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RESEARCH ARTICLE

Barriers to undergoing cervical cancer screening among health sciences university students in Japan: A cross-sectional study

Running title: Factors in cervical cancer screening

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Abstract

In most developed countries, cervical cancer screening and human papillomavirus vaccination have reduced cervical cancer incidence. However, said incidence has been increasing in Japan, possibly because of the low screening rate. Although the cervical cancer incidence has increased in people in their 20s, the screening rate among 20–24-year-olds in Japan is only 10.2%, meaning that cervical cancer screening rates should be increased among Japanese young women. We conducted a questionnaire survey among students at health sciences universities to determine their knowledge of cervical cancer, screening rates, and barriers to screening. Students taking specialized medical courses were highly knowledgeable; recognition of the facts that “cervical cancer can be prevented through screening” and that “the risk of cervical cancer increases in one’s 20s” was significantly high among those who underwent screening. On the other hand, only 7.5% of students used the free coupons for screening. The knowledge of cervical cancer improves screening rates. Therefore, educational programs to raise awareness on the importance of cervical cancer screening among non-medical and health sciences university students and young women in general are required.

Keywords

Cervical cancer, cancer screening, university students, young women, Japan

Key points

- Since cervical cancer is increasing in Japan, the screening rate must be improved, especially among young women.
- Our survey found that the knowledge of cervical cancer was higher among university students taking specialized medical courses, with a particularly high screening rate among students who knew that the risk of cervical cancer increases in one's 20s.
- While the distribution of free coupons was effective to a certain effect, it was not sufficient, and further study is needed to determine the effectiveness of this method.

1 INTRODUCTION

Cervical cancer is caused by human papillomavirus (HPV), with approximately 570,000 cases and 311,000 deaths worldwide (WHO, 2022). It is one of the most common cancers among Japanese women, affecting approximately 11,000 women and causing 3,000 deaths annually (National Cancer Center Japan, 2019). In most developed countries, cervical cancer screening and HPV vaccination have reduced the incidence of cervical cancer. However, unlike in other developed countries, the incidence of cervical cancer is increasing in Japan (Lin et al., 2021; National Cancer Center Japan, 2019). This phenomenon is attributable to the low rate of cervical cancer screening in Japan. Cervical cancer can be prevented through screening; the screening rate is 70%–80% in Europe and United States, though the screening rate in Japan is only 42.1% (OECD, 2015). In Japan, for cervical cancer screening, cytology alone (age range, 20–69 years; interval: two years) and HPV testing alone (age range, 30–60 years; interval, five years) are recommended as grade A diagnostic methods. In contrast, the combination of cytology and HPV testing (age range, 30–60 years; interval, five years) is deemed as a grade C diagnostic method owing to its high false-positive rate. Additionally, since 2009, free coupons have been distributed to women aged 20 years as the incidence of cervical cancer increases from the 20s among Japan individuals. However, the screening rate among 20–24-year-olds is only 10.2% (Ministry of Health, Labour and Welfare, 2010).

Vaccination against HPV is another method to prevent cervical cancer. Since 2006, HPV vaccines have been introduced in many countries in Europe and the

United States, and the vaccination rates have reached 50%–85% (Mehanna et al., 2019; Patel et al., 2018; Suzuki et al., 2022; Vänskä et al., 2021). Consequently, the number of precancerous cervical lesions has been reduced by approximately 50% in these countries (Baldur-Felskov et al., 2014; Crowe et al., 2014; Pollock et al., 2014). In Japan, an urgent public promotional campaign for vaccination started in 2010, and 70%–80% of the targeted young women were vaccinated in 2012 (Hanley et al., 2015; Sawada et al., 2018; Ueda, Enomoto, et al., 2015). In April 2013, HPV vaccination started as an official routine vaccination for girls aged 12–16 years (Suzuki et al., 2022). However, because of repeated media reports of scientifically unverified adverse events following vaccination, proactive recommendation of the HPV vaccine was suspended in June 2013, only 2 months after its introduction. Consequently, the vaccination completion rate dropped to 0.6% (Hanley et al., 2015). In November 2021, 9 years after the proactive recommendation was suspended, the Japanese Ministry of Health, Labour and Welfare announced the resumption of the proactive recommendation and implementation of catch-up vaccination for women born between 1997 and 2005 who missed the opportunity for vaccination (Suzuki et al., 2022). However, achieving the same vaccination rates as those before suspension seems unlikely. Therefore, it is necessary to improve the cervical cancer screening rate in Japan, especially among young women. However, it is expected that medical or health science university students, who have more medical knowledge than have young women in general, would have higher screening rates. Therefore, we conducted a questionnaire survey among students at health sciences universities to clarify their

