The distress and needs of Chinese patients with pituitary adenoma: a preliminary survey

Type
Research paper

Keywords
nursing, China, pituitary adenoma, needs, distress, care

Abstract
Introduction
It is necessary to investigate the current psychological distress and needs status of patients with pituitary adenoma in China.

Material and methods
Patients with pituitary adenoma treated in our hospital from May 2019 to December 2019 were included. The psychological distress and needs scale for pituitary adenoma patients was used to investigate the psychological distress and needs of patients. Besides, univariate and multiple linear regression analyses were conducted to analyze the influencing factors.

Results
A total of 254 valid questionnaires were included. The total psychological distress and need score of patients with pituitary adenoma was (23.89±18.41) and (21.91±20.03) points respectively. There were significant differences on the psychological distress score in different occupational status, personal income, types of pituitary adenomas, size of pituitary adenoma, invasiveness, endocrine level and history of surgery (all p<0.05). The size of pituitary adenoma, endocrine level and pituitary adenoma type were the influencing factors of patients' psychological distress(all p<0.05). There were significant differences on the need score in different age, occupational status, personal income, types of pituitary adenomas and endocrine level(all p<0.05). Endocrine level, other rare types of pituitary adenoma and age were the influencing factors of patients' needs (all p<0.05).

Conclusions
Our study is one of the few studies focused on the psychological distress and needs status of Chinese patients with pituitary adenoma. Medical staff should pay attention to the psychological distress of patients with large, rare type of pituitary adenomas and abnormal endocrine level, and take corresponding interventions to alleviate their psychological distress.
Title page

Title: The distress and needs of Chinese patients with pituitary adenoma: a preliminary survey

Running title: distress and needs & pituitary adenoma

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Conclusion: Our study is one of the few studies focused on the psychological distress and needs status of Chinese patients with pituitary adenoma. Medical staff should pay attention to the psychological distress of patients with large, rare type of pituitary adenomas and abnormal
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**Keywords:** distress; needs; pituitary adenoma; China; nursing; care

**Background**

Pituitary adenoma is a neuroendocrine tumor that originates from the anterior pituitary. It is the most common pituitary disease, accounting for about 10%-15% of intracranial tumors[1]. Pituitary adenomas cause mass effect and endocrine disorders[2, 3]. The space-occupying effect causes neurological symptoms such as headache, dizziness, decreased vision, and visual field defects[4]. Growth hormone adenoma causes excessive growth of soft tissues and bones in the patient's body, and excessive growth hormone also affects multiple systems and organs in the patient's body[5]. Even after active surgery, drug and radiotherapy treatment, not all patients' symptoms can be improved. Faced with problems such as unimprovable symptoms, long-term effects of hormone overdose, the possibility of tumor recurrence, long-term medication and hormone monitoring, patients can also suffer from certain psychological distress, which affects their quality of life[6]. In addition, in the course of long-term illness, patients still have a series of needs, which affect their effective response to the disease[7]. An in-depth understanding of the psychological distress and needs of patients with pituitary adenoma is of great significance for improving the quality of life of patients.

Many studies[8, 9] have shown that patients with pituitary adenoma have certain psychological distress and it seriously affects their quality of life. Studies[10, 11] have shown that compared with healthy controls, patients with pituitary diseases have a higher prevalence of severe depression and
adjustment disorders, and patients with pituitary diseases have a higher incidence of psychosomatic syndromes such as irritability, low morale, and continuous somatization. Besides, patients with pituitary adenoma have different needs. A qualitative study[12] has reported that patients hope to obtain more information about diseases from medical staff, such as adverse drug reactions, the effects of diseases on physical, mental, cognitive, sexual function and fertility. Patients expect medical staff to give more advice on the stress management and lifestyle[13]. Understanding the current psychological distress and needs of patients with pituitary adenoma can provide a scientific basis for formulating targeted intervention measures. However, there are few researches on the psychological distress and needs of patients with pituitary adenomas, which needs further investigations. Therefore, this study aimed to understand the psychological distress and needs of patients with pituitary adenoma in China, analyze the influencing factors of psychological distress and needs of patients with pituitary adenoma, to provide a theoretical basis for the management of pituitary adenoma.

Methods

Ethical consideration

In this study, all methods were conducted in accordance with the relevant guidelines and regulations. This study passed the ethical review of our hospital (review number: ECSU-20019000115), and all included patients agreed to participate in this study, and written informed consents had been obtained from all the included patients.

Sample size calculation

It’s been reported[14] that factor analysis should be conducted for generally less than 40 items. In most cases, a sample size of 200 is sufficient. It was considered[15] that for factor analysis, the
number of pre-samples should be 5 times the number of entries; if the ratio of the number of pre-
samples to the number of entries was 10:1, the result would be more stable. The number of items in
our survey scale is 33. Except for one open question, it was estimated that there were 32 items for
factor analysis. According to the principle of sample size calculation, the sample size should be 160
to 320.

