



## Engagement of female staff in prehospital emergency medical services from the perspective of service recipients: development and psychometric testing of the scale

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### Abstract

**Background & Aims:** Although most countries have long used female staff for prehospital emergency medical services (EMS), this is quite a recent development for the Iranian health system. It is hence necessary to analyze the perspectives of its recipients about the feasibility of assigning female staff to prehospital EMS to improve this service and compare it with other countries. This study aimed to design and evaluate the psychometric properties of a scale for assessing the feasibility of using female staff in prehospital EMS.

**Materials & Methods:** This was a methodological study. The literature was reviewed to develop items for the scale. The scale's content validity index (CVI) was then evaluated based on expert opinions, and its face validity was examined by eliciting comments from the target group and experts. Following that, 456 EMS recipients from East Azerbaijan Province, Iran, completed the electronic version of the scale. Finally, the construct validity and reliability of this scale were determined using exploratory factor analysis (EFA) and internal consistency (Cronbach's alpha), respectively.

**Results:** The findings confirmed the scale's high content validity and internal consistency, as well as its acceptable face validity. The EFA findings also revealed three factors, all of which were based on primary domains: the need for engagement (17 items), groundwork (14 items), and staffing (9 items).

**Conclusion:** The study's findings suggested that the intended scale's design and psychometric properties were appropriate for Iranian culture. Therefore, it can be used to examine public opinion before, during, and after the inclusion of female personnel in prehospital EMS.

**Keywords:** Female, Emergency Medical Services, Patients, Psychological Test, Questionnaire Design

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## Introduction

Prehospital emergency medical services (EMS) are critical in the health care system because they are the first line of care and treatment for emergency outpatients. Hence, it is critical to identify the strengths and weaknesses of prehospital EMS and improve its quality (1). In 1975, the Ministry of Health of Iran launched a system to deal with emergency situations. In the following years, this system was among the best in the world in terms of equipment and performance. This system, which later became EMS, employed male personnel from the beginning (2). Hence one of the major gaps in this regard is the lack of Iranian female staff in EMS to assist women at risk (3), even though women account for a large proportion of prehospital EMS recipients. According to Hosseini et al., one of the most common reasons for requesting prehospital EMS is labor pain. As a result, it appears that the presence of female staff in prehospital EMS can significantly improve their performance (4).

According to the evidence, female personnel have always played an important role in prehospital EMS; for example, they replaced male staff in EMS during World War II (5). Using female personnel in prehospital EMS is a common practice all over the world, and prehospital emergency teams typically include both men and women. For example, 42% of EMS personnel in Germany, 42% (6) in England, 42% (7), and in Australia 43% (8) are female. Furthermore, the proportion of female in prehospital staff in EMS in the United States increased from 25% in 2008 to 35% in 2017 (9, 10). Female staff is also common in prehospital EMS in West Asia; since 2004, Dubai has been recruiting female personnel for prehospital EMS, and the number of female personnel working in EMS reached 200 in 2018, accounting for 23% of the total staff in the EMS of Dubai (11, 12). Since 2010, the Kuwaiti emergency medical system has been recruiting female staff for night shifts (13). Some studies have discussed the benefits of having female staff in prehospital EMS. For example, Waldron et al. discovered a link between the gender of staff among EMS technicians and treatment refusal,

with the presence of female staff significantly reducing treatment refusal (14).

