also considered one of the most key concepts in urban studies and a tool for analyzing and improving the capability of spaces and communities to cope, adapt, and restore from crises (17, 18).

According to the experts, such as Gorji et al., Atrachali et al., Salomon et al., Grabowski et al., Adger, Carpenter et al. and Bruneau et al., this concept is divided into three dimensions, including social

(social capital and participation), institutional (planning and risk management), and physical-infrastructural (physical resistance and urban services) (19-25). Walker & Salt and Ahern, have particularly introduced resilience as the capability to adapt quickly and adopt adaptive solutions in facing change, which is directly associated with the philosophy of acupuncture (26, 27). Urban acupuncture is an urban design strategy that targets specific, small-scale interventions in critical areas of a city to generate broader positive impacts on the urban fabric. By focusing on key nodes or "pressure points," such interventions aim to stimulate systemic improvements in social, institutional, and physical-infrastructural resilience. In this context, urban acupuncture can strengthen community engagement, optimize local resources, and enhance adaptive capacities in problematic urban areas. In an attempt to explain the association between urban acupuncture and strengthening resilience in problematic fabrics, the present study provides a theoretical and practical framework for promoting resilience in Zabol using a qualitative approach and conceptual analysis.

Methods

Research setting and population

This study was conducted in the dysfunctional urban fabrics of Zabol City. This area was prioritized for planned urban interventions due to physical deterioration, functional inefficiency, and social vulnerability. The present study population included experts, urban managers, university professors, and urban development specialists who had direct knowledge and experience with the urban resilience and intervention methods in problematic fabrics.

Data collection method

Information was collected through two primary sources: 1) documentary studies and review of reliable scientific literature in

the field of urban resilience, and 2) semi-structured individual interviews with experts. The interview sample included 38 urban development professionals, comprising urban planners, municipal managers, and academics. Participants were selected using purposive and snowball sampling based on specific criteria: a minimum of five years of professional experience in urban planning or management, expertise in urban resilience or related fields, and active involvement in projects or research relevant to deteriorated urban fabrics. Each interview lasted 25 to 50 minutes on average. Theoretical saturation was reached after 21 interviews, but data collection continued until 38 interviews were completed to ensure adequacy and comprehensiveness of the dataset.

Methodology

This study was qualitative and based on a parallel single-method design. Based on Morse's typology, it used two qualitative methods simultaneously; one as the basic method and the other as a complementary method, and their results were finally integrated.

a) First section (Basic Method): Meta-synthesis – In this stage, an initial conceptual model of the resilience of dysfunctional urban fabrics was extracted through a systematic review of scientific sources and documentary studies. This model included three main cores: “governance”, “social equity”, and “physical-historical”.

To develop a conceptual model of resilience in problematic urban fabrics and examine social factors affecting health, with emphasis on urban acupuncture and vulnerability in border cities, a systematic review was conducted. The review followed PRISMA guidelines and involved multiple sequential steps:

1. **Search Strategy:** Comprehensive searches were carried out in databases including Scopus, Web of Science, and PubMed,

using keywords such as “urban resilience,” “problematic urban fabrics,” “social determinants of health,” “urban acupuncture,” and “vulnerability in border cities.” Boolean operators and truncations ensured the inclusion of all relevant studies.

2. **Inclusion and Exclusion Criteria:** Studies were included if they examined urban resilience, social health factors, or urban acupuncture interventions in vulnerable or border city contexts. Studies not available in English or Persian, or those without full texts, were excluded.
3. **Quality Assessment:** Methodological quality was evaluated using standardized tools appropriate for qualitative, quantitative, or mixed-methods studies, ensuring the reliability of the extracted evidence.
4. **Data Extraction:** Information regarding study objectives, setting, population, interventions, outcomes, and key findings was systematically extracted.
5. **Synthesis:** Findings were analyzed to identify recurring themes, conceptual linkages, and gaps in the literature, particularly concerning the interplay between social factors, urban resilience, and targeted small-scale interventions (urban acupuncture).

