Survey of Ambulance Usage by Patients in Metropolitan and Provincial Cities in Indonesia for Emergency Medical Services Utilization

Syaribah Noor Brice; Paul Harper; Raden Suhartono; Asti P. Rini; Aryono Djuned Pusponegoro; Geraint Palmer; Vincent Knight; Mark Tuson; Jennifer Lloyd; Jonathan Turnbull-Ross; Daniel Gartner.

Abstract

Purpose: Emergency Medical Services in Indonesia continue to face challenges. The system operation and resource availability vary from region to region which may influence the access and utilization of the services. The study aims to describe the utilization of EMS in metropolitan and provincial cities in Indonesia.

Design/methodology/approach: We used a cross-sectional survey design involving patients who attended four general hospitals across the metropolitan city of Jakarta and one hospital in the provincial city of Jayapura in Papua. The questionnaires covered patients' demographic and medical profiles, reasons for choosing the transportation mode, and time related to the emergency event. All patients attended the hospital emergency departments had equal opportunity to be included. Nurses working at the hospitals administered the questionnaires based on the answers given by the patients. Statistical tests such as Chi square and Kruskal Wallis were used to compare the data.

Findings: A total of 1,521 patients gave verbal consent to participate. The samples composed those patients from the metropolitan (82.1%) and provincial cities (17.9%). Only 10.9% of patients in metropolitan Jakarta and 2.6% in provincial city Jayapura came to the hospital emergency departments in an ambulance. A high proportion of patients did not know how to contact an ambulance (71.7% in metropolitan and 73% in provincial cities, respectively).

Originality/value: Studies on ambulance utilization in Indonesia are scarce. This study serves as an update to the previous study for metropolitan Jakarta and as far as the authors' knowledge, this is the first study that surveyed the utilization of emergency medical services in provincial city of Jayapura at this level.

Keywords: Emergency medical services, ambulance services, Low- and Middle-Income Countries, Southeast Asian countries, Indonesia, hospital emergency department.

Introduction

Emergency medical services (EMS) in Indonesia is still not a subject of priority and shared similar characteristics to other low- to middle-income countries – LMICs (Bhattarai, et al., 2023), despite existing evidence that suggests early intervention of many acute conditions can lower the rates of morbidity and mortality (Dünser, et al., 2024). Indonesian EMS consists of pre-hospital, hospital and the development of emergency medicine as a specialty (Yusvirazi, et al., 2018). Unmet demand persists (BPS-Statistics of DKI Jakarta Province, 2022), such as a low utilization of ambulance at pre-hospital settings (Brice, et al., 2022). This can be a result from the fact that the services are not well organised, lack of funding, lack of trained paramedics, and faced by lack of road infrastructure (Suryanto, et al., 2017).

The emergency events can be due to acute health problems (both communicable or non-communicable diseases), natural and man-made disasters, or trauma injuries such as accident, poisoning, drowning, self-harm, etc. With respect to clinical problems, ischemic heart disease and stroke in Indonesia have shown an annual increase of approximately 2% and accounted for 14.38% and 19.42% of all deaths in 2019 respectively (IHME, 2022). Meanwhile, trauma resulting from road injuries contributed to around 2% of deaths in the same year (IHME, 2022). In relation to disasters, Indonesia experienced around 2,392 incidents in 2022 affecting more than 200,000 people through deaths, injuries, and suffering (PDSI, 2022). Prompt assessment and timely treatment of life-threatening conditions can significantly reduce both morbidity and mortality (Gong, et al., 2020). In particular, in developing countries, effective prehospital trauma care has been shown to reduce mortality by 25% (Henry & Reingold, 2012).

In LMICs, access barriers to prehospital emergency care can be related to the cultural and organisational features of the care provision which include infrastructure, communication and coordination, availability of transportation, equipment, and resources such as personnel and finances (Kironji, et al., 2018). Studies also found that the access barriers can contribute to long ambulance response time (Whitake, et al., 2024) and delay in patient transfer to hospital emergency departments (Li, et al., 2022). In a country with geographical differences, limited resources and restricted access to prehospital care can contribute to inequalities in accessing the service (McHenry & Smith, 2023; Jarman, et al., 2019).

Limited resources, such as emergency transportation, have been much discussed in literature when concerning the provision of emergency services in developing countries (Choi, et al., 2017). While the ambulance availability rate is between 0.3-3.2 per 100,000 population in Pan Asian countries (Shin, et al., 2012), Indonesia especially in Jakarta has 0.8 ambulances per 100,000 population (Brice, et al., 2022) and probably far less across the whole country with a population over 280 million.

Specific studies conducted in Southeast Asian countries have highlighted challenges in the provision of EMS. The EMS in Indonesia and Malaysia face major issues concerning efficiencies in information sharing between the pre-hospital and hospital care (Tokita et al., 2024). In Vietnam, the unmet need of EMS remains considerable, primarily due to inadequate ambulance resources (Hoang et al., 2021). In contrast, Singapore's EMS system has undergone substantial advances in pre-hospital care through initiatives such as the expansion of ambulance fleets, implementation of digital case recording, introduction of mechanical CPR, and deployment of community responders (Nadarajan et al., 2024**).**

Studies on ambulance utilization have employed various approaches, including quantitative, qualitative and mixed methods designs (Setyawan & Setiyarini, 2025). In developing countries, such as Ethiopia, a cross-sectional design has been used to explore the ambulance utilization trend as well as patients' demographic and clinical profiles (Adem et al., 2024). Similarly, another study explored the relationship between patients' satisfaction and ambulance use (Asfaw et al., 2024). Although both studies employed survey-based design involving ambulance users, they lack qualitative analysis of patients' decision-making process.

