Analysis of the disease spectra in patients seeking emergency medical treatment in Haikou, China

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ABSTRACT

Objective: To explore the characteristics of medical emergency disease spectra in Emergency Department of Haikou, China; and to provide clinical data for emergent disease treatment as well as emergency department personnel and equipment management. **Methods**: A total of 11 870 patients (over 16 years old) who visited Emergency Departments of the First Affiliated Hospital of Hainan Medical University, Haikou city from January 1, 2015, through December 31, 2015 were selected. Data on patients' age, sex, diagnosis, treatment duration, and treatment month were analyzed with Microsoft Excel. **Results**: Peak treatment times were from 18:00 to 24:00. The top four diseases were involved with respiratory, digestive, nervous, and cardiovascular systems, respectively. Respiratory problems peaked from November to February and digestive problems peaked from February to August. Temperatures ranging from >22.5 ℃ to 26 ℃ and high humidity exacerbated respiratory and digestive system diseases. **Conclusion**: The frequency of specific diseases that require emergency room care are affected by the local climate of Hainan Province.

1. Introduction

Emergency medical treatment has become an independent discipline within the twenty-first century[1], and has been enhanced to meet the needs of emergency medical staff and improve the success rate for various medical rescues. This emerging discipline has been of great importance to the medical profession worldwide. The emergency clinic in any hospital is the first stop for effective treatment of critical and severely injured patients, which is important for reducing morbidity and mortality rates. The analysis and research of the characteristics of medical emergency disease spectra in emergency departments aims to provide better treatment for various diseases, which has also been of great significance in the prevention of the diseases. In this paper, the emergency cases in the First Affiliated Hospital of Hainan Medical University from January 1, through December 31, 2015, were collected and analyzed.

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2. Materials and methods

The medical records of 11 870 male and female patients over 16 years old were collected for the study. These patients were treated in the emergency room of our hospital from January 1, to December 31, 2015. patients gender, age, blood pressure, respiration, body temperature, treatment time, complaints, diagnosis, monthly average temperature, and other related information were collected for analysis.

Patient characteristics were analyzed and patients were divided into three groups based on age as follows: youth (16–39 years), middle aged (40–59 years), and elderly (60 years or above). Treatment time was divided into morning (7:00–11:59), afternoon (12:00–17:59), evening (18:00–23:59), and early morning (00:00–6:59). Time of year was divided into spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). Patient diseases were classified according to their primary diagnosis.

Microsoft Excel 2010 (Microsoft Corporation, Beijing, China) was used to compile and analyze data.

3. Results

3.1. Sex and age distribution

The sex and age distribution of the medical emergency patients are shown in Figure 1. Among the 11 870 cases, 5 595 were male (47.1%) and 6 245 were female (52.6%). The male-to-female ratio was about 1:1.12. There were 6 456 patients in the youth group, accounting for 55% of the total, and 2 733 patients in the middle-aged group (23.3%). The elderly group was comprised of 2 548 patients accounting for 21.7% of the total. The age group from 20 to 29 years showed the largest number of visits to the emergency room. Number of female patients were more than male patients.
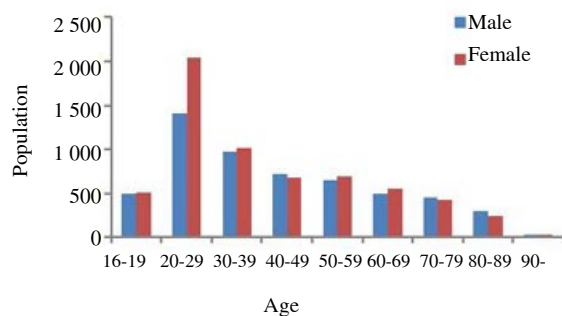

Figure 1. Distribution of age, sex, and number of visits to the emergency department.

