Analysis of Esophageal Cancer Death at Different Educational Levels in Inner Mongolia from 2009 to 2015

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Abstract

Objective: This study aimed to clarify the death characteristics of esophageal cancer in Inner Mongolia and the population distribution with various education levels. **Methods:** The mortality rate of esophageal cancer was calculated using the monitoring point of Death Registry System in Inner Mongolia from 2009 to 2015. The gender, age, region, ethnicity at two education levels of percentage were calculated and the χ^2 test was executed. **Result:** The mortality rate of esophageal cancer was $10.10/10^5$, China Adjustment Mortality was $10.97/10^5$, World Adjustment Mortality was $9.08/10^5$ in Inner Mongolia. The death of esophageal cancer showed statistical significance at two educational levels ($P < 0.05$). High school and below accounted for 93.9% at the education level, and above high school accounted for 3.5%. In addition, there were significant differences in the percentage of death by gender, age and region at two educational levels ($P < 0.05$). **Conclusion:** Education level has a certain relation with the death of esophageal cancer. To improve the health level, health education plans can be formulated according to esophageal cancer prevention relevant policy with different education levels.

Keywords

Esophageal Cancer, Death, Education Level

1. Introduction

It was estimated that one in every 20 cancer deaths worldwide in 2018 was esophageal cancer [1]. A previous study reported that Chinese patients with esophageal cancer, liver cancer and stomach cancer account for nearly half of the

global cancer cases [2]. Nearly 50% of the world's esophageal cancer cases occur in China [3]. Esophageal cancer related death was fourth in China in 2016, the mortality rate was $15.17/10^5$ [4]. The impact of esophageal cancer on human beings can't be underestimated. It can be seen that esophageal cancer had a higher death rate and worthy of paying attention. Many studies have shown that unreasonable dietary nutrition, alcohol, tobacco and other factors can increase the risk of esophageal cancer [5] [6]. However, there are relatively less studies on the general characteristics of the population in Inner Mongolia, especially the correlation between education level and esophageal cancer.

There is a close correlation between educational levels and mortality rates [7]. A relevant study has investigated six regions in China (North China, Northeast China, East China, Central South, Southwest, Northwest). The results showed that the mortality in the six regions of China is different [8]. The higher the education level, the lower the mortality [8]. Besides educational level the research showed that age, marriage and occupation were closely related to mortality [9]. At the beginning of the century, we have studied digestive system cancer and had corresponding research results [10]. This study will further investigate the characteristics of esophageal cancer death in one of the digestive system cancers in Inner Mongolia.

2. Materials and Methods

2.1. Data Source

Data were obtained from Death Registry System (DRS) in the Inner Mongolia Centers for Disease Control and Prevention (CDC), 2009 to 2015. There were eight monitoring points from 2009 to 2012. The monitoring points were twenty from 2013 to 2015. The monitoring points were selected by the method of multi-stage stratified cluster random sampling [11]. The monitoring points covered the eastern, central and western regions of Inner Mongolia, including urban and rural areas. The permanent resident population in 2009-2012 was 2.4 million, accounting for about 10% of Inner Mongolia population. The permanent resident population in 2013-2015 was 5.8 million, accounting for about 23% of the Inner Mongolia population. The cause of death data was taken as the information of the death with esophageal cancer according to several methods, such as clinical diagnosis, surgery, pathological diagnosis, laboratory tests and postmortem inferences [12]. According to the International Classification of Diseases (ICD-10) criteria, the ICD underlying cause of death code ranges from C15.0 to C15.9 [13].

The researchers summarized the death data of esophageal cancer in monitoring points in Inner Mongolia from 2009 to 2015. Combined with demographic characteristics, required data were classified. There were diagnostic methods, education level, age, ethnicity and other factors. We divided diagnostic methods into clinical diagnosis and laboratory tests, including clinical, physical and chemistry examination, as well as pathological diagnosis, surgical diagnosis and

posthumous diagnosis. There was only one clear demarcation in high school among various educational levels by the DRS of Inner Mongolia CDC. We had to divide education levels into high school and below, including high school, technical school, junior high school, primary school, illiterate or semi-illiterate; above high school, including college, graduate students; Unknown, education level is not indicated. We divided age into five groups, <45, 45-, 55-, 65-, 75+. The number of esophageal cancer deaths in different age groups under 45 years old was very small. Therefore, this study divided the age group under 45 years old into a single group. We divided ethnicity into The Mongol Ethnicity, including Mongolia, Evenki and Daur; The Han Ethnicity; Others, Including the Hui, Manchu.

2.2. Statistical Analysis

The researchers calculated the seven-year average mortality rate of esophageal cancer (Mortality = The number of deaths/population × 100,000) and china adjustment mortality (CAM), and world adjustment mortality (WAM). The percentage of esophageal cancer by sex, age, region and ethnicity with different education levels was calculated. The χ^2 test was used to compare the effects of different population characteristics on death from esophageal cancer. $P \leq 0.05$ indicated statistical significance. The above data were calculated and analyzed using Microsoft excel and SPSS 22.0 statistical analysis software.