In neighbouring countries such as Malaysia, one study analysed the costs and utilization of ambulance services from the perspective of providers (Bahari et al., 2022). The findings indicated variations in both costs and utilization depending on the ambulance's age, ambulance types and the region. The ambulance's age was measured in life years. The findings suggested that the older the ambulances the lower the cost they incurred. The authors argued this could be due to the low utilisation of the ambulances. However, the study did not explore patients' perspective.

Studies concerning emergency services utilization in Indonesia are scarce. This is mainly due to the fragmented services and data availability. The utilization of emergency services in

metropolitan Jakarta has been explored previously (Brice, et al., 2022). The results have been presented and discussed with the Health Office in Jakarta. However, nothing with similar quality has been done in the provincial city of Jayapura, in the region of Papua. Furthermore, no study has investigated the utilisation of EMS in both Jakarta and Papua simultaneously. Since the previous study, EMS in Jakarta has undergone some improvements including call centre integration and increased resources. A question remains whether the improvements has led to the increase in utilization of ambulances in Jakarta. This study endeavours to answer that question and fill the research gap concerning the utilization of ambulances in Jayapura. It draws on insights from urban-rural health disparity theory to interpret differences in emergency service use between a metropolitan and a provincial city. While both Jakarta and Jayapura are urbanized, the provincial city of Jayapura displays features commonly associated with rural or underserved areas — such as limited access to specialized emergency services, fewer tertiary hospitals, and a population that often resides farther from major healthcare facilities (Smith et al., 2008; Hart et al., 2005).

The study seeks to describe the utilization of EMS in metropolitan and provincial cities in Indonesia by examining patients' profiles, their medical conditions, as well as the transportation modes they used to reach the hospital. The objectives are to answer the following questions: 1. What can we describe about patients who attended hospital emergency departments from looking at their basic profiles and medical conditions? 2. How did the patients go to the hospitals in the event of emergency? 3. What are the reasons for using or not using an ambulance? 4. What are the reasons for choosing the hospitals? 5. How did the ambulances perform compared to other transportation modes? These questions aim to provide a better understanding on how patients use emergency services. They can reveal who is most in need, what barriers exist to accessing ambulances, and how well ambulances perform compared to other transport modes. The significance of the study includes informing health policy on EMS development, identifying access barriers, and providing insights to enhance emergency preparedness and system responsiveness.

Methodology

Study setting

Jakarta is a metropolitan city with a population density of around 15,000 /km2 (BPS-Provinsi DKI Jakarta, 2019), whilst Jayapura is a provincial city in Papua region with a population

density of 431/km2 (note: population density in whole Papua region is 13.7/km2) (BPS-Statistics of Papua Province, 2023).

Emergency ambulance service in Jakarta has a different set up than the one in Jayapura. In Jakarta, ambulance services are provided by various organisations, ranging from government funded to private sector. The main government-funded organisation responsible for these services is the *Pusat Krisis dan Kegawatdaruratan Kesehatan Daerah* (PK3D).

In contrast, Papua does not have an equivalent system for ambulance services. In this region, ambulances are operated by individual hospitals. Only 94% of general hospitals in Papua have ambulances compared to 100% of general hospitals in Jakarta (Badan LITBANGKES, 2012).

Government funded ambulance services have different types: advance ambulances, basic ambulance units, ambulances for specific purposes such as for newborn, and motorcycle ambulances for rapid response. Their function includes pre-hospital medical evacuation as well as inter-hospital transport. These services are provided free of charge to Jakarta residents. Ambulances in Jakarta are stationed at various locations, including government offices, community health centres, hospitals, police and fire stations (Dinas Kesehatan, 2022).

The survey was conducted from 12 December 2022 to 25 January 2023 in four general hospitals in Jakarta and one general hospital in the city of Jayapura. The hospitals in Jakarta were purposively selected to ensure coverage of the major areas within the city. Of the five hospitals invited to participate, four accepted the invitation. Since the participating hospitals were general hospitals, the study managed to include large number of patients exceeding the required sample size for a large population in Jakarta. Due to limited research resources, only one hospital was included from Jayapura. All participating hospitals had an ED operating 24 hours a day, seven days a week and accepted referrals from community health services or other hospitals. The specialist hospitals were excluded, as they typically treat patients with specific medical conditions such as cancer or cardiovascular disease.

Study design

This cross-sectional study utilized a survey to collect information such as patients' demographic profiles, patients' choice on transportation modes and hospitals, and self-

reported timestamps. A structured questionnaire was developed and administered in person to consenting patients.

Study samples

Patients of all ages and sexes who attended the hospital emergency department during the study period were invited to participate with their verbal consent. The minor patients were represented by their parent or guardian. All patients had equal right to participate or refuse to join in the study. The study only included those patients or patients' guardians who gave the consent to participate. It excluded patients who attended the hospitals for purposes other than the emergency department, such as patients with scheduled visits to the outpatient clinics. Using Cochran's sample size formula, the required sample size for large population, with a 95% confidence level, a 5% margin of error and an estimation of 50%, was approximately 384 participants. However, due to limitation in time, research resources, and the number of participating hospitals, the study adopted a strategy of inviting as many participants as possible. The overall reported response rate was 52%. In total, the study included 1,521 participants, comprising 1,249 (82.1%) from metropolitan Jakarta and 272 (17.9%) from provincial city of Jayapura.

