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REVIEW ARTICLE
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A COMPARATIVE STUDY OF INTERVENTIONAL OUTCOMES ON HAND CONTAMINATION AND HAND WASHING PRACTICES AMONG THE HOSPITAL WORKERS OF A TERTIARY CARE CENTRE IN THE KANYAKUMARI DISTRICT

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Abstract:

Introduction: Hand hygiene is critical for controlling infections, particularly in healthcare settings where healthcare-associated infections pose a significant risk. This study addresses the need for ongoing monitoring of hand hygiene practices among hospital workers. The World Health Organization's "Clean Care is Safer Care" strategy provides a framework, emphasizing five key moments for hand hygiene. Hospital workers often harbour pathogens making proper hand washing crucial. Therefore the present study was conducted to determine the effectiveness of infection control intervention to improve compliance with hand washing and to evaluate the bacterial load on hands using a semi-structured, pre tested questionnaire and also laboratory test which is a sterile Test-tube with sterile 50ml peptone water among hospital workers in the tertiary care centre in Kanyakumari district.

Aims and Objectives:

1. To determine the effectiveness of hand washing practices and not practice among the hospital workers of a tertiary care hospital in Kanyakumari district.
2. To estimate the bacterial load on the hands of the hospital workers as a possible indicator of improvement post-intervention.

Materials and Methods: This is a Hospital-based interventional study, conducted at Kanyakumari Government Medical College & Hospital, total study participants involved is 110 hospital workers. The study comprised pre- and post-intervention phases, including educational training on hand washing. Statistical analysis is done using IBM SPSS software, Version 22. Paired samples t-tests is used to compare the results.

Results: Demographic characteristics provided insights into participant's age, gender, experience and duty shifts. The intervention demonstrated significant improvements. Adherence to hand washing protocols, knowledge of hand washing steps and hand hygiene compliance rates substantially increased post-intervention.

Conclusion: The study concludes that the implemented intervention effectively enhanced hand hygiene practices among hospital workers. The findings contribute valuable insights for healthcare institutions aiming to reduce healthcare-associated infections. Continued emphasis on education, awareness, monitoring is crucial for sustaining and further improving hand hygiene practices, promoting a safer healthcare environment.

Keywords: Hand hygiene, Hand washing techniques, Infections, Hospital workers

Introduction:

Hand hygiene plays a crucial role in controlling and preventing infections. While there is heightened awareness of hand washing and hygiene, particularly among frontline workers and the general population in response to the COVID-19 pandemic, consistent adherence to these practices requires ongoing monitoring. Healthcare-associated infections, also known as "nosocomial or hospital acquired infections" , occur during patient care in healthcare facilities and are not present at the time of admission.[1] Studies suggest that 10 out of every 100 patients admitted to hospitals in developing countries are at a higher risk of healthcare-associated infections.[2]Hand hygiene is a fundamental aspect of infection control, especially in healthcare settings.

To promote hand hygiene, health care workers have adopted the World Health Organization's 11-step hand washing technique. Opportunities in the hospital setting are seized to reinforce hand hygiene practices among all healthcare workers, including multipurpose and sanitary workers.[2,3]

According to the World Health Organization, the multimodal "Clean Care is Safer Care" strategy emphasizes the "Five Moments for Hand Hygiene": Before touching a patient, Before a septic procedures, After their the exposure of body fluid, After touching a patient, After touching the patient's surroundings. The hands of healthcare workers commonly harbour pathogens such as methicillin-resistant S.aureus (MRSA), vancomycin-resistant Enterococcus (VRE), MDR-Gram Negative bacteria (GNBs), Candida spp and Clostridium difficile. These pathogens can survive for up to 150 hours and are associated with a significant number of deaths. Proper hand washing is identified as a simple and cost-effective measure to reduce health care-associated infections and save lives.[4]

Health care-associated infections pose a significant threat to patient safety, and hospital workers play a key role in preventing their spread. Given the potential risks associated with inadequate hand hygiene, interventions aimed at enhancing hand-washing practices are essential.[5]

Therefore, the current study was conducted to assess the effectiveness of an infection control intervention in enhancing compliance with hand washing. The study evaluated bacterial load on hands by using a semi-structured pretested questionnaire and laboratory test involving a sterile test tube with sterile 50ml peptone water. The participants in this study were hospital workers in a tertiary care centre in Kanyakumari district.

