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Factors Influencing Self-Help Education During Public Emergencies Among Older Migrants: A Cross-Sectional Study in China's mainland

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ABSTRACT

Background: The number of older adult migrants in China continues to grow. As a unique population characterized by both "mobility" and "aging," they face heightened risks during public emergencies.
Objective: This study investigated the current acceptance rate among these older adult migrants with respect to education for self-help in a public emergency (ESHPE) and analyzed influencing factors.
Study design: A cross-sectional study.
Methods: This study's data were derived from the 2018 National Migrant Population Dynamic Monitoring Survey, conducted by the National Health Commission of China; overall, 5840 migrants were included in this study. SPSS 25.0 and RStudio 4.3.2 were utilized to analyze the selected sample, while Chi-square tests were conducted to perform univariate analysis on the acceptance rate of ESHPE among older adult migrants. A combination of the Random Forest model and binary logistic regression analysis was employed to assess the importance of statistically significant variables.
Results: Overall, 1162 older adult migrants received ESHPE, representing an acceptance rate of 19.90 %. The acceptance rate was lower among those aged over 75 (Odds Ratio [OR] : 0.637, 95 % Confidence Interval [CI] : 0.454–0.893); residing in rural villages (OR : 0.757, 95 % CI : 0.616–0.931); with a migration duration of 11–15 years (OR : 0.679, 95 % CI : 0.540–0.853), 16–20 years (OR : 0.725, 95 % CI : 0.547–0.961), or over 20 years (OR : 0.708, 95 % CI : 0.531–0.943); who had migrated for family (OR : 0.646, 95 % CI : 0.544–0.768), social (OR : 0.559, 95 % CI : 0.434–0.718), or other reasons (OR : 0.364, 95 % CI : 0.191–0.691); and who had not established resident health records (OR : 0.693, 95 % CI : 0.582–0.825) or were unaware of or unclear about such records (OR : 0.494, 95 % CI : 0.388–0.630).
Conclusions: The acceptance rate of ESHPE in this cohort remains relatively low. Therefore, targeted intervention measures tailored to their specific needs must be developed, and more focused educational resources for public emergencies must be created. Online interactive platforms should be established to enhance the self-help education content and strategies. Such measures should help improve the acceptance rate of ESHPE among older adult migrants.

1. Introduction

Public emergencies, including natural disasters, accidents, public health incidents, and social safety events,[1] pose significant threats to social stability and public safety. These events are typically unpredictable and destructive, potentially resulting in large-scale casualties and economic losses.[2,3] In recent years, the frequency of public emergencies has increased worldwide, with the COVID-19 pandemic

Abbreviations: ESHPE, Education for self-help in a public emergency; CMDS, China Migrants Dynamic Survey; PPS, Probability proportional to size; RF, Random forest; OOB, Out-of-bag; MDA, Mean Decrease in Accuracy; OR, Odds Ratio; CI, Confidence Interval

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serving as an example. These events hinder society's development[4,5] and profoundly impact the public's psychological and physical health.[6–8] In such emergencies, an individual's self-help ability directly affects their odds of survival and speed of post-disaster recovery. Therefore, conducting education for self-help in a public emergency (ESHPE) is of paramount importance. ESHPE, an important component of residents' health education, includes the emergency awareness, knowledge, and skills needed in the pre-incident prevention, in-process response, and post-incident disposal stages.[9] ESHPE not only equips the public with emergency knowledge and skills but also enhances their emergency response ability, thereby minimizing the negative impacts of disasters.[10]

A broad and widely utilized definition of migrant, as provided by the International Organization for Migration, is as follows: "an umbrella term, not defined under international law, reflecting the common lay understanding of a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons."[11] However, in China, the term "migrant" refers to those whose current address does not match their household registration.[12] According to the 2018 China Migrant Population Development Report, the size of China's migrant population has entered an adjustment period.[13] However, the number of older adult migrants continues to grow.[14] As a vulnerable group characterized by both "mobility" and "aging," older adult migrants face heightened risks during public emergencies. Factors such as declining physiological functions and reduced cognitive abilities further increase their vulnerability in such situations,[15–17] thus increasing their reliance on external support during emergencies.[18] Additionally, because of household registration restrictions and the instability associated with migration, older adult migrants frequently struggle to access public services and resources on par with local residents, further exacerbating their vulnerability during public emergencies.[19] Therefore, providing ESHPE for older adult migrants is essential to improve their emergency response capabilities. In China, with the rapid urbanization process resulting in a yearly increase in the older adult migrant population, effectively improving this group's self-help abilities has become an urgent social issue.

