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Purpose in life and tobacco use among community-dwelling mothers of early adolescents

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ABSTRACT

Objectives The rising prevalence of tobacco use and tobacco-attributable deaths among women is of worldwide concern. In particular, smoking prevention for mothers in early midlife is a significant international public health goal. A higher sense of purpose in life (PIL) is thought to reduce detrimental health behaviours. However, little is known about the association between a sense of PIL and tobacco use. This study investigates this association among community-dwelling mothers of early adolescents.

Design This population-based cross-sectional study uses a self-reported questionnaire from the Tokyo Early Adolescence Survey, a large community-based survey conducted in Japan between 2012 and 2015.

Setting Participants were randomly recruited from the resident registries of three municipalities in Tokyo, Japan.

Participants A total of 4478 children and their primary parents participated. Responses from 4063 mothers with no missing data were analysed (mean age=42.0 years (SD=4.2)).

Measures Participants' tobacco use, including the number of cigarettes smoked per day, was documented using a questionnaire. PIL was assessed using a Purpose in Life scale derived from Ryff's Psychological Well-Being Scale.

Results Greater PIL was associated with a decreased likelihood of tobacco use, even when adjusted for confounders (OR=0.80, 95% CI 0.70 to 0.91). Multinomial logistic regression analyses revealed that PIL was inversely associated with tobacco consumption among mothers. These associations remained after controlling for psychological distress, socioeconomic factors and frequency of alcohol consumption among moderate to heavy smokers (OR=0.70, 95% CI 0.57 to 0.86), while attenuated among light smokers.

Conclusions Increasing PIL may be a valuable intervention for reducing tobacco use among women in early midlife. This study can contribute to our understanding of the psychology of smoking behaviour and shed light on the targeted intervention to reduce tobacco use among early midlife mothers.

Strengths and limitations of this study

- The study investigated the association between a sense of purpose in life (PIL) and tobacco use among community dwelling mothers in early midlife.
- Data were collected from a large community-based sample of mothers in early-middle age, randomly recruited from the resident registries of three municipalities in Tokyo.
- We demonstrated the association between PIL and tobacco use while controlling for confounders, including demographic variables and psychological distress.
- The study adopted a cross-sectional design and was limited to determining a causal relationship between PIL and tobacco use.

INTRODUCTION

The tobacco epidemic is one of the most significant international public health threats. Globally, more than 1 in 10 adult deaths is estimated to be due to tobacco. The WHO is particularly concerned about the possibility that the global increase in deaths due to tobacco is driven by the accelerating rate of tobacco use in women.[1] Smoking prevalence among women is not decreasing, while that among men has been decreasing rapidly during the past three decades in Japan.[2] Tobacco use among women is dramatically increasing among those aged between 30 and 50 years old,[3] and tobacco cessation in early midlife is associated with a substantial decline in mortality risk for women.[4 5] In addition, maternal smoking is the major determinant of child's passive smoking[6] and smoking initiation.[7] Smoking prevention for women, especially mothers, in early midlife, is therefore a significant international public health goal.

We examined the association between purpose in life (PIL) and tobacco use in women in early midlife. PIL is a component of psychological eudaemonic well-being, and refers to the extent to which individuals regard their own life as meaningful.[8]

Previous studies, which have mainly examined elderly populations, have shown that a higher sense of PIL is associated with reduced risk for diseases (eg, Alzheimer's disease,[9] myocardial infarction,[10] stroke,[11] cerebral infarctions[12]) and with better physical function[13] and lower mortality.[14–19] A growing body of research indicates the existence of links between PIL and health behaviours[20] (eg, use of preventive healthcare services,[21] daily exercise,[22–24] maintenance of a healthy diet,[25 26] preventive behaviours for breast cancer).[23] Recent systematic review showed that greater PIL is related to a range of better health outcomes for older adults.[27] The significance of PIL on better health is recently recognised cross-culturally (eg, Ikigai in Japanese). Recent evidence demonstrated that PIL was associated with healthy glucoregulation among Japanese adults,[28] which had also demonstrated in Western countries.[29] In contrast, lower PIL is associated with detrimental health behaviours. Previous research in this area has mainly concentrated on the association between PIL and addiction.[30–33]