Even though Iran is an Islamic country and gender compliance among patients and caregivers is highly valued, only male staff are permitted to participate in prehospital EMS. To meet the emergency needs of women, an emergency system was launched in 2018 in some Iranian cities, including Tehran, Shiraz, and Behbahan, that provided special emergency teams composed of two female nurses and a male driver. Nonetheless, this new system did not progress very far, and there is no written data on its performance (2). Currently, all EMS personnel are male, and if a female client has an emergency, the male personnel will take care of her. This may result in dissatisfaction. In the research of Torabi pour et al. in Iran, the most important factor that reduces the efficiency of EMS was the factors related to human resources (15). Although 20% of emergency medicine capacity in Iranian universities has recently been allocated to female students, there are insufficient documents indicating whether women's capabilities in EMS, social acceptance, organizational structure, and other dimensions were considered in making such a decision. More research on the presence of female staff in prehospital EMS is thus required to assess the efficacy of such services. The feasibility of any idea should be assessed from various perspectives before putting it into action (2). To the leading information, the current research is the primary of its kind in Iran.

Iran's culture is established in Islamic and one might anticipate that patients within the city may feel more comfortable in intuitive with caregivers of their possess sexual orientation (16). Moreover, concurring to Islamic tenets, females are anticipated to look for care from a same sexual orientation clinician, particularly in sex delicate specialties, unless there's no female clinician accessible to offer administrations to other females (17). There is a need for a valid and reliable scale that is appropriate for each community's culture and religion to investigate the perspectives of service recipients and social acceptance. As a result, this study aimed to design and evaluate the psychometric properties of a scale for

assessing the feasibility of using female staff in prehospital EMS.

## Materials & Methods

The instrumentation method proposed by Waltz et al. was used in this methodological study (18). The stages of the study were as follows.

### *Goal-setting and Scoping:*

It is advised to first determine the primary aim of the instrumentation (18). The primary aim of this study was to elicit service recipients' perspectives on the presence of female staff in prehospital EMS. This study focused on three topics: social acceptance, necessary facilities, and female technicians' expectations.

### *Development of item Tools:*

The initial items were developed after a review of the literature. This step resulted in the creation of 50 items. After rewording the items, the finalized items were scored on a 5-point Likert scale; higher scores indicate a respondent's greater agreement with an item.

### *Content Validity:*

To ensure content validity, the content validity index (CVI) was used to examine the item's relevance. To calculate CVI, 15 emergency and instrumentation experts were polled. The experts rated the "relevance" of each item on a 4-point Likert scale (from 1: not very relevant to 4: very relevant). Item-CVI was calculated by dividing the number of experts who gave each item a score of 3 or 4 by the total number of experts. Furthermore, the mean CVI for the entire scale was calculated by adding all I-CVIs and dividing by the number of items.

### *Face Validity:*

To assess the face validity of the proposed scale, 15 service recipients and 15 faculty members were randomly selected and asked to review the scale and express their thoughts on the wording and comprehensibility of the items. They were also asked to

comment on the face validity of the items and make suggestions for improving them.

### *Reliability (internal consistency):*

The internal consistency (reliability) of the scale was determined using Cronbach's alpha of the items ( $n = 456$ ).

### *Exploratory factor analysis (EFA):*

The intended scale's subscales were evaluated using EFA in IBM-SPSS 21. Using Oblimin with Kaiser Normalization and an eigenvalue greater than one, principal axis factoring was used to identify the main factors.

### *Participants and Study Setting:*

This study was carried out in Iran's East Azerbaijan Province, which had 137 emergency units during the study period, including 76 road units and 61 urban units. For sampling, an electronic version of the scale was uploaded to <https://porsline.ir/>, and the link was sent to the mobile phone numbers of approximately 4,000 people who had called the 115 system over the previous six months to complete the scale. Two weeks after no new questionnaires were completed, the sampling link was deactivated.

### *Ethical Considerations:*

This research project was conducted after obtaining permission from the Regional Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1400.606). Before using the scale, respondents were required to fill out an informed consent form. They were also given an email address to which they could send their potential suggestions to the authors.

## Results

This study resulted in the completion of 456 questionnaires. According to the data, the mean age of respondents was  $35.01 \pm 10.79$  years ( $R = 13-80$ ) and the mean frequency of using prehospital EMS was  $2.71 \pm 2.60$  ( $R = 1-15$ ). The demographic information of the respondents is presented in Table 1.

