



OPEN A cross-sectional study of swallowing function and influencing factors in 392 psychiatric inpatients in Guangzhou China

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Psychiatric inpatients might experience a higher incidence of dysphagia. However, the factors specifically affecting psychiatric inpatients with dysphagia remain unexplored. This study aims to explore the swallowing function and influencing factors of psychiatric inpatients. A total of 392 psychiatric inpatients were selected for this study. Their swallowing function was evaluated using the Standardized Swallowing Assessment. The data collected included sociodemographic characteristics, Social Support Rating Scale (SSRS) and Activity of Daily Living Scale (ADL). 75% of patients ($n = 265$) were female and 332 (84.7%) were over 60 years old. The significant factors influencing the swallowing function among psychiatric inpatients included age, diagnosis, duration of illness, somatic comorbidities and admission routes ($P < 0.05$). After subjecting these factors to linear regression analysis, it was revealed that the swallow function of psychiatric inpatients was strongly correlated with dementia, ADL (moderate dependence, severe dependence), somatic comorbidities, SSRS (utilization of social support, objective support) ($P < 0.05$). Psychiatric inpatients with dysphagia was affected to varying degrees by dementia, self-care ability, somatic comorbidities and social support. The swallowing function of psychiatric inpatients was associated with dementia, the ability to perform daily activities, somatic comorbidities and social support. Future studies should focus on the recovery of swallowing function and somatic comorbidities, self-care ability, and multi-level social support for psychiatric inpatients.

Keywords Psychiatric inpatients, Swallowing function, Activities of daily living, Social support, Somatic comorbidities, Cross-sectional study

Mental disorders are a growing public health burden globally in terms of prevalence, cost-of-illness, and morbidity¹. psychiatric inpatients might experience a higher incidence of dysphagia and choking due to factors of medication side effects and behavioral abnormalities (Kristy J et al.². Research has shown that the prevalence of dysphagia ranges between 30 and 40% in elderly patients, 44% in those admitted to geriatric acute care, and 60% in institutionalized elderly patients (Li-Chan³, Pere⁴. Therefore, it is crucial to accurately evaluate swallowing function in psychiatric inpatients, including several factors that could account for dysphagia.

In the psychiatric hospitals, Alzheimer's disease is one of the main types of dementia. Extensive studies reported that dysphagia is a common complication in Alzheimer's patients, with an incidence of 13% to 57% (Alagiakrishnan et al.⁵. The severity of dysphagia directly influences nutrition, hydration, the presence of

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pressure ulcers, the presence and severity of respiratory infections, the severity of cognitive-behavioral changes, and the general health of individuals with Alzheimer's disease^{6,7}. Additionally, the status of daily activities was associated with swallowing ability⁸. However, the study did not specifically address the relationship between the ability to perform daily activities and the degree of dysphagia.

Dysphagia in psychiatric inpatients leads to an increased risk of somatic comorbidity. Dysphagia was an inability to safely and efficiently carry food from the mouth to the stomach for adequate nutrition and water due to impaired function of the jaw, lips, tongue, soft palate, throat, esophageal sphincter or esophagus. Patients diagnosed with major depressive disorder often suffer from dysphagia, while major depression is an independent risk factor for dysphagia⁹. Dysphagia is also associated with feelings of shame, embarrassment, and social isolation¹⁰, Maclean et al.^{11,12}. Nevertheless, few studies have accounted for the status of social loneliness and social support in psychiatric inpatients suffering from dysphagia.

The European Society for Swallowing Disorders and the European Union Geriatric Medicine Society currently recognizes dysphagia as one of the main geriatric syndromes that is detrimental to patient's general health and well-being¹³. Empirical studies showed the characteristics of dysphagia in patients with organic diseases, such as stroke, nasopharyngeal carcinoma, and Parkinson's disease. Anti-psychotics might influence the swallowing function, but very few studies unveiled the severity and relevant factors of dysphagia in patients with mental disorders, then this limitation would hinder the development of targeted intervention^{14–16}. Understanding the swallowing function and the factors affecting this condition among psychiatric inpatients could solve this issue¹⁷. Therefore, the current study explores the swallowing function and influencing factors of psychiatric inpatients to present a basis for improving their swallowing function.

