

# Hospital anxiety and depression scale exhibits good consistency but shorter assessment time than Zung self-rating anxiety/depression scale for evaluating anxiety/depression in non-small cell lung cancer

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## Abstract

This study aimed to compare Zung self-rating anxiety/depression scale (SAS/SDS) and hospital anxiety and depression scale (HADS) regarding the detection rate, detection consistency, and time of assessment in non-small cell lung cancer (NSCLC) patients.

Totally 290 NSCLC patients who underwent surgical resection were consecutively recruited and clinical data of patients were collected. Patients' anxiety and depression were assessed using HADS and SAS/SDS when they were discharged from hospital and consumption of the time for completing HADS and SAS/SDS was recorded.

The anxiety detection rates by SAS (57.9%) and HADS-A (51.0%) were of no difference ( $P = .095$ ). Also, there was no difference in anxiety severity detected by the 2 scales ( $P = .467$ ). Additional correlation analysis revealed that both anxiety scores ( $r = 0.702$ ,  $P < .001$ ) and detected anxiety (Kappa = 0.626,  $P < .001$ ) were consistent by SAS and HADS-A. Regarding depression, depression detection rate by SDS (47.6%) was higher than that of HADS-D (39.3%) ( $P = .044$ ); the depression severity by SDS was more advanced than that by HADS-D ( $P = .002$ ). The subsequent correlation analysis showed that both depression scores ( $r = 0.639$ ,  $P < .001$ ) and detected depression (Kappa = 0.624,  $P < .001$ ) were consistent by SDS and HADS-D. In addition, the time for HADS assessment ( $7.6 \pm 1.2$  minutes) was shorter than SAS/SDS assessment ( $16.2 \pm 2.1$  minutes) ( $P < .001$ ).

HADS could be a better choice for assessing anxiety and depression in NSCLC patients, benefiting from its shorter assessment time but consistent detection rate compared with SAS/SDS.

**Abbreviations:** CEA = carcino-embryonic antigen, HADS = hospital anxiety and depression scale, HADS-A = HADS for anxiety scale, HADS-D = HADS for depression scale, IQR = interquartile range, LYN = lymph node, NSCLC = non-small cell lung cancer, SAS/SDS = Zung self-rating anxiety/self-rating depression scale, SD = standard deviation.

**Keywords:** anxiety and depression, consistency, hospital anxiety and depression scale, non-small cell lung cancer, Zung self-rating anxiety/self-rating depression scale

## 1. Introduction

Lung cancer is the most frequently diagnosed malignancy, which accounts for 13% of new cancer cases and nearly 20% of cancer-

related deaths.<sup>[1]</sup> Non-small cell lung cancer (NSCLC) represents 85% of total lung cancers and is histologically divided as adenocarcinoma, squamous cell carcinoma, or large-cell carcinoma.<sup>[2]</sup> With the advances in cancer treatment, NSCLC mortality has been significantly reduced, however, the disease affects all aspects of patients including daily life, social network, and poses financial burden.<sup>[3]</sup> This arises psychological issues in NSCLC patients, particularly anxiety and depression, which cause repercussions on patients' quality of life as well as prognosis.<sup>[4]</sup> However, under-diagnosis of anxiety and depression due to neglecting of symptoms is very common, thus, the corresponding treatment of anxiety or depression is notably insufficient in NSCLC patients. This addresses the necessity of active screening of psychological distress and maintenance of mental health in NSCLC patients.

Zung self-rating anxiety/self-rating depression scale (SAS/SDS) and Hospital anxiety and depression scale (HADS) are 2 commonly used scales for evaluating the emotional state of non-psychiatric individuals.<sup>[5]</sup> In cancer studies, these 2 scales have been used for defining anxiety and depression, which help physicians to make further treatment decisions.<sup>[6,7]</sup> Based on the current information, there are generally 20% to 40% of cancer patients present anxiety and depression, most of which are assessed by these 2 scales, and both anxiety and depression are correlated with advanced disease state, severe symptoms as well

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All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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as poor prognosis.<sup>[8]</sup> As for in NSCLC, the assessments of anxiety and depression using SAS/SDS or HADS also exist, however, there is absence of evidence about which scale is more suitable.<sup>[8,9]</sup> Hence, we thought that instruction about the superiority between SAS/SDS and HADS in assessing anxiety/depression in NSCLC patients would help clinicians' choice for appropriate measurements.

Therefore, the present study compared SAS/SDS and HADS regarding the detection rate, detection consistency, and time of assessment in NSCLC patients.

