

Prevalence of Generalized Anxiety Disorder in Japan: A General Population Survey

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Purpose: Generalized anxiety disorder (GAD) is among the most prevalent and highly disabling mental health conditions that negatively impacts patient's quality of life (QOL) and disrupts activities of daily living. However, the recognition of GAD is difficult due to substantial overlap with other mental disorders. The purpose of this study was to estimate the prevalence of GAD, assess QOL of probable GAD patients in Japan, and gain insights on the status of visiting medical institutions as well as their recognition/awareness of the disorder.

Patients and Methods: We conducted a web-based cross-sectional survey of 20,009 participants using a questionnaire with approximately 30 single/multiple choice or open-ended questions in Japanese.

Results: Overall prevalence of GAD based on Generalized Anxiety Disorder 7-item (GAD-7) cutoff score of ≥ 10 and questionnaires developed with reference to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria was 7.6% (n=1530) and 6.0% (n=1197), respectively. The degree of coincidence between GAD diagnosis by DSM-5 criteria and GAD-7 scores was moderate (Cohen's Kappa=0.47, $p < 0.01$). Younger people reported a substantially higher prevalence of GAD compared to older. QOL scores assessed using EuroQol 5 dimensions 5-level and EuroQol Visual Analog Scale were substantially lower in probable GAD patients than those with GAD-7 < 10. Anxiety/depression and pain/discomfort were the most prevalent issues and depression was the most reported comorbidity for the probable GAD patients. Probable GAD patients "currently visiting medical institutions" for anxiety or other mental issues were 27.6% (422/1530); a majority had seen specialists. Most of the probable GAD patients had never heard of the disease.

Conclusion: We found higher prevalence of GAD and lower QOL of probable GAD patients in Japan. There is a need for creating awareness about GAD among the general population and developing clinical guidelines on GAD in Japan so that physicians can educate their patients.

Keywords: GAD-7, generalized anxiety disorder, Japan, prevalence, quality of life

Introduction

Background

Generalized anxiety disorder (GAD) is a chronic and recurring psychiatric condition characterized by at least 6 months of persistent and excessive uncontrollable anxiety and worry about multiple events.¹ Key symptoms of GAD include restlessness, irritability, difficulty concentrating, muscle tension, sleep disturbances, and fatigue combined with significant distress or impairment in social, occupational, or other areas of function.² GAD is associated with severe impairments in the quality of life (QOL) and psychological well-being of patients.^{3,4} GAD impacts social functioning in patients, resulting in poor QOL, and raising the need to address the humanistic impact of GAD on patients.³ Additionally, patients with GAD are severely impacted by a fear of anxiety and negative beliefs about worry.⁴

Epidemiology: Burden of GAD

GAD is among the most common anxiety disorders globally. The World Mental Health Survey data of 26 countries from 2001 to 2012, which used the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) diagnostic

criteria, suggest that GAD has a combined lifetime and a 12-month prevalence of 3.7% and 1.8%, respectively.⁵ Studies from Canada and Singapore reported the prevalence for lifetime/12-months as 8.7%/2.6%,⁶ 0.9%/0.4%,⁷ respectively, using World Mental Health Composite International Diagnostic Interview. In urban China, the prevalence of undiagnosed/diagnosed GAD was 5.3%/0.5% as per Generalized Anxiety Disorder 7-item (GAD-7) questionnaire data from the China National Health and Wellness Survey 2012–13.⁸

In Japan, the prevalence of GAD is substantial with a prevalence of 3.2% in the year 2003 according to a study that employed the GAD screening questionnaire based on DSM-IV developed by the National Institute of Mental Health.⁹ The lifetime and 12-month prevalence of GAD in Japan for the period 2001–2012 from the World Mental Health Survey data were 2.6% and 1.2%, respectively.⁵ In the World Mental Health Japan Survey, the lifetime and 12-month prevalence of GAD for the period 2013–2015 estimated using the DSM-IV diagnostic criteria were 1.6% and 0.6%, respectively.¹⁰