Materials and methods

Subjects

A consecutive sampling method was used to recruit 392 psychiatric inpatients in the Affiliated Brain Hospital, Guangzhou Medical University, from February 2021 to March 2022. The inclusion criteria were: (1) Chinese diagnostic criteria for mental disorders (CCMD-3), which included patients with schizophrenia, affective disorders, dementia, and other mental disorders; (2) patients were able to respond naturally and complete the scale rating; (3) patients or their family member agreed to sign informed consent. Meanwhile, the exclusion criteria were (1) patients suffering from end-stage diseases (life expectancy < 6 months) and (2) patients with severe hearing or visual impairment. This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the Affiliated Brain Hospital of Guangzhou Medical University. In terms of power analysis, we had carried out effectiveness analysis which showed acceptable power with significance level of 0.05 ($R^2 = 0.345$, adjusted $R^2 = 0.335$), indicating the sample size ($n = 392$) of this study was suitable to support the results.

Questionnaire

General information

A self-designed questionnaire was used to collect the patient's demographic information: gender, age, marital status, educational background, diagnosis, duration of illness, frequency of hospitalization, lifestyle habits, and somatic comorbidities.

Social support rating scale (SSRS)

The Social Support Rating Scale (SSRS) was a 10-items scale that had been popularly used to evaluate the level of social support. SSRS includes three dimensions: subjective support (item 1, 3, 4, and 5), objective support (item 2, 6, and 7), and social support utilization (item 8, 9, and 10). Item 1–5 and item 8–10 applied 4-point Likert rating method; results of item 6 and item 7 were the sum of selected items. The total score ranges between 10 and 40. A higher overall score indicates greater social support¹⁸.

Activity of daily living scale (ADL)

The ADL scale was developed by Lawton and Brody in 1969. The scale consists of the Physical Self-maintenance Scale (PSMS) and the Instrumental Activities of Daily Living Scale (IADL), which was mainly used to assess the daily living ability of the subjects. ADL was a 10-items scale evaluating the ability of daily living, including feeding, bathing, grooming, dressing, bowel control, bladder control, toilet use, transfers, mobility on level surfaces, and stairs. The range of ADL score was 0 to 100, the results of ADL were defined as complete independence (100 points), slight dependence (61–99 points), moderate dependence (41–60 points), and severe dependence (≤ 40 points). A Low ADL score indicated severe disability with great need for nursing care (Lawton et al.¹⁹).

Standardized swallowing assessment (SSA)

The SSA items ranged from easy to difficult, which could avoid causing adverse reactions in patients with severe dysphagia. The SSA was performed in three parts: (1) Clinical examination, including consciousness, head and trunk control, breathing, lip closure, soft palate movement, laryngeal function, gag reflex and spontaneous cough. (2) Patients were instructed to swallow 5ml of water three times to observe the laryngeal movement and wheeze during swallowing. (3) If there was no abnormality in the above examination, the patient was instructed to swallow 60ml of purified water to observe swallowing time and cough. The scale is widely used to assess swallowing function, hence the good reliability and validity. The overall score ranges between 18 and 46, where a higher score represents poorer swallowing function^{20,21}.

Data collection

This study was conducted in the Affiliated Brain Hospital, Guangzhou Medical University. Within the first three days of admission, based on participants' physical and mental conditions, one or two sections of short interview (approximately 30 min) would be conducted to complete scales rating by research assistants. Researchers used Mandarin or local dialect for data collection, and researchers underwent consistency training to provide participants with consistent instructions for filling out the scale. If patients did not understand the relevant content, researchers would explain the content in detailed. The scales were immediately collected and checked upon completion. In addition, other general information would be extracted from hospital information system (HIS), including gender, age, marital status, educational background, diagnosis, duration of illness, frequency of hospitalization, lifestyle habits, and somatic comorbidities. A total of 392 questionnaires were distributed in this study, and 392 were returned with an effective rate of 100%.

Statistical analysis

Statistical Package for Social Sciences (SPSS) version 25.0 (IBM, USA) was used for data analysis. The continuous data were presented as mean \pm standard deviation (SD), while the categorical data were expressed as frequency and percentage. The difference between two categories was evaluated using the independent sample *t*-test, while one-way analysis of variance (ANOVA) was utilized for three or more categories. The non-parametric K-independent sample test was also used to rank the variables. In addition, the linear regression analysis was performed to determine factors influencing swallowing function in psychiatric inpatients. The level of significance was set at $P < 0.05$.

