

Knowledge, Attitudes, Practices, and Acceptance of Gynecologic Cancer Patients Toward Covid-19 Vaccine in Thailand: A Multicenter Cross-sectional Study

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Received: August 13, 2023;

Revised: November 12, 2023;

Accepted: November 17, 2023

ABSTRACT

OBJECTIVE To evaluate the knowledge, attitudes, practices (KAP), and acceptance of gynecologic cancer patients from the 4 regions of Thailand related to the COVID-19 vaccine.

METHODS Gynecologic cancer patients from Chiang Mai University Hospital, Khon Kaen University Hospital, Khon Kaen Hospital, Prince of Songkhla University Hospital, and the National Cancer Institute (NCI) in Bangkok were surveyed using a WHO survey instrument.

RESULTS Between February and September 2022, 1,263 patients participated in this project of whom 1,084 (85.8%) had received the COVID-19 vaccine. The highest rate of vaccination was the NCI followed by Khon Kaen, Chiang Mai, and Songkhla. Of the participants, 28.2% were infected with COVID-19 and 12.9% of the infected participants were unvaccinated. Regarding KAP, the average scale level of overall participants reported ease in obtaining health literacy, a moderate probability of having severe COVID-19 infection, knowledge and adoption of proper appropriate behavior for the prevention of COVID infection, little stress regarding possible COVID-19 infection, and quite a lot of a significant level of trust in healthcare workers. Most participants generally agreed with the lifting of some regular rules to reduce the risk of infection and often many expressed a feeling of general well-being. The significantly different levels of rating scale by unvaccinated and vaccinated participants in the key areas were as follows: (Patients rated each of the areas investigated on a scale of 0 to 6, with 0 indicating lowest level of agreement/acceptance and 6 indicating the highest level) health ministry recommendations (3.92 vs. 4.16), ease of getting the COVID vaccine (3.6 vs. 3.9), “no need to receive the vaccine due to the disease being rare” (2.6 vs. 2.2), “stress made me not want to get vaccinated” (2.6 vs. 2.1), “if everyone is vaccinated, no need for me to vaccinate” (2.5 vs. 1.9), and the importance of COVID-19 vaccines (3.7 vs. 4.2).

CONCLUSIONS Most gynecologic cancer patients from the 4 regions of Thailand had received the COVID-19 vaccine and exhibited good knowledge, attitudes, and practices related to this pandemic.

KEYWORDS COVID-19-vaccine, gynecologic cancer patients, attitude, practice

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INTRODUCTION

Although worldwide the outbreak of COVID-19 nowadays was not as severe as in 2020, occasional COVID cases still did occur. According to the WHO Coronavirus (COVID-19) dashboard, 768,187,096 confirmed cases of COVID-19, including 6,645,714 deaths were reported in June 2023. In Thailand from 3 January 2020 to 21 June 2023 there were 4,749,910 confirmed cases of COVID-19 with 34,292 deaths reported, with the peak incidence between June 2021 and June 2022 (1). The COVID-19 pandemic in Thailand spread in five waves. In the first wave (March–May 2020), transmission was linked to boxing events and entertainment venues in Bangkok. The second wave (December 2020–January 2021) was triggered by the spread among migrants working at the Central Shrimp Market, Samut Sakhon Province. In the third wave (April–June 2021), the increase of COVID-19 cases was linked to an entertainment venue in the Thonglor District of Bangkok. That wave was severe and was driven by the highly transmissible Alpha type, resulting in more hospitalizations and an increased strain on healthcare services. During this third wave, many vaccination campaigns were rolled out on 7 June 2021. Two vaccine types (Sinovac and Astra Zeneca) were available at that time. The fourth wave (July–December 2021) was caused by the highly contagious Delta variant which was transmitted faster than the alpha type. The fifth wave (January–March 2022) was caused by the Omicron variant which increased the risk of infection but with a less severe clinical presentation (2, 3). At that time, more vaccine options, e.g., the m-RNA vaccine, were available.

To reduce the incidence of COVID-19 infection and the mortality rate, social distancing, face masks, and personal hygiene measures were introduced. Those measures, combined with herd immunity produced by vaccination were seen as the most effective preventive measures (4). One major concern for infected COVID-19 patients with comorbidities including chronic obstructive pulmonary disease (COPD), diabetes mellitus, hypertension, and especially cancer, was the risk of developing severe symptoms (5). Cancer patients could potentially become immunocompromised by the effects

of antineoplastic therapy, supportive medications such as steroids, and the immunosuppressive properties of the cancer itself, factors which increase the risk for COVID-19-related morbidity and mortality (6). Saini et al. (7) performed a systematic review of 52 studies involving a total of 18,650 cancer patients infected with COVID-19 and found the probability of death to be as high as 25.6%. Patients with cancer can benefit from having good knowledge, attitudes, and practices (KAP) related to the disease and are a key target population for COVID-19 vaccination. A study in India surveyed these issues in 521 gynecologic cancer patients and found overall good KAP related to the COVID-19 pandemic (8). Regarding COVID-19 vaccine acceptance among cancer patients, Chun et al. (9) recently reported the acceptance of COVID-19 vaccination among cancer patients in Korea was only 61.8%. A study by Prabani et al. (10) included a systematic review of 29 studies and found the pooled prevalence of COVID-19 vaccination acceptance was 59%. However, the data on KAP and COVID-19 vaccination acceptance in Thai gynecologic cancer patients was limited. Understanding the level of KAP in a population and knowing the COVID-19 vaccination rate is helpful for designing preventive strategies and health promotion guidelines.

