

ORIGINAL ARTICLE

Temporary employment and suicidal ideation in COVID-19 pandemic in Japan: A cross-sectional nationwide survey

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Abstract

Objectives: Association between employment contract (temporary vs. permanent) and suicidal ideation (persistent suicidal ideation [i.e., with onset before COVID-19] or newly developed under COVID-19 pandemic) was examined using a nationally representative cross-sectional study in Japan.

Methods: An Internet survey was conducted from August to September 2020. The participants' inclusion criteria for this study were as follows: (i) 20–65 years old, (ii) employees (excluding self-employed, students, retired, housewives, and unemployed). The associations of suicidal ideation with the employees' factors were analyzed using the multinomial logistic regression model, adjusting for covariates (sex, age, marital status, education, company size, industries, and a history of psychiatric disease).

Results: Of total 12 249 participants, 72.4% were permanent and 27.6% were temporary employees. The prevalence was 8.5% for persistent suicidal ideation and 3.2% for newly developed suicidal ideation in the COVID-19 pandemic. Temporary employment was significantly associated with persistent suicidal ideation (adjusted odds ratio [aOR] = 1.36 [95% confidence interval, CI: 1.16–1.59]; $P < .001$), but not associated with newly developed suicidal ideation (aOR = 1.10 [0.85–1.42]; $P = .457$) after adjusting the covariates. Sensitivity analysis showed temporary employment was significantly associated with persistent suicidal ideation only in women. Newly developed suicidal ideation was significantly higher among participants of a young age, employees in drinking/eating/hotel business industry, and those having a history of psychiatric disease than among the counterparts.

Conclusions: Working on a temporary employment contract was associated with persistent suicidal ideation under conditions of COVID-19 outbreaks in Japan. However, the result showed no significant difference in newly developed suicidal ideation. Further longitudinal study will be needed to examine the risk of being employed on an unstable occupational contract in the prolonged pandemic.

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KEYWORDS

mental health, occupational health, public health, suicidality

1 | INTRODUCTION

Having precarious employment, including being employed in temporary or insecure jobs, is a matter of low social status and is a suggested risk factor of overall deteriorated mental health.^{1–3} However, an international cross-sectional survey including 9565 people from 78 countries conducted around April to June 2020 showed that there was no significant group difference in stress, depression, and well-being between full-time and part-time employees.⁴ A cohort study among 2351 Japanese general workers showed that longitudinal changes of depression scores were not significantly different between permanent and non-permanent workers.⁵ Contrary to that, another cohort study showed that working in a part-time job was associated with depressive symptoms under the pandemic.³ The mental health status among temporary employees is thus still undetermined. However, there is not adequate evidence from research on this topic concerning suicidal ideation.

Previous studies before COVID-19 showed associations of temporary employment with high suicidal ideation, in Canada and South Korea.^{6–10} However, one Japanese study reported that temporary employment was related to low suicidal ideation among female workers.¹¹ Having a temporary job benefits workers by allowing them to control their work time, variety of work experience, work-life balance, and it can be a step for permanent job.^{12,13} As the work conditions and health of temporary workers may depend on the social and environmental context, the relationship between employment contract and suicidal ideation continues to be unclear.

A temporary job is generally so unstable and insecure that it needs to be evaluated according to the social situation, such as under conditions of the COVID-19 pandemic. In uncertain circumstances, temporary work may increase the perception of workers' instability. The presence of disadvantaged socio-demographic status is suggested to affect the disparities on mental health outcome in the COVID-19 pandemic due to lack of social resources.¹⁴ Studies examining suicidal ideation and socio-demographic disadvantages have increased under the worldwide COVID-19 pandemic, including such factors as being female, young, Black, Asian, of a minority ethnic group, and being unemployed.^{15–17} In Japan, the number of suicides in the young female population (less than 40 years of age) increased by 163.1% in August 2020 compared to the mean of the same month in the previous

three years.¹⁸ This trend continued to November 2020.^{19,20} The young female population is suggested to be working in vulnerable conditions more so than others.^{18,20} Yet, there is limited evidence of an association between suicidal ideation and working conditions in the COVID-19 pandemic.

The first aim of this study was to examine the relationship between suicidal ideation and temporary employment by using nation-wide representative data. The authors separated suicidal ideation into two variables: (i) persistent suicidal ideation which was first recognized before COVID-19 and continued to the present and (ii) newly developed suicidal ideation which was recognized after COVID-19. This separation cannot be detected how COVID-19 influenced on the employees' suicidal ideation; however, examining the differences of newly developed suicidal ideation in employment status can be useful to estimate their changes in mental health under the COVID-19 pandemic. The second aim was to examine the associated basic demographic and job-related factors (i.e., company size, industry) with suicidal ideation among employees during the pandemic.

2 | METHODS

2.1 | Study design and procedure

This study used data from the Japan COVID-19 and Society Internet Survey (JACSIS). JACSIS was a cross-sectional online survey conducted from August to September in 2020. Email messages for survey requests were sent to the research panelists (aged 15–79 years) of a large Internet survey company (Rakuten Insight, Inc., <https://insight.rakuten.co.jp/>). The total number of the registered panel was over 2.2 million and comprised individuals with wide range of sociodemographic backgrounds to be nationally representative. Panel members were registered from whole across the country. Potential participants were selected by each sex, age and prefecture category (covering all 47 prefectures) using a simple random sampling representative of the official Japanese demographic composition as of October 1, 2019. The panelists who consented to participate in the survey, accessed the designated website and responded to the survey. The panelists had the option to not respond to any part of the questionnaire and the option to discontinue the survey at any point. This study reached 224 389 participants using

a stratified sampling for gender, age, and each prefecture. The survey was closed when the target numbers of respondents for each sex, age, and prefecture category were met. The participation rate for the survey was 12.5% (28 000 of 224 389).

