Examination of a nationwide cohort of individuals with high health literacy in terms of their health-related lifestyles and attainment of the goals of the “National Health Promotion in the 21st Century” Program

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Abstract

Background: In Japan, where the population is aging particularly rapidly, “healthy aging” is being advocated as a means of addressing the potential societal burdens caused by older adults’ need for nursing care and the high associated health-care costs. To improve healthy aging among the population, the Japanese government has launched the “National Health Promotion in the 21st Century” (HJ21), which contains goals concerning areas such as lifestyle behavior and use of preventive medicine. Low health literacy is associated with many health-related issues; however, whether individuals with high health literacy are meeting the HJ21 goals has not yet been examined. This study aims to determine whether a cohort with high health literacy are meeting such goals, and to compare the cohort’s performance with the national average.

Methods: This is a cross-sectional survey study. Study participants, sourced from all prefectures in Japan, were professional specialists in health management certified by the Japanese Association of Preventive Medicine for Adult Disease. We measured data concerning the cohort’s demographic information, health perception, lifestyle (including physical activity) and use of preventive medicine.

Results: The cohort showed many characteristics of high health literacy. The cohort had an overall healthy lifestyle and met most of the HJ21 goals; in particular, a high proportion underwent health-maintenance exams and cancer screenings.

Conclusions: The high health literacy cohort showed a healthy lifestyle. Compared to the national average, a higher proportion of the cohort met the HJ21 goals and received preventive medicine.
INTRODUCTION

The global population, particularly that of Japan, is aging rapidly [1]. It is projected that, by 2060, 40% of the Japanese population will be aged 65 years or older [2]. Consequently, concerns regarding potential increased health care costs for older adults and the societal burden of providing nursing care for this population in a rapidly aging society has led to the prioritization of “healthy aging” [3]. A notable effort to address this issue is “National Health Promotion in the 21st Century” (HJ21), launched by Japan’s Ministry of Health, Labour and Welfare and comprises a number of health- and lifestyle-related goals for individuals. This endeavor is designed to reduce late middle-age death, extend healthy life expectancy, and improve quality of life [4, 5, 6].

Healthy aging concerns living independently while maintaining physical, psychological, and social functions. Many factors are associated with healthy aging, including biological, behavioral, psychological, and social determinants [7]; of these, health literacy is particularly notable [8, 9]. Specifically, health literacy is considered to represent individuals’ capacity to obtain and understand basic health information and services, and to make appropriate health-related decisions based on this information [10]. Health literacy is associated with disease mortality [11, 12], overall health status [12], use of health care services [12, 13, 14], adherence to medication [12, 15], disease prevention [12, 16, 17], use of emergency medicine services, rate of hospitalization, and health behaviors [11, 14, 15, 18]. Thus, higher levels of health literacy may decrease disease mortality and comorbidity, leading to longer healthy longevity. In the US in 2010, the Department of Health and Human Services released a national action plan to help the entire population make
informed decisions and improve their health, longevity, and quality of life [19]. The United States also made policies that overtly seek to improve health literacy in the wider community, and identify a range of actions to support this including improvements to adult literacy and language programs [20]. Ultimately, such endeavors are expected to reduce health care costs by increasing health literacy capacity [21].

The relationship between health literacy and healthy lifestyle behavior has not yet been examined in the context of national health promotion campaigns (e.g., the HJ21). While the value of health literacy in terms of various health outcomes is acknowledged by both researchers and policy-makers, most previous investigations have focused on low health literacy. Consequently, data regarding high health literacy or the outcomes of acquiring high health literacy is lacking. Therefore, investigating the relationship between high health literacy and level of achievement of national health promotion campaign goals is of great interest. Considering this, the present study aimed to examine whether a cohort with high health literacy would show a healthy lifestyle in terms of the HJ21 framework. Specifically, this study aims to (1) describe whether such a cohort meets HJ21 goals, and (2) compare the cohort to national averages for health-related lifestyle and behavior, including preventive medicine use.