METHODS

Patients Selection

This study multicenter cross-sectional study included five gynecologic cancer institutes in four provinces representing the 4 regions of Thailand: Chiang Mai University Hospital (Chiang Mai, northern region), Khon Kaen University Hospital (Khon Kaen, northeast region), Khon Kaen Hospital (Khon Kaen, north-east region), and Prince of Songkhla University Hospital (Songkhla, southern region), plus the National Cancer Institute (NCI) (Bangkok, central region). After receiving approval from each local Research Ethics Committee, this cross-sectional study was conducted between February and December 2022. The inclusion criteria consisted of gynecologic cancer patients treated at one of the institutes who were able to verbally communicate well in the Thai language.

Patients who received the COVID-19 vaccine before being diagnosed with gynecologic cancer were excluded.

Eligible patients were invited to participate in the study and all provided informed consent. The patients were interviewed for 15–20 minutes by well-trained interviewers, completing the World Health Organization (WHO) Regional Office for Europe survey tool (11) while they were waiting to see physicians at the outpatient unit. The WHO survey instrument served as a guide for conducting COVID-19 behavioral insights research. The questionnaire covered of 16 issues: 1) demographic data, 2) history of COVID-19 infection, 3) data on COVID-19 vaccination status, 4) health literacy regarding COVID-19 from most difficult to easiest rating scale 1 to 7), 5) probability and severity of COVID-19 infection (rating scale 1 to 7 from never to the most, 6) behavior related to prevention of COVID-19 infection in the previous seven days (rating scale 1 to 7 from never to always), 7) impact of COVID-19 (rating scales 1 to 7 from the most to least), 8) level of trust in the source of information (rating scale 1 to 7 from the least to most), 9) level of trust in the Institute to handle COVID-19 infection (rating scale 1 to 7 from the least to the most), 10) the lifting of regular rules for the COVID-19 pandemic (rating scale 1 to 7 from strongly disagree to strongly agree), 11) unwanted behavior in the previous two weeks during the COVID-19 pandemic (3 options: yes, no, not regularly), 12) general level of well-being in the previous two weeks during the COVID-19 pandemic (rating scale 1 to 7 from always to never), 13) opinion regarding not receiving COVID-19 vaccination (rating scale 1 to 7 from strongly disagree to strongly agree), 14) factors related to affecting the decision to vaccinate (rating scale 1 to 7 from least influential to most influential), 15) impact of side effects of COVID-19 vaccine (rating scale 1 to 7 from the lowest to highest) 16) the encouraging factors to receive the COVID-19 vaccine (2 choice answer; yes or no).

Following the validation of the Thai translation of the original English version by forward and backward translations and a pilot study with 63 participants and further study with 300 participants at Chiang Mai University Hospital,

all interviews were conducted in Thai and were compiled for further analysis. Details of COVID-19 vaccination status and basic clinical data such as age, type of cancer, education level, underlying diseases, and the status of cancer treatment were reviewed as well.

Sample size calculation

The primary outcome of this study was the proportion of Thai gynecologic oncology patients who were willing to receive the COVID-19 vaccine. A previous study in Korea found 62% of cancer patients were amenable to obtaining the COVID-19 vaccine (9). The sample size for this study was calculated using the formula for estimating an infinite population proportion (12). This study needed 1,200 participants divided into 4 regions.

Statistical analysis

Statistical analysis was carried out using IBM SPSS statistics V22.0 for Windows program (IBM, Armonk, New York, USA). Means and standard deviations were calculated for descriptive analysis. The Chi-square or Fisher's exact test was used for comparative analysis of aspects of the factors, and the ANOVA test was used to compare differences in attitude among the provinces from four regions and differences in attitude between the COVID-19 vaccinated and non-vaccinated groups. A $p < 0.05$ was considered statistically significant.

Ethical approval

The study was approved by Research Ethics Committees as follows:

Chiang Mai University: Research ID: 08662
Study Code: OBG-2564-08708

Prince of Songkla University: Research ID:
REC.65-119-12-1

Khon Kaen University: Research ID: HE651078

Khon Kaen Hospital: Research ID: KE-MOU65014

The National Cancer Institute Research ID: EC COA 013/2022

RESULTS

Demographic data of the participants

A total of 1,263 patients participated in this study. The number of patients in each center

was as follows: Chiang Mai University Hospital (363), Khon Kaen University Hospital (150), Khon Kaen Hospital (150), Prince of Songkhla University Hospital (300), and the National Cancer Institute (NCI) (300). Demographic data of the participants are presented in [Table 1](#). The mean age was 54.56 years old and the most common type of gynecologic cancer was cancer of the cervix. Approximately 40% of the participants had completed elementary school. Most of the participants did not work in the medical field. Half the subjects had been diagnosed with an underlying condition, and roughly 60% were presently under cancer surveillance.

COVID-19 infection experience

Regarding COVID-19 experience, only 357 (28.3%) had been previously infected with COVID-19 and most of those cases (330) were a mild form. Only 27 cases (2.1%) presented with a severe form; of those, only two had not received the COVID-19 vaccine. Eight of the 27 severe cases of COVID-19 infection were currently receiving cancer treatment. The incidence of COVID-19 infection was not significantly different between participants who were vaccinated for COVID-19 and those who were unvaccinated (28.7% versus 23.6%, $p = 0.577$ (95% confidence interval 0.544–0.598) by chi-square test).

