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Survival And Mortality Risk Factors Analysis Of Alzheimer's Disease: A Long-term Follow-up Study From A Chinese Clinical Cohort

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Background

- Alzheimer's disease (AD) has emerged as a major global threat to longevity. Despite the rapid aging of the population in China, long-term survival data from largescale Asian cohorts remain insufficient. This study aimed to characterize long-term survival, identify mortality risk factors, and analyze specific causes of death in a clinical cohort of AD patients.

Methods

- A total of 1212 participants were enrolled from the memory clinic and neurology department between November 2010 and December 2024. Diagnosis was definitively confirmed via positive A β -PET imaging, cerebrospinal fluid biomarkers, or blood-based biomarkers. Patients were followed every 3-6 months with routine assessments, including evaluation of cognitive function, behavioral and psychological symptoms. New-onset comorbidities and causes of death were meticulously documented. Survival analysis was performed using the Kaplan-Meier method, and mortality risk factors were examined using Cox proportional hazards regression models. Further analysis were conducted, stratified by sex.

Results

- Baseline data are shown in Table 1.

Table 1. Demographic and clinical characteristics of patients

Characteristics	Total	Died	Survival	P value
n(%)	1212(100)	203(16.7)	1009(83.3)	
Age (years), mean $\pm$ SD	74.6 $\pm$ 10.1	79.3 $\pm$ 11.1	73.6 $\pm$ 9.6	<0.001*
Sex, n (%)				
Male	564(46.5)	112(55.2)	452(44.8)	0.007*
Female	648(53.5)	91(44.8)	557(55.2)	
Disease duration (years), mean $\pm$ SD	7.6 $\pm$ 4.2	10.6 $\pm$ 2.5	7.0 $\pm$ 4.3	<0.001*
Education duration, n (%)	9.9 $\pm$ 4.1	9.5 $\pm$ 4.7	10.0 $\pm$ 4.0	0.129
BMI	23.4 $\pm$ 3.4	23.1 $\pm$ 3.7	23.5 $\pm$ 3.3	0.131
ADL at recruitment (Mean $\pm$ SD)	29.5 $\pm$ 11.9	35.5 $\pm$ 13.9	28.3 $\pm$ 11.1	<0.001*
MMSE	18.8 $\pm$ 7.2	15.0 $\pm$ 7.6	18.7 $\pm$ 7.0	<0.001*
Cardiometabolic diseases				
Coronary heart disease, n (%)	154(12.7)	36(17.7)	118(11.7)	0.018*
Stroke, n (%)	150(12.4)	31(15.3)	119(11.8)	0.172
Diabetes, n (%)	148(12.2)	31(15.3)	117(11.6)	0.434
Hypertension, n (%)	457(37.8)	75(36.9)	382(37.9)	0.806
Lifestyle factors				
Smoking, n (%)	278(22.9)	51(25.1)	227(22.5)	0.417
Alcohol consumption, n (%)	145(12.0)	30(14.8)	115(11.4)	0.176