Data collection

Information on patients consisted of demographic characteristics such as age on visit, sex, and patients' occupation. Due to inconsistency found in data entry, the variable occupation was not used in this report. Patients' age was measured in year. Patients' medical conditions included chief complaints and comorbidities. To be consistent with the previous study, we categorised the medical conditions into 9 categories namely Medical, Trauma, Obstetrics, Cardiovascular (General), Cardiovascular (ACS), Respiratory, Self-Harm, Neurological, and Mental Health. There were around 182 medical conditions listed in these categories. Medical conditions that were not part of the named categories, were classified under the category 'Other' for the purpose of analysis. The categorisation of the conditions followed the medical codes provided by the Welsh Ambulance NHS Trust who supported the study (Brice, et al., 2022).

The survey also collected information related to transportation modes used by the patients to go to the hospitals, reasons on using the chosen transport and hospital, patients' knowledge

on contacting ambulance, the associated cost in using the transportation mode, whether the patients have health insurance, and whether the patients needed surgery.

Time-related information included the time when the emergency took place, the time when the patients decided to go to the hospital and hence call for transport, the time when the transportation arrived, the time when the patients left for the hospital, the time when the patients arrived at the hospital, and the time when the patients received the first treatment. Based on these six timestamps, we evaluated the following variables:1. *Patient delay: the time between the emergency occurring and the decision to go to the hospital or call for a transport.* 2. *Transport response time: the time between the decision to go to the hospital and transport arrival.* 3. *Time on the scene: the time between the arrival of transport and departure to the hospital.* 4. *Travel time: the time from leaving the scene until arrival at the hospital.* 5. *Patient waiting time: the time from the patients' arrival at the hospital until the start of treatment.* 6. *Time to treatment: the time duration between when the emergency occurred and when the patient received the treatment for the first time* (Brice, et al., 2022).

This study used a structured questionnaire from the previous study in Jakarta (Brice, et al., 2022). The reliability of the questionnaire was not assessed in this study, as the original instrument focused mainly on content validity. The local health professionals, the ED directors and the 118 Emergency Ambulance Services, reviewed and assessed the appropriateness of the questionnaire to the context. Finally, the nurses from each hospital administered the paper-based questionnaires based on the answers given by the patients and guardians.

Data analysis

The supervisors of the survey prepared the data using Microsoft Excel. The data analysis was conducted using Python version 3.7.1 with packages including Pandas, Numpy, Scipy.Stats, and Matplotlib Pyplot. The analysis was grouped based on categories of different city types as well as entire dataset. Statistical tests were performed for the numerical and categorical data using a p-value of 0.05 for any significant results. P-values that gave extremely low values were reported as $p < 0.001$ and $p < 0.05$ if between 0.001 and 0.05. The normality tests were conducted on the numerical data (age and time duration) followed by the comparison tests between groups. Normality tests (Shapiro-Wilk) were performed on numerical data including the age of patients and duration between events. The results indicated that the age

and duration between events were not normally distributed ($p < 0.001$ and $p < 0.05$ respectively). For this reason, we use non-parametric tests (Kruskal Wallis) for further analysis. Continuous numerical data were also presented using summary statistics including median and interquartile (IQR) range, whereas the categorical data were presented using counts and percentages. Chi-square tests were performed to test the difference in the proportion of variables between two different types of cities or different categories such as transportations. In the case where sample size and group numbers were small, the comparison of proportion between groups in two cities was conducted using Fisher's Exact test. The results reported as significant differences with $p < 0.05$.

Results

What can we describe about patients who attended hospital emergency departments from looking at their basic profiles and medical conditions?

The summary of patients' basic characteristics and the categories of medical conditions is presented in Table 1. The study included 1,521 participants, comprising 1,249 (82.1%) from metropolitan Jakarta and 272 (17.9%) from the provincial city of Jayapura. There were no missing values detected in the basic characteristics such as age and gender. Overall, the sample consisted of 54.9% males (n = 835) and 45.1% females (n = 686). This slight male's predominance was consistent across both locations: in the metropolitan city, males comprised 55.2% (n = 690) and females 44.8% (n = 559), while in the provincial city, males accounted for 53.3% (n = 145) and females 46.7% (n = 127). In the metropolitan city, the median age was 41 years (IQR: 27-57) compared with 23 years (IQR: 14-35) in the provincial city. Overall, patients in the provincial city were younger than those in the metropolitan city ($p < 0.001$).

Information on whether patients used health insurance indicated that majority of patients attended the hospital EDs have used health insurance to cover the costs (n = 1306, 85.9%). The metropolitan and provincial cities shared similar proportions being 85.9% (n = 1073) and 85.7% (n = 233), respectively ($p = 0.99$).

Patients' medical conditions varied from city to city. A total of 122 unique chief medical complaints were identified in the study, 113 in metropolitan and 40 in provincial city. At the aggregated level, the most common medical complaint was related to pyrexia (n = 201,

13.2%) followed by dyspnoea (n = 110, 7.2%) and headache (n = 63, 4.1%). Pyrexia accounted for the highest medical complaints in both metropolitan (n = 123, 9.8%) and provincial (n = 78, 28.7%) cities. Tropical diseases such as malaria only appeared in the provincial city (n = 39, 14.3%), while conditions such as cancer (n = 41, 3.3%) or Covid-19 (n = 27, 2.2%) were found exclusively in the metropolitan area.

For further analysis, the medical conditions were classified into broader categories (Table 1): respiratory (n = 227, 14.9%), trauma (n = 122, 8.0%), neurological (n = 82, 5.4%), cardiovascular (general) (n = 46, 3%), cardiovascular--Acute Coronary Syndrome (ACS) (n = 13, 0.85%), general medical (n = 1022, 67.2%), obstetrics (n = 9, 0.6%), paediatrics, self-harm, and mental health. No cases were reported in the paediatrics, self-harm, or mental health categories.