2.2 | Management of data quality

To validate data quality, we excluded respondents showing discrepancies and/or artificial/unnatural responses.²¹ Three question items of “Please choose the second from the bottom,” “choosing positive in all of a set of questions for using drugs” and “choosing positive in all of a set of questions for having chronic diseases” were used to detect any discrepancies ($n = 1955$, $n = 476$, $n = 187$, respectively). We excluded respondents with discrepancies or artificial/unnatural responses (remaining $n = 25 482$).

2.3 | Participants

The study sample was selected only from employees based on the question about current job situations. We excluded self-employed, students, retired, housewives, and not employed from the sample ($n = 1733$, $n = 1751$, $n = 1065$, $n = 4197$, $n = 3015$, respectively). In addition, those who indicated their worked hours per week was 0 in the last month were excluded ($n = 447$). Those whose age ranged between 20 and 65 were selected to generate evidence for representative sample of working population in Japan. The total of 1025 participants were excluded due to the limitation of the age.

2.4 | Measurement variables

2.4.1 | Employment status

Employment status was defined into the categories permanent and temporary. Permanent employment included full-time managers and general employees. Temporary employment included temporary staff, contract employees, and employees with part-time jobs.

2.4.2 | Suicidal ideation

Suicidal ideation was measured using one item: “Have you ever wanted to die from April 2020 to the present?” The response options were “1. Experienced for the first time,” “2. It has been around for a long time,” and “3. Not”. Persistent suicidal ideation that began prior to the

pandemic was defined as Yes (2). Newly developed suicidal ideation in the COVID-19 pandemic was defined as Yes (1).

2.4.3 | Covariates

Occupational variables

Self-reported working hours per week in the last month was categorized as: <20 h, 20–39 h, 40–59 h, and over 60 h. Job demand and control were measured by the corresponding items of the Brief Job Stress Questionnaire (BJSQ).²² Answer options were provided by a 4-point rating scale. Four items of job demand and three items of job control were used as covariates (with possible score ranges of 4–16 and 3–12, respectively). Job demand included the items: “I have an extremely large amount of work to do,” “I can’t complete work in the required time,” “I have to work as hard as I can,” and “I have to pay very careful attention.” Job control included the items: “I can work at my own pace,” “I can choose how and in what order to do my work,” and “I can reflect my opinions on workplace policy.” Company size, consisting of the total number of employees in their company (not including the grouped companies), was classified into four groups: more than 1000, 300–999, 50–299, or less than 50 employees per company/organization. The type of industry was classified into 14 groups: public office; forestry and mining; construction; manufacturing; electricity/gas/water supply; information and technology; transportation, retail and wholesale; finance and insurance; real estate; drinking/eating/hotel; medical and welfare; education; and others. Occupational type was categorized into non-manual (i.e., office work) and manual (e.g., sales, physical work).

Demographic variables

Age (categorized: 20–29, 30–39, 40–49, 50–65), gender, educational attainment (high school, vocational/college, over undergraduate), and marital status were measured as demographic variables. History of psychiatric disease was measured by two items about past medical history of depression or psychiatric disease other than depression. The authors defined history if respondents answered “Yes” on either item. Annual income in the fiscal year of 2019 was measured by 20 response options.

2.5 | Statistical analysis

The difference in prevalence of persistent suicidal ideation and newly developed suicidal ideation in the COVID-19 pandemic was analyzed using chi square test by demographic and occupational variables. Factors associated

with suicidal ideation were analyzed using multinomial logistic regression, where responses of newly developed and persisted suicidal ideations each against that of "none of suicidal ideation" were modeled, including employment status, sex, age category, marital status, education, company size, industries, and a history of psychiatric diseases as explanation variables. For sensitivity analysis, the same analysis stratified by gender was conducted. Statistical significance was set as a two-sided $P < .05$. SPSS 26.0. Japanese version (IBM Corp) was used.

The study was reviewed and approved by the Research Ethics Committee of the Osaka International Cancer Institute (no. 20084) and by the Research Ethics Committee of Graduate School of Medicine/Faculty of Medicine, The University of Tokyo (no. 2020336NI).

3 | RESULTS

Among the whole sample of 28 000, a total of 12 249 employees were included in the analysis based on the eligibility criteria. The participants' characteristics are shown in Table 1. The mean age was 43.3 (SD = 11.7). Permanent employment comprised 72.4% of the sample. Most of the participants were working per week for 40–59 h (54.5%), as a full-time employment. History of psychiatric disease was noted by 13.4% of the participants. Table S1 shows the basic characteristics of job and socioeconomic status stratified by employment status, sex and age category. Temporary employees showed low job demand, low job control, less working hours, less education attainment, high proportion of manual workers and psychiatric disease. Of the variable household annual income, 16% were categorized as missing. Table S2 shows the distribution of industry participants employed stratified by employment status, sex and age category.

