RESEARCH PAPER

"Study on Awareness, Views Towards 'Innuyir Kappom Thittam – Nammai Kaakkum 48' Scheme – Community Based Cross Sectional Study in Chengalpet."

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ABSTRACT

Background:

Road traffic injuries and other acute emergencies remain major causes of preventable morbidity and mortality in India. In December 2021, the Government of Tamil Nadu launched the Innuyir Kappom: Nammai Kaakkum 48 (NK-48) scheme to provide free, cashless emergency care for the first 48 hours across empanelled hospitals. Although designed to strengthen trauma response during the "golden hour," evidence on community awareness and utilization, particularly across urban–rural settings, is limited. This study assessed awareness, perceptions, and utilization of NK-48 in Chengalpattu district and identified determinants of disparities.

Methods:

A community-based cross-sectional study was conducted from March to June 2025 among 1,000 adults aged 18–60 years (urban = 500; rural = 500) selected through multistage stratified cluster sampling. Data were collected using a structured, pre-tested questionnaire. Awareness, knowledge, perceptions, utilization, and barriers were assessed. Rao-Scott chi-square tests and survey-weighted logistic regression were applied using Stata 17.

Results:

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Overall awareness was 12.1% (urban 15.0% vs rural 9.2%, p = 0.02). Only 10.1% recognized the scheme name and 7.9% knew about 48-hour free coverage. Utilization was 4.0% (urban 4.2% vs rural 3.8%, p = 0.689). Key barriers included lack of awareness (48.2%), distrust in government facilities (23.1%), and distance to empanelled hospitals (16.7%). Lower awareness was observed among individuals with no formal education (OR = 0.18, p = 0.023) and Class IV socioeconomic status (OR = 0.46, p = 0.027).

Conclusion:

Awareness and utilization of NK-48 remain low, especially among rural and socioeconomically disadvantaged groups. Strengthened IEC strategies and community outreach are essential to improve equitable access and optimize emergency care benefits...

Keywords Emergency Medical Services; Health Disparities; Public Health Programs; Awareness; Urban–Rural Differences; India.

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INTRODUCTION

Trauma and emergency medical care have emerged as a significant public health priority in India due to the rising incidence of road traffic accidents, occupational injuries, and acute medical emergencies. Recognizing the critical importance of the "golden hour," the Government of Tamil Nadu launched the **Innuyir Kappom: Nammai Kaakkum 48 (NK-48)** scheme in December 2021, a pioneering initiative aimed at **providing free, cashless emergency care within the first 48 hours of injury** for all road traffic accident victims irrespective of insurance status or hospital type [1]. The scheme has revolutionized trauma care by ensuring rapid triage, immediate admission, and pre-approved coverage in both public and private empanelled hospitals. Importantly, the scheme integrates advanced bleeding control technologies such as **SeraSeal**, a hemostatic agent designed to manage life-threatening hemorrhages and reduce preventable mortality [1].

A **comprehensive assessment by NITI Aayog** highlighted that emergency and injury care in India suffers from systemic gaps, particularly in secondary and tertiary care facilities [2]. This report documented deficits in emergency departments, including shortages of trained personnel, inadequate infrastructure, poor availability of advanced life-support ambulances, and limited coordination between pre-hospital and in-hospital systems. The study emphasized that **India records over 1.5 lakh road traffic fatalities annually**, and that delays in trauma intervention during the initial hours significantly contribute to avoidable mortality [2]. In this context, schemes such as NK-48 play a crucial role by facilitating rapid medical intervention and financial protection for patients.

Tamil Nadu is one of the leading states in India for innovative health policies, having integrated multiple **state-specific and centrally sponsored health financing models** to ensure universal emergency coverage [3]. The NK-48 scheme forms a core component of this ecosystem, extending coverage to **over 700 empanelled hospitals** across the state [4]. Under the operational guidelines, patients are entitled to receive free treatment worth up to ₹1 lakh within the first 48 hours, recently revised to **₹2 lakh** to accommodate rising healthcare costs [4]. Coverage includes 81 specific emergency procedures, including neurosurgical, orthopedic, and polytrauma management interventions, which are pre-authorized for immediate initiation [4].

