Dermatol Ther (Heidelb) (2022) 12:2355–2369
https://doi.org/10.1007/s13555-022-00803-0

ORIGINAL RESEARCH

A Cross-Sectional Study on Factors Affecting the Decision to Conduct Dermatologic Surgery Procedures During the COVID-19 Pandemic

Rungsima Wanitphakdeedecha · Tatre Jantarakolica · Tatchalerm Sudhipongpracha · Supisara Wongdama · Mia Katrina R. Gervasio · Ma. Christina B. Gulfan · Yuri Yogya · Krisinda Clare C. Dim-Jamora

Received: July 17, 2022 / Accepted: August 26, 2022 / Published online: September 16, 2022

ABSTRACT

Introduction: The Coronavirus disease 2019 (COVID-19) pandemic has greatly affected medical practices worldwide. Due to the transmissibility of the SARS-CoV-2 virus, the risks and benefits of conducting non-emergent and aesthetic procedures have shifted. This study primarily aimed to investigate the different factors affecting the physician's decision to conduct dermatologic surgery procedures during the COVID-19 pandemic based on their own vaccination status. Secondly, this study also aimed to determine the level of institutional trust in the respondents' respective governments and ministries of health.
Methods: This was a questionnaire-based cross-sectional study conducted from October to December 2021. The survey was electronically distributed to members of the Cyber Conference of Aesthetic Dermatology and Skin Surgery in APAC (CyAsia) and members of dermatological societies across nine countries in Asia. The survey asks the participants' tendencies to perform procedures based on patient willingness to undergo nasal swabbing prior to the procedure, the type of procedure to be performed (cancer removal vs. filler augmentation), and the type of vaccine received by the physician (inactivated, viral vector, mRNA or protein-based).
Results: A total of 351 participants completed the questionnaire. Data were analyzed using a conditional logistic regression model according to the participants' country of origin, specialty, age, level of trust in the national government, and level of trust in their respective health ministries. Tendencies to conduct dermatologic procedures were highest for doctors who received mRNA vaccines and lowest among doctors who received inactivated vaccines. Willingness of the patients to undergo pre-procedure nasal swabbing was also a significant factor in deciding to treat, whereas the type of procedure performed was a non-significant factor.
Conclusions: This study highlights the important factors that influence the decision to

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s13555-022-00803-0.

R. Wanitphakdeedecha (✉) · S. Wongdama · M. K. R. Gervasio · Ma. C. B. Gulfan · Y. Yogya
Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Pran-nok Road, Bangkoknoi, Bangkok 10700, Thailand
e-mail: rungsima.wan@mahidol.ac.th

T. Jantarakolica
Faculty of Economics, Thammasat University, Thammasat, Thailand

T. Sudhipongpracha
College of Interdisciplinary Studies, Thammasat University, Thammasat, Thailand

K. C. C. Dim-Jamora
Makati Medical Center, The Medical City Ortigas, Manila, Philippines

conduct dermatologic procedures during the COVID-19 pandemic.

Keywords: Dermatologic surgery; COVID-19; Procedures; Vaccines; Decisions

Key Summary Points

The COVID-19 pandemic has greatly affected medical practices worldwide.

The factors that influence the decision to conduct dermatologic surgery procedures during the COVID-19 pandemic include the type of vaccination the doctors received prior to the procedures and the willingness of the patients to undergo pre-procedure nasal swabbing.

The type of procedure performed (aesthetic or non-aesthetic type) was a non-significant factor.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) forever changed the landscape of procedural dermatology since it was first reported as a pandemic on March 11, 2020 [1]. Initial efforts to contain its spread have led to a drastic decline in both clinic and hospital-based dermatologic practice, with a shift towards teledermatology, and triaging of cases into urgent and non-urgent [2, 3]. In the hopes of continuing clinical practice despite the pandemic, multiple recommendations have been put forth to guide the conduct of dermatologic procedures with the aim of safeguarding both physician and patient safety [4–6]. Central to these recommendations are thorough patient screening and appropriate pre-procedural COVID-19 testing [7], which have both proven to be indispensable measures to ensure safety prior to performing procedures.

Concurrent to the safety protocols governing procedures, mass COVID-19 vaccination rollout became a top priority. With an urgent global response much warranted, the manufacture and release of COVID-19 vaccines was accelerated, and thereafter worldwide vaccination campaigns began on April 2021 [8, 9]. Having efficacious COVID-19 vaccines coupled with robust vaccination campaigns are crucial to controlling the pandemic [10]. Institutional trust in both the government’s COVID-19 response and the nation’s scientific community are important predictors of vaccine acceptance and likelihood of endorsing vaccination to others [11]. As such, government leaders and public health experts hold key positions in ensuring the success of vaccination campaigns [12, 13].

Global vaccination development and implementation are still on-going, leaving currently placed safety protocols to be in a constantly fluctuating state. The primary objective of this study was to therefore investigate the different factors affecting the physician’s decision to conduct dermatologic surgery procedures during the pandemic based on their own vaccination status. Secondly, this cross-sectional study also aimed to determine the level of institutional trust in the respondents’ respective governments and ministries of health.

METHODS

Participants

This was a questionnaire-based, cross-sectional study. The survey was electronically distributed to doctors who are members of Cyber Conference of Aesthetic Dermatology and Skin Surgery in APAC (CyASIA) and members of dermatological societies across nine countries in Asia. Inclusion criteria were as follows: the participant is (1) a general practitioner, dermatologist, or dermatologic surgeon who is a member of CyASIA or a member of the respective dermatologic society in their country of practice, (2) aged 18 years or older, (3) able to read and understand English, and (4) willing to answer the online survey. Those unwilling to answer the online survey were excluded, and those with missing answers to questions were withdrawn from the study.