knowledge of cervical cancer, screening rate, and what inhibits them from undergoing screening. To our knowledge, no survey on cervical cancer screening among Japanese students at health sciences universities or medical universities has been reported. This is the first report to survey cervical cancer screening among Japanese students at health sciences universities.

2. METHODS

2.1. Aim

This survey aimed to determine the barriers to undergoing cervical cancer screening among Japanese health sciences university students.

2.2. Data collection

This survey was performed from November 2022 to February 2023 on 549 women and men majoring in nursing at the Ehime Prefectural University of Health Sciences and clinical laboratory science at the Kobe University. The following information was explained to the target students in writing and orally: "purpose of this survey," "responses to this survey are free, and failure to respond will not affect grades at all," and "anonymity will be ensured so that individuals will not be identified when the publication results." Consent from students was confirmed by them checking the "I agree" box on the questionnaire form. The anonymous questionnaire was distributed directly to the students, and the completed questionnaires were collected in a collection box in another room. The survey included seven common questions for both sexes and three additional questions for women. The common questions for both sexes investigated the attributes of the

target students (questions 1–3) and their knowledge of cervical cancer (questions 4–7) (Table 1). The additional questions for women only asked whether they had undergone cervical cancer screening (question 8), received a free coupon (question 9), and how to increase the cervical cancer screening rate (question 10). The questions in the abovementioned questionnaire were developed in consultation with a public health nursing expert (SI) and two clinical laboratory scientists (NT and HOh). When creating these questions, we used questions that had been pre-tested and checked for ease of response. Questionnaires with extreme bias and many non-responses were excluded from the analysis.

2.3. Data analysis

Cronbach's alpha was calculated to assess the reliability of the responses to the questionnaire. For questions 4–10, after confirming the proportions of the attributes of the participants and dividing them into groups to avoid the influence of confounding factors, the proportions between groups were evaluated using the χ^2 test or Fisher's direct method. We used IBM SPSS Statistics (version 28.0; IBM Corp., Armonk, NY, United States) for statistical analysis, and a P-value <0.05 was considered statistically significant.

2.4. Ethical considerations

This survey was approved by the Ethics Committee of Kobe University Graduate School of Health Sciences (No. 1131) and Ehime Prefectural University of Health Sciences (No. 21-009), and written informed consent was obtained from all students. The study was conducted in accordance with the principles of the Declaration of Helsinki.

3. RESULTS

Four hundred forty-two students responded, with a response rate of 80.5% (442/549). Except for four respondents who did not respond to Question 9, all respondents responded to all questions. These four students who did not respond were not included in the subject of Question 9 and, therefore, did not affect the analysis results. In addition; Cronbach's alpha in this survey was 0.603.

3.1. Attributes of target students (questions 1–3)

We obtained responses from 442 students, including those who did not respond to some questions. The proportions of students' ages, grades, and sexes are summarized in Table 2. The percentages of males in freshmen, sophomore, junior, and senior years were 11.4% (14/123), 16.8% (25/149), 2.8% (4/141), and 17.2% (5/29), respectively. The percentages of the sexes by age were as follows: 86.3% (126/146) were women and 13.7% (20/146) were men up to 19 years, and 90.5% (268/296) were women and 9.5% (28/296) were men between 20–24 years, with no significant differences found on the χ^2 test (P=1.178).