Challenges in Management of GAD

Globally, GAD is a well-recognized disease, and several clinical practice guidelines and approved therapeutic options are available.¹¹ Synthesis of efficacy and acceptability data for GAD treatment suggests that varied treatment options across different classes of medications are available.¹² On the other hand, the diagnosis of GAD is often challenging. The condition frequently coexists with and is often misdiagnosed as depressive disorder and/or social anxiety disorder leading to underdiagnosis.¹³ Additionally, a possibility for overdiagnosis also exists due to the “wastebasket” category.^{2,5,14}

Contrastingly, the GAD landscape in Japan is characterized by the absence of national clinical practice guidelines and also approved drugs. Thus, one may speculate that GAD awareness and recognition by both the general population and physicians is limited. Although GAD is diagnosed based on the DSM-5 diagnostic criteria and a self-administered screening tool like GAD-7, a large proportion of Japanese patients with GAD may continue to be treated insufficiently due to low awareness of GAD. Some results indicate that up to 31.8% of Japanese patients with GAD perceived a need for treatment; this rate is marginally lower than in other high-income countries.¹⁵

Objectives

Although the prevalence of GAD in Japan has been reported in the past, recent data on the disease burden and status of GAD awareness and recognition are unavailable. Since the recognition of the disease of GAD in Japanese society is low, it is unclear whether the patients visit medical institutions adequately and are diagnosed/treated appropriately. There is, therefore, a need to characterize the epidemiological burden of GAD in the Japanese context. The objectives of this study were (i) to estimate the prevalence of GAD and assess the QOL of patients with GAD in Japan and (ii) to gain insights into their status of recognition/awareness of the disorder and visits to medical institutions.

Materials and Methods

Study Design

This study was registered in the University Hospital Medical Information Network Clinical Trials Registry (UMIN-CTR: UMIN 000049572). This was an observational, cross-sectional study, conducted using a quantitative web-based questionnaire between December 12 and 19, 2022. The study intended to estimate the prevalence of GAD, the QOL of patients with GAD, as well as the actual/real-world conditions of their medical consultation behavior and disease recognition. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist¹⁶ was used as guidance when reporting this study.

Participant Recruitment

Recruitment of participants in this online survey was based on invitations to participate, which were shared with a cohort of the general population; randomly selected people registered with the Rakuten Insight online panel. The adult men and women (aged ≥ 18 years) from the general population who were currently residing in Japan and agreed to participate in the research were included in the study. Age-stratified random sampling was carefully performed by referring to the age group distribution ratios per gender, issued by the Japanese government’s statistical studies to avoid bias among the participants.

Before administering the survey questionnaire, informed consent for participation was obtained electronically via a consent form explaining detailed terms and conditions for the study and the ability to withdraw from the study before data lock. Study participants were provided with an honorarium to compensate for their time.

Outcomes

The primary outcome of this study was to evaluate the prevalence of GAD in the general population in Japan. The study utilized the Japanese version of the GAD-7 questionnaire,¹⁷ an easy-to-use, 7-item, 4-point (0 to 3) scale that is developed as a self-administered questionnaire for the assessment of GAD. The assessment was based on scores relative to the full score of 21. A score of 0–4 indicated no or minimal; 5–9, mild; 10–14, moderate; and 15–21, severe anxiety.¹⁷ Using a cutoff value of 10, the GAD-7 questionnaire demonstrated good psychometric properties with 89% sensitivity and 82% specificity in diagnosing GAD globally,¹⁸ and its Japanese version is also a valid and reliable tool with sensitivity and specificity of 88% and 82%, respectively.¹⁹ Thus, the participants in this study were further stratified based on their GAD-7 scores into values ≥ 10 or < 10 ; the participants were defined as probable GAD patients when the GAD-7 score was ≥ 10 .

Additionally, questionnaires developed with reference to the DSM-5 diagnostic criteria for GAD, the Japanese version of DSM-5 from the American Psychiatric Association issued in 2013, were used to estimate whether the participants met the DSM-5 diagnostic criteria for GAD.

