FITNESS, PERFORMANCE AND HEALTH JOURNAL
2024; 3(2): 23-34
Published online 09 16 2024 (https://todoxpublisher.com/index.php/fphj/index)
doi: https://doi.org/10.53797/fphj.v3i2.3.2024
e-ISSN 2821-3785

Clinical Characteristics Analysis of 1482 Cases of Esophageal Cancer in Western Guangxi, China

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Abstract: To investigate the epidemiological characteristics and trends of esophageal cancer at the Affiliated Hospital of Youjiang Medical University for Nationalities over the past 30 years, aiming to inform prevention and treatment strategies in western Guangxi. Medical records from January 1994 to December 2023 of patients diagnosed with esophageal cancer were reviewed. Patients were grouped into three 10-year intervals for comparative statistical analysis, focusing on variables such as pathological type, onset location, age, clinical stage, ethnicity, gender, treatment modality, clinical symptoms, comorbidities, and urban-rural distribution. The majority of esophageal cancer cases were males (81.24%), predominantly Han Chinese (61.07%), with the disease mostly occurring in the middle esophagus (59.99%). Squamous carcinoma was the most common pathology (90.22%), with progressive dysphagia being the prevalent symptom (78.14%). Most patients were diagnosed at advanced stages, with an increase in those receiving comprehensive treatment (47.90%). Esophageal cancer in western Guangxi shows an aging trend with higher incidence in rural areas. The predominant pathology is squamous cell carcinoma, with the middle esophagus being the common site. There is a need to enhance cancer prevention education in rural areas, tailor prevention strategies to regional clinical characteristics, and improve outcomes through routine screening and early treatment in high-risk groups.

Keywords: Esophageal cancer, Epidemiology, Clinical features, analysis.

1. Introduction

Approximately 600,000 new cases of Esophageal cancer (EC) occur globally each year. EC has the characteristics of high incidence, high aggressiveness, high mortality and poor prognosis. Its incidence ranks seventh among all malignant tumors in the world, and its overall mortality ranks sixth(Sung et al., 2021). According to WHO, in 2020, there were 324,000 new cases and 301,000 deaths of EC in China, accounting for 53.70% and 55.35% globally, respectively, and the incidence and mortality rates of EC in China ranked first in the world (Li et al., 2021). In recent years, although the incidence and mortality of esophageal cancer in western developed countries such as Europe and the United States have a downward trend, the

situation is still grim in some countries and regions in Africa and Asia, including China, and there is a trend of increasing year by year in western Guangxi, and the trend of younger people is obvious, which seriously threatens people's health. According to pathological types, Esophageal squamous cell carcinoma is divided into Esophageal squamous cell carcinoma (ESCC) and Esophageal adenocarcinoma (EAC). ESCC is mainly composed in European and American countries, while EAC is mostly composed in our country (Arnold et al., 2020). The etiology of EC is still unclear, and its occurrence is closely related to factors such as alcohol consumption, smoking, insufficient fruit intake, high body mass index, and is the result of a combination of factors(D. Max Parkin, 2002). In recent years, with the improvement of the health awareness of Chinese residents and the level of EC diagnosis and treatment, the characteristics of the onset and clinical features of EC have changed. In this study, we collected the clinical data of EC patients and analysed the clinical epidemiological characteristics of EC and its changing trends, so as to provide a reference basis for the prevention and treatment of EC in this region.

2. Materials and Methods

2.1 General Information

A total of 1,482 cases of EC patients diagnosed by pathology from 1 January 1994 to 31 December 2023 were selected from the Affiliated Hospital of Right River College of Ethnic Medicine, among which there were 1,204 male cases and 278 female cases, with the average age of onset being 62.43 years old; 905 cases of Han Chinese patients, 537 cases of Zhuang Chinese patients, and 40 cases of other nationalities; 1,337 cases of squamous carcinoma, 60 adenocarcinoma, and 85 cases of other types of cancer; 42 cases, 261 cases, 889 cases, and 290 cases of patients with cervical, upper, middle and lower stages 0-II, respectively. Pathological types: 1337 squamous carcinomas, 60 adenocarcinomas, 85 other types of carcinomas, 42 patients with cervical segment, 261 patients with upper segment, 889 patients with middle segment and 290 patients with lower segment. 429 patients with stage 0-II EC, and 1053 patients with stage III-IV EC. There were 359 patients with surgical treatment and 710 patients with comprehensive treatment. Inclusion criteria: ① patients with pathological diagnosis of primary EC; ② patients with complete medical records; ③ patients with complete medical records for the first time in our hospital, or patients with EC diagnosed outside the hospital for the first time, but visiting our hospital again. Exclusion criteria: ① patients with incomplete medical records; ② patients with repeated diagnosis and treatment; ③ patients not from Guangxi region; ④ patients with non-primary malignant tumors.

