

## Original Article

## Attitudes and Knowledge of Thai Health Professionals and the General Public Toward Using 70% Isopropyl Alcohol Before Intradermal, Subcutaneous, and Intramuscular Injections/Vaccinations

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### Abstract

**Introduction:** Using 70% isopropyl alcohol for skin preparation before intradermal (ID), subcutaneous (SC), and intramuscular (IM) vaccinations/injections is a routine practice for all Thai medical personnel, yet there is no direct evidence it reduces infections. Many studies, including the WHO best practices for injections and related procedures toolkit 2010, state cleaning dirty skin with soap and water is sufficient. This study assessed the percentage of medical personnel familiar with this toolkit and their skin preparation attitudes and knowledge. WHO injection practices information was discussed. Patients and their relatives' opinions were collected. Two cross-sectional questionnaires in 400 medical and 400 non-medical persons at Thammasat University Hospital January - February 2020 and April - June 2021.

**Methods:** One questionnaire was given to health professionals on their attitude, knowledge, and knowledge sources toward skin preparation; another was distributed to patients and relatives on attitudes about cleaning injection sites with soap and water.

**Results:** Only 19.0%, 19.0%, and 14.8% of medical personnel and 17.3%, 17.3%, and 17.8% of the general public agreed solely cleaning sites with soap and water was sufficient in ID, SC, and IM vaccinations/injections, respectively. Only 20.0% - 23.8% of medical personnel knew about the WHO toolkit; nonetheless, 52.0% - 55.8% said they would follow it.

**Conclusions:** Using alcohol as routine skin preparation lacks scientific evidence, potentially leading to skin irritation/allergies, wasting both time and money. Medical professionals require an introduction to WHO best practices for injections, and patients and their relatives require more education on using soap and water, as appropriate.

**Keywords:** Attitude, Knowledge, Injection, Skin preparation, 70% isopropyl alcohol

Received: 24 July 2020

Revised: 13 August 2021

Accepted: 10 September 2021

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## Introduction

Using 70% isopropyl alcohol for skin preparation before intradermal (ID), subcutaneous (SC), and intramuscular (IM) vaccinations/injections, is something medical personnel are routinely taught.<sup>1</sup> However, there are numerous studies,<sup>2-6</sup> including the latest World Health Organization (WHO) best practices regarding injections, that indicate skin preparation with isopropyl alcohol before vaccinations/injections does not prevent infection; even if not used, there is no increase in infections.<sup>7</sup> In addition, cleaning the skin with alcohol may have side effects such as allergies or skin irritation.<sup>8, 9</sup> It is also time-consuming and may waste money.

In Thailand, most medical personnel use 70% isopropyl alcohol as skin preparation before these procedures. To the best of our knowledge, there is no data or research identifying actually why Thai medical professionals use alcohol as skin preparation. Data is also absent in regard to awareness on WHO injection practices. At Thammasat University Hospital (TUH), a tertiary university hospital, our infection control unit still recommends the use of 70% isopropyl alcohol as skin preparation before ID, SC, and IM vaccinations/injections.

The first objective of research is to study the percentage of medical personnel with prior knowledge of these WHO practices, their attitudes toward skin preparation before injections, and knowledge sources regarding these procedures. The second objective is to raise the awareness of the WHO practices and initiate discussion regarding the practice of using 70% isopropyl alcohol for cleaning skin before injection. In addition, we wish to understand patient opinions on the use of alcohol prior to injections.

## Methods

Two questionnaires were used during January - February 2020 and April - June 2021. The first one was for medical professionals: a combined total of 400 doctors, fourth to sixth-year medical students, and nurses aged between 18 - 60 years working at TUH. The second questionnaire was given to 400 members of the general public, aged between 18 - 60 years, who were at TUH either as patient or relative of one. Participant baseline characteristics and their answers for each question were reported as a percentage (%).

## Questionnaire for health professionals

First, we measured attitudes toward skin preparation in intradermal (ID) drug injection, subcutaneous (SC) drug injection, and intramuscular (IM) vaccine injection whether it is okay to administer them without 70% isopropyl alcohol swabbing, except on dirty skin versus cleaning the site with soap and water. Next, their skin preparation knowledge of ID, SC, and IM were discussed; questions are as follows.

