

243; 95% CI, 59.0–71.0) of participants aged 16 to 35 years whereas 32.1% (25/78; 95% CI, 21.7–42.5) of those aged 16 to 25 years reported having participated in CC screening at least once in their lifetime.

Comparison of HPV and CC Knowledge Between the JPN Study and the AUS Study

In the JPN study, HPV knowledge was assessed in the 164 participants who reported knowing what HPV was, whereas the questions about factors to reduce CC risks (CC knowledge) were asked to all participants. Percentages of correct answers to each item for HPV and CC knowledge were compared with data from the AUS study (Table 3). In both studies, almost all participants answered correctly “false” to the question that no factors reduce CC risks. Compared with the participants in the AUS study, those from Japan aged 16 to 25 years demonstrated better knowledge for HPV being a common virus and being sexually transmitted ($P < 0.05$). Among all JPN participants, 73.3% (95% CI, 66.5–80.1) recognized HPV as a common virus compared with 47.9% (95% CI, 44.1–51.7) for the AUS study. On the other hand, the correct answer of “no” regarding HPV as an inherited virus was obtained significantly less often in the JPN study (37.6%; 95% CI, 30.2–45.0) than in the AUS study (69.9%; 95% CI, 66.4–73.4). For the questions regarding reduction of CC risk, the correct answer rates of “true” for the Papanicolaou test were more than 90% in both studies; however, the answer rate of “true” regarding the HPV vaccine was significantly

higher in the AUS study (94.2; 95% CI, 91.5–96.9) than in the JPN study (80.7%; 95% CI, 75.7–85.7). The correct answer rate of “true” for refraining from smoking was very low (31.3%; 95% CI, 25.5–37.1) in the JPN study and was significantly lower than the rate (42.8%; 95% CI, 37.0–48.6) in the AUS study.

Although the mean (SD) HPV knowledge score among the JPN study participants aged 16 to 35 years at 3.1 (2.5) (95% CI, 2.8–3.5) was slightly higher than that among the AUS study participants aged 16 to 25 years (2.8 [2.4]; 95% CI, 2.5–3.1) ($P = 0.03$), it is noteworthy that there was no significant difference in the mean HPV knowledge scores for participants aged 16 to 25 years in both studies. The CC knowledge scores were comparable between the studies (JPN, 4.9 [1.0] and 95% CI, 4.8–5.0 vs AUS, 5.0 [1.0] and 95% CI, 4.9–5.1).

Predictors of High Knowledge Scores of HPV and CC Among Participants in the JPN Study

Table 4 shows predictors of high HPV knowledge. Awareness of HPV vaccine (adjusted odds ratio [OR], 10.31; 95% CI, 3.46–30.76; $P < 0.001$) and self-reported administration of HPV vaccination (adjusted OR, 3.11; 95% CI, 1.09–8.87; $P = 0.034$) were significant predictors of high HPV knowledge, with scores of 5 to 6 points. Whereas awareness of chlamydia was a significant predictor of a high HPV score (adjusted OR, 2.57; 95% CI, 1.11–5.94) in the

TABLE 3. Comparison between participants in Japan study and Australia study concerning their knowledge of HPV and CC Correct Answer Rates to Each Question

	Japan (16–35 Years Old), % (95% CI)	Japan (16–25 Years Old), % (95% CI)	Australia (16–25 Years Old), % (95% CI)
About HPV	n = 165	n = 48	n = 173
Sexually transmitted infection (T)	87.9 (82.9–92.9)*	93.8 (87.0–100.0)*	73.4 (70.0–76.8)
Common virus (T)	73.3 (66.5–80.1)*	77.1 (65.2–89.0)*	47.9 (44.1–51.7)
Inherited virus (F)	37.6 (30.2–45.0)*	39.6 (25.8–53.4)*	69.9 (66.4–73.4)
Rare virus that infects only people with many sex partners (F)	84.8 (79.3–90.3)*	81.2 (70.1–92.3)	75.7 (72.4–79.0)
Affects only the elderly (F)	92.1 (88.0–96.2)	95.8 (90.1–100.0)	94.2 (92.4–96.0)
Related to CC (T)	87.3 (82.2–92.4)	81.2 (70.3–92.3)*	92.4 (90.4–94.4)
About factors to reduce CC risks	n = 243	n = 78	n = 278
Papanicolaou test (T)	97.5 (95.5–99.5)*	98.7 (96.2–100.0)*	91.4 (88.1–94.7)
HPV vaccine (T)	80.7 (75.7–85.7)*	82.1 (73.6–90.6)*	94.2 (91.5–96.9)
Safe sex (T)	68.3 (62.4–74.2)	74.4 (64.7–84.1)	71.9 (66.6–77.2)
Refrain from smoking (T)	31.3 (25.5–37.1)*	26.9 (17.1–36.7)*	42.8 (37.0–48.6)
Exercise (F)	63.0 (56.9–69.1)*	64.1 (53.5–74.7)	54.0 (48.1–59.9)
Healthy food (F)	51.4 (45.1–57.7)	55.1 (44.1–66.1)	47.8 (41.9–53.7)
Nothing (F)	99.6 (98.1–100.0)	100.0	99.6 (98.9–100.0)

* $P < 0.05$ compared with the data in Australia.