## 2. Methods

### 2.1. Patients

In this study, we used the HADS and SAS/SDS to evaluate the anxiety and depression status of NSCLC patients who completed the surgery treatment and were discharged from hospital. The HADS and SAS/SDS were fulfilled by the NSCLC patients on the day of discharge. The detection rate, detection consistency, and consumption of the time for completing HADS and SAS/SDS in NSCLC patients were investigated. From September 2017 to October 2019, 290 NSCLC patients who underwent surgical resection in our hospital were consecutively recruited in this study. The inclusion criteria were as follows: confirmed diagnosis of primary NSCLC; age older than 18 years; underwent surgical resection; able to complete assessment of anxiety and depression. The exclusion criteria included: severe cognitive impairment (e.g., Alzheimer's disease); severe mental disorder (e.g., schizophrenia); concomitant with severe heart, liver, or kidney disease; suffered from other malignancies; pregnant or lactating women.

This study was approved by the Ethics Committee of our hospital, and all patients provided the written informed consents before recruitment.

### 2.2. Clinical data collection

Clinical data were collected after recruitment including: socio-demographic characteristics: age, sex, marry status, employment status before surgery, and level of education; medical histories and complications: smoke, drink, hypertension, hyperlipidemia, diabetes; tumor features: differentiation grade, tumor size, lymph node (LYN) metastasis, tumor, node, metastasis (TNM) stage, carcino-embryonic antigen (CEA) level.

### 2.3. Assessment of anxiety and depression

Anxiety and depression were assessed using HADS and SAS/SDS when patients were discharged from hospital. Before filling in the scales, investigator would interpret the contents of scales to patients, then patients were required to complete the scales by themselves. Consumption of the time for completing HADS and SAS/SDS was recorded, which consisted of the time of interpreting the contents of scales to patients by investigator and the time of completing the scales by patient.

### 2.4. HADS and definition

HADS comprised of 2 subscales: HADS for anxiety scale (HADS-A) and HADS for depression scale (HADS-D). Both HADS-A and HADS-D consisted of 7 items, and each item was answered by the patient on a 4-point (0–3) response category so the possible scores ranged from 0 to 21 for anxiety and 0 to 21 for depression,

respectively. The anxiety/depression was defined as HADS-A/HADS-D score  $\geq 8$ . The anxiety severity was defined as: 0 to 7, no anxiety; 8 to 10, mild anxiety; 11 to 14, moderate anxiety; 15 to 21, severe anxiety; similarly, the depression severity was defined as: 0 to 7, no depression; 8 to 10, mild depression; 11 to 14, moderate depression; 15 to 21, severe depression.<sup>[10]</sup>

### 2.5. SAS/SDS and definition

Both SAS and SDS consisted of 20 items, and each item scored 1 to 4 points individually, resulting in a 20 to 80 raw score. The standard score was calculated by multiplying raw scores by 1.25, and as a result, the total standard score ranged 25 to 100. According to the total SAS score, the anxiety/depression was defined as SAS/SDS score  $\geq 50$ . The anxiety severity was defined as: 25 to 49, no anxiety; 50 to 59, mild anxiety; 60 to 69, moderate anxiety; 70 to 100, severe anxiety. Also, the depression severity was defined as: 25 to 49, no depression; 50 to 59, mild depression; 60 to 69, moderate depression; 70 to 100, severe depression.<sup>[11,12]</sup>

### 2.6. Statistical analysis

SPSS 24.0 statistical software (IBM, Chicago, IL) was used for data process and statistical analysis. GraphPad Prism 8.01 (GraphPad Software Inc., San Diego, CA) was used for graphs making. Data were described as mean with standard deviation (SD), median with interquartile range (IQR), or count (percentage). SAS/SDS score and HADS score were displayed by histogram. Comparison of anxiety/depression detection rate was determined by Chi-square test. Comparison of anxiety/depression severity was determined by Wilcoxon rank sum test. Correlation between SAS score and HADS-A score, or between SDS score and HADS-D score was determined by Spearman rank correlation test. Consistency between SAS anxiety occurrence and HADS anxiety occurrence, or between SDS depression occurrence and HADS depression occurrence was determined by kappa consistence test. Independent factors related to anxiety occurrence or depression occurrence were determined by forward stepwise multivariate logistic regression model analysis. A  $P$  value  $< .05$  was considered significant.