Patients

We adopted the convenience sampling method and selected patients with pituitary adenoma who
had been treated in the Department of Neurosurgery of our hospital from May 2019 to December
2019 as the research populations, The inclusion criteria for patients in this study were as following:
① age ≥18 years old; ② patients were diagnosed with pituitary adenoma; ③ patients voluntarily
participated in this study. ④ Patients received pituitary adenoma surgery or related medical
treatment for 3 months or more.

The exclusion criteria of patients in this study were as following: ① those patients who could not
communicate normally and finished the survey; ② patients with previous mental illnesses such as
schizophrenia and depression or dementia; ③ patients who were not agree to participant in this
study.

Survey tools

General information The demographic information included age, gender, education level, medical
insurance type. And the disease-related information included pituitary adenoma classification,
pituitary adenoma size, invasiveness, surgical status and medication. Tumor invasiveness was
defined according to the invasiveness Knosp grade of pituitary adenoma, Knosp≥3 grade judged
that tumor was aggressive, Knosp≤2 grade judged that tumor was not invasive.
Psychological distress and needs scale  The psychological distress and needs in patients with pituitary adenoma were investigated by the Chinese version of the psychological distress and needs scale for patients with pituitary adenoma[16]. The item level content validity index (I-CVI) of each item in the Chinese version of the scale was 0.833-1, and the average scale level content validity index (S-CVI) was 0.958. The Cronbach’s α coefficient in the “mental distress” part was 0.945, and the test-retest reliability was 0.917; the Cronbach’s α in the “needs” part was 0.950, and the test-retest reliability was 0.913. The scale contained a total of 28 items. The first 27 items evaluated five dimensions: emotional problems, social function, physical and cognitive problems, negative disease perception, and sexual function. The scale adopted a percentile scoring method. The scores of each dimension and total scale were 0-100 points. The calculation formula was: Dimension (total scale) score = actual score of the dimension (total scale)/highest possible score ×100. The higher the psychological distress score, the more serious the psychological distress, the higher the demand score, the more the patient expected the support from medical staff.

Data collection and quality control

We selected appropriate pituitary adenoma patients based on the inclusion and exclusion criteria established by the study, and the investigator himself explained the purpose and significance of the study to the patient, and issued informed consent and questionnaires. In the case of informed consent, a unified guideline was used to introduce the method and requirements for filling out the questionnaire in this study, which was filled out by the patient himself. If patients had any questions during the questionnaire filling process, we used the unified explanatory language to answer patients. After completing the filling of questionnaire, the researchers conducted on-site quality control, including checked the questionnaire item by item to check the incomplete or unclear information.
with obvious logical errors.

Statistical methods

We used SPSS25.0 for statistical analysis of the data. The measurement data was expressed by mean ± standard deviation, and the counting data was expressed by frequency and percentage. The t-test and analysis of variance were used for single factor analysis with Bonferroni method, and multiple linear regression was used to analyze the influence of various factors on the psychological distress and needs of patients with pituitary adenoma. In this study, the difference was statistically significant with P<0.05.

Results

The characteristics of included patients

A total of 270 questionnaires were distributed, and 254 valid questionnaires were returned. The effective response rate was 94.07%. As presented in Table 1, The patients were 20-72 years old, with an average age of (41.32±12.45) years old. Among them, 15 (5.90%) patients received gamma knife treatment, 178 (70.1%) patients received surgery, and 12 (6.74%) of the patients only received craniotomy, 161 (90.45) %) people only received transnasal sphenoid approach surgery, 5 (2.81%) patients received both craniotomy and transnasal sphenoid approach surgery, 28 (11.02%) patients took the anti-depressants treatment after surgery. The characteristics of included patients were presented in Table 1.

| Table 1 The characteristics of included patients(n=254) |
|------------------------------------------------------|

Psychological distress and needs in patients with pituitary adenoma

The total psychological distress score of patients with pituitary adenoma was (23.89±18.41) points,
of which the negative disease perception dimension score was the highest, and the social function dimension score was the lowest. The total need score of patients with pituitary adenoma was (21.91±20.03) points, of which the negative disease perception dimension scored the highest, and the social function dimension scored the lowest points.

Table 2 Psychological distress and need scores of patients with pituitary adenoma

As presented in Table 3, univariate analysis indicated that there were significant differences of psychological distress score in the different occupational status, personal income, types of pituitary adenomas, size of pituitary adenoma, invasiveness, endocrine level and history of surgery (all p<0.05).

Table 3 Univariate analysis of psychological distress scores in patients with pituitary adenoma

As presented in Table 4, multiple linear regression analysis showed that the size of pituitary adenoma, endocrine level and pituitary adenoma type were the influencing factors of patients' psychological distress (all p<0.05).

