

The preference for online medical consultation services and the associated factors in China: a national cross-sectional study

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Abstract

Background: As a new means of the delivery of health care services, online medical consultation has become an increasingly popular trend over the past few years. Little is known about the public's preference for online medical consultation services in China. Understanding the factors associated with the willingness from a broader perspective is paramount to optimize resource allocation and enhance the preference.

Objective: Our study aims to evaluate the public's preference for online medical consultation, and further explore the associated factors of the preference from the perspectives of demographic factors, physical status, mental health status and health promoting behaviors.

Methods: This was a population-based cross-sectional study in 148 cities in China and conducted from June 20, 2023 to August 31, 2023. We collected demographic data and used visual analog scale (VAS) scores to assess the public's preference for online medical consultation by a 100-point scale. we also collected the following information: a) sociodemographic characteristics; b) psychologic status: anxiety (assessed by Generalized Anxiety Disorder-7), depressive disorders (assessed by Patient Health Questionnaire-9) and self-efficacy (assessed by New General Self-Efficacy Scale); c) health-promoting behaviors; d) health literacy: electronic health literacy (assessed by e-Health Literacy Scale Short Form) and medication literacy (assessed by Medication Literacy Scale). A stepwise regression analysis was used to assess the factors associated with the preference. Subgroup analysis was performed by the presence of chronic disease or not.

Results: This study included a total of 30,044 valid questionnaires. People have a moderate willingness to accept online medical consultation, with a mean score of 49.82 ± 28.59 out of 100. The results showed that residents in east China ($\beta = -1.90$, $P < 0.01$), who lived with their parents ($\beta = -0.86$, $P = 0.03$), with mild anxiety ($\beta = -1.27$, $P = 0.02$), with mild depression ($\beta = -1.41$, $P < 0.001$) was associated with a lower preference for online medical consultation. However, residents with medical-related occupations ($\beta = 5.25$, $P < 0.001$), with undergraduate or college degree or above ($\beta = 1.85$, $P < 0.001$), with monthly per capita household incomes $\geq 3,000$ RMB ($\beta = 5.09$, $P < 0.001$), who currently used traditional Chinese medicine ($\beta = 1.72$, $P < 0.01$), who were vaccinated ($\beta = 3.29$, $P < 0.001$), with chronic diseases ($\beta = 1.64$, $P < 0.001$), with high medication literacy ($\beta = 2.64$, $P < 0.001$), with high ehealth literacy ($\beta = 11.45$, $P < 0.001$), with high self-efficacy ($\beta = 3.57$, $P < 0.001$) had a higher preference for online medical consultation. Subgroup analysis demonstrates inconsistent results among people with and without chronic diseases.

Conclusions: This national, cross-sectional study revealed that people have a moderate willingness to accept online medical consultation services among Chinese residents. This study identified multiple factors associated with the preference, including demographic factors, physical status, mental health status and health promoting behaviors. Our study highlights the potential demand for online medical consultation services in China and underscores the need for tailored policies to address the diverse needs of different population. Clinical Trial: None.

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Abstract

Background: As a new means of the delivery of health care services, online medical consultation has become an increasingly popular trend over the past few years. Little is known about the public's preference for online medical consultation services in China. Understanding the factors associated with the willingness from a broader perspective is paramount to optimize resource allocation and enhance the preference.

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with high ehealth literacy ($\beta = 11.45$, $P < 0.001$), with high self-efficacy ($\beta = 3.57$, $P < 0.001$) had a higher preference for online medical consultation. Subgroup analysis demonstrates inconsistent results among people with and without chronic diseases.

Conclusions: This national, cross-sectional study revealed that people have a moderate willingness to accept online medical consultation services among Chinese residents. This study identified multiple factors associated with the preference, including demographic factors, physical status, mental health status and health promoting behaviors. Our study highlights the potential demand for online medical consultation services in China and underscores the need for tailored policies to address the diverse needs of different population.

