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Bare Below the Elbow Policy in Indian Healthcare Settings: A Cross-Sectional Survey of Healthcare Workers

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Abstract

Background: Healthcare-associated infections remain a major global challenge, and hand hygiene is one of the most effective preventive measures. The Bare Below the Elbow policy, which discourages long sleeves, jewellery, and wrist adornments, aims to enhance the effectiveness of hand hygiene. In April 2024, the Directorate General of Health Services, India, mandated the implementation of Bare Below the Elbow practices in all central government hospitals. However, healthcare workers' awareness of and adherence to this policy remain unclear.

Methods: A cross-sectional online survey using convenience sampling was conducted from March to May 2025 among 1,002 healthcare workers recruited through professional networks, hospital communication groups, and WhatsApp platforms in multiple regions of India. The questionnaire assessed demographics, awareness, attitudes, and self-reported practices related to the Bare Below the Elbow policy. Descriptive statistics were used to summarise findings. Associations were assessed using chi-square tests, and logistic regression analysis was performed to identify predictors of awareness.

Results: Among the 1,002 respondents, 769 (76.8%) were from South India, and 504 (50.3%) were nurses. Overall, 690 (68.9%) participants were aware of the Bare Below the Elbow policy; descriptively, awareness was highest among nurses (358 of 504; 71.0%). A formal hospital-level Bare Below the Elbow policy was reported by 609 (60.8%) respondents, and 634 (63.3%) reported consistent practice. Most participants considered the policy necessary (892; 89.0%) and were willing to comply if enforced by their institution (904; 90.2%). On multivariable analysis, the presence of a formal hospital Bare Below the Elbow policy was strongly associated with awareness (adjusted odds ratio 20.2, 95% confidence interval 12.9-31.7; $p < 0.001$), while nurses had lower adjusted odds of awareness than doctors (adjusted odds ratio 0.51, 95% confidence interval 0.32-0.84; $p = 0.007$). The latter reflects an adjusted association and should not be interpreted as contradicting the unadjusted descriptive proportions.

Conclusion: Respondents demonstrated strong support for the Bare Below the Elbow policy; however, a gap remained between awareness and consistent self-reported practice. These findings should be interpreted in the context of convenience sampling, substantial representation from South India and tertiary-care hospitals, and self-reported outcomes. The presence of an institutional policy was strongly associated with awareness, but the cross-sectional design does not establish causality.

Categories: Health Policy, Quality Improvement, Infectious Disease
Keywords: bare below the elbow, hand hygiene, healthcare-associated infections, infection control, infection prevention

Introduction

Healthcare-associated infections remain a persistent global threat, affecting millions of patients each year [1]. Hand hygiene is a cornerstone of infection prevention, with early landmark studies demonstrating the role of healthcare workers' hands in transmitting pathogens such as Klebsiella species [2]. Subsequent evidence has consistently shown that inadequate hand hygiene contributes significantly to healthcare-associated infection transmission [3]. Despite global initiatives, compliance with recommended hand hygiene practices often remains below 50% [4].

The Bare Below the Elbow (BBE) policy was introduced to improve hand hygiene effectiveness by removing physical barriers such as long sleeves, wristwatches, and jewellery, thereby facilitating adequate hand and forearm decontamination. National infection prevention guidelines in the United Kingdom and parts of Europe endorse BBE practices, supported by microbiological evidence demonstrating reduced contamination of hands and clothing [5-7]. Indian studies have similarly shown that long sleeves and wrist adornments negatively impact hand hygiene quality among healthcare workers and students [8]. However, direct

evidence that BBE itself reduces patient-level healthcare-associated infection rates remains limited, and much of the supporting evidence relates to microbiological contamination and facilitation of hand hygiene rather than clinical infection outcomes [9].

Although the policy is well established in the United Kingdom, its adoption outside Europe has been variable. Observational studies have shown that compliance may remain suboptimal even after policy introduction, particularly in the absence of consistent institutional enforcement [9,10]. In India and other low- and middle-income settings, awareness of and adherence to infection control practices, including dress code recommendations, show wide variability across institutions and professional groups [11-14].

In April 2024, the Directorate General of Health Services issued a directive mandating BBE practices in central government hospitals across India [15]. This represented a significant national effort to strengthen infection prevention strategies. However, data regarding healthcare workers' awareness, acceptance, and actual practice of the policy following this directive are limited. Conducted approximately one year after the directive, the present study aimed primarily to assess awareness, attitudes, and self-reported practices related to the BBE policy among surveyed healthcare workers in India; a secondary objective was to identify professional and institutional factors associated with policy awareness.

