RESEARCH ARTICLE

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The Utilization of Human Papillomavirus Testing for Cervical Cancer Screening in Thailand: A Comparison of Screening with and without Self-sampling Samples

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Abstract

Background: Cervical cancer (CC) screening shifted from Pap-smear to human papillomavirus (HPV) testing HPV with and without a self-sampling HPV-test in Thailand. Few studies have reported the initial outcomes of such a transition. This study aims to explore CC screening rate, CC detection and compare the CC detection rate by HPV with and without self-sampling methods in Krabi, province. **Methods:** A retrospective study was conducted from 1st October 2023 to 30th September 2024. A total of 11,925 women's records were retrieved. Information on demographic, screening results and cancer diagnosis was retrieved from the Krabi provincial hospital. Different proportions of CC detections and self-test collection based on demographic features were tested using chi-square and Fisher's exact tests. **Result:** CC screening rate was 42.4%: 10,619 (89%) of women had an HPV test and 1,306 (11%) had a Pap-smear test. The screening rate was 30.2% in 2023 and 52.1% in 2024. With regard to age, occupation, and health insurance schemes there was a significant difference in the proportion of those taking the self- collection test. Religion showed non-significance difference in the proportion of self-sampling test in relation to religion. CC detection was 3% among women who underwent the Pap-smear test and 0.12% for those who performed the HPV test. There is a significant difference in CC detection between the HPV with and without a self-sampling test. **Conclusion:** CC screening with HPV testing, especially with self-sampling, showed a promising approach to increasing CC screening uptake in the population. The rate of CC detection through self-sampling was lower in the early years of implementation compared to non-self-sampling methods. Ensuring the correct performance of self-sampling should be carefully considered and monitored in the future.

Keywords: cervical cancer screening- HPV- Pap smear- Thailand

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Introduction

Cervical cancer (CC) is a leading cause of mortality among women. In 2022, an estimated 662,301 were newly diagnosed with CC and approximately 348,874 women died from the disease, worldwide. The age standardized incidence rate (ASIR) and age standardized mortality rate (ASMR) were 14.1 and 7.1 per 100,000, respectively. It is the second most prevalent malignant tumour in developing countries [1]. In Thailand, the disease ranked 5th, with 8662 cases and 4576 deaths from CC in 2022. The ASIR and ASMR were 14.9 and 6.9 per 100,000, respectively. The World Health Organization (WHO) issued a call to action to eliminate CC and launched the Global Strategy to accelerate the elimination of the disease as a public health problem by 2030 [2]. One of the approaches to mitigate the burden of this cancer is to screen women during the pre-cancer phase in which cervical cancer could be detected using a Pap smear/HPV-test [3].

In Thailand, cervical cancer screening was introduced by the Ministry of Public Health in cooperation with the National Health Security Office. The national cervical cancer screening programme was launched using the Pap smear, covering 76 provinces nationwide under the Universal Coverage Scheme in 2005 [4]. Based on the Thai Behavioural Risk Factor Surveillance System (BRFSS), the results of the survey showed that, in 2010, 67.4% of women aged 30–60 years had been screened for CC in

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the past 5 years [5]. From 2020, HPV testing has been introduced as a primary screening test for all Thai women attending primary care units instead of the conventional Pap test [4]. However, the programme struggled during the COVID-19, with recent data in 2023 showing the screening rate was 46.8% in Thailand, far behind the target [6]. The low rate of screening might be due to barrier factors, which include shyness; embarrassment; fear of pain; no awareness about the cause of CC and the importance of screening; being unmarried; self-perception of being healthy or having no risk thus deeming a test unnecessary; or anxiety about the abnormal results [7].

To improve the uptake rate, the self-test has been introduced. The approach has been documented with regard to improving the uptake of cervical cancer screening worldwide [8]. A previous study in southern Thailand reported high acceptability of self-sampling, but this was greatly different when considered by religious background [9]. In 2023, Thailand provided a free-of-charge test for all Thai women aged 30 to 60 years old at the primary care unit. However, this was a pilot test of the self-test collection programme.

Krabi province is one of the pilot areas that have implemented the HPV-test with self-sampling since 2023; the programme provides the HPV-test screening with the option to self-sampling.

Notwithstanding, a lack of studies reported on the current situation of this programme. Furthermore, the province is in the southern part of Thailand where religions are mixed with high numbers of Buddhist and Muslims, which might affect the uptake rate of cervical cancer screening, especially with the self-test collection approach. As a result, this study aims to investigate cervical cancer screening utilizing the HPV test and to compare the screening and detection rate between the different screening modalities. We also compare the screening and detection rate between the HPV-test with and without self-sampling based on data from Krabi province.