TABLE 1 HERE

Overall, 32.4% (n = 493) of patients attending hospital emergency departments had at least one comorbidity. Interestingly, comorbidities were observed only among patients in the metropolitan city. A total of 508 individual illnesses were recorded, indicating that some patients had multiple comorbid conditions. The most common comorbidities were diabetes, including diabetes mellitus (n = 97, 19.10%), followed by hypertension (n = 96, 18.90%). Other comorbidities included tuberculosis (n = 35, 6.89%), chronic kidney disease (n = 37, 7.28%), anaemia (n = 21, 4.13%), stroke including ischaemic stroke (n = 26, 5.12%) and bronchopneumonia (n = 20, 3.94%). The list of individual comorbidities experienced by the participants can be found in supplementary Table S2 in Additional File 2.

How did the patients go to the hospitals in the event of emergency?

Patients used various modes of transportation to go to the hospital EDs (Table 1). The distribution of transportation modes differed significantly between the two cities ($p < 0.05$). Overall, only 9.4% (n = 143) of total patients (N = 1,521) arrived at the hospital by ambulances. In the metropolitan city, 10.9% (n = 136 of 1,249) of patients used ambulances, compared with only 2.6% (n = 7 of 272) in the provincial city.

In the provincial city, participants more frequently used their own cars (n = 130, 47.8%) and motorcycles (n = 94, 34.6%) compared with those in the metropolitan city, where 32.9% (n = 411) used their own cars and 20.2% (n = 252) used motorcycles. Conversely, ride-sharing

service cars were used more often in the metropolitan city (n = 383, 30.7%) than in the provincial city (n = 8, 2.9%).

Among patients who arrived by ambulances (Table 1), most had conditions categorized as 'Medical' (n = 92, 64.3%). Only 7.7% (n = 11) of ambulance users had trauma-related conditions, and 4.2% (n = 6) had cardiovascular diseases (ACS and general combined).

Table 2 presents further analysis of transportation modes across medical categories. In the combined dataset, only 9.0% (n = 11) of patients with trauma arrived by ambulance. The majority of trauma patients (n = 38, 31.1%) arrived on motorcycles. Those patients who arrived in their own cars represented a similar proportion to those who used ride-sharing service cars (n = 32, 26.2%). Approximately 50% (n = 23) of patients with general cardiovascular diseases and 53.8% (n = 7) of patients with ACS arrived in their own cars. Only 15.4% (n = 2) of patients with ACS and 8.7% (n = 4) with general cardiovascular were transported by ambulance. Additional details on transportation mode distributions by medical category are presented in Table 2.

TABLE 2 HERE

Table 1 also presents the analysis of transportation costs, which varied significantly between the two cities ($p < 0.05$). Overall, 81.9% of patients spent less than 100,000 IDR (approximately 6.7 USD). The proportion of patients was higher in the metropolitan city (n = 260, 95.6%) than in the provincial city (n = 986, 78.9%).

What are the reasons for using or not using an ambulance?

The survey recorded reasons for using ambulances (Table 1). Overall, 62.9% (n = 90) of patients who used ambulances did so because of their medical condition, which was the most common reason in both the metropolitan (n = 86, 63.2%) and provincial (n = 4, 57.1%) cities. Other reasons, such as advice from doctors or others, or the patient's own initiative, accounted for 16.8% (n = 23) in the metropolitan city. Only 2.8% (n = 4) of patients reported that the ambulance was affordable, with none in the provincial city stated affordability as a reason.

Patients who did not use an ambulance reported different reasons. Overall, 43.2% (n = 595) did not know that an ambulance could serve them, and 37.8% (n = 521) thought it was not

necessary. The proportion of patients unaware of ambulance availability was greater in the metropolitan area (n = 510, 45.8%) than in the provincial city (n = 85, 32.1%). Approximately 3.8% (n = 42) of metropolitan patients reported that an ambulance was not available when contacted, compared with 8.3% (n = 22) in the provincial city. Waiting times for the ambulance was considered too long by 8.9% (n = 99) of patients in the metropolitan city compared with 2.3% (n = 6) in the provincial city. Cost was cited as a barrier by 4.6% (n = 51) of metropolitan patients, compared with 0.4% (n = 1) in the provincial city.

Knowledge of how to call an ambulance was similar between the two cities. Overall, 72% (n = 1095) of patients did not know how to contact an ambulance, with 71.7% (n = 896) in the metropolitan city and 73.2% (n = 199) in the provincial city. Among those patients who arrived in an ambulance in the metropolitan city, 32.4% (n = 44) were referred from other hospitals, whereas no referral patients in the provincial city arrived by ambulance.

Further analysis revealed that 90.9% (n = 130) of all ambulance users had used national health insurance. The proportion was higher in the provincial city (n = 7, 100%) than in the metropolitan city (n = 123, 90.4%).

What are the reasons for choosing the hospitals?

The distribution of reasons for choosing a hospital varied significantly between cities ($p < 0.05$). Overall, 83.8% (n = 1,275) of patients selected hospitals due to referrals. In the Indonesian healthcare system, referrals typically originated from primary healthcare facilities or other hospitals. This reason was more common in the metropolitan city (n = 1,240, 99.3%) than in the provincial city (n = 35, 12.9%).

Patients who used an ambulance cited two primary reasons for hospital selection. First, in the metropolitan area, 99.3% (n = 135) chose the hospitals due to referral from other hospital compared with 85.7% (n = 6) in the provincial area. Second, proximity was a reason in 14.3% (n = 1) of provincial patients compared with 0.7% (n = 1) in the metropolitan city.

Overall, 27.5% (n = 419) patients stated that they required surgery. The proportion differed substantially between the cities: 33.8% (n= 416) in the metropolitan versus 1.1% (n = 3) in the provincial city. Among those who needed surgery, 90.5% (n =379) of them were not related to trauma.