Previous studies suggested that interventions and promotions focusing on psychological factors were important for smoking prevention and cessation among women. Meta-analyses have shown that women have more difficulty maintaining long-term smoking cessation than men,[34] and nicotine replacement therapy for smoking cessation is less effective in women than in men, in particular for supporting long-term maintenance of smoking cessation.[35] Another meta-analysis demonstrated that motivational interviewing, which is a psychological approach used to enhance PIL among people with addictive behaviours, could be effective for tobacco cessation.[36]

PIL might be a significant psychological factor for promoting tobacco cessation among women. However, relatively little is known about the association between PIL and tobacco use, with no study to date examining this association in women in early midlife. A previous survey on 341 adults in Hungary[37] demonstrated that daily smokers had lower PIL than non-smokers, although the sample was limited to a small number and did not focus on women in early midlife. In the current study, we hypothesised that PIL is inversely associated with tobacco use among early midlife mothers, even after controlling for demographic variables and the effect of psychological distress. Psychological distress (depression and/or anxiety) often co-occurs with tobacco use.[38–45] Since psychological distress (ill-being) is inversely associated with PIL[8 46 47] and is positively associated with substance abuse,[31 32] it could confound associations between PIL and tobacco use. We also hypothesised that PIL is inversely associated with the amount of tobacco consumption.

METHODS

Study design, sample and survey procedure

This study used data from the Tokyo Early Adolescence Survey (T-EAS)[48 49] which was originally designed as a baseline survey for the Tokyo Teen Cohort, a currently ongoing longitudinal cohort study (http://ttcp.umin.jp/index.html). The T-EAS is a multidisciplinary survey of 10-year-old adolescents and their primary caregivers (98.5% mothers). The T-EAS contains questions about tobacco use, PIL and psychological distress, as well as a variety of other potentially confounding variables. Participants were randomly recruited from the resident registries of three municipalities in Tokyo: Setagaya Ward, Mitaka City and Chofu City. Participants were sent invitation letters on or around the child's 10th birthday. The survey was completed in two home visits. During the first visit, written informed consent from the primary caregiver (generally the mother) was obtained; participants were then asked to complete the questionnaires at home before the second visit. During the second visit, both the adolescent and the primary caregiver were each asked to complete the self-report questionnaires separately. The questionnaires were enclosed in envelopes by the respondents immediately after completion. In addition, the primary caregiver responded to a semistructured interview. All data were collected anonymously. The T-EAS was conducted by three research institutes: Tokyo Metropolitan Institute of Medical Science, The University of Tokyo and SOKENDAI (The Graduate University for Advanced Studies). This survey was approved by the ethics committees of these three institutes.

Participants

A total of 4478 children and their primary parents participated in the T-EAS (response rate 43.8%). We used the primary parent data for the purposes of the current study. Of the 4478 respondents, 68 were men and were hence excluded to focus the investigation on the association between PIL and tobacco use in women. An additional 347 female respondents' data were excluded due to incomplete answers to the questions on tobacco use, PIL, psychological distress or other confounding variables. The final dataset therefore contained data from 4063 respondents.

Measures

Tobacco use

Respondents were asked whether they used tobacco. Those who answered 'yes' were subsequently asked about the number of cigarettes they smoked per day. A binary variable was created ('0: non-smokers' vs '1: smokers'), based on the first question. Respondents were then split into '0: non-smokers', '1: light smokers (less than half a pack (=10 cigarettes) per day)' and '2: moderate to heavy smokers (more than or equal to half a pack per day)', to assess potential dose–response effects.

Purpose in life

PIL was assessed using a 14-item version of the Purpose in Life scale derived from Ryff's Psychological Well-Being scales.[8] The scale included items such as 'I have a sense of direction and purpose in life', and 'My daily activities often seem trivial and unimportant to me' (reverse

coded). Each item was rated on a 6-point Likert scale (1: strongly disagree; 6: strongly agree) and scores were summed, so that continuous scores ranged from 14 to 84. Higher scores indicated a higher sense of PIL.

Psychological distress

Psychological distress was assessed using the K6.[50] This survey contains six items, assessing how frequently during the past 30 days respondents felt: (1) so depressed that nothing could cheer them up, (2) hopeless, (3) restless or fidgety, (4) that everything was an effort, (5) worthless and (6) nervous. Each item was scored on a 5-point Likert scale (0: never; 4: most of the time). Scores were summed, with the resulting raw scores ranging from 0 to 24. Higher scores indicate more frequent psychological distress during the past 30 days.