This systematic and transparent process provided a strong evidence base to develop a culturally and contextually informed conceptual model, highlighting the relationships between urban structural, social, and institutional factors, and proposing actionable strategies for enhancing resilience and health in border cities

b) Second section (Complementary Method): Content Analysis – In this stage, data from semi-structured interviews were analyzed.

Statistical analysis

Qualitative data were analyzed using NVIVO software. This software was used to codify data, classify concepts, and

analyze the frequency of extracted codes. Finally, the final model of dysfunctional urban fabric resilience was formulated and presented in the form of a "star seed" model.

Results

The statistical population of the present study included 38 professors and experts in urban planning. Accordingly, the interview was conducted with 38 people, and 528 initial codes (number of references) were extracted in the research process. After conducting several reviews and integrating codes based on similarities in several steps, 22 primary codes, 8 axial codes, and 3 selective codes were extracted for dysfunctional fabric resilience according to the acupuncture approach and vulnerability in border towns.

Coding data obtained from the interview in NVIVO software

Generally, open coding seeks to make data and phenomena in the form of concepts. To display the relationships between the categories, NVVO software uses and combines various clustering algorithms to group similar cells. Meta-synthesis (Basic

method) and Content Analysis (Supplementary Method) methods were first used since the present study was conducted in a parallel method, so the basic components of resilience and acupuncture approach were examined by the meta-synthesis method, and the primary conceptual model, which consisted of 3 primary components, was presented Figure 1

The urban resilience indicators in the context of semi-structured interviews were extracted using the content analysis method. NVIVO software was used to analyze qualitative data Table 1. The components and open codes of each component display the frequency of references.

Coding the data obtained from the interview

This stage aims to establish a relationship between the classes generated in the coding stage. In the second step of this study, 8 components were obtained according to the data obtained from the study of upstream documents and deep interviews, and their category.

Table 1. Open coding of data obtained from the interview according to the number of dysfunctional fabric resilience references based on the acupuncture approach and vulnerability in border cities

No, of references	Extracted codes	Number of references	Extracted codes
26	Recognition of traditional institutions	32	Planning and designing public space
19	Activation of specialized committees	41	Social capital
21	Capacity building for traditional institutions	31	Paving the way for improving environmental conditions
22	Paying attention to social potential in planning	25	conformity between program rules and the environment
24	Determining local character and role	23	User features
34	Adjusting traditionalization of improving the current status	21	Density features
22	consolidating traditionalization of the current status	19	Visual features
21	Valuing background	22	Access network features
20	Common literature of empathy and synergy between decision maker and decision builder	31	Participation in institutions (NGOs)
22	Strengthening the social fabric of the area by looking at mental attachments	32	Social capital
22	Feeling a sense of choice - a sense of competence	28	Sense of belonging to the place

