

# BMJ Open Association between alcohol consumption/alcohol use disorders and patient complexity: a cross-sectional study

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## ABSTRACT

**Objectives** The objective was to clarify the relationship between alcohol consumption/alcohol use disorders and patient complexity.

**Design** Cross-sectional study.

**Setting** A clinic located on a remote island in Okinawa, Japan, providing general outpatient practices and round-the-clock emergency services.

**Participants** Patients who lived on the island, visited Tarama Clinic from 1 April 2018 to 30 June 2018, were aged ≥20 years and had decision-making capacity were judged to be eligible for this study.

**Main outcome measures** Alcohol consumption/alcohol use disorders as measured by the Alcohol Use Disorders Identification Test (AUDIT) and patient complexity as scored by the Patient Centered Assessment Method (PCAM).

**Results** During the 3-month study period, 355 patients (163 women and 192 men) with mean (SD) age of 66.4 (13.6) years were included. Multiple regression analysis of PCAM scores showed that, after adjusting for age, sex, education, occupation, physical activity, smoking, annual medical expenses and number of family members living with the patient, AUDIT scores classified as 'dependence likely' were associated with PCAM scores (p value=0.040).

**Conclusions** Alcohol consumption and alcohol use disorders classified as dependence likely are associated with patient complexity.

## INTRODUCTION

Alcohol use is one of the leading risk factors for global deaths and disease burden, accounting for 2.8 million deaths (2.2% and 6.8% of age-standardised deaths in women and men, respectively) and leading to 1.6% and 6.0% of disability-adjusted life-years in women and men, respectively.<sup>1</sup>

The use of alcohol has been identified as a causal factor for more than 200 diseases and injuries.<sup>2</sup> It causes not only physical conditions, including gastrointestinal diseases such as liver cirrhosis and pancreatitis and a wide variety of cancers, but also neuropsychiatric conditions, including alcohol use disorders, epilepsy, depression and anxiety disorders.<sup>3</sup> Excessive alcohol intake impairs cognitive

## Strengths and limitations of this study

- This is the first study to identify a relationship between alcohol consumption/alcohol use disorders as measured by the Alcohol Use Disorders Identification Test and patient complexity as scored by the Patient Centered Assessment Method.
- The particular condition, where most residents of the island were expected to choose Tarama Clinic because of the considerable geographical restrictions preventing them attending other medical institutions, enabled this study to be population-based.
- The study's generalisability is limited, because it was conducted on a remote island in Okinawa, Japan, the community of which is ethnically, religiously, culturally and politically homogeneous.
- It was a cross-sectional study and therefore a causal relationship between alcohol consumption/alcohol use disorders and patient complexity cannot be inferred.
- Although consecutive sampling was used, some otherwise eligible patients were not enrolled, which may have resulted in selection bias.

function.<sup>4</sup> The use of alcohol is also associated with both intentional injuries such as suicide and violence and unintentional injuries.<sup>3,5,6</sup>

In addition to these harmful effects on the physical and mental health, alcohol drinking is related to adverse social consequences. Transgression of boundaries between normal and abnormal drinking, namely the harmful use of alcohol or alcohol dependence, gives rise to social problems such as family disruption, loss of earnings and unemployment.<sup>7</sup> Moreover, those who have alcohol problems are likely to be subjected to social disapproval or be stigmatised by members of their community.<sup>7,8</sup> Stigmatisation reportedly leads to reduced accessibility to medical service and worse quality of medical care.<sup>7,9–12</sup> Additionally, expenditure on alcohol consumption

causes economic problems, especially when the individual concerned has a low income.<sup>3 13</sup>

It is now increasingly accepted that these psychological and social factors contribute to deterioration in health; however, they have received little attention in the past. It has been newly proposed that the biopsychosocial model be substituted for the biomedical model, the latter having been preponderant in the mid-20th century but now being recognised as limited by its understanding of patients exclusively from a biological point of view.<sup>14</sup> As its name implies, the biopsychosocial model is a holistic model that incorporates biological, psychological and social characteristics of patients' illnesses.<sup>14</sup> These characteristics are all included in what is termed patient complexity, which is defined as 'the person-specific factors that interfere with the delivery of usual care and decision-making for whatever conditions the patient has.'<sup>15</sup> Although medical professionals often become frustrated in the face of such factors due to the lack of clear ideas of how the patient is complex and what to do about it, the concept of patient complexity provides them with a common vocabulary and method to identify and act in systematic and comfortable way.<sup>15</sup>