METHOD

Study design

This is a cross-sectional study involving a nationwide cohort of professional specialists in health management. The study population was identified as all individuals who are certified professionals in health management obtained from the
register of the Japanese Association of Preventive Medicine for Adult Disease (JAPA). We included professionals who actively maintained their knowledge and skills in the study. We excluded individuals who did not regularly participate in the continuous education provided by JAPA. Among these individuals (n = 9149), our final study sample were certified professionals who agreed to participate in the study (n = 4820). We administered to these individuals a survey regarding health-related lifestyle and behavior, which was based on the HJ21 goals. The survey included questions concerning demographic data, self-perceived health status, lifestyle, and use of preventive medicine services. The HJ21 goals are based on national data such as the results of the National Health and Nutrition Survey and the National Comprehensive Survey of Living Conditions, along with existing evidence regarding health promotion. This allowed us to assess the cohort’s status for each goal and compare the cohort’s data with national averages. The ethical committee of the Saitama Medical University approved the study (ID 896, 2018).

Study participants

Study participants were certified specialists in health management who were receiving continuing professional education through resources regularly provided by JAPA [22]. Specialists in health management are certified through multiple study processes. The certification is sponsored by the Ministry of Education, Culture, Sports, Science and Technology. The certification verifies that the individual possesses a high level of health-related knowledge and skills and can make high-level health-related decisions. Proficiency is obtained through the learning process of becoming specialists in the area of health promotion and disease prevention, and also through activities as specialists. Certified specialists are expected to engage with the communities and societies in which they live, and to promote health using
the knowledge and skills they acquire during their course, certification process, and continuing education [22].

Variables and measurements

Variables measured in this study include demographic data, health perception, health-related lifestyle and behavior (including physical activity and exercise, nutrition and diet, smoking habit, stress, and alcohol intake), purposeful life score, use of preventive medicine services such as cancer screenings and annual health maintenance exams. Numeric data were obtained for age, weight, height, body mass index (BMI) and alcohol intake. Meanwhile, data for gender, health perception, smoking habit, stress, and use of preventive medicine services were treated as either binary or ordinal.

Analysis

Descriptive statistics (means and standard deviations) were used to describe the study participants’ characteristics. The proportions of the cohort who performed each lifestyle practice were calculated, and the results were compared with gender-matched national averages and the HJ21 goals. The comparisons were performed statistically, using a one-sample student t-test for numeric data and a one-sample z-test for proportions. Proportions of the use of preventive medicine services were also calculated. All statistical tests were two-tailed. P-values of less than .05 were considered as statistically significant. IBM SPSS Statistics (Version 26.0. Armonk, NY) was used for the analysis.

RESULTS

Descriptive analysis
The demographic characteristics of the cohort are shown in Table 1. Overall, 9,149 specialists were invited to participate, of whom, 4,820 agreed (response rate: 52.7%). This sample comprised individuals from all prefectures in Japan. Overall, the proportion of the cohort aged 65 years or older was 23.7% (1,142 out of 4,820); 37.2% (525 out of 1,630) of the total number of males, and 19.3% (617 out of 3,190) of the total number of females. The average age of the male and female cohort was 57.8 and 54.1 years, respectively. The average BMI of the males and females was 23.3 kg/m$^2$ and 21.2 kg/m$^2$, respectively. Over 80% of the cohort calculated their BMI correctly. Most of the cohort (93.2% and 93.9% of the males and females, respectively) perceived themselves to have good health. Finally, a high proportion of the cohort desired a healthier lifestyle (88.3% and 89.3% of the males and females, respectively).
### Table 1
Demographic characteristics of the study cohort.

