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Epidemiology of 27046 Pre-Hospital Trauma Patients: A Retrospective Cohort Study

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ABSTRACT

Background: This study analyzes the epidemiological characteristics of pre-hospital emergency trauma patients in Wenzhou City from 2023 to 2024, aiming to provide a basis for formulating effective pre-hospital emergency trauma prevention and control measures.
Method: We reviewed 27,046 emergency trauma cases that met the inclusion and exclusion criteria in the medical record system database of Wenzhou Emergency Center from 2023 to 2024 and conducted a descriptive epidemiological analysis of the cases from multiple perspectives based on various causes of trauma.
Results: Among the 27,046 trauma patients, 60.7% were male and 39% were female, with a gender ratio of 1.5:1. The age group with the highest incidence of trauma is 35 to 65 years old, accounting for 49.9% of cases. Highways and streets are the main places where trauma occurs, with a frequency of 61.0%. The main causes of injuries were traffic accidents and falls, accounting for 39.2% and 33.6% respectively. The central city area has the highest number of trauma patients. There are two peak traffic accident injuries daily, at 8 a.m. and 6 p.m. Fall injury associations peaked between 8 a.m. and 9 a.m. and tapered off after that. The average time it took the ambulance to arrive at the scene in the morning was 8 minutes and 46 seconds, and the time it took to transport the injured to the hospital was 9 minutes and 46 seconds. The four-minute breakdown of these times ranges from 5 minutes and 27 seconds to 11 minutes and 33 seconds.
Conclusion: The pre-hospital emergency trauma in Wenzhou City exhibits distinct regional distribution characteristics. This information is significant for the rational allocation of emergency resources and the development of effective trauma prevention and control measures.

Keywords: Pre-hospital trauma; traffic accidents; epidemiology

1. INTRODUCTION

Trauma has become a serious public health issue worldwide. A study on traffic safety and public health shows that traffic injuries are the leading cause of death among Chinese residents, especially those aged 15 to 29, and are now one of the top ten causes of death[1].Compared with other diseases, trauma can be better prevented, Understand the occurrence patterns and characteristics of pre-hospital emergency care for trauma patients, Taking effective preventive measures can reduce the damage caused by trauma[2-3]; This study analyzed the

epidemiological information of pre-hospital trauma emergency patients from April 2023 to March 2024, explore the current situation and trends of trauma epidemiology in this region, more proactive prevention of pre-hospital trauma.

MATERIALS AND METHODS

2.1 Inclusion Criteria

This study collected data from trauma patients in the medical record system database of Wenzhou Emergency Center from April 1, 2023 to March 31, 2024; Inclusion criteria: (1) the preliminary diagnosis is injury, (2) emergency treatment was provided on the spot, (3) prehospital medical records are complete. (4) Cases that refuse to be sent to the hospital and have incomplete information were excluded. The total number of patients is 27046.

2.2 Study design

Establish an analysis database and organize the data to meet the analysis requirements. The variables include basic patient information, area, reaction time, injury mechanism, injury location, etc. Descriptive epidemiological methods are used to analyze the population, time, and trauma characteristics of trauma patients. Perform analysis.

2.3 STATISTICAL ANALYSIS

Use Excel 2013 software to enter and organize data, import SPSS21.0 software for statistical analysis; use descriptive statistical data to evaluate the prevalence, sociodemographic, and injury-related characteristics of trauma patients. Use mean and standard deviation (SD), median, and interquartile range (IQR) of variables with normal and non-normal distribution to describe central tendency. Test level $\alpha=0.05$.

3. RESULTS

3.1 Patients' characteristics

We reviewed the medical record registration system, which recorded 62663 cases, among which 27046 (43%) trauma patients were included in the analysis cohort. Male trauma patients accounted for 60.7% (Figure 1), female trauma patients accounted for 39%, and the mean age was 47.3±19.5 years and 51.3±20.2 years, the ratio of male to female is 1.5:1. The age group with high incidence of trauma is between 35-65 years old (49.9%), followed by those over 65 years old (21%); The risks of occupational injuries include industrial workers, other professionals, and agricultural workers, accounting for 28.8%, 22.3%, and 21.3%, respectively; The proportion of male trauma patients is higher than that of female; The difference in trauma composition between males and females was statistically significant ($P<0.001$) (Table 1).

