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Research Article

Depressive Symptoms and Lifestyle Related Factors in Japanese Employees

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Abstract

Background: The aim of this study was to examine the relationship between depressive symptoms and lifestyle related factors.

Methods: 2,220 employees (1,069 for males and 1,151 for females) in Japan completed the screening test of the Center for Epidemiologic Studies Depression Scale (CES-D). The cutoff point for the CES-D scores was 16 or above (high scorers).

Results: The identified factors that showed significant effect from the binomial multivariate logistic regression for high scorers were as follows: "habits of having breakfast" in all participants; "have good eating habits" in females and all participants; "satisfaction with sleep" in males, females, and all participants; "smoking habits" in females; "daily alcohol consumption" in males and all participants; "hypertension" in females; "periodontal disease" in all participants; "history of medication" in females and all participants.

Conclusion: Healthy lifestyle was found to be a factor related to the depressive symptoms of the Japanese employees.

Introduction

Japan has a high rate of employee suicides [1]. It is important to understand these employees' actual situations and to promote their mental health in the country [2-4]. Many previous studies have reported the relationship between lifestyle and depressive symptoms or that between clinical findings, physical disease, and depressive symptoms [5-8]. Many of these studies reported that people with a poor lifestyle or those suffering from physical diseases tend to show a worse state of mental health, as assessed by the self-reported depression scale. The present study is one of the relatively rare studies that report the relationship between depressive symptoms and lifestyle, clinical findings, and medical history among the same sample of employees. Therefore, the information revealed in this study can be considered useful for future strategies in mental health promotion among employees in occupational settings.

In advance, we hypothesized that employees with a poor lifestyle, those suffering from physical diseases, and those who have a medical history would tend to obtain high scores on the CES-D. The results of this study support our hypotheses. However, though many previous reports have suggested the relationship between physical disease, laboratory findings related to physical diseases, and depressive symptoms, the results of this study have unexpectedly revealed relatively few items that demonstrate a significant relationship between those factors. Furthermore, this study has clearly shown the result of the relationship between the depression scale and lifestyle, rather than physical diseases or clinical findings related to physical diseases; this is a very interesting and important result. This result indicates that it is important to promote research that focuses on lifestyle for the prevention of depressive disorders among employees.

Materials and Methods

The information presented in this report was collected as part of the Northern-Japan Occupational Health Promotion Centers Collaboration Study for Mental Health (NOCS-MH) for the occupational health promotion centers of the six administrative divisions located in the prefectures of northern Japan (Hokkaido, Aomori, Iwate, Miyagi, Akita, and Yamagata prefectures). NOCS-MH investigates stress situations and stress management skills and assesses depressive symptoms in employees. The information on the Akita prefecture was taken from the NOCS-MH. The recruitment for generating employees' responses was conducted as follows. The first step involved recruiting randomly selected employers (random systematic sampling) and then encouraging their employees to answer the survey during the survey period (January–February 2007). For the study, twenty employers from public and private sector companies based in the Akita prefecture were invited, and they agreed to participate in the study. Participation in the survey was voluntary and confidential. The Japan Labour Health and Welfare Organization, which has established occupational health promotion centers in each administrative division, approved the study protocol [4].

This study involved the administration of the CES-D. Each of the 20 items on the CES-D is rated on a four-point scale, ranging from "rarely or never" (value = 0) to "most or all the time" (value = 3) and refers to how often the respondent felt about the item during the previous week. The sum of the response scores ranged from 0 to 60. A cutoff score of 16 conventionally indicates significant current depressive symptomatology. In other words, calibration studies of the CES-D indicate that scores of 16 or above represent "probable" depression symptoms [4, 9]. The study also collected socio-demographic information, including sex, age distribution, and level of education obtained. The questionnaire also collected information about the employees' occupational characteristics (full-time work, managerial class, and job category). The employees had to choose one of the following job categories: clerical or administrative support, professional, sales- or service-related occupation, technical support, and others. The survey included items on the average number of working hours per day ($\leq$8 and >8 hours). Regarding the lifestyle related factors, which were taken into account "the seven lifestyle items in Breslow's index" [10], we set eight items as a style suitable for self-administrative health questionnaires. The following are these items: "habits of having breakfast daily," "have good eating habits (e.g. taking a balanced meal everyday)," "average sleep duration per day (6-8 hours and <6 or >8 hours)," "satisfaction with amount of sleep," "habits of engaging in exercise or sports for good health," "current habits of smoking," "habits of daily alcohol consumption," "habits of doing activities such as recreation and learning outside of work." Regarding clinical evidence or laboratory findings, the questionnaire focused on any indication of the following eight items provided after a health & medical examination: "hypertension," "obesity," "thinness," "diabetes or pre-diabetic state," "intestinal disease," "periodontal disease," "hyperlipidemia," or "liver dysfunction." Regarding medical history, the questionnaire covered "the incident of being admitted to a hospital or visiting a medical institution regularly for treatment within the past one year."