Some tools, such as INTERMED<sup>16 17</sup> and the Minnesota Complexity Assessment Method,<sup>15</sup> have been developed for assessing this patient complexity. Another of these tools, the Patient Centered Assessment Method (PCAM),<sup>18</sup> was designed mainly for use in primary care settings. PCAM assesses patient complexity from four perspectives: 'Health and Well-being,' 'Social Environment,' 'Health Literacy and Communication' and 'Service Coordination.'<sup>19</sup> The first domain Health and Well-being is certainly subject to being influenced by alcohol consumption, because it contains a question regarding lifestyle behaviours related to drinking.<sup>19</sup> Furthermore, as described above, alcohol consumption causes a wide variety of biological, psychological and social problems. Therefore, it is expected to have pervasive influences not only on the first domain, but also the other domains: Social Environment, Health Literacy and Communication, and Service Coordination.

Thus, it remains unclear how alcohol consumption influences patient complexity, holistically and quantitatively. The objective of this study was to clarify the relationship between alcohol consumption/alcohol use disorders as measured by the Alcohol Use Disorders Identification Test (AUDIT)<sup>20</sup> and patient complexity as scored by PCAM, the rationale being that better understanding of this relationship could guide physicians on optimal provision of medical care to patients with alcohol-related problems or biopsychosocial complexity.

## METHODS

### Design

This was a cross-sectional study and reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.<sup>21</sup>

### Setting

This study was conducted on Tarama Island, a remote island in Okinawa, Japan. The island is located about 67 km from Miyako Island<sup>22</sup> (125 min by ferry<sup>23</sup> or 25 min by air<sup>24</sup>), which is the fourth largest island of Okinawa<sup>25</sup> and is located about 300 km from the main island of Okinawa<sup>26</sup> (55 min by air<sup>24</sup>). The island's population is 1194 (555 women and 639 men), of whom 916 (76.7%) are aged 20 years or older.<sup>27 28</sup> The percentage of the population aged 65 years and older is 26.4%, which is almost the same as the national average (26.6%).<sup>28</sup> The population density is 54.3/km<sup>2</sup>.<sup>29</sup> Other than a dental clinic, the island has only one medical institution without beds, Tarama Clinic, Okinawa Miyako Hospital. This clinic has four staff members (a physician, a nurse, a nurse assistant and a clerk) and provides general outpatient practices and round-the-clock emergency services.

Japan has a 'free access system,' which means that patients are allowed to visit any clinics or hospitals. However, most residents of the island were expected to choose Tarama Clinic because there are considerable geographical restrictions preventing them attending other medical institutions. This particular condition enabled this study to be population-based; that is, it included almost all patients living in the region.

### Participants

Patients who lived on the island and visited Tarama Clinic from 1 April 2018 to 30 June 2018 were consecutively included in this study. Patients who were aged less than 20 years or who lacked decision-making capacity were excluded. Those who met these conditions were judged to be eligible for this study. Otherwise eligible patients who refused to participate were excluded, as were patients, whose participation was judged by the principal investigator to have unfavourable influences on the patient-physician relationships. When the principal investigator was out of the office and so unable to seek informed consent, or when obtaining informed consent would have interfered with routine medical practice because there were too many patients in the waiting-room, otherwise eligible patients were not enrolled.