Table 4 Multiple linear regression analysis of influencing factors of psychological distress in patients with pituitary adenoma

As presented in Table 5, univariate analysis indicated that there were significant differences of need score in the different age, occupational status, personal income, types of pituitary adenomas and endocrine level (all p<0.05).
As presented in Table 6, multiple linear regression analysis showed that endocrine level, other rare types of pituitary adenoma and age were the influencing factors of patients' needs (all p<0.05).

Discussions

A total of 254 patients with pituitary adenoma have been investigated in this study. Among them, prolactin type patients were the most, followed by non-functioning patients, acromegaly patients, Cushing's disease patients, and other rare type patients. Our findings are similar to previous related epidemiological survey results[17, 18], in which the prevalence of prolactinoma is the highest, followed by non-functioning type, acromegaly and Cushing's disease. Although the prevalence of acromegaly and Cushing’s disease is relatively low, China’s population base is large and the number of patients is still large[19]. The psychological distress and needs scale of patients with pituitary adenoma is a self-rating scale, which requires higher reading comprehension of patients[20]. Besides, patients with higher education level pay more attention to their own psychosocial problems, and they will have better acceptance of survey and higher degree of cooperation[21, 22].

The results of this study showed that unemployed patients have higher psychological distress and need scores than working patients, and non-income patients have higher psychological distress and demand levels. Previous study[23] has found that occupation is one of the influencing factors of the quality of life of patients with pituitary adenoma. It’s been reported [24, 25] that 28% of patients
with pituitary adenoma have no paid work, and Cushing’s disease has the highest proportion of unpaid work, reaching 47%. Working patients can be distracted to a certain extent through work[26]. Not only can they get financial support from the job, but also get more information and social support to promote the patient's physical and mental health[27, 28]. Therefore, medical staff should pay more attention to the psychological state and needs of patients with pituitary adenoma who are not working and have no stable income, and help patients choose cost-effective treatment options to reduce the psychological burden of medical expenses on patients[29].

We have found that patients with other rare types of pituitary adenomas have the highest levels of psychological distress and needs. The possible reason may be that the mixed adenomas can secrete multiple hormones, leading to a variety of endocrine disorders[30]. The clinical manifestations are diverse, overlapping, and more complex, which causes greater psychological burden on patients and more needs. Patients with thyroid stimulating hormone adenoma and gonadotropin adenoma often seek medical treatment in multiple departments, and the medical treatment process is often complicated and tortuous[31]. Therefore, medical staff should pay special attention to the psychological conditions of patients with rare type pituitary adenomas, explain the clinical manifestations, treatment plans, and post-treatment of the disease, help patients build confidence in treating the disease, and alleviate the psychological distress of patients. Besides, it is necessary to understand the needs of patients and develop a personalized care plan.

Endocrine level is an important factor affecting patients' psychological distress and needs. Studies [31, 32] have shown that after active treatments such as surgery and radiotherapy, residual functional pituitary adenomas will secrete excessive hormones. At present, relevant researches focus on the health management of patients with pituitary adenomas during the perioperative period, while...
neglecting the long-term follow-up health management of patients with pituitary adenomas that have developed into chronic diseases[33]. Therefore, long-term follow-up patients with pituitary adenomas urgently need effective health managements to improve their self-management ability, reduce their psychological burden and improve their quality of life.

The larger the pituitary adenoma, the more aggressive, and the higher the level of psychological distress in patients with a history of surgery. Previous study[34] has showed that the size of preoperative pituitary adenomas is a factor that affects the total resection rate of endoscopic sinus surgery. The larger the preoperative pituitary adenoma size, the lower the total resection rate[35]. In large adenomas and giant adenomas, the total cut rate under the microscope is 14.3%-56.4%[36]. Patients with incomplete pituitary adenomas have a low endocrine remission rate[37]. Furthermore, patients undergoing surgery will undergo longer-term recovery, and complications such as hypopituitarism and diabetes insipidus may occur after surgery[38-40]. Therefore, medical staff should pay attention to the psychological distress and needs of patients with giant adenomas, surgical history, and invasive pituitary adenomas.

