

# Medical Adhesives Related Skin Injury (MARSİ): Nursing Expertise that Improves Patient Care and Comfort

Soumya Swaroop Patra, Mamata Swain\*, Susan Konda

Department of Medical Surgical Nursing, Sum Nursing College, "Siksha 'O' Anusandhan" (DTU) University, Bhubaneswar, Odisha, India.

\*Corresponding Author's Email: mamataswain@soa.ac.in

## Abstract

This study aimed to evaluate the knowledge and practical application of information related to Medical Adhesive-Related Skin Injuries (MARSİ) among nurses working in inpatient departments of selected hospitals in Bhubaneswar. A total of 230 participants were included, and a descriptive research design was employed for data collection using a structured questionnaire through purposive sampling. The analysis, conducted using IBM SPSS version 23, revealed that the majority of nurses exhibited moderate knowledge of MARSİ (92%), with 8% possessing high knowledge. In terms of practical application, 60% demonstrated good practice scores, 38% had average scores, and 2% displayed poor scores. Comparison of knowledge scores between Intensive Care Unit (ICU) and General Ward nurses indicated a statistically significant difference, with ICU nurses scoring higher. While demographic factors showed no significant impact on knowledge levels, participation in workshops/seminars was positively associated with increased knowledge. The findings underscore the need for continuous education and training to enhance nurses' understanding and implementation of MARSİ prevention and management practices, emphasizing the importance of ongoing efforts to raise awareness and adherence to best practices. The study suggests future research should focus on developing effective educational programs and interventions to reduce MARSİ incidence in healthcare settings.

**Keywords:** Knowledge, Knowledge on Practice, Medical Adhesive-Related Skin Injury (MARSİ).

## Introduction

Medical adhesive-related skin injury (MARSİ) is a prevalent yet frequently under reported condition that compromises the integrity of the skin. The repetitive application and removal of medical adhesives, a common practice in healthcare, significantly elevates the risk of MARSİ (1). MARSİ is characterized by the persistence of erythema and other cutaneous abnormalities, such as vesicles, bullae, erosions, or tears, for at least 30 minutes following the removal of adhesive material (2). Contrary to MARSİ, injuries can occur due to various causes, such as severe trauma, infections, pre-existing medical conditions like diabetes, and the development of pressure sores among the elderly. The skin's external protective layer comprises two primary components: the epidermis and the dermis (1,2). Medical Adhesive-Related Skin Injury (MARSİ) represents a significant cutaneous anomaly that endures for more than 30 minutes post-adhesive

removal. Skin injuries linked to adhesive tapes can arise from incorrect or repeated application and removal practices, as well as the selection of inappropriate tape types without considering the patient's skin type or the specific clinical context. Skin stripping, a frequent consequence of the repetitive application and removal of tape, involves the destruction of the epidermis, resulting in skin denudation and injury. It stands as one of the most prevalent types of adhesive-related injuries (3).

The incidence of MARSİ has been extensively studied across various healthcare settings, revealing a range of prevalence rates. These rates include 10.96% in a Beijing Intensive Care Unit (ICU) (4), 19.5% among premature newborns using tape in a Brazilian neonatology department (5), and a staggering 41.9% among frontline medical staff using protective medical adhesive dressings during the 2019 COVID-19 pandemic in China (6).

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Numerous risk factors associated with MARSIs have been identified, encompassing lifestyle factors such as alcoholism and smoking, underlying medical conditions, and factors related to the patient's skin. Additionally, independent risk factors for neonatal MARSIs, including gestational age, ECG monitoring, and ambient temperature, have been established (7). The extensive body of research on MARSIs extends to studies aiming to identify prevalence and risk factors. For instance, a cross-sectional observational study conducted in China sought to identify the prevalence and risk factors of MARSIs at peripherally inserted catheter (PICC) insertion sites among oncology patients, ultimately identifying a total MARSIs prevalence of 29.83%. Independent risk factors included age greater than or equal to 50 years and hematologic malignancies (8). Similarly, a cohort study carried out in a Brazilian teaching hospital evaluated the prevalence of MARSIs and its associated factors in neonatology patients, particularly premature newborns using medical tapes, concluding that adhesive tapes posed injury risks to this vulnerable population. Furthermore, a survey conducted in 2022 aimed to assess the knowledge, attitudes, and behaviors of neonatal nurses regarding medical adhesive-related skin injury (MARSIs). The study found that factors such as MARSIs training, education, and work experience significantly influenced nurses' MARSIs-related knowledge, attitudes, and behaviors. These findings underscore the importance of enhancing learning and promoting standardized protective behaviors to reduce MARSIs incidence (9).