### Question

Q1: Will 70% isopropyl alcohol swabbing before injections minimize the risk of infection?

Q2: Can 70% isopropyl alcohol affect some medication constituents and the action of drugs?

Q3: Should you swab for 30 seconds then wait for 30 seconds after using 70% isopropyl alcohol swabs, before injections?

Q4: Can injections be safely given by just cleaning the site with soap and water?

Q5: Do you know the WHO has announced that it is not necessary to use alcohol to clean the skin before injections?

Q6: If the WHO announced that alcohol is unnecessary to clean the skin before injections, would you follow this recommendation?

Their sources of knowledge on skin preparation before injections were also examined e.g. other health personnel, medical textbooks, medical journals, internet, or friends.

## Questionnaire for the general public

Here, we looked at their attitudes toward skin preparation in ID, SC, and IM: whether they can be safely administered without 70% isopropyl alcohol swabbing, except on dirty skin, and if cleaning the site with the soap and water was sufficient.

This research was approved by the Research Ethics Subcommittee on Human Research, Faculty of Medicine, Thammasat University on January 8, 2020 (Research Project Code MTU-EC-RM-1-12).

## Results

As mentioned, there were equal numbers of participants for both medical (n = 400) and the patients and their relatives (n = 400). 47.8% of the medical professional were male, mean age 27.5 years; 62.5% were doctors, 24.0% medical students,

and 13.5% nurses (Table 1). Only 19.0%, 19.0%, and 14.8% of medical personnel agreed injections

without 70% isopropyl alcohol as a skin preparation was effective in ID, SC, and IM, respectively.

**Table 1** Characteristics of medical professionals and general public

Characteristics	Medical professionals n = 400		General public n = 400	
	Gender (male; %)	47.8		34.8
Age (years; mean)	27.5 ± 5.2		43.6 ± 15.2	
Subgroup category (%)	doctors	62.5	patients	47.8
	medical students	24.0	relatives	52.2
	nurses	13.5		

For Q1, 11.3%, 10.3%, and 9.3% of medical professionals stated that 70% isopropyl alcohol swabbing before injections does not minimize the risk of infection in ID, SC, and IM. On Q2, 22.5%, 16.0%, and 16.8% thought that alcohol might affect some medication constituents in ID, SC, and IM. In Q3, 68.8%, 68.3%, and 68.0% of them agreed skin preparation using a 70% isopropyl alcohol swab for 30 seconds and waiting 30 seconds before injections is the correct methods for ID, SC, and IM.

For Q4, 33.3%, 28.3%, and 25.5% confirmed ID, SC, and IM vaccinations/injections can be given by just cleaning the site with soap and water. Next, on Q5, 23.8%, 20.5%, and 20.0% knew about the WHO announcement on cleaning the skin before ID, SC, and IM vaccinations/injections using soap and water, no alcohol. With Q6, 55.8%, 53.3%, and 52.0% said they would follow WHO recommendations on cleaning the skin without alcohol before ID, SC, and IM vaccinations/injections (Table 2).

**Table 2** Medical professionals' attitudes and knowledge toward skin preparation in intradermal (drugs), subcutaneous (drugs), and intramuscular (vaccine injections)

	Doctors (n = 250)			Medical students (n = 96)			Nurses (n = 54)			All (n = 400)		
	ID	SC	IM(V)	ID	SC	IM(V)	ID	SC	IM(V)	ID	SC	IM(V)
Attitude (Y; %)	16.0	16.0	14.0	22.9	22.9	15.6	25.9	25.9	16.7	19.0	19.0	14.8
Knowledge												
Q1 (N; %)	10.8	8.0	8.0	13.5	15.6	12.5	9.3	11.1	9.3	11.3	10.3	9.3
Q2 (Y; %)	23.2	15.6	15.6	26.0	18.8	21.9	13.0	13.0	13.0	22.5	16.0	16.8
Q3 (Y; %)	70.4	69.6	69.2	62.5	61.5	62.5	72.2	74.1	72.2	68.8	68.3	68.0
Q4 (Y; %)	35.6	30.4	26.4	35.4	29.2	27.1	18.5	16.7	18.5	33.3	28.3	25.5
Q5 (Y; %)	26.8	22.8	21.2	17.7	14.6	15.6	20.4	20.4	22.2	23.8	20.5	20.0
Q6 (Y; %)	54.4	50.8	48.4	56.3	55.2	56.3	61.1	61.1	61.1	55.8	53.3	52.0