Materials and Methods

Study design and settings

A retrospective study was adopted. The cervical cancer screening data were retrieved from Krabi Hospital from January 2023 to December 2024.

Population

Krabi Province is located approximately 780 km south of Bangkok in southern Thailand, covering an area of 4,708 km². The population of Krabi Province, based on the 2020 census, was approximately 500,000 people, with 50.5% of the population being female. The number of women eligible for CC screening and aged 30–60 years old was 12,456 and 15,661 in 2023 and 2024, respectively.

HPV Self-sampling delivery

The HPV test kit was delivered by agency responsible for procuring HPV DNA test kits distributes them to the designated hub hospitals. These hub hospitals are then responsible for disseminating the test kits to affiliated sub-district health-promoting hospitals (SHPHs) within their network. Eligible woman ca received it at the SHPHs. Upon collection of the self-sampled specimens, the SHPHs or primary care units of the hospitals are required to record detailed information such as the individual's full name and the date of sample collection, as specified in the form accompanying the test kit. The collected specimens are then sent back to the hospital. The hub hospital consolidates all collected specimens and forwards them to the designated laboratory or hospital responsible for HPV DNA testing. The laboratory or responsible institution conducting the HPV DNA test and Liquid-Based Cytology records the test results and returns the results to the hub hospital. The hub hospital then informs the service recipients of their results and follows up with individuals who receive abnormal screening outcomes. These individuals are referred to the appropriate hospital for further diagnostic examination.

Data Source

The CC screening data were retrieved from Krabi Hospital. The hospital records all women who have been screened for CC. Information of screened women comprised age, religion, occupation, insurance scheme, history of screening type (Pap-smear, HPV-test with self-sampling/ without self-sampling), genotype and diagnosed with cervical cancer. A case of cervical cancer was defined according to the International Classification of Diseases 10th edition (ICD-10) code for cervical cancer (C53). In this study, we enrolled women aged over 15 years old for the eligible are not only specify for age-specific (30–60 years-old), but it was also for women with certain risk factors, such as a history of abnormal Pap smear results, multiple sexual partners, early onset of sexual activity, or a history of sexually transmitted infections, may be considered for more frequent screening.

Statistical analysis

Categorized data were reported as number and percentage, while continuous data were summarized as means with standard deviations or medians with ranges (minimum: maximum) when continuous variables showed non-normal distribution.

Chi-square and Fisher's exact test were used to test the differences between screening modalities, and by demographic features. Statistical significance was set at $p<0.05$. All examinations were conducted using Stata version 15.

Results

Characteristics of the participants

There were 11,925 women who had been screened during 2023–2024: 89% were screened by the HPV test and 11% by Pap-smear. The majority of cervical screening was with women aged 30–60 years old. While there was no-specific religion shown to have the higher proportion of women taking the HPV test (9.2%) than the Pap-smear (2.9%), Islam and Buddhist was shown to have slightly higher number of women taking the Pap-smear test than taking the HPV-test. Women who are self-employed and are part of the Universal Coverage Scheme make up the

Table 1. Types of Screening by Demographic Features

Variable	Total		HPV test		Pap-smear		
	n	%	n	%	n	%	p-value
Overall	11,925	100	10,619	89	1,307	11	
Age							<0.001
15–29	269	2.3	41	0.4	228	17.5	
30–59	11,485	96.3	10,557	99.4	929	71	
≥60	171	1.4	21	0.2	150	11.5	
Religion							<0.001
Buddhist	7,861	65.9	6,962	65.6	899	68.8	
Islam	3,053	25.6	2,684	25.3	369	28.3	
Not specified	1,011	8.5	973	9.2	38	2.9	
Occupation							<0.001
Government	443	3.7	370	3.5	73	5.6	
Self-employed	8,796	73.8	7,929	74.7	867	66.4	
Student	108	0.9	71	0.7	37	2.8	
Employee	66	0.6	48	0.4	18	1.4	
No job	2,512	21.1	2,201	20.7	311	23.8	
Insurance scheme							<0.001
Self-paid	3,208	26.9	3,190	30	18	1.4	
Civil servant rights/government agency rights	744	6.2	609	5.7	135	10.6	
Social security rights	1437	12.1	1091	10.3	346	27.2	
Local government employee welfare rights	255	2.1	209	2	46	3.6	
Universal Coverage Scheme	6,247	52.4	5,518	52	729	57.2	
Genotype							
None detected	11,160	93.6	9,854	92.8	-	-	
Low risk	25	0.2	25	0.24	-	-	
High risk	704	5.9	704	6.63	-	-	
Both	36	0.3	36	0.34	-	-	

highest proportion of those taking up the CC screening. Genotype-positive for high-risk HPV was 5.9%, 0.2% for low risk, and 0.3% for both types (Table 1). Detailed in HPV genotypes were demonstrated in Table 2.