Other covariates

The following covariates were examined for their potential confounding effects: age, educational attainment, marital status, annual family income and frequency of alcohol consumption. High socioeconomic status (represented by educational attainment and annual family income here) is known to be associated with higher PIL,[46] and socioeconomic disadvantage is a risk factor for tobacco use.[51–54] Educational attainment was coded as follows: '1: junior high school or lower', '2: high school', '3: technical or junior college' and '4: 4-year university or higher'. Marital status was dichotomised as '1: yes' or '0: no', depending on whether the respondent was in a marriage or marriage-like relationship. Family income over the past year was divided into four categories: '1: less than 4 million yen', '2: 4–6 million yen', '3: 7–9 million yen' and '4: over 10 million yen'. Frequency of alcohol consumption was assessed using a 5-point Likert scale (0: do not drink; 4: more than four times a week).

Statistical analyses

Cross tabulation, χ^2 tests and residual analyses were conducted to test the differences between three groups based on the amounts of tobacco used (none, light and moderate to heavy smokers), and covariates in categorical variables as well as analyses of variance (ANOVAs) were used in continuous variables. Correlation coefficients among all variables also examined. We conducted binomial logistic regression analyses (using a binary-dependent variable: non-smokers vs smokers) to test the association between PIL and tobacco use. The PIL score was standardised to report ORs per one SD change of PIL scores. Logistic regression model 1 was unadjusted for covariates; model 2 was adjusted for socioeconomic covariates: age, education, marital status and family income; model 3 was further adjusted for alcohol consumption and finally, model 4 was further adjusted for psychological distress. In order to further examine the relationship between PIL and tobacco use, we conducted multinomial logistic regression analyses to assess the effect of PIL on the degree of tobacco use. Regression models 5–8 were identical to models 1–4, except that the dependent variable was multivariate: non-smokers, light smokers and moderate or heavy smokers.

Patient involvement

Patients were not involved in developing the study hypothesis, recruitment, outcome measures, study design or implementation. Patients were not involved in interpretation or writing up on the results. There are no plans to disseminate the results of the research to study participants or the relevant patient community.

RESULTS

Prevalence of smokers and corresponding descriptive statistics

Of the 4063 respondents (mean age 42.0 years; SD 4.2; 95.8% married; 40.1% achieved a degree from a 4-year university or higher; 8.8% had family income less than 4 million yen), 324 (8.0%) were smokers. A total of 204 (5.0%) were light smokers, 120 (3.0%) were moderate to heavy smokers. X^2 tests and ANOVA indicated that inverse associations were clearly evident between tobacco use and PIL, age, education, marital status and annual family income (table 1). Residual analyses indicated that lower educational attainment (light smokers with junior high school or lower education (adjusted residuals=6.9, p<0.01) and those with high school education (adjusted residuals=6.9, p<0.01); moderate or heavy smokers with junior high school or lower education (adjusted residuals=7.0, p<0.01) and those with high school education (adjusted residuals=7.6, p<0.01)), not being married (light smokers without being married (adjusted residuals=4.8, p<0.01); moderate to heavy smokers without being married (adjusted residuals=8.3, p<0.01)), lower family income (light smokers with the lowest family income (less than 4 million yen) (adjusted residuals=6.1, p<0.01) and those with the second lowest family income (4 to 6 million yen) (adjusted residuals=2.6, p<0.01); moderate to heavy smokers with the lowest family income (adjusted residuals=6.7, p<0.01) and those with the second lowest family income (adjusted residuals=4.7, p<0.01)) and the most frequent alcohol use (light smokers with the most frequent alcohol consumption (more than four times a week) (adjusted residuals=6.6, p<0.01); moderate to heavy smokers with the most frequent alcohol use (adjusted residuals=2.7, p<0.01)) were associated with increasing tobacco use. Psychological distress was higher in smokers than in non-smokers (table 1). On the other hand, the highest alcohol consumption was reported by light smokers (table 1). PIL was positively correlated with age, educational attainment, family annual income while negatively correlated with tobacco consumption and psychological distress (table 2). Tobacco consumption was positively correlated with alcohol consumption and psychological distress while negatively correlated

Table 1 Descriptive statistics for Tokyo Early Adolescence Survey variables broken down by tobacco use