3.2. Time of day and seasonal distribution of medical emergency patients

Number of visits to emergency room reached a peak in the afternoon and evening, the largest number of visits came from 18:01 to 24:00, as shown in Figure 2. The number of patients seeking emergency treatment was highest in summer and winter, and the density from December through March was higher than that from June through November (Figure 2).
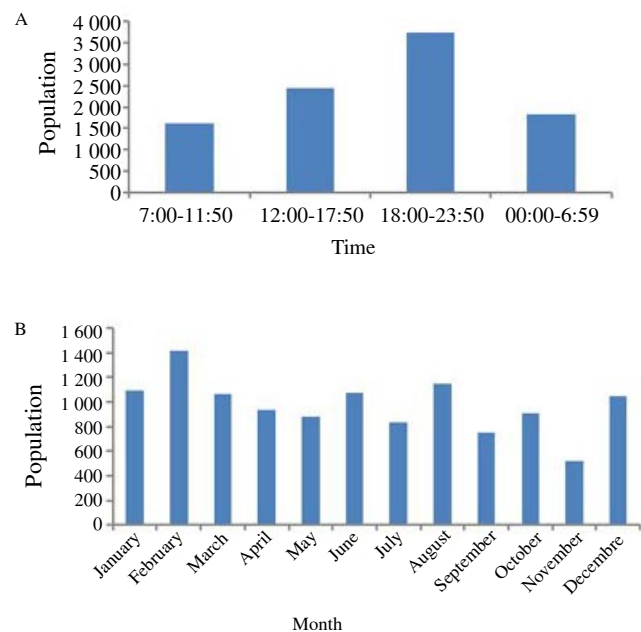

Figure 2. Distribution of different timeand the number of visits to the emergency department.

3.3. Medical emergency disease spectra

The most common medical emergency diseases in Haikou were diseases of respiratory, digestive, cardiovascular, nervous, and urinary systems. Respiratory system disease was the most frequent (4 988, 43%), followed by digestive system disease (3 387 cases, 29%), nervous system disease (1 452 cases, 13%), and cardiovascular system disease (1 086 cases, 9.0%). Patients who suffered from any of these four diseases accounted for 94.0% of all medical emergency visits. Other visits were for accidental poisoning (1.0%), urinary tract infection (1.0%), and others not identified (4.0%). The proportion of different diseases by month is shown in Figure 3. In February, the largest patients seeking emergency treatment had complaint of respiratory disease (709, 50%) and nervous system disease (171, 12.1%). But in August the highest number of patiesnt had complaint of digestive system disease (399, 34.8%). In December most patients suffered from cardiovascular system disease (149, 14.2%). In November the number of patients were the least overall across all diseases.
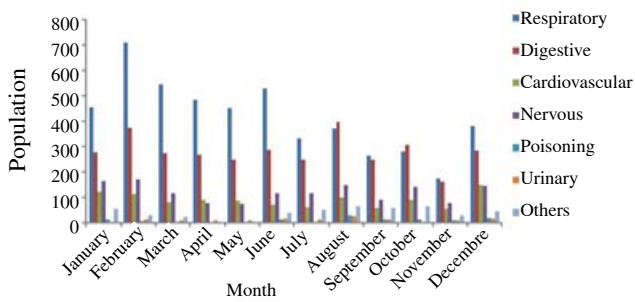
Figure 3. (A) Percentage of patients suffering from specific diseases who sought emergency medical treatment. (B)Visits by month and disease of patients seeing emergency medical treatment.

3.4. Distribution of disease spectra by age group

Of the three groups, the youth group accounted for the largest number of patients the elderly suffered from cardiovascular and nervous system diseases, respectively (Figure 4A).There was a significant upward trend in the frequency of respiratory disease from November to February, when it reached its peak (Figure 4B).
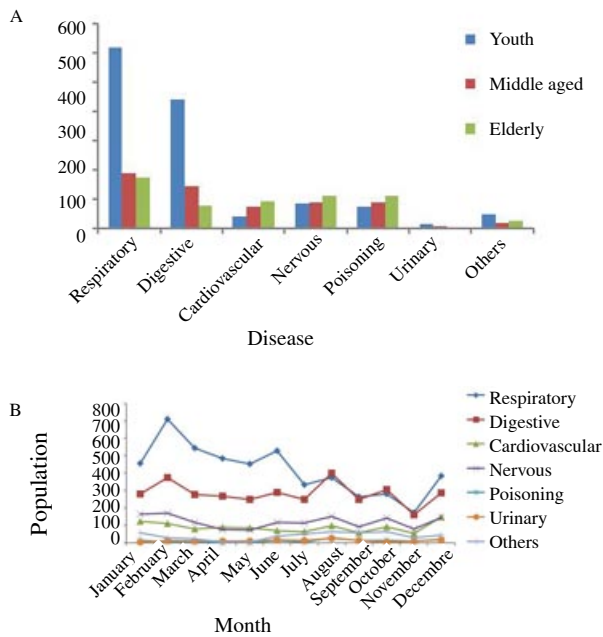

Figure 4. Frequency of diseases by age group (A)and time(B).