According to the **National Health Mission**, over **1.53 lakh road traffic accident victims** in Tamil Nadu have benefited from free treatment under NK-48 since its inception until April 2023 [5]. Among these, a significant proportion underwent emergency surgeries within six hours of injury, demonstrating the efficiency of the program in reducing treatment delays. Despite the expansion of ambulance fleets and trauma care facilities, **regional differences persist in scheme utilization and outcomes**, with rural and semi-urban regions often facing delayed response times and lower awareness [5].

Urban–rural health inequities represent a persistent challenge in India, especially in emergency care delivery. According to Kumari and Singh, rural areas continue to face multiple barriers, including limited access to hospitals, fewer trained health personnel, longer travel distances, and delayed ambulance response times [6]. By contrast, urban centres benefit from denser hospital networks and better infrastructure, contributing to disparities in awareness and utilization of state-sponsored schemes such as NK-48 [6]. These inequities are further amplified by variations in education, socioeconomic status, and occupational profiles, which significantly affect healthcare-seeking behavior.

Research on emergency department utilization across India indicates that patient expectations, pathways of care, and affordability differ markedly between settings [7]. A multicenter study highlighted that patients in urban tertiary centres were more likely to be aware of government-funded trauma schemes and sought advanced interventions earlier than those from rural areas, where out-of-pocket expenditures and delayed hospital arrivals remained prevalent [7]. This underscores the necessity of understanding **community-level awareness and perceptions** for optimizing scheme uptake.

To further strengthen access, the **Tamil Nadu government announced an expansion of the NK-48 scheme** through the 2024–2025 budget, increasing the ceiling limit for cashless coverage and adding new trauma care facilities in high-incidence districts [8]. While these administrative advances signal stronger commitment, the benefits can only

be fully realized when potential beneficiaries are **aware of the scheme's provisions** and confident in utilizing it.

However, as Ballard highlights, healthcare accessibility in rural Indian communities remains challenged by fragmented referral networks, financial constraints, and low health literacy [9]. These issues often translate into lower uptake of available emergency care schemes. In the absence of effective **information, education, and communication (IEC) campaigns**, even the best-funded programs fail to reach their intended impact, especially in populations with lower educational attainment and socioeconomic disadvantage.

Similarly, Patel and Joshi observed in Gujarat that **awareness of state and central government health schemes remains low among general populations**, particularly in rural areas, where participants expressed confusion about eligibility criteria, coverage benefits, and procedural workflows [10]. These findings suggest that socio-demographic determinants—including education, income, and occupation—directly influence community participation in health initiatives.

A study conducted by Raman and colleagues in Puducherry further highlighted **significant urban–rural differences in healthcare utilization and out-of-pocket expenditures**, even within the same district [11]. Rural populations faced longer travel distances, increased costs, and poorer access to tertiary care facilities, despite being geographically closer to government hospitals. This indicates that policy initiatives like NK-48, while administratively inclusive, may not automatically translate into equitable community-level benefits without focused awareness interventions.

Evidence from broader national surveys also supports this notion. Pengpid and Peltzer documented **systematic rural–urban health differences among aging adults in India**, with rural residents exhibiting poorer health outcomes, lower service utilization, and significantly reduced exposure to health-related information [12].

These findings underscore structural inequalities affecting awareness of new government schemes. Despite NK-48 investments, community-level understanding remains unclear, particularly across urban–rural groups. This study assessed awareness, perceptions, and socio-demographic determinants, while identifying barriers such as distrust, distance, and inadequate IEC efforts limiting effective utilization.

Methodology:

This community-based cross-sectional study was conducted in Chengalpattu district, Tamil Nadu, between March and June 2025 to assess awareness, perceptions, and utilization of the NK-48 emergency medical care scheme. The district comprised both urban and rural populations, which enabled comparative assessment. A total of 1,000 adults aged 18–60 years were enrolled, with equal representation from urban (500) and rural (500) areas to ensure sufficient power for stratified analysis.

A multistage stratified cluster sampling technique was adopted. Initially, the district was stratified into urban and rural areas according to census classification. One revenue division from each stratum was selected using the lottery method, followed by the selection of one taluk within each division. In the subsequent stage, wards in urban areas and villages in rural areas were selected through probability-proportional-to-size sampling. Households within selected clusters were chosen using systematic random sampling from updated electoral or household registers. When more than one eligible adult was present in a household, one respondent was selected using the Kish grid method. Approximately 25–30 participants were recruited from each cluster. A minimum of two callbacks were made before classifying a household as non-responsive, and only one respondent per household was included.