How did the ambulances perform compared to other transportation modes?

Ambulance response time, defined as the duration between calling an ambulance and its arrival at the patient's location, was significantly longer than for other transport modes (median = 30 minutes, IQR = 15-57 minutes). In the metropolitan area, ambulance response time was significantly slower than in the provincial area ($p < 0.001$), with a median of 30 minutes (IQR = 14-60 minutes) compared with 10 minutes (IQR ≈ 5-30 minutes), respectively. In the metropolitan city, the fastest response time was achieved by motorcycles (median < 5 minutes, IQR = 5-10 minutes), whereas in the provincial city, ride-sharing service cars had the shortest response (median = 7 minutes, IQR = 4-12.6 minutes).

Regarding travel time, provincial ambulances had a slightly longer median travel time than metropolitan ambulances (~50 minutes vs. ~47 minutes, $p < 0.001$), but their IQR was shorter (20-52 minutes versus 32-69 minutes in the metropolitan city). Figure 1 illustrates ambulance travel time for different medical conditions.

FIGURE 1 HERE

Patients who arrived by ambulance in the metropolitan city had a relatively similar IQR for waiting time to treatment in the hospital compared with those patients in the provincial city (IQR = 4.2-16 minutes and 4.8-17 minutes, respectively).

In emergency situations, patients might experience a delay before deciding to seek hospital care or call for transport. The longest patient delay was observed among those patients with cardiovascular diseases who used ambulances, with a median delay of approximately 27 hours (IQR = 14-39 hours), compared with patients using other modes of transport. This pattern was consistent with the longer ambulance response and time to treatment for these patients.

Patients with ACS had the longest ambulance travel time (median = 71 minutes, IQR = 58-84 minutes), followed by those with obstetric conditions (median = 60 minutes, IQR = 66-72 minutes). Figure 1 illustrates the distribution of ambulance travel times by medical condition. The shortest ambulance travel time was observed among patients with respiratory problems (median = 35 minutes, IQR = 28-47 minutes).

A detailed descriptive summary of different transport modes and associated time analyses is provided in supplementary Table S1 in Additional File 1.

Discussion

The results indicate that the utilization of ambulances by patients attending hospital emergency departments in Indonesia is relatively low, at less than 10% in total. Although there was a slight increase of 1.6% in ambulance utilization in Jakarta compared with a previous study (Brice, et al., 2022), similar pattern cannot be confirmed in Jayapura since this was the first study conducted in Papua Province at this level. Recently, the regional ambulance provider *Pusat Krisis dan Kegawatdaruratan Kesehatan Daerah* (PK3D) in Jakarta has implemented an integrated approach to provide multiple access points for ambulance services through a single call centre. This initiative aims to improve call management and prioritization of emergency ambulance resources. However, its effectiveness in increasing the utilization of ambulance remains to be investigated.

The low utilization of ambulances might not be surprising. Among the Indonesian population, individual perceptions and beliefs regarding the disease and treatment can influence health-seeking behaviour (Widayanti et al., 2020). A lack of awareness of symptoms, such as those of cardiovascular diseases, may contribute to prolong patient delays (Dewi, et al., 2024). People often seek alternative treatments or self-care for their illnesses (Suswardany et al., 2017). Such belief systems and reliance on alternative remedies can lead to avoidance of using ambulance services (Wiyarta et al., 2025). Another possible contributing factor might relate to EMS literacy. In this study, a high proportion of patients did not know how to contact an ambulance. Among those who did use an ambulance, transportation was often arranged by healthcare staff at the referring hospital or by family members. Indeed, in Indonesia, family members play an important role in the decision to seek medical care (Martina, et al., 2022) and possibly the use of ambulances (Adem et al., 2024).

The reasons reported for not using ambulances included cost, availability, response time, lack of awareness of the ambulance service, and perceived illness severity. Previous studies have found that patients' perception on their condition can be influenced by several factors, including prior experience with illness, interaction with emergency medical team (Chung, et al., 2022), and cultural, psychological, or socioemotional factors (Fles, et al., 2017; Kahissay, et al., 2017; Xu, et al., 2022; Booker, et al., 2017).

In Jayapura, the low utilization of ambulances may be attributed to limited resources compared to Jakarta. Past research has shown that resource limitations in rural regions can lead to inequalities in access to emergency care (Li, et al., 2022). Health authorities in different provinces may implement different policies. While Jakarta has developed an integrated call centre system, similar innovation have not yet been implemented in Jayapura. Papua has adopted a telephone-guided resuscitation strategy to overcome access barriers and optimize limited resources. The strategy aims to facilitate knowledge transfer and support prompt intervention for time-sensitive emergency cases, such as cardiac arrest (Fukushima & Bolstad, 2020), where early intervention can significantly improve emergency responses time and patient survival (Bobrow, et al., 2016; Song, et al., 2014).

The low utilization of ambulances in both cities may also indicate an existing unmet demand, which remains a persistent challenge in LMICs, as observed in Vietnam (Hoang, et al. (2021). In Indonesia, this unmet demand may be driven by major issues such as the lack of EMS standardization, limited resource provision and a shortage of trained paramedics (Tokita et al., 2024).

The study also highlighted a high utilization of health insurance in both cities. This may reflect increasing public awareness of the benefit of the insurance in covering medical costs (Pertiwi & Nurcahyanto, 2017) and the availability of accessible healthcare facilities (Mustafidah & Indrawati, 2021), including ambulance services. Indeed, over 90% of ambulance users in this study were covered by the national insurance scheme, suggesting that people are more likely to use ambulance services when they are covered by insurance (Meisel, et al., 2011).