COVID-19 vaccination

Most of the patients (73.8%) had received two to three doses of COVID-19 vaccine as of the time of the survey ([Table 2](#)). The highest vaccination rate (at least one dose) was in Bangkok (93.3%) followed by Khon Kaen (87.7%), Chiang Mai (82.9%), and Songkhla (80.8%). This difference was statistically significant ($p < 0.001$, 95% confidence interval 0.000–0.002) by Chi-square test. The majority of the vaccinations were Sinovac and AstraZeneca ([Table 3](#)). A significantly higher proportion of the participants who were currently under surveillance status for their cancer had been vaccinated than those in the ongoing cancer treatment phase (94.5% vs. 82.9%, $p < 0.001$ (95% confidence interval <0.000–0.000), Chi-square test).

Table 1. Demographic data of all participants

	N (%)
Mean age $\pm$ SD (years)	54.46 $\pm$ 12.58
Type of cancer	
Cervix	507 (40.1)
Uterus	316 (25.0)
Ovary	355 (28.1)
Fallopian tube	23 (1.9)
Other*	62 (4.9)
Education	
No formal education	42 (3.3)
Elementary	497 (39.4)
High school	342 (27.1)
Bachelor	297 (23.5)
Beyond bachelor	85 (6.7)
Health-professional	
Yes	71 (5.6)
No	1186 (93.9)
Missing	6 (0.5)
Underlying disease	
Yes	641 (50.8)
No	587 (46.5)
Unknown	35 (2.7)
Household membership	
Alone	107 (8.5)
Children under 18-year-old	256 (20.3)
People over 65 years and/or with chronic disease	216 (17.1)
Other	684 (54.1)
Personal financial situation over the past 3 months	
Improved	63 (5.0)
Unchanged	718 (56.8)
Worse	441 (34.9)
Unknown	42 (3.3)
Cancer treatment status	
Currently undergoing treatment	468 (37.1)
Surveillance	795 (62.9)

*Other: primary peritoneal carcinoma (9), vulvar cancer (14), vaginal cancer (11), gestational trophoblastic neoplasia (28)

Table 2. COVID-19 vaccination status

Doses	N (%)
Never	179 (14.2)
1 st dose	50 (4.0)
2 nd dose	492 (39.0)
3 rd dose	440 (34.8)
4 th dose	99 (7.8)
More than 4 doses	3 (0.2)
Total	1,263

Vaccination received during cancer surveillance = 751 cases (94.5% of participants in this status)

Vaccination received during treatment = 388 cases (82.9% of participants in this status)

Table 3. Details of COVID-19 vaccine by type and dosage

	Dose 1 (%)	Dose 2 (%)	Dose 3 (%)	Dose 4 (%)	Dose 5 (%)
Chiang Mai					
Sinovac	110 (30.3)	31 (8.5)	–	–	–
AstraZeneca	117 (32.2)	144 (39.7)	31 (8.5)	–	–
Pfizer	26 (7.2)	66 (18.2)	101 (27.8)	11 (3.0)	–
Moderna	14 (3.9)	16 (4.4)	23 (6.3)	9 (2.5)	–
Sinopharm	34 (9.4)	33 (9.1)	1 (0.3)	–	–
Not received	62 (17.0)	73 (20.1)	207 (57.1)	343 (94.5)	363 (100.0)
Khon Kaen					
Sinovac	93 (31.0)	24 (8.0)	–	1 (0.3)	–
AstraZeneca	90 (30.0)	119 (39.7)	14 (4.7)	3 (1.0)	1 (0.3)
Pfizer	38 (12.8)	57 (19.0)	82 (27.3)	13 (4.3)	1 (0.3)
Moderna	13 (4.3)	10 (3.3)	38 (12.7)	9 (3.0)	2 (0.7)
Sinopharm	28 (9.3)	27 (9.0)	1 (0.3)	–	–
Missing	1 (0.3)	–	–	–	–
Not received	37 (12.3)	63 (21.0)	165 (55.0)	274 (91.4)	296 (98.7)
Songkhla					
Sinovac	101 (33.7)	30 (10.0)	–	–	–
AstraZeneca	77 (25.7)	134 (44.7)	20 (6.7)	2 (0.7)	–
Pfizer	42 (14.0)	43 (14.3)	60 (20.0)	5 (1.7)	–
Moderna	1 (0.3)	4 (1.3)	7 (2.3)	2 (0.6)	–
Sinopharm	13 (4.3)	16 (5.3)	1 (0.3)	–	–
Missing data	6 (2.0)	4 (1.3)	1 (0.3)	–	–
Not received	60 (20.0)	69 (23.1)	211 (70.4)	291 (97.0)	300 (100.0)
Bangkok					
Sinovac	75 (25.0)	38 (12.7)	2 (0.7)	–	–
AstraZeneca	151 (50.3)	164 (54.7)	45 (15.0)	7 (2.3)	–
Pfizer	17 (5.7)	31 (10.3)	87 (29.0)	19 (6.3)	1 (0.3)
Moderna	4 (1.3)	6 (2.0)	19 (6.3)	6 (2.0)	2 (0.7)
Sinopharm	29 (9.7)	30 (10.0)	5 (1.7)	–	–
Missing data	4 (1.3)	–	–	–	–
Not received	20 (6.7)	31 (10.3)	142 (47.3)	268 (89.4)	297 (99.0)