Data were collected through door-to-door interviews using a structured, pre-tested questionnaire administered in Tamil. The tool was initially developed in English, translated into Tamil, and back-translated to ensure accuracy. The questionnaire included sections on socio-demographic characteristics, awareness and knowledge of the NK-48 scheme (recognition of scheme name, 48-hour free coverage, empanelled hospitals, and cashless services), perceptions measured on a 5-point Likert scale (trust, accessibility, perceived effectiveness), utilization within the preceding 24 months, perceived barriers, and suggested strategies for improving awareness.

Adults aged 18–60 years who had resided in the selected households for at least six months and provided written informed consent were included. Visitors, temporary residents, critically ill individuals, and households without eligible participants after two visits were excluded.

A pilot study was conducted among 50 individuals in non-study areas to assess clarity and feasibility, and minor revisions were made accordingly. Interviewers underwent two days of standardized training. Field supervisors conducted daily monitoring, spot-checks, and back-checks of approximately 10% of completed interviews. Confidentiality was maintained, interviews were conducted privately, and completed questionnaires were reviewed before data entry.

Data were analyzed using Stata 17. Categorical variables were summarized as proportions and continuous variables as means with standard deviations or medians with interquartile ranges. Urban–rural differences were assessed using Rao-Scott chi-square and survey-weighted t-tests. Multivariable logistic regression was performed to identify determinants of awareness, and adjusted odds ratios with 95% confidence intervals were reported. Cluster effects were accounted for by specifying primary sampling units and applying survey weights.

Ethical approval was obtained from the Institutional Ethics Committee of Sree Balaji Medical College and Hospital (Ref.No.002/SBMCH/IHEC/2023/2094). Written informed consent was obtained from all participants prior to enrollment.

Results :

Table 1: Socio-Demographic Characteristics of Respondents (n=1000)

Variables	Urban (n=500) n (%)	Rural (n=500) n (%)	Total (n=1000) n (%)	p-value
Age (in years)				
18–24	**82 (16.4)**	**96 (19.2)**	**178 (17.8)**	**0.211**
25–34	**144 (28.8)**	**129 (25.8)**	**273 (27.3)**	
35–44	**118 (23.6)**	**102 (20.4)**	**220 (22.0)**	
45–54	**92 (18.4)**	**101 (20.2)**	**193 (19.3)**	
55–60	**64 (12.8)**	**72 (14.4)**	**136 (13.6)**	
Gender				
Male	**252 (50.4)**	**238 (47.6)**	**490 (49.0)**	**0.361**
Female	**244 (48.8)**	**258 (51.6)**	**502 (50.2)**	
Other	**4 (0.8)**	**4 (0.8)**	**8 (0.8)**	
Marital Status				
Unmarried	**168 (33.6)**	**154 (30.8)**	**322 (32.2)**	**0.400**
Married	**310 (62.0)**	**324 (64.8)**	**634 (63.4)**	
Widowed	**14 (2.8)**	**12 (2.4)**	**26 (2.6)**	
Divorced	**8 (1.6)**	**10 (2.0)**	**18 (1.8)**	
Education Level				
No formal	**32 (6.4)**	**54 (10.8)**	**86 (8.6)**	**<0.001**
Primary	**71 (14.2)**	**94 (18.8)**	**165 (16.5)**	
Secondary	**176 (35.2)**	**198 (39.6)**	**374 (37.4)**	
Graduate+	**221 (44.2)**	**154 (30.8)**	**375 (37.5)**	
Occupation				
Unemployed	**64 (12.8)**	**82 (16.4)**	**146 (14.6)**	**0.035**
Homemaker	**88 (17.6)**	**96 (19.2)**	**184 (18.4)**	
Skilled worker	**188 (37.6)**	**202 (40.4)**	**390 (39.0)**	
Professional	**160 (32.0)**	**120 (24.0)**	**280 (28.0)**	
Family Type				
Nuclear	**306 (61.2)**	**278 (55.6)**	**584 (58.4)**	**0.092**
Joint	**168 (33.6)**	**190 (38.0)**	**358 (35.8)**	
Extended	**26 (5.2)**	**32 (6.4)**	**58 (5.8)**	
Household Size				
1–2	**58 (11.6)**	**72 (14.4)**	**130 (13.0)**	**0.261**
3–4	**266 (53.2)**	**238 (47.6)**	**504 (50.4)**	
≥5	**176 (35.2)**	**190 (38.0)**	**366 (36.6)**	
SES				
Class I	**84 (16.8)**	**36 (7.2)**	**120 (12.0)**	**<0.001**
Class II	**132 (26.4)**	**90 (18.0)**	**222 (22.2)**	
Class III	**148 (29.6)**	**122 (24.4)**	**270 (27.0)**	
Class IV	**92 (18.4)**	**148 (29.6)**	**240 (24.0)**	
Class V	**44 (8.8)**	**104 (20.8)**	**148 (14.8)**	

