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COMPARISON BETWEEN TRADITIONAL SURGICAL HAND SCRUBBING WITH POVIDONE-IODINE AND SURGICAL HAND RUBBING WITH PROPAN-2-OL

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Abstract

Background: *Surgical hand antisepsis is as an effective way to prevent surgical site infection (SSI). Methods involved in the traditional surgical hand scrubbing with povidone iodine (PVI) and surgical hand rubbing with propan-2-ol are widely employed. Its efficacy, timing and associated risk factors are compared in this study.*

Study Design: *Pilot quasi-experimental study at a Tertiary Care Hospital in Kharian Pakistan*

Methods: *Two hundred surgical staff were randomized into two groups, Group A (scrubbing PVI) and Group B (**Ru**bbing with propan-2-ol). The bacterial counts were measured before and after antisepsis. Additional evaluation was performed on compliance, skin irritation, and time efficiency. The analysis of data was done using statistical software, and thereafter it was presented through tables, graphs, and pie charts.*

Results: *Group B led to a significant decrease in bacterial counts **and so did the** Group A ($p > 0.05$). In Group B, the average time required for hand antisepsis was **less than** 1 min, whereas **on average** 5 min was required in Group A ($p<0.001$). **One** percent and **two** percent of the Group A and Group B, respectively, experienced skin irritation. Nevertheless, compliance was higher in the rubbing group than in the scrubbing group (95 percent vs. 85 percent), respectively.*

Conclusion: *Propan-2-ol surgical hand rubbing reduces bacterial load as much as traditional PVI scrubbing whilst reducing time, inducing **insignificant** skin irritation, and better compliance. This implies that, by reverting to alcohol-based hand antisepsis, surgical safety and efficiency will be improved.*

INTRODUCTION

One of the most prevalent problems of healthcare is surgical site infection (SSI) contributing to an increase of morbidity, a longer hospital stay, and higher healthcare costs [1]. The fundamental role of effective surgical hand antisepsis in minimizing the risk of SSIs has been shown. The traditional practice has been surgical hand scrubbing with antiseptics such as povidone-iodine (PVI) [2]. Nevertheless, with more advanced antiseptic formulation, alcohol-based rub products such as propan-2-ol have become popular as they are quick acting and simple to use [3].

It is well known that PVI is an antimicrobial agent ranging to many pathogens such as bacteria, fungi, and viruses [4]. The conventional technique is a prolonged hand and forearm scrub for complete antisepsis [5]. However, the use of this compound has come into disrepute due to its efficacy, prolonged procedure time, and reduced compliance [6].

On the contrary, alcohol-based hand rubs (e.g., propan-2-ol) provide rapid antimicrobial action usually after rubbing the hand and forearm once completely [7]. Their integration into surgical workflows [8] can be easier, and they are less likely to cause skin irritation. According to studies, alcohol-based hand rubs were as effective as the more traditional scrubbing method in reducing microbial counts [9]. However, we should further look for comparative effectiveness, especially in a surgical setting.

To compare the efficacy, time efficiency, skin tolerance, compliance, and associated risk factors of traditional surgical hand scrubbing with PVI to surgical hand rubbing using propan-2-ol. Whereby, this study assesses these parameters in order to develop evidence-based recommendations regarding ideal surgical hand antisepsis practices.

Methodology

Study Design and Participants

It was a pilot quasi-experimental study which was conducted at a tertiary care hospital in Kharian, Pakistan from 30th April 2024 to 29th July 2024. Surgical staff members who consented to the study included 200 surgeons, nurses and technicians. Participants were randomly assigned to two groups:

Group A: Traditionally surgical hand scrubbing with PVI. Each hand's palmer surface, web surfaces, the back surface and nail/finger tips are each scrubbed 5 times. Followed by the wrist, and the volar and the dorsal surfaces of the forearms scrubbing respectively of the each arm 5 times. The whole scrub is then washed out by the flowing water from finger tips to the elbow.

Group B: Propan-2-ol, surgical hand rubbing. In this, propan-2-ol is poured on the palm and then it is rubbed over each and every surface of the hands and forearms.

Need for Inclusion and Exclusion criteria

Inclusion criteria:

- Individuals active on the surgical staff as part of patient care.
- There is no known allergy to antiseptic agents used.
- Willingness to follow study protocols and to participate.

Exclusion criteria:

- A record of severe skin conditions.
- Antimicrobial use on hands in the recent past.
- Noncompliance with study procedures.

Intervention

Group A: The task executed by the participants was the performance of surgical hand scrubbing using standard protocol with PVI solution covering all hand surfaces and forearms.

Group B: Antiseptic (Propan-2-ol) was applied to the participants hands according to a recommended guideline for application of the antiseptic and coverage of the hands.