The study found that ambulance response times in metropolitan Jakarta were slower than in the provincial city of Jayapura. Considering the challenging geographical conditions in Papua, characterized by vast land and mountains, it is surprising that ambulance response time is still better than in Jakarta. This finding contradicts previous research from Saudi Arabia, where EMS response times in urban areas were shorter than in rural areas (Moafa, et al., 2020). However, the study in Saudi Arabia used routinely collected data, which makes direct comparison with the current study difficult. Nonetheless, the findings may suggest that traffic conditions in Jakarta could be the major problem in achieving faster ambulance response times. Other contributing factors may include poor road conditions in certain areas of Jakarta and the distance between patients and ambulance posts (Rojak et al., 2024).

Although the importance of ambulance response time has been discussed, studies have indicated a lack of evidence-based standards for determining target response times (Wankhade, 2011). Further studies are needed to evaluate the significance of the ambulance response times in the context of EMS in Indonesia.

Limitations of the study

The results shared in this report must be taken cautiously due several limitations. Firstly, limited research resources and time constrained the scope of the survey, preventing broader coverage of hospitals across the provincial city of Jayapura or the wider Papua region. Nevertheless, the study included the general hospital that was strategically selected to maximize the likelihood of capturing referrals from across the city. Secondly, the survey relied on patients' recall of the timestamps during the emergency event, which may affect the reliability and accuracy of the data. To minimize recall bias, event sequences were manually verified by the survey supervisor. Thirdly, the data collection method in which the hospital staff read questions to patients or their guardians and recorded their response on the paper, may have introduced bias due to human error. To mitigate this, the responses were checked against the hospital records whenever available. For cases where hospital data were not available, inconsistent responses were excluded from the analysis. Fourthly, the reliability of the questionnaire was not assessed in this study. Although the content was validated by local experts in the original study and deemed contextually appropriate, future study should include reliability testing, including assessment of internal consistency. Finally, the findings should not be generalized beyond the survey population.

Practical and research implications

The survey was conducted in the absence of aggregated data on emergency service utilization, whether pre-hospital or in hospital. We suggest making some improvements in EMS data collection at the regional and national levels. The availability of such data would support the research and development of healthcare services in Indonesia. It would enable in-depth analyses of emergency medical service utilization, covering both ambulance and hospital resources. Such analyses could inform whether current resources are adequate to serve the diverse population across regions and whether they are used efficiently.

The questionnaire covered only patients' demographics, utilization of different transportations, and timestamps related to emergency events. In future studies, it would be

ideal to link survey results with health data beyond the hospital emergency department, including inpatient services, outpatient clinics, and community health centres. This would allow further analysis of the whole patient care pathway across different health care services. Additionally, further research should be conducted in other regions of Indonesia to provide a more comprehensive understanding of EMS nationwide.

Despite the limitations, the study offers valuable insights into the utilization of EMS in Indonesia, a topic that has been rarely studied. It is the first study to examine both a metropolitan and a provincial city, each with different characteristics. The study provides an example of how the EMS utilization can be explored by analysing patients' characteristics, time-related data, and methods of transportation used by the patients. The results highlighted the need to continued improvement in the provision of emergency services to ensure the equality, accessibility, and quality of care across the country.

Conclusions

The utilization of emergency medical services (EMS) in Indonesia continues to be low. This study revealed several factors influencing patients' decisions not to use ambulances during emergencies. These include limited knowledge of how to contact an ambulance, poor awareness of medical conditions requiring urgent care, concern about the cost of using ambulance services, the long waiting time for an ambulance, and the unavailability ambulances when needed. These findings highlight the need to strengthen public awareness, improve ambulance accessibility, and enhance system coordination to ensure that emergency medical resources are used effectively and equitably across regions.

Declarations

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Authors contributions

SNB, PH, APR, RS designed the survey. APR and RS conducted the survey. SNB performed data analysis and initial report writing. PH, DG, GP, MT, VK, JTR, RS, ADP, APR, and JL contributed to reviewing and improving the paper.

Data availability statement

Information on the data underpinning the results presented here, including how to access them, can be found in the Cardiff University data catalogue at: http://doi.org/10.17035/d.2023.0278032583

Ethics Statement and consent to participate

The study adhered to the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all patients who visited the hospital's emergency departments. Most of the questionnaires were incorporated into routine hospital data collection, necessitating the acquisition of verbal consent from all patients. For individuals under the age of eighteen, their parents or guardians served as their representatives in the consent process. The procedure for obtaining verbal consent and securing ethical approval was granted by the Ethics Committee of the Faculty of Medicine, University of Indonesia – Cipto Mangunkusumo Hospital, No. KET-1380/UN2.F1/ETIK/PPM.00.02/2022.

Consent for publication

Not applicable

Competing interest

None declared.

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Table 1: Transport modes, costs, insurance, patients' reasons, and medical condition. Source: Authors own work.