Aims and Objectives:

1. To determine the effectiveness of hand washing practices and not practices among the hospital workers of a tertiary care hospital in Kanyakumari district
2. To estimate the bacterial load on the hands of the hospital workers as a possible indicator of improvement post-intervention.

Materials and Methods:

This hospital-based interventional study, conducted at Kanyakumari Government Medical College & Hospital over three months (December 2022 to February 2023), focuses on hand hygiene of Hospital Workers. All 110 hospital workers distributed across morning, afternoon, and night shifts are included in the study with participation contingent on attendance at interventional training on hand hygiene. Exclusion criteria encompass individuals who missed the training due to extended leave or other reasons. Study tool can be rephrased as follows –

A semi-structured-pretested questionnaire and sterile Test-tube with sterile 50ml peptone water are used as study tool to evaluate the bacterial load in the hands of the hospital worker. The current study was approved by the Institutional Ethical Committee. This study comprises three phases.

Phase I (Pre-intervention) : After obtaining the informed consent from the study participants pre-intervention data were collected by using Pre structured questionnaire translated in local language Tamil, questions were related to hand hygiene practices. Then the finger tips were dipped in 50 ml of peptone water in sterile Test - tube, were taken by a trained person and the Test-tubes were transported to the microbiology department for the further microbial analysis.

Phase II (Intervention) : An interventional training program was given to all study participants which included health education and demonstration of 11 steps of hand washing technique which was organized by the Community Medicine and the Microbiology department.

Phase III (Post-Intervention) : One month after the interventional program on hand hygiene practices, again the same questionnaire was given to all study participants and the finger tips were dipped in 50ml of peptone water in sterile Test-tube were taken by a trained person. The test - tube were transported to the microbiology department for further microbial analysis. Thus, the bacterial load on the hands of the hospital workers were measured both pre-intervention, post intervention and the results were compared for any improvement in the hand hygiene practices during post intervention.

Statistical analysis, performed using SPSS software version 22.0. Paired samples t-test to compare pre- and post-intervention results, evaluating the effectiveness of the intervention in improving hand hygiene practices among hospital workers.

Results:

Table1: Distribution of baseline demographics among the study participants

Parameter	Total no. of participants n=110	Percentage (%)
Age Distribution:		
21-30 years	30	27
31-40years	45	41
41-50years	20	19
≥ 51 years	15	13
Gender:		
Male	35	32
Female	75	68
Years of Experience in Healthcare:		
1-5years	35	32
6-10years	30	27
11-15years	20	18
≥16 years	25	23
Working shift:		
Morning shift	66	60
Afternoon shift	22	20
Night shift	22	20

Table 1, provides a snapshot of the demographic characteristics of the study participants, offering insights into their age distribution, gender, years of experience and working shifts. The majority of participants fall within the 31-40 age category, with 27% in the age of 21-30 years category and 41 % in the 31-40 years category. The distribution then tapers off for older age groups, with 19 % in the 41-50years category and 13% in the 51+years category. The study population is predominantly female, constituting 68 % of the participants, while males make up the remaining 32 %. The participants have varying levels of experience in healthcare. The largest group has 1-5 years of experience (32%), followed by experience of 16+ years (23%), 6-10 years (27 %), and 11-15 years (18 %). The participants are distributed across different shifts, with 66 participants in the morning shift, 22 in the afternoon shift and 22 in the night shift.