2.2 Methods

In order to facilitate the statistical analysis of the development trend of esophageal cancer in the past 30 years, 1,482 patients with esophageal cancer in this group were divided into 3 groups according to the time period, namely group A (1994-2003), Group B (2004-2013), and group C (2014-2023). Pathological type, location, age, clinical stage, ethnicity, gender, treatment mode, clinical symptoms, comorbidities, urban and rural regional distribution and other characteristics of each group and all patients with esophageal cancer were statistically analyzed and compared.

2.3 Statistical Analysis

Spaa19.0 software was used for analysis, count data were expressed as rate 'case (%)', measurement data were analysed by $\chi 2$, and all statistical data were $P<0.05$ as the difference was statistically significant.

3. Results

3.1 Clinical Features of the Esophageal Cancer

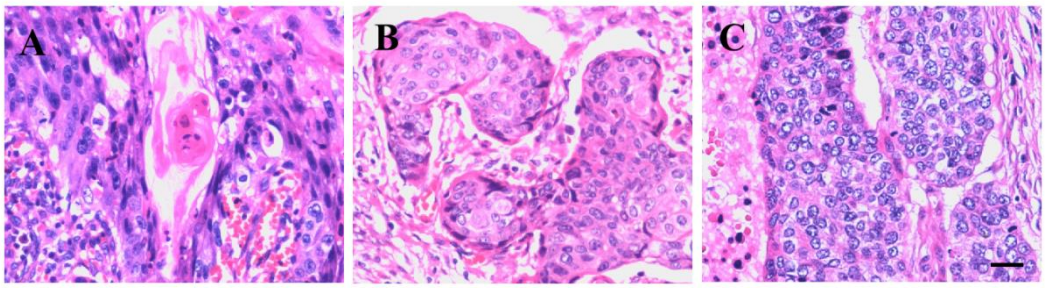
There were 1482 patients with esophageal cancer, 1204 males and 278 females, with a sex ratio of 4.33:1. The average age of onset was 62.43 years old, among which there were 798 patients with esophageal cancer in the age group of 60-80 years old, which was the peak age group for the onset of esophageal cancer. There were 956 cases (64.51%) of rural patients and 526 cases (35.49%) of urban patients, with more rural patients than urban. There were 537 cases (36.23%) of Zhuang Chinese patients, 905 cases (61.07%) of Han Chinese patients, and 40 cases (2.7%) of other nationalities, with the Han population dominating the esophageal cancer. Pathologic type of squamous carcinoma was dominant in 1337 cases (90.22%), followed by adenocarcinoma in 60 cases (4.04%), small cell carcinoma in 26 cases (1.75%), undifferentiated carcinoma in 21 cases (1.42%), and other types of carcinoma in 38 cases (2.57%). The site of disease was the most common in the middle segment in 889 cases (59.99%), and in the cervical segment, upper segment and lower segment in 42 cases (2.83%), 261 cases (17.61%), and 290 cases (19.57%), respectively. Among the clinical symptoms, progressive dysphagia was the main symptom in 1158 cases (78.14%), and other symptoms included choking sensation, burning pain behind the sternum, post-swallowing discomfort, etc. in 324 cases (21.86%). 429cases (28.9%) were patients with Stage 0-II esophageal cancer, and 1053 cases (71.05%) were patients with Stage III-IV esophageal cancer. The treatment of esophageal cancer patients was mainly based on comprehensive treatment in 710 cases (47.90%), surgical treatment in 359 cases (24.22%), and no treatment after diagnosis in 109 cases (7.36%), **Table 1**. The pathological features of 3 randomly selected patients were shown in **Figure 1**.