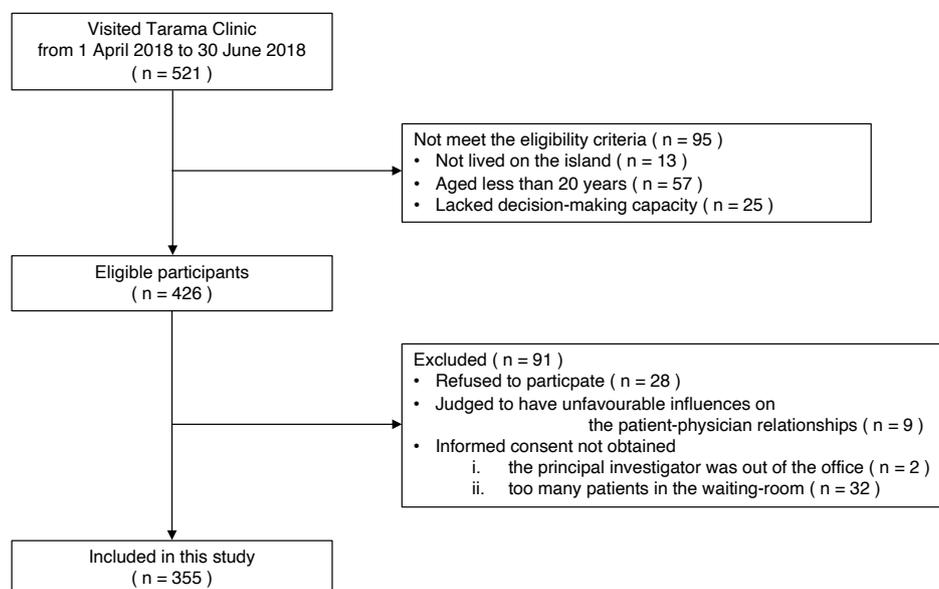
After the principal investigator had fully informed the patients of the content of this study, those who agreed to participate provided written consent.

### Outcome measures

Data described below were collected from 1 April 2018 to 31 March 2019.

### PCAM

PCAM is a tool for assessing patient complexity across four domains: Health and Well-being, Social Environment, Health Literacy and Communication and Service Coordination.<sup>19</sup> Each domain has two or four areas of inquiry: Health and Well-being inquires about items— (1) physical health needs, (2) physical health impacting on mental well-being, (3) lifestyle impacting on physical



**Figure 1** A flowchart detailing the process of inclusion and exclusion of study participants.

or mental well-being and (4) other mental well-being concerns; Social Environment about items—(1) home environment, (2) daily activities, (3) social networks and (4) financial resources; Health Literacy and Communication about items—(1) health literacy and (2) engagement in discussion; and Service Coordination about items—(1) other services and (2) service coordination.<sup>30</sup> Each of the 12 items has four defined levels of complexity, which are labelled as ‘routine care,’ ‘active monitoring,’ ‘plan action’ and ‘act now’ in order of increasing complexity.<sup>19</sup> Each item is also scored from 1 to 4; thus, the lowest possible score of PCAM is 12 and the highest possible score 48.<sup>19</sup> Patient complexity becomes greater as the score increases. PCAM scores were determined during patients’ office visits by a single physician, the principal investigator, in accordance with the user guide,<sup>30</sup> which eliminated any inter-rater variability. PCAM scores and PCAM four-domain scores were used for the multiple regression analyses.

### AUDIT

AUDIT is a tool for screening for hazardous drinking, harmful drinking and alcohol dependence in terms of 10 items across three domains: ‘Hazardous Alcohol Use’ (three items), ‘Dependence Symptoms’ (three items) and ‘Harmful Alcohol Use’ (four items).<sup>20</sup> Each item is scored from 0 to 4 or 0, 2 or 4. The lowest possible score of AUDIT is 0 and the highest possible score 40.<sup>20</sup> Likelihood and severity of hazardous drinking, harmful drinking and alcohol dependence become greater as the score increases. AUDIT scores were determined by filling in a self-administered questionnaire. A nurse supported patients to answer the questions if needed or desired. For the descriptive statistical analyses, AUDIT scores were divided into the following categories to compare with a nationwide survey in Japan: patients scoring 12 or more

points; 15 or more points (potential alcoholism); and 20 or more points (suspected alcoholism).<sup>31</sup> As for multiple regression analyses, AUDIT scores were divided into the following categories based on four levels of risk in accordance with the guidelines: ‘low risk’ being designated for AUDIT scores from 0 to 7; ‘medium risk’ 8–15; ‘high risk’ 16–19; and ‘dependence likely’ 20–40.<sup>20</sup>