This present study has found that patients under the age of 60 have a higher level of needs than those over the age of 60. The possible reason may be that young patients with pituitary adenomas need to return to work, and their social and family responsibilities are heavier[41, 42]. Besides, pituitary adenomas may cause changes in the patient's appearance, affecting marriage, childbirth, and sexual life[43]. Young patients pay more attention to the long-term adverse effects of the disease and have higher expectations for recovery[44]. Therefore, it is necessary to strengthen the long-term follow-up of young patients, teach patients to manage their own health and provide certain psychological support to meet the needs of patients.
There are several shortcomings in this study that must be considered. **Firstly,** the influencing factors included in this study explain only 13.7% and 12.4% of the psychological distress and needs variation of patients with pituitary adenoma. **Other factors such as drug treatment, duration of illness, and disease acceptance** are not included. It is recommended that future studies expand the scope of influencing factors and explore other factors that can be intervened in the psychological distress and needs of patients with pituitary adenomas. **Secondly,** the research subjects included in this study are patients who have undergone surgery or medication for 3 months or more, and the results of the study are applicable to patients who have been followed up out of hospital for a long time. It is suggested that follow-up studies can also include hospitalized patients and patients in the recovery stage within 3 months after surgery to explore the psychological distress and needs of patients with pituitary adenomas at different stages of the disease. **Thirdly,** due to the limitations of manpower and material resources and the low incidence of some types of pituitary adenomas, there are only 20 patients with Cushing's disease in the investigation, which cannot well represent the psychological distress and level of needs of patients with Cushing's disease. Our study is one of the few studies focused on the psychological distress and needs status of Chinese patients with pituitary adenoma. We will continue to include patients with Cushing's disease, expand the sample size, and analyze the psychological distress and needs of patients with Cushing's disease more comprehensively in the future.

**Conclusions**

Patients with pituitary adenomas have certain psychological distress and needs, especially in the dimensions of perception of negative diseases, physical and cognitive problems. Patients who are unemployed or retired, less income, rarely typed pituitary adenomas and abnormal endocrine levels
have higher levels of psychological distress and needs. Clinically, attention should be paid to the above-mentioned patients' psychological distress and needs, and targeted support and psychological interventions should be given to improve patients' self-management ability and quality of life.

List of abbreviations

I-CVI: item level content validity index
S-CVI: scale level content validity index

Declarations

Ethics approval and consent to participate

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Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Author contributions

M S, G S designed research; M S, G S, Y Y, C W, C M, L Y, Y H conducted research; M S, G S, Y
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Reference

1. Oh JS, Kim HJ, Hann HJ, Kang TU, Kim DS, Kang MJ, Lee JY, Shim JJ, Lee MR, Ahn HS: Incidence, mortality, and cardiovascular diseases in pituitary adenoma in Korea: a nationwide population-based study. Pituitary 2021, 24(1):38-47.

2. Cote DJ, Smith TR, Kaiser UB, Laws ER, Stampfer MJ: Body habitus across the lifespan and risk of pituitary adenoma. J Clin Endocrinol Metab 2021.

3. Ertek S: Molecular economy of nature with two thyrotropins from different parts of the pituitary: pars tuberalis thyroid-stimulating hormone and pars distalis thyroid-stimulating hormone. Arch Med Sci 2021, 17(1):189-195.

4. Parkin K, Kapoor R, Bhat R, Greenough A: Genetic causes of hypopituitarism. Arch Med Sci 2020, 16(1):27-33.

5. Castellanos LE, Misra M, Smith TR, Laws ER, Iorgulescu JB: The epidemiology and management patterns of pediatric pituitary tumors in the United States. Pituitary 2021.

6. Liu Z, Zhang H, Liu S, Chen H: The functional evaluation of pituitary in patients with a surgical resection of sellar tumours. Arch Med Sci 2020, 16(2):460-465.

7. Whipple SG, Savardekar AR, Rao S, Mahadevan A, Guthikonda B, Kosty JA: Primary Tumors of the Posterior Pituitary Gland: A Systematic Review of the Literature in Light of the New 2017 World Health Organization Classification of Pituitary Tumors.
8. Kao KT, Stargatt R, Zacharin M: Adult Quality of Life and Psychosocial Outcomes of Childhood Onset Hypopituitarism. *Horm Res Paediatr* 2015, 84(2):94-101.

9. Huguet I, Ntali G, Grossman A, Karavitaki N: Cushing's Disease - Quality of Life, Recurrence and Long-term Morbidity. *Eur Endocrinol* 2015, 11(1):34-38.

10. Feelders RA, Pulgar SJ, Kempel A, Pereira AM: The burden of Cushing's disease: clinical and health-related quality of life aspects. *Eur J Endocrinol* 2012, 167(3):311-326.

11. Postma MR, Netea-Maier RT, van den Berg G, Homan J, Sluiter WJ, Wagenmakers MA, van den Bergh AC, Wolffenbuttel BH, Hermus AR, van Beek AP: Quality of life is impaired in association with the need for prolonged postoperative therapy by somatostatin analogs in patients with acromegaly. *Eur J Endocrinol* 2012, 166(4):585-592.

12. Chao W, Meifen S, Qi Y: Structural equation model of coping style, hope level and quality of life of patients after pituitary tumor surgery. *Nursing Research* 2016, 30(35):4402-4406.