| Age range (years) | Total | Male | Female |
|-------------------|-------|------|--------|
| > 29              | 4820  | 1630 | 3190   |
| 30–39             | 372   | 108  | 264    |
| 40–49             | 930   | 275  | 655    |
| 50–59             | 1541  | 434  | 1107   |
| 60–69             | 1291  | 508  | 783    |
| 70–79             | 489   | 233  | 256    |
| > 80              | 68    | 44   | 24     |

| Age (Ave years, SD) | Total  | Male  | Female |
|---------------------|--------|-------|--------|
| > 29                | 55.4 (12.2) | 57.8 (12.5) | 54.1 (11.8) |
| 30–39               | 161.3 (8.0)  | 169.1 (6.1)  | 157.3 (5.5)  |
| 40–49               | 57.5 (10.8)   | 66.8 (9.8)    | 52.7 (7.7)    |

| BMI (Ave kg/m², SD) | Total  | Male  | Female |
|---------------------|--------|-------|--------|
| > 29                | 21.9 (3.3)  | 23.3 (2.9)  | 21.2 (3.3)  |

| Good health perception (%) | Total | Male | Female |
|----------------------------|-------|------|--------|
| > 29                       | 93.6  | 93.2 | 93.9   |

| Obesity (%) | Total | Male | Female |
|-------------|-------|------|--------|
| > 29        | 15    | 24.6 | 10.1   |

| Reading nutritional information labels (%) | Total | Male | Female |
|-------------------------------------------|-------|------|--------|
| > 29                                      | 82.2  | 72.3 | 87.3   |

| Maintaining a balanced diet in daily life (%) | Total | Male | Female |
|-----------------------------------------------|-------|------|--------|
| > 29                                          | 90.8  | 87.1 | 92.6   |

| Skipping breakfast (%) | Total | Male | Female |
|------------------------|-------|------|--------|
| > 29                   | 8.2   | 16.2 | 6.8    |

| Regular exercise (%) | Total | Male | Female |
|----------------------|-------|------|--------|
| > 29                 | 83.5  | 86   | 82.3   |

| Exercise frequency (%) | Total | Male | Female |
|------------------------|-------|------|--------|
| 5–7/week               | 29.5  | 34.6 | 27     |
| 2–4/week               | 32.4  | 33.1 | 32     |
| 1/week or less         | 38    | 32.2 | 40.9   |

| Sleep (%) | Total | Male | Female |
|-----------|-------|------|--------|
| Satisfactory | 21.3 | 23.5 | 20.2   |
| Adequate   | 57.3  | 56.2 | 58     |
| Not adequate | 20.3 | 19.3 | 20.8   |
| Not satisfactory | 1    | 1    | 1      |

| Rest (%) | Total | Male | Female |
|----------|-------|------|--------|
| Satisfactory | 21.3 | 26.6 | 18.6   |
| Adequate  | 54.1  | 52.9 | 54.8   |
| Not adequate | 21.2 | 17.4 | 23.1   |
| Not satisfactory | 3.3 | 3.1  | 3.4    |

| Stress (%) | Total | Male | Female |
|------------|-------|------|--------|
| High       | 20.4  | 16.9 | 22.2   |
| Moderate   | 54    | 51   | 55.5   |
| Low        | 21.8  | 26.6 | 19.3   |
| None       | 3.7   | 5.3  | 2.9    |

| Smoking (%) | Total | Male | Female |
|-------------|-------|------|--------|
| Current     | 6.1   | 9.7  | 4.2    |
| Past        | 17.9  | 30   | 11.7   |

| Alcohol (%) | Total | Male | Female |
|-------------|-------|------|--------|
| > 29        | 25.7  | 29.8 | 18.5   |

| Excessive alcohol intake (%) | Total | Male | Female |
|-------------------------------|-------|------|--------|
| > 29                          | 5.8   | 12   | 2.6    |

| Intention to adopt a healthier lifestyle (%) | Total | Male | Female |
|---------------------------------------------|-------|------|--------|
| > 29                                        | 88.9  | 88.3 | 89.3   |