Prevalence of suicidal ideation is shown in Table 2. As a whole sample, the prevalence of persistent suicidal ideation, 8.5% ($n = 1041$), and of newly developed suicidal ideation in the COVID-19 pandemic was 3.2% ($n = 388$). Temporary employment showed statistically significant high persistent and newly developed suicidal ideation compared to permanent employment (10.3% vs. 7.8%; $P < .001$, 3.6% vs. 3.0%; $P = .046$, respectively). For both persistent and newly developed suicidal ideation there were several significant differences of high prevalence (female, young age, single, history of psychiatric disease, high job demand, and low job control). As for working hours, the prevalence of both ideations was significantly high in participants working 20–39 h per week and significantly low in those 40–59 h.

Table 3 shows the odds ratio for two types of suicidal ideation. Temporary employment showed significant

TABLE 1 Participants' characteristics ($N = 12\,249$)

Variables [possible range]	<i>N</i> (%)	Mean (SD) [min–max]
Employment status		
Permanent	8872 (72.4)	
Officers	668 (7.5)	
Employed managers	1789 (20.2)	
General employees	6424 (72.4)	
Temporary	3377 (27.6)	
Temporary staff	303 (9.0)	
Contract workers	812 (24.0)	
Part-time workers	2262 (67.0)	
Gender		
Male	7095 (57.9)	
Female	5154 (42.1)	
Age		43.29 (11.70) [20–65]
20–29 years old	1982 (16.2)	
30–39 years old	2660 (21.7)	
40–49 years old	3568 (29.1)	
50–65 years old	4039 (33.0)	
Marital status		
Married	7064 (57.7)	
Single	5185 (42.3)	
Education attainment		
High school/others	2912 (23.8)	
Vocational/college	2784 (22.7)	
4-year university or more	6553 (53.5)	
Company size		
<50 employees	4065 (33.2)	
50–299 employees	3128 (25.5)	
300–999 employees	1759 (14.4)	
≥1000 employees/public sector	3297 (26.9)	
Industry		
Public office	937 (7.6)	
Forestry and mining	53 (0.4)	
Construction	670 (5.5)	
Manufacturing	2311 (18.9)	
Electricity, gas, water supply	182 (1.5)	
Information and technology	681 (5.6)	
Transportation	564 (4.6)	
Retail and wholesale	1333 (10.9)	
Finance and insurance	584 (4.8)	
Real estate	222 (1.8)	

TABLE 1 (Continued)

Variables [possible range]	N (%)	Mean (SD) [min-max]
Drinking, eating, hotel	449 (3.7)	
Medical and welfare	1553 (12.7)	
Education	615 (5.0)	
Others	2095 (17.1)	
History of psychiatric disease		
Yes	1636 (13.4)	
No	10 613 (86.6)	
Occupational type		
Non-manual	6180 (50.5)	
Manual	6069 (49.5)	
Working hours/week		
<20 h	1255 (10.2)	
20–39 h	3621 (29.6)	
40–59 h	6677 (54.5)	
>60 h	696 (5.7)	
Job demand [4–16] ^a		10.08 (3.16) [4–16]
Job control [3–12] ^a		7.66 (2.24) [3–12]

^aHigher scores indicated low job demand and high control.

associations with persistent suicidal ideation, after adjusting the covariates (adjusted odds ratio [aOR] = 1.36 [95% confidence interval, CI: 1.16–1.59]; $P < .001$). No significant associations were found in newly developed suicidal ideation (aOR = 1.10 [0.85–1.42]; $P = .457$).

For persistent suicidal ideation, the factors significantly associated were being young (20–29 years old: aOR = 1.99 [1.62–2.46], 30–39 years old: aOR = 1.73 [1.42–2.10], 40–49 years old: aOR = 1.52 [1.26–1.82]), being single (aOR = 1.82 [1.58–2.10]), working in some specific industries (electricity/gas/water supply: aOR = 1.87 [1.10–3.17], transportation: aOR = 1.49 [1.02–2.20]) and history of psychiatric disease (aOR = 4.99 [4.33–5.76]). The crude associations were found in being female, employed in a <50 employees sized company and employed in drinking/eating/hotel business industry; however, these factors turned into no significance after adjusting covariates.

For newly developed suicidal ideation in the COVID-19 pandemic, factors significantly associated after adjusting covariates were being young (20–29 years old: aOR = 3.40 [2.41–4.79], 30–39 years old: aOR = 2.86 [2.08–3.93], 40–49 years old: aOR = 1.94 [1.42–2.66]) compared with over 50 years old, working in drinking/eating/hotel business industry (aOR = 2.08 [1.11–3.90]) compared to the public officers and history of psychiatric disease (aOR = 5.36 [4.31–6.67]). The crude associations were found in being female, being single, employed in a 300 to

999-employee-sized company and employed in medical and welfare; however, these factors turned into no significance after adjusting covariates.

The odds ratio for two types of suicidal ideation stratified by gender is presented in Table 4. For persistent suicidal ideation, 20–29, 30–39, 40–49 years old, being single, and history of psychiatric disease were associated with high ideation after adjusting covariates in both men and women. Only in women, temporary employment was associated with persistent suicidal ideation. For newly developed suicidal ideation, 20–29 and 30–39 years old, and history of psychiatric disease were associated with high ideation after adjusting covariates in both men and women. Transportation industry in men and 40–49 years old in women were also associated.