Survey Administration

The survey was formatted in Google Forms and distributed electronically from October to December 2021. Participants were recruited through the investigators' contacts as well as through the administrators of CyASIA and the dermatological societies in Thailand, Indonesia, Philippines, Taiwan, Singapore, Cambodia, Malaysia, Hong Kong, and South Korea. Respondents were able to access the survey through a provided link. All responses were kept anonymous, and the data were stored in a central database with a unique code to access the data.

Variables

There were three measurable outcomes in this study: first is the type of vaccine received by the physician (no vaccination, inactivated, viral vector, mRNA or protein-based vaccine), second is the type procedure performed (basal cell carcinoma removal on the nose or filler augmentation on the nose), and third is preprocedural swabbing (patient agreed to undergo RT-PCR before the procedure or refused). Participants were presented with a total of 20 case scenarios to which they would reply yes if they would perform the procedure and no if they would not.

Respondents were also asked about their level of trust in the national government and the role of their respective ministries of health in protecting their safety and welfare during the pandemic. Responses were graded from 0 to 5, with 0 being the lowest and 5 being the highest.

Statistical Analysis

Based on an infinite population proportion formula, samples were set to be 350 observations by given proportion of board-certified dermatologists to total medical doctors = 1.2%, margin of error = 1.5%, and confidence interval level of 99%.

$$n = \frac{Z^2_{1-\frac{0.01}{2}}(0.012)(1-0.012)}{0.015^2} = 350.$$

The sample include 351 respondents observed by using stratified random sampling. In order to analyze willingness to treat the patient, multivariate analysis using random effects logit model for the respondents' decision on discrete choice experiment questions based on different scenarios were employed.

Index function of random effects logistic model can be stated as:

$$I_{is} = \beta_0 + \sum_{k=1}^{4} \beta_k VAC_{kis} + \gamma CR_{is} + \delta SW_{is} + \alpha_i + \varepsilon_{it}. \quad (1)$$

Then, $\text{Prob}(Y_{is} = 1) = \frac{1}{1+e^{-I_{is}}}$ where Y_{is} is the decision to treat the patient of respondent i under scenario s, equals to 1 for *yes*, and 0 otherwise; VAC_{kis} is the dummy variable of respondent i under scenario s that respondent got vaccine k or not, equal to 1 for *vaccinated by vaccine k*, and 0 otherwise; CR_{is} is the dummy variable of respondent i under scenario s that the treated procedure is cancer removal or not, equal to 1 for *cancer removal*, and 0 otherwise; SW_{is} is the dummy variable of respondent i under scenario s that the patient agrees to swab test or not, equal to 1 for *agree*, and 0 otherwise; α_i is cross-sectional random effects of respondent I; ε_{is} is the stochastic random error of respondent i under scenario s.

The model can be estimated by employing maximum likelihood estimation (MLE) method using Gauss–Hermite quadrature algorithm.

Data on participant characteristics were analyzed using descriptive statistics. Statistical analysis was performed using SPSS Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL, USA).

Ethical Considerations

This study was conducted in accordance with the guidelines of the Helsinki Declaration of 1964 and its later amendments. The study protocol was approved by the Institutional Review

Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (Si 796/2021) and was registered at the Thai Clinical Trials Registry (TCTR20211014006).

RESULTS

Table 1 shows characteristics of respondents categorized by country, specialty, years of experiences, and age of the respondents. A total of 351 participants completed the online survey comprised of the following practitioners: 108 general practitioners (30.8%), 196 dermatologists (55.8%), 24 dermatologic surgeons (6.8%), and 23 from other subspecialties (6.6%). The majority of the respondents were from Thailand (115; 32.76%), Indonesia (95; 27.07%) and the Philippines (91; 25.93%), with others (50; 14.25%) from the following countries: Taiwan (26; 7.41%), Singapore (7; 1.99%), Cambodia (7; 1.99%), Malaysia (6; 1.71%), Hong Kong (3; 0.85%), South Korea (1; 0.28%).

Analysis by Country

The majority of the respondents have received at least two doses of the vaccine against COVID-19 (Fig. 1). Table 2 shows the results of the logistic regression analysis based on country of practice. Overall, the odds ratios for all types of vaccines are significantly higher ($p < 0.01$) compared to no vaccinations, indicating a tendency to treat if the physician is vaccinated. This is similar to the overall odds ratio for patient swabbing, which is also significantly high (OR 77.32; $p < 0.01$), indicating a tendency to treat if the patient agrees to undergo RT-PCR prior to the procedure. As for the type of procedure performed, the total result is non-significant (OR 1.04), whether the type of procedure performed involves cancer removal or filler injections.

Based on country of practice, inactivated vaccines yielded the lowest odds ratios among respondents from different countries. In Thailand, odds ratios for performing procedures were comparatively highest (OR 51.62; $p < 0.01$) if the physician received an mRNA vaccine. With regards to the type of procedure performed, the Philippines yielded significantly higher odds (OR 1.46; $p < 0.05$) of performing cancer removal compared to filler injections. Among all the variables, pre-procedural swabbing yielded the highest odds ratios, with physicians from the Philippines being 188.15 times ($p < 0.01$) more likely to perform a procedure if the patient underwent nasal swabbing prior.

Analysis by Specialty

Table 3 shows the results of logistic regression analysis by specialty. The odds ratios for inactivated vaccines were again lowest for all specialties. Notable is the difference in odds ratios for the type of procedure performed. General practitioners show significantly lower odds (OR 0.51; $p < 0.01$) of performing cancer removal procedures compared to filler injections, while both dermatologists and other subspecialties show significantly greater odds (OR 1.37 and 2.35, respectively; $p < 0.01$) of performing cancer removal compared to filler injections. For dermatologic surgeons, however, the odds (OR 1.29) are non-significant in relation to the type of procedure. With regards to pre-procedural swabbing, the odds ratios are significantly higher across all specialties, especially with dermatologic surgeons who were 263.79 times more likely to perform a procedure if the patient underwent swabbing beforehand.