	Non-smokers	Light smokers	Moderate to heavy smokers	P values
N (%)	3739 (92.0)	204 (5.0)	120 (3.0)	
Purpose in life, mean (SD)	57.3 (9.7)	54.8 (9.8)	52.6 (9.9)	<0.001
Age, mean (SD)	42.0 (4.1)	41.2 (5.0)	40.5 (4.8)	<0.001
Education, n (%)				
Junior high school or lower	22 (0.6)	12 (5.9)	9 (7.5)	<0.001
High school	512 (13.7)	66 (32.4)	48 (40.0)	
Technical or junior college	1626 (43.5)	89 (43.6)	51 (42.5)	
4-year university or higher	1579 (42.2)	37 (18.1)	12 (10.0)	
Marital status, n (%)				
Yes	3613 (96.6)	182 (89.2)	97 (80.8)	<0.001
No	126 (3.4)	22 (10.8)	23 (19.2)	
Family annual income, n (%)				
Less than 4 million yen	285 (7.6)	42 (20.6)	31 (25.8)	<0.001
4–6 million yen	1022 (27.3)	74 (36.3)	57 (47.5)	
7–9 million yen	1162 (31.1)	55 (27.0)	21 (17.5)	
More than 10 million yen	1270 (34.0)	33 (16.2)	11 (9.2)	
Alcohol use, n (%)				
Non	1160 (31.0)	44 (21.6)	43 (35.8)	<0.001
Less than once a month	563 (15.1)	35 (17.2)	9 (7.5)	
2–4 times a month	689 (18.4)	24 (11.8)	15 (12.5)	
2–3 times a week	594 (15.9)	21 (10.3)	16 (13.3)	
More than four times a week	733 (19.6)	80 (39.2)	37 (30.8)	
K6 (psychological distress), mean (SD)	2.9 (3.3)	3.4 (3.4)	3.5 (3.9)	0.026

with age, educational attainment, marital status and family annual income (table 2). Age, educational attainment and family annual income were positively correlated among each other. Marital status was positively correlated with educational attainment and family annual income. Psychological distress was positively correlated with age, while negatively correlated with marital status and family annual income (table 2).

Association between PIL and tobacco use

Table 3 shows the binominal ORs for tobacco use compared with no smoking. PIL was strongly inversely associated with tobacco use in the analysis without covariates (model 1). The OR was not attenuated after adjusting for socioeconomic variables (model 2). This was also the case after adjusting for alcohol consumption (model 3) and, finally, for psychological distress (model 4). With regard

Table 2 Correlation coefficients among all variables

		1	2	3	4	5	6	7	8
1	PIL	–	**−0.092*****	**0.034***	**0.147*****	0.006	**0.138*****	0.013	**−0.342*****†
2	Tobacco consumption		–	**−0.067*****	**−0.203*****	**−0.144*****	**−0.172*****	**0.065*****	**0.038***
3	Age			–	**0.048****	0.030	**0.143*****	0.020	**0.055*****
4	Education				–	**0.076*****	**0.323*****	−0.019	−0.023
5	Marital status					–	**0.257*****	−0.003	**−0.054*****
6	Family annual income						–	0.021	**−0.048****
7	Alcohol use							–	−0.006
8	Psychological distress (K6)								–

Spearman's rank correlation coefficients except a correlation between continuous variables (PIL and K6).
Bold: Correlation coefficient is statistically significant.
*P<0.05; **P < 0.01; ***P < 0.001.
†Pearson correlation coefficient.
PIL, purpose in life.

Table 3 Logistic regression coefficients for odds of tobacco use, with and without potential confounding variables

	Model 1		Model 2		Model 3		Model 4	
	OR (95% CI)	P values	OR (95% CI)	P values	OR (95% CI)	P values	OR (95% CI)	P values
Purpose in life	0.71 (0.63 to 0.80)	<0.001	0.81 (0.71 to 0.91)	0.001	0.80 (0.71 to 0.91)	<0.001	0.80 (0.70 to 0.91)	0.001
Age			0.98 (0.95 to 1.00)	0.061	0.97 (0.95 to 1.00)	0.043	0.97 (0.95 to 1.00)	0.044
Education			0.44 (0.38 to 0.52)	<0.001	0.45 (0.38 to 0.52)	<0.001	0.45 (0.38 to 0.52)	<0.001
Marital status			0.41 (0.27 to 0.62)	<0.001	0.41 (0.27 to 0.63)	<0.001	0.41 (0.27 to 0.63)	<0.001
Family income			0.71 (0.62 to 0.82)	<0.001	0.71 (0.62 to 0.81)	<0.001	0.71 (0.62 to 0.81)	<0.001
Alcohol use					1.18 (1.10 to 1.28)	<0.001	1.18 (1.10 to 1.28)	<0.001
Psychological distress							1.00 (0.96 to 1.04)	0.974

to the covariates in the fully adjusted model, educational attainment, marital status and family annual income were inversely associated with tobacco use. There was a positive association between tobacco use and frequency of alcohol consumption. Psychological distress was not associated with tobacco use.