Several studies have identified a multitude of risk factors associated with MARSIs, including mechanical damage, edema, hyperthermia, specific medications, contact dermatitis, and delayed ambulation (2, 10-11). Understanding and addressing these risk factors are pivotal in the prevention of MARSIs.

In light of these considerations, this study contributes to the body of knowledge on MARSIs by investigating the knowledge levels of nurses in Intensive Care Units (ICUs) and general wards regarding this prevalent and concerning healthcare issue. The findings of this study are expected to shed light on the current understanding of MARSIs among healthcare professionals and potentially inform

strategies for its prevention and management in clinical settings.

## Methodology

A quantitative research approach was adopted to assess the knowledge and knowledge on practice related to Medical Adhesive-Related Skin Injury (MARSIs) among nurses working in inpatient departments (IPD) in selected hospitals in Bhubaneswar. The research design employed was Descriptive research design. The main research variables under scrutiny were knowledge and knowledge on practice. Additionally, demographic variables such as age, gender, educational status, nursing experience, working unit, and attendance at MARSIs-related seminars or workshops were considered. The study was conducted at the Institute of Medical Sciences (IMS) in Bhubaneswar, Khurda, Odisha. The population included all registered nurses, irrespective of gender, working in IPD in selected hospitals in Bhubaneswar. This encompassed nurse working in medical, surgical, orthopedics, oncology, and ICU wards. The study sample comprised nurses working in IPD departments across various settings, meeting the inclusion criteria. The sample size was calculated using Yamane's formula, yielding a predicted size of 222. However, to minimize the risk of sample dropout, the final sample size was set at 230 participants. Purposive sampling technique was employed, enabling the researchers to select cases based on their knowledge of the population. Inclusion criteria included nurses with more than 6 months of working experience and actively involved in patient care in IPD. Exclusion criteria covered nurses who were disinterested in participating in the survey and those solely engaged in administrative and outpatient department (OPD) duties.

The following tools were employed in this study. Tool-1: Demographic Performa for Nurses: This tool was designed to gather essential demographic information about the participating nurses. It comprises eight items, including age, gender, educational status, job designation, current work area, years of working experience, history of suffering from medical adhesive-related skin injury, and attendance at MARSIs-related workshops or

seminars. Tool-2: Knowledge of Nurses about Medical Adhesive and Skin Injury: This tool aims to assess nurses' knowledge concerning medical adhesive and skin injuries. It consists of 16 items, covering various aspects of MARSIS, such as its definition, the outermost layer of the skin affected, conditions responsible for MARSIS, layers affected by MARSIS, the virus responsible, manifestations like scaly dermatitis and skin injury, incidence rates, contributing factors, associated disease conditions, allergic and contact dermatitis, conditions conducive to maceration, types of medical adhesive dressings, changes in skin color, and best practices for MARSIS prevention. Scoring was conducted with a maximum possible score of 16, with a correct answer receiving a score of 1 and an incorrect one scoring 0. Interpretation categorized scores into "Low knowledge" (0-5), "Moderate knowledge" (6-11), and "High knowledge" (12-16). Tool-3: Nurses' Knowledge on Practice of Patients with Medical Adhesive-Related Skin Injury: This tool consisted of eight questions related to nurses' practices regarding patients with MARSIS. The items encompassed aspects such as dressing techniques, frequency of dressing changes (e.g., every 3rd day), monitoring for skin dryness or soakage, adherence to sterile procedures, utilization of gloves, observation of any discharge, and identification of allergic reactions. Scoring followed a rating scale with a score of 1 for correct practices and 0 for incorrect ones. The scoring categories were defined as "Poor Practice" (0-2), "Average Practice" (3-5), and "Good Practice" (6-8).