Other outcomes included the estimation of EuroQol 5 dimensions 5-level (EQ-5D-5L) scores, the Japanese version of a self-administered questionnaire for quantitative assessment of QOL among subjects with GAD-7 scores of ≥ 10 or < 10 and analysis of the humanistic impact of GAD on patients.²⁰ This involved assessing descriptions in 5 dimensions: “mobility”, “self-care”, “usual activities”, “pain/discomfort”, and “anxiety/depression”. Assessments were also done using the EuroQol Visual Analog Scale (EQ VAS).^{20,21}

Furthermore, to examine the status of disease recognition and the treatment landscape for GAD, patients with probable GAD were asked about their recognition of GAD as a disease, visitation status to medical institutions for GAD, and their behavioral response to treatment.

Survey Questionnaire

The online survey required 10–15 minutes to complete and had approximately 30 single/multiple choice and some open-ended questions covering the following areas: participant demographics; applicability to DSM-5 diagnostic criteria; status of medical consultations; GAD awareness and sources of information; status of request for receiving treatment; and underlying diseases and history/family history of mental disorders. The survey questions were in the Japanese language and an English translation of the questionnaire is provided in [Supplementary Table 1](#).

After the participants received emails with the uniform resource locator (URL) to access the web-based questionnaire, responses were recorded and collected electronically and converted into a secure cloud storage system established by Viatrix Pharmaceuticals Japan Inc. To ensure that the survey-user interface worked seamlessly as designed, dummy data were recorded and verified for accuracy in the captured database which was later deleted. No identifiable information about the participants was collected. The questionnaire was delivered to 229,198 individuals and closed when the number of replies reached more than 20,000 cases. After the target number of responses was reached, outliers with unclear or inappropriate open-ended responses were removed from the analysis after careful assessment of data distribution and realistic responses, as prespecified in the protocol.

Statistical Analyses

The estimated target sample size was 20,000 to include a minimum of 400 respondents with GAD-7 score of ≥ 10 (probable GAD patients) considering the previously reported GAD prevalence of 3.2% in the general population and its statistical variation. Data extraction and analyses were performed by 2 independent analysts and matched to verify accuracy. Descriptive analyses were carried out and data were presented as counts and percentages for categorical variables and as summary statistics (mean, standard deviation, median, or range) for continuous variables. Pearson’s chi-squared test was used to compare categorical variables, unpaired *t*-test with Welch’s correction to compare continuous variables, and Mann–Whitney *U*-test was used to compare ordinal variables between groups, with a 2-sided α of 0.05.

Statistical analyses were performed using ASSUM Windows Version 5.8, R-4.2, JMP Pro 17 and Microsoft Excel Microsoft 365 MSO.

Ethical Considerations

The study was conducted in accordance with the protocol, the Declaration of Helsinki,²² and other applicable laws and regulations of Japan, as appropriate. The study was approved by the Ethics Committee of the Medical Corporation TOUKEIKAI Kitamachi Clinic ERB (approval number: KXJ09221).

Results

Participants

A total of 229,198 individuals were contacted to participate in the study. A total of 20,012 (8.7%) individuals responded, of which 20,009 participants had provided valid responses and were included in the analyses.

Participant Demographics

Prevalence of GAD Based on GAD-7 (GAD-7 Score of ≥ 10)

Overall

The prevalence of probable GAD based on a GAD-7 cutoff score of ≥ 10 was 7.6% (1530/20,009).

By Age and Sex

The prevalence of GAD was significantly higher in those with younger age in both genders ($p < 0.01$), with approximately one-fourth of participants in their 30s and younger, and about 17–18% prevalence for those in their 50s, while it was 7% or less for those aged 60 years and above (Table 1). The prevalence was slightly higher among women (7.8% [789/10,071]) than men (7.5% [741/9938]).

Table 1 Characteristics of Probable GAD Patients and Participants Without GAD

Patient Characteristics, n (%)	GAD-7 ≥ 10 (n=1530)	GAD-7 < 10 (n=18,479)	p value ^a
Sex			
Female	789 (51.6)	9282 (50.2)	0.31
Age (years)			
Mean (SD)	41.6 (14.1)	50.6 (16.4)	<0.01
Age (years) and sex			
Male^b			
18–29	204 (27.5)	1385 (15.1)	<0.01
30–39	169 (22.8)	1302 (14.2)	
40–49	176 (23.8)	1698 (18.5)	
50–59	123 (16.6)	1719 (18.7)	
60–69	44 (5.9)	1515 (16.5)	
70–79	25 (3.4)	1578 (17.2)	

(Continued)

Table 1 (Continued).