3.2. Knowledge of cervical cancer (questions 4–7)

For these questions, the highest proportion (90.0%, 398/442) of the students knew of the term "HPV." Moreover, 83.9% (371/442) of students were aware that "cervical cancer can be prevented through screening," and 79.9% (353/442) knew that "HPV is related to cervical cancer." However, a lower proportion (61.8%, (273/442) of students knew that "the risk of cervical cancer increases in one's 20s" (Table 3).

When the responses to the above questions were divided between freshmen, who were mainly taking liberal arts courses, and sophomores, juniors, and seniors, who were taking specialized medical courses, the sophomore-to-senior groups exhibited significantly higher knowledge of all four questions than exhibited the freshmen group (Table 4). To confirm the difference in knowledge by sex, the same analysis was conducted separately for men and women. We observed that women had significantly more knowledge of questions 4 (P=0.001), 5 (P=0.004), and 7 (P=0.014). In contrast, they showed no significant difference for question 6 (cervical cancer can be prevented through screening).

3.3. Reasons of cervical cancer screening (questions 8a–e)

Of the 394 women participants, only 44 (11.1%) had undergone cervical cancer screening; the frequency of screening was “once every 2 years” for 24 (54.5%), “annually” for 16 (36.4%), and “other” for 4 participants (9.1%). The most common reason for undergoing screening was a “free coupon” (n=18; 40.9%), followed by “recommendation by family/friends” (n=8; 18.2%), “recommendation by a doctor” (n=6; 13.6%), “mass health screening” (n=4; 9.1%), “feeling abnormal” (n=4; 9.1%), and “other” (n=4; 9.1%). Moreover, the age at first screening was 19 years for 14 (31.8%) and more than 20 years for 30 (68.2%) participants.

When the 352 (88.9%) women participants who had never undergone cervical cancer screening were asked for the reason behind not doing so (multiple responses allowed), the most common response was “it is not relevant for me yet” for 32.4% of participants, followed by “do not feel the need to undergo screening” for 30.4%, “busy and have no time” for 27.6%, “resistance to seeing an

obstetrician/gynecologist” for 22.7%, and “do not know the procedure to undergo screening” for 22.4%.

As for the knowledge of cervical cancer (questions 4–7) among students who had and had not undergone screening, the former had significantly higher levels of recognition of the facts that “cervical cancer can be prevented through screening” and that “the risk of cervical cancer increases in one’s 20s” (Table 5).

3.4. Reasons behind the free coupons for cervical cancer screening (question 9)

The analysis was limited to 268 women participants aged 20–24 years, as this was the age group to which the municipality sent free coupons. A total of 65.7% (176/268) of the students responded that they had never received a free coupon from the municipality, 20.9% (56/268) had received a free coupon but did not undergo screening, 7.5% (20/268) had used a free coupon for screening, and 3.0% (8/268) had received a free coupon but did not open it.

Among the students who had received the free coupon but did not undergo screening, a significantly high proportion of students stated the following reasons: “do not understand the need to undergo screening” ($P<0.001$), “painful and scary” ($P = 0.007$), “embarrassed to undergo screening” ($P=0.029$), and “busy and did not have time” ($P=0.039$).

3.5. Strategies to improve the rate of cervical cancer screening (question 10)

For the multiple-choice question on ways to improve the screening rate, the most common responses were “free of charge” at 59.6% (235/394), followed by “female doctor” at 53.3% (210/394), “online appointment” at 38.3% (151/394), “screening

on holiday" at 37.1% (146/394), "screening facility in neighborhood" at 35.5% (140/394), and "no prior registration required" at 21.1% (83/394).

4. DISCUSSION

One factor that hinders women from undergoing cervical cancer screening is their lack of knowledge of cervical cancer (Budkaew & Chumworathayi, 2014; Issa et al, 2021). In this study, we surveyed university students majoring in nursing and clinical laboratory science and considered them to be more knowledgeable than young women in general. The results of this survey revealed that these students had a high rate of recognition of the existence of HPV (90.0%) and of the facts that cervical cancer can be prevented through screening (83.9%) and that HPV is closely related to cervical cancer (79.9%). However, only 61.8% of students knew that the risk of cervical cancer increases in one's 20s, suggesting that this may be the cause of the low cervical cancer screening rate among 20-year-olds. Comparing the knowledge of cervical cancer between students who had undergone cervical cancer screening and those who had not, we observed that the recognition of the facts that "cervical cancer can be prevented through screening" and that "the risk of cervical cancer increases in one's 20s" was significantly higher among the former. The recognition rate for the four questions on the knowledge of cervical cancer was significantly higher for the sophomore-to-senior groups than for the freshmen group, possibly because they acquired knowledge about cervical cancer through specialized medical courses. In fact, as for the students who were the subject of this survey, in their second- and third-years, knowledge about