**Table 1.** Demographic information of respondents

Variable		Frequency	Percentage
Frequency of using EMS	1	233	51.1
	2	88	19.3
	3	41	9.0
	4	13	2.9
	5	38	8.3
	6	11	2.4
	7	3	.7
	8	2	.4
	10	16	3.5
	11	1	.2
	15	4	.9
	15	6	1.3
	Total	456	100.0
Gender	Male	307	67.3
	Female	149	32.7
	Total	456	100.0
Marital status	Single	139	30.5
	Married	317	69.5
	Total	456	100.0
Actions taken for the client	Died	18	3.9
	Treated	141	30.9
	Not cooperated in transferring to the hospital	14	3.1
	Transferred to the hospital	283	62.1
	Total	456	100.0
Pulse and blood pressure control by technicians	Not done	143	31.4
	Done	313	68.6
	Total	456	100.0
Electrocardiography	Not done	396	86.8
	Done	60	13.2
	Total	456	100.0
Serum injection	Not done	325	71.3
	Done	131	28.7
	Total	456	100.0
Patient handling	Not done	235	51.5
	Done	221	48.5
	Total	456	100.0
Drug therapy	Not done	340	74.6
	Done	116	25.4

Variable		Frequency	Percentage
Oxygenation	Total	456	100.0
	Not done	339	74.3
	Done	117	25.7
	Total	456	100.0
Clinical examinations	Not done	252	55.3
	Done	204	44.7
	Total	456	100.0
Pulse oximetry (oxygen level control)	Not done	332	72.8
	Done	124	27.2
	Total	456	100.0

**Content and Face Validity:**

Ten items that were repeated and received a lower score were eliminated. The I-CVI for the remaining items (above .8) and the mean CVI for 40 items (CVI > 0.92) were excellent. The suggestions of the respondents regarding face validity led to changes in the wording of some items.

**Exploratory Factor Analysis:**

The EFA was used to evaluate the scale's construct validity. The Kaiser-Meyer-Olkin (KMO) test value was 0.94, indicating that the sample size was adequate for this analysis. The results of Bartlett's test ( $p = 0.001$ ) also demonstrated the appropriate sample size and a significant correlation between them for EFA (Table 2).

**Table 2.** Result of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.945
Bartlett's Test of Sphericity	Approx. Chi-Square	10281.045
	df	780
	Sig.	.000

According to this test, three factors with eigenvalues greater than one predicted 53.41% of the total variance. These three factors were the importance of engagement (17 items), groundwork (14 items), and staffing (9

items). Table 3 displays the results of this test as well as the factor loading of factors. It is worth noting that no items were removed during this stage.

**Table 3.** the EFA results along with factor loading

item	Factor		
	1	2	3
1. The presence of a female technician is useful for providing services to children and infants in prehospital emergencies	.881	.049	-.094
2. Express your agreement with the presence of a female technician in prehospital EMS teams sent to homes	.829	-.140	-.035
3. Express your agreement with the presence of a female technician in prehospital EMS teams sent to women's gatherings such as swimming pools and weddings	.828	.005	-.084