13. Webb SM, Santos A, Aulinas A, Resmini E, Martel L, Martinez-Momblan MA, Valassi E: Patient-Centered Outcomes with Pituitary and Parasellar Disease. *Neuroendocrinology* 2020, 110(9-10):882-888.

14. Yang CJ, Huang GS, Xiao FR, Lou MF: Symptom distress and quality of life after stereotactic radiosurgery in patients with pituitary tumors: a questionnaire survey. *PLoS One* 2014, 9(2):e88460.
15. Jang MK, Park CG, Jang S, Kim EH: Prevalence and Impact of Postoperative Headaches in Nonfunctioning Pituitary Macroadenoma Patients: A Longitudinal Cohort Study. *World Neurosurg* 2020, **133**:e633-e639.

16. Yongxia S: Compilation and application of the nursing professional social support demand scale for cancer patients. Anhui Medical University; 2015.

17. Tiemensma J, Biermasz NR, van der Mast RC, Wassenaar MJ, Middelkoop HA, Pereira AM, Romijn JA: Increased psychopathology and maladaptive personality traits, but normal cognitive functioning, in patients after long-term cure of acromegaly. *J Clin Endocrinol Metab* 2010, **95**(12):E392-402.

18. Tiemensma J, Biermasz NR, Middelkoop HA, van der Mast RC, Romijn JA, Pereira AM: Increased prevalence of psychopathology and maladaptive personality traits after long-term cure of Cushing's disease. *J Clin Endocrinol Metab* 2010, **95**(10):E129-141.

19. Guo X, Wang K, Yu S, Gao L, Wang Z, Zhu H, Xing B, Zhang S, Dong D: Patient Characteristics, Diagnostic Delays, Treatment Patterns, Treatment Outcomes, Comorbidities, and Treatment Costs of Acromegaly in China: A Nationwide Study. *Front Endocrinol (Lausanne)* 2020, **11**:610519.

20. Sievers C, Ising M, Pfister H, Dimopoulou C, Schneider HJ, Roemmler J, Schopohl J, Stalla GK: Personality in patients with pituitary adenomas is characterized by increased anxiety-related traits: comparison of 70 acromegalic patients with patients with non-functioning pituitary adenomas and age- and gender-matched controls. *Eur J Endocrinol* 2009, **160**(3):367-373.

21. Tiemensma J, Andela CD, Kaptein AA, Romijn JA, van der Mast RC, Biermasz NR, Pereira
AM: Psychological morbidity and impaired quality of life in patients with stable
treatment for primary adrenal insufficiency: cross-sectional study and review of the
literature. *Eur J Endocrinol* 2014, **171**(2):171-182.

22. Placzek H, Xu Y, Mu Y, Begelman SM, Fisher M: **Clinical and Economic Burden of**
Commercailly Insured Patients with Acromegaly in the United States: A Retrospective
Analysis. *J Manag Care Spec Pharm* 2015, **21**(12):1106-1112.

23. Solomon E, Branisteau D, Dumbrava A, Solomon RG, Kiss L, Glod M, Preda C: **Executive functioning and quality of life in acromegaly.** *Psychol Res Behav Manag* 2019,**12**:39-44.

24. Andela CD, Tiemensa J, Kapte M, Scharloo M, Pereira AM, Kamninga NG, Biermasz NR: **The partner's perspective of the impact of pituitary disease: Looking beyond the patient.** *J Health Psychol* 2019, **24**(12):1687-1697.

25. Alibas H, Uluc K, Kahraman Koytak P, Uygur MM, Tuncer N, Tanridag T, Gogas Yavuz D: **Evaluation of depressive mood and cognitive functions in patients with acromegaly under somatostatin analogue therapy.** *J Endocrinol Invest* 2017, **40**(12):1365-1372.

26. Lesen E, Granfeldt D, Houchard A, Dinet J, Berthon A, Olsson DS, Bjarholt I, Johannsson G: **Comorbidities, treatment patterns and cost-of-illness of acromegaly in Sweden: a register-linkage population-based study.** *Eur J Endocrinol* 2017, **176**(2):203-212.

27. Christofides EA: **Clinical importance of achieving biochemical control with medical therapy in adult patients with acromegaly.** *Patient Prefer Adherence* 2016, **10**:1217-1225.

28. Jakobsson Ung E, Olofsson AC, Bjorkman I, Hallen T, Olsson DS, Ragnarsson O,
18

Skoglund T, Jakobsson S, Johannsson G: The pre- and postoperative illness trajectory in patients with pituitary tumours. *Endocr Connect* 2019, 8(7):878-886.

29. Yoshida K, Fukuoka H, Matsumoto R, Bando H, Suda K, Nishizawa H, Iguchi G, Ogawa W, Webb SM, Takahashi Y: The quality of life in acromegalic patients with biochemical remission by surgery alone is superior to that in those with pharmaceutical therapy without radiotherapy, using the newly developed Japanese version of the AcroQoL. *Pituitary* 2015, 18(6):876-883.