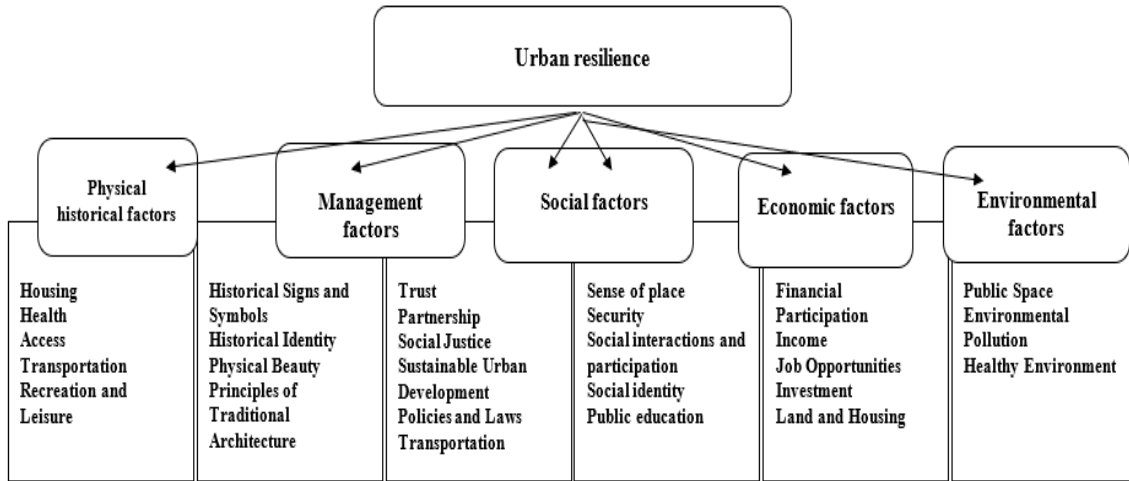


Figure 1. Urban Resilience Indicators (Reference: Author)

Selective Coding: Data from the interview

Selective coding (according to the results of the previous two stages of coding) is the primary stage of theorizing. A sufficient description of the dysfunctional fabric resilience components and re-evaluating the axes creates the question of how these components increase the dysfunctional fabric capacity based on the acupuncture approach and vulnerability in border towns,

and finally, what are the primary categories and concepts. Figure 2 displays the themes and sub-themes of the 3 primary components of dysfunctional fabric resilience according to the analyses and frequencies obtained.

Table 2 shows the content categorization of open, axial, and selective codes of the data obtained from the qualitative data analysis.

Table 2. Content categorization of extracted codes based on the number of references to dysfunctional fabric resilience

Selective code	Axial code (theme)	Open source (sub-theme)
Physical-historical	Vitality	Planning and design of public space
		Social capital
		Paving the way for improving environmental conditions
	Internal development	Conformity between program rules and the environment
		User features
		density features
Governance	Forming a local management core	Visual features
		Access network features
	Institutional and realization-oriented planning	Strengthening local duty and roles
		Recognition of traditional institutions
		Activation of specialized committees
		Capacity building for traditional institutions
Social equality	identity	Paying attention to social potential in planning
		Determining local character and role
	social inclusion	Adjusting traditionalization (improving the current status)
		Consolidating the traditionalization of the current status
Faith and human dignity	social inclusion	Valorizing background
		Participation in Institutions (NGO)
		Social Capital
Feeling a sense of choice - a sense of competence	Faith and human dignity	Sense of belonging to place
		Common literature of empathy and synergy between the decision maker and the decision builder
Feeling a sense of choice - a sense of competence	Faith and human dignity	Strengthening the social fabric of the area by looking at mental belonging
		Feeling a sense of choice - a sense of competence