Results

Demographic and clinical variables

A total of 392 psychiatric inpatients were included in this study; 67.6% ($n = 265$) were female, 76.3% ($n = 299$) had spouses, and 80.7% ($n = 332$) were > 60 years old. psychiatric inpatients with schizophrenia accounted for 30.4% ($n = 119$), mood disorders at 36.0% ($n = 141$), and 27.8% ($n = 109$) had dementia. Furthermore, 42.9% ($n = 168$) of psychiatric inpatients have had the disease for > 10 years, 87.5% ($n = 343$) had somatic comorbidities, and 88.2% ($n = 346$) attended high school or lower (Table 1).

Single-factor analysis of SSA scores in psychiatric inpatients

Age, diagnosis, duration of illness, somatic comorbidities, and admission route demonstrated statistical significance ($P < 0.05$). Likewise, the SSRS and ADL scores among psychiatric inpatients were statistically significant ($P < 0.05$) (Table 2).

The influencing factors of swallowing function in psychiatric inpatients

Univariate linear regression analysis was performed ($P < 0.05$), and the multivariate linear regression analysis model was established. The swallowing function of psychiatric inpatients was set as the dependent variable. Age, diagnosis, duration of illness, somatic comorbidities, admission route, the SSRS and ADL scores were statistically significant as independent variables. The results showed that dementia, ADL, and somatic comorbidities affected the swallowing function of psychiatric inpatients, and the swallowing function was associated with SSRS (utilization of social support, objective support) ($P < 0.05$).

The regression analysis demonstrated that the total SSA score of dementia patients was higher and accompanied by poorer swallowing function (95% CI: 1.761–3.05, $P < 0.001$) than patients with other mental disorders. Secondly, psychiatric inpatients with moderate (95% CI: 0.931–2.597, $P < 0.001$) and severe dependence (95% CI: 1.412–3.149, $P < 0.001$) on the daily activity exhibited poorer swallowing function. Third, more somatic comorbidities in psychiatric inpatients affected the SSA score (95% CI: 0.349–1.903 $P = 0.005$). Finally, the gradual increase in social support resulted in lower SSA scores (95% CI: 0.035–0.29, $P = 0.012$). On the contrary, the objective support in SSRS decreased, and the SSA scores increased correspondingly (95% CI: -0.298 to 0.063, $P = 0.003$) (Tables 3 and 4).

Discussion

At present, the swallowing function of psychiatric inpatients department seriously affected the daily eating condition and nutritional status of patients. Thus, examining the influencing factors of swallowing function in aged psychiatric inpatients was necessary: understanding the major weakness of intervening dysphagia through investigating its related factors brought benefit to improve the swallowing function. To the best of our knowledge, this study is one of the first to evaluate the swallowing function of psychiatric inpatients in multiple aspects in China. Therefore, the current study explored the swallowing function and its influencing factors of psychiatric inpatients to present a basis for improving their swallowing function. It was discovered that the prevalence of dysphagia was higher in dementia patients than in those with other psychiatric disorders. Nevertheless, Lin et al. investigated that the elderly with symptoms of depression were more prone to impaired swallowing than asymptomatic patients²². The daily activities and somatic comorbidities of psychiatric inpatients also influenced their swallowing function. This study also found significant differences in SSA scores among psychiatric inpatients of different ages, suggesting that age was related to dysphagia in psychiatric inpatients. Previous studies had shown that the incidence of dysphagia in the elderly population increased with age, among which the prevalence of dysphagia in the elderly aged 60–69 years, 70–79 years, 80 years and above was 21.0%, 28.0% and 41.0%, respectively²³. Despite the indirect impact of social support on the swallowing function of psychiatric inpatients, high and low social support might provide two distinct directions in improving swallowing function.