30. Crespo I, Santos A, Valassi E, Pires P, Webb SM, Resmini E: Impaired decision making and delayed memory are related with anxiety and depressive symptoms in acromegaly. *Endocrine* 2015, 50(3):756-763.

31. Simpson GK, Koh ES, Whiting D, Wright KM, Simpson T, Firth R, Gillett L, Younan K: Frequency, clinical correlates, and ratings of behavioral changes in primary brain tumor patients: a preliminary investigation. *Front Oncol* 2015, 5:78.

32. Andela CD, Scharloo M, Pereira AM, Kaptein AA, Biermasz NR: Quality of life (QoL) impairments in patients with a pituitary adenoma: a systematic review of QoL studies. *Pituitary* 2015, 18(5):752-776.

33. Yedinak CG, Fleseriu M: Self-perception of cognitive function among patients with active acromegaly, controlled acromegaly, and non-functional pituitary adenoma: a pilot study. *Endocrine* 2014, 46(3):585-593.

34. Martin-Rodriguez JF, Madrazo-Atutxa A, Venegas-Moreno E, Benito-Lopez P, Galvez MA, Cano DA, Tinahones FJ, Torres-Vela E, Soto-Moreno A, Leal-Cerro A: Neurocognitive function in acromegaly after surgical resection of GH-secreting adenoma versus naive
acromegaly. *PLoS One* 2013, 8(4):e60041.

35. Sobrinho LG, Duarte JS, Paiva I, Gomes L, Vicente V, Aguiar P: **Paternal deprivation** prior to adolescence and vulnerability to pituitary adenomas. *Pituitary* 2012, 15(2):251-257.

36. Machado-Alba JE, Machado-Duque ME: **Prescription patterns of long-acting somatostatin analogues. SAGE Open Med** 2017, 5:2050312117694795.

37. Geraedts VJ, Andela CD, Stalla GK, Pereira AM, van Furth WR, Sievers C, Biermasz NR: **Predictors of Quality of Life in Acromegaly: No Consensus on Biochemical Parameters. Front Endocrinol (Lausanne)** 2017, 8:40.

38. Kyriakakis N, Lynch J, Gilbey SG, Webb SM, Murray RD: **Impaired quality of life in patients with treated acromegaly despite long-term biochemically stable disease: Results from a 5-years prospective study. Clin Endocrinol (Oxf)** 2017, 86(6):806-815.

39. Jawiarczyk-Przybylowska A, Szcesniak D, Ciulkowicz M, Bolanowski M, Rymaszewska J: **Importance of Illness Acceptance Among Other Factors Affecting Quality of Life in Acromegaly. Front Endocrinol (Lausanne)** 2019, 10:899.

40. Gatto F, Campana C, Cocchiara F, Corica G, Albertelli M, Boschetti M, Zona G, Criminelli D, Giusti M, Ferone D: **Current perspectives on the impact of clinical disease and biochemical control on comorbidities and quality of life in acromegaly. Rev Endocr Metab Disord** 2019, 20(3):365-381.

41. Guo X, Wang K, Yu S, Gao L, Wang Z, Zhu H, Xing B, Zhang S, Dong D: **Quality of Life and its Determinants in Patients With Treated Acromegaly: A Cross-Sectional Nationwide Study in China. J Clin Endocrinol Metab** 2021, 106(1):211-225.
Kamusheva M, Vandeva S, Mitov K, Rusenova Y, Elenkova A, Zacharieva S, Mitkova Z, Tachkov K, Dimitrova M, Doneva M et al: New Epidemiological, Clinical and Economic Data for Patients With Acromegaly in Bulgaria. Front Public Health 2020, 8:147.

Oliveira BA, Araujo B, Dos Santos TM, Ongaratti BR, Leaes Rech CGS, Ferreira NP, JF SP-L, da COM: Health-related Quality of Life in Acromegaly Patients: Results from Generic and Disease-specific Questionnaires. Indian J Endocrinol Metab 2020, 24(5):402-405.