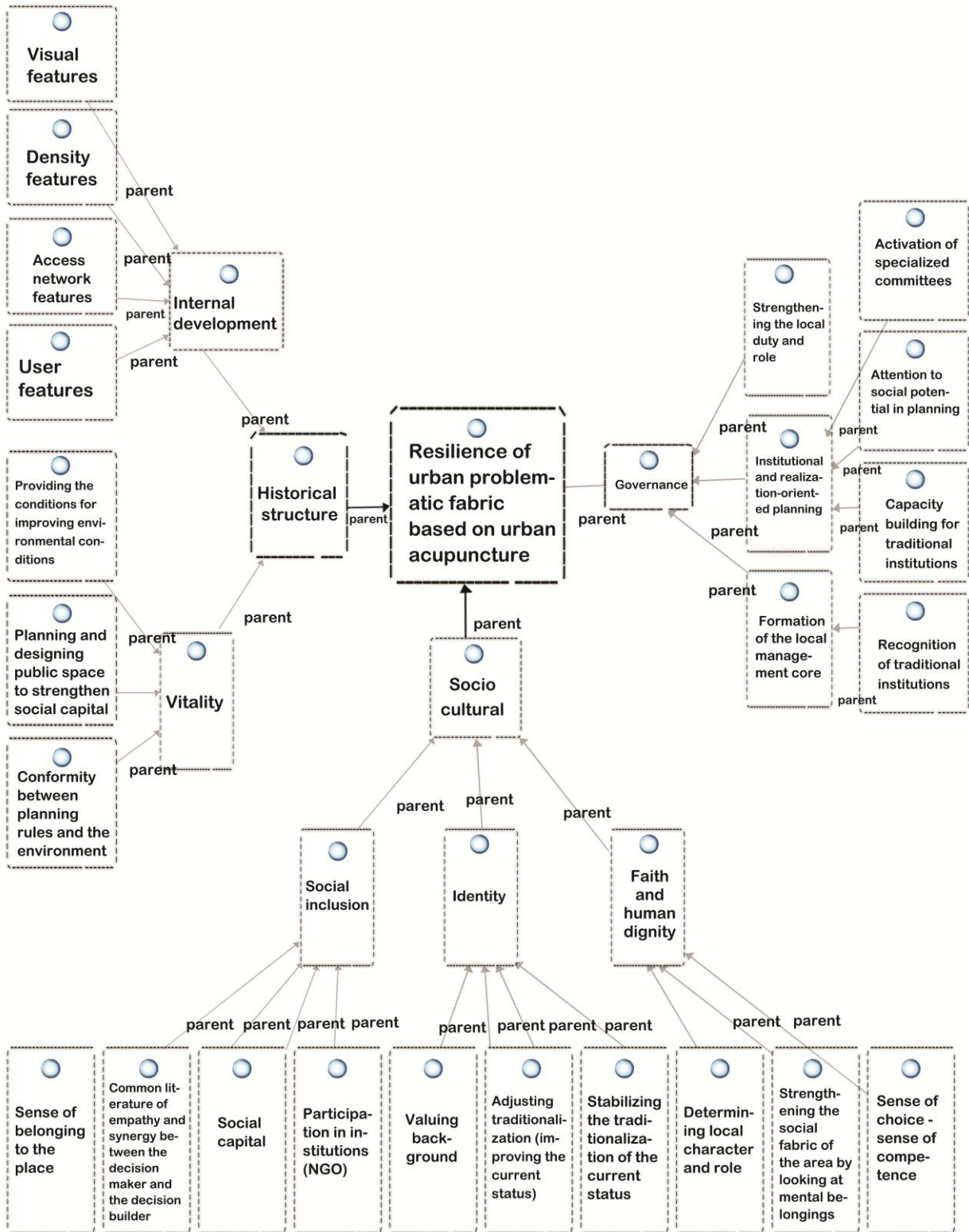


Figure 2. Explanation of the components of dysfunctional fabric resilience based on the acupuncture approach and vulnerability in border cities

Discussion

The study developed a conceptual model to enhance the resilience of dysfunctional urban fabrics in border cities, emphasizing

the urban acupuncture approach and vulnerability. Using qualitative analysis through meta-synthesis and content analysis, the model was structured around

three cores: governance, social equity, and physical-historical, employing the “star seed” framework to illustrate causal and hierarchical relationships among resilience factors.

In the governance dimension, findings highlighted that strengthening local institutions, implementing realization-oriented planning, and forming local decision-making cores are crucial for resilience. These results align with Pratama et al. (16), who emphasized that acupuncture-based interventions are most effective when supported by local institutions and public participation. Moreover, clear institutional frameworks are necessary, as their absence increases vulnerability in socially eroded urban fabrics, suggesting that establishing inter-sectoral local structures can significantly enhance resilient processes.

In the social equity dimension, three components of “identity”, “social inclusion”, and “faith and human dignity” were extracted from the interviews and content analysis as the primary axes. Interpretation of these results suggests that social resilience does not depend merely on infrastructure, but is based on mutual understanding, a sense of worth, and a socio-cultural bond between residents and the environment. This is in line with the results of the study by Fitzgibbons, who considered the role of social justice and participation in decision-making to be effective in promoting resilience (28). At the identity level, elements such as “determining the local role,” “consolidating traditionalization,” and “valuing historical background” were identified. They lead to increased cohesion during crisis by preserving cultural authenticity and strengthening social cohesion. In other words, respect for the past creates a mental-emotional bond between residents and the space that increases the capacity to adapt to changes.