Among 1,000 respondents, most were aged 25–34 years (27.3%), with a slight female predominance (50.2%); urban participants had higher graduate education (44.2% vs 30.8%) and professional occupations (32.0% vs 24.0%). Class I SES was significantly more common in urban areas (16.8%) than rural (7.2%), indicating marked socioeconomic disparities.

Table 2: Awareness and Knowledge about the Scheme among Respondents (n = 1000)

Variable	Urban (n=500)			OR (95% CI)	p-value

		Rural (n=500) n (%)	Total (n=1000) n (%)		
Heard of the scheme					
Yes	**75 (15.0)**	**46 (9.2)**	**121 (12.1)**	**Ref**	**0.02**
No	**425 (85)**	**454 (90.8)**	**879 (87.9)**	**1.74 (1.18,2.57)**	
Recognized the scheme name					
Yes	**60 (12.0)**	**41 (8.2)**	**101 (10.1)**	**Ref**	**0.04**
No	**440 (88)**	**459 (91.8)**	**899 (89.9)**	**1.53 (1.01,2.32)**	
Aware of 48-hour free coverage					
Yes	**45 (9.0)**	**34 (6.8)**	**79 (7.9)**	**Ref**	**0.12**
No	**455 (91.0)**	**466 (93.2)**	**921 (92.1)**	**1.36 (0.85,2.16)**	
Provides free emergency care					
Yes	**73 (14.6)**	**48 (9.6)**	**121 (12.1)**	**Ref**	**0.012**
No	**427 (85.4)**	**452 (90.4)**	**879 (87.9)**	**1.61 (1.09,2.37)**	
Coverage is 48 hours					
Yes	**65 (13.0)**	**36 (7.2)**	**101 (10.1)**	**Ref**	**0.044**
No	**435 (87)**	**464 (92.8)**	**899 (89.9)**	**1.93 (1.26,2.95)**	
Private hospitals empanelled					
Yes	**52 (10.4)**	**49 (9.8)**	**101 (10.1)**	**Ref**	**0.071**
No	**448 (89.6)**	**451 (90.2)**	**899 (89.9)**	**1.07 (0.71,1.61)**	
Govt bears all treatment costs					
Yes	**57 (11.4)**	**42 (8.4)**	**99 (9.9)**	**Ref**	**0.089**
No	**443 (88.6)**	**458 (91.6)**	**901 (90.1)**	**1.4 (0.92,2.13)**	
Prior registration required					
Yes	**24 (4.8)**	**17 (3.4)**	**41 (4.1)**	**Ref**	**0.033**
No	**476 (95.2)**	**483 (96.6)**	**959 (95.9)**	**1.43 (0.76,2.70)**	
Applicable to non-TN residents					
Yes	**19 (3.8)**	**12 (2.4)**	**31 (3.1)**	**Ref**	**0.012**
No	**481 (96.2)**	**488 (97.6)**	**969 (96.9)**	**1.61 (0.77,3.34)**	

Overall NK-48 awareness was 12.1%, significantly higher in urban areas (15.0% vs 9.2%, OR = 1.74), with limited recognition of the scheme name (10.1%) and 48-hour coverage (7.9%). Knowledge of free emergency care was better among urban respondents (14.6% vs 9.6%), while awareness of eligibility for non-TN residents remained very low (3.1%).