Total Participants	n = 1249 (82.1%)	n = 272 (17.9%)	N = 1521 (100%)			
	Metropolitan Med (Q1, Q3)	Provincial Med (Q1, Q3)	Total Med (Q1, Q3)	Kruskal Wallis	P-value	Effect size (η^2)
Age:			N = 1521	118	< 0.001	0.077
Male	39 (23, 57)	23 (14, 38)	36 (21, 53)			
Female	42 (28, 57)	24 (15, 33)	38 (25, 55)			
Total by cities	41 (27, 57)	23 (14, 35)	38 (22, 55)			
	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Sex:			N = 1521	0.26	0.61	0.013
Male	690 (55.2%)	145 (53.3%)	835 (54.9%)			
Female	559 (44.8%)	127 (46.7%)	686 (45.1%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Insurance usage			N = 1521	0.0001	0.99	0.00026
Yes	1073 (85.9%)	233 (85.7%)	1306 (85.9%)			
No	176 (14.1%)	39 (14.3%)	215 (14.1%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Medical categories (all patients)			N = 1521	50.57	< 0.05	0.182
Medical	792 (63.4%)	230 (84.6%)	1022 (67.2%)			
Cardiovascular (General)	45 (3.6%)	1 (0.3%)	46 (3.0%)			
Cardiovascular (ACS)	13 (1.0%)	0 (0.0%)	13 (0.85%)			
Trauma	107 (8.6%)	15 (5.5%)	122 (8.0%)			
Respiratory	204 (16.3%)	23 (8.5%)	227 (14.9%)			
Obstetrics	9 (0.7%)	0 (0.0%)	9 (0.6%)			
Neurological	79 (6.3%)	3 (1.1%)	82 (5.4%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Transport mode: (all patients)			N = 1521	175.87	< 0.05	0.34
Ride-sharing service car	383 (30.7%)	8 (2.9%)	391 (25.7%)			

Own car	411 (32.9%)	130 (47.8%)	541 (35.6%)			
Motorcycle	252 (20.2%)	94 (34.6%)	346 (22.7%)			
Ambulance	136 (10.9%)	7 (2.6%)	143 (9.4%)			
Taxi	50 (4.0%)	15 (5.5%)	65 (4.3%)			
Public transport	3 (0.2%)	16 (5.9%)	19 (1.2%)			
Other	14 (1.1%)	2 (0.7%)	16 (1.1%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Medical categories (ambulance users)			N = 143	2.175	0.9	0.123
Medical	86 (63.2%)	6 (85.7%)	92 (64.3%)			
Cardiovascular (General)	4 (2.9%)	0 (0%)	4 (2.8%)			
Cardiovascular (ACS)	2 (1.5%)	0 (0%)	2 (1.4%)			
Trauma	11 (8.1%)	0 (0%)	11 (7.7%)			
Respiratory	18 (13.2%)	1 (14.3%)	19 (13.3%)			
Obstetrics	2 (1.5%)	0 (0%)	2 (1.4%)			
Neurological	13 (9.6%)	0 (0%)	13 (9.1%)			
Total	136 (100%)	7 (100%)	143 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Transport cost (IDR (GBP))*			N = 1521	42.48	< 0.05	0.167
< 100 k (< £5.54)	986 (78.9%)	260 (95.6%)	1246 (81.9%)			
100 - 500 k (£5.54 - £27.68)	188 (15.1%)	11 (4.0%)	199 (13.1%)			

500 - 1,000 k (£27.68 - £55.37)	(56 (4.5%)	1 (0.4%)	57 (3.75%)			
> 1,000 k (> £55.37)	19 (1.5%)	0 (0.0%)	19 (1.25%)			
	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Reasons for using ambulance: (ambulance users)			N = 143	5.47	0.24	0.196
Affordable	4 (2.9%)	0 (0.0%)	4 (2.8%)			
Medical condition	86 (63.2%)	4 (57.1%)	90 (62.9%)			
Advice from doctor/others	22 (16.2%)	1 (14.3%)	23 (16.1%)			
Own initiative	22 (16.2%)	1 (14.3%)	23 (16.1%)			
Other	2 (1.5%)	1 (14.3%)	3 (2.1%)			
Total	136 (100%)	7 (100%)	143 (100%)			
	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Reasons for not using ambulance: (non-ambulance users)			N= 1378	63.84	< 0.05	0.215
Too expensive	51 (4.6%)	1 (0.4%)	52 (3.8%)			
Not available	42 (3.8%)	22 (8.3%)	64 (4.6%)			
Takes too long	99 (8.9%)	6 (2.3%)	105 (7.6%)			
Not necessary	378 (34.0%)	143 (54%)	521 (37.8%)			
Not aware	510 (45.8%)	85 (32.0%)	595 (43.2%)			
Other	33 (2.9%)	8 (3.0%)	41 (3.0%)			
Total	1113 (100%)	265 (100%)	1378 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Do the patients know how to contact an ambulance?			N = 1521	0.16	0.69	0.01
Yes	353 (28.3%)	73 (26.8%)	426 (28.0%)			
No	896 (71.7%)	199 (73.2%)	1095 (72.0%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Is ambulance user referred from other hospital?			N = 143	1.93	0.16	0.116
Yes	44 (32.4%)	0 (0%)	44 (30.8%)			
No	92 (67.6%)	7 (100%)	99 (69.2%)			
Total	136 (100%)	7 (100%)	143 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Fisher's Exact OR	P-value
Did ambulance users use insurance?			N = 143	0.0	1.0
Yes	123 (90.4%)	7 (100%)	130 (90.9%)		
No	13 (9.6%)	0 (0%)	13 (9.1%)		
Total	136 (100%)	7 (100%)	143 (100%)		

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)

Reasons for choosing the hospital:			N = 1521	1243.29	< 0.05	0.904
Nearest hospital	3 (0.24%)	56 (20.6%)	59 (3.9%)			
Referral hospital	1240 (99.28%)	35 (12.9%)	1275 (83.8%)			
Been treated before	2 (0.16%)	123 (45.2%)	125 (8.2%)			
Private hospital	0 (0.0%)	2 (0.7%)	2 (0.1%)			
Government hospital	2 (0.16%)	0 (0.0%)	2 (0.1%)			
Personal reason	2 (0.16%)	53 (19.5%)	55 (3.6%)			
Other	0 (0.0%)	3 (1.1%)	3 (0.2%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Fisher's Exact Test OR	P-value
Ambulance users' reasons for choosing the hospital:			N = 143	22.5	0.96
Nearest hospital	1 (0.7%)	1 (14.3%)	2 (1.4%)		
Referral hospital	135 (99.3%)	6 (85.7%)	141 (98.6%)		
Total	136 (100%)	7 (100%)	143 (100%)		