Keywords: cross-sectional study; preference; medical; online; consultation service

Introduction

As a new means of the delivery of health care services, online medical consultation has become an increasingly popular trend over the past few years,[1] especially after the outbreak of COVID-19.[2] Online medical consultation allows health care to be delivered remotely using electronic services, and is viewed as a cost-effective alternative to conventional episodic face-to-face consulting.[3, 4] This service has the potential to bridge gaps in healthcare delivery, especially in regions with limited access to offline healthcare facilities.[3,4] Online medical consultation has been demonstrated to be an effective mode of healthcare delivery in disease management, including for services such as cardiovascular diseases,[5] diabetes,[6] digestive disease,[7] sleep disorders,[8] obstetrics.[9]

Overall, low preference for online medical consultation services was reported in both developed and developing countries, such as in the US,[10] Italy,[10] Australia,[10] the UK,[10] Norway,[10] Belgium,[10] South Korea,[10] Malaysia.[11] In China, the healthcare system is faced with challenges of uneven resource allocation and low accessibility.[12] Though China ranks second globally in terms of investment in telemedicine systems,[12] the utilization rates of telemedicine are still low. Till now, there is a lack of comprehensive, nationally representative studies examining the public's preference for online medical consultation services against the unique background in China from a national level. Moreover, factors influencing the preference are multifaceted and existing studies predominantly focus on demographic (eg. age, gender, medical insurance), socioeconomic (eg. income, price), health service distance factors associated with preference.[10, 13] However, there is a scarcity of evidence on how social, physical, psychologic, and behavioral factors could

potentially influence the preference for the service. Understanding the factors associated with the willingness from a broader perspective is paramount to optimize resource allocation and enhance the preference.

Our study aims to evaluate the public's preference for online medical consultation, and further explore the associated factors of the preference from the perspectives of demographic factors, and physical and psychologic health status and health promoting behaviors. The study also seeks to explore the potential differences in associated factors across various subgroup such as the presence of chronic disease or not. By identifying barriers and facilitators to the use of the service, this research strives to inform policy decisions, guide the development of targeted interventions, and enhance the integration of online medical consultation services into the broader healthcare system.

Methods

Study design and Participants

This was a population-based cross-sectional study and conducted from June 20, 2023 to August 31, 2023. The survey involved a total of 148 cities in 23 provinces, 5 autonomous regions, 4 municipalities directly under the central government, and 2 special administrative regions in China. Based on the Seventh National Population Census, quota sampling of selected residents in 148 cities was conducted with quota attributes of sex, age, and urban-rural distribution to obtain the samples in line with the demographic characteristics.[14] A total of 45,830 questionnaires were collected.

The investigators collected the questionnaires via face-to-face interactions to the respondents. Prior to data collection, informed consent was obtained from all participants. If the participants included in the study possessed the cognitive capacity but were unable to complete the survey autonomously, the investigators and their teams would conduct individual interviews and provide guidance with the questionnaire administration.

For this study respondents, the inclusion criteria were: (1) participants aged ≥ 18 years; (2) those who have Chinese nationality and are permanent residents of China; (3) those that can complete the questionnaire on their own or with the help of an investigator; (4) those who voluntarily agreed to participate in the study and signed an informed consent form. Exclusion criteria for respondents were: (1) those had cognitive dysfunction and insanity; and (2) those involved in other similar research projects.

After a careful process of logical examination and data screening, we have excluded questionnaires with duplicate entries, incomplete information (missing data for any question), or inconsistent and patterned responses. A total of 30,044 questionnaires were considered suitable for inclusion in the statistical analysis.

2.2 Ethics statements

The research protocol was approved by the Ethical Review Committee of Shandong Provincial Hospital (SWYX: NO.2023-198). The study was officially registered in the China Clinical Trial Registry (Registration No: ChiCTR2300072573).

Instruments

Visual analog scale (VAS) scores were used to assess the public's preference for online medical consultation by a 100-point scale, specifically rating their willingness to accept the service from 0 (not willing at all) to 100 (fully willing). To investigate the factors associated with the public's preference for online medical consultation services, we collected the following information: a) sociodemographic characteristics: age, gender, place of residence, region, occupational status, occupational type, education level, monthly per capita household income, marital status, presence of children and cohabitation situation (live alone, live with parents); b) psychologic status: anxiety, depressive disorders and self-efficacy; c) health-promoting behaviors: use of traditional Chinese medicine and inoculation of vaccine; d) health literacy: electronic health literacy and medication literacy.