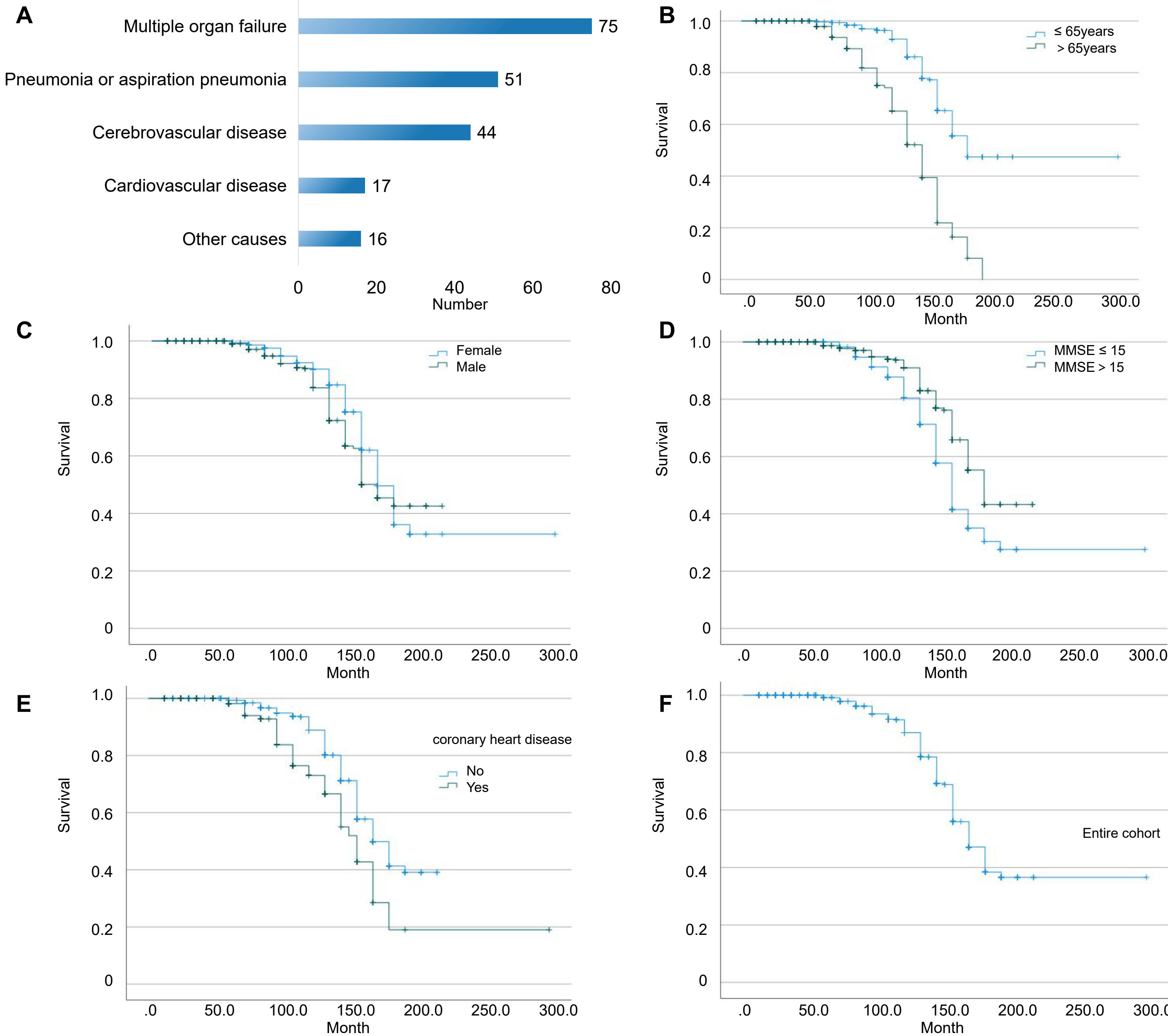
- During follow-up, 203 deaths occurred, with a median survival of 14 years.
- Univariate analysis identified older age at onset, male, longer disease duration, comorbid coronary heart disease, lower baseline MMSE scores and higher baseline ADL scores associated with increased mortality. In the multivariate model, male, age at onset $\geq$ 65 years, and coronary heart disease remained independent predictors of shorter survival (Table 2).

Table 2. Multivariable Cox proportional hazards regression analysis of factors associated with survival in patients with Alzheimer's disease

	P value	Exp(B)	95% CI	
			Lower	Upper
Sex	0.009*	1.457	1.097	1.935
Years of education	0.155	0.976	0.943	1.009
MMSE total score	0.042*	0.974	0.949	0.999
Coronary heart disease	0.005*	1.709	1.175	2.486
ADL total score	0.275	1.008	0.994	1.022
Age	0.038*	1.017	1.001	1.033

- The leading cause of death were multiple organ failure. Notably, the distribution of causes of death showed a significant sex-based difference ($p = 0.046$). males died more frequently from cardio-cerebrovascular diseases, whereas females predominantly died from multiple organ failure (Figure 1).

Figure 1. A-F.Survival Analysis



A.Bar chart of causes of death. Multiple organ failure was the most frequent cause, followed by pneumonia/aspiration pneumonia, cerebrovascular disease, cardiovascular disease, and other causes.B, Kaplan-Meier survival curves by age (≤ 65 vs > 65 years). X-axis: months; Y-axis: survival probability.C, Kaplan-Meier survival curves by sex (male vs female).D.Kaplan-Meier survival curves by MMSE score (≤ 15 vs > 15).E.Kaplan-Meier survival curves by presence of coronary heart disease (yes vs no).F.Overall Kaplan-Meier survival curve for the entire cohort.

Conclusion

- Our findings highlight the survival characteristics and mortality patterns of patients with AD. These findings provide important clinical guidance for preventing the major causes of death and improving survival in patients with AD.