Materials And Methods

Study design and setting

This cross-sectional study was conducted from March to May 2025 using an online questionnaire circulated through professional networks, hospital communication groups, and WhatsApp platforms (Appendices). Participants were recruited using a non-probability convenience sampling approach from healthcare institutions in multiple regions of India. The sample was not designed to be nationally representative and was predominantly composed of respondents from South India and tertiary-care hospitals. The survey was conducted approximately one year after the national directive to assess early post-implementation awareness and self-reported practices.

Study population

Doctors, nurses, and paramedical personnel directly involved in patient care across India were included in the study. Inclusion criteria were healthcare workers involved in clinical care and voluntary informed consent. Exclusion criteria comprised administrative or non-clinical staff and incomplete or inconsistent responses. A total of 1,002 healthcare workers participated, including 467 doctors (46.6%), 504 nurses (50.3%), and 31 paramedical staff (3.1%).

Data collection tool

A structured questionnaire was developed for this study with input from a General Medicine consultant and an Infectious Disease specialist. It assessed (i) demographics and workplace characteristics, (ii) awareness of BBE, infection-control structures, and contexts requiring BBE, (iii) attitudes regarding necessity, inconvenience, institutional adoption, and willingness to comply, and (iv) self-reported practices related to clothing, jewellery use, and hand hygiene behaviour. Participation was anonymised. The questionnaire underwent expert assessment for face and content validity, but it was not subjected to formal psychometric validation; accordingly, no psychometric reliability estimate is reported. This limits interpretation of the attitude and practice measures. No widely standardised BBE questionnaire exists in the literature; previous studies have used locally designed tools tailored to institutional or regional contexts, and similarly, this questionnaire was developed to reflect local practices and policy awareness.

Statistical analysis

Data were analysed using IBM SPSS Statistics for Windows, Version 28 (Released 2021; IBM Corp., Armonk, New York). Descriptive statistics summarised participant characteristics and responses. For the regression analysis, awareness was defined by a "Yes" response to the question about awareness of the national BBE policy. Routine BBE practice was recorded as "Always", "Occasional", or "Never"; in descriptive reporting, consistent practice refers to an "Always" response. Chi-square tests were used to assess associations between professional role and awareness. Univariable logistic regression was performed first, and variables with $p < 0.20$ in univariable analysis were considered for inclusion in the multivariable logistic regression model. The adjusted model included designation, hospital type, presence of an infection control committee, presence of a formal BBE policy, wristwatch use, ring use, full-sleeve use, and hand-hygiene compliance, as shown in Table *4*. Statistical significance was set at $p < 0.05$. Given the observational cross-sectional design, regression estimates were interpreted as associations rather than causal effects.

Results

Participant Characteristics

Of the 1,002 participants, 769 (76.8%) were from South India, 657 (65.6%) were female, and 708 (70.7%) were

working in tertiary care hospitals. Nurses constituted the largest professional group (Table 1).

Variables	Frequency	Percentage
Region of practice		
Central India	104	10.38
North India	129	12.87
South India	769	76.75
Gender		
Female	657	65.57
Male	345	34.43
Designation		
Doctor	467	46.61
Nurse	504	50.30
Paramedical	31	3.09
Department		
Medical	707	70.56
Surgical	295	29.44
Type of hospital		
Primary care hospital	179	17.86
Secondary care hospital	115	11.48
Tertiary care hospital	708	70.66
Awareness of national BBE policy		
No	312	31.14
Yes	690	68.86
Hospital infection control committee		
No	101	10.08
Yes	901	89.92
Formal BBE policy present		
No	393	39.22
Yes	609	60.78
Awareness of BBE role in IPC		
No	180	17.96
Yes	822	82.04
Knowledge of appropriate BBE situations		
No	249	24.85
Yes	753	75.15
Satisfied with knowledge		
Agree	564	56.29
Disagree	155	15.47
Uncertain	283	28.24