Patient Characteristics, n (%)	GAD-7 ≥ 10 (n=1530)	GAD-7 <10 (n=18,479)	p value ^a
Female^c			
18–29	189 (24.0)	1325 (14.3)	<0.01
30–39	159 (20.2)	1260 (13.6)	
40–49	192 (24.3)	1637 (17.6)	
50–59	145 (18.4)	1683 (18.1)	
60–69	55 (7.0)	1562 (16.8)	
70–79	49 (6.2)	1815 (19.6)	
Education (years), mean (SD)	14.1 (2.2)	14.4 (2.0)	<0.001
Work status			
Unemployed/retired	225 (14.7)	2988 (16.2)	<0.001
Homeworker	152 (9.9)	2538 (13.7)	
Employed/students	1153 (75.4)	12,953 (70.1)	
Cohabiting with			
Spouse	629 (41.1)	10,999 (59.5)	<0.01
Son(s), daughter(s)	433 (28.3)	6309 (34.1)	<0.01
I live alone	358 (23.4)	3635 (19.7)	<0.01

Notes: ^ap value <0.01. ^bFor GAD-7 ≥ 10 , n=741, for GAD-7 <10, n=9197. ^cFor GAD-7 ≥ 10 , n=789, for GAD-7 <10, n=9282. t-tests were used for continuous variables. χ^2 tests were used for dichotomous variables.

Abbreviations: GAD, generalized anxiety disorder; GAD-7, generalized anxiety disorder 7-item; SD, standard deviation.

Characteristics of Probable GAD Patients and Participants Without GAD

Age and Sex

The mean (standard deviation [SD]) age of probable GAD patients, 41.6 (14.1) years, was significantly lower than that of participants without GAD, 50.6 (16.4) years ($p < 0.01$). The proportion of females among probable GAD patients was higher than among participants without GAD, but the difference was not statistically significant (Table 1).

Cohabiting Family Members

Probable GAD patients were less likely to live with their spouse (41.1% vs 59.5%, $p < 0.01$) or children (28.3% vs 34.1%, $p < 0.01$) and more likely to live alone (23.4% vs 19.7%, $p < 0.01$) compared to the non-GAD group (Table 1).

Degree of Coincidence Between Participants Qualifying for the GAD-7 and DSM-5 Criteria

Although meeting DSM-5 diagnostic criteria in this study was not based on a physician's diagnosis, but on self-report, of all the participants (n=20,009), 1197 met the DSM-5 criteria for GAD. The prevalence of GAD was estimated to be 6.0% using the DSM-5 criteria. As shown in Table 2, the degree of coincidence between the diagnosis of GAD by GAD-7 score and DSM-5 criteria, as expressed by kappa value was moderate (Cohen's Kappa=0.47, $p < 0.01$).

The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the GAD-7 diagnosis to the DSM diagnosis were 58%, 96%, 45%, and 97%, respectively. Notably, the proportion of participants

Table 2 The Degree of Coincidence Between the Diagnosis of GAD by GAD-7 Score and DSM-5

Participants	GAD (DSM-5)	Non-GAD (DSM-5)	Total
GAD-7 ≥ 10	694	836	1530
GAD-7 < 10	503	17,976	18,479
Total	1197	18,812	20,009

Note: Cohen's Kappa=0.47; $p < 0.01$.

Abbreviations: DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; GAD, generalized anxiety disorder; GAD-7, generalized anxiety disorder 7-item.

qualifying for the DSM-5 criteria for GAD was related to their GAD-7 scores. Among the participants with GAD-7 scores of 0–4, 5–9, 10–14, and 15–21, 0.7%, 12.7%, 35.6%, and 63.3%, respectively, met the DSM-5 criteria for GAD. Thus, the proportion of participants who met the DSM-5 criteria for GAD increased with higher GAD-7 scores.