Data Collection

Both groups were sampled prior to and after antisepsis, with quantitative cultures used to measure bacterial counts. Observation and self-

reported questionnaires were used to monitor compliance. Post-procedure, we assessed skin irritation using a standardized dermatological scale. Digital timings were recorded for time efficiency.

Statistical Analysis

Analysis of the data was undertaken using SPSS software version 25. Participant characteristics and outcomes were summarized with descriptive statistics. Continuous variables were compared between groups using t-tests and binary variables were contrasted using chi-square tests. Statistical significance was defined as a $p < 0.05$.

Ethical Considerations

The Institutional Review Board (IRB) of the Hospital approved the study. Before inclusion, all participants gave written informed consent.

Results

Participant Demographics

200 participants were divided into a Group A of 100 participants and a Group B of 100 participants. Group A had mean age 35± 8 years, and Group B had mean age 34 ± 7; gender distribution was similar in both groups (Table 1).

Table 1. Demographics of Study Participants

Parameter	Group A (PVI Scrub)	Group B (Propan-2-ol Rub)	p-value
Number of Participants	100	100	-
Mean Age (years)	35 ± 8	34 ± 7	0.35
Gender (Male/Female)	60/40	58/42	0.78

Bacterial Reduction

Both groups showed significant reductions in bacterial counts post-antisepsis. Group A had a mean reduction of 140 ± 55 CFU, while Group B had a mean reduction of 143 ± 61 CFU (Table 2). The difference was not statistically significant ($p = 0.7$).

Table 2. Bacterial Counts Pre- and Post-Antisepsis

Group	Pre-Antisepsis (Mean CFU)	Post-Antisepsis (Mean CFU)	p-value
Group A (PVI Scrub)	150 ± 50	10 ± 5	-
Group B (Propan-2-ol Rub)	155 ± 55	12 ± 6	0.7

Time Efficiency

The average time taken for hand antisepsis was significantly shorter in Group B (<1 minute or 52 ± 6 seconds) compared to Group A (approximately 5 minutes or 290 ± 20 seconds) ($p<0.001$).

Figure 1. Comparison of Hand Antisepsis Time Between Groups

Skin Irritation

Skin irritation was reported in 1% of participants in Group A and 2% in Group B. This difference was statistically insignificant (p = 1).

Compliance Rates

Compliance was higher in Group B (95%) compared to Group A (85%) (Table 3).

Table 3. Compliance Rates

Group	Compliance (%)	p-value
Group A (PVI Scrub)	85	-
Group B (Propan-2-ol Rub)	95	0.019

Risk Factors

Different risk factors were identified, including time constraints, skin sensitivity, and workflow integration. Group A was more affected by time constraints whereas Group B primarily faced minimal workflow adjustments.

Discussion

The study shows that propan-2-ol surgical hand rubbing is as effective as traditional PVI scrubbing at reducing overall bacterial load, with similar reductions in bacterial counts post-antisepsis. The demonstration of non-inferiority with propan-2-ol aligns with previous studies [10, 11] and confirms the feasibility of alcohol-based hand rubs in the surgical theatre.

Propan-2-ol rubbing provides a considerable advantage in the time taken for hand antisepsis. This approximately one-minute application directly contrasts with a five-minute scrubbing protocol and has applications to improvements in workflow efficiency and turnaround time in busy surgical environments. This can speed up the entire process and therefore help increase the operating room efficiency and decrease delay [12]. Another important factor is skin tolerance, which is generally lower in the alcohol-based group, but the use of PVI is known to cause skin dryness and irritation [13], which may lead to decreased compliance and increased rate of occupational dermatitis among surgical staff [14]. We conclude that the effect on the skin of propan-2-ol is insignificant to decrease the sustained adherence to hand hygiene protocols.

It is possible that the higher compliance rates seen in the propan-2-ol group were a result of convenience and a reduced time burden. Compliance with antiseptic practices is critical to their consistency, leading to a reduction of SSI risk [15]. Alcohol-based rubs have the ease of use and therefore can be better integrated and accepted into routine surgical procedures [16].

However, limitations exist. This was a single-center study, and results may differ in other settings or for larger, more different populations. Moreover, the long-term outcomes not tested, such as the actual SSI rate, would allow better clinical potential assessment of the antisepsis methods.

Multi-center trials with a larger number of samples and long-term clinical outcomes should be considered in the future. Assessing the cost effectiveness of each method would also be valuable, taking into account product costs, time savings, and (perhaps) SSI reduction.

Conclusion

Surgical hand rubbing with propan-2-ol is as effective as conventional PVI scrubbing in reducing bacterial counts on the hands of the operating personnel; further its novel method offers reduced time, fewer skin irritations, and better compliance. These results favour the use of alcohol-based hand rubs as an alternative to traditional scrub techniques applied during surgical care tasks throughout the perioperative setting, enabling potential improvements in surgical safety and operational efficiency.

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