### Other explanatory variables

Age and sex were obtained from medical records and annual medical expenses during the previous year were calculated from medical fee receipts. Education (<High school’ or ‘≥High school’), occupation (‘In work’ or ‘Out of work’), physical activity (‘Exercising’ or ‘Not exercising’), smoking (‘Current smoker,’ ‘Ex-smoker’ or ‘Never smoker’) and number of family members living with the patient were obtained from a self-administered questionnaire. A nurse also assisted patients if needed or desired. ‘In work’ included full-time or part-time workers, and housewives or househusbands; ‘Out of work’ included those without an occupation. ‘Exercising’ was defined as engaging in physical activity for more than 30 min, twice a week and for 1 year or more.

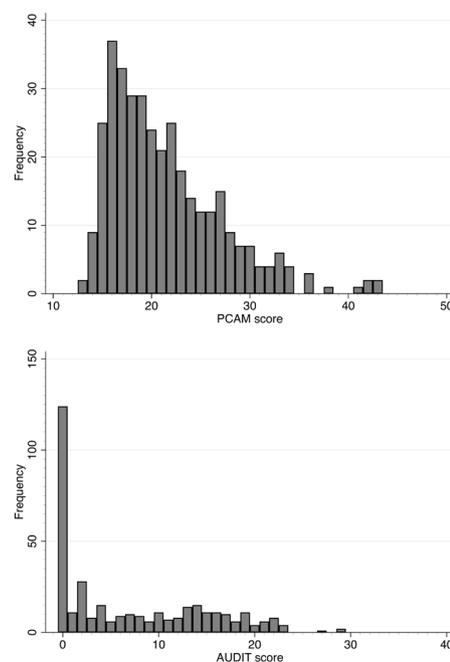
### Sample size

To the best of our knowledge, there have been no published studies on the association between alcohol consumption/alcohol use disorders and patient complexity, which made it difficult to determine the meaningful effect size to calculate the required sample size. As the next step in this study, we planned to examine the validity and reliability of PCAM in a primary care setting, so the sample size was estimated using factor analysis. A wide range of sample sizes are recommended in factor analysis, these usually being described as either the sample size or the ratio of a sample size to number of variables. A sample

**Table 1** Characteristics of the 355 study participants

Age, mean (SD), years	66.4 (13.6)
By age group, no. (%)	
<35 years	6 (1.7)
35 to <45 years	19 (5.4)
45 to <55 years	42 (11.8)
55 to <65 years	86 (24.2)
65 to <75 years	85 (23.9)
≥75 years	117 (33.0)
Sex, no. (%)	
Women	163 (45.9)
Men	192 (54.1)
Education, no. (%)	
<High school	187 (52.7)
≥High school	168 (47.3)
Occupation, no. (%)	
In work	307 (86.5)
Out of work	48 (13.5)
Physical activity, no. (%)	
Exercising	53 (14.9)
Not exercising	302 (85.1)
Smoking, no. (%)	
Current smoker	50 (14.1)
Ex-smoker	118 (33.2)
Never smoker	187 (52.7)
Annual medical expenses, no. (%)	
<100 000 yen	194 (54.6)
100 000 to <200 000 yen	108 (30.4)
200 000 to <300 000 yen	31 (8.7)
≥300 000 yen	22 (6.2)
Number of family members living with the patient, no. (%)	
0	66 (18.6)
1	165 (46.5)
2	73 (20.6)
3	29 (8.2)
4	8 (2.3)
≥5	14 (3.9)

size of 300 is considered good.<sup>32</sup> In contrast, a larger ratio of a sample size to number of variables such as 20:1 is reportedly better.<sup>33</sup> This resulted in the calculation of a sample size of 240 for 12 PCAM items. Of these two possibilities, 300 was adopted as an adequate required sample size.