Statistical analyses were performed using SPSS version 11.0J for Windows (SPSS, Tokyo, Japan). Statistical differences for cross tabulations in each category were measured using Pearson's χ^2 statistic. Furthermore, binomial multivariate logistic regressions were performed using a CES-D score (<16 or $\geq$16) as the dependent variable.

Results

Of the 2,976 employees who were administered the questionnaire, 2,684 responded (a response rate of 90.2%). The number of satisfactory responses, excluding those with insufficient data, was 2,220, including 1,069 males and 1,151 females. Mean scores and standard deviations of the CES-D scores for the entire age group were 16.09 ± 8.61 (15.56 ± 8.26 for males and 16.58 ± 8.89 for females). In Table1, a lower mean CES-D score was observed among males than females in many of the categories. In the category of education, the participants with "some tertiary education" had the highest mean CES-D score. A lower mean CES-D score was observed among males with "full-time work" than those with "no full-time work"; however, that was not

Table 1: Numbers, percentages, mean scores, and standard deviations of the CES-D scores according to socio-demographic and employment-related factors of sample.

	Total				Male				Female			
	n	%	Mean	SD	n	%	Mean	SD	n	%	Mean	SD
Total	2220	100	16.09	8.61	1069	100	15.56	8.26	1151	100	16.58	8.89
Age												
-29	415	18.7	17.78	9.50	175	16.41	16.49	8.91	240	20.9	18.71	9.83
30-39	584	26.3	16.10	8.36	269	25.2	15.96	8.09	315	27.4	16.22	8.59
40-49	676	30.5	15.70	8.67	303	28.3	14.95	8.24	373	32.4	16.32	8.97
50-	545	24.5	15.28	7.89	322	30.1	15.30	8.01	223	19.4	15.26	7.73
Education												
Compulsory/senior high school	1299	58.5	15.75	8.01	762	71.3	15.47	7.72	537	46.7	16.14	8.39
Some tertiary education	711	32.0	16.94	9.44	165	15.4	16.42	9.53	546	47.4	17.10	9.41
Graduate degree or higher	185	8.3	15.39	9.42	135	12.6	15.08	9.44	50	4.3	16.22	9.42
Employment status												
Full-time work	1860	83.8	15.97	8.55	973	91.0	15.36	8.00	887	77.1	16.64	9.07
No full-time work	347	15.6	16.87	8.97	87	8.1	17.97	10.70	260	22.6	16.51	8.31
Employee type												
Non-managerial class	1933	87.1	16.24	8.59	865	80.9	15.91	8.34	1068	92.8	16.51	8.79
Managerial class	268	12.1	14.76	8.63	193	18.1	13.75	7.57	75	6.5	17.39	10.49
Job category												
Clerical/administrative	351	15.8	14.24	7.85	205	19.2	14.05	7.76	146	12.7	14.51	8.00
Professional	693	31.2	16.82	9.16	229	21.4	15.13	8.31	464	40.3	17.65	9.45
Sales/service	388	17.5	16.55	8.76	171	16.0	16.66	9.01	217	18.9	16.47	8.58
Technical	444	20.0	16.43	8.51	278	26.0	16.15	8.19	166	14.4	16.88	9.03
Others (on-site workers etc.)	245	11.0	15.50	7.33	133	12.4	15.84	7.28	112	9.7	15.09	7.39
Working hours per day												
$\leq$8h	1317	59.3	15.92	8.59	473	44.2	15.59	8.31	844	73.3	16.10	8.74
>8h	890	40.1	16.33	8.58	588	55.0	15.49	8.08	302	26.2	17.95	9.27

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Table 2: Lifestyle-related factors and the differences between non-high scorers on the CES-D (<16) and high scorers on the CES-D (≥16).

