# The Comparison of Clinical analysis of Chinese and German Patients with Obstructive Sleep Apnea Syndrome

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**Abstract:** *Objective:* To compare the sex ratio, age distribution, severity of the illness, comorbidities, and the treatment of the patients with obstructive sleep apnea syndrome in China and Germany. *Methods:* A retrospective study of the data was conducted, and a total of 200 patients diagnosed with obstructive sleep apnea syndrome in Germany and China from March 2013 to October 2015 were analyzed. The sex ratio, age distribution, severity of the illness, comorbidities and treatment methods were analyzed. *Results:* There was no significant difference in the severity of disease, sex ratio, and age distribution between the patients with obstructive sleep apnea syndrome in China and Germany($P>0.05$). In terms of comorbidities, the combination of moderate and severe patients in the German group, compared with the moderate and severe patients in the Chinese group, except for cerebrovascular disease, the comorbidities were less than those in the Chinese group($P<0.05$), the difference was statistically significant. In terms of treatment, the patients in the German group were compared with the patients in the Chinese group with light, moderate, and severe patients. Except for the German patients who received oral appliances and surgical treatment, more patients were treated than Chinese patients($P<0.05$), the difference is statistically significant. *Conclusion:* The two country(Germany and China) are basically the same in the diagnosis and treatment of obstructive sleep apnea syndrome, but Germany pays more attention to details and individualization in treatment.

**Keywords:** Obstructive sleep apnea syndrome;

Diagnosis and treatment; Retrospective study

## 1 Introduction

Obstructive sleep apnea syndrome (hereinafter referred to as OSAS) is a disease with the high prevalence rate and a potential risk. It is mainly manifested as snoring during sleep combined with apnea and hypopnea. And hypoxemia and hypercapnia occur repeatedly at night. The sleep was in disorder, causing lethargy at daytime, work accidents and traffic accidents. And OSAS can also cause complications of blood vein of heart, brain and lung, as well as damage of function of multiple organs, which will seriously affect patients' quality of living and lifetime[1,2]. We have known OSAS for only a short time, especially the public has very limited knowledge of OSAS and poor coordination to us, which leads to high incidence of poor therapeutic effect and complications in patients with OSAS. Therefore, we aim to optimize our awareness and methods of diagnosis and therapy of patients with OSAS by analyzing the clinical feature of Chinese and German patients with OSAS.

## 2 Objects and methods

### 2.1 Objects

From March 2013 to October 2015, 200 adult

patients with OSAS monitored and diagnosed by a polysomnography (PSG) monitor were selected from the Diagnosis and Treatment Center of Sleep and Respiration of Sichuan Province Fourth People's Hospital and also 200 adult patients were selected from the Sleep Center of Soest City Hospital in Germany. The diagnostic criteria of OSAS in China refers to the guidelines for the diagnosis and treatment of obstructive sleep apnea hypopnea syndrome (2011 revision)[1]. The diagnostic criteria of OSAS Germany refers to the clinical guidelines of ACP (American College of Physicians) for obstructive sleep apnea treatment of adult in 2014[3].

## 2.2 Methods

All patients were asked about their medical history on the day of admission, including history of hypertension, diabetes, coronary heart disease (CHD) and cerebrovascular disease. All patients were measured for body weight, waist circumference, and neck circumference according to standard methods. Computing formula: body mass index (BMI) = body mass (kg) / height$^2$(m$^2$). Monitor of SomnoScreen PSG

was selected for polysomnography(PSG). According to results from PSG, the two groups of patients were divided into 3 groups based on AHI: AHI: 5-15 times/h, group of mild OSAS , AHI: 15-30 times / h, group of moderate OSAS , AHI> 30 times/h , group of severe OSAS . The options of therapy selected by all patients were recorded.

## 2.3 Statistical methods

The SPSS16.0 statistical software was used. Measurement data are expressed as mean ± standard deviation ($x\pm s$). Enumeration data were tested by $\chi^2$. The difference was considered statistically significant when $P<0.05$.