Knowledge, Attitude, and Practices (KAP) data

KAP data (Table 4) shows the mean level of these factors for all the participants combined and stratified by provinces. Overall, most of the participants reported they felt great ease in achieving health literacy, a moderate probability of getting a severe COVID-19 infection, indicated they exhibited proper behavior for the prevention of infection, reported they felt little stress of regarding the risk of COVID infection, had quite a lot of trust in healthcare workers, quite agreed were in agreement with suspending some regular rules as a means of controlling the COVID-19 pandemic, and often with had a feeling of general well-being. However, for some of the issues there were significant differences among the regions, e.g., participants from Songkhla Province felt finding informa-

tion about COVID-19 to be more difficult than did participants in other regions. Participants from the northern region revealed the in general reported exhibiting more proper behavior for the prevention of COVID-19 infection in the last seven days than participants in the other areas. Participants from Khon Kaen Province felt the lowest impact from COVID-19. Most participants indicated they had not exhibited unwanted inappropriate behaviors related to the COVID-19 pandemic within the previous two weeks (Table 5).

The opinions on these issues of the 179 participants who were unvaccinated for COVID-19 are summarized in Table 6 (level 0 = strongly disagree; level 6 = strongly agree). For the statement, “If other people are vaccinated, there is no need for me to be vaccinated,” the

Table 4. Mean level of knowledge, attitudes, and practices (KAP) of COVID-19 stratified by province

Item, Mean (95% confidence interval)	Chiang Mai	Khon Kaen	Songkhla	Bangkok	Total	p-value*
Health literacy[#]						
Ease of finding information about COVID-19	4.03 (3.90-4.17)	3.98 (3.82-4.14)	1.88 (1.76-2.00)	4.00 (3.86-4.13)	3.50 (3.41-3.58)	< 0.001
Knowledge of what to do if infected with COVID-19	4.04 (3.92-4.16)	4.13 (4.00-4.27)	4.17 (4.03-4.32)	4.06 (3.93-4.19)	4.10 (4.03-4.16)	0.445
Evaluation of the reliability of COVID-19 vaccine	3.56 (3.43-3.69)	3.89 (3.73-4.04)	4.36 (4.07-4.65)	3.58 (3.45-3.70)	3.83 (3.74-3.92)	< 0.001
Practice recommendations for COVID-19 prevention	4.14 (4.02-4.27)	4.20 (4.06-4.34)	3.58 (3.44-3.72)	4.18 (4.05-4.31)	4.03 (3.96-4.10)	< 0.001
Understanding and following the “work from home” policy	4.26 (4.15-4.38)	4.28 (4.15-4.41)	4.47 (4.34-4.60)	4.23 (4.10-4.36)	4.31 (4.25-4.37)	0.50
Understanding recommendations for COVID-19 prevention	4.32 (4.20-4.44)	4.29 (4.15)	4.28 (4.14-4.41)	4.39 (4.26-4.53)	4.32 (4.25-4.39)	0.646
Understanding and following the social distancing policy	4.33 (4.21-4.45)	4.26 (4.12-4.40)	4.34 (4.21-4.47)	4.22 (4.08-4.36)	4.29 (4.22-4.36)	0.51
Data on COVID-19 vaccine	4.15 (4.02-4.28)	4.16 (4.01-4.30)	4.23 (4.09-4.37)	4.18 (4.04-4.32)	4.18 (4.11-4.25)	0.86
Understanding recommendations for COVID-19 vaccination	4.27 (4.15-4.39)	4.27 (4.13-4.41)	4.34 (4.21-4.47)	4.18 (4.05-4.31)	4.26 (4.20-4.33)	0.41
Following COVID-19 vaccination guidelines	4.32 (4.20-4.44)	4.25 (4.11-4.39)	4.41 (4.28-4.53)	4.33 (4.19-4.47)	4.33 (4.26-4.39)	0.47
Probability and Severity of COVID-19 infection[#]						
Probably of COVID-19 infection	2.75 (2.59-2.91)	2.40 (2.22-2.58)	2.41 (2.23-2.58)	3.11 (2.95-3.28)	2.67 (2.58-2.76)	<0.001
Risk of having COVID-19 infection	2.84 (2.68-3.00)	2.47 (1.81-3.13)	2.51 (2.33-2.69)	2.83 (2.66-3.00)	2.67 (2.50-2.84)	0.28
Probability of severe COVID-19 infection	2.98 (2.82-3.14)	2.09 (1.93-2.26)	2.54 (2.37-2.71)	2.90 (2.75-3.06)	2.65 (2.56-2.73)	<0.001
Behavior to prevent COVID-19 infection in the last 7 days[#]						
Wash hands with soap for at least 20 seconds	5.03 (4.90-5.16)	4.32 (4.14-4.51)	4.04 (3.87-4.21)	3.92 (3.75-4.08)	4.36 (4.28-4.45)	< 0.001
Avoid contact with eyes, nose, and mouth with dirty hands	4.79 (4.63-4.95)	4.61 (4.44-4.77)	4.23 (4.05-4.40)	4.20 (4.03-4.36)	4.47 (4.39-4.56)	< 0.001
Use disinfectants to clean hands when soap and water are not available	4.97 (4.83-5.12)	4.78 (4.62-4.94)	4.50 (4.34-4.66)	4.22 (4.05-4.38)	4.63 (4.55-4.71)	< 0.001
Avoid social events	5.07 (4.71-5.44)	4.52 (4.35-4.69)	4.45 (4.27-4.63)	4.06 (3.87-4.24)	4.55 (4.42-4.68)	< 0.001
Work/study from home	4.71 (4.52-4.89)	4.37 (4.18-4.56)	4.52 (4.32-4.71)	3.75 (3.52-3.99)	4.36 (4.25-4.46)	< 0.001
Used antibiotics to prevent or treat COVID-19	4.72 (4.53-4.90)	4.48 (4.31-4.66)	4.31 (4.11-4.51)	3.79 (3.55-4.02)	4.35 (4.24-4.45)	< 0.001
Wear a mask in public	5.79 (5.72-5.85)	5.36 (5.23-5.49)	5.78 (5.70-5.87)	5.44 (5.31-5.57)	5.60 (5.55-5.65)	< 0.001
Ensure physical distancing in public	5.60 (5.52-5.69)	5.22 (5.10-5.33)	5.56 (5.46-5.65)	5.23 (5.10-5.37)	5.41 (5.36-5.47)	< 0.001
Disinfect surfaces	5.35 (5.25-5.45)	4.87 (4.70-5.04)	5.19 (5.07-5.31)	4.67 (4.50-4.84)	5.04 (4.97-5.11)	< 0.001