Association between PIL and amount of tobacco consumption

Figure 1 shows the ORs for smoking consumption, produced by multinomial logistic regressions comparing light and moderate to heavy smoking against the no smoking reference category. Without any adjustment (model 5), PIL was inversely associated with both light and moderate to heavy smoking (light smoking: OR=0.77, 95% CI: 0.67 to 0.89, p<0.001; moderate to heavy smoking: OR=0.62, 95% CI: 0.52 to 0.74, p<0.001). The ORs remained significant after adjusting for socioeconomic covariates (model 6: light smoking: OR=0.86, 95% CI: 0.74 to 1.00, p=0.046; moderate to heavy smoking: OR=0.72, 95% CI: 0.59 to 0.87, p<0.001) and further adjustment for alcohol consumption (model 7: light smoking: OR=0.86, 95% CI: 0.74 to 0.99, p=0.041; moderate to heavy smoking: OR=0.71, 95% CI: 0.59 to 0.87, p<0.001). Adjusting further for psychological

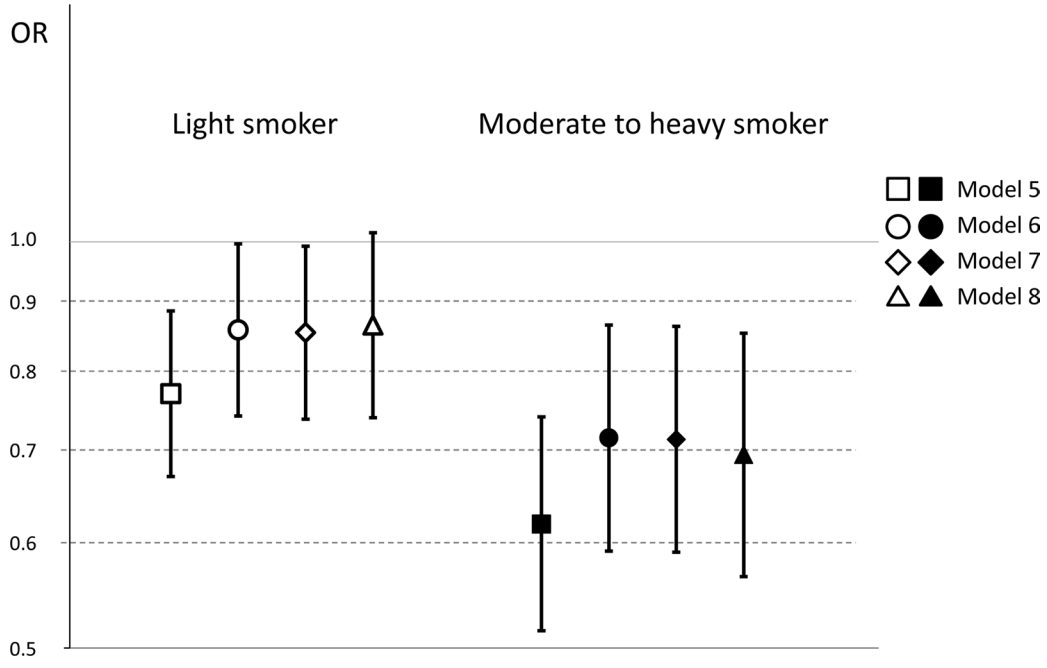

Figure 1 ORs for purpose in life from multinomial logistic regression analysis predicting smoking consumption (reference: non-smoker) with and without potential confounding variables. Model 5: without any adjustment; model 6: adjusting for socioeconomic covariates (educational attainment and family income); model 7: adjusting for socioeconomic covariates and alcohol consumption; model 8: adjusting for socioeconomic covariates, alcohol consumption and psychological distress.

distress (model 8), the association between PIL and light smoking was not significant (OR=0.87, 95% CI: 0.74 to 1.02, p=0.079). On the other hand, the OR for moderate to heavy smoking was not attenuated after adjustment for any of the aforementioned variables (OR=0.70, 95% CI: 0.57 to 0.86, p<0.001; see figure 1).