| Annual health maintenance exams (%) | Total | Male | Female |
|-------------------------------------|-------|------|--------|
| > 29                                | 78.8  | 79.4 | 78.5   |

| Annual cancer screenings (%) | Total | Male | Female |
|------------------------------|-------|------|--------|
| Gastric cancer               | 49.3  | 47.4 | 50.4   |
| Lung cancer                  | 47    | 45.3 | 48     |
| Colon cancer                 | 53.6  | 50.8 | 55.2   |
| Breast cancer††              | NA    | NA   | 57.3   |
| Cervical cancer††            | NA    | NA   | 55.4   |

† Proportion among females who were 40 years or older, and who underwent screening within the previous year.
‡ Proportion among females who were 20 years or older, and who underwent screening within the previous year.
¶ Prevalence among males aged 30–39 years.
Lifestyle characteristics of the study participants

Food and diet

Approximately 25% of the males had a BMI of 25 kg/m² or higher, indicating obesity; however, only 10% of the females were obese. Meanwhile, 72.3% of the males reported “reading nutritional information labels” on foods, 87.1% reported “maintaining a balanced diet in daily life,” and 16.2% of those aged 30 years or older reported “skipping breakfast.” Similar to the males, 87.3% and 92.6% of the females reported “reading nutritional information labels” and “maintaining a balanced diet in daily life,” respectively; only 6.8% reported “skipping breakfast.”

Exercise

For the males, 34.6% exercised 5–7 days per week, compared to 27.0% of the females. Additionally, 86.0% of the males engaged in exercise regularly and 82.3% for the females.

Smoking

Overall, 6.1% of the cohort reported smoking at the time of the survey. Of the males, 9.7% were smokers and 30.0% had quit smoking; these values were 4.2% and 11.7%, respectively, for the females.

Alcohol

Regarding alcohol, 25.7% of the cohort reported drinking; 29.8% and 18.5% of the males and females, respectively. Meanwhile, 12.0% of the males and 2.6% of the females showed an excessive alcohol intake (drinking ≥ 40 grams of alcohol per day).

Sleep and rest

Although most of the cohort reported having satisfactory or adequate sleep and
rest, a significantly large proportion felt that their sleep and rest were inadequate (20.3% and 20.5% of the males, and 21.8% and 26.5% of the females, respectively).

Stress

A significant number of the cohort reported experiencing stress (74.4% reported moderate or high levels of stress). Of the males, 16.9% reported high stress and 26.6% reported moderate stress; among the females, these percentages were 22.3% and 55.5%, respectively.

Characteristics of preventive medicine use

The proportions of participants who underwent annual health maintenance exams and cancer screenings are shown in Table 1. High proportions of both the males and females underwent annual health maintenance exams (79.4% and 78.5% of the males and females, respectively); however, only 47.4%, 45.3%, and 50.8% of the males had screenings for gastric, lung, and colon cancer, respectively. Among the females, these percentages were 50.4%, 48.0%, and 55.2%, respectively. Further, 57.3% of the 40–65-year-old females underwent annual breast cancer screenings, and 55.4% of the females aged 20–65 years underwent annual cervical cancer screenings.

Table 2 shows a comparison of the proportions of the male who performed select lifestyle with the gender-matched averages for the Japanese population, and the HJ21 goals. For most characteristics (12 out of 15), our male cohort showed higher proportions when compared to the gender-matched national average; the male also met nine of the 14 HJ21 goals (HJ21 does not include a goal for smoking). For diet and food, they met two of five goals (“reading nutritional information labels” and “maintaining a balanced diet in daily life”), with the proportions among the male
cohort for these characteristics being much higher than the HJ21 targets (72.3% vs 30%, and 87.1% vs 30%). The goals the male did not meet were “not skipping breakfast,” “intention to achieve ideal weight management,” and “obesity.” However, for the former two, the prevalence among the male was, nevertheless, close to the target. For obesity, the HJ21 target (< 15% prevalence) was much lower than the prevalence among the male (24.6%). The cohort also failed to reach the targets for stress and alcohol intake, but achieved all targets concerning preventive medicine, including undergoing health maintenance exams and cancer screenings, scoring much higher than the national average.