Analysis by Age

When analyzed by age (Table 4), inactivated vaccines again yielded the lowest odds ratios across all age groups. For respondents younger than 30, the tendency to perform procedures was highest if the doctor received an mRNA vaccine (OR 63.26; $p < 0.01$), whereas for age group older than 50, the highest odds ratios were seen with viral vector vaccines (OR 74.67; $p < 0.01$). In addition, the older age group showed significantly higher odds of performing cancer removal procedures (OR 1.65; $p < 0.05$) and a significantly higher tendency for performing procedures if the patient underwent RT-PCR prior (OR 267.78; $p < 0.01$).

Table 1 Respondents categorized by country, specialty, years of experience, and age. Source: Survey results

(Observing period)	Thailand (13/10/21–17/10/21)	Indonesia (13/10/21–23/11/21)	Philippines (13/10/21–29/11/21)	Others (13/10/21–2/12/21)	Total (13/10/21–2/12/21)
General practitioners Obs.	80	11	4	13	108
%	69.6%	11.6%	4.4%	26.0%	30.8%
Years of experience (mean)	7.7	7.4	7.3	11.2	8.1
s.d.	5.5	6.5	6.7	8.4	6.1
Age (mean)	34.4	31.2	34.8	40.8	34.8
s.d.	6.9	12.3	9.4	7.6	8.0
Dermatologists	19	79	74	24	196
%	16.5%	83.2%	81.3%	48.0%	55.8%
Years of Experience (mean)	12.1	8.7	10.3	12.8	10.1
s.d.	8.6	6.5	9.4	10.5	8.5
Age (mean)	40.5	41.3	40.6	41.8	41.0
s.d.	9.9	7.4	11.3	11.6	9.8
Dermatologic surgeons	8	5	7	4	24
%	7.0%	5.3%	7.7%	8.0%	6.8%
Years of experience (mean)	6.6	8.2	10.3	17.8	9.9
s.d.	5.4	5.7	10.5	4.8	7.8
Age (mean)	35.6	38.4	41.0	48.5	39.9
s.d.	6.0	4.4	11.0	6.4	8.4
Other subspecialties	8	0	6	9	23
%	7.0%	0.0%	6.6%	18.0%	6.6%
Years of experience (mean)	11.1	-	5.0	16.0	11.4
s.d.	7.8	-	0.6	10.0	8.7
Age (mean)	39.1	-	31.3	45.9	39.7
s.d.	7.8	-	0.8	9.8	9.4
Total	115	95	91	50	351
	100.0%	100.0%	100.0%	100.0%	100.0%

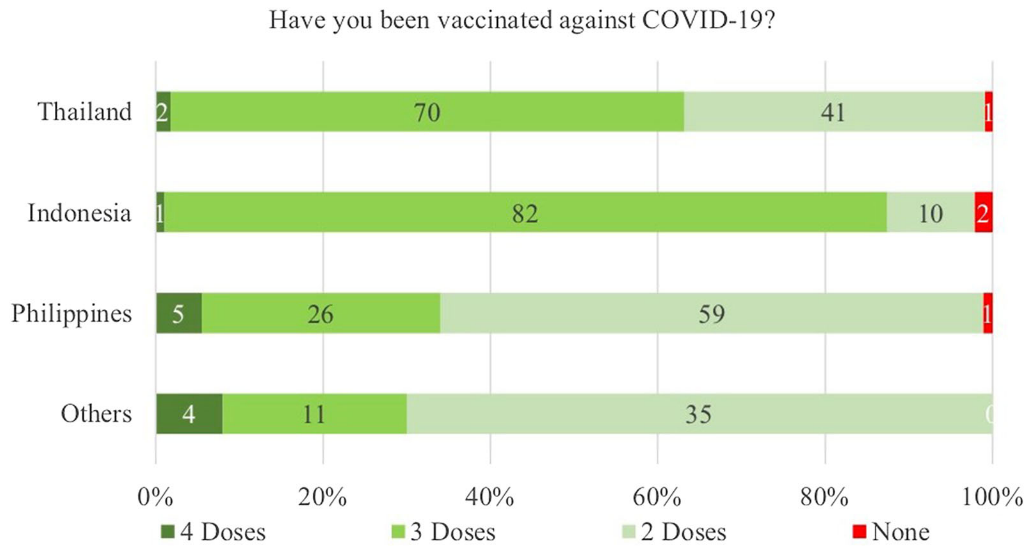

Fig. 1 Number of vaccine doses received by respondents categorized by country

Analysis by Level of Trust in the National Government

The level of trust in the participants' respective national governments is shown in Fig. 2. The majority of the respondents from Thailand and the Philippines show a low level of trust, whereas in Indonesia and in other countries, there is a high level of trust in their national government.

Logistic regression analysis (Table 5) shows that those with a low level of trust exhibit the greatest discrepancies in odds ratios for different types of vaccines. In contrast, those with a high level of trust show almost similar tendencies with different types of vaccines. However, regardless of the level of trust, odds ratios for inactivated vaccines remain lowest among all groups. With regards to the type of procedure performed, the odds ratios are non-significant across all groups, whereas pre-procedural swabbing all exhibit similarly significant odds ratios ($p < 0.01$).

Analysis by Level of Opinion of the Roles of the Health Ministry

When asked about the role of their respective ministries of health in protecting their safety and welfare during the pandemic, the majority of the respondents from Thailand rated their performance as poor, whereas those from Indonesia and other countries rated their performance as good (Fig. 3). Logistic regression analysis (Table 6) shows that those with poor ratings have significantly higher tendencies to perform procedures with mRNA vaccines (OR 48.59; $p < 0.01$), while those with good ratings show similar odds ratios across all vaccines. Again, however, inactivated vaccines yielded the lowest odds ratios across all groups. As for the type of procedure performed, the odds ratios were non-significant, while for pre-procedural swabbing, the odds ratios were all similarly significant ($p < 0.01$).