*Comparison between groups, [#]scale 0 = lowest, 6 = highest

Table 4. Mean level of knowledge, attitudes, and practices (KAP) of COVID-19 stratified by province (continued)

Item, Mean (95% confidence interval)	Chiang Mai	Khon Kaen	Songkhla	Bangkok	Total	p-value*
Impact of COVID-19[#]						
Impact is close to me	1.69 (1.54–1.84)	2.19 (1.98–2.40)	2.30 (2.11–2.49)	2.07 (1.89–2.25)	2.05 (1.95–2.14)	< 0.001
Spread rate	1.55 (1.42–1.68)	1.97 (1.78–2.16)	2.10 (1.93–2.27)	1.87 (1.71–2.03)	1.86 (1.77–1.94)	< 0.001
Thinking of COVID-19	1.85 (1.70–2.00)	3.10 (2.91–3.28)	2.17 (1.99–2.36)	1.89 (1.74–2.04)	2.23 (2.14–2.32)	< 0.001
Fear-inducing	2.39 (2.23–2.54)	3.50 (3.32–3.69)	2.42 (2.23–2.60)	2.25 (2.09–2.41)	2.63 (2.65–2.72)	< 0.001
COVID-19 media is addictive	2.93 (2.78–3.08)	4.01 (3.82–4.19)	3.12 (2.95–3.29)	2.84 (2.68–3.00)	3.21 (3.12–3.29)	< 0.001
Feeling hopeless	4.01 (3.85–4.18)	4.72 (4.57–4.87)	4.33 (4.18–4.49)	3.93 (3.76–4.10)	4.24 (4.16–4.32)	< 0.001
Feeling stress	3.75 (3.58–3.93)	4.60 (4.43–4.76)	4.08 (3.92–4.25)	3.69 (3.52–3.87)	4.02 (3.93–4.11)	< 0.001
Level of trust in sources of information[#]						
Media (television, radio, newspapers)	3.31 (3.16–3.45)	3.99 (3.83–4.15)	3.70 (3.55–3.84)	3.65 (3.51–3.80)	3.64 (3.57–3.72)	< 0.001
Healthcare workers	4.13 (3.99–4.28)	4.38 (4.23–4.53)	4.23 (4.08–4.38)	3.89 (3.74–4.04)	4.16 (4.08–4.23)	< 0.001
Social media	3.11 (2.95–3.27)	4.00 (3.83–4.17)	3.17 (3.00–3.34)	3.29 (3.13–3.45)	3.38 (3.30–3.46)	< 0.001
Actors, internet idols	2.15 (2.00–2.30)	3.42 (3.24–3.60)	2.48 (2.33–2.63)	2.66 (2.51–2.82)	2.65 (2.57–2.73)	< 0.001
Ministry of Health	3.86 (3.70–4.02)	4.20 (4.05–4.35)	4.33 (4.19–4.47)	3.75 (3.59–3.92)	4.03 (3.95–4.10)	< 0.001
Department of Disease Control	3.77 (3.61–3.93)	4.15 (3.99–4.30)	4.31 (4.16–4.46)	3.81 (3.64–3.97)	4.00 (3.92–4.08)	< 0.001
World Health Organization (WHO)	3.59 (3.42–3.76)	4.10 (3.93–4.26)	4.12 (3.96–4.28)	3.77 (3.59–3.94)	3.88 (3.79–3.96)	< 0.001
National COVID-19 information application	3.54 (3.38–3.70)	4.13 (3.97–4.29)	3.98 (3.82–4.14)	3.27 (3.07–3.47)	3.72 (3.63–3.81)	< 0.001
Frequency of seeking COVID-19 information	3.38 (3.23–3.54)	3.61 (3.42–3.79)	3.55 (3.40–3.70)	3.51 (3.37–3.66)	3.51 (3.43–3.59)	0.194
Level of trust in agencies treating COVID-19 infection[#]						
Family doctors	4.55 (4.43–4.66)	4.54 (4.40–4.68)	4.46 (4.31–4.60)	4.29 (4.14–4.43)	4.46 (4.39–4.53)	0.030
Employers	2.81 (2.63–3.00)	3.47 (3.28–3.67)	3.47 (3.29–3.65)	3.28 (3.11–3.46)	3.24 (3.14–3.33)	< 0.001
Hospitals	4.25 (4.12–4.37)	4.35 (4.21–4.50)	4.45 (4.32–4.58)	4.27 (4.14–4.41)	4.33 (4.26–4.39)	0.192
Ministry of Health	4.03 (3.89–4.17)	4.31 (4.17–4.44)	4.35 (4.21–4.48)	4.05 (3.90–4.21)	4.18 (4.11–4.25)	0.003
Department of disease control	3.89 (3.74–4.04)	4.22 (4.08–4.36)	4.27 (4.13–4.42)	4.00 (3.85–4.16)	4.09 (4.01–4.16)	0.001
Schools	2.57 (2.39–2.76)	3.65 (3.49–3.81)	3.42 (3.25–3.59)	3.04 (2.87–3.21)	3.14 (3.05–3.23)	< 0.001
Places of worship (temple/church etc.)	2.45 (2.26–2.62)	3.52 (3.35–3.69)	3.28 (3.11–3.45)	2.78 (2.61–2.94)	2.98 (2.89–3.06)	< 0.001
Opinion of COVID-19 infection control efforts[#]						
Proper strategy	3.57 (3.43–3.71)	4.29 (4.15–4.43)	4.00 (3.84–4.16)	3.95 (3.82–4.09)	3.93 (3.86–4.01)	< 0.001
Can convince other people	3.58 (3.45–3.72)	4.32 (4.19–4.46)	4.10 (3.96–4.25)	4.11 (3.99–4.23)	4.01 (3.94–4.08)	< 0.001