Despite ESHPE's undeniable importance, current research on the acceptance of such education among older adult migrants and its influencing factors remains insufficient. Existing domestic and international studies predominantly focus on general health education[20,21] or specific categories such as mental health education,[22] chronic disease education,[23,24] and communicable disease education,[25] with a notable lack of research specifically addressing ESHPE. This study focuses on the acceptance of ESHPE among older adult migrants, which compensates for the deficiencies of current research to an extent.

This study utilizes data from the 2018 National Migrant Population Dynamic Monitoring Survey and employs Random Forest (RF) models and binary logistic regression analysis to systematically analyze the factors influencing the acceptance of self-help health education among older adult migrants. By identifying key influencing factors, this study provides a scientific foundation for formulating targeted health education policies, thereby enhancing the self-help capabilities of older adult migrants during public emergencies and reducing the negative impacts of disasters.

2. Methods

2.1. Study design and participants

This was a cross-sectional study. This study's data were derived from the 2018 China Migrants Dynamic Survey (CMDS), conducted by the National Health Commission of China.[26] The survey employed a stratified, multi-stage sampling method based on probability proportional to size (PPS). In the first stage, the townships (towns and streets) were sampled according to the PPS method. In the second stage, village (neighborhood) committees were picked within the selected townships (towns and streets) using the same method. Finally, in the third stage, individual respondents were selected from the chosen village (neighborhood) committees.[12] The target population included migrants aged 15 years and older who had resided in their current location for at least one month and did not hold local household registration (hukou). The survey covered 31 provincial-level administrative units of China's Mainland, including provinces, autonomous regions, municipalities, and the Xinjiang Production and Construction Corps.[27] The United Nations and World Health Organization (WHO) define individuals aged 60 and above as elderly. Additionally, migrants must have resided in their current location for at least six months to be eligible for health education programs. For this study, the sample was further restricted to migrants aged 60 years and older who had lived in their current location for at least six months.[10] Finally, 5840 migrants were included in this analysis after excluding those with missing information on any study variables.

2.2. Dependent variable and data measurement

This study's dependent variable was the acceptance rate of ESHPE, defined as the proportion of respondents who had received ESHPE relative to the total surveyed population. This variable was derived from the survey question "In the past year, have you received health education in the following areas in your current community/workplace?" Respondents who selected the option "the education for self-help in a public emergency" were considered to have received ESHPE. The dependent variable was treated as a binary variable: Respondents who selected the option for ESHPE were coded as "1," whereas those who did not select it were coded as "0."

2.3. Independent variables and data measurement

Based on previous studies,[28–30] and considering the national context of China, this study included 11 independent variables—namely, gender, age, ethnicity, educational level, household registration type, region, residence type, migration duration, migration distance, migration reasons, and resident health records. The original survey categorized "migration reasons" into numerous subcategories, and these were consolidated into four broader categories for this study—specifically, economic, family, social, and other reasons. For ethnicity, we combined all non-Han ethnic groups into a single category labeled "minority." Age and migration duration were calculated by subtracting the respondent's birth year and year of migration from 2018, respectively. Subsequently, they were further categorized into stages for analysis. The original survey divided regions into four categories, which were adjusted into the following three regions for this study: eastern, central, and western China.[31]

2.4. Statistical methods

2.4.1. The random forest mode

The RF model employs a bagging algorithm to randomly sample the dataset, generating multiple training sets. For each training set, a decision tree is constructed as the base classifier. The final prediction is determined by majority voting across all trees. The importance of variables is ranked based on the best variables selected as splitting nodes in the decision trees.[32–34] The underlying principle is that during each bagging-based resampling process for building a decision tree, some samples are not selected. They are known as out-of-bag (OOB) data. These OOB samples can be utilized for cross-validation, and the cross-validation error serves as the basis for scoring variable importance.[35,36] The RF model is suitable for both classification and regression tasks. Since the dependent variable in this study was a typical binary classification variable, a binary classification RF model was constructed. Our binary classification Random Forest model evaluated

the importance of each independent variable by calculating the Mean Decrease in Accuracy (MDA).[37] A higher MDA value indicates greater variable importance.[8] The random forest was employed to identify key predictive factors through variable importance measures. In this study, the importance of each factor was evaluated by using the RF model to understand the impact of each factor on the acceptance rate of ESHPE to complements the binary logistic regression.