The Generalized Anxiety Disorder-7 (GAD-7) was used to assess the severity of anxiety in the past two weeks, scored on a 4-point Likert scale ranging from 0 to 21.[15] It was categorized as no anxiety (0-5), mild anxiety (6-9), moderate to severe anxiety (10-21). The Patient Health Questionnaire-9 (PHQ-9) was used to assess the severity of depression in the past 2 weeks on a 4-point Likert scale ranging from 0 to 27.[16] It was categorized as no depression (0-5), mild depression (6-9), and moderate to severe depression (10-27). The e-Health Literacy Scale Short Form (eHEALS-SF) was used to measure individual capabilities in searching, locating, and evaluating health information from electronic sources to address health-related issues.[17] It uses a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree' (1-5 points).[18] The cumulative score reflects the level of e-health literacy. The Medication Literacy Scale (ML-SF) was used to

assess an individual's ability to recognize, understand and effectively communicate medication-related information. Items are scored on a scale of 1 to 5, from 'strongly disagree' to 'strongly agree'. [19] The cumulative score reflects the overall level of an individual's medication literacy. The New General Self-Efficacy Scale (NGSES) was used to assess individuals' confidence in their ability to overcome challenges and achieve goals. Items were scored from 1 to 5, ranging from 'strongly disagree' to 'strongly agree'. [20] The scores were summed, with higher scores indicating greater self-efficacy among participants. The number of include items and the Cronbach's alpha coefficient for each instrument is shown in Table 1.

Statistical methods

All data were statistically analyzed using SPSS 28.0. Descriptive statistics were used to calculate frequencies and percentages for categorical variables, and means and standard deviations (SDs) for continuous variables. The ANOVA analysis, t-tests, and Mann-Whitney U tests were used to compare differential factors for influencing residents' preferences for online medical consultation services, selected based on the number of groups and data normality. A stepwise regression analysis was used to assess the factors associated with the preference. A p-value < 0.05 was considered statistically significant. Since the presence of chronic disease significantly impacts patients' utilization and experience of telemedicine services, [21] subgroup analysis was performed by the presence of chronic disease or not.

Results

Descriptive statistics and univariate analysis

This study included a total of 30,044 valid questionnaires. Among the respondents, 15,009 (50.0%) were male and 15,035 (50.0%) were female; 20,728 (69.0%) lived in urban areas and 9,316 (31.0%) in rural areas; 24,443 (81.4%) were between 18-59 years old, and 5,601 (18.6%) were aged 60 years and above.

The VAS score for the preference for online medical consultation services among Chinese residents was 49.82 ± 28.59 . There were differences in VAS scores for acceptance across different geographical regions (Figure 1). The average score of the GAD-7 scale was 4.30 ± 4.52 , the PHQ-9 scale was 5.87 ± 5.53 , the eHEALS-SF scale was 17.40 ± 5.02 , the ML-SF scale was 20.78 ± 4.48 and the NGSES scale was 10.89 ± 2.43 .

The analysis results indicated that place of residence, education level, region, monthly per capita household income, occupation status, occupation type, marital status, presence of children, living alone, with chronic diseases, current use of traditional Chinese medicine, inoculation of vaccine, medication literacy, self-efficacy, ehealth literacy, as well as anxiety and depressive disorders were all statistically significant factors (Table 2).

Multivariable stepwise linear regression

To explore the relationship between various factors and residents' preference for online medical consultation, this study conducted a multiple stepwise linear regression analysis to examine the contribution of each independent variable in the predictive model (Table 3). Compared with residents in west China, those lived in east China ($\beta=-1.90$, $P<0.001$), central China ($\beta=-2.10$, $P<0.001$) and northeast China ($\beta=-5.77$, $P<0.001$) all had a lower preference for online medical consultation services. Individuals with medical-related occupations ($\beta=5.25$, $P<0.001$) were associated with a higher preference for online medical consultation services compared to those with non-medical related occupations. People with undergraduate or college degree or above ($\beta=1.85$, $P<0.001$) had a higher preference for online medical consultation services compared to those with senior high or below. Preference for online medical consultation services was higher among those with monthly per capita household incomes greater than 3,000 RMB ($\beta=5.09$, $P<0.001$) compared to those with monthly per capita household incomes $\leq 3,000$ RMB. There was a lower preference for online medical consultation services among those who live with their parents ($\beta=-0.86$, $P=0.032$) compared to those who do not. People who currently used traditional Chinese medicine ($\beta=1.72$, $P<0.001$) were more receptive to pay for online medical consultation services compared to those who did not use any. Compared to non-vaccinated individuals, those who were vaccinated ($\beta=3.29$, $P<0.001$) had a higher preference for online medical consultation services. Residents with chronic diseases ($\beta=1.64$, $P<0.001$) had an increased preference for online medical consultation services compared to those without chronic diseases. Compared to individuals with no anxiety, those with mild anxiety ($\beta=-1.27$, $P=0.02$) were associated with a lower preference for online medical consultation services. Additionally, compared to individuals with no depression, those with mild depression ($\beta=-1.41$, $P<0.001$) were associated with a lower preference for online medical consultation services. There was an elevated preference for online medical consultation services among those with high medication literacy ($\beta=2.64$, $P<0.001$) compared to those with low medication literacy. Compared to individuals with low ehealth literacy, those with medium ($\beta=7.04$, $P<0.001$) and high ehealth literacy