cervical cancer was studied clinical laboratory science majors in "Pathology" and "Cytopathology," and nursing majors in "Pathology" and "Obstetrics and Gynecology." Our results indicate that even health science university students have limited knowledge of cervical cancer before taking specialized medical courses. Additionally, in a previous study, 261 junior and senior Japanese women university students, excluding medical faculty, were surveyed about their recognition of cervical cancer, and only 26% responded that they “knew” that the main cause of cervical cancer is HPV (Kawata & Koga, 2020). A survey of women college students not from a biology-related background in India reported a rate of recognizing HPV as a cause of cervical cancer of 24.5% (35/143) (Rashid, et al, 2016). In contrast, in a survey of Greek female university students (most of the students from non-health-science majors), 82.4% (695/843) knew that HPV causes cervical cancer (Michail, et al, 2014). Therefore, it must be said that the awareness of the causes of cervical cancer among Asian women university students is lower than among students in Europe and other countries. Furthermore, in the present survey, the sophomore-to-senior groups exhibited significantly higher knowledge of the fact that HPV was closely related to cervical cancer than exhibited the freshmen group. Similarly, a survey of Indian college students reported that students from a biology background (46.6%) recognized HPV as a cause of cervical cancer significantly more than did students from a non-biology background (21.9%) (Rashid, et al, 2016).

The Japanese Ministry of Health, Labour and Welfare recommends that women undergo cervical cancer screening at the age of 20 years, followed by regular

screening every 2 years. Additionally, free coupons have been distributed to women aged 20 years, but the screening rate among 20–24-year-olds in Japan remains low at 10.2% (Ministry of Health, Labour and Welfare, 2010). In the current survey, the screening rate of the 20–24-year-old students was 11.2%, which is similar to previous data. Surprisingly, the screening rate among health science university students, who are considered to have a wealth of knowledge about cervical cancer, was similar to that among young women in general. A possible reason for the same screening rate in this survey conducted in 2022 and in previous data may be that students refrained from screening because of the COVID-19 pandemic which started in 2020. In fact, in South Korea, which has a medical insurance system similar to Japan's, it has been reported that the screening rate for various cancers, including cervical cancer, decreased significantly in 2020 compared to that in 2019 (Lee et al., 2022). In particular, they described that the screening rate was significantly lower among those without chronic diseases. In this survey, when students who had never undergone screening were asked for the reason, the most common response was that "I feel it is not relevant to me yet," suggesting that healthy students in their 20s with low recognition may be hesitant to visit a hospital for screening given the risk of COVID-19 infection.

When asked about the means to improve the cervical cancer screening rate, the most common response was to make it "free of charge." However, even among students aged 20–24 years who should have received free coupons, those who answered "did not receive a free coupon" and "received a free coupon but did not

make an appointment or open it" accounted for 89.6% of the responses. Accordingly, it is highly likely that free coupons will not directly increase the screening rate. One of the reasons why many students responded that they did not receive free coupons was that they had left their parents' homes and were living in a boarding house in the vicinity of the university and had not yet reported their new address to the municipality; therefore, they may not have received free coupons directly. Moreover, among students who "received a free coupon but did not make an appointment or open it," a significantly high proportion of students answered that they "did not understand the need to undergo screening," believed that it was "painful and scary," and were "embarrassed to undergo screening" and "busy and did not have time." Therefore, students with low recognition may not have undergone screening because of the hassle of the procedure or feelings of embarrassment. However, the item that most strongly prompted one to undergo a screening was "free coupons" (40.9%, 18/44), and a minor effect was observed. Ueda et al. stated that the screening rate of 20-year-old Japanese women who receive free coupons was higher than that of 21–24-year-old women (Ueda, Sobue, et al., 2015). In addition, they noted that although free coupons motivate initial screening, they do not lead to continued screening. Tabuchi et al. (2013) stated that eliminating payments would increase the cancer screening rate among women in Japan, but this strategy would not be highly cost-effective. Therefore, there is still some debate regarding whether eliminating co-payments would improve the cervical cancer screening rate. Yagi et al. (2016) reported that distributing leaflets on cervical cancer and screening among parents living with their 20-year-old