**Figure 2** Distribution of PCAM and AUDIT scores. AUDIT, Alcohol Use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

### Statistical analysis

Descriptive statistical analyses were used to demonstrate the distribution of PCAM and AUDIT scores and to compare AUDIT scores with a nationwide survey in Japan. Multiple regression analyses were used to evaluate the association between PCAM and AUDIT scores after adjustment for age, sex, education, occupation, physical activity, smoking, annual medical expenses and number of family members living with the patient.

Statistical analyses were performed using Stata/MP V.15.1.<sup>34</sup> P values less than 0.05 were considered to denote statistical significance.

### Patient and public involvement

This study was conducted without patient or public involvement.

### RESULTS

During the 3-month study period, 521 patients who visited Tarama Clinic were consecutively included. Of these patients, 95 did not meet the eligibility criteria: 13 did not live on the island, 57 were aged less than 20 years and 25 lacked decision-making capacity. This left 426 eligible patients, 71 of whom were excluded: 28 refused to participate, the participation of 9 was judged to have unfavourable influences on the patient-physician relationships, and informed consent was not obtained from 2 because the principal investigator was out of the office and from another 32 because there were too many patients in the waiting room. The main reason for judging a patient's participation as likely to unfavourably impact the patient-physician relationship was that they had confirmed or

**Table 2** Multiple regression analysis of the PCAM scores

	Regression coefficient	95% CI	P value	Standardised regression coefficient	95% CI
<b>AUDIT score</b>					
Low risk	Reference				
Medium risk	1.050	-0.613 to 2.713	0.215	0.077	-0.045 to 0.199
High risk	1.361	-0.666 to 3.387	0.187	0.074	-0.036 to 0.183
Dependence likely	2.480	0.117 to 4.843	0.040	0.111	0.005 to 0.217
Age, years	-0.009	-0.065 to 0.047	0.746	-0.022	-0.155 to 0.111
<b>Sex</b>					
Female	Reference				
Male	0.615	-0.722 to 1.952	0.366	0.054	-0.063 to 0.170
<b>Education</b>					
≥High school	Reference				
<High school	1.320	0.056 to 2.584	0.041	0.115	0.005 to 0.226
<b>Occupation</b>					
In work	Reference				
Out of work	3.814	2.146 to 5.483	<0.001	0.228	0.128 to 0.328
<b>Physical activity</b>					
Exercising	Reference				
Not exercising	1.838	0.341 to 3.335	0.016	0.115	0.021 to 0.208
<b>Smoking</b>					
Never smoker and ex-smoker	Reference				
Current smoker	3.465	1.828 to 5.101	<0.001	0.211	0.111 to 0.310
Annual medical expenses, ×10 <sup>4</sup> yen	0.160	0.107 to 0.212	<0.001	0.297	0.199 to 0.396
Number of family members living with the patient	-0.492	-0.902 to -0.082	0.019	-0.114	-0.209 to -0.019

Omnibus test: p value <0.001 and adjusted R<sup>2</sup> 0.236.

AUDIT, Alcohol Use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

suspected mental or personality disorders, the concern being that information about the study and invitation to participate might be experienced as a psychological burden and lead to interruption of their regular visits. Thus, 355 patients, 83.3% of eligible patients, were finally included (figure 1). The characteristics of the 355 study participants are shown in table 1. There were no missing values among outcome measures and other explanatory variables for the study participants.

PCAM and AUDIT scores were distributed as shown in figure 2. The mean (SD) of PCAM and AUDIT scores were 21.4 (5.7) and 7.0 (7.5), respectively. In total, 3.7% of women, 54.7% of men and 31.3% overall scored AUDIT scores of 12 or more points, 2.5%, 36.5% and 20.8% scored 15 or more points, and 0.6%, 12.5% and 7.0% scored 20 or more points.

Multiple regression analysis of PCAM scores showed that, after adjusting for age, sex, education, occupation, physical activity, smoking, annual medical expenses and number of family members living with the patient, AUDIT scores classified as dependence likely (compared with those classified as low risk) were associated with PCAM

scores (p value=0.040), whereas those classified as medium risk and high risk were not (p values=0.215 and 0.187) (table 2). Moreover, the standardised regression coefficient of AUDIT scores classified as dependence likely was 0.111, the 95% CI of which overlapped with those of other variables (table 2). Among explanatory variables, the variance inflation factors ranged from 1.04 to 2.12.