QOL of the Probable GAD Patients

QOL scores were significantly lower among the probable GAD patients (GAD-7 score of ≥ 10) than among those with GAD-7 score of < 10 . The mean (SD) EQ-5D-5L index value of 0.75 (0.17) vs 0.92 (0.11) and EQ VAS of 51.6 (23.40) vs 77.2 (16.90) were significantly lower among the probable GAD patients than those with GAD-7 score of < 10 ($p < 0.01$) (Table 3). Based on subscales analysis, “pain/discomfort” (median, probable GAD patients: 2, without GAD: 1) and “anxiety/depression” (median, probable GAD patients: 3, without GAD: 1) were the most serious issues for the probable GAD patients.

QOL Among Participants Qualifying for Both GAD-7 and DSM-5

In this study, 694 participants met the GAD criteria both as per GAD-7 and DSM-5. The EQ-5D-5L index value and EQ VAS among those who met both GAD-7 and DMS-5 criteria were substantially lower than those qualifying for only one criterion (Table 4).

Healthcare-Seeking Behavior for Anxiety or Other Mental Issues

Of the 1530 probable GAD patients, 51.2% had “never visited a medical institution” for anxiety or other mental issues, 27.6% were “currently visiting one”, and 21.2% had “visited before, but not now”. Of those who had visited healthcare institutions for anxiety or other mental issues ($n=747$), the majority (81.0%) had seen specialists (psychiatrists, psychosomatic medicine doctors) and 18.1% had seen internists. The participants visited healthcare institutions because “my symptoms were severe” (54.1%), “my symptoms made daily life difficult” (52.6%), “a friend or family member recommended it” (23.7%), and “found out about it on the internet” (17.1%) (Supplementary Table 2).

Table 3 QOL of the Study Participants, Stratified by GAD-7 Levels

Variables/Categories	GAD-7 ≥ 10 ($n=1530$)	GAD-7 < 10 ($n=18,479$)	p value
EQ-5D-5L			
Index value, mean (SD)	0.75 (0.17)	0.92 (0.11)	$< 0.01^a$
EQ VAS, mean (SD)	51.6 (23.40)	77.2 (16.90)	$< 0.01^a$

Note: ^aWelch's t-test.

Abbreviations: EQ-5D-5L, EuroQol 5 dimensions 5-level; EQ VAS, EuroQol Visual Analog Scale; GAD-7, generalized anxiety disorder 7-item; QOL, quality of life; SD, standard deviation.

Table 4 QOL of Participants by GAD Status Based on Degree of Coincidence with GAD-7 and DSM-5 Diagnostic Criteria

			GAD-7	
			≥10	<10
DSM-5	GAD present ^a	n	694	503
		Mean EQ-5D-5L index value	0.71	0.77
		Mean EQ VAS	44.7	59.8
	GAD absent	n	836	17,976
		Mean EQ-5D-5L index value	0.78	0.93
		Mean EQ VAS	57.4	77.7

Note: ^aParticipants who met the DSM-5 criteria for GAD based on questionnaire.

Abbreviations: DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; EQ-5D-5L, EuroQol 5 dimensions 5-level; EQ VAS, EuroQol Visual Analog Scale; GAD, generalized anxiety disorder; GAD-7, generalized anxiety disorder 7-item; QOL, quality of life.

Status of Disease Recognition Among the Probable GAD Patients

Disease Awareness

Among the probable GAD patient group, 76.5% had never heard of the disease “generalized anxiety disorder” or GAD. On the other hand, only 3.9% knew details about the characteristics of the disease and treatment, 11.8% had a rough idea about what kind of a disease it is, and 7.9% had only heard about the disease name. Among the probable GAD patients who recognized the disease of GAD (n=360), the main routes of information acquisition for disease-aware patients were: “looked it up on my own” (41.1%), “happened to hear the name of the disease” (26.9%), and “heard it from a medical professional” (23.9%) ([Supplementary Table 2](#)).

Motivation to Receive Treatment

Among the probable GAD patients, 61.4% wished to receive treatment for the problem and the remaining 38.6% did not feel the necessity ([Supplementary Table 2](#)).

Understanding of the Underlying Cause of GAD

Among the probable GAD patient group, 46.3% thought “it is a personality” and 31.3% thought “it is a disease”, 11.0% thought “it is neither personality-related, nor a disease”, while the remaining 11.3% was “not sure” ([Supplementary Table 2](#)).