Table2: Comparison on Pre-and Post-Intervention of Hand Washing Adherence among Hospital Workers

Questions	**Pre-intervention**	**Post-intervention**	**p-value**
Teaching on Hand Washing			
Yes	40%	95%	
No	60%	5%	**0.000**
Hand Wash After Touching Patient			
Yes	25%	87%	
No	75%	13%	**0.000**
Method Used for Hand Washing:			
Water	15%	10%	
Water and Soap	50%	65%	0.262
Water and Soap Liquid	35%	25%	
Knowledge of 8Steps in Hand Washing:			
Yes	20%	78%	
No	80%	22%	**0.000**
Ability to Mention Steps of Hand Washing:			
Correct	10%	45%	
Incorrect	50%	30%	**0.000**
Not Sure	40%	25%	
Reasons for Skipping Hand Washing at Home:			
No Need	5%	10%	
No Available Time	25%	20%	
Keep Forgetting	20%	15%	0.159
Poor Water Supply	50%	55%	
Frequency of Nail Cutting:			
Weekly	10%	30%	
1-2Weeks	15%	25%	
3-4Weeks	25%	20%	**0.002**
More than a Month	40%	15%	
Do Not Know	10%	10%	
Hand Washing After Using Toilet:			
Yes	30%	98%	
No	70%	2%	**0.001**
Number of Times Hands Washed in a Day:			
Once	10%	5%	
2-3Times	30%	45%	0.159
4-5Times	40%	35%	
More than 5 Times	20%	15%	

Removal of Watch/Bracelet During Hand Wash: Yes No	 25% 75%	 60% 40%	 **0.002**
Removal of Ring During Hand Wash: Yes No	 30% 70%	 45% 55%	 **0.02**
Washing of Wrist During Hand Washing: Yes No	 30% 70%	 80% 20%	 **0.001**
Washing of Web of Fingers During Hand Washing: Yes No	 15% 85%	 70% 30%	 **0.004**
Washing of Tip of Fingers During Hand Washing: Yes No	 40% 60%	 85% 15%	 **0.003**

*p-value<0.05 is considered statistically significant

Table No. 2, demonstrates a note worthy improvement in hand washing practices following the implemented intervention. Before the intervention, only 40% of participants had received teaching on hand washing, while post-intervention, this figure substantially increased to 95%, indicating a successful educational impact (p-value = 0.000). Similarly, hand washing after patient contact showed a significant enhancement, rising from 25% pre-intervention to 87% post-intervention (p-value = 0.000). Notably, there was a substantial increase in participants correctly knowing the 8 steps of hand washing, with the percentage rising from 20% to 78% post-intervention (p-value = 0.000). Furthermore, the intervention resulted in a positive shift in behaviors such as hand washing after toilet use (p-value = 0.001) and improved adherence to practices like removing accessories during hand washing (p-values ranging from 0.002 to 0.004). While the distribution of methods used for hand washing did not exhibit a statistically significant difference (p-value = 0.262), the overall findings indicate a substantial positive impact on hand hygiene practices among the studied hospital workers.