($\beta = 11.45$, $P < 0.001$) both had a higher preference for online medical consultation services. Moreover, compared to individuals with low self-efficacy, those with medium ($\beta = 1.37$, $P = 0.011$) and high self-efficacy ($\beta = 3.57$, $P < 0.001$) had a higher preference for online medical consultation services.

Subgroup analysis

To explore the discrepancies in preference for online medical consultation services between patients with chronic diseases and those without, the study further conducted a stepwise regression analysis of the subgroups by chronic disease status (Table 4). Among individuals without chronic diseases, the occupation type [medical related occupation ($\beta = 6.51$, $P < 0.001$)], education level [undergraduate or college or above ($\beta = 1.39$, $P < 0.001$)], region [central China ($\beta = -2.06$, $P < 0.001$), east China ($\beta = -1.76$, $P < 0.001$), northeast China ($\beta = -4.95$, $P < 0.001$)], per capita monthly income of households [>3000 RMB ($\beta = 5.68$, $P < 0.001$)], health-promoting behaviors [current use of traditional Chinese medicine ($\beta = 1.60$, $P < 0.001$), inoculation of vaccines ($\beta = 3.23$, $P < 0.001$)], mental health status [anxiety (mild anxiety, $\beta = -1.25$, $P = 0.017$), depressive disorders (mild depression, $\beta = -1.49$, $P = 0.002$), self-efficacy (medium self-efficacy, $\beta = 1.81$, $P = 0.011$; high self-efficacy, $\beta = 3.73$, $P < 0.001$)], health literacy [ehealth literacy (medium, $\beta = 6.62$, $P < 0.001$; high, $\beta = 11.16$, $P < 0.001$), high medication literacy ($\beta = 2.23$, $P < 0.001$)] were consistent with the overall population.

In individuals with chronic diseases, the monthly per capita household income [>3000 RMB ($\beta = 4.111$, $P < 0.001$)], region [central China ($\beta = -2.15$, $P = 0.004$), east China ($\beta = -2.20$, $P < 0.001$), northeast China ($\beta = -7.64$, $P < 0.001$)], education level [undergraduate or college or above ($\beta = 2.89$, $P < 0.001$)], living conditions [live with parents ($\beta = -1.89$, $P = 0.033$)], health-promoting behaviors [inoculation of vaccines ($\beta = 3.32$, $P < 0.001$), current use of traditional Chinese medicine ($\beta = 2.19$, $P = 0.002$)], health literacy [ehealth literacy (medium, $\beta = 7.43$, $P < 0.001$); high, $\beta = 11.43$, $P < 0.001$), medication literacy (high, $\beta = 4.47$, $P < 0.001$)], mental health status [anxiety (mild, $\beta = -1.93$, $P = 0.003$), self-efficacy (high, $\beta = 3.29$, $P = 0.002$)] showed correlations consistent with the general trend. Different from the general population, individuals with moderate to severe depression ($\beta = 1.54$, $P = 0.025$) had a higher preference for online medical consultation services compared to those without depression.

Discussion

Principle Findings

To our knowledge, the study represents the largest exploration to investigate the public's preference for online medical consultation services and the factors associated with the public's preference in China. This nationwide cross-sectional study reveals a moderate willingness for online medical consultation services among Chinese residents, with an average score of 49.82 ± 28.59 out of 100 points. The study has identified multiple factors associated with the preference of Chinese residents for online medical consultation services, including demographic factors (education level, per capita monthly income of households, region, occupation type, living with parents), health literacy (ehealth literacy and medication literacy), health promoting behaviors (current use of traditional Chinese medicine, inoculation of vaccines), and physical and mental health status (with chronic diseases, anxiety and depressive disorders, self-efficacy). Subgroup analysis demonstrates inconsistent results among people with and without chronic diseases, particularly in aspects of occupation type, living with parents, depressive disorders and self-efficacy.