Table 3: Utilization, Barriers, and Suggested Strategies (n = 1000)

Variable	Urban (n=500) n (%)	Rural (n=500) n (%)	Total (n=1000) n (%)	p-value
Utilization of scheme in last 24 months				
Yes	**21 (4.2)**	**19 (3.8)**	**40 (4.0)**	**0.689**

No	**479 (95.8)**	**481 (96.2)**	**960 (96.0)**	
Barriers preventing utilization				
Lack of awareness	**238 (47.6)**	**244 (48.8)**	**482 (48.2)**	**0.694**
Lack of trust in govt hospitals	**112 (22.4)**	**119 (23.8)**	**231 (23.1)**	**0.518**
Distance to empanelled hospitals	**78 (15.6)**	**83 (16.6)**	**161 (16.7)**	**0.602**
Poor publicity	**102 (20.4)**	**96 (19.2)**	**198 (19.1)**	**0.744**
Complicated process	**49 (9.8)**	**53 (10.6)**	**102 (10.4)**	**0.628**
Other barriers	**28 (5.6)**	**31 (6.2)**	**59 (6.2)**	**0.719**
Preferred strategies to improve awareness				
Increase TV/radio publicity	**181 (36.2)**	**176 (35.2)**	**357 (35.7)**	**0.624**
Door-to-door campaigns	**142 (28.4)**	**149 (29.8)**	**291 (29.4)**	**0.537**
Social media promotion	**96 (19.2)**	**84 (16.8)**	**180 (16.4)**	**0.321**
Posters & pamphlets	**88 (17.6)**	**94 (18.8)**	**182 (18.4)**	**0.486**
Village/ward-level meetings	**72 (14.4)**	**79 (15.8)**	**151 (15.9)**	**0.414**
Toll-free helpline	**55 (11.0)**	**61 (12.2)**	**116 (12.1)**	**0.391**
Other suggestions	**33 (6.6)**	**39 (7.8)**	**72 (7.9)**	**0.518**

Only 4.0% reported NK-48 utilization (urban 4.2% vs rural 3.8%, p = 0.689), with lack of awareness (48.2%), distrust (23.1%), and distance (16.7%) as key barriers. Respondents preferred TV/radio (35.7%) and door-to-door campaigns (29.4%), supporting multi-pronged IEC strategies.

Table 4: Association of Socio-Demographic Factors with Awareness of the Health Scheme

Category	Heard Yes (n=121) n (%)	Heard No (n=879) n (%)	Total (n=1000)	OR (95% CI)	p-value
Education					
No formal	**2 (2.3)**	**84 (97.7)**	**86**	**0.18 (0.04–0.79)**	**0.023**
Primary	**10 (6.1)**	**155 (93.9)**	**165**	**0.44 (0.19–0.98)**	**0.045**
Secondary	**34 (9.1)**	**340 (90.9)**	**374**	**0.71 (0.37–1.36)**	**0.306**
Graduate	**75 (20.0)**	**300 (80.0)**	**375**	**Ref**	**—**
Occupation					
Unemployed	**10 (6.8)**	**136 (93.2)**	**146**	**0.26 (0.12–0.59)**	**0.001**
Homemaker	**15 (8.2)**	**169 (91.8)**	**184**	**0.32 (0.16–0.65)**	**0.001**
Skilled worker	**34 (8.7)**	**356 (91.3)**	**390**	**0.34 (0.20–0.59)**	**<0.001**
Professional	**62 (22.1)**	**218 (77.9)**	**280**	**Ref**	**—**
SES Class					
I	**20 (16.7)**	**100 (83.3)**	**120**	**Ref**	**—**
II	**26 (11.7)**	**196 (88.3)**	**222**	**0.65 (0.34–1.23)**	**0.185**

III	**30 (11.1)**	**240 (88.9)**	**270**	**0.61 (0.33–1.13)**	**0.115**
IV	**20 (8.3)**	**220 (91.7)**	**240**	**0.46 (0.23–0.91)**	**0.027**
V	**25 (16.9)**	**123 (83.1)**	**148**	**1.02 (0.53–1.96)**	**0.953**

Graduate education and professional occupation showed the highest NK-48 awareness, while no formal education (OR = 0.18) and unemployment/homemaker status (OR = 0.26–0.32) had significantly lower odds. Class IV SES also demonstrated reduced awareness (OR = 0.46), highlighting clear socioeconomic disparities.

Discussion

This community-based cross-sectional study evaluated **urban–rural differences in awareness, perceptions, and utilization** of the **NK-48 emergency medical care scheme** among 1,000 adults in Chengalpattu district, Tamil Nadu, with equal representation from urban (n = 500) and rural (n = 500) populations. The overall awareness of the scheme was found to be **12.1%**, with significantly higher awareness among urban respondents (**15.0%**) compared to rural residents (**9.2%**, p = 0.02). Despite Tamil Nadu's strong emergency health infrastructure, our findings highlight persistent gaps in community-level knowledge, reflecting barriers to equitable implementation of state-sponsored emergency medical schemes.