History/Family History of Mental Disorders and Comorbidities

Among the probable GAD patients, 26.9% reported a history of a diagnosis of depression. This was followed by 8.8% with panic disorder and 5.4% with social anxiety disorder. On the other hand, only 4.0% had a history of GAD diagnosis ([Figure 1](#)). Among the blood relatives of probable GAD patients, 18.2% had been diagnosed with depression; 4.7% with panic disorder; and 1.7% with social anxiety disorder, while only 1.4% mentioned a past diagnosis of GAD ([Supplementary Table 3](#)). Among those with probable GAD, circulation (25.0%), gastroenterology (18.1%), nephrology, urology, and gynecology (18.0%), and skin (18.0%) were the most commonly affected systems ([Supplementary Table 4](#)). Specifically reflux esophagitis, irritable bowel syndrome, migraine headaches, and neuralgia were more frequently diagnosed among the probable GAD patients (data not shown).

Discussion

This web-based, cross-sectional online survey related to GAD among the general population in the Japanese setting provides relevant data on the prevalence of GAD, QOL of the probable GAD patients, their health-seeking behaviors, and the overall recognition/awareness of the disorder.

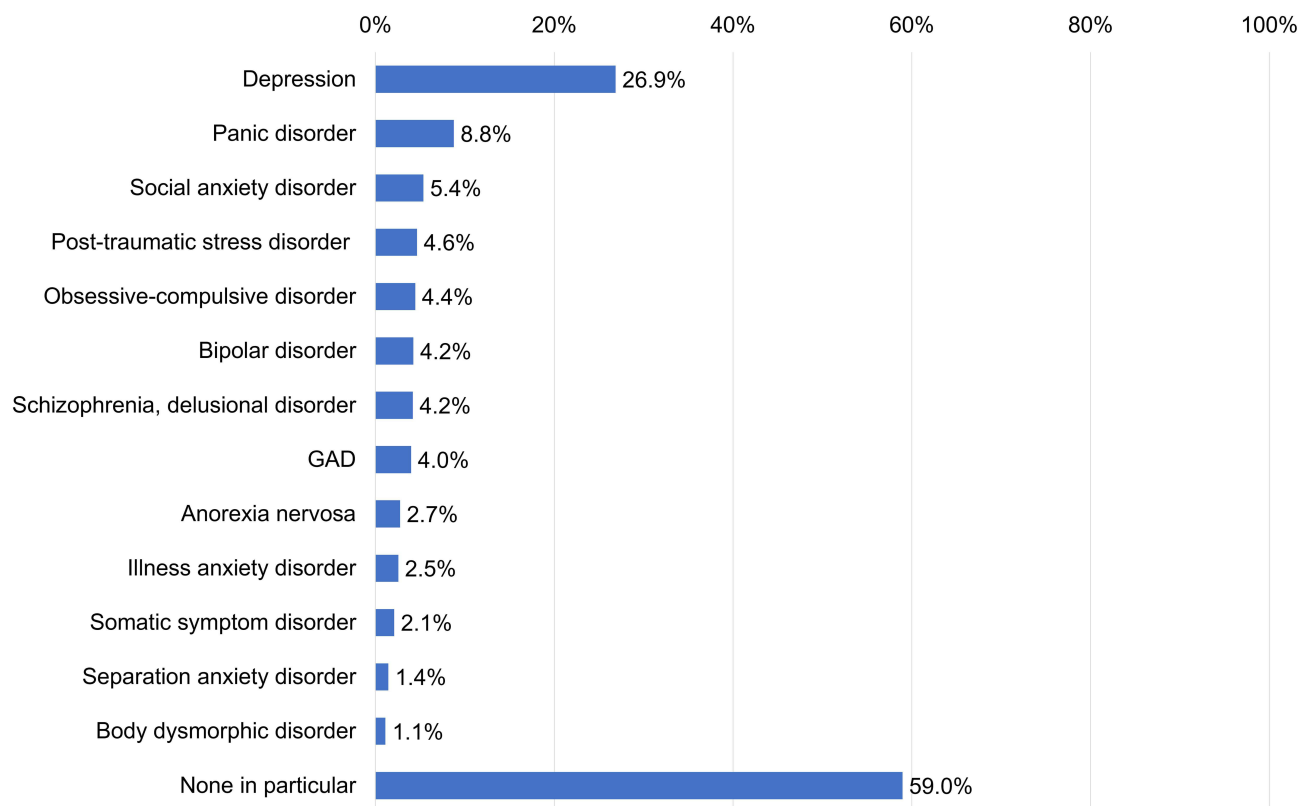


Figure 1 History of mental disorders among probable GAD patients (n=1530).