Item	Frequency	Proportion (%)
Sex		
Male	127	32.4
Female	265	67.6
Age (yrs)		
< 60	60	15.3
60–70	174	44.4
> 70	158	40.3
Diagnosis		
Schizophrenia	119	30.4
Affective disorder	141	36.0
Dementia	109	27.8
Other mental illnesses	23	5.9
Duration of illness (yrs)		
0–5	166	42.3
5–10	58	14.8
> 10	168	42.9
Somatic comorbidities		
Yes	343	87.5
No	49	12.5
First hospitalization		
Yes	277	70.7
No	155	29.3
Marital status		
With a spouse	299	76.3
Without a spouse	93	23.7
Educational background		
Primary school and below	144	36.7
Middle and high school	202	51.5
College and above	46	11.7
Drinking		
No	371	94.6
Yes	21	5.4
Smoking		
No	374	95.4
Yes	18	4.6
Admission route		
Outpatient and emergency admission	379	96.7
Others	13	3.3
ADL		
Complete independence	118	30.1
Slight dependence	182	46.4
Moderate dependence	45	11.5
Severe dependence	47	12.0

Table 1. Demographic and clinical variables.

Earlier studies reported that comorbidities of mental and somatic diseases are common in healthcare data and clinical practice²⁴. In the present study, psychiatric inpatients with more somatic comorbidities was significantly associated with dysphagia. Comorbidities such as obesity, diabetes, and cardiovascular impairment reduced the average life expectancy of psychiatric inpatients between 15 and 20 years (M et al.^{25–27}. Moreover, psychiatric symptoms or diagnoses other than anxiety disorders and depression might be prevalent in dysphagia patients⁹. However, few treatment-effect studies have been conducted in dysphagia patients with psychiatric comorbidity⁹. Therefore, there is an urgent need to prioritize medical attention for psychiatric inpatients with somatic comorbidities regardless of age and diagnosis to reduce the impact of dysphagia on their treatment outcome.

Dysphagia in psychiatric inpatients is also significantly associated with their daily activities²⁸. Patients with an increased risk of dysphagia exhibited lower ADL, poorer nutritional status and cognitive function, and frailty compared with other patients in general²⁸. Despite that, the current study found that psychiatric inpatients with

Item	SSA	t/F	P
Sex			
Male	19.56 ± 3.75	1.551	0.123
Female	18.98 ± 2.81		
Age			
< 60	18.08 ± 0.46	23.262	0.000
60–70	18.41 ± 1.89		
> 70	20.41 ± 4.25		
Diagnosis			
Schizophrenia	18.16 ± 0.92	43.208	0.000
Affective disorder	18.09 ± 0.45		
Dementia	21.68 ± 4.91		
Other mental illnesses	19.09 ± 2.86		
Duration of illness (yrs)			
≤ 5	19.53 ± 3.52	6.420	0.002
5–10	19.95 ± 4.33		
> 10	18.54 ± 1.97		
Somatic comorbidities			
Yes	19.31 ± 3.33	-5.607	0.000
No	18.14 ± 0.74		
First hospitalization			
Yes	19.25 ± 3.18	0.846	0.398
No	18.96 ± 3.09		
Marital status			
With a spouse	19.14 ± 3.11	1.047	0.395
Without a spouse	19.24 ± 3.29		
Educational background			
Primary school and below	19.46 ± 3.64	1.908	0.150
Middle and high school	18.87 ± 2.69		
College and above	19.57 ± 3.34		
Drinking			
No	19.15 ± 3.16	-0.392	0.695
Yes	19.43 ± 3.17		
Smoking			
No	19.16 ± 3.16	-0.154	0.878
Yes	19.28 ± 3.12		
Admission route			
Outpatient and emergency admission	19.20 ± 3.20	5.378	0.000
Others	18.15 ± 0.38		
ADL			
Complete independence	18.08 ± 0.40	32.197	0.000
Slight dependence	18.63 ± 1.86		
Moderate dependence	21.04 ± 4.59		
Severe dependence	22.17 ± 4.59		
SSRS			
Objective support		3.230	0.000
Subjective support		1.667	0.037
Utilization of social support		2.253	0.018

Table 2. Single-factor analysis of SSA scores in psychiatric inpatients.

moderate to severe dependence in ADL affected swallowing function more than patients without dependence. Wang et al.²⁹ also reported that patients with dysphagia had a higher dependence on performing daily activities, and 85.7% of them had severe dependence or total dependence (Wang et al., 2012). Improving the patient's physical, daily activity, and cognitive functions could enhance their oral hygiene and swallowing ability.