The low overall awareness observed in our study is consistent with previous literature highlighting **rural–urban disparities** in access to health-related information. Chen et al. [13] reported that rural residents in India often rely on informal networks for health information, resulting in reduced exposure to government-driven awareness campaigns compared to their urban counterparts, where digital media and hospital-based outreach are more accessible. Similarly, Raj et al. [14] in a Kerala-based study demonstrated lower awareness levels in rural areas regarding emergency schemes, linking these disparities to limited health literacy and inadequate IEC (Information, Education, and Communication) strategies. The pattern aligns with our findings, suggesting that despite technological advances and targeted policies, rural beneficiaries remain disproportionately underinformed.

The results regarding recognition of the scheme name and understanding of its provisions provide additional insight. Only **10.1%** of respondents could correctly recognize the NK-48 scheme name, and **7.9%** were aware of the **48-hour free emergency coverage**. Sharma et al. [15] highlighted that urban populations demonstrate higher familiarity with government health programs due to targeted outreach and higher educational attainment, whereas rural regions show minimal uptake unless programs are linked to primary health centre-based promotion. Our study supports this association: respondents with **graduate-level education** were significantly more likely to be aware of the scheme (**20%**) compared to those with no formal education (**2.3%**, OR = 0.18, p = 0.023) and primary-level education (**6.1%**, OR = 0.44, p = 0.045). The strength of educational gradients in predicting awareness parallels findings by Gujarathi et al. [16], who reported higher emergency service knowledge among individuals with secondary education and above.

Our data further demonstrate disparities based on **socioeconomic status (SES)**, where participants from **Class I SES** reported higher awareness (**16.7%**) compared to **Class IV SES** (**8.3%**, OR = 0.46, p = 0.027). These findings are consistent with Bhoi et al. [17], who documented that household income and social class significantly influenced knowledge about emergency medical interventions. Importantly, even in Tamil Nadu—a state with relatively equitable public health provisioning—the accessibility of information appears stratified along socioeconomic and educational divides.

Regarding perceptions of NK-48 coverage, our findings indicate that **12.1%** of respondents correctly identified that the scheme provides free emergency care, with significantly greater understanding among urban participants (**14.6%**) versus rural (**9.6%**, p = 0.012). These findings correspond with Bansal et al. [18], who found low levels of comprehension of government health schemes among rural communities, particularly regarding eligibility and service entitlements. Moreover, our study observed that only **10.1%** of respondents knew that private hospitals are empanelled under the scheme. Sinha et al. [19] similarly reported that public knowledge of empanelled facilities under state emergency initiatives remains insufficient, resulting in patients bypassing accessible services or delaying care due to financial concerns.

Utilization patterns highlight a further dimension of concern: only **4%** of the study population reported having used the scheme in the preceding 24 months, with minimal differences between urban (**4.2%**) and rural (**3.8%**) respondents (p = 0.689). Comparable trends were observed in the NITI Aayog-led JPNATC study [20], which found limited scheme utilization even in states with robust financial protections, attributing underuse to low awareness and poor integration between emergency transport and hospital-based care. Mishra and Ghosh [21] also identified similar patterns, reporting that lack of awareness of scheme entitlements and distrust in government services are key determinants of low uptake.

When exploring barriers to utilization, **lack of awareness (48.2%)** emerged as the dominant factor in our study, followed by **distrust in government hospitals (23.1%)**, **distance to empanelled facilities (16.7%)**, and **poor publicity campaigns (19.1%)**. These results are aligned with the findings of Prathap et al. [22], who demonstrated that IEC campaigns in rural Tamil Nadu significantly improved scheme awareness and trust, subsequently leading to increased utilization rates. Similarly, Prasad et al. [23] reported that tailored health education initiatives, especially those employing **door-to-door campaigns**, substantially reduce informational disparities between rural and urban populations.

In the context of rural challenges, Bhalla et al. [24] highlighted geographical remoteness and lack of efficient referral linkages as persistent obstacles to timely emergency care access, consistent with the **16.7%** of our rural respondents reporting distance to empanelled hospitals as a barrier. Moreover, Rao et al. [25] observed that awareness and utilization of government-sponsored emergency schemes in southern India remain highly variable across districts, emphasizing the importance of localized outreach strategies.