Compared to other countries, residents in China have a relatively lower willingness for online medical consultation services. A cross-sectional survey with 237 participants in Malaysia revealed that the average score on the Unified Theory of Acceptance and Use of Technology (UTAUT) scale was 65.97 out of 90, which indicates a high level of patient acceptance towards replacing in-person care with online consultation services.[11] A study in Norway found that 72% of 2043 participants agreed that online medication consultations could lead to better follow-up care, and 58% believed it to be an effective way of improving treatment quality.[22] Another study in Mozambique indicated that 69% of 403 participants showed high willingness to use online medication consultation services in cases of mild illness, affordable pricing, and follow-up visits.[23] Online medical consultation services in China are still in the early development stage, implying significant variations in the organization and content of such services across different facilities, systems, and regions.[24] A discrete choice experiment conducted in China suggested that the most valued non-monetary attribute was doctor's evaluation score, followed by waiting time, grade of doctor's hospital, doctor's professional title and scale of consultation platform when people selected online medical consultation services.[25] Collectively, online medical consultation services encounter challenges in infrastructure, service processes, cost implications, reimbursement policy, trust in professionals and accessibility levels in practice, which may impact the confidence of Chinese residents in using such services.[26]

Multiple demographic factors have been shown to be significant factors associated with preference for online medical consultation services. Both educational levels and income, as key indicators of socioeconomic status, were found to demonstrate significant influence on individuals' preference and utilization of online medical consultation services, which aligns with previous studies.[27, 28] Interestingly, our study identified the highest preference for online medical consultation services in West China compared with other regions. Medical resources in China have long been faced with the challenges of uneven distribution, unequal quality, and scarcity of high-quality. Considering the regional development imbalance in China, residents in West China are most limited to high-quality medical resources and therefore online medical consultation service may be an alternative for medical service.[29-31] Additionally, our study presented a view that people working in medical related occupations were more likely to use online medical consultation services. Similarly, a previous survey found that 62.6% of Italian mental health professionals indicated a greater inclination towards using online consultation services,[32] which is aligned with our findings. Surprisingly, reduced willingness to pay for online medication consultation services was seen in respondents living with their parents. In contrast to our findings, a previous study in Germany showed residents who live with a partner were more inclined to utilize online medical services compared to those who have never used such services.[27] The differences may stem from variations in financial independence, autonomy in health-related decision-making, and perceived healthcare needs across diverse lifestyles and cultural backgrounds.

In terms of health literacy, ML-SF scale and eHEALS-SF scale were both used to measure the ability of residents to access, comprehend, and apply health information to make health decisions.[33] Our research revealed that residents with better medication literacy and e-health literacy had a higher willingness for online medical consultation services. Some previous studies have yielded comparable findings,[34, 35] underscoring the importance of health literacy in shaping individuals' engagement with digital health services. It suggests that enhancing these competencies may be crucial for promoting the adoption of telemedicine services. As for health promoting behaviors, our study found that residents who had received vaccinations and currently used traditional Chinese medicine were more inclined to use online medical consultation services. Health-promoting behaviors, as manifestations of health literacy, represent the practical application of health knowledge and skills in daily activities.[36] These behaviors not only reflect an individual's level of health literacy but also reinforce it, creating a positive feedback loop that may influence health-related decision-making,

including elevated preference for online medical consultation services.

This study also investigated the impact of physical and mental health status. It showed that self-efficacy (assessed by NGSES scale) is positively associated with residents' preference for online medical consultation services. Individual characteristics of seeking health-related information, willingness to engage in online treatment, and inclination to communicate with primary care physicians online could predict patients' motivation to utilize internet medical services.[28] Individuals with higher self-efficacy have been shown to benefit from better health literacy, as they tend to seek and utilize health information on online platforms,[37] which may explain our findings. Notably, this study revealed that patients with mild anxiety (assessed by the GAD-7 scale) and mild depression (assessed by the PHQ-9 scale) both have a lower preference for online medical consultation services. The study in Netherlands concluded a distinct finding that health anxiety negatively predicts overall satisfaction with online consultation services ($\beta = -0.19, P < 0.01$), mainly because that individuals perceiving higher levels of health anxiety are less satisfied and feel that they received less professional care and have shorter consultation time with professionals.[38] However, the aforementioned study primarily focuses on satisfaction with service received rather than pre service preference as we proposed.[38] Another study on online ophthalmology consultation services in China found that depression was more prevalent among people who expressed satisfaction with online consultations, suggesting that individuals suffering from depression may tend to utilize and appreciate the convenience of online consultation services.[39] The disparities of the findings underscore the impacts of anxiety and depression symptoms on the acceptance and satisfaction of online consultation services, and highlight the importance of future studies in evaluating online medical services on specific mental circumstances.