DISCUSSION

Two years on since the beginning of the pandemic, COVID-19 has caused significant disruptions and unprecedented challenges to healthcare systems worldwide. At its peak, severe lockdown measures were implemented globally in an attempt to curtail the spread of the virus, as well as to shift resources towards the pandemic response [10, 13]. Though the pandemic is far from over, and new variants are still expected to emerge, increased global

Table 2 Estimated results of random effects logit models and subsample analysis based on country

Variable	Total	Thailand	Indonesia	Philippines	Others[a]
Vaccine					
Inactive	12.46***	9.35 ***	17.49 ***	37.83 ***	3.82 ***
Viral vector	29.44***	29.64***	28.49***	60.12***	16.16***
mRNA	36.71***	51.62***	27.68***	62.16***	21.86***
Protein-based	28.57***	34.09***	22.64***	49.25***	19.72***
Procedure					
Cancer removal	1.04	0.97	0.79	1.46**	1.20
Patient					
Swab	77.32***	57.31***	127.53***	188.15***	23.18***
Constant	0.03***	0.05***	0.01***	0.01***	0.11***
lnsig2u	3.81***	3.48***	3.29***	4.62***	3.68***
Observations	7020	2300	1900	1820	1000
Respondents	351	115	95	91	50
log-likelihood	− 2563.5	− 835.6	− 670.6	− 596.5	− 398.1
Chi-square test[b]	1507.1***	455.1***	463.1***	369.4***	187.6***
LR test (rho = 0)[c]	1315.5***	389.7***	298.4***	364.8***	199.5***
AUC[d]	0.8393	0.8367	0.8653	0.8573	0.7951

*Significant at 0.1, **significant at 0.05, ***significant at 0.01. Odds ratio is reported

[a]Other countries consist of Taiwan, 26 obs. (7.41%), Singapore, 7 obs. (1.99%), Cambodia, 7 obs. (1.99%), Malaysia, 6 obs. (1.71%), Hong Kong, 3 obs. (0.85%), and South Korea, 1 obs. (0.28%)

[b]Overall Chi-square tests of all models indicate that all independent variables in the model can significantly explain decision to treat the patients

[c]LR tests of all models indicate that respondents' specific characteristics are significant differences and have been controlled for in the models

[d]Area under the receiver operating characteristic (ROC) curve (AUC) of all models, which are between 0.7951 to 0.8653, indicate that the estimated models give approximately 80% accurate prediction

vaccination rates and decreased mortality rates have resulted in easing of restrictions and the resumption of medical practices under the new normal [14, 15]. While dermatology practices are generally classified as low risk, possible exposure to COVID-positive patients or asymptomatic carriers remain inevitable [16]. Thus, moving forward, it is imperative to implement safe practices in the aftermath of the pandemic—practitioners need to prepare to decide which procedures, when, how and whom should be done, taking into account the risks and benefits for both the physician and the patient [6].

We thus sought to evaluate how factors such as physician vaccination, type of procedure, and pre-procedural swabbing affect the decision to conduct dermatologic procedures during the pandemic. Overall, all types of vaccines (whether inactivated, viral vector, mRNA or protein-based), show significantly higher odds ratios ($p < 0.01$) compared to no vaccinations, indicating a tendency to treat if the physician is vaccinated. The odds for each type of vaccine,

Table 3 Estimated results of random effects logit models and subsample analysis based on specialty

Variable	Total	General	Derm	D_Surg	Other[a]
Vaccine					
Inactive	12.46***	11.15***	16.80***	7.69***	5.97***
Viral vector	29.44***	33.30***	35.44***	18.28***	15.47***
mRNA	36.71***	52.72***	38.94***	31.08***	17.43***
Protein-based	28.57***	37.97***	30.18***	20.80***	19.71***
Procedure					
Cancer removal	1.04	0.51***	1.37***	1.29	2.35***
Patient					
Swab	77.32***	45.99***	110.18***	263.79***	34.43***
Constant	0.03***	0.08***	0.01***	0.05***	0.09***
lnsig2u	3.81***	4.33***	3.18***	5.18***	2.81**
Observations	7020	2160	3920	480	460
Respondents	351	108	196	24	23
log-likelihood	− 2563.5	− 770.2	− 1409.2	− 151.8	− 169.5
Chi-square test[b]	1507.1***	414.7***	906.2***	81.6***	85.2***
LR test (rho = 0)[c]	1315.5***	435.2***	604.2***	100.7***	69.6***
AUC[d]	0.8393	0.8273	0.8623	0.8568	0.8222

*Significant at 0.1, ** significant at 0.05, *** significant at 0.01. Odds ratio is reported

[a]Other countries consist of Taiwan, 26 obs. (7.41%), Singapore, 7 obs. (1.99%), Cambodia, 7 obs. (1.99%), Malaysia, 6 obs. (1.71%), Hong Kong, 3 obs. (0.85%), and South Korea, 1 obs. (0.28%)

[b]Overall Chi-square tests of all models indicate that all independent variables in the model can significantly explain decision to treat the patients

[c]LR tests of all models indicate that respondents' specific characteristics are significant differences and have been controlled for in the models

[d]Area under the receiver operating characteristic (ROC) curve (AUC) of all models, which are between 0.8222 to 0.8623, indicate that the estimated models give approximately 80% accurate prediction

however, are not equal, with respondents 36.71 times more likely to perform a procedure after receiving an mRNA vaccine compared to 12.46 times more likely with an inactivated vaccine (Tables 2, 3, 4, 5, 6). This result may be indicative of the level of trust in vaccinations, with participants showing higher overall trust in the efficacy of mRNA vaccines, thus yielding a higher tendency to treat. With regards to the type of procedure, the overall odds are non-significant, suggesting that the procedure performed whether pathologic or aesthetic does not factor into decision-making. Notably, the greatest overall tendency to perform a procedure comes from pre-procedural swabbing, with results showing 77.32 times greater odds of performing a procedure if the patient undergoes swabbing beforehand.