2.4.2. Statistical analysis

In this study, SPSS 25.0 and RStudio 4.3.1 were utilized to analyze the selected sample of older adult migrants. For categorical variables, descriptive statistical analysis was performed using frequencies (N) and percentages (%). Chi-square tests were conducted to perform univariate analysis on the acceptance rate of ESHPE among older adult migrants. Based on the results of the univariate analysis, the RF model was employed to assess the importance of variables with statistical significance. In addition, based on the results of the univariate analysis, binary logistic regression was used for multivariate analysis. A *P-value* of less than 0.05 was considered statistically significant.

3. Results

3.1. Demographic characteristics of participants

This study included 5840 participants, with men accounting for 57.60 % (3364/5840). Most participants were aged 60–65 years, accounting for 56.32 % (3289/5840). Regarding educational attainment, 92.81 % (5420/5840) had obtained middle school or technical secondary school education or below, while only 7.19 % (420/5840) had a college degree or higher. Regarding the type of current residence, 4781 individuals lived in urban communities, and 1059 individuals lived in rural villages. The migration duration was predominantly less than 10 years, with 68.61 % of participants falling into this category (4007/5840). Regarding migration distance, cross-provincial migration accounted for 45.31 % (2646/5840), and family-related reasons were the primary cause of migration, representing 46.42 % (2711/5840). Table 1 presents detailed participant information.

Table 1
Baseline characteristics and variable assignment table of the study population.

Variables	Category	Score	n(%)
Gender	Male	1	3364(57.60)
	Female	0	2476(42.40)
Age (years)	60–65	1	3289(56.32)
	66–70	2	1537(26.32)
	71–75	3	607(10.39)
	> 75	4	407(6.97)
Ethnicity	Han	1	5376(92.05)
	Minority	2	464(7.95)
Educational level	Primary school or below	1	2683(45.94)
	Middle school/ technical secondary school	2	2737(46.87)
	College or above	3	420(7.19)
Household registration type	Agricultural	1	2971(50.87)
	Non-agricultural	2	1821(31.18)
	Agricultural-to-urban	3	550(9.42)
	Non-agricultural-to-urban	4	277(4.74)
	Urban residents	5	217(3.72)
	Others	6	4(0.07)
Region	East	1	2409(41.25)
	Central	2	1367(23.41)
	West	3	2064(35.34)
Residence type	Urban community	1	4781(81.87)
	Rural village	2	1059(18.13)
Migrating duration (years)	0–5	1	2512(43.01)
	6–10	2	1495(25.60)
	11–15	3	791(13.54)
	16–20	4	532(9.11)
	> 20	5	510(8.73)
Migration distance	Cross-provincial	1	2646(45.31)
	Intra-provincial (cross-city)	2	2024(34.66)
	Intra-city (cross-county)	3	1170(20.03)
Migration reasons	Economic reasons	1	2111(36.15)
	Family reasons	2	2711(46.42)
	Social reasons	3	887(15.19)
	Others	4	131(2.24)
Resident health records	Established	1	1810(30.99)
	Not established, never heard of	2	2113(36.18)
	Not established, but heard of	3	1115(19.09)
	Unclear	4	802(13.73)

Data are presented as n(%).

3.2. Acceptance rate of ESHPE among older adult migrants with different characteristics

Among the participants, 1162 individuals had received ESHPE, while 4678 individuals had not; hence, the acceptance rate was only 19.90 %.

The univariate analysis results revealed that factors such as gender, age, educational level, household registration type, region, residence type, migration duration, migration distance, migration reason, and establishment of resident health records significantly influenced whether older adult migrants received ESHPE ($P < 0.05$). Table 2 presents the results in detail.

3.3. Ranking of factors influencing the acceptance rate of ESHPE among older adult migrants

To understand the impact of each factor on the acceptance rate of ESHPE and assess the importance of factors influencing the acceptance rate of ESHPE among older adult migrants, an RF model was constructed based on the results of the univariate analysis. The dependent variable was the acceptance rate of ESHPE, while the independent variables included gender, age, educational level, household registration type, region, residence type, migration duration, migration distance, migration reasons, and resident health records (10 variables in total). The importance of the 10 influencing factors, ranked from high to low, was as follows: household registration type (19.28), region (17.58), resident health records (17.09), educational level (13.96), migration distance (11.44), migration duration (10.02), migration reasons (9.73), age (5.70), gender (1.67), and residence type (−0.59) (Fig. 1).