To further explore the robustness and consistency of the main research findings, we conducted a subgroup analysis based on the presence of chronic diseases or not. The findings indicate that the impact of living with parents, occupation type, self-efficacy and depressive disorders is inconsistent between participants with chronic diseases and those without chronic diseases. Specifically, in individuals without chronic diseases subgroup, people who work in medical-related professions or have a moderate to high level of self-efficacy have a higher willingness for online medical consultation services, whereas those with mild depression show a lower willingness. This observation reflects a unique interest in online medical consultation services among healthy populations. Interestingly, the association between high self-efficacy and higher preference for online

medical consultation services was only observed in individuals in chronic disease. Individuals with chronic diseases often require ongoing management of their conditions, including medication adherence and regular consultations. High self-efficacy in this context may empower them to take a more proactive role in their healthcare,[40] leading to a greater preference for convenient and accessible online medical consultation services.

Implications

Our study highlights the potential demand for online medical consultation services to improve access to healthcare in China. As an emerging form of telemedicine, electronic consultation has been developed in China for less than 20 years serving as an alternative to the scarce offline medical resources. Despite this, there is a limited public awareness, a lack of trust and a low level of health literacy, which hampers the swift adoption of this non-face-to-face consultation.[41, 42] The identified factors associated with preference highlight the need for tailored policies to address the diverse needs of different population subgroups. For example, targeted interventions may be needed for individuals with lower education levels or those living in rural areas to improve their access and willingness to use online medical services. Integrating mental health resources and support within these platforms may improve overall health outcomes and user engagement. Moreover, the possibility of the coverage of online medical consultation services by medical insurance reimbursement can be discussed for future policy development. For internet hospitals and platforms providing online services, effective marketing strategies can be implemented to improve platform accessibility, enhance service experience and promote health-promoting behaviors.

Limitations and Future Research

There are some limitations in our study needed to be addressed. Firstly, our study was based on self-reported data of the survey respondents, and there may be some recall bias during information collection. Secondly, this study used cross-sectional data as the data source, which makes it difficult to make causal inferences. Thirdly, despite our current sample (n=30,044) being representative, it slightly underrepresents the residents living in northeast China (n=1471), suggesting a minor socioeconomic disparity in survey completion. Future research needs to focus on longitudinal tracking studies to reveal the causal relationships among key determinants determining Chinese residents' preference for online medical consultation services.

Conclusion

This national, cross-sectional study revealed that people have a moderate preference for online medical consultation services among Chinese residents. The study has identified multiple factors associated with the preference of Chinese residents for online medical consultation services, including demographic factors, physical status, mental health status and health promoting behaviors. Our study highlights the potential demand for online medical consultation services to improve access to healthcare in China and underscores the need for tailored policies to address the diverse needs of different population subgroups.

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Table 1 Summary of Questionnaires and Reliability

Questionnaire	Dimension	Number of Items	Cronbach's Alpha
GAD-7	Anxiety Severity Assessment	7	0.941
PHQ-9	Depression Severity Assessment	9	0.927
eHEALS-SF	E-Health Literacy	5	0.952
ML-SF	Medication Literacy	6	0.798
NGSES	Self-Efficacy	3	0.913

Table 2 Factors associated with Chinese residents' preference for online medical consultation services