Comparison of cervical cancer screening rate by fiscal year

There were 3766 and 8159 women who underwent screening, accounting for a 30.2% and 52.1% screening rate in 2023 and 2024, respectively. The HPV test was the dominant method of screening (Table 3).

Distribution of HPV-testing with self and non-self-test collection by demographic

Table 4 reports the distribution of HPV screening with self-test collection, The results revealed that women aged 30–60 years old and who are part of the civil servant scheme make up the majority of those undertaking self-sampling in both fiscal years. The majority of those choosing self-sampling in 2023 were women who are Buddhist, employed and receive Local Government Employee Welfare. Those women who do not specify a particular religion, are government employees and are part of the civil servant scheme make up the majority of those undertaking self-sampling in 2024.

Diagnosed with cervical cancer by types of screening

Overall, 55 of the 11,925 women (0.5%) were diagnosed with cervical cancer. There were 1,306 and

Table 2. Distribution of HPV Genotype

HPV type	n	%
genotype_35	14	0.13
genotype_45	15	0.14
genotype_33	26	0.24
genotype_31	33	0.31
genotype_56	42	0.4
genotype_59	54	0.51
genotype_18	61	0.57
genotype_53	61	0.57
genotype_39	71	0.67
genotype_66	75	0.71
genotype_51	82	0.77
genotype_58	93	0.88
genotype_68	120	1.13
genotype_52	134	1.26
genotype_16	166	1.56

Table 3. Comparison of Screening Types by Fiscal Year

Fiscal year	Pap smear	%	HPV-test	%	Total screened	Target population	screening rate
2023	477	13%	3289	87%	3766	12456	30.2
2024	829	10%	7330	90%	8159	15661	52.1

10,619 women who underwent the Pap-smear and HPV-test, with 38 (2.9%) and 17 (0.2%) diagnosed with CC, respectively. The detection rate was quite similar between the fiscal years.

Focusing on the HPV-test, there were 5,394 and 5,225 women who performed the self- and non-self-sampling test, with 5 (0.1%) and 12 (0.2%), respectively, diagnosed with CC. There was a similar detection rate of CC between 2023 and 2024 for those who underwent the non-self-sampling test, while there were 0 cases in 2023 and 5 (0.1%) women in 2024 who performed the self-sampling test who were diagnosed with CC. A modest but statistically significant difference in the cervical cancer detection rate between self-sampling and non-self-sampling tests was observed in 2023 (Table 5).

Discussion

In 2020, Thailand changed its approach to cervical cancer screening from the Pap-smear to the HPV test; however, the progression was hindered by the COVID-19 pandemic. This study utilizes CC screening data from a provincial hospital. The results show that 42.4% of women received a screening for CC; 10,619 (89%) had an HPV test, and 1,307 (11%) had a Pap smear. In 2023 and 2024, the screening rate was 30.2% and 52.1%, respectively. The percentage of people who took the self- collection test varied significantly by age, employment and health insurance plan. Religion did not significantly affect the percentage of people who took the self-test. The cervical cancer detection rate was 3% among women who underwent a Pap-smear test and 0.12% for those who performed the HPV test. The number of individuals diagnosed with cervical cancer was lower among those who performed the self-sampling test compared to those who did not.