Attitude: Can the injection without 70% isopropyl alcohol as a skin preparation, except the dirty skin, be safely done by just cleaning the site with the soap and water?

Knowledge: Q1: Will 70% isopropyl alcohol swabbing before injections minimize the risk of infection?

Q2: Can 70% isopropyl alcohol affect some medication constituents and the action of drugs?

Q3: Should you swab for 30 seconds then wait for 30 seconds after using 70% isopropyl alcohol swabs, before injections?

Q4: Can injections be safely given by just cleaning the site with soap and water?

Q5: Do you know the WHO has announced that cleaning the skin before injections does not need to use alcohol?

Q6: If the WHO recommends that cleaning the skin before injection does not need alcohol, would you follow this recommendation?

ID: intradermal, SC: subcutaneous, IM: intramuscular, V: vaccine

Y: yes, N: no, Q: question

Sources of their knowledge are mostly from other health personnel, then medical textbooks, internet, medical journals, and friends at 55%, 14%, 13.8%, 10%, and 7.3% respectively.

The general public sample consisted of 47.8% patients and 52.2% relatives (Table 1); 34.8%

were male, and the mean age was 43.6 years. Merely 17.3%, 17.3%, and 17.8% of participants agreed injections without 70% isopropyl alcohol as a skin preparation was safe in ID, SC, and IM, respectively (Table 3).

**Table 3** Attitudes of general public toward skin preparation in intradermal (drugs), subcutaneous (drugs), and intramuscular (vaccine injections)

	Patients (n = 191)			Relatives (n = 209)			All (n = 400)		
	ID	SC	IM(V)	ID	SC	IM(V)	ID	SC	IM(V)
Attitude (Y; %)	14.7	14.7	16.2	19.6	19.6	19.1	17.3	17.3	17.8

Attitude: Is it ok to do the injection without 70% isopropyl alcohol as a skin preparation, except on dirty skin, by just cleaning the site with soap and water?

ID: intradermal, SC: subcutaneous, IM: intramuscular, V: vaccine, Y: yes

### Discussion

Here, the percentage of medical personnel and the general public acquainted with the WHO best practices for injections and related procedures toolkit 2010 were examined. We wished to establish

our personnel's attitudes, knowledge, and sources of information on whether ID, SC, and IM vaccination injections should be given by just cleaning the site with soap and water (Table 4).<sup>7</sup>

**Table 4** Skin preparation according to WHO Best Practices for Injections and Related Procedures Toolkit 2010<sup>7</sup>

Type of injection	Skin preparation and disinfection	
	Soap and water	60 - 70% Alcohol (isopropyl alcohol or ethanol)
<b>Intradermal</b>	Yes	No
<b>Subcutaneous</b>	Yes	No
<b>Intramuscular</b>		
• Immunization	Yes	No
• therapeutic	Yes*	Yes*
<b>Venous access</b>	No	Yes

\* Unresolved issue because there is insufficient evidence on the need to disinfect the skin with alcohol before an intramuscular injection; further studies are warranted.

Finally, we wanted to give them some awareness of the WHO best practices and raise the question of whether we really need to clean the skin with 70% isopropyl alcohol before injections in Thailand.