Table 1 General clinical data of 1482 cases of esophageal cancer

Clinical program		N	Component ratio（%）
Genders	male	1204	81.24
	female	278	18.76
Ages (Years)	< 60 岁	684	46.15
	≥ 60 岁	798	53.85
City and countryside	countryside	956	64.51
	towns	526	35.49
Site of disease	neck segment	42	2.83
	upper section	261	17.61
	middle section	889	59.99
	the following section	290	19.57
Pathological type	squamous carcinoma	1337	90.22

continued

	adenocarcinoma	60	4.04
	small cell carcinoma	26	1.75
	undifferentiated carcinoma	21	1.42
	other	38	2.57
clinical staging	0-II	429	28.90
	III-IV	1053	71.10
clinical symptom	progressive dysphagia	1158	78.14
	other	324	21.86
Treatment	surgeries	359	24.22
	comprehensive treatment	710	47.90
	untreated	109	7.36



A: Patient, male, 67 years old, consistent with highly differentiated squamous carcinoma;
B: Patient, female, 60 years old, consistent with moderately differentiated squamous carcinoma;
C: Patient, male, 75 years old, consistent with poorly differentiated squamous carcinoma.

Figure 1 Pathological features of EC (HE, ×200)

3.2 Analysis of Trends in Age of Onset

1482 cases of EC patients with the age of onset of 28-89 years, the average age of onset of 62.43 years, the average age of onset of patients in group A was 60.26 years, the average age of patients in group B was 62.89 years, and the average age of onset of patients in group C was 65.35 years, and there was a statistically significant difference in the comparisons ($P < 0.05$), suggesting that there is a trend of increase in age of onset of the patients, **Table 2**.

Table 2 Analysis of the trend of age change in the incidence of esophageal cancer

Clinical program	A	B	C	F	P
Average age of onset	60.26	62.89	65.35	38.20	0.000

3.3 Analysis of Trends in the Gender Ratio

There were 1204 male and 278 female esophageal cancer patients in the whole group, and the gender ratio of male to female was 4.33:1. The male to female ratio of patients in group A was 3.08:1, the male to female ratio of patients in group B was 3.64:1, and the male to female ratio of patients in group C was 5.29:1, and there was a statistically significant difference in the

comparisons (P<0.05), which suggests that the male to female gender ratio had a tendency to increase, **Table 3**.

Table 3 Analysis of trends in the sex ratio of esophageal cancer

Clinical program	A	B	C	X^2	P
Genders				43.657	0.000
male	160	335	709		
female	72	98	108		

3.4 Trend Analysis of Changes in Incidence Sites

There were 889 patients with mid-stage esophageal cancer, and its composition ratio was 45.26% in Group A, 53.65% in Group B, and 67.61% in Group C. There was a statistically significant difference in the comparison (P＜0.05), suggesting that the composition ratio of patients with mid-stage esophageal cancer was on the rise, **Table 4**.

Table 4 Trend analysis of esophageal cancer incidence site changes

Clinical program	N	A	B	C	X^2	P
Site of disease					48.429	0.000
neck segment	42	8	14	20		
upper section	261	56	92	113		
middle section	889	105	235	549		
the following section	290	63	97	130		

3.5 Trend Analysis of Changes in Clinical Staging

In the clinical staging , patients with stage III-IV esophageal cancer cases, its composition ratio was 63.36% in group A, 69.40% in group B, and 74.14% in group C. There was a statistically significant difference in the comparison (P<0.05), and there was a rising trend in the composition ratio of patients with stage III-IV esophageal cancer, **Table 5**.

Table 5 Trend analysis of changes in clinical staging of esophageal cancer

Clinical program	N	A	B	C	X^2	P
Clinical staging					11.007	0.004
0-II	429	85	134	210		
III-IV	1053	147	304	602		

3.6 Trend Analysis of Patients with Comorbidities

There were 393 cases of patients with comorbid esophageal cancer, and the composition ratio was 15.08% in Group A, 23.28% in Group B, and 31.52% in Group C, with statistically significant differences (P<0.05), and the proportion of patients with comorbid esophageal cancer had a tendency to increase, **Table 6**.