Figure 1:Distribution of Hand Washing Practices Before and After Intervention

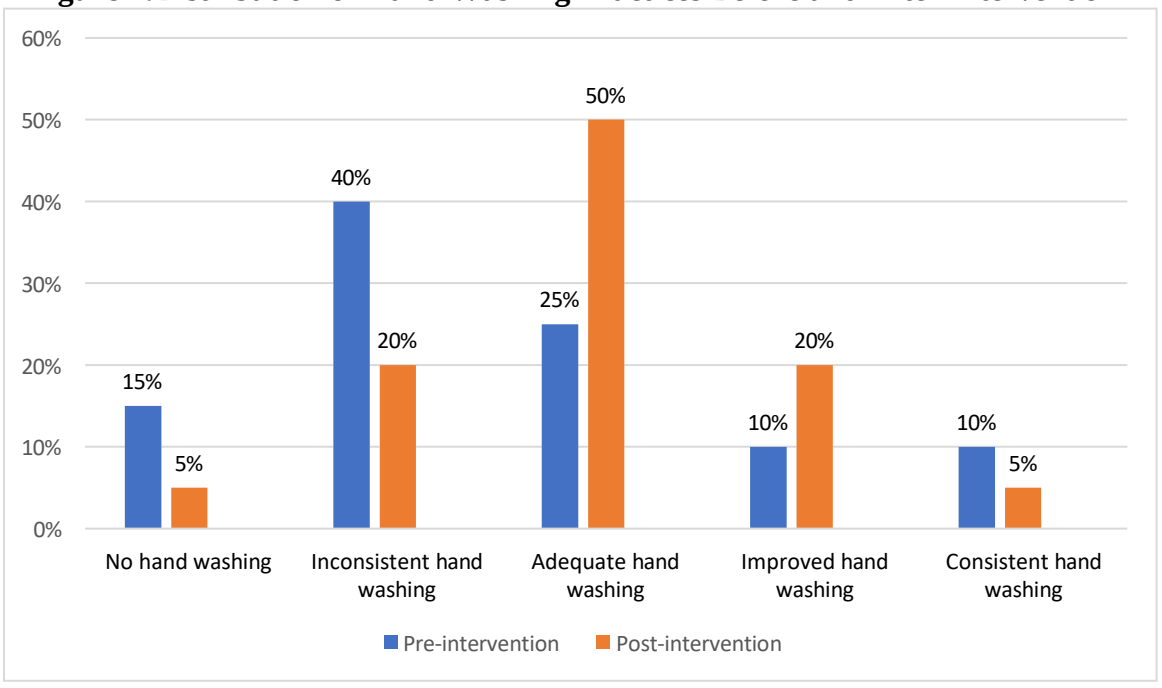

Figure 1, illustrates the expected changes in the distribution of hand washing practices among hospital workers before and after the intervention. Before the intervention 15% of hospital workers reported not practicing hand washing. After the intervention, this percentage reduced to 5%. This indicates a positive impact, with fewer individuals neglecting hand washing. Prior to the intervention, 40% of hospital workers engaged in inconsistent hand washing practices. Post-intervention, this percentage decreased to 20%. The decline suggests that the intervention may have contributed to a more consistent adoption of hand washing habits. Before the intervention, 25% of hospital workers reported adequate hand washing practices. After the intervention, this percentage increased to 50%. The increase reflects a positive shift towards more individuals engaging in proper hand washing. Initially, 10% of hospital workers had improved hand hygiene practices. After the intervention, this percentage increased to 20%. This suggests that the intervention may have played a role in enhancing hand hygiene practices among a higher percentage of individuals. Before the intervention, 10% of hospital workers consistently practiced hand washing. After the intervention, this percentage decreased to 5%. This slight decrease could be due to the redistribution of individuals into other categories, indicating a shift in overall hand washing behaviors. The data suggests that the intervention likely influenced a positive change in the distribution of hand washing practices, with more individuals adopting adequate and improved hand hygiene practices.

Figure 2: Distribution of Hand Contamination in Pre and Post-Intervention among Hospital Workers