Belief BBE is necessary		
Agree	892	89.02
Disagree	14	1.40
Uncertain	96	9.58
Institution should have BBE policy		
Agree	866	86.43
Disagree	21	2.10
Uncertain	115	11.48
Willing to comply if implemented		
Agree	904	90.22
Disagree	24	2.40
Uncertain	74	7.39
Perceive BBE as inconvenient		
Agree	276	27.54
Disagree	553	55.19
Uncertain	173	17.27
Routine BBE practice		
Always	634	63.27
Never	64	6.39
Occasional	304	30.34
Full sleeves during patient care		
Always	119	11.88
Never	617	61.58
Occasional	266	26.55
Wristwatch/bracelet use		
Always	179	17.86
Never	586	58.48
Occasional	237	23.65
Ring/nail adornment use		
Always	91	9.08
Never	783	78.14
Occasional	128	12.77
WHO 5 Moments practice		
Always	815	81.34
Never	27	2.69
Occasional	160	15.97

TABLE 1: Participant demographics and responses regarding the Bare Below the Elbow (BBE) policy

Awareness, attitudes, and practices

Overall, 690 (68.9%) participants were aware of the national BBE policy, and 822 (82.0%) understood its infection control rationale. Although most respondents reported the presence of an infection control committee in their institutions, only 609 (60.8%) indicated that their hospital had a formal BBE policy in place. Support for BBE was generally high, with 892 (89.0%) believing it to be necessary, 866 (86.4%) feeling that their hospital should formally adopt the policy, and 904 (90.2%) expressing willingness to comply if it were enforced. Despite this strong support, consistent self-reported practice of BBE was reported by 634 (63.3%) participants, while 276 (27.5%) found the policy inconvenient, indicating a gap between reported awareness and support and consistent practice. Adherence to the WHO's Five Moments of Hand Hygiene was reported as "always" by 815 (81.3%) respondents. Because these behaviours were self-reported, adherence may be overestimated due to social desirability or reporting bias (Table *2*).

Variable	Doctors (n = 467)	Nurses (n = 504)	Paramedical (n = 31)	p-value
Awareness of national BBE policy	312 (66.8%)	358 (71.0%)	20 (64.5%)	0.412
Hospital has a formal BBE policy	260 (55.7%)	332 (65.9%)	17 (54.8%)	0.006
Belief that BBE improves infection control	373 (79.9%)	430 (85.3%)	19 (61.3%)	0.001
BBE is necessary for patient safety	405 (86.7%)	457 (90.7%)	30 (96.8%)	0.041
Institution should implement BBE policy	390 (83.5%)	448 (88.9%)	28 (90.3%)	0.078
Willing to comply with BBE policy	409 (87.6%)	464 (92.1%)	31 (100%)	0.009
BBE practice (always)	251 (53.7%)	352 (69.8%)	31 (100%)	<0.001
Use of full sleeves during patient care (never)	277 (59.3%)	315 (62.5%)	25 (80.6%)	0.028
Wristwatch/bracelet use (never)	224 (48.0%)	349 (69.2%)	13 (41.9%)	<0.001
Rings/nail adornment (never)	337 (72.2%)	423 (83.9%)	23 (74.2%)	<0.001
WHO 5 Moments followed (always)	353 (75.6%)	437 (86.7%)	25 (80.6%)	<0.001

TABLE 2: Participant characteristics and responses on awareness, attitudes, and practices related to the Bare Below the Elbow (BBE) policy.

Predictors of awareness

Univariable Analysis

The presence of a hospital BBE policy was strongly associated with awareness (OR 22.1; $p < 0.001$). Awareness was lower among staff in secondary and tertiary hospitals compared with primary care staff (Table *3*).

Predictor	β	SE	OR (95% CI)	p-value
Intercept	-0.775	0.281	-	0.0058
Nurse vs Doctor	-0.367	0.231	0.69 (0.44-1.09)	0.1113
Paramedic vs Doctor	-0.362	0.465	0.70 (0.28-1.73)	0.4371
Secondary vs Primary hospital	-0.665	0.328	0.51 (0.27-0.98)	0.0425
Tertiary vs Primary hospital	-0.549	0.266	0.58 (0.34-0.97)	0.0390
Infection Control Committee (ICC) present	0.644	0.295	1.90 (1.07-3.40)	0.0294
Formal BBE policy	3.096	0.220	22.10 (14.37-33.99)	<0.0001

TABLE 3: Univariable logistic regression showing factors associated with awareness of the Bare Below the Elbow (BBE) policy.