T, true; F, false.

TABLE 4. HPV knowledge of participants in Japan and ORs of high HPV knowledge compared with low/moderate HPV knowledge using univariate and multivariate analyses

Characteristic	Low (0–1)	Moderate (2–4)	High (5–6)	OR (95% CI)	P	Adjusted OR (95% CI)	P
Age group, y							
16–17	3	1	0	NA		NA	
18–21	13	5	11	1.00		1.00	
22–25	17	7	21	1.80 (0.68–4.80)	0.841	1.36 (0.41–4.46)	0.984
26–30	24	18	33	1.52 (0.62–3.75)		1.15 (0.36–3.68)	
31–35	30	19	41	1.53 (0.64–3.70)		1.07 (0.35–3.30)	
Educational level							
<High school graduate	3	1	1	0.43 (0.04–4.14)		NA	
High school graduate	23	7	17	1.00	0.261	1.00	0.491
>High school graduate	61	42	87	1.53 (0.79–2.98)		1.65 (0.72–3.77)	
Country of birth							
Japan	86	49	101	1.00	0.169	1.00	0.125
Others	1	1	5	3.21 (0.61–16.88)		6.22 (0.60–64.14)	
Age at first vaginal intercourse, y							
Never/age not specified	20	14	18	1.00	0.373	1.00	0.295
12–15	5	1	8	2.49 (0.69–8.99)		2.56 (0.56–11.76)	
16–18	26	14	31	1.45 (0.69–3.06)		1.95 (0.76–5.02)	
19–24	35	16	47	1.70 (0.84–3.45)		2.17 (0.88–5.35)	
25–30	1	5	2	0.59 (0.11–3.25)		0.51 (0.07–3.94)	
Chlamydia awareness							
No	7	5	5	1.00	0.367	1.00	0.465
Yes	80	45	101	1.66 (0.55–5.03)		1.72 (0.40–7.41)	
Awareness of HPV vaccines							
No	33	10	4	1.00	<0.001	1.00	<0.001
Yes	53	39	102	10.83 (3.73–31.51)		10.31 (3.46–30.76)	
Self-reported HPV vaccination status							
No	77	42	87	1.00	0.074	1.00	0.034
Yes	5	7	18	2.04 (0.93–4.46)		3.11 (1.09–8.87)	

NA, not applicable.

AUS study,⁹ it was not significant in the JPN study (adjusted OR, 1.72; 95% CI, 0.40–7.41). There was no significant predictor related to high CC knowledge scores of 5 to 7 points found (Table 1, Supplemental Digital Content 1, <http://links.lww.com/IGC/A226>).

DISCUSSION

In Australia and Japan, the recent age-adjusted CC incidences are 4.9 and 9.8, respectively, and the mortality rates of CC are 1.4 and 2.6, respectively, per 100,000 women.¹⁸

Australia has established a well-organized cervical screening program by conventional Papanicolaou test screening. The uptake is approximately 60% of the target population, and the program has succeeded in decreasing both the incidence and mortality rates of CC.^{18,19} In contrast, in Japan, the seriously low acceptance rate of the Papanicolaou test is thought to be the main reason for the increase in number of CC patients in Japan. The recommended CC screening guideline for JPN women is twice yearly for those 20 years and older.²⁰ The self-reported coverage rate of the Papanicolaou test in the targeted women was only 32% in the survey of 2010.¹⁵ This is one of the lowest rates among developed

countries.²¹ We recently reported that only 59.5% of young female workers or students in the Yokohama City University Hospital-based community who received catch-up HPV vaccinations (mean, 28; range, 21–48 years) had undergone CC screening in their lifetime.¹⁵ In the present study, Papanicolaou test uptake in the participants' lifetime was 65%, which suggests that the participants of the present study had higher CC screening rates.