*Comparison between groups, [#]scale 0 = lowest, 6 = highest

Table 4. Mean level of knowledge, attitudes, and practices (KAP) of COVID-19 stratified by province (continued)

Item, Mean (95% confidence interval)	Chiang Mai	Khon Kaen	Songkhla	Bangkok	Total	P-value*
Agreement with suspending regular rules to help control the COVID-19 pandemic[#]						
Vaccination along with the recommendation	4.94 (4.78–5.09)	4.93 (4.75–5.10)	4.28 (4.08–4.49)	4.96 (4.80–5.12)	4.79 (4.70–4.87)	< 0.001
More strictly recommendation	3.08 (2.93–3.22)	2.03 (1.81–2.24)	3.06 (2.88–3.23)	3.61 (3.45–3.76)	2.95 (2.86–3.04)	< 0.001
Increased screening, testing	4.23 (4.10–4.37)	4.27 (4.13–4.41)	4.10 (3.94–4.26)	4.39 (4.26–4.52)	4.25 (4.18–4.32)	0.046
Financial impact	4.08 (3.93–4.23)	4.10 (3.94–4.27)	4.19 (4.03–4.36)	4.36 (4.21–4.51)	4.18 (4.10–4.26)	0,050
Requirement to wear a mask in a closed environment	4.69 (4.56–4.82)	5.09 (4.96–5.23)	5.04 (4.91–5.17)	5.07 (4.94–5.20)	4.96 (4.89–5.03)	< 0.001
Reopening of schools	3.36 (3.22–3.51)	4.15 (4.01–4.29)	4.37 (4.22–4.52)	4.47 (4.33–4.61)	4.05 (3.97–4.13)	< 0.001
Opening borders with more countries	2.41 (2.25–2.57)	3.78 (3.61–3.94)	3.44 (3.25–3.63)	3.59 (3.40–3.77)	3.26 (3.17–3.35)	< 0.001
Feeling of general well-being within 2 weeks (during COVID-19 pandemic)[#]						
Joyful	2.85 (2.70–3.00)	2.81 (2.66–2.96)	2.19 (2.03–2.35)	2.99 (2.34–3.64)	2.72 (2.55–2.89)	0.007
Peaceful	2.64 (2.48–2.80)	2.75 (2.61–2.90)	2.05 (1.90–2.20)	2.91 (2.25–3.56)	2.59 (2.42–2.76)	0.004
Enthusiastic	2.85 (2.70–3.00)	2.84 (2.70–2.99)	2.09 (1.94–2.24)	2.93 (2.27–3.58)	2.69 (2.52–2.85)	0.002
Fresh	2.54 (2.38–2.70)	2.72 (2.58–2.87)	1.96 (1.81–2.10)	2.89 (2.24–3.54)	2.53 (2.36–2.70)	0.001
Interesting	2.72 (2.56–2.87)	2.82 (2.67–2.96)	2.03 (1.88–2.18)	2.68 (2.52–2.84)	2.57 (2.49–2.65)	< 0.001

Table 5. Inappropriate behavior within the past two weeks (during the COVID-19 pandemic)

Item	Yes (%)	No (%)	Not regularly (%)	Missing data (%)
Reducing exercise	437 (34.6)	416 (32.9)	402 (31.8)	8 (0.7)
Drinking alcohol	18 (1.4)	226 (17.9)	1015 (80.4)	4 (0.3)
Eating unhealthy food	133 (10.5)	385 (30.5)	741 (58.6)	4 (0.4)
Smoking more	7 (0.6)	205 (16.2)	1046 (82.8)	5 (0.4)
Postponing other vaccinations (including for family members)	73 (5.8)	626 (49.6)	560 (44.3)	4 (0.4)
Avoiding going to the doctor for a non-COVID-19-related problem	105 (8.3)	703 (55.7)	449 (35.6)	6 (0.4)
Buying drugs that I heard are good for treating COVID-19	137 (10.8)	481 (38.1)	635 (50.3)	10 (0.8)

average score ranged from 2.25 to 3.57.