## 3. Results

### 3.1. NSCLC patients' characteristics

The mean age was  $61.2 \pm 9.5$  years and the sex composition was 70 (24.1%)/ 220 (75.9%) females/males. There were 158 (54.5%) patients who smoke, 118 (40.7%) patients who drink, and 113 (39.0%), 74 (25.5%), 52 (17.9%) patients complicated with hypertension, hyperlipidemia, diabetes, respectively. The detailed information about marry status, employment, education level, and tumor features were listed in Table 1.

### 3.2. Anxiety detection rate by SAS and HADS-A

The distribution of SAS score (mean  $50.5 \pm 12.0$ ) (Fig. 1A) and HADS-A score (mean  $8.3 \pm 3.7$ ) (Fig. 1B) was shown. The anxiety detection rate by SAS was 57.9%, which was similar to that by HADS-A (51.0%) ( $P = .095$ ) (Fig. 1C). Besides, the detected anxiety severity between SAS and HADS-A was of no difference ( $P = .467$ ) (Fig. 1D).

<b>Table 1</b>	
<b>Disease characteristics of NSCLC patients.</b>	
<b>Characteristics</b>	<b>NSCLC patients (N = 290)</b>
Age (years), mean $\pm$ SD	61.2 $\pm$ 9.5
Gender, No. (%)	
Female	70 (24.1)
Male	220 (75.9)
Medical histories and complications, No. (%)	
Smoke	158 (54.5)
Drink	118 (40.7)
Hypertension	113 (39.0)
Hyperlipidemia	74 (25.5)
Diabetes	52 (17.9)
Marry status, No. (%)	
Married	193 (66.6)
Single/divorced/widowed	97 (33.4)
Employed before surgery, No. (%)	
No	186 (64.1)
Yes	104 (35.9)
Education level, No. (%)	
Primary school or less	29 (10.0)
High school	129 (44.5)
Undergraduate	103 (35.5)
Graduate or above	29 (10.0)
Differentiation, No. (%)	
Well	61 (21.0)
Moderate	156 (53.8)
Poor	73 (25.2)
Tumor size (cm), mean $\pm$ SD	5.4 $\pm$ 2.1
LYN metastasis, No. (%)	91 (31.4)
TNM stage, No. (%)	
I	86 (29.7)
II	108 (37.2)
III	96 (33.1)
CEA (ng/mL), median (IQR)	6.8 (2.9–31.4)

CEA = carcinoembryonic antigen, IQR = interquartile range, LYN = lymph node, NSCLC = non-small cell lung cancer, SD = standard deviation, TNM = tumor, node, metastasis.

### 3.3. Anxiety detection consistency between SAS and HADS-A

SAS and HADS-A scores were positively correlated with each other as analyzed by Spearman rank correlation test ( $P < .001$ , Spearman  $r = 0.702$ ) (Fig. 2A). In addition, the anxiety detection by SAS and HADS-A was consistent as analyzed by Kappa consistence test ( $P < .001$ , Kappa = 0.626) (Fig. 2B). This evidence showed the good consistency between SAS and HADS-A in detecting anxiety in NSCLC patients.

### 3.4. Depression detection rate by SDS and HADS-D

The distribution of SDS score (mean  $48.7 \pm 13.1$ ) (Fig. 3A) and HADS-D score (mean  $7.5 \pm 3.6$ ) (Fig. 3B) was shown. The depression detection rate by SDS was 47.6%, which was higher than that by HADS-D (39.3%) ( $P = .044$ ) (Fig. 3C). Furthermore, the depression severity detected by SDS was more advanced compared with that detected by HADS-D ( $P = .002$ ) (Fig. 3D).

### 3.5. Depression detection consistency between SDS and HADS-D

SDS and HADS-D scores were positively correlated with each other as analyzed by Spearman rank correlation test ( $P < .001$ ,

Spearman  $r = 0.639$ ) (Fig. 4A). Besides, the depression detection by SDS and HADS-D was consistent as detected by kappa consistence test ( $P < .001$ , Kappa = 0.624) (Fig. 4B). This showed that SDS and HADS-D were consistent in detecting depression in NSCLC patients.

### 3.6. Consumption of time between Zung SAS/SDS and HADS

Zung SAS/SDS consumed a mean time of  $16.2 \pm 2.1$  minutes, which was longer than that of HADS ( $7.6 \pm 1.2$  minutes) ( $P < .001$ ) (Fig. 5).