3.2 Patient injury mechanism and onset time

According to the Injury Survey (Table 2), roads/streets are the main site of trauma (61.0%). This was followed by the home (12.9%); the main types of injury were road traffic accidents and falls. The proportions were 60.1% and 23.1%, respectively; the injured parts were mainly limbs, head and face. The proportions were 39.2% and 33.6%, respectively; the number of trauma cases during the day was higher than that at night.There are two peak times of the day for traffic accident injuries. 8:00 am and 6:00 pm. The number of fall injuries reached a high level between 8 am and 9 am, and then gradually decreased (Figure 2); the difference in injury mechanism was statistically significant ($P<0.001$).

3.3 Ambulance arrival location and hospital arrival time

The overall distribution of ambulance arrival location and hospital arrival time did not follow a normal distribution after the normality test, so the median distribution and interquartile range were used to describe its central tendency and zonal trend. The median ambulance arrival time in the city is 8:46 minutes. The interquartile range is 5:27 minutes. The increment of ambulance arrival time at the hospital is

9:46 minutes. The interquartile range is 11:33 minutes.

The longest ambulance arrival time and hospital arrival time in each administrative region are CN County and TS County, respectively. The median time is 9:46 minutes and 21:45 minutes, respectively. The shortest median ambulance and hospital arrival time is 7 minutes in LG City. :30 minutes, and the central city is 8:09 minutes. TS County has the longest interquartile range of arrival time at the scene and arrival time at the hospital, which are 8:36 minutes and 28:39 minutes, respectively. The shortest interquartile range of arrival time at the scene is LG City. It is 4:08 minutes. The interquartile range for the shortest PY county arrival time at the hospital is 7:56 minutes.

3.4 spatial location distribution

Classify and count trauma patients by administrative region. The central urban area accounts for the largest proportion of 24%-29.94%, followed by RN City, which accounts for more than 18%, and WC County and TS County, which account for the least, 2.18% each. In comparison, the central urban area is an area with a higher incidence of trauma (Figure 3).

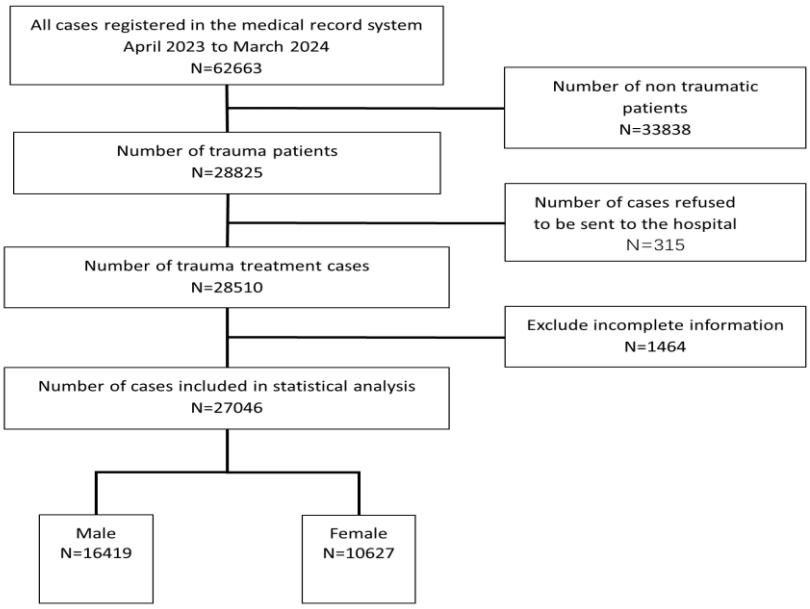

Fig.1.Inclusion and exclusion flow diagram.