4 | DISCUSSION

This was the first study to examine the impact of temporary work on suicidal ideation by using a large-scale nationwide survey in Japan. Temporary employment showed significant associations with persistent suicidal ideation, after adjusting the covariates (Table 3). On the other hand, no significant associations were found in newly developed suicidal ideation after adjusting the covariates while temporary employment showed significant associations in crude model (Table 3). From the results of sensitivity analysis, temporary employment was associated with persistent suicidal ideation, only in women (Table 4). This result coincided with previous reports conducted before COVID-19, which found that precarious employment was associated with suicidal ideation.^{6–10} Most reasonable discussion is that having a precarious job and its instability may cause mental health deterioration. In addition to economic instability, another possible effect of having an instable job may be “thwarted belongingness,” based on the interpersonal-psychological theory of suicidal behavior.²³ Workplace injustice and disparities with permanent employees (lack of sick leave, low salaries, etc.) might make temporary employees more likely to feel isolated. Regarding the gender difference, our findings suggested women with temporary employment increased the persistent suicidal ideation compared to those with permanent employment. This result was not in line with the findings of a previous study in Japan, showing temporary employment decreased the risk for suicidal ideation only in women.¹¹ The literature¹¹ discussed that lower levels of organizational commitment and low job stress (e.g., low interpersonal conflicts, short working hours) may be protective for suicidal ideation in women.¹¹ But the background of women with temporary job possibly

TABLE 2 Prevalence of suicidal ideation in August 2020 among employees in Japan ($N = 12\,249$)

	Total N	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
		N (%)	P -value ^a	N (%)	P -value ^a
Total	12 249	1041 (8.5)		388 (3.2)	
Employment status			<.001**		.046*
Permanent	8872	692 (7.8)		266 (3.0)	
Temporary	3377	349 (10.3)		122 (3.6)	
Gender			.042*		<.001**
Male	7095	575 (8.1)		192 (2.7)	
Female	5154	466 (9.0)		196 (3.8)	
Age			<.001**		<.001**
20–29 years old	1982	243 (12.3)		98 (4.9)	
30–39 years old	2660	249 (9.4)		111 (4.2)	
40–49 years old	3568	317 (8.9)		114 (3.2)	
50–65 years old	4039	232 (5.7)		65 (1.6)	
Marital status			<.001**		<.001**
Married	7064	419 (5.9)		191 (2.7)	
Single	5185	622 (12.0)		197 (3.8)	
Education attainment			.605		.210
High school	2912	254 (8.7)		101 (3.5)	
Vocational/college	2784	244 (8.8)		96 (3.4)	
4-year university or more	6553	543 (8.3)		191 (2.9)	
Company size			.157		.143
<50 employees	4065	368 (9.1)		125 (3.1)	
50–299 employees	3128	275 (8.8)		97 (3.1)	
300–999 employees	1759	146 (8.3)		71 (4.0)	
≥1000 employees/public sector	3297	252 (7.6)		95 (2.9)	
Industry			.075		.055
Public office	937	65 (6.9)		21 (2.2)	
Forestry and mining	53	6 (11.3)		3 (5.7)	
Construction	670	59 (8.8)		22 (3.3)	
Manufacturing	2311	181 (7.8)		64 (2.8)	
Electricity, gas, water supply	182	23 (12.6)		7 (3.8)	
Information and technology	681	65 (9.5)		18 (2.6)	
Transportation	564	57 (10.1)		20 (3.5)	
Retail and wholesale	1333	118 (8.9)		40 (3.0)	
Finance and insurance	584	40 (6.8)		14 (2.4)	
Real estate	222	19 (8.6)		6 (2.7)	
Drinking, eating, hotel	449	51 (11.4)		25 (5.6)	
Medical and welfare	1553	127 (8.2)		62 (4.0)	
Education	615	49 (8.0)		16 (2.6)	
Others	2095	181 (8.6)		70 (3.3)	
History of psychiatric disease			<.001**		<.001**

TABLE 2 (Continued)

	Total <i>N</i>	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
		<i>N</i> (%)	<i>P</i> -value ^a	<i>N</i> (%)	<i>P</i> -value ^a
Yes	1636	386 (23.6)		146 (8.9)	
No	10 613	655 (6.2)		242 (2.3)	
Working hours/week			.001*		.045*
<20 h	1255	122 (9.7)		41 (3.3)	
20–39 h	3621	350 (9.7)		133 (3.7)	
40–59 h	6677	516 (7.7)		187 (2.8)	
>60 h	696	53 (7.6)		27 (3.9)	
Job demand			<.001**		<.001**
High	5790	623 (10.8)		249 (4.3)	
Low	6459	418 (6.5)		139 (2.2)	
Job control			<.001**		<.001**
High	4932	307 (6.2)		126 (2.6)	
Low	7317	734 (10.0)		262 (3.6)	

^a*P* value for difference was calculated by the chi square test for variables compared to the response of “none”.

P* < .05; *P* < .01.

changed over the time since the previous study conducted. Governmental report presented that women make up the two-third of the temporary employees in Japan and large number of temporary employees who like to upgrade their job to permanent position were more in women than men.²⁴ Female employment, however, faced the disadvantages under the economically unstable situation due to COVID-19. That “status inconsistency”²⁵ may cause perceived isolation and less belongingness, affecting the study findings. However, this study did not take their willingness to the job. Further study will be needed to examine the status inconsistency and suicidal ideation.

There was no significant difference in the newly developed suicidal ideation between temporary and permanent employees (Table 3). This result did not suggest that the COVID-19 pandemic increased suicidal ideation among temporary employees. The findings echoed previous studies showing mental health in temporary employees was not deteriorated in the COVID-19 pandemic.^{4,5} Other job characteristics and personal circumstances may be more important factors regarding vulnerability in response to COVID-19. As recent studies have suggested, regardless of the employment contract present, “working” provided a better outcome compared to unemployment or loss of job in the COVID-19 pandemic.^{3–5} A possible reason for finding no significant association with newly developed suicidal ideation may be that the pandemic has been more burdensome based on personal background (e.g., age, family) or industry than on employment status. Although

the economic situation has been worsened, it is unclear whether temporary employees are unique to be disadvantaged workers in such a situation.