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Chi	P-value	Effect size (Cramer's V)
Need surgery?			N = 1521	114.45	<0.05	0.274
Yes	416 (33.3%)	3 (1.1%)	419 (27.5%)			
No	833 (66.7%)	269 (98.9%)	1102 (72.5%)			
Total	1249 (100%)	272 (100%)	1521 (100%)			

	Metropolitan n (%)	Provincial n (%)	Total n (%)	Fisher's Exact OR	P-value
Need surgery due to trauma?			N = 419	0.05	<0.05
Yes	38 (9.1%)	2 (66.7%)	40 (9.5%)		
No	378 (90.9%)	1 (33.3%)	379 (90.5%)		
Total	416 (100%)	3 (100%)	419 (100%)		

Note:

The total percentage may not add up 100% due to rounding effect.

The transportation costs conversion used 1 USD = 14,973.8 IDR from Xe.com on 30/05/2023

Kruskal Wallis compares the median between groups in two different cities. P-value < 0.001 suggests that the difference in median age between male and female in two cities is significant. In our case, patients in metropolitan city were older than in the provincial city with females were slightly older than males.

Chi2 test compares the difference in proportion between groups in two cities. P-value < 0.05 indicates a significant difference in the proportions of categories between the two cities.

Fishers' Exact tests the difference in 2x2 contingency table when one of area has small size. However, if the table is larger than 2x2, Chi2 can be used instead. P-value < 0.05 shows significant difference in the proportions of categories between the two cities.

The effect size indicates the strength of the association between groups.

1. For Kruskal Wallis, the effect size was computed using η^2.
2. For Chi-square test, the effect size was computed using Cramer's V value.
3. For Fishers' Exact test, the OR indicates the effect size.

Table 2. Distribution of Transportation Modes for Medical Categories. Source: Authors own work.

Combined Data

Medical category	Ambulance n (%)	Motorcycle n (%)	Own car n (%)	Public transport n (%)	Ride-sharing service car n (%)	Taxi n (%)	Other n (%)	Total N (%)
Cardiovascular (ACS)	2(15.4)	-	7(53.8)	-	3(23.1)	-	1(7.7)	13(100)
Cardiovascular (General)	4(8.7)	4(8.7)	23(50.0)	-	12(26.1)	3(6.5)	-	46(100)
Medical	92(9.0)	251(24.6)	368(36.0)	13(1.3)	239(23.4)	49(4.8)	10(1.0)	1022(100)
Neurological	13(15.9)	3(3.7)	36(43.9)	-	26(31.7)	4(4.9)	-	82(100)
Obstetrics	2(22.2)	2(22.2)	2(22.2)	-	3(33.3)	-	-	9(100)
Respiratory	19(8.4)	48(21.1)	73(32.2)	5(2.2)	76(33.5)	5(2.2)	1(0.4)	227(100)
Trauma	11(9.0)	38(31.1)	32(26.2)	1(0.8)	32(26.2)	4(3.3)	4(3.3)	122(100)
Total	143(9.4)	346(22.7)	541(35.6)	19(1.2)	391(25.7)	65(4.3)	16(1.1)	1521(100)

Metropolitan (Jakarta)

Medical category	Ambulance n (%)	Motorcycle n (%)	Own car n (%)	Public transport n (%)	Ride-sharing service car n (%)	Taxi n (%)	Other n (%)	Total N (%)
Cardiovascular (ACS)	2(15.4)	-	7(53.8)	-	3(23.1)	-	1(7.7)	13(100)
Cardiovascular (General)	4(8.9)	4(8.9)	22(48.9)	-	12(26.7)	3(6.7)	-	45(100)
Medical	86(10.9)	169(21.3)	259(32.7)	2(0.3)	233(29.4)	34(4.3)	9(1.17)	792(100)
Neurological	13(16.5)	3(3.8)	33(41.8)	-	26(32.9)	4(5.1)	-	79(100)
Obstetrics	2(22.2)	2(22.2)	2(22.2)	-	3(33.3)	-	-	9(100)
Respiratory	18(8.8)	42(20.6)	63(30.9)	-	75(36.8)	5(2.5)	1(0.5)	204(100)
Trauma	11(10.3)	32(29.9)	25(23.4)	1(0.9)	31(29.0)	4(3.7)	3(2.8)	107(100)
Total	136(10.9)	252(20.2)	411(32.9)	3(0.2)	383(30.7)	50(4.0)	14(1.1)	1249(100)

Provincial (Jayapura)

Medical category	Ambulance n (%)	Motorcycle n (%)	Own car n (%)	Public transport n (%)	Ride-sharing service car n (%)	Taxi n (%)	Other n (%)	Total N (%)
Cardiovascular (General)	-	-	1(100.0)	-	-	-	-	1(100)
Medical	6(2.6)	82(35.7)	109(47.4)	11(4.8)	6(2.6)	15(6.5)	0.4	230(100)
Neurological	-	-	3(100.0)	-	-	-	-	3(100)
Respiratory	1(4.3)	6(26.1)	10(43.5)	5(21.7)	1(4.3)	-	-	23(100)
Trauma	-	6(40.0)	7(46.7)	-	1(6.7)	-	6.7	15(100)
Total	7(2.6)	94(34.6)	130(47.8)	16(5.9)	8(2.9)	15(5.5)	2(0.7)	272(100)

Figure 1. Box plots for the distribution of travel time by ambulances for different medical conditions. Created by the authors. Source: Authors own work.

Supplementary Information:

Additional File 1.pdf