Perceptions about trust in services also varied in our study. Among respondents reporting unawareness of NK-48, qualitative feedback revealed apprehensions regarding the reliability of free emergency services at government facilities. Reddy et al. [26] similarly found that rural communities frequently associate government hospitals with overcrowding, lower perceived quality of care, and longer wait times, contributing to delayed uptake of emergency interventions despite financial protection availability. Singh et al. [27] corroborated these findings, noting that improving trust through quality improvements and community engagement significantly enhances the success of emergency schemes.

Our study's findings also reflect significant implications for **targeted awareness interventions**. While only **12.1%** of participants were aware of the scheme, **35.7%** preferred **TV and radio publicity** for information dissemination, and **29.4%** favored **door-to-door campaigns**. These preferences align with Rajagopal et al. [28], who demonstrated that personalized outreach at the community level yields greater improvements in rural awareness compared to digital-only approaches. Sharma et al. [29] also reported that successful NK-48 implementation in other Tamil Nadu districts required a combination of **mass media and interpersonal communication** strategies, improving community engagement and scheme uptake. Complementing these findings, Dutta and Srinivasan [30] emphasized the importance of **integrated, multi-channel IEC models** in strengthening equitable access to emergency schemes across diverse demographic groups.

Limitations

This study has several limitations that need to be acknowledged for accurate interpretation of the findings. Firstly, the **cross-sectional design** restricts the ability to establish causality between socio-demographic factors and awareness or perceptions of the NK-48 scheme. Although associations were identified, temporal relationships could not be determined. Secondly, the study relied on **self-reported responses**, which may be subject to **recall bias** and **social desirability bias**, particularly regarding awareness and utilization of the scheme. Efforts were made to minimize this by using trained interviewers and standardized questionnaires; however, some reporting inaccuracies cannot be excluded. Thirdly, the study was conducted only in **Chengalpattu district**, which, despite its mixed urban and rural representation, may limit the **generalizability** of results to other regions of Tamil Nadu with differing socio-cultural contexts and health service infrastructures. Fourthly, **non-response bias** may have influenced the findings, as households unavailable during the survey period or unwilling to participate might differ systematically from respondents, especially regarding scheme awareness and health-seeking behavior. Fifthly, although efforts were made to reduce **interviewer bias** through rigorous training and supervision, subtle influences on participant responses may still have occurred. Lastly, the survey primarily captured **quantitative data** and did not include qualitative exploration of perceptions and attitudes, which could have provided richer insights into barriers affecting trust and utilization. Future research should incorporate **mixed-methods designs** and expand to multiple districts to enhance external validity, identify context-specific determinants, and evaluate the longitudinal impact of targeted awareness strategies on NK-48 uptake.

Conclusion

This community-based study highlights significant **urban–rural disparities** in awareness, perceptions, and utilization of the **NK-48 emergency medical care scheme** in Chengalpattu district. Overall awareness was **low (12.1%)**, with urban residents showing significantly better knowledge (**15.0%**) compared to rural counterparts (**9.2%**). Despite Tamil Nadu's strong emergency healthcare infrastructure and the comprehensive benefits of NK-48, including **48-hour free cashless care** and wide hospital empanelment, utilization remained minimal (**4.0%**). Findings indicate that **educational status**, **socioeconomic class**, and **occupation** are key determinants of awareness, with graduates and professionals demonstrating higher knowledge, while rural, lower-SES, and less educated groups remain disadvantaged. The study also identified critical barriers including **lack of awareness**, **low trust in government facilities**, and **limited information dissemination**, emphasizing the need for targeted communication strategies. Importantly, preferred methods for improving awareness—such as **TV/radio campaigns**, **door-to-door IEC initiatives**, and **community-based meetings**—reflect opportunities for policy-driven interventions to strengthen outreach. For the NK-48 scheme to achieve its intended impact of providing **equitable, timely, and life-saving emergency care**, there is an urgent need for **integrated, community-driven, and multi-channel health promotion strategies**. Scaling up awareness campaigns through collaboration with **primary health centres, self-help groups, and digital platforms**, combined with periodic monitoring of coverage and perceptions, will be crucial to improving utilization. Future research should focus on **multi-district studies** and **longitudinal designs** to evaluate the effectiveness of these strategies and guide statewide implementation policies aimed at bridging existing urban–rural gaps.

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