Multiple regression analysis of PCAM four-domain scores after the same adjustments showed that AUDIT scores classified as high risk and dependence likely (compared with those classified as low risk) were associated with Health and Well-being (p values=0.008 and 0.001) (table 3). However, AUDIT scores were not associated with Social Environment (table 4). Medium risk, high risk and dependence likely were all associated with Health Literacy and Communication (p values=0.008, 0.030 and 0.012) (table 5). Meanwhile, AUDIT scores were not associated with Service Coordination (table 6).

## DISCUSSION

More than 30% of people in the study had problematic alcohol consumption. Additionally, alcohol consumption

**Table 3** Multiple regression analysis of the PCAM four-domain scores (Health and Well-being)

	Regression coefficient	95% CI	P value	Standardised regression coefficient
<b>AUDIT score</b>				
Low risk	Reference			
Medium risk	0.634	−0.053 to 1.321	0.070	0.116
High risk	1.136	0.299 to 1.973	0.008	0.153
Dependence likely	1.713	0.737 to 2.689	0.001	0.191
Age, years	−0.020	−0.043 to 0.003	0.094	−0.117
<b>Sex</b>				
Female	Reference			
Male	0.180	−0.372 to 0.733	0.521	0.039
<b>Education</b>				
≥High school	Reference			
<High school	0.261	−0.262 to 0.783	0.327	0.057
<b>Occupation</b>				
In work	Reference			
Out of work	0.702	0.013 to 1.391	0.046	0.105
<b>Physical activity</b>				
Exercising	Reference			
Not exercising	0.613	−0.005 to 1.232	0.052	0.095
<b>Smoking</b>				
Never smoker and ex-smoker	Reference			
Current smoker	1.463	0.787 to 2.140	<0.001	0.222
Annual medical expenses, ×10 <sup>4</sup> yen	0.047	0.026 to 0.069	<0.001	0.221
Number of family members living with the patient	−0.227	−0.396 to −0.058	0.009	−0.131

Omnibus test: p value <0.001 and adjusted R<sup>2</sup> 0.188.

AUDIT, Alcohol use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

and alcohol use disorders classified as dependence likely were associated with patient complexity.

First, more than 30% of people in the study had problematic alcohol consumption. Assuming that those not included in this study (561 people, or the total population aged 20 years or older of 916 people minus 355 study participants) were non-problematic drinkers, this still means that the proportion of problematic drinkers on the island is more than 12%. A national survey reported that 1.3%, 10.6% and 5.5% of Japanese women, men and overall had AUDIT scores of 12 or more points; 0.6%, 5.3% and 2.7% had 15 or more points; and 0.2%, 2.0% and 1.0% had 20 or more points.<sup>31</sup> Our findings strongly suggest that the percentages of individuals on the island with potential and suspected alcoholism is much higher than the national average. This might be because there is a regionally specific drinking custom called ‘Otōri’ on the island, where a group of people pass around a glass of alcohol.<sup>35</sup> This custom is broadly accepted and may cause alcohol-related problems.<sup>36 37</sup>

Second, alcohol consumption and alcohol use disorders classified as dependence likely were associated with

patient complexity. AUDIT scores classified as dependence likely were found to have an average of 2.48 points higher PCAM scores, which is corresponding to approximately 6.9% of the range of PCAM scores (36 points: the highest score 48 minus the lowest score 12), compared with those classified as low risk. Additionally, we did not detect any significant differences in the strength of relationships with PCAM scores between the variables because the 95% CIs of standardised regression coefficients overlapped. Other variables not included in this study could also lead to the relatively small impact of AUDIT scores on PCAM scores. Much previous research has examined and clarified the relationship between alcohol consumption and different individual physical and psychological conditions and social circumstances.<sup>3–13</sup> However, this is the first study to provide a holistic perspective on the detrimental impact of alcohol consumption and alcohol use disorders on patient complexity.