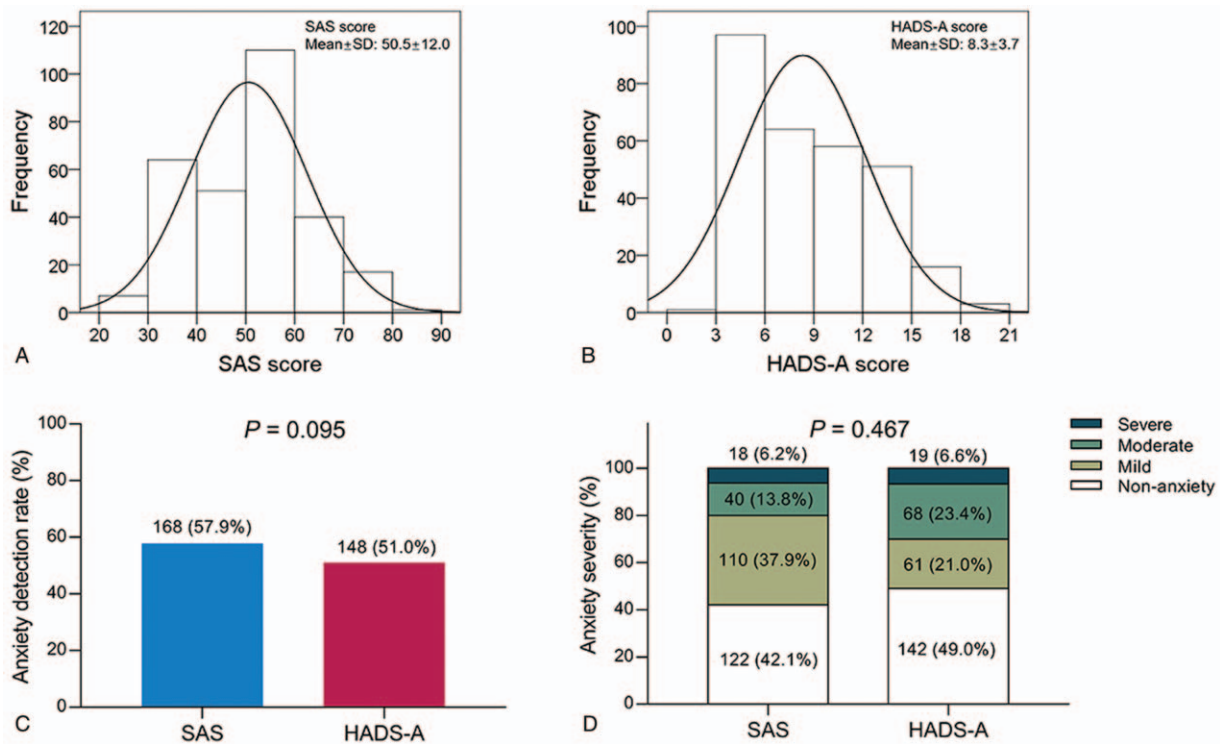
### 3.7. Independent factors for anxiety and depression

Additionally, we evaluated the factors associated with anxiety and depression in NSCLC patients. For anxiety, forward stepwise multivariate logistic regression showed that diabetes (overall survival [OR] = 3.141,  $P = .001$ ), marry status (single/divorced/widowed vs married) (OR = 1.903,  $P = .018$ ), and poor differentiation (OR = 1.757,  $P = .003$ ) were independent factors for SAS anxiety occurrence (Fig. 6A). Hypertension (OR = 1.756,  $P = .044$ ), diabetes (OR = 5.335,  $P < .001$ ), marry status (single/divorced/widowed vs married) (OR = 2.927,  $P < .001$ ), poor differentiation (OR = 1.883,  $P = .003$ ), and higher TNM stage (OR = 2.182,  $P < .001$ ) were independent factors for HADS anxiety occurrence. As for depression, forward stepwise multivariate logistic regression showed that diabetes (OR = 2.743,  $P = .002$ ) and tumor size  $> 5$  cm (OR = 1.654,  $P = .038$ ) were independent factors for SDS depression occurrence (Fig. 6B). History of smoke (OR = 0.514,  $P = .014$ ) was independently correlated with lower HADS depression occurrence, while diabetes (OR = 5.634,  $P < .001$ ), marry status (single/divorced/widowed vs married) (OR = 2.376,  $P = .002$ ), poor differentiation (OR = 1.570,  $P = .030$ ), and higher TNM stage (OR = 1.603,  $P = .008$ ) were independent factors for HADS depression occurrence.