3.5. Changes in disease frequency based on climate

The frequency of respiratory and digestive system diseases changed dramatically with changes in temperature and humidity, but there were no changes in the frequency of nervous system, cardiovascular system, and other diseases. The frequency of respiratory disease was highest at 22.5 ℃ and lowest at 23.0 ℃. The frequency of digestive system diseases was fairly steady when temperatures were from 18.5 ℃ to 22.5 ℃, it was the lowest at 23.0 ℃ and highest at 29.0 ℃. The frequency of all other diseases showed no significant upward or downward trend with temperature changes; however, when temperatures was >29.0 ℃, all diseases showed an increase treand in frequency. When the humidity went from 77% to 80%, the frequency of all diseases increased, reaching a peak when the humidity was 80%. There was an upward trend in frequency when humidity increased from 83% to 86%, the number of patients had complaint of respiratory system diseases were the highest during this period, followed by those of digestive system disease(Figure 5).
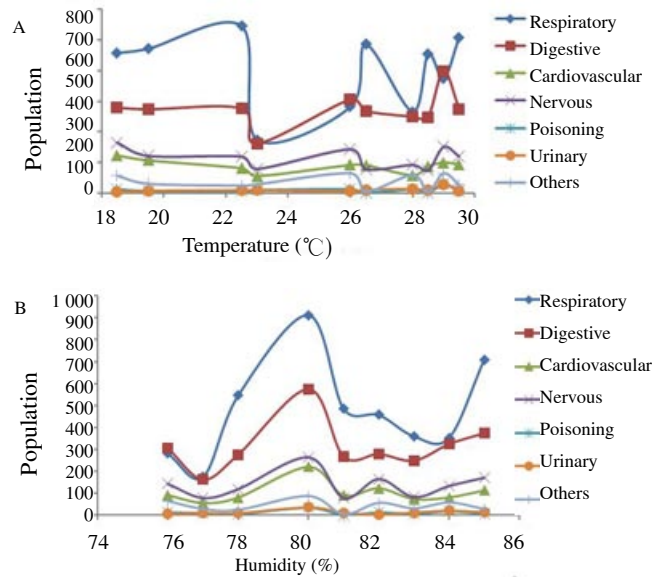

Figure 5. Frequency of diseases with changes in temperature(A)and humidity(B).

4. Discussion

With the development of emergency medical treatment, more research on the characteristics the spectra of diseases requiring emergency treatment has evolved. Because of different natural environments, economic development levels, and living conditions, there are also differences in the spectra of emergency diseases across different regions[2]. Until now, there has been no relevant research on the relationship between diseases and climate changes (mainly, temperature and humidity) in Haikou. In this study, we analyzed the relationship between the spectra of diseases treated in the emergency room and changes in temperature and humidity to assess the frequency of each diseases during these changes to improve the accuracy of predicting these diseases and the capacity for emergency intervention.

We found that, in Haikou, the top four diseases were related to the respiratory (43%), digestive (29%), nervous (13%), and cardiovascular systems (9.0%). In Huashan[3], the top four diseases in order of frequency were related to the respiratory, digestive, cardiovascular, and endocrine systems. In Wannan[4], they were related to the respiratory, cardiovascular, accidental poisoning, and digestive systems, respectively, and in Shandong[5], they were

related to the cardiovascular, nervous, respiratory, and digestive, systems, respectively. From this, it can be determined that although the disease spectra were slightly different in different areas, diseases related to the respiratory, digestive, cardiovascular, and nervous systems were the most common throughout China. It is also worth noting that the changes in the frequency of these diseases differed with the changes in seasons within different regions.

Studies have shown that respiratory diseases peak in winter and spring[6]. In Hainan, the frequency of respiratory diseases is high throughout the year, but peaks in February. One reason may be that respiratory diseases are sensitive to changes in temperature and humidity, with temperature being one of the most important factors. The relationship between temperature and morbidity shows a J-type or U-type nonlinear distribution characteristics[7,8]. Humidity also plays an important role in the frequency of respiratory diseases, which increases under extremely humid conditions with a U-type nonlinear relationship[9,10]. The optimum temperature and humidity of each region as related to the frequency of disease were different, and there has been no relevant study on this in Hainan Province. According to the temperature and humidity trend diagram for Haikou, when the temperature ranges from 18 to 22.5 ℃ and humidity ranges from 78% to 80% and >85%, the frequency of respiratory system diseases is the highest. The average temperature in winter in Haikou is <21 ℃. In other seasons, the average temperatures range from >23 ℃ to <30 ℃. The optimum temperature for people to avoid these diseases is between 24 ℃ and 28 ℃. Morbidity rates are low in appropriate temperatures, but when the temperature decreases, the rate increases[11].