For persistent suicidal ideation, the factors significantly associated were being young, being single, working in some specific industries (electricity/gas/water supply, transportation) and history of psychiatric disease after adjusting covariates (Table 3). Being single has been known as a risk factor of suicidal ideation regardless of COVID-19.²⁶ Especially under COVID-19, people with less family support might be more affected by “thwarted belongingness” by losing ties with non-family members. A previous population-level survey in the United States (2016) indicated five industry groups that showed significantly high suicide rates: (i) Mining, Quarrying, and Oil and Gas Extraction, (ii) Construction, (iii) Other Services (e.g., automotive repair), (iv) Agriculture, Forestry, Fishing, and Hunting, and (v) Transportation and Warehousing.²⁷ Our findings partially confirm this report. The possible reasons may be that employees in such industries are required to have relatively low skills and face fluctuating economic situations.²⁸ Another possible reason may be high exposure to infection. The employees in such industries can be regarded as essential workers. Although workplace measures responding to COVID-19 were associated with good mental health and high job performance,²⁹ less measures were implemented for some workers, especially in the transportation industry.³⁰

For newly developed suicidal ideation in the COVID-19 pandemic, factors significantly associated were being

TABLE 3 Odds ratio for suicidal ideation among Japanese employees in the COVID-19 pandemic (August 2020) by using multinomial logistic regression analysis ($N = 12\ 249$)

	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic		Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
	Crude		Crude		Adjusted**		Adjusted**	
	OR	95% CI	OR	OR	OR	95% CI	OR	95% CI
Employment status								
Permanent	1.00	-	1.00	1.00	1.00	-	1.00	-
Temporary	1.37	1.20–1.57	1.36	1.36	1.25	1.00–1.55	1.10	0.85–1.42
Gender								
Male	1.00	-	1.00	1.00	1.00	-	1.00	-
Female	1.14	1.01–1.30	0.95	0.95	1.44	1.17–1.76	1.24	0.98–1.57
Age								
50–65 years old	1.00	-	1.00	1.00	1.00	-	1.00	-
40–49 years old	1.63	1.37–1.94	1.52	1.52	2.09	1.54–2.85	1.94	1.42–2.66
30–39 years old	1.75	1.45–2.10	1.73	1.73	2.78	2.04–3.79	2.86	2.08–3.93
20–29 years old	2.39	1.98–2.89	1.99	1.99	3.44	2.50–4.73	3.40	2.41–4.79
Marital status								
Married	1.00	-	1.00	1.00	1.00	-	1.00	-
Single	2.19	1.93–2.50	1.82	1.82	1.53	1.25–1.87	1.11	0.89–1.38
Education attainment								
4-year university or more	1.00	-	1.00	1.00	1.00	-	1.00	-
Vocational/college	1.07	0.91–1.25	1.06	1.06	1.20	0.93–1.54	1.18	0.90–1.55
High school	1.07	0.91–1.24	1.03	1.03	1.20	0.94–1.54	1.30	0.99–1.70
Company size								
≥1000 employees	1.00	-	1.00	1.00	1.00	-	1.00	-
300–999 employees	1.11	0.90–1.37	1.05	1.05	1.43	1.05–1.96	1.32	0.95–1.82
50–299 employees	1.17	0.98–1.40	1.10	1.10	1.09	0.82–1.46	0.98	0.73–1.33
<50 employees	1.21	1.02–1.43	1.15	1.15	1.09	0.83–1.43	0.95	0.71–1.28
Industry								
Public office	1.00	-	1.00	1.00	1.00	-	1.00	-
Forestry and mining	1.79	0.73–4.35	1.51	1.51	2.76	0.79–9.62	2.68	0.75–9.59
Construction	1.31	0.91–1.89	1.29	1.29	1.51	0.82–2.78	1.58	0.84–2.95
Manufacturing	1.15	0.85–1.54	1.10	1.10	1.26	0.76–2.07	1.24	0.75–2.06
Electricity, gas, water supply	1.98	1.19–3.29	1.87	1.87	1.87	0.78–4.47	1.84	0.76–4.48
Information and technology	1.42	0.99–2.04	1.27	1.27	1.22	0.64–2.31	1.18	0.62–2.26
Transportation	1.53	1.06–2.22	1.49	1.49	1.66	0.89–3.10	1.79	0.95–3.39
Retail and wholesale	1.31	0.96–1.80	1.13	1.13	1.38	0.81–2.36	1.28	0.73–2.23
Finance and insurance	0.99	0.66–1.49	1.02	1.02	1.07	0.54–2.12	1.10	0.55–2.20

TABLE 3 (Continued)

	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic		Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
	Crude		Crude		Adjusted ^a		Adjusted ^a	
	OR	95% CI	OR	OR	OR	95% CI	OR	95% CI
Real estate	1.26	0.74–2.15	1.19	1.19	1.23	0.49–3.10	1.26	0.49–3.22
Drinking, eating, hotel	1.79	1.22–2.63	1.25	1.25	2.72	1.50–4.91	2.08	1.11–3.90
Medical and welfare	1.22	0.89–1.66	1.11	1.11	1.84	1.11–3.04	1.66	0.98–2.82
Education	1.17	0.79–1.72	1.11	1.11	1.18	0.61–2.28	1.31	0.67–2.58
Others	1.29	0.96–1.73	1.05	1.05	1.54	0.94–2.52	1.42	0.85–2.37
History of psychiatric disease								
No	1.00	-	1.00	1.00	1.00	-	1.00	-
Yes	5.19	4.51–5.97	4.99	4.99	5.31	4.28–6.58	5.36	4.31–6.67

Abbreviations: CI, confidence interval; OR, odds ratio.