Table 6 Trend analysis of patients with esophageal cancer with comorbidities

Clinical program	A	B	C	X^2	P
Complication				28.361	0.000
Yes	35	102	256		
No	197	336	556		

3.7 Trend Analysis of Changes in Patients Receiving Surgical Treatment

Among the treatment modalities, 359 patients with esophageal cancer who received surgical treatment had a composition ratio of 20.68 % in Group A, 23.97 % in Group B, and 25.37 % in Group C. There was a statistically significant difference in the comparisons (P>0.05), suggesting that the proportion of patients with esophageal cancer who received surgical treatment did not significantly increase, **Table 7**.

Table 7 Trend analysis of changes in surgical treatment of esophageal cancer patients

Clinical program	A	B	C	X^2	P
surgical treatment				11.987	0.002
Yes	48	105	206		
No	184	333	606		

3.8 Trend Analysis of Changes in Patients Receiving Comprehensive Treatment

Among the treatment modalities, the cases of esophageal cancer patients who received comprehensive treatment, its composition ratio was 37.50% in Group A, 46.35% in Group B, and51.72% in Group C, and there was a statistically significant difference by comparison (P< 0.05), suggesting that the proportion of patients with esophageal cancer who received comprehensive treatment had an upward trend, **Table 8**.

Table 8 Trend analysis of changes in esophageal cancer patients receiving comprehensive treatment

Clinical program	N	A	B	C	X^2	P
Comprehensive treatment					15.236	0.000
Yes	710	87	203	420		
No	772	145	235	392		

4. Discussion

EC is one of the common malignant tumors of the digestive tract, and China is the country with the highest incidence rate of EC in the world, and also the country with the highest number of morbidity and mortality. The incidence of EC has declined in recent years due to the continuous improvement of society, economy and living standard, sanitary conditions and education level, but the incidence rate and mortality rate of EC in Guangxi region have gradually increased in recent years. This paper discusses the clinical epidemiological characteristics of 1,482 cases of EC and its trend in the Affiliated Hospital of Youjiang Medical University of Nationalities in the past 30 years, which can provide a reference basis for the prevention and treatment of EC in this region.

4.1 Gender and Age Trends in EC Incidence

The incidence rate of esophageal cancer in China is higher in males than in females, with a ratio of about 1.3-3:1 and the incidence rate of males in non-high-incidence areas of esophageal cancer can be 5-10 times higher than that of female. The male-to-female sex ratio in our data was 4.33:1, with significantly more male patients than female, while the male-to-female sex ratio increased over time from 3.08:1 in Group A to 5.29:1 in Group C, with an upward trend ($P < 0.05$). This may be related to the male patients' bad lifestyle habits such as smoking and drinking alcohol. Some studies have reported that smoking and alcohol consumption are risk factors for esophageal cancer, and smoking and alcohol consumption have a synergistic effect can further increase the incidence of esophageal cancer(Xia et al., 2020). In addition to smoking and drinking, the male population tends to be the nucleus of society and the family, with high work pressure, which may reduce the body's immune tolerance and increase susceptibility to tumors due to relatively high psychosocial stress(Jing, 2012). This could partly explain why men are more likely to develop EC than women. From the analysis of age structure, the incidence of EC ≥ 60 years old in this study was 53.85% (798/1482). The onset age of EC squamous cell carcinoma patients in Ka shgar, Xinjiang ranged from 40 to 91 years old, among which 63.77% (440/690) were ≥ 60 years old. 447 EC patients admitted to a hospital in Hebei Province, the incidence of ≥ 60 years old was 68.7% (Huilai et al., 2022). The mean age of onset of EC in our data group increased over time from 60.26 years in Group A to 65.35years in Group C, with a trend of increasing year by year ($P < 0.05$). The high incidence of malignant tumors in this age group is due to the ageing of the population, as well as the high incidence of malignant tumors in the elderly due to their long exposure to risk factors and the ageing of the organism.