Table 1. Demographics

	Total（%）	Male（%）	Female（%）	P value
age				<0.001
≤14	1021（3.8）	687（4.2）	334（3.1）	
15~	5355（19.8）	3537（21.5）	1818（17.1）	
35~	13495（49.9）	8148（49.6）	5347（50.3）	
≥65	5690（21.0）	3077（18.7）	2613（24.6）	
Unknown	1485（5.5）	970（5.9）	515（4.8）	
Profession				<0.001
agricultural personnel	5756（21.3）	3323（20.2）	2433（22.9）	
industrial personnel	7795（28.8）	5245（31.9）	2550（24.0）	
business personnel	4606（17.0）	2442（14.9）	2164（20.4）	
government personnel	2857（10.6）	1701（10.4）	1156（10.9）	
Other practitioners	6032（22.3）	3708（22.6）	2324（21.9）	

Table 2. Damage mechanism

	Total（%）	Male（%）	Female（%）	P value
place of occurrence				<0.001
Highway/Street	16511（61.0）	9653（58.8）	6858（64.5）	
home	3476（12.9）	1647（10.0）	1829（17.2）	
Industrial and construction sites	1576（5.8）	1409（8.6）	167（1.6）	
public places	2071（7.7）	1437（8.8）	634（6.0）	
trading place	670（2.5）	509（3.1）	161（1.5）	
farm/farmland	269（1.0）	183（1.1）	86（10.8）	
other	2473（9.1）	1581（9.6）	892（8.4）	
Injury type				<0.001
traffic accident	16237（60.1）	9247（56.3）	6990（65.9）	
fall	6255（23.1）	3826（23.3）	2429（22.9）	
blunt force trauma	1812（6.7）	1400（8.5）	412（3.9）	
sharp injury	999（3.7）	744（4.6）	255（2.4）	
animal bite	66（0.2）	42（0.3）	24（0.2）	
scald	60（0.2）	39（0.2）	21（0.2）	
Poisoned	46（0.2）	36（0.2）	10（0.1）	
other	1571（5.7）	1085（6.6）	460（4.3）	
Injury site				<0.001
Head and face	12680（33.6）	8096（35.1）	4584（31.1）	
neck	740（2.0）	531（2.3）	209（1.4）	
Chest	2229（5.9）	1486（6.4）	743（5.1）	
abdomen	927（2.5）	581（2.5）	346（2.4）	
pelvis	960（2.5）	506（2.2）	452（3.1）	
body surface	1446（3.8）	922（4.0）	524（3.6）	
Lower back	3463（9.2）	1992（8.6）	1471（10.1）	
spine	491（1.3）	267（1.2）	224（1.5）	
limbs	14789（39.2）	8713（37.7）	6076（41.5）	
Injury time				<0.001
Daytime 6:00-18:00	17483（64.6）	10263（62.5）	7220（67.9）	
Night 18:00-6:00	9563（35.4）	6156（37.5）	3407（32.1）	

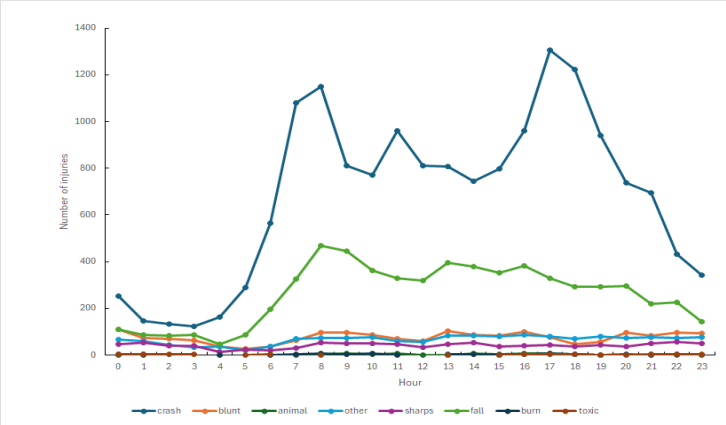

Fig 2. Distribution characteristics of trauma patients at different time points.