^aAdjusted for sex, age category, marital status, education, company size, industries, and history of psychiatric disease.

young, working in drinking/eating/hotel business industry and history of psychiatric disease after adjusting covariates (Table 3). Recent studies also have suggested young people are at risk of increased suicidal ideation and suicide under the COVID-19 pandemic.^{16,18} Young people are regarded as a mentally vulnerable and socioeconomically disadvantaged (e.g., low social support) population in the pandemic.^{31,32} Employers should pay attention to young employees affected by the impacts of the pandemic. Drinking/eating/hotel businesses may be affected by the economic impacts due to governmental restriction. They may temporarily have reduced working hours, leading to feelings of isolation, fear of job loss, and immediate financial pressure.³³ Exposure to infection has also burdened service sectors in face-to-face jobs that cannot be done from home.³³ Newly developed suicidal ideation in drinking/eating/hotel businesses may reflect the current severe situation among employees in that industry. To be mentioned, this association was not found in sensitivity analysis stratified by gender (Table 4). In men, transportation industry was associated with newly developed suicidal ideation. Employees in transportation industry were known to show greater depression,^{34,35} due to inappropriate job environment. COVID-19 may impact on job demand and increase the disparity in job environment (e.g., job insecurity, lack of reward). Workers with history of psychiatric disease were found at risk of newly developed suicidal ideation (Table 3). Previous studies reported that individuals with a history of mental health diagnosis showed high levels of depressive, anxiety, and trauma-related symptoms in the pandemic. The study indicated

that such history was most likely to be associated with a worsened outcome among all other covariates (e.g., age, sex, income, job loss).³⁶ In the COVID-19 pandemic, employees with history of psychiatric concerns might need additional support.

This study did not find significant association between sex, education and company size and suicidal ideation (Table 3). However, many previous studies have already revealed that females have been more affected by the pandemic in physical and mental health.^{16,32} Besides, the cohort study of employees in Japan showed less educated employees longitudinally showed mental health deterioration.³⁷ Employers and occupational health staff should closely monitor those potentially vulnerable employees. In Japan, past economic crisis has increased suicide among working-aged males, especially managers and specialists.^{38,39} However, this COVID-19 pandemic presented a different pattern of suicide: increased among participants who are female and those who are young whose lives and economic situations have been highly affected by the pandemic.²⁰

5 | LIMITATION

This study has several limitations. Although this study was cross-sectional and it was impossible to draw a conclusion about a causal association, this study tried to resolve development of suicide ideation along with time scale. The time-relationship between the job status and outcome was not able to be concluded in this study because the outcome

TABLE 4 Odds ratio for suicidal ideation among Japanese employees in the COVID-19 pandemic (August 2020) by using multinomial logistic regression analysis ($N = 12\ 249$).

	Total N	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic		Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
		Crude		Crude		Adjusted ^a		Adjusted ^a	
		OR	95% CI	OR	OR	OR	95% CI	OR	95% CI
Men ($n = 7095$)									
Employment status									
Permanent	6213	1.00	-	6213	1.00	-	-	1.00	-
Temporary	882	1.51	1.20–1.90	882	1.20	0.80–1.82	0.89–1.49	1.02	0.65–1.60
Age									
50–65 years old	1591	1.00	-	1591	1.00	-	-	1.00	-
40–49 years old	2018	1.70	1.34–2.17	2018	1.52	0.98–2.34	1.24–2.05	1.45	0.93–2.26
30–39 years old	1591	1.96	1.52–2.51	1591	2.67	1.77–4.02	1.49–2.51	2.82	1.85–4.30
20–29 years old	1066	2.97	2.30–3.83	1066	3.11	2.01–4.82	1.76–3.09	3.15	1.96–5.09
Marital status									
Married	4444	1.00	-	4444	1.00	-	-	1.00	-
Single	2651	2.41	2.03–2.86	2651	1.48	1.11–1.98	1.53–2.26	1.07	0.77–1.48
Education attainment									
4-year university or more	4590	1.00	-	4590	1.00	-	-	1.00	-
Vocational/college	980	1.14	0.89–1.45	980	1.10	0.72–1.67	0.83–1.40	1.11	0.72–1.71
High school	1525	1.04	0.84–1.29	1525	1.08	0.76–1.53	0.83–1.31	1.20	0.83–1.76
Company size									
≥1000 employees	2244	1.00	-	2244	1.00	-	-	1.00	-
300–999 employees	1077	1.23	0.94–1.62	1077	1.40	0.92–2.13	0.88–1.55	1.31	0.86–2.02
50–299 employees	1813	1.28	1.01–1.61	1813	1.25	0.86–1.81	0.91–1.48	1.11	0.76–1.64
<50 employees	1961	1.28	1.02–1.60	1961	0.78	0.52–1.18	0.94–1.55	0.73	0.47–1.13
Industry									
Public office	690	1.00	-	690	1.00	-	-	1.00	-
Forestry and mining	35	1.44	0.42–4.90	35	3.25	0.70–15.04	0.34–4.18	3.85	0.81–18.28
Construction	439	1.25	0.79–1.99	439	1.74	0.81–3.75	0.77–2.04	2.12	0.96–4.68
Manufacturing	1754	1.26	0.89–1.79	1754	1.30	0.69–2.44	0.85–1.75	1.34	0.70–2.53
Electricity, gas, water supply	132	1.78	0.95–3.36	132	2.16	0.75–6.16	0.83–3.12	2.30	0.79–6.74
Information and technology	524	1.70	1.12–2.58	524	1.50	0.70–3.21	0.98–2.32	1.57	0.72–3.42
Transportation	437	1.39	0.88–2.20	437	2.29	1.11–4.74	0.85–2.19	2.67	1.27–5.64
Retail and wholesale	634	1.29	0.85–1.96	634	1.20	0.56–2.57	0.80–1.93	1.46	0.67–3.19
Finance and insurance	300	0.77	0.42–1.41	300	0.87	0.31–2.46	0.48–1.66	1.09	0.38–3.13
Real estate	136	1.30	0.65–2.58	136	1.20	0.34–4.27	0.70–2.92	1.72	0.47–6.29
Drinking, eating, hotel	151	2.17	1.23–3.84	151	2.32	0.87–6.22	0.84–2.85	2.50	0.89–6.99
Medical and welfare	546	1.25	0.80–1.93	546	1.91	0.93–3.9	0.70–1.77	1.95	0.93–4.10