In the social inclusion component, the role of social capital, participation in

institutions, a sense of belonging to place, and the production of a common literature in empathy among decision-makers were highlighted as prerequisites for resilient collaborations. This result is in line with the study by Clark, who emphasized that intervention approaches in dilapidated fabrics should be rooted in social and cultural values (4). In the physical-historical dimension, preserving social customs and traditions, paying attention to the historical background of residents, and integrating it into planning were identified as key results. Unlike the mechanical interventions seen in many past development projects in Iran, this study revealed that utilizing historical and cultural capacities is not only a conservation strategy but also an effective resilience tool. The formation of new urban spaces (such as the neighborhood house) rooted in the lived experience of residents can improve social interactions and lead to intra-local participation.

The same result has been reported in the study by Fitzgibbons (28).

The analytical interpretation of the star seed model also suggests that the hierarchical structure of the components reveals their flexibility and interdependence. In other words, increasing resilience is impossible from a unidimensional path and requires simultaneous coordination at the institutional, social, and physical levels. This model provides a bottom-up, fabric-oriented, and local approach consistent with the urban acupuncture approach compared to traditional crisis management models focusing on top-down responses.

Data collection tool in this study (semi-structured interviews with 38 experts using the theoretical saturation technique and analysis with NVivo software) paved the way to accurately extract the components and explain the relationships between them, so the final model structure not only has conceptual coherence but also can be applied in urban policy-making. In total, the present study presented a model that can be

implemented at the local level, focusing on Zabol City with dilapidated fabrics and structural problems. Comparing with previous studies indicates that the distinguishing point of this model is the combination of a cultural-social approach with small-scale, feasible, and low-cost interventions that can empower residents and revitalize dysfunctional fabrics step by step (29).

According to the results obtained, the resilience model of dysfunctional fabrics with an emphasis on the acupuncture approach and vulnerability in border cities based on the star seed model was presented as the final model. The mentioned model includes 3 basic cores including governance, social equality, and physical-historical. Institutional planning, the formation of an interdisciplinary headquarters, and strengthening the role and duty of institutions were presented as sub-themes of governance. Other important components in the "social equality" section are the literature of empathy and synergy, participation in institutions, and the preservation of faith and human dignity.

Other important axes are paying attention to the historical background of the residents, adjusting, and establishing traditions in planning. Social customs and traditions between residents play a key role in solving problems related to various areas of life and are very effective in solving problems. Regarding social interactions, they can be useful as mediators facilitating relations between service-providing institutions representing the government and the people to solve problems and pave the way for the empowerment of residents if residents are educated and familiarized with the culture of the city and citizenship, the social potential of influential individuals is utilized, and the role of these individuals is organized in the form of non-governmental organizations.

Respecting the subjective values of the residents and looking to the past, measures such as creating a neighborhood-house

(forming the core of local management) for local actions (bottom-up approach), which are the primary principles of the acupuncture approach, are vital in the fabric of resilience. Thus, urban planners and designers have strengthened the belief in collective wisdom among residents and have included human dignity in the heart of planning by recognizing local-traditional institutions. Additionally, design considerations for the optimal use of natural potential (paving the way for improving environmental conditions) and designing principles according to the conditions were evaluated positively in inducing a sense of vitality. Urban managers and planners should pay attention to it in the physical planning aspect.

The present study developed a resilience model for dysfunctional urban fabrics using a "star seed" conceptual framework, emphasizing the urban acupuncture approach. The model comprises three cores: governance, social equality, and physical-historical, each encompassing key components.