Variable	N (%)	Mean	SD	P value
Gender				
Male	15,009 (50.0)	50.09	28.67	0.095
Female	15,035 (50.0)	49.54	28.52	
Age				
18-59 years old	24,443 (81.4)	49.69	28.70	0.108
60 years old and above	5,601 (18.6)	50.37	28.12	
Place of Residence				
Rural	9,316 (31.0)	47.52	28.42	<0.001
Urban	20,728 (69.0)	50.85	28.61	
Education Level				
Junior high or below	9,241 (30.8)	45.49	28.15	<0.001
Senior high	6,187 (20.6)	49.84	28.40	
Undergraduate/college or above	14,616 (48.6)	52.54	28.62	
Region				
East	10,320 (34.3)	49.86	28.87	<0.001
Northeast	1,471 (4.9)	45.81	29.87	
Central	6,587 (21.9)	48.85	27.93	
West	11,666 (38.8)	50.84	28.49	
Monthly per capita household income (RMB)				
≤3000	8,777 (29.2)	44.57	28.57	<0.001
3001-6000	13,425 (44.7)	50.29	28.06	
6001-9000	3,491 (11.6)	54.41	27.96	
≥9001	4,351 (14.5)	55.28	28.97	
Occupation status				
Unemployed	16,745 (55.7)	48.06	28.27	<0.001
Employed	13,299 (44.3)	52.04	28.84	
Occupation type				
Nonmedical related	28,538 (95.0)	49.37	28.52	<0.001
Medical related	1,506 (5.0)	58.36	28.68	
Marital status				
No	10,622 (35.3)	50.28	28.60	0.037
Yes	19,422 (64.6)	49.56	28.59	
Presence of Children				
No	10,479 (34.9)	51.42	28.54	<0.001
Yes	19,565 (65.1)	48.96	28.58	
Live with parents				
No	23,474 (78.1)	49.69	28.60	0.149
Yes	6,570 (21.9)	50.27	28.57	
Live alone				
No	24,598 (81.9)	49.66	28.61	0.036
Yes	5,446 (18.1)	50.55	28.48	
With chronic disease				
No	20,451 (68.1)	50.15	28.74	0.003
Yes	9,593 (31.9)	49.10	28.26	

Current use of traditional Chinese medicine				
No	10,703 (35.6)	47.67	28.56	<0.001
Yes	19,341 (64.4)	51.01	28.54	
Inoculation of vaccine				
No	12,836 (42.7)	46.93	28.33	<0.001
Yes	17,208 (57.3)	51.97	28.60	
Depressive disorders (PHQ-9)				
No depression	14,614 (48.6)	50.64	29.16	<0.001
Mild depression	9,567 (31.8)	48.61	28.18	
Moderate to severe depression	5,863 (19.5)	49.74	27.75	
Anxiety (GAD-7)				
No anxiety	19,070 (63.5)	50.27	28.96	<0.001
Mild anxiety	7,149 (23.8)	48.23	27.95	
Moderate to severe anxiety	3,825 (12.7)	50.53	27.82	
Medication literacy (ML-SF)				
Low medication literacy	4,850 (16.1)	46.18	28.62	<0.001
Medium medication literacy	20,936 (69.7)	49.35	27.82	
High medication literacy	4,258 (14.2)	56.25	31.18	
Ehealth literacy (eHEALS-SF)				
Low ehealth literacy	4,949 (16.5)	41.73	28.28	<0.001
Medium ehealth literacy	21,028 (70.0)	50.31	27.61	
High ehealth literacy	4,067 (13.5)	57.13	31.47	
Self-efficacy (NGSES)				
Low self-efficacy	3,173 (10.6)	46.11	27.80	<0.001
Medium self-efficacy	23,241 (77.4)	49.56	27.94	
High self-efficacy	3,630 (12.1)	54.72	32.52	

Table 3 Stepwise regression model of preference for online medical consultation services

Variables	Unstandardized Coefficients		Standardized Coefficients	95% CI	P value
	β	SE	β		
Per capita monthly income of households (RMB) (Ref: ≤3000)					
>3000	5.09	0.37	0.08	(4.37, 5.82)	<0.001
Education level (Ref: Senior high or below)					
Undergraduate/college or above	1.85	0.36	0.03	(1.15, 2.56)	<0.001
Occupation type (Ref: Non-medical related)					
Medical related	5.25	0.75	0.04	(3.77, 6.72)	<0.001
Region (Ref: West)					
Central	-2.10	0.43	-0.03	(-2.94, -1.25)	<0.001
East	-1.90	0.38	-0.03	(-2.65, -1.15)	<0.001
Northeast	-5.77	0.77	-0.04	(-7.29, -4.25)	<0.001
Live with parents (Ref: No)					
Yes	-0.86	0.40	-0.01	(-1.65, -0.08)	0.032
With chronic disease (Ref: No)					
Yes	1.64	0.38	0.03	(0.90, 2.38)	<0.001
Current use of traditional Chinese medicine (Ref: No)					
Yes	1.72	0.36	0.03	(1.03, 2.42)	<0.001
Inoculation of vaccine (Ref: No)					
Yes	3.29	0.34	0.06	(2.62, 3.96)	<0.001
Depressive disorders (PHQ-9) (Ref: No depression)					
Mild depression	-1.41	0.38	-0.02	(-2.16, -0.66)	<0.001
Anxiety (GAD-7) (Ref : No Anxiety)					
Mild anxiety	-1.27	0.42	-0.02	(-2.10, -0.45)	0.002
Medication literacy (ML-SF) (Ref: Low medication literacy)					
High medication literacy	2.64	0.51	0.03	(1.65, 3.63)	<0.001
Ehealth literacy (eHEALS) (Ref: Low ehealth literacy)					
Medium ehealth literacy	7.04	0.48	0.11	(6.11, 7.97)	<0.001
High ehealth literacy	11.45	0.67	0.14	(10.13, 12.77)	<0.001
Self-efficacy (NGSES) (Ref: Low self-efficacy)					
Medium self-efficacy	1.37	0.54	0.02	(0.32, 2.42)	0.011
High self-efficacy	3.57	0.71	0.04	(2.17, 4.97)	<0.001