Second, Haikou has a tropical monsoon marine climate without four distinct seasons. The tourist season is from late November to February, with a mild climate. According to some statistics, the resident population of Haikou reached >2.2 million[12], while its overnight domestic and tourist population reached 12 million[13] in 2015, with >1.0 million people during the Golden Week of the Spring Festival in Haikou[14]. Given the large number of tourists who had contact with each other, the transmission of bacteria and viruses related to respiratory system diseases increased, which might explain their high incidence.

Third, the migratory bird season is a very common phenomenon in the region. With Haikou's relatively warm winters, a large number of people visit the city to observe migratory bird life. This also contributes to the transmission of bacteria and viruses among the population.

According to the research, digestive system diseases have obvious seasonal distribution, with higher incidence rates in summer and winter. The frequency of digestive system diseases in Haikou is high year round, but peaks in summer and winter. These results are different from those of previous reports. The reasons for this phenomenon are that, first, Hainan Province has year-round high humidity and heat, which is more notable in summer, and has an abundance of seafood, which is a dietary stable. High temperatures and humidity are conducive to the growth of a majority of bacteria. If people consume meat, fish, crabs, or conch that live on halophilic

bacteria, or food contaminated by Staphylococcus, the results could be acute gastroenteritis. Second, winter is tourism season in Hainan, especially during the Spring Festival. Roadside food stands are quite common during this period, and unhealthy and irregular diets are a common cause of gastrointestinal diseases. Some tourists develop acute infectious diarrhea because of living arrangements and changes in dietary habits, which explains the peak in digestive system diseases in February.

Several studies suggest that cardiovascular diseases have obvious seasonal characteristics and peak during cold winters[15,16]; however, one such study showed that the disease was affected more by circadian rhythms and days of the week, and that seasonal effects were not obvious[17]. There have been no relevant reports about the influence of seasonal change on cardiovascular diseases in Hainan, but the assessments of patients from our hospitals showed no obvious high and low periods, which might be related to the mild climate. This phenomenon might need further study.

Among the patients ranging in age from 20 to 39 years, the number of females was higher than that of males; there was no significant difference between the male and female ratios in the other age groups, which did not agree with the results of previous reports. We suggest that temperature has different effects according to the sex and age of those with the common diseases, such as those with respiratory diseases. Women are most affected by high temperatures, followed by men affected by both high and low temperatures, followed by women affected by low temperatures. Because women are more sensitive to temperature changes and more women are working outside of the home and face pressures from society and their families, their immune systems might be compromised, which might account for these differences in disease frequency between the sexes. This also suggests that the effects of high temperatures on the young and middle-aged groups were more obvious than that in the elderly group[20]. Our research also showed that most of the respiratory system diseases occurred in the middle-aged group, which is consistent with this research. The peak time of day for emergency room visits was from 18:01 to 24:00, which might be a result of the rich and varied night life in Hainan, but could also be related to the available hours at emergency clinics. According to this phenomenon, the emergency department should increase staff at night to ensure that services and treatment are orderly and of high quality.

5. Conclusions

With respiratory and digestive system diseases accounting for a large proportion of emergency visits in Hainan, and because these are usually caused by bacterial and viral infections, targeted treatment is rare. If checks on rapidly spreading pathogens can be performed in these clinics, it would be more conducive to an accurate diagnosis and treatment of these diseases.

The spectra of diseases in emergency patients in different regions vary, which might be related to climate[18]; however, diseases

related to the respiratory, digestive, cardiovascular, and nervous systems are still the most common and frequent that are treated in the emergency clinics, which is consistent with the results of mainland studies[19]. Therefore, these common diseases remain the main threats to people's health. When considering the configuration of the team of emergency physicians, it is important that general practitioners be provided with training in specific disease spectra to enable them to become experts in one field while possessing overall medical knowledge and abilities. We should highlight the studies on respiratory, digestive, cardiovascular, and nervous system diseases as the focus of emergency care to improve the level of diagnosis and treatment.

Disease awareness and prevention are key to controlling the frequency of these diseases. By maintaining personal hygiene, ensuring reasonable and healthy eating habits, maintaining good sleep, and keeping good exercise routines, the incidence of these diseases can be reduced. With time, the disease spectra would change in different regions, different hospitals, or even in the same hospital in the same area. Those researchers with enough staff and equipment should expand their study scope of the disease spectrum because the wider the scope, the more representative it is of the population.

This study had some limitations. The characteristics of the disease spectra was representative of only those patients who were seen in the emergency room in the First Affiliated Hospital of Hainan Medical University in 2015, which is not representative of the entire population. Further studies are necessary to assess the spectrum of these diseases by increasing the number of cases presenting at the emergency room in different years and in different regions to help provide guidance for emergency treatment in the entire country.