| | Non-high scorers on the CES-D (<16) | | | | | | High scorers on the CES-D (≥16) | | | | | | % of high scorers on the CES-D (≥16) | | |
| | Total (n = 1222) | | Male (n = 626) | | Female (n = 596) | | Total (n = 998) | | Male (n = 443) | | Female (n = 555) | | Total (45.0%) | Male (41.4%) | Female (48.2%) |
	n	%	n	%	n	%	n	%	n	%	n	%	%	%	%
Lifestyle-related factors															
Having breakfast daily (Total**, Male*, Female**)	901	73.7	444	70.9	457	76.7	668	66.9	284	64.1	384	69.2	42.6	39.0	45.7
Good eating habits (Total**, Male**, Female**)	850	69.6	369	58.9	481	80.7	611	61.2	223	50.3	388	69.9	41.8	37.7	44.6
Average sleep duration of "<6 or >8 h" (Total**, Male**)	165	13.5	73	11.7	92	15.4	178	17.8	84	19.0	94	16.9	51.9	53.5	50.5
Satisfaction with sleep (Total**, Male**, Female**)	784	64.2	419	66.9	365	61.2	434	43.5	209	47.2	225	40.5	35.6	33.3	38.1
Exercise or sports for good health (Total*)	269	22.0	168	26.8	101	16.9	183	18.3	100	22.6	83	15.0	40.5	37.3	45.1
Current smoking (Female**)	481	39.4	380	60.7	101	16.9	418	41.9	277	62.5	141	25.4	46.5	42.2	58.3
Daily alcohol consumption (Total**, Male**)	433	35.4	344	55.0	89	14.9	270	27.1	194	43.8	76	13.7	38.4	36.1	46.1
Doing activities such as recreation and learning	261	21.4	152	24.3	109	18.3	183	18.2	91	20.5	92	16.6	41.2	37.4	45.8

Significances representing the differences between non-high scorers on the CES-D and high scorers on the CES-D about the number of cases (Total, Male, Female) for each category (Pearson's χ^2 statistic) *p<0.05, **p<0.01.

Table 3: Presence of clinical findings and the differences between non-high scorers on the CES-D (<16) and high scorers on the CES-D (≥16).

| | Non-high scorers on the CES-D (<16) | | | | | | High scorers on the CES-D (≥16) | | | | | | % of high scorers on the CES-D (≥16) | | |
| | Total (n = 1222) | | Male (n = 626) | | Female (n = 596) | | Total (n = 998) | | Male (n = 443) | | Female (n = 555) | | Total (45.0%) | Male (41.4%) | Female (48.2%) |
	n	%	n	%	n	%	n	%	n	%	n	%	%	%	%
Presence of clinical findings															
Hypertension (Female*)	188	15.4	129	20.6	59	9.9	126	12.6	90	20.3	36	6.5	40.1	41.1	37.9
Obesity	246	20.1	155	24.8	91	15.3	182	18.2	106	23.9	76	13.7	42.5	40.6	45.5
Thinness	39	3.2	23	3.7	16	2.7	41	4.1	22	5.0	19	3.4	51.3	48.9	54.3
Diabetes or pre-diabetic state	59	4.8	45	7.2	14	2.3	53	5.3	38	8.6	15	2.7	47.3	45.8	51.7
Intestinal disease	71	5.8	40	6.4	31	5.2	65	6.5	23	5.2	42	7.6	47.8	36.5	57.5
Periodontal disease (Total*)	44	3.6	24	3.8	20	3.4	57	5.7	28	6.3	29	5.2	56.4	53.8	59.2
Hyperlipidemia	337	27.6	205	32.7	132	22.1	240	24.0	137	30.9	103	18.6	41.6	40.1	43.8
Liver dysfunction	128	10.5	110	17.6	18	3.0	100	10.0	80	18.1	20	3.6	43.9	42.1	52.6
History of medication (Female*)	463	37.9	229	36.6	234	39.3	417	41.8	167	37.7	250	45.0	47.4	42.2	51.7

Significances representing the differences between non-high scorers on the CES-D and high scorers on the CES-D about the number of cases (Total, Male, Female) for each category (Pearson's χ^2 statistic). *p<0.05, **p<0.01.