Comparison of the level of agreement with statements related to the decision to vaccinate or not between unvaccinated and vaccinated participants found significant differences (0 = strongly disagree; 6 = strongly agree) as follows: agree with health ministry recommendations (3.92 vs. 4.16), the vaccine is easy to get

(3.6 vs. 3.9), no need to vaccinate for a rare disease (2.6 vs. 2.2), stress made me not want to vaccinate (2.6 vs. 2.1), if everyone is vaccinated, there no need for me to vaccinate (2.5 vs. 1.9), and COVID-19 vaccines are important (3.7 vs. 4.2). Details are shown in [Table 7](#).

Of the factors that encouraged the 1,083 participants to get the COVID-19 vaccine, the

Table 6. Opinion of participants Who were unvaccinated for COVID-19 (N=179)

Item Mean (95% confidence interval)	Chiang Mai (N=62)	Khon Kaen (N=37)	Songkhla (N=60)	Bangkok (N=20)	Total (N=179)	p-value
Level of agreement[#]						
Vaccine can control the spread of COVID-19	3.29 (2.92–3.66)	2.95 (2.49–3.40)	3.50 (3.14–3.86)	3.30 (2.64–3.96)	3.29 (3.08–3.50)	0.317
Once infected with COVID, there is no need to vaccinate	2.63 (2.26–3.00)	3.16 (2.65–3.67)	2.85 (2.42–3.28)	2.75 (2.09–3.41)	2.83 (2.60–3.05)	0.414
If other people are vaccinated, there is no need for me to vaccinate	2.15 (1.85–2.44)	2.38 (1.95–2.80)	2.38 (1.98–2.79)	1.95 (1.39–2.51)	2.25 (2.05–2.45)	0.516
If a COVID-19 vaccine is available and recommended for me, I think most of my family and friends would want me to get it	3.56 (3.22–3.91)	3.19 (2.68–3.70)	3.53 (3.13–3.93)	3.10 (2.46–3.74)	3.42 (3.21–3.64)	0.477
If a COVID-19 vaccine is available and recommended, I think that other people whose opinions I value would want me to get it	3.58 (3.24–3.92)	4.11 (2.40–5.81)	3.62 (3.25–3.99)	3.35 (2.63–4.07)	3.68 (3.29–4.06)	0.669
Trust in vaccine manufacturers^{##}						
Pfizer	3.84 (3.52–4.15)	3.32 (2.90–3.75)	3.48 (3.13–3.84)	3.45 (2.80–4.10)	3.57 (3.38–3.76)	0.234
Moderna	3.77 (3.46–4.09)	3.35 (2.91–3.79)	3.32 (2.96–3.67)	3.40 (2.75–4.05)	3.49 (3.30–3.69)	0.222
Astra Zeneca	3.45 (3.17–3.73)	3.16 (2.73–3.60)	3.15 (2.81–3.49)	3.40 (2.75–4.05)	3.28 (3.10–3.47)	0.505
Sinovac	3.37 (3.08–3.67)	3.11 (2.67–3.55)	3.03 (2.68–3.39)	3.20 (2.46–3.94)	3.18 (2.99–3.38)	0.541
Sinopharm	3.27 (2.98–3.57)	3.16 (2.71–3.62)	3.15 (2.79–3.51)	3.40 (2.75–4.05)	3.22 (3.03–3.42)	0.869

[#] scale 0 = strongly disagree, 6 = strongly agree, ^{##}scale 0 = lowest, 6 = highest

Table 7. Factors affecting decision regarding getting the COVID-19 vaccination among unvaccinated (N=179) and vaccinated (N=1,083) participants (scale 0 = least affect, 6 = greatest affect)

Factor	Unvaccinated (%)	Vaccinated (%)	p-value
The country that produced the vaccine	3.16	3.45	0.429
Type of vaccine	3.30	3.78	0.733
Producer of the vaccine	3.30	3.53	0.377
Effectiveness	3.71	4.14	0.121
Recommend from your doctor	4.03	4.29	0.234
Recommendation of the Ministry of Health	3.92	4.16	0.030
A long-lasting vaccine	3.42	3.62	0.970
Possibility of serious side effects	3.96	3.95	0.652
Number of people vaccinated	3.76	3.82	0.588
Risk of COVID-19 infection	3.24	3.61	0.807
Ease of getting the vaccine	3.59	3.92	0.004
Allowed to see family and friends	3.39	3.78	0.538
Allowed to travel	3.50	3.69	0.198
Allowed gathering in groups	3.55	3.76	0.075
Safety of the vaccine	3.05	3.68	0.084
No need to vaccinate as the infection is rare	2.66	2.21	< 0.001
Stress made me not want to vaccinate	2.58	2.14	< 0.01
Comparison of the benefits and risks of vaccinating	3.69	3.63	0.115
If everyone is vaccinated, no need for me to vaccinate	2.47	1.93	< 0.001
Due to the pandemic, everyone should be vaccinated	3.77	4.52	0.096
COVID-19 vaccines are important for your health	3.70	4.20	0.020
Vaccination prevents COVID-19 infection in the community	3.53	4.07	0.091
Worry about serious vaccine side effects	3.85	3.32	0.610
Trust in the health worker who vaccinated you	3.75	4.34	0.789