An HPV vaccine program in Australia began in 2007 and is ongoing for a target age of 12 to 13 years.^{13,14} In addition, a catch-up program was offered for women up to 26 years old through the end of 2009, and this achieved a high level of vaccination coverage.^{13,14} In Japan, only opportunistic HPV vaccination was available until a nationwide HPV vaccination program was widely initiated in 2011, mainly targeting girls aged 13 to 16 years. The nationwide HPV vaccination program was funded equally by the national government and by each regional government for either bivalent or quadrivalent HPV vaccines and finished in March 2013 achieving a high coverage rate (>70%).²² Subsequently, total coverage by the JPN government was endorsed and started in April 2013. However, its active approval has been suspended indefinitely since July 2013 to investigate mass media reports of a severe chronic pain syndrome.²³ This potential adverse reaction has not been confirmed medically, nor has it been reported at such rates elsewhere in the world.²⁴ However, in this current study, as most JPN study participants were older the target age for the national HPV vaccine program, the rate of self-reported HPV vaccination was low, at 21.8% in women aged 16 to 25 years, much lower than the rate of 58.3% in the AUS study. Such a difference between the JPN and AUS HPV vaccination programs for young women may enlarge the gap in CC status between Japan and Australia in the future.

Although more than half of the target women aged 16 to 35 years living in Kanagawa Prefecture were estimated to be FB users,^{11,25,26} we also placed an advertisement banner on the YKCCPP HP to boost subjects to be recruited. In this study, 52% were recruited by FB, whereas the remainder was recruited by HP, although the 2 groups did not differ significantly, except for sexual experiences. Even with study methods using an SNS, it was more difficult to recruit girls aged 16 to 17 years. In the AUS study, the study population of these ages was 14.0% in contrast to 19.8% of the target population.⁸ This tendency was greater in the JPN study with only 4 high school students (1.6%) participating in the study from among the 7.4% of the target population. The low participation rate among this age group in the JPN study was thought to be due to only approximately 30% of girls aged 16 to 17 years in the target population being FB users^{11,25,26} and due to the need for parental consent for participants younger than 20 years. This is in contrast to Australia in which it allows for professional assessment for mature minor status for those younger than 18 years to participate without parental consent. Another bias in the JPN study not seen in the AUS study⁸ was an uneven participation by geographic region. One explanation for the overrepresentation in Yokohama City is that our local CC prevention projects were well advertised by those living in Yokohama City. A limitation of our study,

using SNS, is the bias that young participants had more awareness and knowledge about HPV and CC than the target populations as reported in the AUS study,^{8,9,27,28} although the latter study was performed 3 years earlier.^{8,9} Our data also showed that significantly more educated women than in the target population participated in the JPN study after adjusting for the age distribution, similar to the AUS study.⁸ Ideally, for the precise comparisons among countries, simultaneous study performance is required. However, in the JPN study, the participants were shown to have very high awareness and knowledge about HPV and CC that was comparable with the AUS study. The high profile of the HPV vaccine program by national and local governments in Japan might have influenced these results, in addition to the television commercial for CC screening advocacy broadcasted repeatedly after the Great East Japan Earthquake in 2011. An important point for ongoing education was the lack of knowledge about the link between smoking and CC in the JPN study.

CONCLUSIONS

The SNSs are an efficient method to recruit young women into health surveys. A nationwide survey about CC prevention using SNSs would be a next step to better understand young women's beliefs and potential barriers to better uptake of the JPN national HPV vaccine program.

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REFERENCES

1. Matsuda A, Matsuda T, Shibata A, et al. Cancer incidence and incidence rates in Japan in 2007: a study of 21 population-based cancer registries for the Monitoring of Cancer Incidence in Japan (MCIJ) project. *Jpn J Clin Oncol.* 2013;43:328–336.
2. Hayashi Y, Shimizu Y, Netsu S, et al. High HPV vaccination uptake rates for adolescent girls after regional governmental funding in Shiki City, Japan. *Vaccine.* 2012;30:5547–5550.
3. Plummer M, Peto J, Franceschi S. International Collaboration of Epidemiological Studies of Cervical Cancer. Time since first sexual intercourse and the risk of cervical cancer. *Int J Cancer.* 2012;130:2638–2644.
4. Morton LM, Cahill J, Hartge P. Reporting participation in epidemiologic studies: a survey of practice. *Am J Epidemiol.* 2006;163:197–203.
5. Blumberg SJ, Luke JV. Reevaluating the need for concern regarding noncoverage bias in landline surveys. *Am J Public Health.* 2009;99:1806–1810.
6. Garrett SK, Thomas AP, Cicuttini F, et al. Community-based recruitment strategies for a longitudinal interventional study: the VECAT experience. *J Clin Epidemiol.* 2000;53:541–548.