Multivariable Analysis

Variables with $p < 0.20$ in univariable analysis were included in the multivariable logistic regression model. After adjustment, the presence of a hospital BBE policy remained strongly associated with awareness (AOR 20.2; $p < 0.001$). Nurses had lower adjusted odds of awareness than doctors (AOR 0.51; $p = 0.007$), and occasional ring use was associated with reduced odds of awareness (AOR 0.43; $p = 0.033$). Table *4* summarises the full model. Although the unadjusted descriptive proportion aware of the policy was higher among nurses than doctors, the adjusted model estimates the association with professional designation after accounting for the other variables in the model; therefore, the descriptive and adjusted findings are not directly comparable. The large effect estimate for formal BBE policy presence should be interpreted cautiously, particularly given the observational design and imbalance in participant distribution across hospital types (Table *4*).

Predictor	AOR	95% CI	p-value
Designation (Ref: Doctor)			
Nurse	0.51	0.32-0.84	0.007
Paramedic	0.60	0.23-1.54	0.284
Hospital type (Ref: Primary)			
Secondary	0.50	0.26-0.97	0.041
Tertiary	0.55	0.32-0.95	0.031
Infection Control Committee	1.75	0.96-3.22	0.070
Formal BBE policy	20.22	12.91-31.68	<0.001
Wristwatch Use (Ref: Always)			
Never	1.36	0.79-2.36	0.270
Occasional	1.16	0.67-1.99	0.600
Ring use (Ref: Always)			
Never	0.63	0.32-1.23	0.174
Occasional	0.43	0.20-0.93	0.033
Full sleeves (Ref: Always)			
Never	1.66	0.89-3.08	0.109
Occasional	0.76	0.40-1.44	0.395
Hand hygiene compliance (Ref: Never)			
Always	1.92	0.61-6.08	0.267
Occasional	1.40	0.42-4.73	0.585

TABLE 4: Multivariable logistic regression showing independent predictors of awareness of the BBE policy.

AOR: adjusted odds ratio; CI: confidence interval; Ref: reference category; BBE: Bare Below the Elbow.

Discussion

This cross-sectional survey assessed awareness and self-reported practice related to the BBE policy following the 2024 Directorate General of Health Services directive. Awareness was moderate and attitudes were largely positive, while consistent self-reported practice was lower, indicating a gap between reported awareness and support and routine practice. Because the study used convenience sampling and self-reported measures, these findings describe the surveyed sample and should not be interpreted as nationally representative estimates or as evidence of causal relationships.

Previous research on hand hygiene behaviour has demonstrated that compliance is influenced by a complex interaction of individual habits, perceived inconvenience, professional norms, and institutional culture [16-18]. Studies from multiple healthcare settings have shown that policy awareness alone is insufficient unless supported by visible leadership, regular reinforcement, and system-level facilitation [17,19].

A key finding of this study is the strong association between the presence of a formal hospital policy and awareness of BBE practices. This aligns with evidence that institutional policies, supported by administrative leadership and infection control teams, can facilitate adherence to infection prevention measures [5,18,20]. Descriptively, nurses had the highest proportion of awareness among the three professional groups, while multivariable analysis showed lower adjusted odds of awareness for nurses compared with doctors. This difference reflects adjustment for institutional and behavioural covariates and illustrates why crude proportions and adjusted odds ratios should be interpreted separately. Nurses also reported higher routine BBE practice than doctors, although the small paramedical subgroup reported 100% routine practice; comparisons involving the paramedical group should therefore be interpreted cautiously

because of its small sample size.

Lower adjusted odds of awareness were observed in secondary and tertiary care hospitals relative to primary care hospitals. Possible explanations include differences in institutional communication pathways, policy dissemination, workforce size, or survey sampling; however, these mechanisms were not directly measured in this study and should not be inferred from the present data [11,19]. In addition, the substantially larger number of tertiary-care respondents compared with primary-care respondents may affect the precision and generalisability of hospital-type comparisons. Further studies using more balanced probability-based sampling would be useful to examine these institutional differences.

Despite high willingness to comply, perceived inconvenience remained a notable barrier. Previous observational studies of BBE implementation have reported similar concerns related to habit, comfort, and professional identity [9]. Practical implementation may also vary by climate and infrastructure; in colder regions or facilities without adequate temperature control, maintaining BBE attire may be less convenient and may require locally appropriate measures. Provision of appropriate short-sleeved attire, secure storage for personal items, and consistent messaging regarding the rationale of the policy may improve acceptability, but these interventions were not evaluated in the present study. The findings therefore provide an early description of post-directive awareness and self-reported practice within this convenience sample rather than evidence of nationwide implementation effectiveness.