observed among females. Regarding the job category, a lower mean CES-D score was observed in the category of "clerical/administrative" work, among both males and females. In addition, the participants with "sales/service" work had the highest mean CES-D score in males, while the participants with "professional" work had the highest mean CES-D score in females. A higher mean CES-D score was observed among females with long working hours (>8 hours); however, that was not observed among males. In Table 2, the overall prevalent rate of high scorers on the CES-D was 45.0% (41.4% for males and 48.2% for females) in the present study. Regarding the items of lifestyle-related factors, the significant differences were examined between the participants with high scores on the CES-D (≥16) and others (<16). Regarding the categories of "habits of having breakfast," "have good eating habits," and "satisfaction with sleep," significant differences were observed among males, females, and all participants. Regarding the "average sleep duration per day," significant differences were observed in males and all participants. Regarding the "exercise for health," significant differences were observed in total participants. Regarding "smoking habits," significant differences were observed in females. Regarding "daily alcohol consumption," significant differences were observed in males and all participants. Regarding "recreation," no significant difference was observed. In Table 3,

regarding the items of "presence of clinical findings" or "history of medication," the significant differences were examined between the participants with high scores on the CES-D (≥16) and others (<16). Regarding the "presence of clinical findings," significant differences were observed in female participants with "hypertension" and all participants with "periodontal disease." Regarding the "history of medication," a significant difference was observed in female participants.

In Table 4, binomial multivariate logistic regressions using a CES-D score (<16 or ≥16) as a dependent variable were performed. The adjusted odds ratio (OR) of each category (lifestyle-related factors, presence of clinical findings, and history of medication) was applicable in the case of participants versus others. Regarding the OR for high scorers on the CES-D (16 or above), we obtain the following results. The independent effect of "habits of having breakfast" on the prevalence of high scorers was significant in all participants (OR = 0.78, 95% CI: 0.64–0.95). The independent effect of "good eat habits" on the prevalence of high scorers was significant in females (OR = 0.64, 95% CI: 0.48–0.86) and all participants (OR = 0.75, 95% CI: 0.62–0.91). The independent effect of "satisfaction with sleep" on the prevalence of high scorers was significant in males (OR = 0.49, 95% CI: 0.37–0.64), females (OR = 0.47, 95% CI: 0.36–0.61) and all participants (OR = 0.46, 95% CI: 0.39–0.56). The independent effect of "smoking habits" on the prevalence of high scorers was significant in females (OR = 1.45, 95% CI: 1.06–1.99). The independent effect of "daily alcohol consumption" on the prevalence of high scorers

was significant in males (OR = 0.63, 95% CI: 0.48–0.82) and all participants (OR = 0.64, 95% CI: 0.52–0.78). The independent effect of "hypertension" on the prevalence of high scorers was significant in females (OR = 0.61, 95% CI: 0.38–0.99). The independent effect of "periodontal disease" on the prevalence of high scorers was significant in all participants (OR = 1.53, 95% CI: 1.00–2.34). The independent effect of "history of medication" on the prevalence of high scorers was significant in females (OR = 1.39, 95% CI: 1.07–1.79) and all participants (OR = 1.28, 95% CI: 1.07–1.55).

Discussion and Conclusion

Mental illness, especially depression or the depressive-state, inflicts great psychological distress on individuals and even entire neighborhoods and is a major problem influencing social life. It results in the decline in the functional activity of daily living, a leave of absence from duty, and temporary absences from school. Though depression or the depressive state can easily have serious consequences including suicidal tendency if left unattended, effective therapies such as psychotherapy and medical therapy can help depression patients. In addition, improvement of depressive symptomatology can be possible in many cases [11]. Therefore, it can be said that close attention should be paid to depression from the clinical psychology, psychiatry, and public health viewpoints. Moreover, it is reported that a person in a depressive state often complains of physical symptoms; therefore, depressed patients are often found in the area of general practice (i.e., not psychiatry), and many of these patients are not diagnosed properly with depression by their doctor [12]. In Asian

Table 4: Effects of lifestyle-related factors, presence of clinical findings and history of medication on the prevalence of high scorers on the CES-D (≥16).