7. Robinson JL, Fuerch JH, Winiewicz DD, et al. Cost effectiveness of recruitment methods in an obesity prevention trial for young children. *Prev Med.* 2007;44:499–503.
8. Fenner Y, Garland SM, Moore EE, et al. Web-based recruiting for health research using a social networking site: an exploratory study. *J Med Internet Res.* 2012;14:1–13.
9. Gunasekaran B, Jayasinghe Y, Fenner Y, et al. Knowledge of human papillomavirus and cervical cancer among young women recruited using a social networking site. *Sex Transm Infect.* 2013;89:327–329.
10. The Ministry of Internal Affairs and Communications. *Telecommunication report from the Ministry of Internal Affairs and Communications in 2011 [Web site]*. Available at: <http://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2011/chapter-3.pdf#page=1>. Accessed March 9, 2014.
11. Lifemedia, Inc. *Research of Japanese Facebook users June 2013 [internal document]*. Available at: http://research.lifemedia.jp/2013/06/130621_facebook.html. Accessed March 9, 2014 (in Japanese).
12. Statistics Japan, Statistics Bureau, Ministry of Internal Affairs and Communications. *Population data from census 2010 [Web site]*. Available at: <http://www.stat.go.jp/english/data/kokusei/index.htm>. Accessed January 26, 2014.
13. Brotherton JM, Fridman M, May CL, et al. Early effect of the HPV vaccination programme on cervical abnormalities in Victoria, Australia: an ecological study. *Lancet.* 2011;377:2085–2092.
14. Garland SM, Skinner SR, Brotherton JM. Adolescent and young adult HPV vaccination in Australia: achievements and challenges. *Prev Med.* 2011;53:S29–S35.
15. Miyagi E, Sukegawa A, Motoki Y, et al. Attitudes toward cervical cancer screening among women receiving HPV vaccination in a university hospital-based community: interim two-year follow-up results. In: *J Obstet Gynaecol Res*, 2014.
16. Statistics Japan, Statistics Bureau, Ministry of Internal Affairs and Communications. *Distribution of educational background in Kanagawa prefecture from employment status survey 2012 [Web site]*. Available at: <http://www.stat.go.jp/data/shugyou/2012/pdf/kgaiyou.pdf>. Accessed July 23, 2013 (in Japanese).
17. Ministry of Health, Labour and Welfare. *National Health and Nutrition Survey 2010 [Web site]*. Available at: <http://www.mhlw.go.jp/stf/houdou/2r9852000002q1st.html>. Accessed July 2, 2013 (in Japanese).
18. National Cancer Institute, U.S. National Institutes of Health. *International Cancer Screening Network. Age-adjusted cervical cancer incidence and mortality rates for 2008 for 32 countries, organized by Region of the World, participating in the ICSN [Web site]*. Available at: <http://appliedresearch.cancer.gov/icsn/cervical/mortality.html>. Accessed July 2, 2013.
19. Australian Government, Australian Institute of Health and Welfare (AIHW). *Australian Cancer Incidence and Mortality (ACIM) books: authoritative information and statistics to promote better health and wellbeing [Web site]*. Available at: <http://www.aihw.gov.au/acim-books/>. Accessed September 15, 2013.
20. Ministry of Health, Labour and Welfare. *Report from the National Screening Committee: Revision of the Programs for Breast and Cervical Cancer Screening based on the Law for the Health Law for the Aged*. Tokyo, March 2004 (in Japanese).
21. OECD Publishing. *Screening, survival and mortality for cervical cancer. OECD (2011), in Health at a Glance 2011: OECD indicators [Web site]*. Available at: http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2011_health_glance-2011-en. Accessed May 26, 2013.
22. Ministry of Health, Labour and Welfare. *An interim nationwide vaccine program, Japan*. Available at: http://www.mhlw.go.jp/bunya/kenkou/kekkaku-kansenshou28/pdf/vaccine_kouhukin_enchou.pdf. Accessed March 24, 2013 (in Japanese).
23. Ministry of Health, Labour and Welfare. *Report from the deliberations on HPV vaccines at adverse reaction committee held on December 25, 2013*. Available at: <http://www.mhlw.go.jp/stf/shingi/0000033881.html>. Accessed March 11, 2013 (in Japanese).
24. World Health Organization. *GACVS Safety update on HPV Vaccines Geneva, 13 June 2013*. Available at: http://www.who.int/vaccine_safety/committee/topics/hpv/130619HPV_VaccineGACVSstatement.pdf. Accessed March 11, 2014.
25. FB Japan. *FB advertisement [Web site]*. Available at: <https://www.FB.com/advertising>. Accessed March 3, 2014.
26. SocialBakers. *FB Statistics by Country*. Available at: <http://www.socialbakers.com/FB-statistics/>. Accessed March 3, 2013.
27. Klug SJ, Hukelmann M, Blettner M. Knowledge about infection with human papillomavirus: a systematic review. *Prev Med.* 2008;46:87–98.
28. Pitts MK, Heywood W, Ryall R, et al. Knowledge of human papillomavirus (HPV) and the HPV vaccine in a national sample of Australian men and women. *Sex Health.* 2010;7:299–303.