	item	Factor		
		1	2	3
4.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to scenes where there are child clients	.796	-.052	.012
5.	Since women account for 50% of the community, the presence of a female technician in prehospital EMS teams is necessary to observe the religious, cultural, and social beliefs	.788	.051	-.047
6.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to scenes where there are female clients	.781	-.105	.041
7.	The presence of a female technician is necessary to solve the problems of female clients	.759	.013	-.073
8.	In distressing and heartbreaking scenes, it is recommended that the male technician does medical care and the female one takes other responsibilities	.659	-.010	-.073
9.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to scenes where there are adolescent clients	.645	-.191	.211
10.	In distressing and heartbreaking scenes, it is recommended that the female technician does medical care and the male one takes other responsibilities	.564	.159	.093
11.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to outdoor accidents	.551	-.280	.308
12.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to scenes where there are male clients	.480	-.311	.297
13.	There should be 2 or 3 special ambulances for women in each town	.453	.362	.075
14.	Female technicians perform poorly in stressful and high-risk situations (e.g. road accidents and construction debris) where there are several critically injured persons	-.437	.352	-.023
15.	Female technicians cannot perform difficult services in critical situations, such as driving, patient transportation, and ambulance checking	-.427	.339	-.113
16.	Express your agreement with the presence of a female technician in prehospital EMS teams sent to male gatherings such as cafeterias or boys' dormitories	.419	-.206	.125
17.	Female technicians outperform their male colleagues in managing heartbreaking scenes	.405	-.086	.125
18.	The simultaneous presence of male and female technicians in an ambulance can cause negative social feedback	-.183	.587	.057
19.	Recruitment of a female technician for prehospital EMS teams requires many facilities and high costs	-.123	.580	.134
20.	Female technicians are at risk of facing immoral behaviors and sexual abuse from clients and their companions	-.106	.555	.033
21.	Considering the Islamic culture prevailing in Iranian society, the clothing of female technicians can be a barrier to emergency services	.003	.508	.011
22.	Female technicians are exposed to violence from some clients	.048	.472	-.088

	item	Factor		
		1	2	3
23.	Female technicians can be as successful and efficient as men in prehospital EMS	.147	-.461	.015
24.	Clients trust female technicians and accept them as an emergency paramedic	.133	-.456	.098
25.	Iranian society is ready to accept female technicians only to take care of and provide services to female clients	.187	.451	.007
26.	Iranian society is ready to accept female technicians to take care of and provide services to both female and male clients	.155	-.443	.227
27.	If the EMS team includes female technicians, the ambulance should be equipped with devices facilitating some physical services , such as client handling	.146	.433	-.065
28.	It is cost-effective to spend financial resources on providing the necessary infrastructure for the presence of female staff in prehospital EMS	.128	.422	.025
29.	I will advise my daughters and other girls around me to select Emergency Medicine as their university major	.126	-.410	.189
30.	The job descriptions of female technicians should be different from those of male technicians	.076	.404	-.004
31.	Women who choose to study Emergency Medicine should have relatively masculine interests and spirit due to the nature of prehospital EMS	.049	.402	-.063
32.	If there is a female technician in an ambulance, the male technician should be only responsible for driving	.103	-.024	.723
33.	Female technicians in an EMS team should be seated in the rear cabin of the ambulance	.023	.133	.637
34.	Express your agreement with each composition of technicians in prehospital EMS teams (one female technician and two male technicians)	.297	.074	.590
35.	Express your agreement with each composition of technicians in prehospital EMS teams (only two female technicians)	-.028	.069	.555
36.	Express your agreement with each composition of technicians in prehospital EMS teams (two female technicians and one driver)	.120	.075	.523
37.	Express your agreement with each composition of technicians in prehospital EMS teams (two female technicians and one male technician)	.257	.045	.517
38.	Express your agreement with each composition of technicians in prehospital EMS teams (one female technician and one male technician)	.155	-.176	.509
39.	Express your agreement with each composition of technicians in prehospital EMS teams (only two male technicians)	-.211	.310	.440
40.	All prehospital EMS teams sent to any mission should include both male and female technicians	.199	-.174	.422
Extraction Method: Principal Axis Factoring.				
Rotation Method: Oblimin with Kaiser Normalization.				

**Reliability (Cronbach's alpha):**

Cronbach's alpha was 0.9 for the entire scale and greater than 0.7 for its subscales, demonstrating the scale's acceptable internal consistency (Table 4).