**Validation of the Tools:** The tools underwent a rigorous validation process to ensure their content validity. They were submitted to a panel of experts consisting of three nursing experts, two medical doctors, and one statistician. The selection of experts was based on their clinical experience and expertise in the research area. The tools were modified based on their valuable suggestions and opinions, confirming their content validity.

**Reliability of the Tools:** The reliability of the tools was assessed using Cronbach's alpha, a widely accepted measure of internal consistency. The

calculated Cronbach's alpha value for the tools was 0.84, indicating an acceptable level of reliability. This ensures that the tools consistently measure what they are intended to assess, contributing to the robustness of the research findings.

**Data Collection Procedure:** The data collection process adhered to a well-structured protocol. Initially, formal written consent was obtained from the medical superintendent and the Head of the Department at IMS and SUM Hospital in Bhubaneswar, ensuring official authorization for the study. Ethical approval was granted by the Institutional Ethical Committee (IEC) of the institution. Over the course of one month, the data collection procedure unfolded systematically. The investigator commenced interactions with the respondents by introducing himself and providing a clear explanation of the study's purpose. Subsequently, informed written consent was secured from all participants, emphasizing their voluntary participation. The initial phase involved the collection and recording of demographic data from the nurses. Following this, data pertaining to knowledge and knowledge on practice related to the subject matter was systematically gathered.

**Plan for Data Analysis:** The analysis of collected data was meticulously planned in accordance with the research objectives, leveraging descriptive statistics as the analytical framework. A comprehensive master sheet was created to consolidate all data efficiently. For the socio-demographic data, descriptive statistics, including frequency and percentage calculations, were employed to provide insights into the variables. The assessment of knowledge levels among nurses regarding medical adhesive-related skin injury was conducted through descriptive analysis, comprising the calculation of mean and standard deviation values. To explore potential disparities in knowledge between nurses in the General Ward and those in the ICU, an unpaired t-test was utilized as the statistical tool of choice. This statistical test aimed to determine if there were statistically significant differences in knowledge between these two groups, shedding light

## Results

**Table 1:** Demographic Characteristics of the Sample

Variable	Frequency(f)	Percentage (%)
<b>Age in year</b>		
20-25	109	47.4
26-30	81	35.2
31-35	28	12.2
Above 35	12	5.2
<b>Gender</b>		
Male	104	45.2
Female	126	54.8
<b>Educational status</b>		
Diploma in nursing	114	49.6
Degree in nursing	103	44.8
Master's in nursing	13	5.7
<b>Designation</b>		
Nursing officer	145	63
Nursing IN-charge	85	37
<b>Current working area</b>		
ICU	118	51.3
General ward	112	48.7
<b>Current working experience</b>		
Less than 1 year	85	37.0
1-2 year	55	23.9
3-4 year	51	22.1
Above 4 year	39	17
<b>Current working experience</b>		
Less than 1 year	85	37.0
1-2 year	55	23.9
3-4 year	51	22.2
Above 4 year	39	17
<b>Current working experience</b>		
Less than 1 year	85	37.0
1-2 year	55	23.9
3-4 year	51	22.1
Above 4 year	39	17

on the nuances of their understanding of the subject matter. Table 1 presents a demographic distribution and professional profile of the study participants. In

terms of age, the majority (47.4%) falls within the 20-25 years range, followed by 35.2% in the 26-30 years category, 12.2% aged 31-35 years, and 5.2%

above 35 years. Gender-wise, 54.8% are female and 45.2% are male. Regarding educational status, 49.6% have a diploma in nursing, 44.8% hold a degree in nursing, and 5.7% possess a master's degree in nursing.

In relation to designation, 63% are nursing officers, while 37% are nursing in-charge. When considering the current working area, 51.3% are in ICU and

48.7% in the general ward. As for working experience, 37% have less than 1 year, 23.9% have 1-2 years, 22.1% have 3-4 years, and 17% have above 4 years of experience. This detailed breakdown of participant characteristics provides a comprehensive understanding of the study population's demographic and professional attributes.