Table 2
Comparison between the male members of the cohort and HJ21 goals regarding lifestyle and preventive medicine use.

|                                | Study Cohort (%) | HJ21 Goal (%) | Gender-matched (%) |
|--------------------------------|------------------|---------------|-------------------|
| Obesity                        | 24.6             | ≤ 15          | 24.3              |
| Intention to achieve ideal weight management | 85.7<sup>a, b</sup> | ≥ 90          | 62.6              |
| Skipping breakfast†            | 16.2<sup>b</sup>  | ≤ 15          | 20.5              |
| Reading nutritional information labels | 72.3<sup>a, b</sup> | ≥ 30          | 20.1              |
| Maintaining a balanced diet in daily life | 87.1<sup>a, b</sup> | ≥ 30          | 18.0              |
| Regular exercise               | 86.0<sup>a, b</sup> | ≥ 63          | 52.6              |
| Achieving exercise goals       | 69.1<sup>a, b</sup> | ≥ 39          | 28.6              |
| Stress                         | 67.9<sup>a, b</sup> | ≤ 49          | 54.6              |
| Inadequate sleep               | 20.3<sup>b</sup>  | ≤ 21          | 23.1              |
| Smoking                        | 9.7<sup>b</sup>   | ,†            | 29.4              |
| Excessive alcohol intake       | 12.0<sup>a, b</sup> | ≤ 3.2         | 4.1               |
| Preventive medicine use        |                  |               |                   |
| Health maintenance             | 79.4<sup>a, b</sup> | ≥ 70          | 44.7              |
| Gastric cancer                 | 47.4<sup>a, b</sup> | ≥ 40          | 36.6              |
| Lung cancer                    | 45.3<sup>a, b</sup> | ≥ 40          | 26.4              |
| Colon cancer                   | 50.8<sup>a, b</sup> | ≥ 40          | 28.1              |

<sup>a</sup> indicates <p> < 0.05 for the study cohort compared to the HJ21 goal (if the goal is met).
<sup>b</sup> indicates <p> < 0.05 for the study cohort compared to the gender-matched national average.
† Prevalence among males aged 30–39 years.
‡ HJ21 does not have a goal for smoking rate.

The female cohort outscored the gender-matched national average in most characteristics (14 out of 16; Table 3). They also attained 11 of the 15 HJ21 goals. For these 11 goals showing statistically significantly higher proportions. Similar to
the males, the female did not meet the stress and alcohol use targets. Further, the female only met one of the HJ21 goals regarding food and diet; however, the prevalence of reading nutritional information labels was higher than the national average (80.7% vs 80.1%). The female met all goals concerning preventive medicine, showing statistically significantly higher prevalence than the national average.

**Table 3**
Comparison between the female members of the cohort and HJ21 goals regarding lifestyle and preventive medicine use.