Conflict of interest statement

We declare that we have no conflict of interests.

Acknowledgements

References

[1]Yu Xue-zhong. The development of the emergency medicine and the developing emergency medicine. *Practical J Clin Med* 2012;**9**(1):1-5.

[2]Wang Cai-Hong, Liu Ji-Nin, Lu An-Yang, Hong Yu, Ouyang Zhi-Bo. Disease spectrums analysis of 3,183 severe cases. *J North Sichuan Med Coll* 2016; **31**(2):235-237.

[3]Lin Jiang. *A study on the disease spectrums and the behavior of seeking medical treatment in emergency internal medicine in Huashan hospital.* Master dissertation submitted to Fudan University. Shanghai: Fudan

University;2009.

[4]Xue Xiang, Xie Dong-Hui. Analysis of disease spectrums and characteristics of 7260 cases in emergency internal medicine. *Adv Clin Med* 2015;**29**(10):91-92.

[5]Fan Gui-Min. *Epidemiology analysis of emergency department patients of a third grade hospital.* Master Dissertation submited to Shandong University. Shandong: Shandong University;2013.

[6]Yang Li-Ming, Wang Xiao-Ming. Influence of climate factors on respiratory diseases and its significance. *Chin J Basic Med Trad Chin Med* 2007;**13**(7):540-541.

[7]Xu Zhi-Wei, Fitz Gerald Gerard, Guo Yu-Ming, Jalaludin Bin, Tong Shi-Lu. Impact of heatwave on mortality under different heatwave definitions: A systematic review and meta-analysis. *Environ Int* 2016; **89-90**:193-203.

[8]Liu Y, Kan H, Xu J, Rogers D, Peng L, Ye XF, et al. Temporal relationship between hospital admissions for pneumonia and weather conditions in Shanghai, China: a time series analysis. *BMJ Open* 2014; **4**(7): e004961.

[9]Barreca AI. Climate change, humidity, and mortality in the United States. *Jeviron Econ Manage* 2012; **63**(1):19-34.

[10]Tiina M. Ikäheimo, Kari Jaakkola, Jari Jokelainen, Jouni Jaakkola, Merja Roivainen, Raija Juvonen. A decrease in temperature and humidity precedes human rhinovirus infections in a cold climate. *Viruses* 2016;**8**(9); doi:10.3390/v8090244.

[11]Ye X, Wolff R, Yu W, Vaneckova P, Pan XC, Tong SL. Ambient temperature and Morbidity: a review of epidemiological evidence. *Environ Health Perspect* 2012;**120**(1):19-28.

[12]Liu Shao-Jun, Zhang Jing-Hong, Wu She-Nan The analysis of possible climate changes on climate comfort and passenger traffic in Hainan Island. *J Trop Meteorol* 2014;**30**(5):977-982.

[13]Wang Chen. Special reports of the two sessions in Haikou in 2016. *Hainan Net* 2016-01-20.

[14]Yu Dong. 1.0054 million tourists came to Haikou during the Spring Festival and Golden Week with the travel income reaching 1.324 billion yuan. *Fenghuang News in Haina* 2015-02-25.

[15]Tong S,Wang XY,Yu W, Chen D, Wang XM. The impact of heatwaves on mortality in Australia: a multicity study. *BMJ Open* 2014;**4**(2):e003579.

[16]Shim SR, Kim JH, Won JH, Song ES, Song YS. Association between ambient temperature and lower urinary tract symptoms: a community-based survey. *Int Braz J Urol* 2016;**42**(3): 521-530.

[17]Ku CS, Yang YC, Lee WJ, Lin S. Absence of a seasonal variation myocardial infarction onset in a region without temperature extremes. *Cardioligy* 1998;**89**:277-282.

[18]Lu Wei. *Analysis of characteristics of emergency disease spectrums in Jincheng mining areas during 2004 and 2009.* Master Dissertation submited to Shanxi Medical University.Taiyuan: Shanxi Medical University; 2010.

[19]Li Yong-Sheng, Feng You-Fan. Analysis of trends of severe diseases spectrums in a certain hospital from 2004 to 2013. *Health Vocational Education* 2016; **34**(14): 89-91.

[20]Mo Yun-Zheng, Zheng Ya-An, Tao Hui, Xu Mei-Mei, Li Guo-Xing, Dong Feng-Ming. Time sequence analysis of the correlation between daily air temperature and the respiratory system diseases. *J Peking University* 2012; **44**(3):416-420.