## 3 Result

The gender ratio of two groups of patients: 86.51% of male patients in Chinese group and 82.34% of male patients in German group. There was no statistical significance in the difference of male to female ratio between the two groups ($P>0.05$). The specific results are shown in Table 1.

**Table 1.** The gender ratio of Chinese and German patients.

| Group | n | Amount(male) | Ratio(male) | $P$ |
| --- | --- | --- | --- | --- |
| China | 200 | 173 | 86.51 | >0.05 |
| Germany | 200 | 165 | 82.34 | >0.05 |

Note: The difference between the two groups was not statistically significant($P>0.05$).

The age distribution of the two groups: the average age of the Chinese group was 47.8 ± 9.7 years, and the average age of the German group was 45.6 ± 8.5 years.

The difference in age distribution between the two groups was not statistically significant($P>0.05$). The specific results are shown in Table 2.

**Table 2.** The comparison in age distribution between the Chinese and German patients.

| Group | n | Age in average(years) | $P$ |
| --- | --- | --- | --- |
| China | 200 | 47.8±9.7 | >0.05 |
| Germany | 200 | 45.6±8.5 | >0.05 |

Note: The difference between the two groups was not statistically significant($P>0.05$).

The severity of the patients in the two groups: the patients were classified by the severity of disease according to AHI: AHI: 5-15 times / h, group of mild OSAS , AHI: 15-30 times/h, group of moderate OSAS, AHI > 30 times/h, group of severe OSAS. There were 23 mild patients, 78 moderate patients,

and 99 severe patients in the Chinese group; there were 36 patients, 72 moderate patients, and 92 severe patients in the German group. There was no statistically significant difference in severity of disease between the two groups ($P>0.05$). The specific results are shown in Table 3.

**Table 3.** The comparison of severity of disease between Chinese and German patients.

| Group | mild | moderate | severe | *P* |
|---|---|---|---|---|
| China | 23 | 78 | 99 | >0.05 |
| Germany | 36 | 72 | 92 | >0.05 |

Note: The difference between the two groups was not statistically significant(*P*>0.05).

The comparison of basic data between the patients of    the two groups. See Table 4.

**Table 4.** The comparison between the severity of disease and basic data of the patients of the two groups(*x*±*s*).

| | | BMI(kg/m$^2$) | Waist circumference(cm) | Neck circumference(cm) |
|---|---|---|---|---|
| Group of China | mild | 24.6±3.0 | 95.1±8.7 | 35.6±2.1 |
| | moderate | 27.6±3.2[a] | 98.4±9.2[a] | 36.8±2.0[a] |
| | severe | 29.3±3.4[a] | 101.6±9.5[a] | 38.5±2.4[a] |
| Group of Germany | mild | 25.8±3.1 | 96.2±9.1 | 36.2±2.3 |
| | moderate | 29.7±3.4[bc] | 101.2±8.6[bc] | 37.8±2.2[b] |
| | severe | 34.5±3.1[bc] | 105.3±9.8[bc] | 39.7±2.3[b] |

Note: In the Chinese group, a comparison of the BMI, waist circumference and neck circumference between the moderate and severe patients was conducted, and [a]*P*<0.05, so the difference was statistically significant; in the German group, a comparison of the BMI, waist circumference and neck circumference between the moderate and severe patients was conducted, and [b]*P*<0.05, so the difference was statistically significant; A comparison of the BMI and waist circumference of the moderate and severe patients between German group and Chinese group was conducted, and [c]*P* <0.05, so the difference was statistically significant.

The complications of the patients of the two groups.    See Table 5.