DISCUSSION

In a community-based sample of mothers in early-middle age, we found that PIL was inversely associated with tobacco use after controlling for age, education, marital status, family income and alcohol use. Importantly, this was also the case even after taking psychological distress into account. PIL was also inversely associated with the risk of moderate to heavy tobacco consumption even after controlling for covariates. This result is consistent with that of a previous study on a community sample in Hungary.[37] We confirmed the association between PIL and tobacco use with a large population-based sample of women in early midlife in Japan.

It is possible that individuals with higher PIL are likely to invest in healthy behaviours because they feel that their lives are meaningful, have a greater will to live and, therefore, are more proactive in taking care of their health[21] (eg, by the avoidance of smoking). They may also be motivated to acquire knowledge regarding health maintenance (ie, the knowledge about how detrimental smoking is). In contrast, since those low in PIL lack a high sense of life's meaningfulness, it may seem pointless for them to protect their health, and they may prefer short-term gratification, such as that obtained through tobacco use.

The association between PIL and tobacco use was robust even when controlling for psychological distress. It may suggest a relationship between a lack of eudaemonic well-being (PIL) and tobacco use, rather than a relationship between ill-being (psychological distress) and tobacco use. Mental well-being and mental illness are correlated but belong to separate continua, with well-being referring to the presence of positive feelings and positive functioning, rather than just the absence of mental illness.[55 56]

The present results suggest that increasing PIL may be a valuable target of intervention for reducing tobacco use, as well as for reducing substance abuse.[32] PIL is modifiable[57 58] and increasing awareness of one's values or long-term goals in life could increase the sense of PIL.[59 60] A systematic review indicated that positive psychological intervention had an impact on improving psychological well-being,[61] as well as a meta-analysis showed that behavioural intervention had a moderate effect on improving psychological well-being including PIL.[62] A new community-based group intervention to promote psychological well-being has been developed and had a positive effect of improving PIL.[63] Promotion focusing on increasing PIL might be effective in reducing tobacco use in public settings.

This study is limited, of course, in its capacity to determine causality, since the data were cross-sectional. Longitudinal studies should be conducted in order to determine whether PIL has a role in tobacco use. We are currently conducting a subsequent longitudinal cohort study (Tokyo Teen Cohort Study), which will further clarify causality between PIL and tobacco use among mothers. The sample was limited only to mothers and we could not examine the association among early-middle-aged women without children. Further studies including them would be needed. Additionally, given that parental smoking, especially maternal smoking, is the major determinant of passive smoking[6] and smoking initiation[7] in children, follow-up studies should examine the transgenerational effects of mothers' tobacco use on the initiation of smoking in their children. The relatively low response rate (43.8%) was also a limitation of the study. A recent study indicated that response rates of national cross-sectional surveys in Japan have declined in the recent decade (from around 70% to 50%).[64] One reason would be that many apartment buildings in Tokyo have recently adopted an automated system that enables residents talk with visitors at the locked gate through video. It allows potential respondents to make a decision of refusing participation without having a face-to-face encounter with the field worker.[64] In future study, we should consider how to overcome this obstacle to achieve higher response rate in general population survey in Tokyo.

In summary, in a large community-based study, we found that high PIL is associated with lower consumption of tobacco among mothers, after controlling for a range of potential confounds, including psychological distress. Our hypothesis, that PIL is independently and inversely associated with tobacco use, was therefore confirmed. This study may contribute to our understanding of the psychology of smoking behaviour and shed light on the target for intervention to reduce tobacco use among early midlife mothers.

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Contributors YM, SY, SA, SKo, AN, MH-H and KK involved in launching and maintaining the survey. SF, SKa and KE have mainly contributed to data collection. MN, SLH and MR mainly contributed to design the study and propose the analysis and interpretation of data. YM and SY wrote the first draft of the manuscript and all the other authors have critically reviewed it. All authors approved the final version of the manuscript.

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Data sharing statement When applying to the research ethics committee for the data set, the authors did not request this to be released as public data. However, the data can be made available to all interested researchers on request to Dr Atsushi Nishida (nishida-at@igakuken.or.jp).

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