|                          | Study Cohort (%) | HJ21 Goal (%) | Gender-matched (%) |
|--------------------------|------------------|---------------|--------------------|
| Obesity                  | 10.1⁰ᵇ           | ≤ 20          | 25.2               |
| Intention to achieve ideal weight management | 80.7            | ≥ 90          | 80.1               |
| Reading nutritional-information labels | 87.3⁰ᵇ         | ≥ 55          | 41.0               |
| Maintaining a balanced diet in daily life | 92.6⁰ᵇ         | ≥ 55          | 40.4               |
| Regular exercise         | 82.3⁰ᵇ           | ≥ 63          | 52.8               |
| Achieving exercise goals | 61.7⁰ᵇ           | ≥ 35          | 24.6               |
| Stress                   | 77.7⁰ᵇ           | ≤ 49          | 54.6               |
| Inadequate sleep         | 21.8             | ≤ 21          | 23.1               |
| Smoking                  | 4.2⁰ᵇ            | < 0.2         | 7.2                |
| Excessive alcohol intake | 2.6              | ≤ 0.2         | 0.3                |
| Preventive medicine use  |                  |               |                    |
| Health maintenance       | 78.5⁰ᵇ           | ≥ 70          | 44.7               |
| Gastric cancer           | 50.4⁰ᵇ           | ≥ 40          | 28.3               |
| Lung cancer              | 48.0⁰ᵇ           | ≥ 40          | 23.0               |
| Colon cancer             | 55.2⁰ᵇ           | ≥ 40          | 23.9               |
| Breast cancer            | 57.3⁰ᵇ           | ≥ 50          | 39.1               |
| Cervical cancer          | 55.4⁰ᵇ           | ≥ 50          | 37.7               |

⁰ Indicates p < 0.05 for the study cohort compared to the HJ21 goal (if the goal is met).

ᵇ Indicates p < 0.05 for the study cohort compared to the gender-matched national average.

† HJ21 does not have a goal for smoking rate.

**DISCUSSION**

Our cohort showed many of the high health literacy characteristics. Our cohort had received modules concerning preventive medicine, lifestyle-related disease mechanisms, nutrition, the health care system, and environmental health, and had passed the final test to become certified specialists in health management [23]. An
example of their level of knowledge was the high number of participants who correctly calculated the ideal weight for their height. BMI is a valuable statistic in regard to healthy lifestyle, and its calculation requires knowledge and skill; this relates to Nutbeam’s definition of functional health literacy: possessing the basic skills a person needs to obtain relevant information [24]. The cohort also provided information regarding their attitude toward healthy lifestyles; most males (88.3%) and females (89.3%) reported intending to develop healthier lifestyles. Further, intention to perform weight control through adopting a healthy diet was 85.7% and 80.7% for males and females, respectively. These percentages were higher than the national average. The abovementioned factors are included in previous reports’ recommended measurement items for health literacy [25]. Notably, our cohort actively participated in continuing professional education, and performed health promotion activities using their knowledge and relevant skills. This relates to the categories of interactive and critical health literacy additional to functional health literacy, which has been widely documented in the literature [24]. The cohort qualitatively showed high health literacy for all categories; however, it may be difficult at present to quantitatively verify their levels in some areas because of lacking a tool to measure health literacy specific to disease prevention and health promotion as discussed elsewhere [26]. Thus validated tools for measuring health literacy in the context of health promotion are needed to confirm these results. High health literacy was also observed regarding the cohort’s attitude towards disease prevention. When compared to the gender- and age-matched national averages, the cohort showed higher use of preventive medicine services. In particular, the proportion of respondents who had annual cancer screenings was significantly high. Several studies have reported that there is an association
between health literacy and use of preventive medicine services [16, 17]. Thus, health literacy represents a foundation for using health care resources. In this regard, Nutbeam proposed that use of preventive medicine is determined by health promotion outcomes such as health-related knowledge, attitude, motivation, and behavioral intentions, which are primary aspects of health literacy [25]. Our finding that a high proportion of the cohort used preventive medicine services indicates that the cohort had high health literacy and sought to improve their health.

Overall, our findings indicated that high numbers of the respondents possessed good health-related lifestyles and behaviors. Previous study of Japanese office workers indicated that the proportion of those in the high health literacy group who reported a healthy diet, regular exercise, adequate sleep, smoking, and alcohol intake were 53.3%, 32.6%, 54.3%, 43.5%, and 31.5%, respectively [27]. Notably, our male cohort showed higher proportions than the male office workers. Thus, our findings support suggestions that high health literacy is associated with healthier lifestyles. Both the male and female cohort met the majority of the HJ21 goals (Tables 2 and 3), and showed a significantly higher prevalence of healthy lifestyle and use of preventive medicine when compared to the gender- and age-matched national averages. As our cohort met all goals regarding receiving annual health maintenance exams and cancer screenings, our results are consistent with existing evidence that high health literacy is associated with a high prevalence of preventive medicine use.