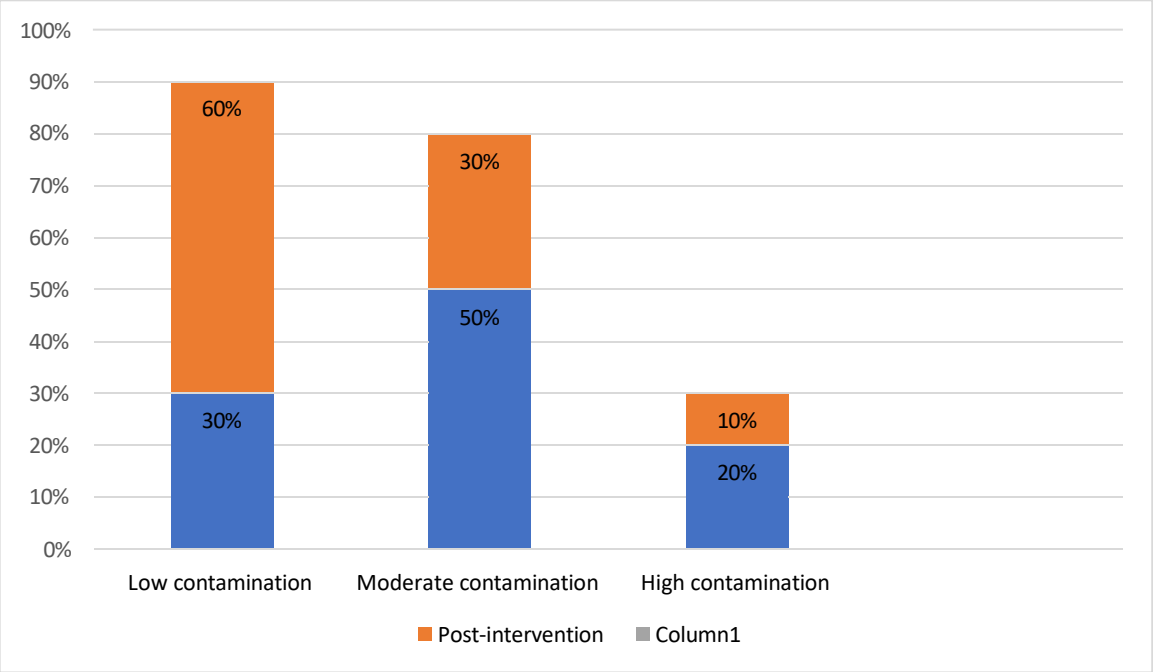

Figure 2, indicates potential changes in hand contamination levels among hospital workers before and after the intervention. Before the intervention, 30% of hospital workers had low hand contamination levels. After the intervention, this percentage increased to 60%. This suggests that the intervention may have contributed to a higher proportion of individuals maintaining cleaner hands. Prior to the intervention, 50% of hospital workers had moderate hand contamination levels. Post-intervention, this percentage decreased to 30%. The decrease implies a positive impact of the intervention in reducing the number of individuals with moderately contaminated hands. Initially, 20% of hospital workers had high hand contamination levels. After the intervention, this percentage decreased to 10%. The decline indicates a potential effectiveness of the intervention in lowering the number of individuals with high levels of hand contamination. Overall, the data suggests that the intervention might have contributed to a positive shift in hand contamination levels, leading to a higher percentage of hospital workers exhibiting lower levels of hand contamination.