The comparatively lower odds of performing procedures with an inactivated vaccine is seen throughout the different subgroup analyses performed in this study (Tables 2, 3, 4, 5, 6). While there are no head-to-head trials that directly compare the efficacy of the different

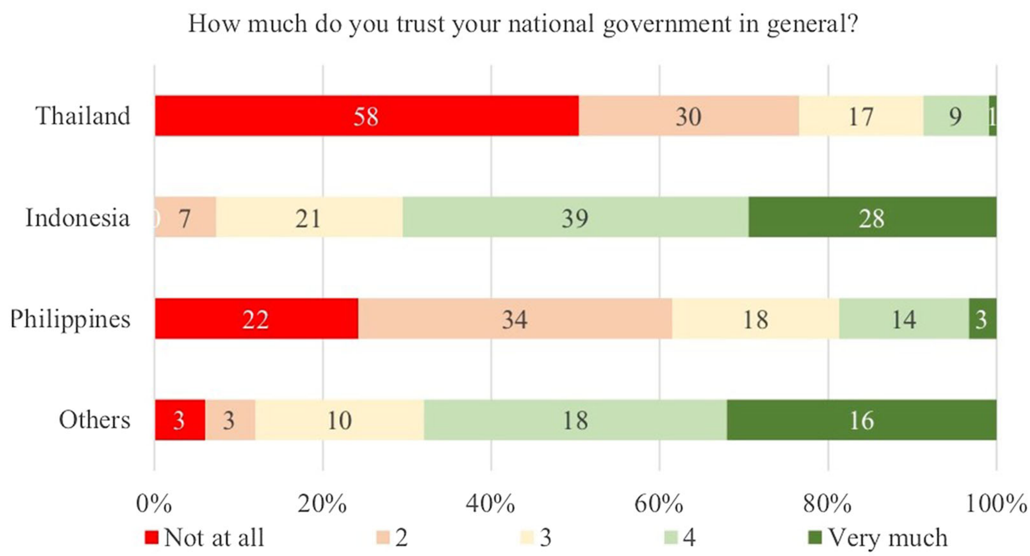

Fig. 2 Physicians' level of trust in the national government categorized by country

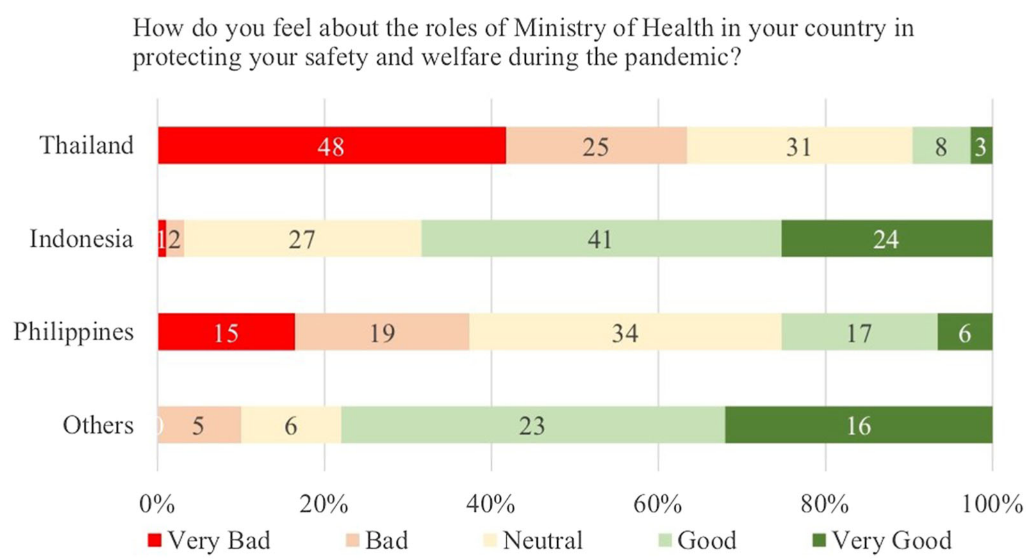

Fig. 3 Physicians' level of opinion on role of the health ministry categorized by country

vaccine types, real-world setting studies have shown the effectiveness of two doses of inactivated vaccines to be 65.7% (95% CI 63.0–68.5%) against COVID-19 infection. This is in contrast to the effectiveness of other vaccine types in fully vaccinated individuals: 88.6% (95% CI 81.6–92.4%) for viral vector vaccines, 89.7% (95% CI 80.2–94.6%) for protein-based vaccines, and up to 98.1% (95% CI 96.0–100.0%) for mRNA vaccines [17, 18]. This difference in effectiveness may explain the greater odds of performing a procedure if the physician received mRNA vaccines compared to inactivated vaccines among different subgroups. It is worth noting, however, that in respondents older than 50 (Table 4), higher odds of performing a procedure are seen with viral vector vaccines. This may be due to vaccine distribution in countries such as Thailand and the Philippines, where viral vector was the

Table 4 Estimated results of random effects logit models and subsample analysis based on age