The screening rate in this study was 42.4%. The rate was lower than the country's average in 2023 (46.8%) and falls far short of the WHO's target of 70%. The screening varied from region to region. Three large-scale cohort studies conducted in the USA reported Pap screening rates were 71%, 79% and 66%, among 41,657, 740 and

Table 4. Distribution of HPV-Testing with Self and Non-Self-Test Collection by Demographic

	Fiscal year 2023				Fiscal year 2024			
	HPV-screening	Self-test sampling			HPV-screening	Self-test sampling		
	number	No (%)	Yes (%)	p-value	number	No	Yes	p-value
Age				<0.001				<0.001
15-29	76	74 (97.4)	2 (2.6)		193	169 (87.6)	24 (12.4)	
30-59	3635	2335 (64.2)	1300 (35.8)		7850	3793 (48.3)	4057 (51.7)	
≥60	55	52 (94.55)	3 (5.5)		116	108 (93.1)	8 (6.9)	
Religion				0.358				0.139
Buddhist	2232	1507 (64.6)	825 (35.4)		5529	2771 (50.1)	2758 (49.9)	
Islam	1081	713 (66)	368 (34)		1972	995 (50.5)	977 (49.5)	
No specify	353	241 (68.3)	112 (31.7)		658	304 (46.2)	354 (53.8)	
occupational				<0.001				<0.001
Government	130	48 (37)	82 (63)		313	87 (27.8)	226 (72.2)	
Self-employ	2718	1802 (66.3)	916 (33.7)		6078	3110 (57.2)	2968 (48.8)	
Student	28	23 (82.1)	5 (17.9)		80	40 (50)	40 (50)	
Employee	19	7 (36.8)	12 (63.2)		47	22 (46.8)	25 (53.2)	
No job	871	581 (66.7)	290 (33.3)		1641	811 (49.4)	830 (50.6)	
Insurance scheme				<0.001				<0.001
Pay by yourself	1,186	791 (66.7)	395 (33.3)		2022	1009 (49.9)	1013 (50.1)	
Civil servant rights/government agency rights	247	122 (49.4)	125 (50.6)		497	210 (42.2)	287 (58.8)	
Social security rights	429	271 (63.2)	158 (36.8)		1008	439 (43.5)	569 (56.5)	
Local government employee welfare rights	86	37 (43.0)	49 (57)		169	71 (42)	98 (58)	
National health insurance rights	1,808	1230 (68.0)	578 (32)		4439	2319 (52.2)	2120 (47.8)	

Table 5. Diagnosed of Cervical Cancer by Types of Screening

	Overall	No	Yes	p-value
Overall	11925	11874 (99.5)	55 (0.5)	<0.001
Pap smear	1306	1268 (97.1)	38 (2.9)	
HPV	10619	10602 (99.8)	17 (0.2)	
2023				
Overall	3766	3748 (99.5)	22 (0.6)	<0.001#
Pap smear	477	462 (96.9)	15 (3.1)	
HPV	3289	3282 (99.8)	7 (0.2)	
2024				
Overall	8,159	8126 (99.6)	33 (0.4)	<0.001#
Pap smear	829	806 (97.2)	23 (2.8)	
HPV	7330	7320 (99.9)	10 (0.1)	
HPV testing				
Self-test				0.078
Yes	5,394	5389 (99.1)	5 (0.1)	
No	5,225	5213 (99.8)	12 (0.2)	
2023				0.047#
Yes	1,305	1305 (100)	0 (0)	
No	1,984	1977 (99.7)	7 (0.3)	
2024				0.758#
Yes	4,089	4084 (99.9)	5 (0.1)	
No	3,241	3236 (99.9)	5 (0.2)	

#p-value from Fishers 'exact test.

1571 women, respectively. The cervical cancer screening participation rates in Europe ranged from 65.8% (Serbia) to 95.4% (Sweden) [10]. In Asia, the screening coverage has been relatively low; Bhutan, Japan, South Korea, Singapore and Thailand had screening coverage rates of more than 50% for women aged 30 to 49 [11, 12]. Many factors are related to the CC screening for Asian women [13]: in Thailand the hindering factors include: shyness; embarrassment; fear of pain; being unmarried; a self-perception of being healthy or having no risk thus deeming the test unnecessary; or anxiety about receiving abnormal results and no awareness of the cause of CC or the importance of screening [14]. Furthermore, a recent study revealed that nearly 96% of women did not know that screening should be done [5]. Therefore, programmes to sustain the knowledge and awareness of cervical cancer screening remain necessary. Notably, despite the policy of changing cervical cancer screening from the Pap smear to HPV testing, this study found that Pap smears were still being performed in this setting – possibly this was opportunistic screening. Opportunistic screening, conducted outside the framework of organized programmes and utilizing screening opportunities during routine healthcare encounters, may lead to higher cancer detection rates compared to standard care. This phenomenon may also account for the greater number of detected cases with the Pap smear compared to HPV testing observed in our study.