3.4. Multivariate analysis of factors influencing acceptance rate of ESHPE among older adult migrants

Binary logistic regression analysis was conducted using “the acceptance rate of ESHPE” as the dependent variable (1 = yes, 0 = no) and based on the results of the univariate analysis, gender, age, educational level, household registration type, region, residence type, migration duration, migration distance, migration reasons, and resident health records as independent variables. The Omnibus test of model coefficients yielded a value of 226.816 ($P < 0.05$), indicating the model was statistically significant.

Regarding educational level, older adult migrants with middle school/technical secondary school education or higher had a higher acceptance rate of ESHPE than those with primary school education or below. Regarding household registration type, urban residents, not

Table 2
Acceptance rate of ESHPE among older adult migrants with different characteristics.

Variables	Categories	Received ESHPE Yes(%)	No(%)	χ^2	*P*
Gender	Male	725(21.55)	2639(78.45)	13.627	< 0.001
	Female	437(17.65)	2039(82.35)		
Age (years)	60–65	686(20.86)	2603(79.14)	14.207	0.003
	66–70	313(20.36)	1224(79.64)		
	71–75	108(17.79)	499(82.21)		
	> 75	55(13.51)	352(86.49)		
Ethnicity	Han	1078(20.05)	4298(79.95)	1.018	0.313
	Minority	84(18.10)	380(81.90)		
Educational level	Primary school or below	435(16.21)	2248(83.79)	42.354	< 0.001
	Middle school/technical secondary school	628(22.94)	2109(77.06)		
	College or above	99(23.57)	321(76.43)		
Household registration type	Agricultural	549(18.48)	2422(81.52)	17.453	0.004
	Non-agricultural	372(20.43)	1449(79.57)		
	Agricultural-to-urban	115(20.91)	435(79.09)		
	Non-agricultural-to-urban	64(23.10)	213(76.90)		
	Urban residents	62(28.57)	155(71.43)		
	Others	0(0.00)	4(100.00)		
Region	East	399(16.56)	2010(83.44)	36.911	< 0.001
	Central	271(19.82)	1096(80.18)		
	West	492(23.84)	1572(76.16)		
Residence type	Urban community	1002(20.96)	3779(79.04)	18.611	< 0.001
	Rural village	160(15.11)	899(84.89)		
Migration duration (years)	0–5	520(20.70)	1992(79.30)	20.224	< 0.001
	6–10	337(22.54)	1158(77.46)		
	11–15	137(17.32)	654(82.68)		
	16–20	87(16.35)	445(83.65)		
	> 20	81(15.88)	429(84.12)		
Migration distance	Cross-provincial	480(18.14)	2166(81.86)	12.693	0.002
	Intra-provincial (cross-city)	452(22.33)	1572(77.67)		
	Intra-city (cross-county)	230(19.66)	940(80.34)		
Migration reasons	Economic reasons	460(21.79)	1651(78.21)	9.062	0.028
	Family reasons	503(18.55)	2208(81.45)		
	Social reasons	178(20.07)	709(79.93)		
	Others	21(16.03)	110(83.97)		
Resident health records	Established	468(25.86)	1342(74.14)	113.586	< 0.001
	Not established, never heard of	308(14.58)	1805(85.42)		
	Not established, but heard of	276(24.75)	839(75.25)		
	Unclear	110(13.72)	692(86.28)		

Data are presented as n(%).