In the governance dimension, institutional planning, inter-sectoral coordinating structures, and the strengthening of local institutions emerged as central pillars. These findings underscore the importance of community-level decision-making and local participation, consistent with Pratama et al. (16), who highlighted that acupuncture-based interventions are most effective when institutional support and public engagement are present. However, unlike some prior studies that focus primarily on structural interventions, our results emphasize the interplay between governance and social empowerment in enhancing resilience.

In the social equality dimension, promoting empathy, active participation, and respect for human dignity were identified as crucial. These components strengthen social capital and cohesion, echoing findings by Gorji et al. (19) on the role of community networks in urban resilience.

Unlike earlier studies that often treat social factors as secondary, the current model positions social equality as a core driver of resilience.

In the physical-historical dimension, attention to cultural heritage, local traditions, and social customs was shown to foster a sense of place and identity. This aligns with the work of Ahern (27), who emphasized the adaptive capacity gained from integrating local culture in urban planning. Moreover, interviews indicated that citizenship education and engagement of influential local figures can bridge government initiatives and community action, reinforcing social empowerment. These insights extend previous research by demonstrating how cultural, social, and institutional factors interact synergistically in promoting resilience, particularly in vulnerable border-city neighborhoods.

In this regard, based on the principles of the urban acupuncture approach, measures such as the creation of “neighborhood houses” and the formation of local management cores were emphasized as examples of bottom-up strategies. These measures will promote resident participation and pave the way for the formation of meaningful local planning processes. Other positive outcomes of this approach are recognizing traditional and informal institutions in the neighborhood fabric, strengthening collective wisdom, and paying attention to human dignity in policymaking. Finally, urban design considerations such as the optimal use of local and natural capacities, utilizing fabric-based design patterns, and the creation of lively and dynamic spaces are among the solutions that can improve environmental quality, increase resident satisfaction, and enhance resilience in problematic fabrics. Thus, attention to these elements should be emphasized and pursued at different levels of policymaking, planning, and urban design.

Recommendations

It is suggested that policymakers and urban planners take steps toward creating a resilient, sustainable, and human-centered structure in problematic urban fabrics by applying an acupuncture approach focusing on resident participation, strengthening institutional capacities, and respecting indigenous values. This path can lead to the formation of innovative, flexible, and locally appropriate policies that will ultimately improve the quality of life and social cohesion.

Conclusion

The present study designed a conceptual model of resilience of problematic urban fabrics with an emphasis on the acupuncture approach and vulnerability in border cities. The results revealed that resilience in this type of fabric is a multidimensional phenomenon and is dependent on various structural, social, cultural, and institutional factors. The final model, inspired by the star seed model, introduces three basic cores of "governance", "social equality", and "physical-historical" as the primary components of resilience of dysfunctional fabrics. From the governance viewpoint, institutionalizing planning, strengthening inter-sectoral structures, and enhancing the role and authority of local institutions are necessary to increase resilience and make urban interventions more efficient. In the social equality dimension, strengthening components such as social capital, sense of belonging, public trust, and human dignity were identified as primary components for promoting social resilience. In the physical-historical dimension, preserving and utilizing cultural heritage, consolidating traditions, and strengthening historical bonds between residents and their living environment play a vital role in increasing social sustainability and improving the quality of urban life. As a low-cost, micro-scale, purposeful, and participatory approach, the urban acupuncture approach can provide effective and replicable

measures to regenerate worn-out and dysfunctional neighborhoods by utilizing local capacities. This approach, especially in Zabol city facing multidimensional problems in urban fabrics, can provide a pragmatic solution to increase resilience at different levels by focusing on effective interventions.

Author's contribution

Hasan Ali Rakhshani Nasab and Nima Jahan Bin developed the study concept and design. Maryam Fadaei Qotbi and Hasan Ali Rakhshani Nasab acquired the data. Hasan Ali Rakhshani Nasab and Nima Jahan Bin 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.

Informed consent

Questionnaires were filled with the participants' satisfaction and written consent was obtained from the participants in this study.

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Conflict of interest

The authors declare that they have no conflict of interests.

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