There were some areas in which the cohort did not meet the HJ21 goals, particularly stress, sleep, and alcohol intake. Our findings regarding the cohort’s suboptimal characteristics may be verified by considering existing theories. Marks et al. found an association between stress, sleep deprivation, and obesity [28]. They
consequently found an association between stress perception, abnormal eating behaviors, sleep deprivation, and obesity [28]. Additionally, our study results showing that the cohort had suboptimal stress perception, sleep, and alcohol intake are consistent with a previously reported theory [29]. Interestingly, stress can lead to an uptake of both unhealthy and healthy alcohol intake. Pohorecky stated that stress leads to excessive alcohol intake [30]; however, several studies have indicated that stress can promote healthy alcohol use, but that this probably depends on the situation causing the stress [31, 32]. Additionally, studies of stress have reported that alcohol may be used to reduce stress [33]. Gender, age, type of stress, perception of stress, successful stress management or coping mechanisms for stress, and other factors may effect positive or negative associations between stress and health-related behaviors [34, 35]. Regardless of the cause of stress, inadequate sleep, and/or excessive alcohol intake, related outcomes should be improved. To achieve this, further exploration of the cause of stress and the mechanistic relationship between stress and inadequate sleep or excessive alcohol intake is required.

While a high proportion of the cohort used preventive medicine services and met the HJ21 goals, it should be noted that the HJ21 goal for preventive medicine use is just 50%. Considering the efficiency of screening, more ambitious goals could be set. Further, the cohort proportion was slightly higher than the goal threshold, also indicating that improvement is possible in this regard. Providing theory- and evidence-based health education to develop personal and social skills that support behavioral change and maintenance could contribute to such an improvement [36]. Our cohort represents a good example of the beneficial effect of administering to individuals an ideal educational program, as they showed, through their responses,
that they were well educated and had sufficiently high health literacy and experience to improve their health-related lifestyles. Investigating whether gaining high health literacy causes positive outcomes is of great scientific interest.

There are several strengths to this study. One is the use of a large nationwide sample, which increases the generalizability of our study results. Second, our cohort comprised people with high health literacy. To the best of our knowledge, this is the first study to investigate health-related lifestyle and preventive medicine screening behavior in terms of a national health promotion campaign. In this sense, the results provide a scientifically important insight, and provide new avenues of research for future health literacy studies.

There are also several limitations to this study. We did not use existing tools to measure the specific health literacy of the cohort, instead focusing on factors that directly indicate health literacy level. Second, the present study is cross-sectional, so the results are correlational in nature. Thus, future studies should investigate, using a longitudinal design, the causal relationship between gaining high health literacy and health-related outcomes. Additionally, the self-report nature of the data may have induced reporting bias; future studies should implement objectively assessed data collection.

CONCLUSION

A cohort of certified specialists in health management who had high health literacy showed healthier lifestyles and met a greater number of HJ21 goals when compared to the gender-matched national averages. The cohort also showed a higher proportion of preventive medicine use.
Declarations

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Author Contributions

All authors contributed to design and analysis of the study. First draft of the manuscript was written by NH and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Compliance with Ethical Standards

Conflict of Interest

The authors declare that they have no conflict of interest.

Research involving Human Participants

Saitama Medical University ethical committee approved the study (ID: 896, 2018)

Informed Consent

All the participants provided written informed consent before the study enrollment.

Data Availability Statement

The dataset generated during and/or analyzed during the current study are available from the corresponding author on reasonable request due to privacy or other restrictions.
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