**Table 4.** Cronbach's alpha for dimensions related to assessing the feasibility of using female staff in prehospital EMS

Dimension	Cronbach's alpha
Necessity of employment	0.94
Groundwork	0.83
Staffing	0.87

**Discussion**

This study aimed to design and evaluate the psychometric properties of a scale for assessing the feasibility of using female staff in prehospital EMS. The initial scale was designed with 50 statements. When determining the validity, ten items were removed and we evaluated the psychometric properties of the scale with 40 items.

The findings revealed that the intended scale's content validity was high because I-CVI was equal to or greater than 0.78 (19). The results revealed no significant change in the scale's face validity.

The EFA was used to evaluate the scale's construct validity. The Kaiser-Meyer-Olkin (KMO) and Bartlett's tests indicated that the sample size for EFA was adequate. Three factors with eigenvalues greater than one explained 53.41% of the total variance. These three factors were the importance of engagement, groundwork, and staffing.

The evidences have shown that the gender compatibility between the patient and the caregiver leads to a better quality of communication with the patient and vice versa, the lack of gender compatibility is the basis for the weakening of the relationship between the caregiver and the patient and lack of sufficient participation in the diagnosis and treatment of the disease (17). The issue of gender compatibility between the patient and the caregiver is important from different aspects, medical, psychiatric, religious, cultural and social. In some cases, gender non-conformity causes different aspects of the disease to be hidden, as well as patient dissatisfaction (20).

The first factor included 17 items that primarily emphasized the importance of having female staff on hand during emergency operations to assist the injured females, adolescents, and children. In other words, it should be determined which types of services necessitate the presence of female personnel and whether they are capable of participating in all types of emergency services or whether their presence is contingent on factors such as the age and gender of the clients.

The female doctor-female patient dyad is the most patient-centered; it is distinguished by longer consultations, more biomedical conversation (such as therapeutic and medical concerns), and more psychosocial talk (such as lifestyle and social factors) (21). By fostering patient trust, improving communication, and raising patient satisfaction, gender concordance may also enhance the entire patient-caregiver relationship (22). Research revealed that gender concordance may be associated with better results for diabetes and hypertension as well as with the provision of preventative counseling. Improved health outcomes can be attained by improving patient-physician communication, as it has a favorable impact on the patient experience in general (22).

It appears that the presence of female emergency personnel is primarily required to provide services to female clients. According to a study conducted on recruited female staff in Saudi Arabia, female patients requested the presence of female staff in prehospital EMS to protect their privacy and adhere to their cultural and religious beliefs (23). This is critical for both female patients and their families, as the lack of female staff in



emergency services is one of the reasons why Iranians are not completely satisfied with EMS in this country (24). Data on cross-gender interactions show that female doctors have a more patient-centered mindset [21]. In actuality, it was discovered that female caregiver worked harder to create partnerships, talked more upbeat, and provided more information and emotional support. Additionally, both male and female patients of female caregiver engaged in more dialogue with them, expressed themselves more openly, shared more information, and revealed partnership declarations (25). Another study found that the absence of female staff was the primary reason for the refusal of help by 20-30 % of women in an Islamic country who needed emergency services, emphasizing the importance of female staff presence in prehospital EMS (23). Women in general receive less emergency care than men, not only in Islamic and Asian countries but also in the United States, owing to men's higher employment rate in EMS (26). A study in the United States, for example, found that while there is an increasing trend in recruiting females for prehospital EMS, the number of female staff does not suffice to support the emergency services that require the presence of female staff (27).

The second factor included 14 items that were primarily focused on the preparations that should be made to maximize the effectiveness of this plan. The empowerment of female employees, their qualifications, the plan's cost-effectiveness, and the necessary facilities were all mentioned in this factor. Given the need for changes in the prehospital EMS system (e.g., structural changes and public culture promotion), it should be determined whether the use of female staff is cost-effective. Female staff's capabilities for working in EMS should also be assessed to ensure that they have the necessary managerial skills to deal with heartbreaking scenes (28). Furthermore, female staff cannot participate in prehospital EMS while pregnant. To reduce occupational hazards for female employees, many European countries relocate pregnant female employees without changing their salaries or providing them with early paid maternity leave (29-31). This increases the financial burden of employing female personnel in

prehospital EMS. All of these issues are assessed on this subscale.