3. Result

Table 1 presented the diagnosis distribution of esophageal cancer monitoring points in Inner Mongolia between 2009 and 2015. 2750 people died from esophageal cancer; clinical and laboratory tests, pathological diagnosis and surgical diagnosis accounted for 97.8% of the esophageal cancer deaths between 2009 and 2015 in Inner Mongolia.

Table 2 presented the death data of each year on esophageal cancer from 2009 to 2015, ranging from $9.30/10^5$ to $11.48/10^5$. The average mortality rate of esophageal cancer in Inner Mongolia monitoring points was $10.10/10^5$, the average CAM was $10.97/10^5$, and the average WAM was $9.08/10^5$. Males and females mortality rates were $16.79/10^5$ and $2.82/10^5$, respectively. Males were 5.95 times higher in females. The male of CAM was $18.00/10^5$, and WAM was $14.18/10^5$. The female of CAM was $3.36/10^5$, and WAM was $3.02/10^5$. The maximum mortality rate of esophageal cancer in Inner Mongolia between 2009-2015 was $11.48/10^5$ and a minimum was $9.30/10^5$. There was no significant change trend observed during seven years (P > 0.05).

The esophageal cancer death in high school and below was 93.9% and above high school was 3.5%. Table 3 presents the demographic characteristics of esophageal cancer deaths at various educational levels. The results showed significant differences in the demographic characteristics percentage of esophageal cancer deaths at various educational levels (P < 0.05), except for ethnicity. In

Table 1. Diagnostic distribution of esophageal cancer monitoring points in Inner Mongolia between 2009 to 2015.

	Number of deaths	Percentage (%)	Cumulative percentage (%)
Diagnostic method			
Clinical Diagnosis and Laboratory tests	1880	68.4	68.4
Pathological Diagnosis	701	25.5	93.9
Surgical Diagnosis	107	3.9	97.8
Posthumous Inference	48	1.7	99.5
Unknown	14	0.5	100.0

Table 2. Mortality of esophageal cancer in monitoring points Inner Mongolia ($1/10^5$).

Year	Total Number of deaths				Male				Female			
	Number of deaths	Mortality rate	CAM	WAM	Number of deaths	Mortality rate	CAM	WAM	Number of deaths	Mortality rate	CAM	WAM
2009*	274	11.48	14.60	12.37	240	19.68	24.01	14.08	34	2.91	4.09	3.73
2010*	232	9.69	10.96	8.96	199	16.28	18.06	14.08	33	2.82	3.60	3.21
2011*	224	9.30	10.17	8.40	201	16.07	17.19	13.53	23	1.99	2.47	2.20
2012*	230	9.41	9.87	8.07	196	15.38	16.24	12.73	34	2.91	2.98	2.52
2013*	556	9.57	10.58	8.70	480	15.69	17.26	13.55	76	2.77	3.37	3.02
2014*	582	9.81	10.24	8.46	507	16.20	16.70	13.15	75	2.68	3.08	2.78
2015*	652	11.15	11.96	9.97	559	18.46	19.60	15.51	93	3.30	3.90	3.56
average	2750	10.10	10.97	9.08	2382	16.79	18.00	14.18	368	2.82	3.36	3.02
r		0.036	−0.179	−0.179		−0.214	−0.286	−0.054		0.090	−0.143	−0.143
P		0.939	0.702	0.702		0.645	0.535	0.908		0.848	0.760	0.760

Table 3. The demographic characteristics of esophageal cancer deaths at various educational levels.

	Total		High School and Below		Above High School		Unknown		c^2	P
	Number of deaths	Percentage (%)	Number of deaths	Percent-age (%)	Number of deaths	Percentage (%)	Number of deaths	Percent-age (%)		
Age									31.791	0.000
≤60	980	35.6	904	35.0	59	60.8	17	23.6		
>60	1770	64.4	1677	65.0	38	39.2	55	76.4		
Gender									13.681	0.001
Male	2382	86.6	2234	86.6	93	95.9	55	76.4		
Female	368	13.4	347	13.4	4	4.1	17	23.6		
Region									22.689	0.000
East	1873	68.1	1782	69.0	45	46.4	46	63.9		
Mid-west	877	31.9	799	31.0	52	53.6	26	36.1		