Variable	Total	Younger than 30	30–50	Older than 50
Vaccine				
Inactive	12.46***	10.89***	12.62***	17.57***
Viral vector	29.44***	35.86***	25.05***	74.67***
mRNA	36.71***	63.26***	29.98***	63.53***
Protein-based	28.57***	46.30***	23.18***	54.05***
Procedure				
Cancer removal	1.04	0.99	1.00	1.65**
Patient				
Swab	77.32***	31.93***	89.38***	267.78***
Constant	0.03***	0.05***	0.03***	0.01***
lnsig2u	3.81***	2.49***	3.86***	7.51***
Observations	7020	1360	4840	820
Respondents	351	68	242	41
log-likelihood	− 2563.5	− 520.6	− 1747.9	− 259.3
Chi-square test[a]	1507.1***	268.9***	1067.8***	162.6***
LR test (rho = 0)[b]	1315.5***	174.8***	910.8***	232.4***
AUC[c]	0.8393	0.8351	0.8424	0.8529

*Significant at 0.1, **significant at 0.05, ***significant at 0.01. Odds ratio is reported

[a]Overall Chi-square tests of all models indicate that all independent variables in the model can significantly explain decision to treat the patients

[b]LR tests of all models indicate that respondents' specific characteristics are significant differences and have been controlled for in the models

[c]Area under the receiver operating characteristic (ROC) curve (AUC) of all models, which are between 0.8351 to 0.8529, indicate that the estimated models give approximately 80% accurate prediction

first type of vaccine approved for inoculation in senior citizens, thus explaining their greater trust in its efficacy [19, 20].

Trust in vaccines is not only inherently tied to its efficacy, it is also affected by institutional trust in both the healthcare system as well as the government. Due to the complexity of safety and efficacy data that form the basis of vaccine policies and recommendations, the public relies heavily on the competence and judgement of government institutions to make recommendations that are in their best interest [10, 21]. This link is made evident in our results (Tables 5 and 6), wherein respondents who have expressed a low level of trust in their government, or rated the performance of their health ministry as poor show the highest discrepancies in their tendency to perform procedures with different types of vaccines. This is in contrast with respondents showing high institutional trust and satisfaction, wherein the odds ratios of performing procedures with different types of vaccines are closer in value.

The immediate effect of the COVID-19 pandemic in the field of dermatology has seen a massive reduction in nonessential visits and

Table 5 Estimated results of random effects logit models and subsample analysis based on level of trust in the national government

Variable	Total	LTrust	MTrust	HTrust
Vaccine				
Inactive	12.46***	13.46***	12.12***	11.65***
Viral vector	29.44***	40.89***	19.23***	25.26***
mRNA	36.71***	57.62***	25.30***	26.85***
Protein-based	28.57***	40.18***	17.79***	24.76***
Procedure				
Cancer removal	1.04	0.95	1.29	1.05
Patient				
Swab	77.32***	77.63***	78.03***	79.63***
Constant	0.03***	0.03	0.03	0.02
lnsig2u	3.81***	3.69***	3.69***	3.84***
Observations	7020	3140	1320	2560
Respondents	351	157	66	128
log-likelihood	− 2563.5	− 1110.0	− 491.5	− 948.5
Chi-square test[a]	1507.1***	627.1***	303.1***	579.0***
LR test (rho = 0)[b]	1315.5***	544.5***	235.3***	502.2***
AUC[c]	0.8393	0.8433	0.8432	0.8380

*Significant at 0.1, **significant at 0.05, ***significant at 0.01. Odds ratio is reported

LTrust is low level of trust (level not at all and 2). MTrust is moderate level of trust (level 3). HTrust is high level of trust (levels 4 and 5)

[a]Overall Chi-square tests of all models indicate that all independent variables in the model can significantly explain decision to treat the patients

[b]LR tests of all models indicate that respondents' specific characteristics are significant differences and have been controlled for in the models

[c]Area under the receiver operating characteristic (ROC) curve (AUC) of all models, which are between 0.8380 to 0.8433, indicate that the estimated models give approximately 80% accurate prediction

procedures, with a global survey showing up to 53% reduction of face-to-face consultations [3]. While ensuring the treatment of high-risk cancers (like melanoma) is strongly recommended, treating low-risk tumors (including basal cell carcinoma), or performing elective procedures (including filler injections) were often postponed to help minimize the spread of the virus [2, 3, 22, 23]. With the treatment area being on the nose, both procedures included in the survey would require the patient to be off-mask for the duration of the treatment, with the patient and doctor in close proximity. The increased transmission probability for both procedures may likely explain the overall non-significant odds of performing cancer removal procedures over filler injections as seen in our survey.

While the overall odds were non-significant, the analyses of different subgroups revealed different tendencies with regards to the type of procedure involved. When analyzed by country (Table 2), respondents from the Philippines showed greater odds of performing cancer removal over filler injections (OR 1.46;

Table 6 Estimated results of random effects logit models and subsample analysis based on level of opinion on role of the health ministry

Variable	Total	PMoH	MMoH	GMoH
Vaccine				
Inactive	12.46***	9.42***	15.26***	14.27***
Viral vector	29.44***	33.50***	23.45***	32.03***
mRNA	36.71***	48.59***	26.88***	37.56***
Protein-based	28.57***	35.87***	18.39***	33.33***
Procedure				
Cancer removal	1.04	1.03	1.04	1.06
Patient				
Swab	77.32***	60.86***	87.45***	91.76***
Constant	0.03***	0.04***	0.03***	0.02***
lnsig2u	3.81***	3.36***	3.96***	4.18***
Observations	7020	2300	1960	2760
Respondents	351	115	98	138
log-likelihood	− 2563.5	− 847.8	− 714.1	− 986.9
Chi-square test[a]	1507.1***	473.7***	439.6***	593.1***
LR test (rho = 0)[b]	1315.5***	381.7***	375.9***	558.0***
AUC[c]	0.8393	0.8398	0.8400	0.8401

*Significant at 0.1, **significant at 0.05, ***significant at 0.01. Odds ratio is reported

PMoH is poor performance of the role of health ministry in dealing with COVID-19 (level very bad and bad). MMoH is moderate performance of the role of MoH in dealing with COVID-19 (level neutral). GMoH is good performance of the role of MoH in dealing with COVID-19 (level good and very good)