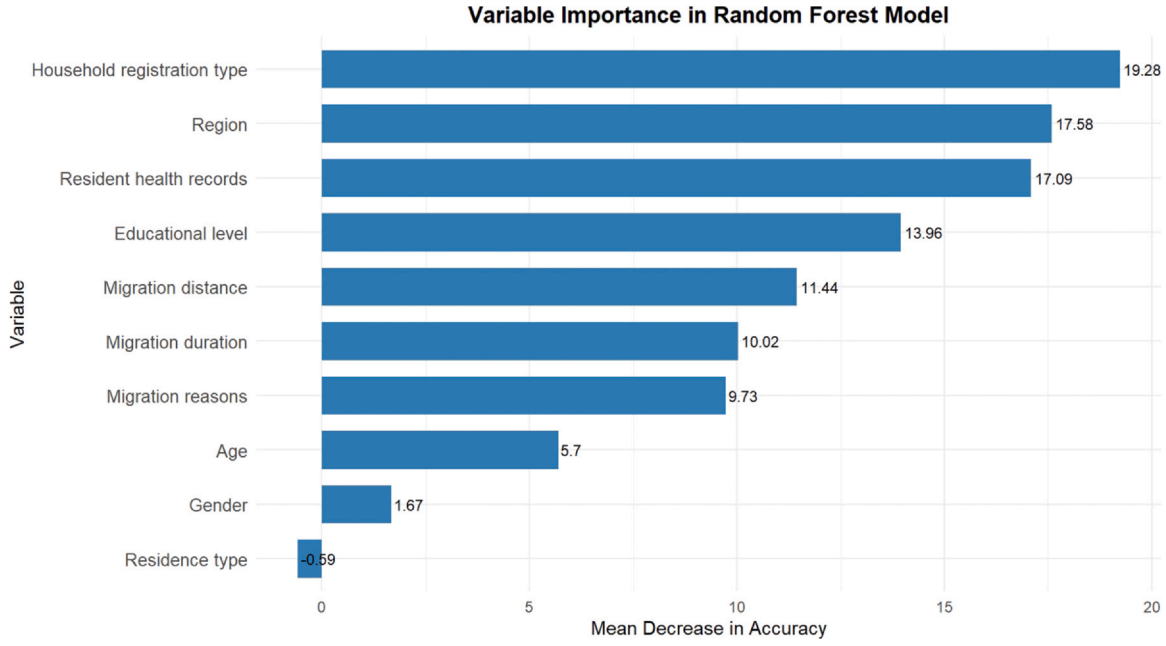

Fig. 1. Factors influencing the acceptance of ESHPE among older adult migrants ranked in order of importance.

Table 3
Factors influencing the acceptance rate of ESHPE among older adult migrants.

Variables	Categories	*b*	*SE*	Waldx^2	*P*	OR	95 % CI
Gender	Male (reference group)						
	Female	−0.096	0.075	1.639	0.200	0.908	0.783–1.053
Age (years)	60–65 (reference group)						
	66–70	−0.127	0.081	2.423	0.120	0.881	0.751–1.033
	71–75	−0.205	0.133	2.368	0.124	0.815	0.627–1.058
	> 75	−0.451	0.172	6.847	0.009	0.637	0.454–0.893
Educational level	Primary school or below (reference group)						
	Middle school/technical secondary school	0.415	0.082	25.788	< 0.001	1.514	1.290–1.777
	College or above	0.561	0.145	14.994	< 0.001	1.753	1.319–2.329
Household registration type	Agricultural (reference group)						
	Non-agricultural	0.059	0.096	0.382	0.537	1.061	0.880–1.279
	Agricultural-to-urban	0.150	0.122	1.529	0.216	1.162	0.916–1.475
	Non-agricultural-to-urban	0.254	0.182	1.950	0.163	1.289	0.903–1.839
	Urban residents	0.530	0.141	14.193	< 0.001	1.699	1.289–2.237
	Others	−19.375	102.386	0.000	0.999	0.000	0.000–0.000
Region	East (reference group)						
	Central	0.138	0.135	1.042	0.307	1.148	0.881–1.495
	West	0.254	0.090	8.054	0.005	1.289	1.082–1.537
Residence type	Urban community (reference group)						
	Rural village	−0.278	0.105	6.962	0.008	0.757	0.616–0.931
Migration duration (years)	0–5 (reference group)						
	6–10	0.195	0.082	5.682	0.017	1.215	1.035–1.427
	11–15	−0.388	0.117	11.013	0.001	0.679	0.540–0.853
	16–20	−0.322	0.144	5.017	0.025	0.725	0.547–0.961
	> 20	−0.346	0.147	5.568	0.018	0.708	0.531–0.943
Migration distance	Cross-provincial (reference group)						
	Intra-provincial (cross-city)	0.066	0.087	0.582	0.446	1.068	0.902–1.266
	Intra-city (cross-county)	0.114	0.116	0.971	0.324	1.121	0.893–1.406
Migration reasons	Economic reasons (reference group)						
	Family reasons	−0.436	0.088	24.494	< 0.001	0.646	0.544–0.768
	Social reasons	−0.582	0.128	20.554	< 0.001	0.559	0.434–0.718
	Others	−1.012	0.327	9.548	0.002	0.364	0.191–0.691
Resident health records	Established (reference group)						
	Not established, never heard of	−0.367	0.089	16.891	< 0.001	0.693	0.582–0.825
	Not established, but heard of	−0.012	0.099	0.014	0.907	0.988	0.814–1.200
	Unclear	−0.704	0.124	32.383	< 0.001	0.494	0.388–0.630