TABLE 4 (Continued)

	Total <i>N</i>	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic		Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
		Crude		Crude		Adjusted ^a		Adjusted ^a	
		OR	95% CI	OR	OR	OR	95% CI	OR	95% CI
Education	303	1.51	0.92–2.48	303	1.65	0.70–3.9	0.85–2.42	1.92	0.79–4.66
Others	1014	1.36	0.93–1.98	1014	1.51	0.78–2.94	0.76–1.69	1.66	0.84–3.32
History of psychiatric disease									
No	6141	1.00	-	6141	1.00	-	-	1.00	-
Yes	954	4.73	3.92–5.71	954	5.27	3.90–7.12	3.93–5.80	5.59	4.10–7.61
Women (<i>n</i> = 5154)									
Employment status									
Permanent	2659	1.00	-	1.00	-	1.00	-	1.00	-
Temporary	2495	1.27	1.05–1.54	1.03	0.77–1.37	1.51	1.21–1.88	1.11	0.80–1.54
Age									
50–65 years old	1619	1.00	-	1.00	-	1.00	-	1.00	-
40–49 years old	1550	1.53	1.18–1.98	2.80	1.79–4.41	1.38	1.06–1.81	2.58	1.63–4.08
30–39 years old	1069	1.51	1.14–2.00	2.93	1.82–4.73	1.46	1.08–1.97	2.94	1.80–4.81
20–29 years old	916	1.80	1.36–2.39	3.75	2.33–6.01	1.63	1.19–2.23	3.82	2.30–6.35
Marital status									
Married	2620	1.00	-	1.00	-	1.00	-	1.00	-
Single	2534	1.92	1.57–2.33	1.45	1.09–1.94	1.81	1.46–2.24	1.19	0.87–1.63
Education attainment									
4-year university or more	1963	1.00	-	1.00	-	1.00	-	1.00	-
Vocational/college	1804	0.95	0.76–1.19	1.05	0.75–1.48	1.02	0.80–1.31	1.25	0.86–1.80
High school	1387	1.02	0.81–1.30	1.18	0.83–1.69	1.00	0.76–1.31	1.42	0.96–2.10
Company size									
≥1000 employees	1053	1.00	-	1.00	-	1.00	-	1.00	-
300–999 employees	682	0.91	0.64–1.28	1.38	0.86–2.24	0.91	0.64–1.31	1.30	0.79–2.13
50–299 employees	1315	0.98	0.74–1.30	0.86	0.55–1.36	1.02	0.76–1.39	0.83	0.52–1.33
<50 employees	2104	1.03	0.80–1.33	1.17	0.79–1.74	1.08	0.81–1.43	1.13	0.74–1.72
Industry									
Public office	247	1.00	-	1.00	-	1.00	-	1.00	-
Forestry and mining	18	2.22	0.59–8.37	1.95	0.23–16.68	1.95	0.47–8.18	1.75	0.19–15.76
Construction	231	1.31	0.71–2.42	1.10	0.41–2.99	1.24	0.65–2.36	1.04	0.37–2.92
Manufacturing	557	0.91	0.53–1.57	1.22	0.53–2.78	0.82	0.46–1.46	1.13	0.49–2.65
Electricity, gas, water supply	50	2.40	1.02–5.62	1.40	0.29–6.83	2.37	0.97–5.79	1.40	0.28–7.06
Information and technology	157	0.80	0.38–1.72	0.77	0.23–2.60	0.70	0.32–1.53	0.64	0.19–2.22
Transportation	127	1.98	1.03–3.81	0.52	0.11–2.49	1.89	0.95–3.77	0.50	0.10–2.46
Retail and wholesale	699	1.15	0.69–1.92	1.17	0.52–2.62	0.94	0.54–1.63	1.01	0.44–2.33
Finance and insurance	284	1.04	0.57–1.91	0.98	0.37–2.59	1.02	0.54–1.92	0.95	0.35–2.55

(Continues)

TABLE 4 (Continued)