Table 3. EMS rescue time

area	Ambulance arrival time		Ambulance arrival time at hospital	
	M	QR	M	QR
central urban area	0:08:37	0:05:20	0:08:09	0:09:22
LQ	0:09:20	0:05:34	0:08:37	0:08:39
YJ	0:09:16	0:06:02	0:15:35	0:24:54
RN	0:08:15	0:05:03	0:12:31	0:15:26

PY	0:08:49	0:05:18	0:09:16	0:07:56
CN	0:09:46	0:05:33	0:09:50	0:10:08
LG	0:07:30	0:04:08	0:09:11	0:08:42
WC	0:09:43	0:07:01	0:15:25	0:17:06
TS	0:09:13	0:08:36	0:21:45	0:28:39
average	0:08:46	0:05:27	0:09:46	0:11:33

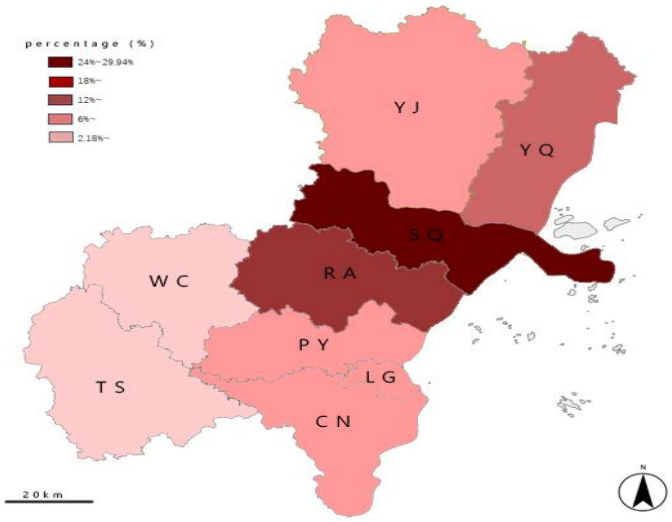

Fig 3. Injury classification by administrative region

4. DISCUSSION

Conducting research on the epidemiology and descriptive data of trauma is an important factor in improving pre-hospital trauma care and is of great significance in formulating trauma prevention and control strategies. As an economically developed city with a high population density, Wenzhou has its own unique epidemiology in pre-hospital trauma care. This study shows that most trauma patients transported by pre-hospital ambulances are concentrated in the age group of 35-65 years. The occupational trauma risks are industrial workers, other occupations and agricultural workers, accounting for 28.8%, 22.3% and 21. 3% respectively; the proportion of men suffering from trauma is higher than that of women; most of the occupations of young and middle-aged men are related to heavy physical labor, transportation and high-altitude work, and the risk of trauma is higher; people in this age group are in a period of active social life; There are more traffic accidents during the day than at night, especially during the morning and evening rush hours; at the same time, due to the increasing density of city cars and electric bicycles year by year, the increase in population density and the increase in the proportion of floating population, local traffic regulations have become more stringent. Therefore, it is necessary to strengthen the management of traffic and public places during periods of high trauma incidence, improve public safety awareness, and effectively reduce the incidence of trauma accidents; ensure emergency rescue resources, including the number of rescuers and ambulances, and smooth life-saving channels during periods of high trauma incidence, so as to ensure that ambulance personnel arrive at the scene as soon as possible to provide trauma treatment.

Elderly people over 65 years of age are also at higher risk of pre-hospital fall injuries. Similar to the results of relevant literature surveys [4-5], it shows that the problem of injuries caused by falls is common; the main reason may be related to internal factors such as muscle strength and joint degeneration caused by aging [6], and the impact of the aging population on social work, the living environment also has a high

correlation [7]. Therefore, in places where the elderly frequently move, such as homes, bathrooms, parks and other places, it is necessary to strengthen anti-slip treatment on the floor and strengthen fall prevention publicity.