Figure 3: Impact of Intervention on Hand Hygiene Compliance Rates

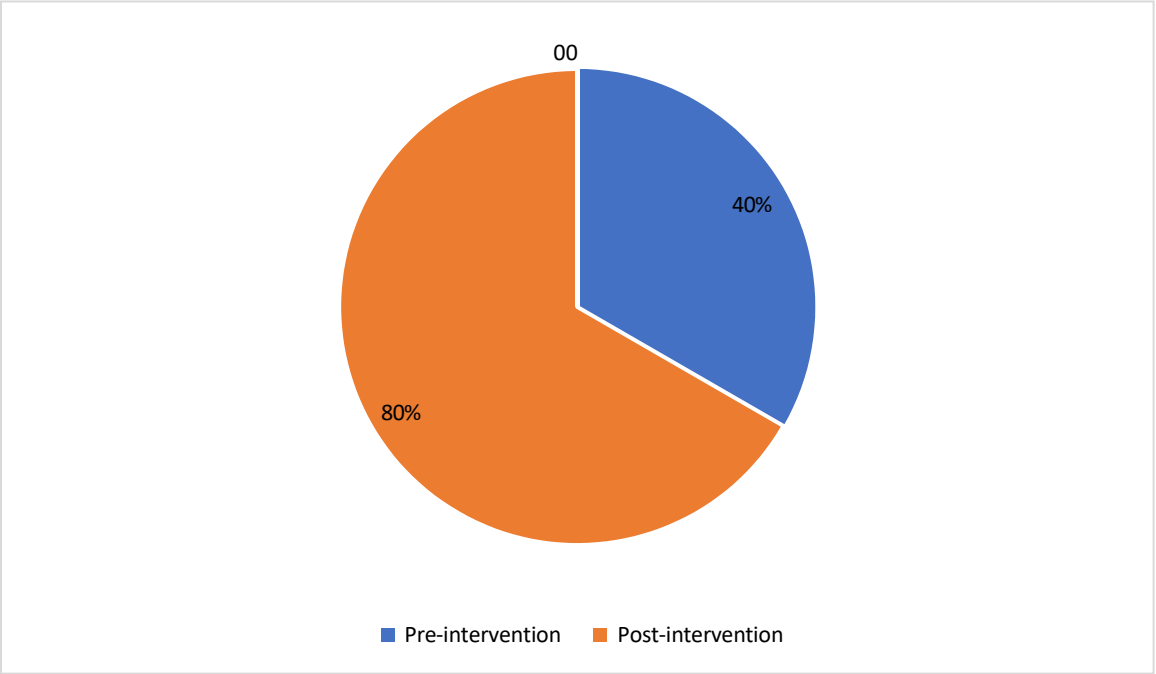

Figure 3, suggests a substantial improvement in hand hygiene compliance rates among hospital workers after the implementation of the intervention. Prior to the intervention (Pre-Intervention stage), the hand hygiene compliance rate was indicated as 40%. Following the intervention (Post-Intervention stage), there was a notable increase, with the hand hygiene compliance rate rising to 80%. This suggests that the intervention had a positive impact on promoting and enhancing hand hygiene practices among the hospital workers. The visual representation in the figure emphasizes the effectiveness of the intervention in fostering a significant improvement in hand hygiene compliance within the study population.

Discussion:

The demographic characteristics outlined in Table 1 offer valuable insights into the composition of the study participants. The majority, encompassing 75 %, fall within the age category of 21-40years, with the most substantial representation in the 31-40 years category. Gender distribution indicates a female majority at 68 %. The participants exhibit diverse experience in health care, with a notable concentration in the 1-5 years category. Regarding work shifts, the majority were assigned to the morning shift, under scoring the significance of understanding these demographics when analyzing hand hygiene practices.

Table 2, provides a comprehensive evaluation of the impact of the intervention on hand hygiene practices among hospital workers. The significant improvement post-intervention is evident in various aspects. Notably, the educational component shows substantial progress, with 95% of participants receiving teaching on hand washing compared to 40% pre-intervention. Hand washing after patient contact experienced a remarkable increase from 25% to 87%, indicating a positive shift in behavioral practices. Knowledge enhancement is evident, with an increase from 20% to 78% in participants correctly identifying the 8 steps of hand washing. Moreover, the intervention influenced positive changes in frequency and accessories removal during hand washing. The findings high light the intervention's effectiveness in enhancing hand hygiene practices.

Comparing the findings of this study with existing literature on hand hygiene practices among hospital workers provides valuable insights into the effectiveness of the intervention and the broader context of infection control. Several key aspects of hand hygiene practices, educational interventions and compliance rates can be considered in relation to similar studies. The educational intervention in this study, focusing on teaching hand washing practices, demonstrated a substantial improvement with 95% of participants receiving teaching post-intervention. This aligns with the

findings of various studies that emphasize the positive impact of educational programs on hand hygiene knowledge and practices among hospital workers (Gould et al.[6]andAllegranzi et al.[7]). The observed increase in knowledge regarding the 8 steps of hand washing (from 20% to 78%) is consistent with interventions that have successfully enhanced hospital workers, understanding of proper hand hygiene techniques (Kampf et al [8]).