## 4. Discussion

Radical treatment is the first choice at early stage of NSCLC, and lobectomy with lymphadenectomy is considered as the only cure. However, comorbidities and adjuvant treatment-related toxicity worsen the quality of life even though the survival of NSCLC patient is prolonged, and unfortunately contributes to poor prognosis.<sup>[13]</sup> In the current management of NSCLC, maintaining the good psychological state as well as improving the quality of life are of equal importance with prolonging survival.<sup>[14–16]</sup> Thus, it is necessary to monitor the psychological distress of NSCLC patients.

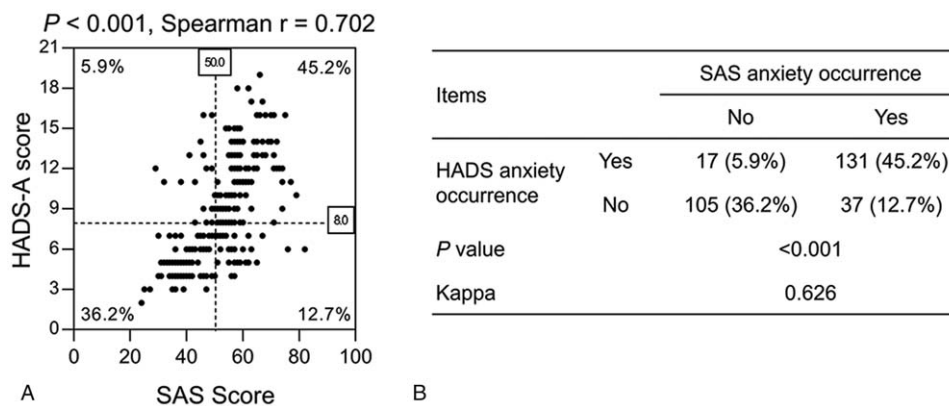
In clinics, the standard diagnosis of anxiety and depression is still via clinical interview by psychologists, meanwhile, self-report measurements such as SAS/SDS and HADS are frequently used for screening and measurement of anxiety/depression as well. SAS/SDS by Zung consists of 20 items per scale (20 in SAS, 20 in SDS); HADS scale by Zigmond and Snaith is composed of 14 items, among which 7 items rate anxiety (HADS-A) and the other 7 rate depression (HADS-D).<sup>[15]</sup> In our study, the anxiety rate by SAS was 57.9%, anxiety rate by HADS-A was 51.0%, which was of no difference. Also, there was no difference in anxiety severity detected by the 2 scales. In addition, correlation analysis revealed that SAS and HADS-A were of good consistency in anxiety detection. As for depression, the depression detection rate by SDS



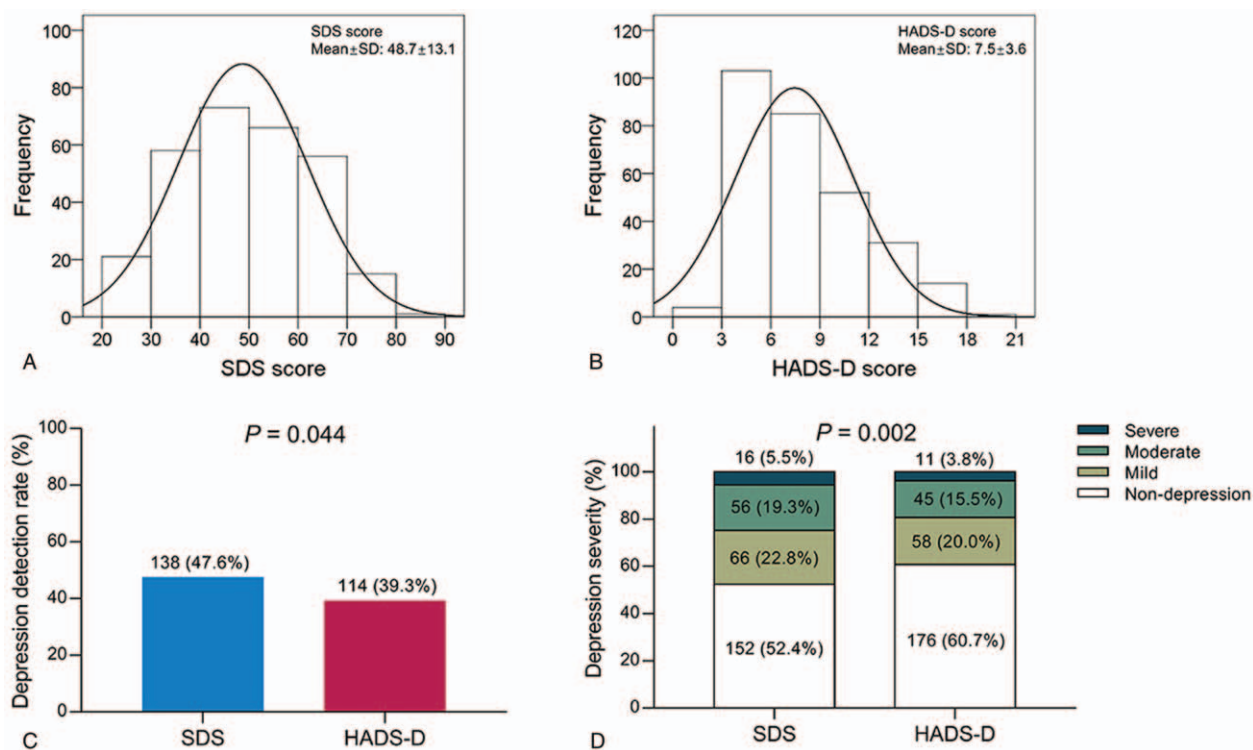
**Figure 1.** Anxiety in NSCLC patients detected by SAS and HADS-A. The distribution of SAS score (A) and HADS-A score (B). Anxiety detection rate (C) and anxiety severity (D) detected by SAS and HADS-A. HADS-A=hospital anxiety and depression scale-anxiety, NSCLC=non-small cell lung cancer, SAS=Zung Self-rating anxiety scale.