4.2 Urban-Rural Disparities in EC Incidence

The incidence of esophageal cancer is closely related to economy, nutritional factors and dietary habits, etc. Generally, there are more rural patients than urban patients (Liu & Russell, 2008; Yamaji et al., 2008). There were 956 rural patients (64.51%) and 526 urban patients (35.49%), with more rural patients than urban patients. Most research studies have shown that the incidence of EC is higher in rural areas than in urban areas. The difference in the incidence rate of EC between urban and rural areas is mainly due to the difference in living standards, living habits and knowledge of EC prevention and treatment. However, Huai'an City, Jiangsu Province, is different in that both incidence and speciation rates are higher in urban than in

rural areas, due on the one hand to the fact that urban dwellers are affected by industrial pollution in the vicinity of their place of residence, and that sources of pollution may increase the exposure of local inhabitants to carcinogens through the emission of exhaust gases, wastewater, and waste residues, leading to a high prevalence of cancer; On the other hand, it may be that the socio-economic development of Huai'an City is more developed, with less difference between urban and rural areas, and the publicity efforts of local medical institutions have contributed to the fact that rural residents are more aware of self-protection and are able to go to hospitals at an early stage of the disease, which has resulted in a lower incidence of the disease in the countryside compared with the city (Hao, 2014). In this study, the incidence composition ratio of rural patients with EC did not change significantly over time during the 30-year period ($P>0.05$), which may be related to factors such as economic status, health awareness, medical resources, literacy level and dietary habits in Guangxi, and the specific reasons need to be further explored.

4.3 Ethnic Disparities in Esophageal Cancer Incidence: The Impact of Genetic, Dietary, and Cultural Factors

The results of this paper showed that there were 905 cases of EC in Han Chinese patients (61.07%), 537 cases in Zhuang Chinese patients (36.23%), and 40 cases in other ethnic groups (2.7%), with the ratio of Han Chinese patients to Zhuang Chinese patients being 1.69:1.The disease is predominantly found in the Han Chinese population. It has been reported (MacInnis et al., 2006)that the differences in nutritional intake due to different dietary habits of different ethnic groups have an impact on the occurrence of EC, such as vitamin C, β-carotene and folic acid, which have a protective effect on the occurrence of EC. This suggests that the development of EC may be related to the genetic differences, dietary habits and cultural differences among different ethnic groups. A survey of deaths from EC among some ethnic minorities in China found that EC was most common among the Kazakhs in Xinjiang, with the mortality rate for both sexes about 2 to 31 times higher than that of other ethnic minorities, and also 2 to 3 times higher than the national average. The study found that the Kazakh group consumed less than the recommended amount of cereals, vegetables, fruits, eggs and pulses, and too much meat and poultry. In addition to irrational dietary structure, there are also obvious characteristics of the eating habits of Xinjiang residents, such as some residents like to drink hot tea and quote well water. Higher temperature water can cause different degrees of damage to the mucosal epithelium of the oesophagus, thus increasing the risk of EC(Pan et al., 2019). Well water is shallow groundwater, which is easily contaminated and has a high nitrite content, and is thought to be closely related to the development of EC (Babaei et al., 2020).

4.4 Site and Histological Trends in the Incidence of EC

The site of esophageal cancer is predominantly in the middle segment, followed by the lower segment and again by other segments. In our data, there were 889 patients (59.99%) with esophageal cancer in the middle segment, and the site of onset was mainly in the middle segment, which was consistent with the report. A total of 235 EC patients were investigated in a hospital in Jinzhou City, 67 in the middle and upper segment, 94 in the middle segment, and 74 in the lower segment(Weidong, 2021).290 patients with esophageal cancer in the lower segment over the past 30 years, and the composition ratio increased from 45.26% in Group A

to 67.61% in Group C over time with an upward trend (P<0.05). However, there are relatively few related reported studies at home and abroad, and the reasons for the rising trend have to be further studied in depth. The data in this paper showed that there were 1337 patients with squamous cell carcinoma (90.22%), followed by 60 patients with adenocarcinoma (4.04%), and the proportion of other types of esophageal cancer was lower, and the composition ratio of squamous cell carcinoma, adenocarcinoma and other types of cancer did not change significantly over time (P>0.05), which was consistent with domestic literature reports(Shaoping, 2024). Squamous cell carcinoma is the main type of EC in China, with high morbidity and mortality, and most patients are in the middle and late stages.