Broersen LHA, Zamanipoor Najafabadi AH, Pereira AM, Dekkers OM, van Furth WR, Biermasz NR: Improvement in Symptoms and Health-Related Quality of Life in Acromegaly Patients: A Systematic Review and Meta-Analysis. J Clin Endocrinol Metab 2021, 106(2):577-587.
| Items                              | Cases(%) |
|-----------------------------------|----------|
| **Age**                           |          |
| ≤44                               | 164 (64.2) |
| 45-59                             | 62 (24.4) |
| ≥60                               | 28 (11.0) |
| **Gender**                        |          |
| Female                            | 173 (68.1) |
| Male                              | 81 (31.9) |
| **Marital status**                |          |
| Married                           | 217 (85.4) |
| Unmarried                         | 34 (13.4) |
| Divorce                           | 3 (1.2)  |
| **Child bearing**                 |          |
| Yes                               | 205 (80.7) |
| No                                | 49 (19.3)  |
| **Occupational status**           |          |
| On-the-job                        | 209 (82.3) |
| Unemployment/retirement           | 45 (17.7)  |
| **Education level**               |          |
| Primary school                    | 26 (10.2) |
| Junior high school                | 53 (20.9) |
| High school or occupational technique school | 50 (19.7) |
| University                        | 125 (49.2) |
| **Personal income(RMB)**          |          |
| None                              | 26 (10.2) |
| <3000                             | 56 (22.0) |
| 3000-6000                         | 93 (36.6) |
| >6000                             | 79 (31.1) |
| **Medical insurance**             |          |
| Self-covered                      | 25 (9.8)  |
| New rural cooperative medical insurance | 33 (13.0) |
| Medical insurance for urban residents | 196 (77.2) |
| **Types of pituitary adenomas**   |          |
| Growth hormone type               | 55 (21.7) |
| Corticotropin type                | 20 (7.9)  |
| Non-function type                 | 76 (29.9) |
| Prolactin type                    | 93 (36.6) |
| Other rare types                  | 10 (3.9)  |
| **Size of pituitary adenoma**     |          |
| Microadenoma                      | 88 (34.6) |
| Large adenoma                     | 155 (61.0) |
| Giant adenoma                     | 11 (4.3)  |
| **Invasiveness**                  |          |
| Yes                               | 65 (25.6) |
| No                                | 189 (74.4) |
| **Endocrine level**               |          |
| Normal                            | 111 (43.7) |
| Abnormal                          | 143 (56.3) |
| **History of surgery**            |          |
| Yes                               | 178 (70.1) |
No 76 (29.9)
Anti-depressants use after
surgery
Yes 28 (11.02)
No 226 (88.98)

Table 2 Psychological distress and need scores of patients with pituitary adenoma

| Dimensions                        | Psychological distress score | Needs scores |
|----------------------------------|------------------------------|--------------|
| Emotional problems               | 26.92±23.28                 | 25.49±26.62  |
| Social function                  | 11.71±18.05                 | 10.65±18.27  |
| Physical and cognitive problems  | 27.39±21.54                 | 27.61±24.54  |
| Negative disease perception      | 34.82±23.95                 | 35.41±27.42  |
| Sexual function                  | 14.22±23.73                 | 15.16±27.38  |
| Total scale score                | 23.89±18.41                 | 21.91±20.03  |

Table 3 Univariate analysis of psychological distress scores in patients with pituitary adenoma

| Variables                        | Psychological distress scores | F/t  | p   |
|----------------------------------|------------------------------|------|-----|
| Age                              |                              |      |     |
| <60                              | 24.81±20.24                 | 0.389| 0.698|
| ≥60                              | 23.84±15.24                 |      |     |
| Gender                           |                              |      |     |
| Female                           | 22.53±17.69                 |      | 0.085|
| Male                             | 26.79±19.64                 | 1.727|     |
| Marital status                   |                              |      |     |
| Married                          | 24.24±18.69                 | 0.295| 0.745|
| Unmarried                        | 22.11±16.91                 |      |     |
| Divorce                          | 19.14±18.06                 |      |     |
| Child bearing                    |                              |      |     |
| Yes                              | 24.07±18.95                 | 0.322| 0.748|
| No                               | 23.12±16.10                 |      |     |
| Occupational status             |                              |      |     |
| On-the-job                       | 22.68±16.40                 |      | 0.024|
| Unemployment/retirement          | 29.51±25.25                 | 2.274|     |
| Education level                  |                              |      |     |
| primary school                   | 30.06±15.99                 | 1.529| 0.208|
| Junior high school               | 20.74±15.80                 |      |     |
| High school or occupational     | 23.30±19.62                 |      |     |
| technique school                 | 24.19±19.25                 |      |     |
| Personal income(RMB)             |                              |      |     |
| None                             | 36.18±28.49                 | 4.892| 0.003|
| <3000                            | 20.35±15.05                 |      |     |
| Variables                                      | Psychological distress scores | F/t | p    |
|-----------------------------------------------|------------------------------|-----|------|
| 3000-6000                                     | 23.63±15.83                  |     |      |
| >6000                                         | 22.67±17.96                  |     |      |
| Medical insurance                             |                              |     |      |
| Self-covered                                  | 26.74±18.90                  | 0.404| 0.668|
| New rural cooperative medical insurance       | 24.72±19.51                  |     |      |
| Medical insurance for urban residents         | 23.39±18.22                  |     |      |
| Types of pituitary adenomas                   |                              |     |      |
| Growth hormone type                           | 27.72±19.37                  | 3.973| 0.004|
| Corticotropin type                            | 29.26±21.09                  |     |      |
| Non-function type                             | 22.36±16.63                  |     |      |
| Prolactin type                                | 20.11±17.77                  |     |      |
| Other rare types                              | 38.89±15.15                  |     |      |
| Size of pituitary adenoma                     |                              |     |      |
| Microadenoma                                  | 20.74±19.56                  | 3.690| 0.026|
| Large adenoma                                 | 24.87±17.30                  |     |      |
| Giant adenoma                                 | 35.27±19.69                  |     |      |
| Invasiveness                                  |                              |     | 0.022|
| Yes                                           | 28.39±19.40                  | 2.303|      |
| No                                            | 22.34±17.85                  |     |      |
| Endocrine level                               |                              |     | 0.000|
| Normal                                        | 18.15±14.45                  |     |      |
| Abnormal                                      | 28.35±19.90                  | 4.727|      |
| History of surgery                            |                              |     | 0.005|
| Yes                                           | 26.00±19.16                  | 2.830|      |
| No                                            | 18.96±15.54                  |     |      |