In Thailand, the screening approach has been changed from the Pap smear to the HPV test. Our results show that the majority of screenings use the HPV test. Interestingly, the cervical screening rate increased by 20% from 2023 to 2024. The possible explanation for this is due to the allowance of self-sampling. The Medical Sciences Department encouraged women to screen using HPV DNA self-sampling kits for free in 2024 [15]; therefore, Thai women could take advantage of the universal health coverage (UHC) insures to obtain the kits for free if they met the criteria. This may be supported by previous evidence that shows insurance is the main predictor for women to have the screening [16]. As a result, our findings show that the proportion of self-sampling also increased by 15% in 2024. Hence, an increase in screening rates in 2024 may be influenced by the self-sampling campaign through the UHC. Although the HPV self-sampling test gained acceptability, the number of cervical cancer cases diagnosed in 2023 differed significantly based on current data. Many Thai women are unfamiliar with self-sampling HPV testing methods [17]. Although Thai women were given guidance and advice from the health personnel at the primary care unit, as well as a brochure on how to perform the self-sampling when receiving the kit, there is no guarantee or process of checking whether the sampling is done correctly. Therefore, there is a need to ensure that self-sample collection is carried out properly and that health personnel are trained to explain the method clearly.

In terms of factors affecting screening [17], it is no surprise that we found age, occupation and insurance types were significantly associated with HPV test screening and self-sampling. This is because most Thai women in this study were under the UHC insurance scheme and met the eligible criteria for the test, since Thai woman aged 30 to

60 years old can access cervical cancer screening free of charge. Self-employment is the main major occupation of those who underwent the screening, for they may have the most available time to undertake a screening compared to other occupations. Another factor that plays a role in the setting of this study is religion. A previous cross-sectional study conducted in southern Thailand revealed Muslim women had an OR of having had a prior Pap test of 0.30 compared with Buddhist women (95% CI: 0.12 to 0.66) [9]. Religion played a non-significant role for self-sampling in our present study. Self-sampling HPV testing was highly acceptable across religious groups, suggesting that it could be beneficial in reducing CC in this region [9]. Our results proved that the self-sampling helps mitigate the barriers to CC screening that Muslim woman in Thailand encounter: it is private and can be done by a woman in her own home, thus reducing the embarrassment and fear associated with having a test at a doctor's surgery.

From a public health viewpoint, the HPV test is acceptable in Thailand, especially with the self-sampling HPV test. This seems to reduce the barriers, such as religion and shyness, for Thai women. However, the methods and process of self-sampling need to be monitored.

Inevitably, the study has some limitations. First, we collected data from the two fiscal years in which self-sampling had just been introduced; therefore, this limited the scope of time for further investigation; for example, we found a great difference in the number of diagnosed cases of cervical cancer in 2023 but not in 2024. Therefore, studies over longer periods are required to monitor differences in the number of diagnoses. Second, this study was based on screening data at a provincial level, in which many related cervical cancer screening variables were not documented. Third, our results are limited to the southern regions of Thailand, therefore generalizing our results to other areas should be done with caution.

This study emphasizes that the HPV test for cervical cancer is a major screening approach in Thailand. Age, occupation and type of insurance are associated with screening using the HPV test. Self-sampling seems to improve the screening rate in Thailand and mitigates the religious barriers in southern Thailand. Ensuring that self-sampling is performed correctly needs to be considered. Further studies over longer periods would help to monitor the screening uptake in the HPV test era in Thailand.

Author Contribution Statement

Conceptualization: J.S., N.S. and Pallop.S. ; data curation: J.S. and N.S.; formal analysis: Pallop.S. and J.S.; investigation: J.S. ; methodology: J.S., N.S. and Pallop.S.; project administration: J.S, N.S.; supervision: N.S., Pallop.S..; validation:K.W., Patumrat .S., N.S, and J.T.; writing-original draft: J.S. and Pallop.S., writing-review and editing: N.S., Pallop.S., K.W., Patumrat .S. All authors have read and agreed to the published version of the manuscript..

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If any scientific Body approved it/ if it is part of an approved student thesis

This study is not a part of student thesis.

Approval

It was approved by the Committee of Research Ethics, Chiang Mai University, Thailand.

Ethical Declaration

Ethical clearance was approved by the Committee of Research Ethics, Chiang Mai University, Thailand. The document number ET012/2025 dated 31 March 2025. All research procedures involving human participants were carried out in accordance with the ethical standards of the national and institutional committee following the Helsinki Declaration of 1964, revised in 2013.

Data Availability

Data supporting this study is available from the corresponding author on reasonable request

Conflict of Interest

All authors declare no conflicts of interest.

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