4.5 Rising Late-Stage Esophageal Cancer Incidence

According to the data in this paper, there were 1053 patients (71.05%) with stage III-IV esophageal cancer, and its composition ratio increased from 63.36% in group A to 74.14% in group C, with a rising trend (P<0.05). The census of the high incidence area of esophageal cancer found that about 90% of patients with early stage esophageal cancer had self-conscious symptoms of different degrees. This may be due to the fact that the majority of the population lacks appropriate understanding and pays sufficient attention to some early symptoms of esophageal cancer, such as choking sensation, burning, pinching or pulling pain behind the sternum, etc., and the patients have already developed to the middle or late stage by the time they seek medical treatment. In addition, due to the rapid development of economy, convenient transportation and widespread implementation of relevant medical insurance policies in Guangxi, more patients with middle- and late-stage esophageal cancer are transferred from lower-level hospitals to our hospital for consultation. This shows that popularizing the knowledge of prevention and treatment of early esophageal cancer, strengthening the secondary prevention of esophageal cancer, and early diagnosis and treatment are the keys to improve the prognosis of esophageal cancer patients. This also indicates that the number of patients with stage III-IV esophageal cancer may further increase in the near future, and it is particularly important to strengthen the comprehensive treatment of esophageal cancer patients.

4.6 Trends in Complications in EC Patients and their Treatment Challenges

In the past 30 years, there were 393 cases of comorbidities among 1482 esophageal cancer patients, including 164 cases of cardiovascular and cerebrovascular diseases, 98 cases of diabetes mellitus and 131 cases of other diseases. The composition ratio was 15.08%, 23.28%, and 31.52% in Group A, Group B, and Group C, respectively, and the difference was statistically significant ($P < 0.05$), which suggested that the proportion of patients with comorbidities of esophageal cancer had a rising trend. This suggests that the proportion of patients with comorbidities is increasing. The increase in the proportion of comorbidities may be related to the improvement of people's living standard, obesity, irrational nutritional structure, staying up late at night, insufficient physical exercise, and bad habits such as smoking and alcohol consumption (Campbell & Junshi, 1994; Chen et al., 2005). This also suggests that the increase of comorbidities will bring difficulties in medical diagnosis and treatment in the future, and it is of great practical significance to strengthen multidisciplinary collaboration in treatment.

4.7 Trends and Challenges in the Comprehensive Treatment of Esophageal Cancer

Although the treatment of esophageal cancer includes surgical treatment, radiotherapy, chemotherapy, traditional Chinese medicine (TCM) and comprehensive treatment, the overall treatment effect of esophageal cancer patients is still unsatisfactory(Mao et al., 2020). Two or more treatments are called comprehensive treatment. In the present data, the percentage of patients who received comprehensive treatment increased from 37.50% in Group A to 51.72% in Group C, which is statistically different from Group C ($P<0.05$), showing that the percentage of patients who received comprehensive treatment for esophageal cancer has been on the rise. This may be related to the improvement of people's economic level, the increase of treatment awareness, and the wide implementation of medical insurance policy. Among 1482 cases of esophageal cancer, 359 cases (24.22%) were treated by surgery, and the rates of surgical treatment were 20.68%, 23.97% and 25.37% in Groups A, B and C, respectively, and the rate of surgical treatment has not yet been significantly improved by comparing them ($P>0.05$). This suggests that accelerating the economic development of western Guilin, popularising the knowledge of early oesophageal cancer prevention and treatment, raising patients' awareness of consultation and treatment, comprehensively implementing the health insurance policy, and strengthening cancer screening for EC so as to increase the rate of surgical treatment are still the key points to which we should focus our efforts.

5. Conclusion

The incidence of esophageal cancer shows an aging trend in the western Guangxi region, mainly in the Han population, the incidence is higher in rural areas than in urban areas, male patients are significantly more than female patients, the incidence site is still mainly in the middle section, the most common pathological type is still squamous cell cancer, the clinical symptoms are mostly progressive dysphagia, the patients are more advanced at the time of treatment, and the number of patients receiving comprehensive treatment is increasing. It is necessary to strengthen the popularization of cancer prevention knowledge in rural areas, take corresponding preventive measures according to the differences in clinical characteristics between regions, perform routine cancer prevention screening for high-risk groups, and improve the curative effect of early diagnosis and early treatment.

Institutional Review Board Statement: The study was carried out according to the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of the Youjiang Medical University for Nationalities (protocol code 2020042601 and date of approval is 20200414).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The analyzed data sets generated during the study are available from the first author on a reasonable request.

Conflicts of Interest: The authors declare that they have no conflict of interest.

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