On the other hand, females are more vulnerable to occupational injuries, such as back and shoulder pain, and mental health problems due to their physical conditions (32, 33). Female staff should therefore be trained in handling the injured, strengthening upper torso muscles, and improving concentration skills. Fundamental changes should be made to mechanical handling equipment (e.g., electric and self-propelled stretchers and electronic chairs) and equipment lighting (34, 35).

The third factor included 9 items, the majority of which were related to one of the questions about ideal staffing.

This factor assesses the ideal staff composition, which is one of the major concerns about the participation of female staff in prehospital EMS. In Turkey, female personnel work in most EMS operations and even as ambulance drivers. (36). Concerns have been raised about increased violence against EMS personnel when EMS is made up entirely of females. However, studies have found no statistically significant difference in this regard between male and female prehospital EMS personnel, and both men and women working in such units face high levels of violence (37, 38). Controversy, in Saudi Arabia, for example, one of the main causes of violence against prehospital EMS staff was opposition to the examination of female patients or those injured by male staff (23, 39). Therefore, the presence of female personnel in prehospital EMS appears to reduce the risk of violence against EMS personnel. On the other hand, the presence of female staff in EMS units necessitates providing facilities for separate accommodation and job descriptions for male and female staff. Indeed, staffing should aim to solve problems related to both employee violence and cost-effectiveness.

#### ***Research Limitations and Future Directions:***

The 3-factor solution showed promising psychometric properties, but it may not mirror the literature in its entirety because there was limited research in this field. Thus, future studies should continue to refine the scale items and provide

confirmatory factor analysis with new samples of participants. While considered a weakness, the findings might also reflect the nature of scale development, which draws on the theory of critical decision-making at each step (40). We believe our study involved necessary steps toward achieving a valid scale of Engagement of Female Staff in Prehospital Emergency Medical Services from the perspective of Service Recipients. We trust the power of our statistical tests, as our sample size was large, and we adopted probability-stratified sampling, allowing the findings to be generalizable to the Staff of the Prehospital Emergency Medical Services population in Iran.

The main research limitation was related to the sampling method, which made it difficult to classify, randomize, and accurately determine the sample size. However, due to the COVID-19 pandemic and the need for a large sample, this sampling method was the only option.

Finally, this scale needs to be validated with new samples and should involve testing construct validity by providing cumulative evidence against already validated measures drawn from the nomological net of female staff engagement. Last, it would be especially useful to assess how this scale performs in other cultures with similar/dissimilar organizational structures. Cross-cultural validation would ensure that culture-sensitive measures are being used for research and organization-driven purposes.

## Conclusion

According to the study findings, the main dimensions that should be considered to assess the feasibility of female staff employment in prehospital EMS from the perspective of service recipients are the necessity of engagement, groundwork, and staffing. The intended scale's design and psychometric properties were both appropriate for Iranian culture. Therefore, it can be used to examine public opinion before, during, and after the inclusion of female personnel in prehospital EMS. Since the presence of female staff in prehospital EMS is regarded as a novel issue, there are numerous concerns about facilities, cost-effectiveness, public opinion, and appropriate staffing. The proposed

scale can provide answers to these questions as well as assist officials in identifying problems and gathering public suggestions and requests.

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## Conflict of Interest

There is no Conflict of interest in this study.

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## Data Availability

The raw data supporting the conclusions of this article are available from the authors upon reasonable request.

## Ethical Statement

This study has been approved with ethics code IR.TBZMED.REC.1400.606.

## Author contributions

Study design: EIA, EA

Data collection: EA

Data analysis: PS

Study supervision: AD

Manuscript writing: EIA, AD

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