daughters in Japan a few months after free coupons were distributed significantly increased the screening rate among 20-year-old women compared to the rate in the previous year. Therefore, in the future, educational activities not only for young women but also for their parents/guardians may lead to an increase in the screening rate among young women. A study of United States college students reported that a brief educational intervention improved the HPV knowledge assessment score from 45% to 79% (Lambert EC., 2001). In the current and previous survey (Rashid, et al, 2016), it is clear that the knowledge about HPV and cervical cancer differs between university majors and faculties. Therefore, we believe that providing education on HPV and cervical cancer at junior and senior high school levels will improve the knowledge of these topics and cervical cancer screening rates among young people, regardless of whether they have medical or health education at university.

Limitations and strengths

This study had several limitations. One is that only two universities were surveyed and that the data are not representative of the entire population of health science university students in Japan. Furthermore, only students of nursing and clinical laboratory science were included, and students of other health sciences and medical majors were not included. Cronbach's alpha coefficient, a measure of reliability, was 0.603 in this survey. Since this coefficient has the characteristic of becoming smaller as the number of question items decreases, it is possible that the number of question items in this survey was insufficient. Despite those limitations, to the best of our knowledge, this is the first report of cervical cancer

screening among Japanese students of health sciences universities.

5. CONCLUSIONS

This survey revealed that knowledge about cervical cancer was high among students who took specialized medical courses. Additionally, our results indicated that recognition of the facts that “cervical cancer can be prevented through screening” and “cervical cancer increases in one’s 20s” are particularly important for improving screening rates. Although distributing a free coupon had a certain effect, said effect was not satisfactory, and further studies are needed on the effectiveness of this method.

6. RELEVANCE FOR CLINICAL PRACTICE

The results of our study could be utilized to improve the educational content to increase cervical cancer screening rates among health sciences university students.

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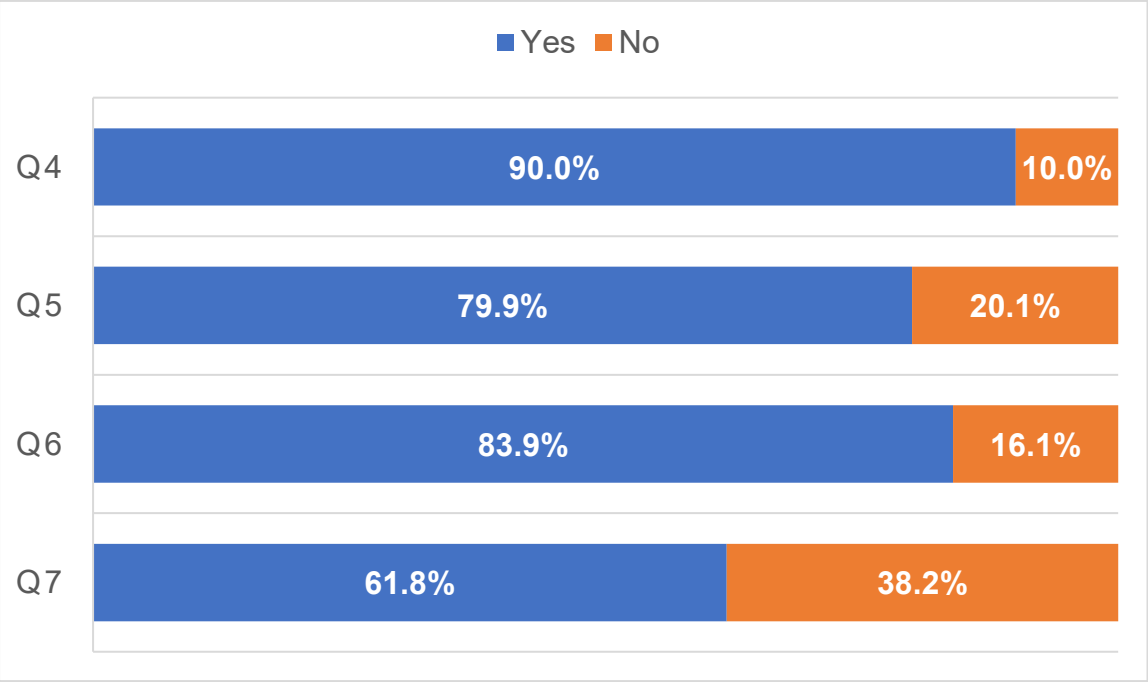
Table 1. Survey questions