This study found that the distribution of injury parts caused by different injury causes is different, and the more easily injured parts are the limbs, head, and face. According to the 2014 national injury surveillance results, the proportion of fractures caused by falls is as high as 29.59% [8]. The data in this study are much higher than the data for the population as a whole. However, injuries to the head and face often have serious consequences, such as brain injury. Therefore, it is an effective protective measure to emphasize wearing a helmet during high-risk activities to reduce the risk of head injury [9]; emergency rescue and first aid training at the scene should also be given full attention.

In terms of regional distribution, this study found that the central urban area and Ruian City had the highest number of trauma cases, while WC County and TS County had fewer trauma cases. It may be related to the different regional population density, traffic flow, economic development level, etc. [10]. The differences in the number of trauma cases in different regions and the different causes of trauma require more targeted and reasonable allocation of medical resources and the formulation of appropriate trauma prevention and control measures.

The research results show that the city's median time for emergency vehicles to arrive at the scene for treatment is 8:46 minutes, with an interquartile range of 5:27 minutes, and the median time for ambulances to arrive at the hospital is 9:46 minutes, with an interquartile range of 11:33 minutes. Trauma is a "time-sensitive" condition, which emphasizes the need for rapid response in trauma care [11]. The response time of first responders to patients with major trauma is an important factor in the success of rescue,

In urban areas of the United States, Emergency medical service units average 7 minutes from the time of a 911 call to arrival on scene [12]. The median time from calling EMS to EMS arrival at the scene in Japan is 8 minutes, with a variation of 1 minute between different regions. [13]; the average time for pre-hospital emergency medical personnel to arrive at the scene in domestic cities is 10∽15 minutes [14]. Although the pre-hospital emergency response time in this region is lower than the national average, there is still a gap compared with the United States, Japan, and Germany. There are large differences in the distribution of the two indicators, ambulance arrival time and hospital arrival time, among different geographical regions, indicating that there may be an imbalance in the allocation of emergency resources within the region. We need to think about how to optimize the pre-hospital first aid system, the layout of first aid stations, the configuration of first aid equipment, etc., to shorten the first aid response time, build a "5-minute first aid response circle" pre-hospital first aid system, and improve the effectiveness of pre-hospital first aid trauma treatment.

5. CONCLUSIONS

In conclusion, injuries caused by traffic accidents and falls are still the main factors in the occurrence of prehospital trauma. Strengthening traffic safety management and fall prevention publicity and education for the elderly can better prevent trauma, optimize prehospital resource allocation, and shorten emergency response time. Time to improve prehospital trauma care capabilities.

6. LIMITATION

The limitations of this study are the same as those of any retrospective methodological study. Missing data is always a limitation of retrospective chart reviews, and our registry does not provide good data on prehospital interventions, patient outcomes, etc. Second, this dataset represents only patients

transported by prehospital ambulance, and patients who self-transported to medical care were not included in our database, which may exclude a subset of patients not included in our analysis. In addition, post-discharge follow-up was not possible due to resource constraints.

Declaration by Authors

Ethical Approval: The Ethics Committee of Wenzhou Emergency Center approved this study, and the authors adhered to the principles of the Declaration of Helsinki.

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Conflict of Interest: All authors approved the present version and declare no conflicts of interest.