Table 4 Stepwise regression analysis of chronic disease-based preference factors for online medical consultation services

Variates	No Chronic Disease					With Chronic Disease				
	Unstandardized		Standardized	95% CI	P value	Unstandardized		Standardized	95% CI	P value
	Coefficients		Coefficients			Coefficients		Coefficients		
	β	SE	β			β	SE	β		
Education level (Ref: Senior high or below)										
Undergraduate/college or above	1.39	0.42	0.02	(0.57, 2.22)	<0.001	2.89	0.66	0.05	(1.59, 4.19)	<0.001
Region (Ref: West)										
Central	-2.06	0.53	-0.03	(-3.09, -1.02)	<0.001	-2.15	0.75	-0.03	(-3.63, -0.67)	0.004
Northeast	-4.95	0.94	-0.04	(-6.79, -3.12)	<0.001	-7.64	1.38	-0.06	(-10.35, -4.94)	<0.001
East	-1.76	0.47	-0.03	(-2.68, -0.85)	<0.001	-2.20	0.66	-0.04	(-3.50, -0.90)	<0.001
Per capita monthly income of households (Ref: ≤3000)										
>3000	5.68	0.46	0.09	(4.78, 6.59)	<0.001	4.11	0.62	0.07	(2.89, 5.32)	<0.001
Occupation type (Ref: Non-medical related)										
Medical related	6.51	0.89	0.05	(4.76, 8.26)	<0.001	-	-	-	-	-
Live with parents (Ref: No)										
Yes	-	-	-	-	-	-1.89	0.89	-0.02	(-3.63, -0.15)	0.033
Inoculation of vaccine (Ref: No)										
Yes	3.23	0.42	0.06	(2.42, 4.05)	<0.001	3.32	0.60	0.06	(2.15, 4.49)	<0.001
Current use of traditional Chinese medicine (Ref: No)										
Yes	1.60	0.42	0.03	(0.78, 2.41)	<0.001	2.19	0.70	0.03	(0.83, 3.56)	0.002

Anxiety (GAD-7) (Ref : No Anxiety)										
Mild anxiety	-1.25	0.52	-0.02	(-2.27, -0.23)	0.017	-1.93	0.66	-0.03	(-3.21, -0.65)	0.003
Depressive disorders (PHQ-9) (Ref: No depression)										
Mild depression	-1.49	0.48	-0.02	(-2.42, -0.56)	0.002	-	-	-	-	-
Moderate to severe depression	-	-	-	-	-	1.54	0.69	0.02	(0.19, 2.89)	0.025
Medication literacy (ML-SF) (Ref: Low medication literacy)										
High medication literacy	2.23	0.57	0.03	(1.12, 3.35)	<0.001	4.47	1.12	0.04	(2.27, 6.66)	<0.001
Ehealth literacy (eHEALS) (Ref: Low ehealth literacy)										
Medium ehealth literacy	6.62	0.70	0.10	(5.25, 7.99)	<0.001	7.43	0.65	0.13	(6.16, 8.71)	<0.001
High ehealth literacy	11.16	0.86	0.15	(9.47, 12.84)	<0.001	11.43	1.31	0.10	(8.86, 14.01)	<0.001
Self-efficacy (NGSES) (Ref: Low self-efficacy)										
Medium self-efficacy	1.81	0.71	0.03	(0.41, 3.21)	0.011	-	-	-	-	-
High self-efficacy	3.73	0.89	0.05	(1.98, 5.47)	<0.001	3.29	1.05	0.03	(1.24, 5.34)	0.002



Figure 1 Distribution of VAS scores for acceptance among Chinese residents for online medical consultation services