Question
1. Age
2. Grade
3. Sex
4. Do you know the term HPV?
5. Do you know that HPV is related to cervical cancer?
6. Do you know that cervical cancer can be prevented through screening?
7. Do you know that cervical cancer increases in one's 20s?
The following questions are for women only.
8. Have you ever undergone a cervical cancer screening?
(a) Reason(s) for not undergoing screening (multiple responses allowed)
(b) Interval between screening
(c) Reason for undergoing screening
(d) Age of first screening
9. Awareness of free coupons
10. How can you make it easier to undergo screening? (multiple responses allowed)

Table 2. Attributes of target students

Characteristic	%
Age	
< 19	33.0% (146/442)
20–24	67.0% (296/442)
Grade	
Freshmen	27.8% (123/442)
Sophomore	33.7% (149/442)
Junior	31.9% (141/442)
Senior	6.6% (29/442)
Sex	
Female	89.1% (394/442)
Male	10.9% (48/442)

Table 3. Knowledge of cervical cancer (questions 4–7)



Q4. Do you know the term HPV?

Q5. Do you know that HPV is related to cervical cancer?

Q6. Do you know that cervical cancer can be prevented through screening?

Q7. Do you know that cervical cancer increases in one's 20s?

Table 4. Relationship between grade and knowledge of cervical cancer

	Freshmen (n=123)	Sophomore-Senior (n=319)	*P* value
Female	109 (88.6%)	285 (89.3%)	0.827
Male	14 (11.4%)	34 (10.7%)	
Q4. Do you know the term HPV?			
Yes	85 (69.1%)	316 (99.1%)	< 0.001
No	38 (30.9%)	3 (0.9%)	
Q5. Do you know that HPV is related to cervical cancer?			
Yes	64 (52.0%)	290 (90.9%)	< 0.001
No	59 (48.0%)	29 (9.1%)	
Q6. Do you know that cervical cancer can be prevented through screening?			
Yes	96 (78.0%)	279 (87.5%)	0.013
No	27 (22.0%)	40 (12.5%)	
Q7. Do you know that cervical cancer increases in one's 20s?			
Yes	56 (45.5%)	225 (70.5%)	< 0.001
No	67 (54.5%)	94 (29.5%)	

Table 5. Relationship between screening experience and knowledge of cervical cancer (women only)

	Screening (+) (n=44)	Screening (-) (n=350)	*P* value
Freshmen	7 (15.9%)	102 (29.1%)	0.064
Junior - Senior	37 (84.1%)	248 (70.9%)	
Q4. Do you know the term HPV?			
Yes	43 (97.7%)	322 (92.0%)	0.229
No	1 (2.3%)	28 (8.0%)	
Q5. Do you know that HPV is related to cervical cancer?			
Yes	39 (88.6%)	284 (81.1%)	0.223
No	5 (11.4%)	66 (18.9%)	
Q6. Do you know that cervical cancer can be prevented through screening?			
Yes	42 (95.5%)	295 (84.3%)	0.047
No	2 (4.5%)	55 (15.7%)	
Q7. Do you know that cervical cancer increases in one's 20s?			
Yes	40 (90.9%)	218 (62.3%)	< 0.001
No	4 (9.1%)	132 (37.7%)	