Our study reported only 20.0% - 23.8% of our medical personnel knew about these WHO practices, while only 14.6 - 17.7% of medical students (n = 96) were aware of the practices. Only

14.8 - 19.0% of all medical personnel agreed that ID, SC, and IM vaccination injections could be given by just cleaning the site with soap and water. Most of them (88.8 - 90.8%) preferred to use 70% isopropyl alcohol swabs believing that using swabs will minimize infection risk, but this was without any clinical evidence. For the majority (55%), the source of their knowledge was from various other medical staff. This was similar to the study in

Penang General Hospital, Malaysia, that showed only 12.5% (total n = 136) of their staff knew about these WHO practices, less than 10% agreed that ID, SC, and IM vaccination injections could be given by just cleaning the site with soap and water, and more than 90% also believed that using swabs will minimize infection risk. In addition, the source of their knowledge was also from other health personnel (70.5%).<sup>10</sup>

In actual practice, they swabbed for a few seconds, usually not > 5 seconds, which is likely ineffective.<sup>11</sup> The correct swabbing technique should be swabbing for 30 seconds and waiting for it to dry completely before injections.<sup>7</sup> In regard to patient attitudes, only 17.3 - 17.8% agreed that ID, SC, and IM vaccination injections could be given by just cleaning the site with soap and water.

In a study with > 5,000 injections in six years, injections were given without any form of skin preparation in all routes from SC, ID, IM to intravenous (IV) in unselected patients; no cases of local or systemic infections were reported.<sup>2</sup> Another study with 225 patients who regularly used insulin in the treatment of diabetes surprisingly had higher infection rates for those who used alcohol to clean the skin before insulin injections, but the infection rate are very low in both groups (1.72 - 7.48 per million). However, this was a survey based on patient recall, and the group using alcohol may have been more concerned about infections; there was also no questionnaire details given in this study.<sup>12</sup> Skin piercing by injections may introduce bacteria, but these are mostly normal flora, at a low dose, non-virulent, and non-pathogenic.<sup>13</sup> Recent guidelines for insulin injections have stated that it is not necessary to use alcohol before injections.<sup>14, 15</sup> Patients who need to perform the injections at home should be instructed by healthcare personnel to simply use soap and water to wash the site if their skin is dirty. However, if their skin is not visibly dirty, they can inject without needing to wash the site.

As people have typically seen the use of 70% isopropyl alcohol swabs before injection as a long-standing routine practice, there seems to be a barrier in changing the attitudes of medical and also the general public: only 14.8 - 19.0% of medical professionals and only 17.3 - 17.8% of the general

public agree not using alcohol is safe. In addition, clinical practice guidelines seem to have limited effects on physician guideline adherence, and the factors involved included awareness, familiarity, agreement, self-efficacy, outcome expectancy, and the ability to overcome the inertia of previous practice.<sup>16</sup> Within our study, the lack of awareness of WHO practices<sup>7</sup> seems to be the main culprit. However, we suspect that even if we educate and raise awareness of reliable guidelines such as the WHO recommendations, only 52.0% - 55.8% of medical personnel will actually follow and agree to cleaning skin with only water and soap before injections. The rest may not agree as they still have lingering doubts as to whether all the studies referenced by the WHO<sup>7</sup> are applicable or relevant to Thailand, or if they were even done in the same context or environment. To improve patient attitudes, successful elements begin with education, clear definitions on how these desired changes would look in practice, allowing patients the opportunity to demonstrate their understanding, and then feedback being given.<sup>17</sup>

Our main limitation is that this is a cross-sectional questionnaire in a small population, i.e. a single hospital study. Our results may only represent the present practices between January - February 2020 and April - June 2021 at our university hospital.

To the best of our knowledge, it still seems that using alcohol as a routine skin preparation does not have any scientific evidence to support it. As it can cost around 4 THB for each cotton pad (TUH reference price), this practice may be slightly expensive for people who need to do regular, frequent, and consistent injections for a long time, especially at home. The alcohol may also make their skin sensitive. It is clear we need more exposure to the WHO best practices for injections and related procedures toolkit 2010 for medical professionals. The Thai general public, i.e. the patients and relatives, should also receive this education. Further studies in the comparison of infection rates as well as the advantages and disadvantages using and not using alcohol as a skin preparation in ID, SC, and IM vaccinations/injections specifically in Thailand should be done to elicit more evidence and confidence in this context.

### Acknowledgments

This study was supported by Faculty of Medicine, Thammasat University, Thailand.

The authors declare no conflict of interest.

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