**Table 5.** The complications of the patients of the two groups (amount %)

| | | Hypertension | Abnormal glucose tolerance | Coronary heart disease | Cerebrovascular disease | Lipid metabolism disturbance | Fatty liver |
|---|---|---|---|---|---|---|---|
| Group of China | mild | 2(8.7) | 1(4.3) | 0(0) | 0(0) | 6(26.1) | 5(21.7) |
| | moderate | 16(20.5)[a] | 12(15.4)[a] | 4(5.1)[a] | 2(2.6)[a] | 27(34.6)[a] | 31(39.7)[a] |
| | severe | 31(31.3)[a] | 28(28.3)[a] | 11(11.1)[a] | 8(8.1)[a] | 38(38.4)[a] | 47(47.5)[a] |
| Group of Germany | mild | 3(8.3) | 2(5.6) | 0(0) | 0(0) | 8(22.2) | 7(19.4) |
| | moderate | 12(16.7)[bc] | 8(11.1)[bc] | 1(1.4)[bc] | 1(1.4)[b] | 16(22.2)[bc] | 23(31.9)[bc] |
| | severe | 26(28.3)[bc] | 25(27.2)[bc] | 8(8.7)[bc] | 5(5.4)[b] | 35(38.0)[bc] | 46(50.0)[bc] |

Note: In the Chinese group, a comparison of complications between the moderate and severe patients was conducted, and [a]*P*<0.05, so the difference was statistically significant; in the German group, a comparison of the complications between the moderate and severe patients was conducted, and [b]*P*<0.05, so the difference was statistically significant; A comparison of the complications of the middle and severe patients between German group and Chinese group was conducted. The complications of German group were less than that of Chinese group, except for the cerebrovascular disease, and [c]*P*<0.05, so the difference was statistically significant.

The comparison of the options of therapy chose by    the patients of the two groups. See Table 6.

**Table 6.** The therapies of the patients of the two groups(amount %)

| | | Adjustment of life | Treatment of position | Dental appliance | Operative treatment | Continuous positive airway pressure |
|---|---|---|---|---|---|---|
| Group of China | mild | 12(52.b | 9(39.1) | 5(21.7) | 4(17.4) | 0 |
| | moderate | 33(42.3) | 21(26.9) | 8(10.3) | 10(12.8) | 6(7.7) |
| | severe | 68(68.7) | 39(39.4) | 16(16.b | 27(27.3) | 39(39.4) |
| Group of Germany | mild | 24(66.7)[a] | 18(50.0)[a] | 15(41.7) | 9(25.0) | 1(2.8)[a] |
| | moderate | 56(77.8)[a] | 25(34.7)[a] | 14(19.4) | 16(22.b | 12(16.7)[a] |
| | severe | 72(78.3)[a] | 35(38.0)[a] | 12(13.0) | 10(10.9) | 67(72.8)[a] |

Note: A comparison of treatments in the mild, moderate and severe patients between German group and Chinese group. Except for the dental appliance and operative treatment accepted by the severe patients in the German group, the patients who accepted treatment in the German group were more than that of Chinese group, and [a]$P<0.05$, so the difference was statistically significant.

## 4 Discussion

As a developing country, China started late at sleep medicine. And there is economic imbalance among different regions. At present, sleep medicine is an interdisciplinary subject, adopting very biased treatment methods. Compared with developed countries, it is still relatively falling behind. The Chinese people has a poor understanding of disease of sleep, and the incidence of complications of obstructive sleep apnea syndrome (OSAS) is comparatively high, leading to higher disability and mortality. Moreover, the monitoring and treatment of sleep in China have not been included in the medical insurance category, but complications caused by OSAS are included in the medical insurance category (including: hypertension, diabetes, coronary heart disease, *etc*.), so the development of the disease cannot be blocked from the source. As a result, some people have low acceptance and identity of sleep diseases. The development of sleep medicine in Germany has gone through two phases: it obtained the "sleep medicine" qualification in 1998; it gradually matured in 2004[4-7]. Patients with OSAS in German have a higher acceptance of treatment, which reduces the incidence of complications and mortality.