	Total			Male			Female		
	OR	95% CI	P- Value	OR	95% CI	P-Value	OR	95% CI	P-Value
Lifestyle-related factors									
Having breakfast daily	0.78	0.64-0.95	<0.05	0.84	0.63-1.11	0.22	0.76	0.57-1.02	0.06
Good eating habit	0.75	0.62-0.91	<0.01	0.78	0.60-1.01	0.06	0.64	0.48-0.86	<0.01
Average sleep duration "<6 or >8 h"	0.99	0.77-1.27	0.925	1.29	0.89-1.87	0.18	0.77	0.54-1.08	0.13
Satisfaction with sleep	0.46	0.39-0.56	<0.01	0.49	0.37-0.64	<0.01	0.47	0.36-0.61	<0.01
Exercise or sports for good health	0.97	0.77-1.22	0.782	1.05	0.76-1.44	0.79	0.95	0.66-1.36	0.78
Current smoking	1.17	0.97-1.42	0.104	1.17	0.89-1.54	0.26	1.45	1.06-1.99	<0.05
Daily alcohol consumption	0.64	0.52-0.78	<0.01	0.63	0.48-0.82	<0.01	0.77	0.54-1.11	0.16
Doing activites such as recreation	0.14	0.66-1.06	0.137	0.82	0.59-1.13	0.23	0.89	0.63-1.26	0.52
Presence of clinical findings									
Hypertension	0.88	0.67-1.15	0.350	1.11	0.79-1.54	0.56	0.61	0.38-0.99	<0.05
Obesity	0.90	0.71-1.14	0.381	0.89	0.66-1.22	0.48	0.96	0.67-1.39	0.84
Thinness	1.07	0.67-1.73	0.772	1.21	0.63-2.30	0.57	0.99	0.47-2.08	0.98
Diabetes or pre-diabetic state	1.35	0.89-2.03	0.157	1.34	0.83-2.17	0.24	1.56	0.70-3.48	0.28
Intestinal disease	1.03	0.71-1.48	0.879	0.88	0.50-1.53	0.64	1.22	0.73-2.02	0.45
Periodontal disease	1.53	1.00-2.34	<0.05	1.65	0.92-2.99	0.10	1.46	0.79-2.70	0.23
Hyperlipidemia	0.94	0.76-1.15	0.531	1.04	0.78-1.38	0.80	0.90	0.66-1.24	0.53
Liver dysfunction	1.04	0.77-1.40	0.794	1.11	0.79-1.57	0.55	1.25	0.63-2.49	0.52
History of medication within the past one year	1.28	1.07-1.55	<0.01	1.12	0.85-1.48	0.44	1.39	1.07-1.79	<0.05

OR, odds ratio; CI, confidence interval; Reference group to which all other categorical variables are capered (binomial multivariate logistic regression).

countries, including Japan, it is said that a tendency to "somatization" (i.e., psychological distress recognized and expressed as a physical symptom) is particularly remarkable [13]. Therefore, it is thought to be important to study the association between psychological distress and physical symptoms. It can be said that these previous reports support the significance of our present research.

Several reports investigated the relationship between depressive symptoms evaluated by CES-D and diabetes, some of which were added in the item regarding lifestyle, influencing both depressive symptoms and diabetes [6-8]. One of these reports is a study examining the bidirectional association between depressive symptoms and type 2 diabetes, using the CES-D score [14].

Several reports point out an association between insomnia and depression [15,16]. There are also some reports from Japan on the relationship between depressive symptoms and sleep state, using the CES-D [17,18]. There is another report on the relationship between lifestyle, as defined by common health habits like sleeping habits, and symptoms of depression [5]. Many of these studies point out sleep disturbances as a risk factor for depression. Moreover, there is a report that examined the relationship between symptoms of depression and hypertension [19,20], and the relationship between obesity and symptoms of depression [21], using the CES-D. Thus, there are many previous reports to suggest that physical abnormal findings and/or physical disease are associated with the symptoms of depression [22-26].

In this study, there were few items where significance was detected regarding clinical findings. Particularly, the items thought to be in close relationship with symptoms of depression, such as obesity and diabetes, were not meaningful in our study. In particular, it is an interesting result that significance was seen in more items regarding lifestyle than clinical findings. It may be said that the importance of lifestyle was proved to be a factor related to the depressive symptom of employees. In addition, though the reasons and/or causations are not entirely clear, the results on the habits of addiction were remarkably different in males and females (i.e., smoking habits were significant in females, and alcohol consumption was significant in males); therefore, it may be said that the sex difference is an important factor.

The limitation of this study lies in its cross-sectional design, which makes it difficult to determine whether the correlation associated with psychological distress is an antecedent or a consequence of depressive symptoms. In order to make inferences with regard to causality, a longitudinal follow-up study will be needed [27]. In addition, because of the self-administered questionnaire survey, subjectivity and the intention of the respondent may be reflected (i.e., there is a possibility that some respondents are reluctant to respond) [9,28,29]. This result suggests that, in future studies, research that focuses on lifestyle will be important for preventing depressive disorders. More detailed investigation will be necessary to clarify this point in the future.

Acknowledgment

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