Figure 1 visually represents the distribution of hand washing practices before and after the intervention. The shift towards reduced instances of no hand washing and inconsistent hand washing post-intervention is evident. Adequate hand washing practices increased, emphasizing the positive impact of the intervention. While consistent hand washing slightly decreased, it may reflect redistribution into other improved categories, indicating an overall positive change in hand hygiene practices. The significant improvement in hand washing adherence after patient contact, rising from 25% to 87% post-intervention is note worthy. Similar studies focusing on specific hand hygiene moments, such as before patient contact, after touching patients and after body fluid exposure have reported positive outcomes following educational interventions (Pittet et al.[9]and WHO, 2009[3]). The substantial increase in adherence rates observed in this study aligns with the World Health Organization's "Five Moments for Hand Hygiene" strategy, emphasizing specific critical times for hand hygiene practices among health care workers (WHO, 2009[3]).

Figure 2 illustrates potential changes in hand contamination levels pre- and post-intervention. A decrease in moderate and high contamination levels post-intervention suggests an effective reduction in contamination, aligning with improved hand hygiene practices. The intervention appears to contribute a higher proportion of individuals maintaining cleaner hands, reflecting positively on infection control. While the distribution of methods used for hand washing did not show a statistically significant difference, the overall improvement in adherence rates suggests that the intervention had a positive impact on the adoption of recommended hand hygiene practices. Similar studies have emphasized the importance of not only knowledge but also the practical aspects of hand hygiene, including the correct techniques and use of appropriate materials (Pittet et al [9]and Larson et al[10]).

Figure 3 emphasizes the significant improvement in hand hygiene compliance rates post-intervention. The rise from 40% to 80% indicates a substantial positive impact, high lighting the success of the intervention in promoting and reinforcing hand hygiene practices among hospital workers. The visual representation enhances the understanding of the intervention's effectiveness. The comparison of hand contamination levels pre- and post-intervention reveals a positive shift with a higher percentage of hospital workers exhibiting lower contamination levels. This aligns with studies that have shown a direct correlation between improved hand hygiene practices and reduced microbial contamination on hands (Pittet et al[9]and Boyce &Pittet, 2002)[11].

The visual representation in Figure 3, illustrating the impact of the intervention on hand hygiene compliance rates, echoes findings from other studies emphasizing the effectiveness of interventions in increasing compliance among healthcare workers (McGuckin et al.[12]; Luangasanatip et al.[13]). The substantial increase from 40% to 80% in compliance rates post-intervention reflects the successful implementation of strategies to reinforce and sustain positive hand hygiene behaviors.

The findings of this study align and contribute to existing literature on hand hygiene practices among healthcare workers. The positive outcomes observed post-intervention including improved knowledge , increased adherence and reduced hand contamination underscore the effectiveness of targeted educational interventions. Comparisons with similar studies emphasize the universal importance of ongoing efforts to enhance hand hygiene practices in healthcare settings, ultimately contributing to the prevention of health care-associated infections.

Conclusion:

The study reveals that the intervention has successfully influenced positive changes in hand hygiene practices among hospital workers, as evidenced by improvements in knowledge, adherence and contamination levels. The comprehensive analysis of demographic characteristics

and various parameters pre- and post-intervention enhances our understanding of the study out comes and emphasizes the importance of targeted interventions for infection control in health care settings. This study suggests that the implemented intervention, which included educational components and targeted strategies has been effective in enhancing hand hygiene practices among hospital workers. The findings contribute valuable information for health care institutions seeking evidence-based interventions to reduce the risk of hospital workers -associated infections.

Recommendation:

Continued emphasis on education, awareness, regular monitoring is crucial for sustaining and further improving hand hygiene practices in health care settings, ultimately promoting a safer and healthier environment for both health care workers and patients.

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