	Total N	Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic		Persistent suicidal ideation		Newly developed suicidal ideation in COVID-19 pandemic	
		Crude		Crude		Adjusted ^a		Adjusted ^a	
		OR	95% CI	OR	OR	OR	95% CI	OR	95% CI
Real estate	86	1.11	0.47–2.61	1.09	0.28–4.22	0.87	0.35–2.14	0.83	0.21–3.33
Drinking, eating, hotel	298	1.35	0.75–2.40	2.10	0.90–4.88	0.99	0.53–1.85	1.58	0.65–3.85
Medical and welfare	1007	1.00	0.61–1.66	1.33	0.62–2.88	0.99	0.58–1.68	1.29	0.58–2.87
Education	312	0.77	0.41–1.44	0.67	0.24–1.88	0.76	0.39–1.47	0.82	0.28–2.35
Others	1081	1.06	0.64–1.73	1.21	0.56–2.62	0.90	0.53–1.53	1.11	0.50–2.46
History of psychiatric disease									
No	4472	1.00	-	1.00	-	1.00	-	1.00	-
Yes	682	5.88	4.76–7.26	5.47	4.03–7.44	5.39	4.35–6.70	5.10	3.73–6.97

Abbreviations: CI, confidence interval; OR: odds ratio.

^aAdjusted for sex, age category, marital status, education, company size, industries, and history of psychiatric disease.

was retrospectively measured and there was a possibility that the job status (i.e., permanent or temporary) was changed over time due to the pandemic. The measurement scale for suicidal ideation was not validated. Newly developed suicidal ideation was measured by asking the firstly recognized suicidal ideation after beginning the COVID-19 pandemic. The impact of COVID-19 cannot be evaluated because of the lack of control. Besides, persistent suicidal ideation may be also influence by COVID-19 due to prolonged negative mood or insufficient factors to improve the ideations. In this study, people with no current suicidal ideation but previous one was not detected. The impact of COVID-19 for suicidal ideation cannot be judged in this study. This study thus cannot conclude the impact of the COVID-19 pandemic on the suicidal ideation among temporary employees. Because the study used a sample recruited from an Internet survey company, selection bias was possible including: having Internet access, relatively high literacy of technology, and motivation for receiving small rewards. Generalizability of the findings to the whole working population is therefore limited. However, this study recruited large participants comprised of almost the same proportions in gender and age (Table 1) from 47 prefectures. Economic situation was not adjusted in this study, which may cause confounding bias. Although the JACSIS study obtained annual income data, there was a relatively high rate of refusal/unknown answers (Table S1). While the experience of the infection may be associated with suicidal ideation in the pandemic, the information of the infection was not available in this study. Finally, the study was conducted at a single point of time during the second wave of the outbreak of COVID-19

in Japan. The findings may be different at other stages of the pandemic and economic situation in Japan.

6 | CONCLUSION

Temporary employment showed significant associations with persistent suicidal ideation, after adjusting the covariates. From the results of sensitivity analysis stratified by gender, this significant associated was remained in women. In addition, the factors significantly associated with persistent suicidal ideation were found to be young, be single, work in some specific industries (electricity/gas/water supply, transportation) and to be with history of psychiatric disease. Although it is unclear whether temporary employees are unique to be disadvantaged workers since the start of the pandemic, many of the factors associated with persistent suicidal ideation were also associated with newly developed. Therefore, continuous support for those with such factors may be needed under the pandemic. A further longitudinal study will be needed to examine the risk of being employed on an unstable occupational contract and workers' suicidal ideation in the prolonged pandemic.

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DISCLOSURE

Approval of the research protocol: The study was reviewed and approved by the Research Ethics Committee of the

Osaka International Cancer Institute (no. 20084) and by the Research Ethics Committee of Graduate School of Medicine/Faculty of Medicine, The University of Tokyo (no. 2020336NI). *Informed consent*: Online informed consent was obtained from all participants with full disclosure and explanation of the purpose and procedures of this study. The panelists had the option to not respond to any part of the questionnaire and the option to discontinue participation in the survey at any point. *Registry and registration number of the study/trial*: N/A. *Animal studies*: N/A. Dr. Nishi reports personal fees from Startia, Inc., personal fees from en-power, Inc., personal fees from MD.net, outside the submitted work. The other authors have no conflicts of interest. The sponsors played no role in the design of the study; in collecting the data or managing the study; in data analysis; in the interpretation of the data; in the preparation, review, or approval of the manuscript; or in the decision to submit the manuscript for publication.

AUTHOR CONTRIBUTIONS

Daisuke Nishi was in charge of this study, supervising the process, and providing his expert opinion on the subject. Natsu Sasaki and Takahiro Tabuchi organized the study design. The questionnaire was created through discussions with collaborators outside of this work. Natsu Sasaki and Mayumi Kataoka analyzed the data. Natsu Sasaki wrote the first draft of the manuscript, and Takahiro Tabuchi, Ryo Okubo, and Ishimaru Tomohiro revised the manuscript critically. All authors approved the final version of the manuscript.

DATA AVAILABILITY STATEMENT

The data used in this study are not available in a public repository because they contain personally identifiable or potentially sensitive patient information. Based on the regulations for ethical guidelines in Japan, the Research Ethics Committee of the Osaka International Cancer Institute has imposed restrictions on the dissemination of the data collected in this study. All data enquiries should be addressed to the person responsible for data management, Dr. Takahiro Tabuchi at the following e-mail address: tabuchitak@gmail.com

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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