(47.6%) was higher than that of HADS-D (39.3%), and the depression severity by SDS was more advanced than that of HADS-D. The subsequent correlation analysis showed that SDS was consistent with HADS-D in detecting depression. In a previous study, the prevalence of anxiety in Chinese NSCLC patients was 43.5%, and the prevalence of depression was 57.1% using HADS,<sup>[16]</sup> which was numerically higher than that in the present study either detected by HADS or SAS/SDS. However, due to the difference in patients, treatment, and sample size, the horizontal comparison of data was of limited value. As for the higher trend of depression rate as well as advanced depression

severity detected by SDS compared with HADS, it might be due to that there were more questions in SDS from various aspects, and the calculation of SDS scores tended to yield more depression patients.<sup>[10–12]</sup> However, the difference in depression rate and depression severity was of little clinical meaning due to small variance in number. It could be concluded that SAS/SDS and HADS were of similar value in assessing anxiety and depression in NSCLC patients, because both scales assessed depressive symptoms including cognitive, emotional, and behavioral symptoms, and were reliable measurement clinically in consensus.<sup>[9,17]</sup> In addition, the time for HADS assessment was half



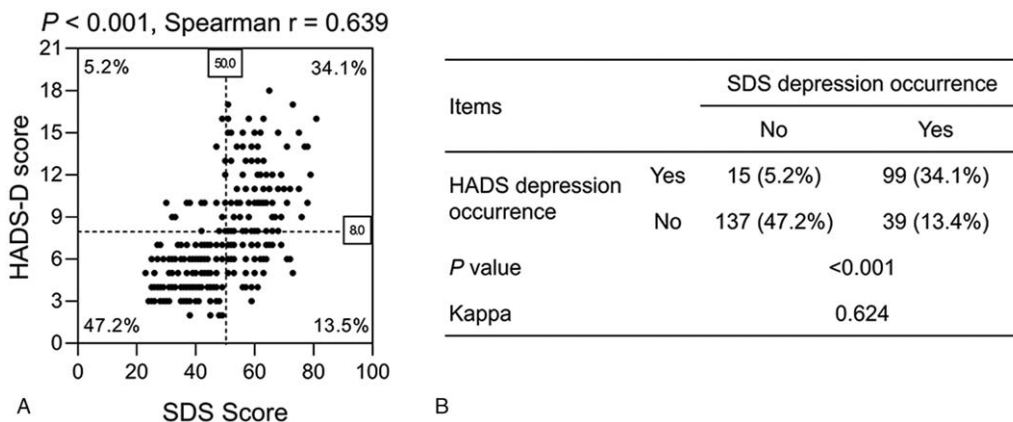
**Figure 2.** Consistency between SAS and HADS-A in NSCLC patients. The correlation between SAS and HADS-A scores by Spearman rank correlation test (A). The correlation of anxiety detection between SAS and HADS-A by kappa consistency test (B). HADS-A=hospital anxiety and depression scale-anxiety, NSCLC=non-small cell lung cancer, SAS=Zung self-rating anxiety scale.