REFERENCES

1. Yang C, Jiang J, Zhou J W Z H M. Traffic safety and public health in China – Past knowledge, current status, and future directions[J]. Accident Analysis and Prevention, 2023, 192(Nov.):1.1-1.10. DOI: 10.1016/j.aap.2023.107272.
2. Longrois D, Maegele M, Bersini H, et al. Streamlining pre-and intra-hospital care for patients with severe trauma: a white paper from the European Critical Care Foundation［J］. Eur J Trauma Emerg Surg, 2019, 45(1): 39-48. DOI: 10.1007/s00068-018-1053-1. Epub 2018 Dec 12.
3. Liew BS, Zainab K, Cecilia A,et al. Early management of head injury in adults in primary care［J］. Malays Fam Physician, 2017, 12 (1): 22-5 PMID: 28503270 PMCID: PMC5420319
4. Salari, N., Darvishi, N., Ahmadipanah, M. et al. Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. J Orthop Surg Res 17, 334 (2022). DOI: org/10.1186/s13018-022-03222-1
5. Hoffman GJ, Tinetti ME, Ha J, Alexander NB, Min LC. Prehospital and Posthospital Fall Injuries in Older US Adults. JAMA Netw Open. 2020 Aug 3;3(8): e2013243. DOI: 10.1001/jamanetworkopen.2020.13243. PMID: 32822491; PMCID: PMC7439104.
6. Moylan KC, Binder E F. Falls in Older Adults: Risk Assessment, Management and Prevention[J]. American Journal of Medicine, 2007, 120(6): 493.e1-493.e6. DOI: 10.1016/j.amjmed.2006.07.022.
7. Vu HM, Nguyen LH, Nguyen HLT, Vu GT, Nguyen CT, Hoang TN, Tran TH, Pham KTH, A Latkin C, Xuan Tran B, S H Ho C, Ho RCM. Individual and Environmental Factors Associated with Recurrent Falls in Elderly Patients Hospitalized after Falls. Int J Environ Res Public Health. 2020 Apr 3;17(7):2441. DOI: 10.3390/ijerph17072441. PMID: 32260192; PMCID: PMC7177702.
8. Er Y, Duan L, Ye P, Wang Y, Ji C, Deng X, Gao X, Jin Y, Wang L. [Epidemiologic characteristics of fall in old population: Results from national injury surveillance in China, 2014]. Zhonghua Liu Xing Bing Xue Za Zhi. 2016 Jan;37(1):24-8. Chinese. DOI: 10.3760/cma.j.issn.0254-6450.2016.01.005. PMID: 26822638.
9. Lam C, Lin MR, Chu SF, Tsai SH, Bai CH, Chiu WT. The effect of various types of motorcycle helmets on cervical spine injury in head injury patients: a multicenter study in Taiwan. Biomed Res Int. 2015; 2015:487985. DOI: 10.1155/2015/487985. Epub 2015 Feb1. PMID: 25705663; PMCID: PMC4330949.
10. Moradi A, Soori H, Kavousi A, Eshghabadi F, Jamshidi E. Spatial Factors Affecting the Frequency of Pedestrian Traffic Crashes: A Systematic Review. Arch Trauma Res. 2016 Aug 17;5(4): e30796. DOI: 10.5812/atr.30796. PMID: 28144600; PMCID: PMC5251886.
11. Mller A, Hunter L, Kurland L, et al. The association between hospital arrival time, transport method, prehospital time intervals, and in-hospital mortality in trauma patients presenting to Khayelitsha Hospital, Cape Town[J]. African journal of emergency medicine: Revue africaine de la medecine d'urgence, 2018, 8(3):89-94. DOI: 10.1016/j.afjem.2018.01.001.
12. Mell HK, Mumma SN, Hiestand B, Carr BG, Holland T, Stopyra J. Emergency Medical Services Response Times in Rural, Suburban, and Urban Areas. JAMA Surg. 2017 Oct 1;152(10):983-984. DOI:

10.1001/jamasurg.2017.2230. PMID: 28724118; PMCID: PMC5831456.
13. Nakao S, Katayama Y, Kitamura T, Hirose T, Sado J, Ishida K, Tachino J, Umemura Y, Kiguchi T, Matsuyama T, Kiyohara K, Shimazu T. Epidemiological profile of emergency medical services in Japan: a population-based descriptive study in 2016. Acute Med Surg. 2020 Jan 30;7(1): e485. DOI: 10.1002/ams2.485. PMID: 32015883; PMCID: PMC6992505.
14. Bing Han,Wanqi Hu,Xilu Tang, 等. Corrigendum to "Optimization of pre-hospital emergency facility layout in Nanjing: A spatiotemporal analysis using multi-Source big data" [Int. J. of Appl. Earth Obs. Geoinf. 133 (2024) 104112] [J]. International Journal of Applied Earth Observation and Geoinformation, 2024, 135. DOI: org/10.1016/j.jag.2024.104112

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