A previous study reported that a decline in self-care ability and increased dependence on daily activities were significantly and independently associated with dysphagia in patients³⁰. Matsuo et al. (2016) also stated that impairment in ADL might be related to inadequate oral functions despite the different motor control

Item	β	P
Age		
< 60	− 1.278	0.004
60–70	− 1.363	0.000
> 70	2.087	0.000
Diagnosis		
Schizophrenia	− 1.445	0.000
Affective disorder	3.481	0.000
Dementia	− 1.688	0.000
Duration of illness(yrs)		
5–10	0.918	0.040
> 10	− 1.103	0.001
Somatic comorbidities	0.730	0.000
ADL		
Complete independence	− 1.559	0.000
Slight dependence	− 0.997	0.002
Moderate dependence	2.122	0.000
Severe dependence	3.414	0.000
SSRS		
Objective support	− 0.268	0.000
Subjective support	− 0.121	0.005
Utilization of social support	0.225	0.004

Table 3. Univariate linear regression analysis of SSA scores in psychiatric inpatients.

	Non-standardized	Coefficients	standardized coefficients	t	P	95% CI
	β	Standardized Error	Beta			
constant	16.721	0.906	–	18.45	$P < 0.001$	14.939, 18.503
Dementia	2.405	0.328	0.342	7.335	$P < 0.001$	1.761, 3.05
ADL (severe dependence)	2.28	0.442	0.235	5.161	$P < 0.001$	1.412, 3.149
ADL (moderate dependence)	1.764	0.424	0.179	4.164	$P < 0.001$	0.931, 2.597
Somatic comorbidities	1.126	0.395	0.118	2.849	0.005	0.349, 1.903
SSRS (objective support)	− 0.181	0.06	− 0.128	− 3.028	0.003	− 0.298, − 0.063
SSRS (utilization of social support)	0.162	0.065	0.106	2.513	0.012	0.035, 0.29

Table 4. Multivariate linear regression analysis of SSA scores in psychiatric inpatients.

mechanisms between oropharyngeal organs and limbs³¹. According to Mehraban et al. (2021), poor cognitive function adversely impacted a patient's self-care ability, leading to significant differences in the etiology of dysphagia among different age groups³². Therefore, improving the psychiatric inpatients of ability in performing daily activities could improve their swallowing function and quality of life.

Objective support refers to the objective, visible, and practical support for psychiatric inpatients. The study observed that better objective support indirectly improves the psychiatric inpatients of swallowing function. Oral function was significantly associated with the frequency of going out in older adults, suggesting the relationship between social withdrawal and oral function³³. Since oral hypofunction is associated with worsening social withdrawal in older adults, it is crucial to maintain oral function in elderly patients³⁴. Several epidemiological studies demonstrated that community-based education and exercise programs could improve oral function and swallowing function in elderly psychiatric inpatients^{35,36}. Iwao et al. demonstrated that long-term care prevention programs as social support for elderly patients (<75 years) could reduce the risk of dysphagia and improve swallowing and oral function effectively³⁷. Therefore, the nurses help reduce family and social burdens by providing objective social support for psychiatric inpatients to improve their swallowing function.

The current study has several limitations. The participants were recruited from a public psychiatric hospital in Guangzhou, China. In addition, this study only used the Standardized Swallowing Assessment scale to test psychiatric inpatients, mainly through water swallowing test to identify patients' swallowing function, and there was no swallowing solids test. Future studies are expected to increase the credibility by applying swallowing solid test and laryngoscopy. Thus, caution should be exercised when generalizing the study findings. In summary, swallowing function was related to the psychiatric inpatients of clinical characteristics and socio-physical function. More somatic comorbidities and lower self-care ability led to poor swallowing function among

psychiatric inpatients. Furthermore, improvements in social support were associated with improved swallowing function.

Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. Data are located in controlled access data storage at the Affiliated Brain Hospital, Guangzhou Medical University.

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Author contributions

This manuscript was in collaboration between all authors. JY, ZL, and AX performed conceptualization. JC, SW, YW and TZ performed formal analysis and investigation. JY, JC, WW and YP performed writing-original draft, AX, ZL and XH performed writing-review and editing. XH, JC, JY and YW also participated in data curation and visualization. All authors reviewed the manuscript. JY, JC and YW contributed equally to this study, and were assigned to be co-first authors. ZL and AX was assigned to be correspondence.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the Affiliated Brain Hospital of Guangzhou Medical University. Informed consent was obtained from all participants or their legal guardians, who had been provided with a full explanation of the purpose and procedure of the study.

Additional information

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