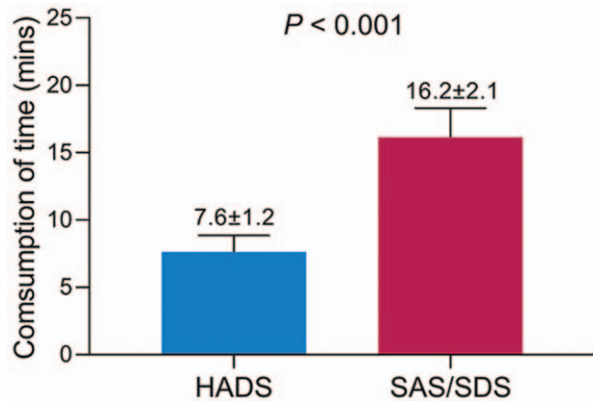
**Figure 3.** Depression in NSCLC patients detected by SDS and HADS-D. The distribution of SDS score (A) and HADS-D score (B). Depression detection rate (C) and depression severity (D) detected by SDS and HADS-D. HADS-D=hospital anxiety and depression scale-depression, NSCLC=non-small cell lung cancer, SDS=Zung self-rating depression scale.

shorter than SAS/SDS assessment, which was consistent with the previous evidence.<sup>[5]</sup> This was due to the length and content of questionnaire as well as the score calculation method. Therefore, it might make HADS more applicable and acceptable in clinics because it shortened the assessment time. In addition, it might make less stress to the patients due to less hospital stay.<sup>[5]</sup> However, the superiority of HADS over SAS/SDS in assessment of anxiety and depression could not be simply concluded from our finding and needed further exploration.

Previous study reveals that diabetes, pain, and preoperative anxiety are risk factors for occurrence of depression after surgical treatment in NSCLC patients.<sup>[15]</sup> As for anxiety, younger age, advanced stage, and previous radiotherapy increase the risk of anxiety in NSCLC patients.<sup>[7]</sup> In line with these evidence, we observed that complications including diabetes, hypertension, and advanced disease condition such as poor differentiation and higher TNM stage were independent risk factors for anxiety. In addition, single/divorced/widowed patients seemed to have