individuals with agricultural household registration, revealed a significant difference, with a positive regression coefficient ($b > 0$). This indicated urban residents were more willing to receive ESHPE. From the perspective of regions, older adult migrants in western China had a higher acceptance rate of ESHPE than those in eastern China. Regarding residence type, older adult migrants living in rural villages had a lower acceptance rate of ESHPE than those living in urban communities. Furthermore, those who had moved for economic reasons were more willing to receive ESHPE. Older adult migrants with a migration duration of 6–10 years had a higher acceptance rate of ESHPE than those with a migration duration of 0–5 years. Those with a migration duration of 11–15 years, 16–20 years, or > 20 years had lower acceptance rates of ESHPE. Finally, older adult migrants who had not established health records (and had never heard of them) or were unclear regarding their status exhibited significant differences and lower acceptance rates of ESHPE in comparison to those who had established health records. Table 3 presents the results in detail.

4. Discussion

The acceptance rate of ESHPE among older adult migrants in China in 2018 was relatively low, at only 19.90 %, indicating a significant gap compared to the target of 95 %.[38] Moreover, it is considerably lower than the acceptance rate among the general migrant population in China.[39] The reasons for this low acceptance rate could include the fact that older adult migrants are predominantly educated at middle school level or below and are of advanced age, which can limit their ability and speed of accepting new information[40] and render them less responsive to health education. Additionally, Tang et al.[41] found that several older adult individuals bear family responsibilities, such as caring for grandchildren, leaving them with limited free time to participate in health education programs. As China's aging population continues to grow and the frequency of public emergencies increases, an urgent need exists to improve ESHPE for older adult migrants. It is essential to consider their dual characteristics, namely, mobility and aging, and integrate demographic factors and migration characteristics to identify their key concerns regarding public emergencies. Local administrators in the inflow areas should provide follow-up services to older adult migrants within their jurisdictions,[42] consolidate their needs for self-help education, and develop more targeted educational resources. Furthermore, health education channels should be expanded by leveraging social media outlets[43] to build health education platforms. Large-character versions and voice interactive education content can be developed to adapt to the characteristics of older adult migrants. The education method is mainly short videos. Further, we can learn from international experience, conduct local language education, encourage older adult migrants to volunteer, and promote ESHPE through the community to increase the sense of participation of older adult migrants. Online health education can overcome spatial and temporal limitations, offer more diverse educational content,[44] and significantly enhance accessibility.

This study indicates that factors such as household registration type, region, age, and migration characteristics significantly influence the acceptance rate of ESHPE among older adult migrants. The differences in the acceptance rate of ESHPE are ultimately attributable to the different level of access to medical service resources among older adult migrants, forming a vicious circle of "low contact-low cognition-low participation." From a demographic perspective, older adult migrants who are older, have lower educational levels, and reside in rural villages exhibit lower acceptance rates of ESHPE. First, older individuals

with lower education levels tend to focus more on their physical health and are less aware of or concerned about health protection during emergencies. Furthermore, they lack the energy and cultural literacy to focus on health education and other health service resources, resulting in lower participation in ESHPE.[45,46] Second, older adult migrants with agricultural household registration or those living in rural villages face challenges owing to the uneven distribution of health resources between urban and rural areas. Residents of rural areas cannot enjoy the same community health service resources as urban residents, and they frequently lack regular health education programs and opportunities to receive ESHPE, lowering accessibility and sensitivity to health education among older adult migrants,[21] which reduces their likelihood to actively seek ESHPE. From a regional perspective, older adult migrants in economically underdeveloped western China have a higher acceptance rate of ESHPE than those in economically developed eastern China. This may be attributed to the significant achievements in basic public health services, including health education, in western regions owing to national policy support.[47] Regarding migration characteristics, older adult migrants who had resided in their current location for less than 10 years and migrated for economic reasons showed higher acceptance rates. This could be because shorter migration durations precipitate less familiarity with the current residence, and economic factors, such as job relocations, often result in greater willingness to integrate into the new community, increasing the likelihood of participating in ESHPE. Therefore, special attention should be paid to older adult migrants who are older, have lower educational attainment, hold agricultural household registration, reside in rural villages, or have longer migration durations. These groups should be included in the scope of health education management in the inflow areas.[42] Local administrators should provide appropriate follow-up services and encourage children's participation and community supervision to enhance the accessibility and awareness of ESHPE among older adult migrants.