factor rated most effective was “easy access to the vaccination site” (79.1%) followed by “receiving a phone call from a nurse when you are eligible to schedule a vaccine appointment” (54.35), “being able to schedule a vaccine appointment online/via mobile application” (43.6%), “receiving a text notification when you are eligible to schedule a vaccine appointment” (32.6%), “being given a day off of work after getting the vaccine” (27.1%), and “free public transportation to a vaccination site” (21.2%).

DISCUSSION

The COVID-19 vaccination rate

The present study was a cross-section survey of gynecologic cancer patients from the 4 regions of Thailand during the Omicron wave. In this survey, we found acceptance rate of the COVID-19 vaccine (at least one dose) among the participants was 85.8%, with the highest rate in Bangkok (the nation's capital). However, among all the participants 23.3% of refused the COVID-19 vaccine during their cancer treatment. The factor regarding accepting vaccination with the greatest difference between the unvaccinated and vaccinated groups was the belief in the unvaccinated group that if everyone is vaccinated, there was no need for them to vaccinate. Concerns regarding the possibility of serious side effects was not significantly different between the groups. Prabani et al. (10) recently published a systematic review and meta-analysis about COVID-19 acceptance and hesitancy among cancer patients. That study searched papers from PubMed, Science Direct, and Cochrane about this issue published between 25 April 2021 and 21 May 2022, selecting 29 studies from different geographical areas for review, but not from Thailand. The study reported the pooled prevalence of COVID-19 vaccine acceptance was 59% (95% confidence interval 52–67%), I²:99%. The pooled etiology of vaccine hesitancy was fear of vaccine-related side effects (53%) and uncertainty about the vaccine's effectiveness (36%). For patients actively undergoing cancer treatment, seven studies were pooled for the final analysis which found that these patients were more likely to be hesitant about COVID-19 vaccination than patients not currently undergoing treatment.

The difference in the vaccine acceptant rate of our report and the Prabani et al. (10) study might be due to the different periods when the surveys were done and to differences in culture of the surveyed populations. In Thailand, from 3 January 2020 to 1 June 2023, a total of 139,247,715 vaccine doses were administered (1).

The COVID-19 experience

Regarding the COVID-19 infection experience, our study found 28.3% of the participants had previously been infected with COVID-19 and that most of those cases (330 cases) were the mild form. Only 27 cases (2.1%) presented with a severe form of COVID-19, but there was no difference in the rate of infection between the vaccinated and unvaccinated in this group. Pinato et al. (13) recently reported on the prevalence and impact of COVID-19 sequelae in 1,557 cancer patients at a median time after infection of 44 days (28–329 days). Of those patients, 234 (15%) were reported to have COVID-19 sequelae, with the most common symptom being respiratory tract problems and fatigue. Unfortunately, our study did not include COVID-19 sequelae data.

Knowledge, Attitude, and Practices (KAP) issues

The KAP survey of gynecologic cancer patients in the present study found positive responses in terms of health literacy issues and appropriate behavior for the prevention of COVID-19, while there was only moderate concern about the severity of COVID-19 infection that might have resulted from less morbidity the perceived lower risk of death or hospitalization of the Omicron wave. The results of the present study are quite similar to a study from India. Poddar et al. (8) surveyed KAP in relation to COVID-19 among 521 Indian gynecologic cancer patients from February to May 2021. That study reported good overall knowledge, attitudes, and practices with a high score of 80%. However, that positive response was quite different from a Romanian study (14) in which a cross-sectional multicentric study of 1,585 Romanian cancer patients during April–May 2020 found only 10.8% had good knowledge about COVID-19 infection. The difference in the Romanian study and the present study might be related to the different

periods in which the surveys were conducted: the present study surveyed the epidemic outbreak in February to December 2022, a year later than the Romanian study. At the time of the present study, most populations had faced COVID-19 for more than two years and would be expected to understand more about the COVID-19 infection.

The strengths and the limitations

A strength of the present study is that the survey was conducted by well-trained interviewers in each of the four regions of Thailand and included a total of 1,263 participants, helping to assure that the data are reliable and to provide important information about KAP among Thai gynecologic cancer patients during the COVID-19 pandemic. However, the survey reflects only short-term responses; some knowledge, attitudes and practice behavior might change with alterations in the current situation.

CONCLUSIONS

During the Omicron epidemic wave, most Thai gynecologic oncology patients from all four regions reported good knowledge, attitudes, and practices related to the COVID-19 outbreak and most received the COVID-19 vaccine, especially those who were in a cancer surveillance situation. The highest acceptance rate of COVID-19 vaccination was in Bangkok, the capital of Thailand.

ACKNOWLEDGEMENTS

We wish to thank all gynecologic oncology officer teams in 5 centers in this study for their collaboration.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

ADDITIONAL INFORMATION

Authors Contribution Statement

P.S., V.C., and R.P.: conceived the presentation idea. V.C., A.R., A.A., K.V. and W.K.: collected

the data. P.S.: verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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