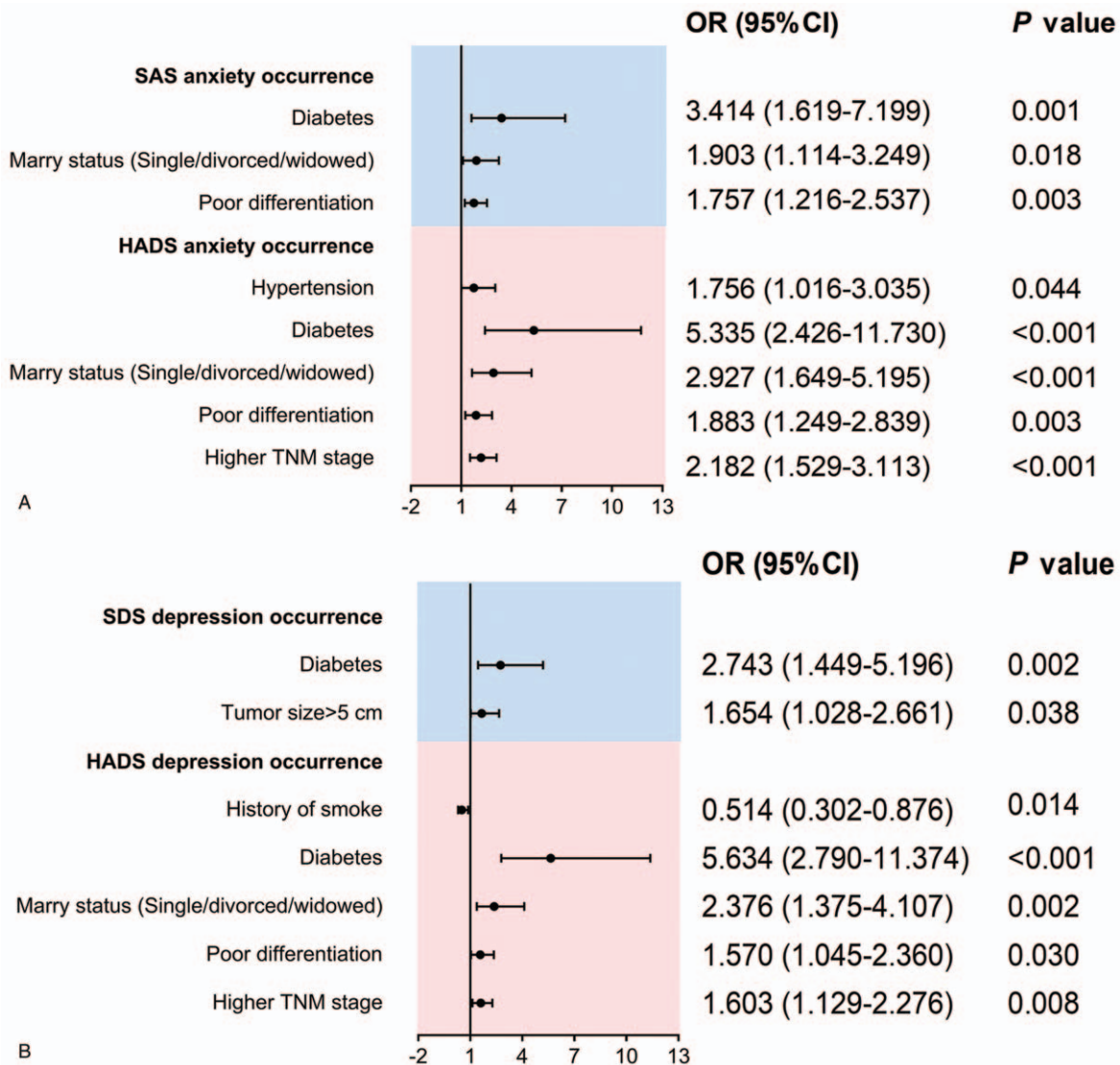
**Figure 4.** Consistency between SDS and HADS-D in NSCLC patients. The correlation between SDS and HADS-D scores by Spearman rank correlation test (A). The correlation of depression detection between SDS and HADS-D by kappa consistency test (B). HADS-D=hospital anxiety and depression scale-depression, NSCLC=non-small cell lung cancer, SDS=Zung self-rating depression scale.



**Figure 5.** Time consumed by SAS/SDS and HADS. Comparison of time consumption of SAS/SDS with HADS scales. HADS=hospital anxiety and depression scale, SAS/SDS=Zung self-rating anxiety scale/Zung self-rating depression Scale.

higher anxiety risk. This could be due to that: patients with background diseases as well as advanced tumor condition might endure more disease-related stress, pain, and fear towards due to severe health condition, thus, they present with more anxiety. Patient without a partner might lack emotional, nursing, and financial support from the partner, which increased the unease feeling about the disease and future, thereby lead to occurrence of anxiety. Similarly, the risk factors for depression included diabetes, history of smoke, advanced tumor features and marry status. History of smoke is a strong risk factor for NSCLC risk as well as advanced tumor feature.<sup>[1]</sup> However, smoke is a way to relieve stress, thus, it is not surprising that history of smoke was correlated with lower risk of depression in NSCLC patients.

There were several shortcomings of this study. The statistical power might be reduced due to the single center and relatively small sample size. Furthermore, anxiety and depression were detected at single time point in this study, thus longitudinal change of anxiety and depression was not measured, which could be investigated in the future to compare the value of these 2 scales.



**Figure 6.** Risk factors for anxiety and depression. Stepwise multivariate logistic regression analysis of independent risk factors for anxiety and depression by SAS/SDS or HADS. HADS=hospital anxiety and depression scale, SAS/SDS=Zung self-rating anxiety scale/ zung self-rating depression scale.

In addition, anxiety and depression rates evaluated by psychiatry department could be used as an accurate reference to further assess the efficiency of SAS/SDS and HADS in the future.

## 5. Conclusion

In conclusion, HADS may be a better choice for evaluating anxiety and depression in NSCLC patients, benefiting from its shorter assessment time but consistent detection rate compared with SAS/SDS.

## Author contributions

**Conceptualization:** Congying Guo.

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**Methodology:** Congying Guo, Xuan Huang.

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**Validation:** Congying Guo, Xuan Huang.

**Visualization:** Congying Guo, Xuan Huang.

**Writing – original draft:** Congying Guo, Xuan Huang.

**Writing – review & editing:** Congying Guo, Xuan Huang.

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