The study found that the establishment of resident health records is a significant factor in promoting the acceptance of ESHPE among elderly migrants, with a high level of importance. Elderly migrants who have established resident health records show a higher acceptance rate of ESHPE compared to those who have not. Additionally, older adult migrants who are aware of resident health records have a higher acceptance rate of ESHPE than those who are unaware. The reasons for this are twofold: First, older adult migrants who have established or are aware of resident health records tend to have higher health awareness,[48] resulting in greater acceptance of and cooperation with health education programs. Second, health education and health records are typically managed by primary healthcare institutions. During the process of establishing or learning about resident health records, older adult migrants are exposed to various health education topics at these institutions, making them more proactive in accepting health education.[49] It can be concluded, therefore, that the establishment of resident health records is beneficial for improving the acceptance rate of ESHPE among older adult migrants.

5. Limitations

This study has four primary limitations. First, we utilized a cross-sectional design, which inherently precludes the determination of causal relationships between the acceptance rate of ESHPE and associated determinants among older adult migrants, temporal trends, or sustained impacts. Second, the generalizability of findings is constrained by population specificity: Our observations pertain exclusively to the acceptance rate of ESHPE among older adult migrants and cannot be extrapolated to characterize behavioral patterns across heterogeneous migrant subgroups. Additionally, numerous risk factors may influence the acceptance of ESHPE among older adult migrants. This study's data were obtained from public databases, which may have resulted in the exclusion of some important potential factors. Factors such as certain psychological and environmental aspects were not included. Therefore, future studies should incorporate more relevant variables. Finally, while the observed uneven distribution of the sample size across stratification variables (e.g., residence type) may introduce selection bias, the magnitude of such potential confounding effects remains empirically unverified, warranting confirmatory studies employing longitudinal designs and more representative sampling strategies.

6. Conclusion

In summary, the acceptance rate of ESHPE among older adult migrants remains relatively low. Considering the dual characteristics of older adult migrants—namely, their mobility and aging status—it is crucial to develop targeted intervention measures tailored to their specific needs and create more focused educational resources for public emergencies. Factors such as age, educational level, household registration type, region, migration duration, migration reasons, and resident health records are the primary determinants influencing the acceptance rate of ESHPE among older adult migrants. Furthermore, the methods and channels whereby older adult migrants receive ESHPE should be further optimized. Social media platforms should be effectively harnessed to deliver ESHPE to older adult migrants. Online interactive education platforms should be established to enrich the content and methods of ESHPE, thereby improving the acceptance level of ESHPE among this population. As China's aging society continues to grow and the likelihood of public emergencies increases, addressing the self-rescue needs of older adult migrants in emergencies holds significant importance.

CRediT authorship contribution statement

Junli Chen: Writing – review & editing, Writing – original draft, Software, Methodology, Data curation. **Qianqian Gao:** Writing – review & editing, Writing – original draft, Data curation, Supervision. **Runguo Gao:** Writing – review & editing, Methodology. **Weiqin Cai:** Writing – review & editing, Supervision, Methodology, Writing – original draft. **Haiyan Li:** Methodology. **Qi Jing:** Supervision, Resources, Project administration. **Hafiz T.A. Khan:** Writing – review & editing. All the authors have read and approved the final version of this manuscript.

Ethics approval

The raw data employed herein were authorized by China's National Population and Family Planning Commission. Each respondent provided informed consent before commencing the interview and completed the questionnaire anonymously. This study utilized de-identified, publicly available survey data from the China Migrants Dynamic Survey for secondary analysis. As the data were pre-existing, anonymized, and did not involve any experimental interventions, no additional ethical approval was required for this study. The study followed the principles of the Declaration of Helsinki as revised in 2013.

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Data availability

Restrictions apply to the availability of these data. Data available upon reasonable request.

Declaration of Competing Interest

All authors of this paper declare that they have no conflicts of interest with the journal, the institutions they are affiliated with, and any organizations, etc.

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