AUDIT scores classified as high risk and dependence likely were associated with Health and Well-being on the PCAM four-domain scores. This is consistent with previous findings that alcohol causes physical harm.<sup>3 5 6</sup>

**Table 4** Multiple regression analysis of the PCAM four-domain scores (Social Environment)

	Regression coefficient	95% CI	P value	Standardised regression coefficient
<b>AUDIT score</b>				
Low risk	Reference			
Medium risk	-0.204	-0.766 to 0.358	0.476	-0.045
High risk	-0.328	-1.013 to 0.357	0.347	-0.054
Dependence likely	-0.375	-1.174 to 0.424	0.356	-0.051
<b>Age, years</b>				
	-0.008	-0.027 to 0.011	0.393	-0.059
<b>Sex</b>				
Female	Reference			
Male	-0.453	-0.905 to -0.001	0.049	-0.120
<b>Education</b>				
≥High school	Reference			
<High school	0.640	0.213 to 1.067	0.003	0.170
<b>Occupation</b>				
In work	Reference			
Out of work	1.650	1.086 to 2.214	<0.001	0.300
<b>Physical activity</b>				
Exercising	Reference			
Not exercising	0.239	-0.267 to 0.745	0.354	0.045
<b>Smoking</b>				
Never smoker and ex-smoker	Reference			
Current smoker	0.367	-0.186 to 0.920	0.193	0.068
Annual medical expenses, ×10 <sup>4</sup> yen	0.021	0.003 to 0.039	0.021	0.120
Number of family members living with the patient	-0.170	-0.308 to -0.031	0.016	-0.119

Omnibus test: p value <0.001 and adjusted R<sup>2</sup> 0.195.

AUDIT, Alcohol Use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

However, a relationship between alcohol consumption/ alcohol use disorders and Social Environment was not established in this study. Considering the fact that drinking alcohol plays roles in creating and maintaining social identity and relationships,<sup>38–42</sup> these roles presumably offset the well-known negative effect of alcohol on Social Environment.<sup>3 4 7–13</sup> Limited health literacy, such as underestimation of drinking alcohol and lack of knowledge of resources to help with problematic drinking, is also associated with harmful drinking.<sup>43</sup> This is consistent with the result that medium risk, high risk and dependence likely were all associated with Health Literacy and Communication. This study did not find a relationship between alcohol consumption/ alcohol use disorders and Service Coordination. This is probably because there is only one medical institution on the island. The limited number of services enable good interconnection and coordination. This coordination may mitigate the harmful impact of alcohol such as reduced accessibility to medical services and worse quality of medical care, which are related to Service

Coordination. These findings could therefore be linked to the relatively small impact of AUDIT scores on PCAM scores.

Despite the small sample size, the high prevalence of problematic alcohol consumption on the island enabled the study to clarify the relationship between alcohol consumption/ alcohol use disorders and patient complexity. Internationally, estimates of prevalence of alcohol dependence, as a percentage of total adult population aged 15 years or more, are reported to be high in Eastern European countries such as Belarus (11.0%) and Hungary (9.4%) and in Russia (9.3%).<sup>3</sup> These figures are comparable with those in our study. We found that problematic drinking was associated with patient complexity, and it is not hard to imagine that a high proportion of problematic drinking may lead to an increase in patients with high complexity in other societies and regions. However, the effect of alcohol drinking on patient complexity will vary across societies and regions. This remote island has the unique custom of Otōri, and it is thought likely that the specific circumstances of each

**Table 5** Multiple regression analysis of the PCAM four-domain scores (Health Literacy and Communication)

	Regression coefficient	95% CI	P value	Standardised regression coefficient
<b>AUDIT score</b>				
Low risk	Reference			
Medium risk	0.708	0.185 to 1.231	0.008	0.164
High risk	0.707	0.070 to 1.344	0.030	0.121
Dependence likely	0.952	0.209 to 1.695	0.012	0.134
Age, years	0.016	-0.001 to 0.034	0.068	0.123
<b>Sex</b>				
Female	Reference			
Male	0.415	-0.006 to 0.835	0.053	0.114
<b>Education</b>				
≥High school	Reference			
<High school	0.530	0.133 to 0.928	0.009	0.146
<b>Occupation</b>				
In work	Reference			
Out of work	0.799	0.274 to 1.324	0.003	0.151
<b>Physical activity</b>				
Exercising	Reference			
Not exercising	0.431	-0.040 to 0.902	0.073	0.085
<b>Smoking</b>				
Never smoker and ex-smoker	Reference			
Current smoker	1.188	0.673 to 1.703	<0.001	0.228
Annual medical expenses, ×10 <sup>4</sup> yen	0.047	0.030 to 0.063	<0.001	0.276
Number of family members living with the patient	-0.003	-0.131 to 0.126	0.968	-0.002