[a]Overall Chi-square tests of all models indicate that all independent variables in the model can significantly explain decision to treat the patients

[b]LR tests of all models indicate that respondents' specific characteristics are significantly differences and have been controlled for in the models

[c]Area under the receiver operating characteristic (ROC) curve (AUC) of all models, which are between 0.8393 to 0.8401, indicate that the estimated models give approximately 80% accurate prediction

$p < 0.05$). When analyzed by age (Table 4), the older than 50 group was 1.65 times ($p < 0.05$) more likely to perform cancer removal, in contrast to the other age groups who were indifferent to the type of procedure. Most interesting is the subsample analysis based on specialty (Table 3) with results showing varying odds: general practitioners are more likely to perform filler injections (OR 0.51; $p < 0.01$), dermatologists and other practitioners are more likely to perform cancer removal (ORs 1.37 and 2.35, respectively; $p < 0.01$), whereas dermatologic surgeons favor neither (OR 1.29; $p > 0.1$). This result may not reflect perceived risk or benefit, rather, it may reflect the capability to perform such procedures. General practitioners may be more trained in aesthetics, and thus are more likely to perform filler injections; dermatologists and other specialties may be more trained in cancer removal thus favoring its treatment, whereas dermatologic surgeons are trained to do both, so they are indifferent.

With regards to preprocedural testing, numerous studies have recommended routine COVID-19 patient testing using real-time reverse transcription-polymerase chain reaction (RT-PCR) of nasopharyngeal swabs at least 72 h prior to any procedure of prolonged duration or involving the central face. As COVID-19 infection may be asymptomatic or may demonstrate very mild symptoms, not only is there a risk of transmission to healthcare workers, but there is also the risk of postprocedural morbidity for the patient themselves [7]. While no test is 100% accurate, RT-PCR remains the gold standard for COVID-19 testing, showing high specificity and high sensitivity in ideal settings [24]. The value of this screening tool is seen in the results of our survey, wherein willingness of the patient to undergo preprocedural swabbing garnered the highest overall odds for performing any procedure (Tables 2, 3, 4, 5, 6). Subgroup analysis has shown that this preprocedural measure is especially important for respondents from the Philippines (Table 2), as well as for dermatologic surgeons (Table 3), with odd ratios of 188.15 and 263.79, respectively ($p < 0.01$). When analyzed by age, the older than 50 age group also showed the greatest tendencies for performing procedures if the patient underwent swabbing prior (OR 267.78, $p < 0.01$). This may be due to a greater risk of serious COVID-19 infections, hospitalizations, and even mortality in individuals over the age of 50, with mortality rates increasing up to 62 times (IRR = 62.1; 95% CI = 59.7, 64.7) in individuals 65 or older [25, 26].

CONCLUSIONS

The results of our study have demonstrated the factors that influence the decision to conduct dermatologic surgery procedures during the COVID-19 pandemic. Limitations of this study include the use of a convenience sampling method to administer the survey, which may have introduced a selection bias. Another limitation is that the study was conducted in a constantly changing, highly dynamic landscape, and thus the results are mere snapshots taken at a particular point in time. Moving forward, it is imperative that we lay the foundations for safe practices as we navigate through the aftermath of the pandemic, resuming medical practices within the realities of a new normal.

ACKNOWLEDGEMENTS

The authors wish to thank Ms. Phonsuk Yamlexnoi, Ms. Chutikan Kiatphansodsai, Ms. Apichaya Jutaphonrakul, and Dr. Thanyaporn Leesanguankul for their assistance in recruiting subjects and managing the database.

Funding. No funding or sponsorship was received for this study or publication of this article. The Rapid Service Fee was funded by the authors.

Author Contributions. Rungsima Wanitphakdeedecha – concept and design, data analysis and interpretation, editing the manuscript; Tatre Jantarakolica – concept and design, data analysis and interpretation, graphs and figures; Tatchalerm Sudhipongpracha – concept and design, data analysis and interpretation; Supisara Wongdama – drafting the manuscript, participant recruitment, data collection and synthesis; Mia Katrina R. Gervasio – participant recruitment, data interpretation, drafting and editing the manuscript; Ma. Christina B. Gulfan – participant recruitment, data interpretation, drafting the manuscript; Yuri Yogya – participant recruitment, data interpretation, drafting the manuscript; Krisinda Clare C. Dim-Jamora – concept and design, participant recruitment, data analysis and interpretation.

Prior Presentation. The findings of this investigation have been presented at the 46th Dermatological Society of Thailand Annual Meeting 2022 free paper presentation on March 11, 2022.

Disclosures. Rungsima Wanitphakdeedecha, Tatre Jantarakolica, Tatchalerm Sudhipongpracha, Supisara Wongdama, Mia Katrina R. Gervasio, Ma. Christina B. Gulfan, Yuri Yogya, and Krisinda Clare C. Dim-Jamora have nothing to disclose.

Compliance with Ethics Guidelines. This study was conducted in accordance with the guidelines of the Helsinki Declaration of 1964 and its later amendments. The study protocol was approved by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (Si 796/2021) and was registered at the Thai Clinical Trials Registry (TCTR20211014006). Those unwilling to answer the online survey were excluded.

Data Availability. The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

REFERENCES

1. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020. Accessed February 16, 2022.

2. Bhargava S, Negbenebor N, Sadoughifar R, Ahmad S, Kroumpouzos G. Global impact on dermatology practice due to the COVID-19 pandemic. Clin Dermatol. 2021;39:479–87. https://doi.org/10.1016/j.clindermatol.2021.01.017.

3. Bhargava S, Mckeever C, Kroumpouzos G. Impact of COVID-19 pandemic on dermatology practices: results of a web-based, global survey. Int J Women's Dermatol. 2021;7:217–23. https://doi.org/10.1016/j.ijwd.2020.09.010.