Through a retrospective study of 200 patients with OSAS in China and 200 patients with OSAS in Germany, this paper systematically analyzes the gender ratio, age distribution, severity of disease, basic data of patient, complications, and treatment of patients with OSAS in both countries. From the perspective of gender ratio, the male patients are 86.51% in the Chinese group and 82.34% in the German group. There were more males than females in the two groups. There

was no statistically significant difference in male to female ratio between the two groups ($P>0.05$). In terms of age distribution, the average age of the Chinese group was (47.8 ± 9.7) years, and the average age of the German group was (45.6 ± 8.5) years. The difference wasn't statistically significant in age distribution between the two groups ($P>0.05$). From the aspect of severity of the disease, there were 23 mild patients, 78 moderate patients, and 99 severe patients in the Chinese group; and there are 36 patients, 72 moderate patients, and 92 severe patients in the German group. There was no statistically significant difference in severity of disease between the two groups ($P>0.05$). Patients with OSAS in both countries are mainly moderate and severe. The reason may be that patients with moderate or severe OSAS have more severe symptoms which can catch the attention to patients or their families. From the perspective of the BMI, neck circumference, waist circumference and other basic data of patients in the two countries, the BMI, waist circumference and neck circumference of the middle and severe patients were compared with those of mild patients in the Chinese group, and the difference was statistically significant($P<0.05$). The BMI, waist circumference, and neck circumference of the moderate and severe patients were compared with those of the mild patients in the German group, and the difference was statistically significant($P<0.05$). The BMI and waist circumference of the moderate and severe patients in the German group were compared with those of the moderate and severe patients in the Chinese group, and the difference was statistically significant($P<0.05$). This may be related to ethnic differences between European and Asian races. Judging from the complications of patients

in the two countries, the complications of the middle and severe patients were compared with those of mild patients in the Chinese group, so the difference was statistically significant($P<0.05$). In the German group, the complications of moderate and severe patients were compared with those of mild patients, so the difference was statistically significant($P<0.05$). It is related to the pathophysiology of chronic intermittent hypoxia in OSAS, and the more severe the sleep apnea was, the greater the risk of complications would be[4]. Compared with the moderate and severe patients in the Chinese group, except for cerebrovascular disease, the complications were less in the German group, so the difference was statistically significant($P<0.05$). The reason may be that the public and medical staff in Germany have a better understanding of OSAS and a better medical insurance system. Patients will see a doctor if they have OSAS-related symptoms, and doctors can provide more help to patients with this disease. In addition, patients with OSAS in Germany have a higher acceptance of treatment, which reduces the incidence of complications and mortality. However, even in the case of very serious symptoms, it is difficult for Chinese patients to go to the hospital because of snoring. Many patients are willing to accept the diagnosis of OSAS until severe complications occur. And due to the lack of awareness of this type of disease, patients with OSAS in China also has poor adherence to treatment, leading to high incidence of complications. Due to the diverse etiology of OSAS and the complex pathological mechanism, the choice of treatment methods varies from disease to disease, requiring comprehensive and individualized treatment[8]. From the perspective of the treatment received by patients in the two countries, the mild, moderate and severe patients in the German group were compared with those in the Chinese group. Except for German patients who received dental appliance and operative treatment, the patients receiving treatment in German group outnumber those in Chinese group, so the difference was statistically significant($P<0.05$). The treatment of patients with OSAS in Germany is more in accordance with the principle of individuation, so their compliance of treatment is better. And from the table, we can see that it is harder for Chinese patients to accept continuous positive airway pressure(CPAP) than German patients. The reason may be that the CPAP is expensive and the Chinese patients cannot comply to the long-term treatment of the CPAP. In Germany, the high level of acceptance of CPAP for patients with moderate to severe OSAS is probably related to their comprehensive medical insurance system and follow-up system.

Through this retrospective clinical study of patients with obstructive sleep apnea syndrome in China and Germany, we have a deeper understanding that Germany and China are basically the same in the diagnosis and treatment of OSAS, but Germany pays more attention to details and individuation in treatment. German patients have a deeper understanding of OSAS and a higher level of acceptance of treatment, with a better medical insurance system. And more patients have received systemic treatment before complications occurred, which greatly reduced the disability and mortality caused by the disease.

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