Omnibus test: p value <0.001 and adjusted R<sup>2</sup> 0.247.

AUDIT, Alcohol Use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

society and region mediate between problematic alcohol drinking and patient complexity.

This study had several limitations. First, it was conducted on a remote island in Okinawa, Japan, the community of which is ethnically, religiously, culturally and politically homogeneous. Both alcohol intake and patient complexity of participants could have been affected by these factors in a biased direction; thus, the association between them may have been underestimated or overestimated. This limits generalisability of the present findings. Second, this was a cross-sectional study; thus, a causal relationship between alcohol consumption/alcohol use disorders and patient complexity cannot be inferred. Third, although consecutive sampling was used, some otherwise eligible patients were not enrolled: 83.3% of eligible patients were included. This failure in sampling could have led to selection bias. Especially, the main reason for judging a patient's participation as likely to unfavourably impact the patient-physician relationship was that they had confirmed or suspected mental or personality disorders. These disorders are inclined to cause biopsychosocial problems (ie, high patient complexity). Thus,

their exclusion could have resulted in underestimation of patient complexity. Most patients from whom informed consent was not obtained because the principal investigator was absent or there were too many patients waiting for a consultation made only a single visit to the clinic (for mild acute diseases, such as upper respiratory inflammation or gastroenteritis) during the registration period. Exclusion of these low complexity, or otherwise-healthy, patients would obviously have resulted in overestimation of patient complexity. Finally, patient complexity has a multidimensional structure and PCAM is only one method. Patient complexity might involve other factors that PCAM does not include and can also be measured by other methods such as patient self-reporting. Thus, patient complexity as scored by PCAM might have been underestimated or overestimated.

#### FUTURE RESEARCH

The development of a Japanese version of PCAM and the examination of its validity and reliability in a primary

**Table 6** Multiple regression analysis of the PCAM four-domain scores (Service Coordination)

	Regression coefficient	95% CI	P value	Standardised regression coefficient
<b>AUDIT score</b>				
Low risk	Reference			
Medium risk	-0.088	-0.603 to 0.426	0.736	-0.022
High risk	-0.155	-0.782 to 0.473	0.628	-0.029
Dependence likely	0.190	-0.541 to 0.921	0.610	0.029
<b>Age, years</b>				
	0.002	-0.015 to 0.020	0.791	0.019
<b>Sex</b>				
Female	Reference			
Male	0.473	0.059 to 0.887	0.025	0.142
<b>Education</b>				
≥High school	Reference			
<High school	-0.111	-0.502 to 0.280	0.577	-0.033
<b>Occupation</b>				
In work	Reference			
Out of work	0.663	0.147 to 1.180	0.012	0.137
<b>Physical activity</b>				
Exercising	Reference			
Not exercising	0.555	0.092 to 1.018	0.019	0.119
<b>Smoking</b>				
Never smoker and ex-smoker	Reference			
Current smoker	0.446	-0.061 to 0.953	0.084	0.093
Annual medical expenses, ×10 <sup>4</sup> yen	0.044	0.028 to 0.060	<0.001	0.283
Number of family members living with the patient	-0.092	-0.219 to 0.034	0.152	-0.074

Omnibus test: p value <0.001 and adjusted R<sup>2</sup> 0.132.

AUDIT, Alcohol Use Disorders Identification Test; PCAM, Patient Centered Assessment Method.

care setting are planned to promote dissemination of the concept of patient complexity in Japan.

## CONCLUSION

Alcohol consumption and alcohol use disorders classified as dependence likely are associated with patient complexity.

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**Patient consent for publication** Not required.

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