4. Cembrano KAG, Ng JN, Rongrungruang Y, Auewarakul P, Goldman MP, Manuskiatti W. COVID-19 in dermatology practice: getting back on track. Lasers Med Sci. 2020;35(8):1871–4. https://doi.org/10.1007/s10103-020-03043-w.

5. Arora G, Arora S, Talathi A, et al. Safer practice of aesthetic dermatology during the COVID-19 pandemic: recommendations by SIG aesthetics (IADVL academy). Indian Dermatol Online J. 2020;11(4):534. https://doi.org/10.4103/IDOJ.IDOJ_328_20.

6. Jindal A, Noronha M, Mysore V. Dermatological procedures amidst COVID-19: when and how to resume. Dermatol Ther. 2020. https://doi.org/10.1111/DTH.13561.

7. Dorri S, Sari F, Seyedhasani SN, Atashi A, Hashemi E, Olfatbakhsh A. Practical recommendations for the preoperative screening and protective protocols in cancer surgeries during COVID-19: a systematic review. Front Surg. 2021;8:567. https://doi.org/10.3389/FSURG.2021.678700/BIBTEX.

8. Wong LP, Alias H, Danaee M, et al. COVID-19 vaccination intention and vaccine characteristics influencing vaccination acceptance: a global survey of 17 countries. Infect Dis Poverty. 2021. https://doi.org/10.1186/S40249-021-00900-W.

9. COVID-19 vaccine tracker and landscape. https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines. Accessed Feb 16, 2022.

10. Lazarus JV, Ratzan SC, Palayew A, et al. A global survey of potential acceptance of a COVID-19 vaccine. Nat Med. 2020;27(2):225–8. https://doi.org/10.1038/s41591-020-1124-9.

11. Bagasra AB, Doan S, Allen CT. Racial differences in institutional trust and COVID-19 vaccine hesitancy and refusal. BMC Public Health. 2021;21(1):1–7. https://doi.org/10.1186/S12889-021-12195-5/TABLES/4.

12. Bargain O, Aminjonov U. Trust and compliance to public health policies in times of COVID-19. J Public Econ. 2020;192: 104316. https://doi.org/10.1016/J.JPUBECO.2020.104316.

13. Elhadi M, Alsoufi A, Alhadi A, et al. Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine: a cross-sectional study. BMC Public Health. 2021;21(1):1–21. https://doi.org/10.1186/S12889-021-10987-3/TABLES/5.

14. Chen JM. Novel statistics predict the COVID-19 pandemic could terminate in 2022. J Med Virol. 2022. https://doi.org/10.1002/JMV.27661.

15. Torres AE, Ozog DM, Hruza GJ. Coronavirus disease 2019 and dermatology practice changes. Dermatol Clin. 2021;39(4):587. https://doi.org/10.1016/J.DET.2021.05.004.

16. Gerami P, Liszewski W. Risk assessment of outpatient dermatology practice in the setting of the COVID-19 pandemic. J Am Acad Dermatol. 2020;83(5):1538–9. https://doi.org/10.1016/J.JAAD.2020.07.035.

17. Zheng C, Shao W, Chen X, Zhang B, Wang G, Zhang W. Real-world effectiveness of COVID-19 vaccines: a literature review and meta-analysis. Int J Infect Dis. 2022;114:252–60. https://doi.org/10.1016/j.ijid.2021.11.009.

18. Heath PT, Galiza EP, Baxter DN, et al. Safety and efficacy of NVX-CoV2373 COVID-19 vaccine. N Engl J Med. 2021;385(13):1172–83. https://doi.org/10.1056/NEJMOA2107659/SUPPL_FILE/NEJMOA2107659_DATA-SHARING.PDF.

19. Republic of the Philippines Department of Health Memorandum No. 2021–0157. https://doh.gov.ph/sites/default/files/health-update/dm2021-0157.pdf. Published 2021. Accessed Mar 17, 2022.

20. Joint Statement by Department of Disease Control of Thailand and AstraZeneca (Thailand). https://ddc.moph.go.th/brc/news.php?news=17595&deptcode=brc&news_views=2994. Accessed Mar 18, 2022.

21. Larson HJ, Clarke RM, Jarrett C, et al. Measuring trust in vaccination: a systematic review. Hum Vaccin Immunother. 2018;14(7):1599–609. https://doi.org/10.1080/21645515.2018.1459252.

22. International League of Dermatological Societies. Guidance on the practice of dermatosurgery and cosmetic procedures during the COVID-19 (SARS-COV-2, coronavirus) pandemic (updated June 2020). https://ilds.org/covid-19/guidance-dermatosurgery-cosmetic-procedures/. Published 2020. Accessed Apr 3, 2022.

23. National Comprehensive Cancer Network. Advisory statement for non-melanoma skin cancer care during the COVID-19 pandemic. https://merkelcell.org/wp-content/uploads/2020/05/NCCN-NMSC.pdf. Accessed Apr 3, 2022.

24. Lieberman JA, Pepper G, Naccache SN, Huang ML, Jerome KR, Greninger AL. Comparison of commercially available and laboratory-developed assays for in vitro detection of SARS-CoV-2 in clinical laboratories. J Clin Microbiol. 2020. https://doi.org/10.1128/JCM.00821-20.

25. Yanez ND, Weiss NS, Romand JA, Treggiari MM. COVID-19 mortality risk for older men and women. BMC Public Health. 2020;20(1):1–7. https://doi.org/10.1186/S12889-020-09826-8/FIGURES/2.

26. Porcheddu R, Serra C, Kelvin D, Kelvin N, Rubino S. Similarity in case fatality rates (CFR) of COVID-19/SARS-COV-2 in Italy and China. J Infect Dev Ctries. 2020;14(2):125–8. https://doi.org/10.3855/JIDC.12600.