Table 4 Multiple linear regression analysis of influencing factors of psychological distress in patients with pituitary adenoma
Table 5 Univariate analysis of needs in patients with pituitary adenoma

| Variables                     | Need scores     | F/t   | p     |
|-------------------------------|-----------------|-------|-------|
| **Age**                       |                 |       |       |
| <60                           | 22.63±20.54     | 2.161 | 0.036 |
| ≥60                           | 16.10±14.24     |       |       |
| **Gender**                    |                 |       |       |
| Female                        | 20.46±19.29     | -     | 0.090 |
| Male                          | 25.02±21.33     | 1.700 |       |
| **Marital status**            |                 |       |       |
| Married                       | 22.02±20.24     | 0.085 | 0.918 |
| Unmarried                     | 21.65±19.23     |       |       |
| Divorce                       | 17.28±19.21     |       |       |
| **Child bearing**             |                 |       |       |
| Yes                           | 21.95±20.58     | 0.056 | 0.956 |
| No                            | 21.77±17.75     |       |       |
| **Occupational status**       |                 |       |       |
| On-the-job                    | 20.68±18.25     | -     | 0.035 |
| Unemployment/retirement       | 27.61±26.33     | 2.119 |       |
| **Education level**           |                 |       |       |
| primary school                | 27.74±16.39     | 1.815 | 0.145 |
| Junior high school            | 17.26±17.62     |       |       |
| High school or occupational technique school | 21.37±20.72 |       |       |
| University                    | 22.89±21.15     |       |       |
| **Personal income(RMB)**      |                 |       |       |
| None                          | 34.87±28.56     | 5.274 | 0.002 |
| <3000                         | 16.53±16.19     |       |       |
| 3000-6000                     | 22.22±16.53     |       |       |
| >6000                         | 21.10±19.30     |       |       |
| **Medical insurance**         |                 |       |       |
| Self-covered                  | 25.85±20.39     | 0.540 | 0.583 |
| New rural cooperative medical insurance | 21.54±20.06 |       |       |
| Medical insurance for urban residents | 21.13±19.85 |       |       |
| **Types of pituitary adenomas** |               |       |       |
| Growth hormone type           | 24.75±21.20     | 2.644 | 0.034 |
| Corticotropin type            | 26.16±23.12     |       |       |
| Non-function type             | 19.37±17.79     |       |       |
| Prolactin type                | 19.73±20.11     |       |       |
| Other rare types              | 37.41±15.00     |       |       |
| **Size of pituitary adenoma** |                 |       |       |
| Microadenoma                  | 19.54±21.00     | 2.242 | 0.108 |
| Large adenoma                 | 22.51±19.09     |       |       |
### Table 6: Multiple linear regression analysis of influencing factors of needs in patients with pituitary adenoma

| Variables                                      | β    | SE   | t     | p     |
|------------------------------------------------|------|------|-------|-------|
| Constant                                       | 24.872 | 4.797 | 5.185 | 0.000 |
| Endocrine level                                | 9.489  | 2.726 | 3.481 | **0.001** |
| Corticotropin type of pituitary adenomas       | 2.242  | 5.018 | 0.447 | 0.655 |
| Non-function type of pituitary adenoma         | 1.569  | 3.849 | 0.408 | 0.684 |
| Prolactin type of pituitary adenoma            | -1.656 | 3.385 | -0.489 | 0.625 |
| Other rare types of pituitary adenoma          | 15.642 | 6.618 | 2.364 | **0.019** |
| Personal income (RMB)                          | -1.119 | 1.531 | -0.731 | 0.465 |
| Age                                            | -9.394 | 4.295 | -2.187 | **0.030** |
| Occupation                                     | -7.063 | 3.946 | -1.790 | 0.075 |