Abbreviation: GAD, generalized anxiety disorder.

The proportion of participants with a GAD-7 score of ≥ 10 (probable GAD patient group) was 7.6%. The results of the study using GAD-7, a simple screening tool, suggested a high prevalence of potential GAD patients, although it is unclear if all need to receive treatment. Moreover, the prevalence of GAD based on the DSM-5 criteria was 6.0%. The 7.6% prevalence of the probable GAD patient group was high compared to previous studies,⁵ including those conducted in Japan.^{9,10} The results may have been influenced by the coronavirus diseases (COVID-19), as the advent of the COVID-19 pandemic led to an increase in cases of depression and anxiety.^{23,24} Indeed, in a recent online cross-sectional survey from Mainland China, a high prevalence of anxiety (approximately 45%) was seen in working-age adults in March 2020.²⁴ We found a lower prevalence of GAD in persons ≥ 65 years of age compared to participants ≤ 30 years of age. Interestingly, a similar pattern was observed in the previous World Mental Health Survey study⁵ and an Australian National Survey of Mental Health and Well-Being.²⁵ Moreover, as reported previously,²⁵ we found that the working-age population showed a relatively high prevalence of GAD.

Also, regarding family members living together, the probable GAD patients were less likely to live with their spouse or children compared to the non-GAD group. This suggests that being single is associated with having GAD, as previously reported.²⁶

Here, the sensitivity and specificity analyses showed that a GAD-7 cutoff score of ≥ 10 led to high specificity (96%) and NPV (97%), but poor sensitivity (58%) and PPV (45%). The trade-off between sensitivity/specificity and PPV/NPV is well known, while researchers try to find an optimal balance to maximize the area under the receiver operating characteristic curve. In this study, the sensitivity and specificity of GAD-7 were not optimally balanced, when using DSM-5 criteria as a gold standard. Our findings were contrary to those of Spitzer et al and Muramatsu et al who showed good sensitivity and specificity (both $>80\%$) with GAD-7 cutoff score of ≥ 10 with diagnosis by mental health professionals using DSM-IV criteria as a gold standard.^{18,19} The differences may be attributable to the nature of our

study; meeting DSM-5 diagnostic criteria was not based on a physician's diagnosis, but on self-report. Nevertheless, the high specificity and NPV values may still be useful to rule out GAD in patients with GAD-7 scores of <10.

Furthermore, our results showed that the QOL of the probable GAD patients was lower than that of those without GAD, implying that GAD poses a considerable humanistic burden. The more severe the disease, the worse the QOL. Moreover, many of the probable GAD patients reported not seeking healthcare from medical institutions. Survey findings suggested that patients sought medical help only when symptoms were severe and made daily life difficult. Based on EQ-5D-5L analysis, the more serious issues for the participants with probable GAD were "anxiety/depression" and "pain/discomfort". These findings also suggested that people with higher GAD-7 scores should consult specialists as a priority to improve their QOL and to determine the necessary treatment.

Surprisingly, the recognition of GAD seems to be extremely low even among probable GAD patients. This seems to be due to a lost opportunity to increase awareness about the disease among patients and families when they visit the physicians. It highlights the need for change in the practice of physicians where they should educate the patients and families about the disease at diagnosis and follow-up visits. While the understanding of GAD was low, many patients wished to receive treatment for their symptoms. This suggests that an opportunity for the successful treatment of patients with GAD presumably exists due to the favorable attitude towards receiving treatment and indicates the need for increasing disease awareness in the general population.

Among the probable GAD patients, many thought that anxiety was not a disease and that their problem stemmed from their own personality, which must have resulted in low healthcare-seeking behavior, further resulting in a lack of motivation for seeking diagnosis and treatment.