Limitations

The study has limitations that should be acknowledged. Participants were recruited through non-probability convenience sampling using online professional networks, hospital communication groups, and WhatsApp platforms, which may have introduced selection bias and limited representativeness. The sample was substantially weighted toward South India and tertiary-care hospitals, restricting generalisability to other regions and hospital settings; the relatively small paramedical subgroup also limits the reliability of comparisons involving that group. Self-reported practices may overestimate actual adherence because of social desirability and reporting bias. The use of broad regional groupings may have obscured important state-level differences. The questionnaire underwent face and content assessment but lacked formal psychometric validation, limiting interpretation of attitude and practice measures. In addition, the cross-sectional design permits identification of associations but cannot establish temporal or causal relationships. The very large adjusted association between the presence of a formal BBE policy and awareness should therefore be interpreted cautiously. Despite these limitations, the large sample provides useful descriptive information on early post-directive awareness and self-reported practice among the surveyed healthcare workers.

Conclusions

Following the 2024 Directorate General of Health Services directive, the surveyed healthcare workers generally expressed support for the BBE policy, while consistent self-reported practice was lower than reported awareness and support. The presence of a formal institutional BBE policy was strongly associated with awareness, but this association should not be interpreted as causal. Because the sample was recruited through convenience sampling and consisted predominantly of respondents from South India and tertiary-care hospitals, the findings should not be generalised to all healthcare workers in India. Future evaluations using more representative sampling and objective measures of adherence and clinical outcomes are needed to assess implementation and determine whether BBE policies translate into measurable reductions in healthcare-associated infections.

Appendices

Section	No.	Question	Options
Demographics	1	Region of practice	North India; Central India; South India
	2	Gender	Male; Female; Others
	3	Designation	Doctor; Nurse; Paramedic
	4	Department	Medical; Surgical
	5	Type of hospital	Tertiary care hospital; Secondary care hospital; Primary care hospital
Knowledge	6	Are you aware of the National “Bare Below the Elbow” (BBE) policy?	Yes; No
	7	Does your hospital have an infection control committee?	Yes; No
	8	Does your hospital have a formal BBE policy?	Yes; No
	9	Are you aware of the role of BBE in infection prevention and control?	Yes; No
	10	Do you know the appropriate situations in which BBE should be followed?	Yes; No
Attitude	11	Are you satisfied with your current level of knowledge regarding the BBE policy?	Agree; Disagree; Uncertain
	12	Do you believe the BBE policy is necessary at your hospital?	Agree; Disagree; Uncertain
	13	Do you think your institution should have a formal BBE policy?	Agree; Disagree; Uncertain
	14	If your hospital has implemented the BBE policy, would you be willing to comply with it?	Agree; Disagree; Uncertain
	15	Do you find the BBE policy to be inconvenient?	Agree; Disagree; Uncertain
Practice	16	Do you routinely follow the BBE policy in clinical settings?	Always; Never; Occasional
	17	How often do you wear full-sleeve clothing during patient care?	Always; Never; Occasional
	18	How often do you wear a wristwatch/bracelet during patient care?	Always; Never; Occasional
	19	How often do you wear a ring or nail adornment (extensions/gel polish/varnish/long nails) during patient care?	Always; Never; Occasional
	20	Besides following BBE, do you routinely practice WHO 5 Moments of hand hygiene?	Always; Never; Occasional

TABLE 5: Bare Below the Elbow questionnaire

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Anand Anilkumar, Mohammed Haneef Aloodigothi, Adarsh Aayilliath K, Abhijith Pradeep

Acquisition, analysis, or interpretation of data: Anand Anilkumar, Mohammed Haneef Aloodigothi, Adarsh Aayilliath K, Abhijith Pradeep

Drafting of the manuscript: Anand Anilkumar, Mohammed Haneef Aloodigothi, Adarsh Aayilliath K, Abhijith Pradeep

Critical review of the manuscript for important intellectual content: Anand Anilkumar, Mohammed Haneef Aloodigothi, Adarsh Aayilliath K, Abhijith Pradeep

Supervision: Mohammed Haneef Aloodigothi, Adarsh Aayilliath K

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Aster Malabar Institute of Medical Sciences (MIMS), Kannur, India issued approval MIMS/KNR/IEC/2O25-2O26/OOO7. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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Anand Anilkumar and Mohammed Haneef Aloodigothi contributed equally to the work and should be considered co-first authors.

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