Continued

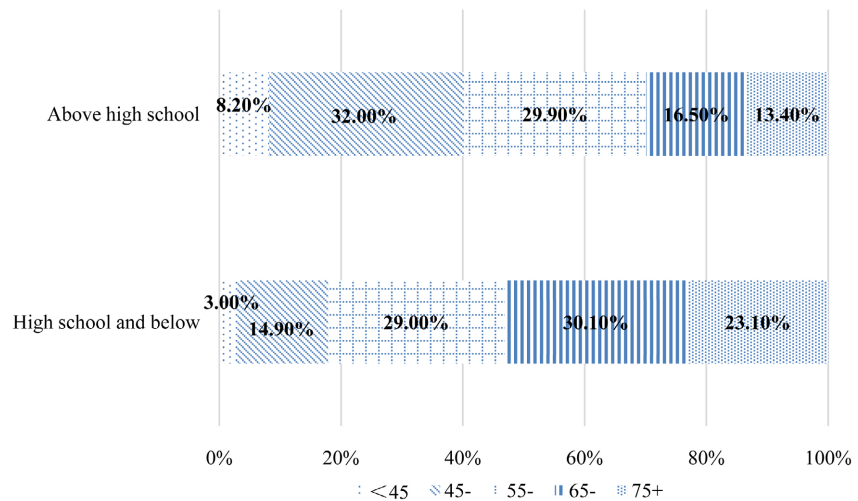| Ethnicity									0.212	0.995
Mongol	2021	73.5	1896	73.5	71	73.2	54	75.0		
Han	690	25.1	648	25.1	25	25.8	17	23.6		
Others	39	1.4	37	1.4	1	1.0	1	1.4		

Figure 1. Age-specific death percentage of esophageal cancer between above high school, high school and below.

terms of age, in high school and below, the percentage of age ≤ 60 deaths from esophageal cancer was 30% lower than for those >60. When the education level was above high school, the percentage of age ≤ 60 deaths from esophageal cancer was 20.8% higher than for those >60. In terms of gender, the percentage of male death from high school and below was 73.2% higher than female. Male death from above high school was 91.8% higher than female. In terms of region, the percentage of high school and below death in the east was 38% higher the mid-west. The percentage of above high school in the east was 7.2% lower than in the mid-west, whether education level was high school and below or above. The death percentage of Han was higher than in Mongolian and other ethnic groups in high school and below or above. However, there was no significant difference between ethnicity and education level ($P > 0.05$).

As shown in **Figure 1**, there were significant differences in the age-specific death percentage of esophageal cancer between above high school and high school and below in Inner Mongolia from 2009 to 2015 ($P < 0.05$). In terms of age-specific percentage, when the age was <45, 45-, 55-, the education level of above high school was higher than the high school and below, 5.2%, 17.1% and 0.9%, respectively. When the age is 65- and 75+, the education level of above high school was lower than high school and below, 13.6% and 9.7%, respectively. The highest percentage (32.0%) of esophageal cancer death was age 45- in the above high school. The highest percentage (30.1%) of esophageal cancer death was age 65- in high school and below.

4. Discussion

Monitoring death causes is an important indicator of the death level of a certain population in a particular period [14]. The average mortality rate of esophageal cancer in Inner Mongolia in seven years was higher than the world's $5.5/10^5$ in 2018. It was lower than China's $12.7/10^5$ in 2018 [15]. Compared with other regions in China, the mortality rate of esophageal cancer in Inner Mongolia was slightly higher than Fuzhou 2011-2019 [16], it was lower than Sichuan province in 2015 [17], and lower than Hebei province 2011-2016 [18]. Our results showed that the mortality rate of males was nearly six times higher than females, which is consistent with a previous study [19]. These findings indicate that male was more prone to esophageal cancer death. Possibly, there may have a certain relationship between the high proportion of male smoking and the different occupation and physiological structure in gender [20]. Therefore, we should pay more attention to the early diagnosis and treatment of esophageal cancer in males [18].

A previous study has shown that the educational level, social and economic status are closely related to the health and disease conditions of population [21]. Based on the distribution of education levels, our study showed that the percentage of esophageal cancer death in high school and below >60 years old was higher. The percentage of esophageal cancer death in above high school ≤60 years old was higher. The esophageal cancer death percentage in the various age at two educational levels found that 45 had the highest percentage of esophageal cancer death in "above high school". Age in 65- had the highest percentage of esophageal cancer death in high school and below. These results showed that the percentage of esophageal cancer death was different at various age. In terms of gender, the percentage of male esophageal cancer death was higher than in females at both two educational levels. Irrespective of education level, the percentage of esophageal cancer death in males was higher than females, especially the male with high education level was more significant. In terms of region, the percentage of esophageal cancer death in high school and below was mainly in the eastern regions. The percentage of esophageal cancer death above high school in the mid-west regions was higher than in the east. Overall, the percentage of esophageal cancer death above high school was significantly less than in high school and below in various populations, seemingly reflecting the relation between educational levels and esophageal cancer death. Some researches showed that esophageal cancer is related to smoking, drinking alcohol [22] [23], drinking hot tea [24] and other risk factors. People with high education levels are more likely to maintain good living habits to reduce the impact of the risk factors on esophageal cancer compared with that in low education levels. It can be seen that people with high education level improve their living manner by establish their living habits, which has an indirect effect on occurrence of esophageal cancer. Actually, it has reported that people with higher education pay attention to their physical conditions, maintain good diets, daily living, personal hygiene, and exercise, and

try to do regular examinations and timely medical treatment, improving their health [8].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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