Only 4.0% amongst probable GAD patients were diagnosed with GAD in the past while a substantial proportion of patients were diagnosed with other mental disorders, such as depression, panic disorder, and social anxiety disorder. This finding is in line with the previous World Mental Health Survey study wherein mood and anxiety disorders were noted as common comorbidities.⁵ This suggests that GAD patients may be frequently diagnosed with other mental disorders or have other mental disorders as comorbidities and received treatment for them. Regarding underlying diseases other than mental disorder, probable GAD patients were likely to have symptoms of autonomic dysfunction. Furthermore, the symptoms often overlap with those of GAD. Therefore, it is important to note that patients who have diseases with autonomic dysfunction may also have GAD as a comorbidity.

This study's strength lies in its comprehensive approach, featuring a large sample size and including diagnosed patients and the general population. It explored the prevalence and characteristics of GAD in Japan, capturing potential cases within the broader community. With a web-based survey of 20,009 participants and a questionnaire in Japanese, it gathered diverse perspectives on GAD. Integrating diagnostic criteria-based assessments and validated screening tools like the GAD-7, the study provided a robust estimation of GAD prevalence, highlighting symptom patterns and demographic variations. Examination of QOL using measures like EQ-5D-5L and EQ VAS revealed GAD's profound impact. The study also illuminated healthcare utilization patterns and GAD awareness levels.

Overall, the prevalence of probable GAD patients was high and most of them had never heard of the disease. Therefore, attempts should also be made to educate the general population about GAD, to increase the level of recognition and understanding regarding the disease among probable GAD patients, and for such patients to see a specialist to improve their QOL. Some of these gaps may be filled by country-level guidelines for diagnosis and treatment of GAD management, which are currently unavailable in Japan. This study contributes to understanding the facts surrounding real-world probable GAD patients and factors that may be contributing to the lower diagnosis rate.

Limitations

This online survey using web-based questionnaire may be limited by selection bias as views are reflective of only those individuals in Japan who can use the internet and computers. As the study included only those volunteering to respond, the findings are limited by response bias including early vs late bias. The possibility of common method bias cannot be denied, though we had adopted methodology so that the respondents would not be able to predict the details of the survey content at the earlier stages. Diagnoses and medications were self-reported by participants using GAD-7 scores and the DSM-5 diagnostic criteria and not by reference to physician confirmation. Responses by study participants to the

screening tool and diagnostic criteria were subjective, results of which may not lead to a definitive diagnosis of GAD. The comorbidities were also self-reported and not assessed based on the health system records. With patient-reported data, the study results are subject to recall bias as well as desirability bias. As the study included only Japanese participants, generalizability to other countries would be limited.

Conclusion

This study assessed the prevalence of GAD among the general population in the Japanese setting using a GAD-7 questionnaire. The study also estimated the QOL, the behaviors of visiting medical institutions, as well as the recognition/awareness of the disorder in probable GAD patients. This study revealed that most probable GAD patients were unaware of GAD, only 4.0% were diagnosed with GAD and a substantial proportion was diagnosed with other mental disorders. These results suggest an iceberg phenomenon with low recognition of the symptoms, delayed health-seeking, possible misdiagnoses or missed diagnoses in patients with comorbid mental disorders and missed treatment opportunities. The GAD-7 scale considerably enhances the efficiency of screening for and monitoring anxiety which provides an opportunity to improve the mental health of patients by early identification of patients who may benefit from pharmacologic or psychotherapeutic treatment. Survey results indicate a requirement for creating awareness about GAD among the general population in Japan by disease education; additionally, these findings also highlight a need for the development of clinical guidelines on GAD diagnosis and treatment in Japan so that physicians can appropriately manage GAD and easily educate their patients.

Abbreviations

DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; EQ VAS, EuroQol Visual Analog Scale; EQ-5D-5L, EuroQol 5 dimensions 5-level; GAD-7, generalized anxiety disorder 7-item; GAD, generalized anxiety disorder; NPV, negative predictive value; PPV, positive predictive value; QOL, quality of life; SD, standard deviation; URL, uniform resource locator.

Data Sharing Statement

The data that support the findings of this study are available from Viatris Inc., but restrictions apply to the availability of these data, and so are not publicly available. Data are, however, available from the authors upon reasonable request and with the permission of Viatris Inc.

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Author Contributions

All authors made a significant contribution to the work reported, whether in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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