**Table 2:** Knowledge Score on Medical Adhesives Related Skin Injury (MARSI)

Knowledge Score	Frequency (f)	Percentages (%)
Low knowledge (0-5)	Nil	Nil
Moderate knowledge (6-11)	213	92
High knowledge (12-16)	17	8

**Table 3:** Frequency, percentages and rank order participants responses to various variables related to MARSI

Variables	Frequency (f)	Percentage (%)	Rank
Define MARSI	192	83.5	1
Outermost layer of the skin	82	35.7	11
Condition responsible for MARSI	120	52.2	4
No.of the skin layers	84	36.5	10
Virus responsible for Epidermal growth	89	38.7	8
Reason for Scaly dermatitis	80	34.8	12
Causes of Skin injury	61	26.5	15
Common incidence of MARSI	133	57.8	2
Factor responsible for MARSI	106	46.1	6
Common disease condition for MARSI	119	51.7	5
Indications of allergic dermatitis	76	33	13
Indications of irritant contact dermatitis	71	30.9	14
Indication for maceration	125	54.3	3
Duration for development of MARSI	87	37.8	9
Early action for MARSI	109	47.4	6
Prevention of MARSI	92	40	7

Table 2 illustrates the distribution of participants' knowledge scores on MARSI. No participants exhibited low knowledge scores (0-5), while the majority (92%) had moderate knowledge scores (6-11). A smaller proportion (8%) had high knowledge scores (12-16), indicating a generally moderate level of knowledge among the study participants. In

summary, the distribution of knowledge scores signifies a generally moderate to high level of knowledge among the study participants regarding Medical Adhesives Related Skin Injury. The results suggest that while the majority have a solid grasp of the subject, there should be proper planning for

further education and training to enhance overall knowledge and ensure comprehensive patient care. Table 3 presents the frequency, percentages and rank order of participants' responses to various variables related to MARSII (Medical Adhesive-Related Skin Injury). The variable "Define MARSII" had the highest frequency (192) and the top rank (1), indicating a strong understanding. Variables like "common incidence of MARSII" (133) and "Indication for maceration" (125) also received high responses, securing rank 2 and 3, respectively. "Condition

responsible for MARSII" (120) and "Common disease condition for MARSII" (119) ranked 4<sup>th</sup> and 5<sup>th</sup> respectively. "Factor responsible for MARSII" and "Early action for MARSII" both had a frequency of 106, sharing the 6<sup>th</sup> rank. "Outermost layer of the skin", "No. of the skin layers" and "Duration for development of MARSII" had lower responses, reflecting ranks 10,11, and 9, respectively. "Indication of dermatitis" and "prevention of MARSII" had moderate frequencies (76 and 92) and ranks (13 and 7), respectively, within the responses.

**Table 4:** Frequency and percentage of knowledge on practice scores among the participants

knowledge on practice score	Frequency (f)	Percentages (%)
Poor Practice (0-2)	3	2
Average Practice (3-5)	89	38
Good Practice (6-8)	138	60

Table 4 illustrates the distribution of knowledge on practice scores among the participants. Among the respondents, 3 individuals (2%) demonstrated poor practice scores (ranging from 0 to 2), 89 participants (38%) exhibited average practice scores (ranging from 3 to 5), and a majority of 138 participants (60%) displayed good practice scores (ranging from 6 to 8). The findings suggest a diverse range of knowledge on practice scores among the participants. A notable proportion, 60%, showed good practice, indicating a solid understanding of the subject matter and its application. This high percentage of good practice scores underscores the potential effectiveness of the participants' training or experience in the domain. Conversely, the presence of individuals with poor practice scores (2%) calls for targeted interventions to enhance their comprehension and skills in this context. 38% of participants with average practice scores could benefit from further education and reinforcement to elevate their practice to a higher level. This distribution highlights the need for continuous professional development and tailored educational initiatives to ensure optimal patient care and outcomes. Table 5 summarizes responses regarding medical adhesive dressing practice. Checking the dressing area in every shift was affirmed by 197

(85.7%) participants, while 33 (14.3%) answered negatively. Medical adhesive dressings were performed every 3<sup>rd</sup> day for 142 (61.7%) participants and not for 88 (38.3%). evaluating skin dryness before applying the medical adhesives was practiced by 16 (72.6%), and 63 (27.4%) responded otherwise. Checking for any soakage after each shift was reported by 142 (61.7%), with 88(38.3%) responding negatively. Considering medical adhesive dressing as a sterile procedure 157 (68.3%) affirmative responses and 73 (31.7%) negatives. Using of sterile gloves while handling medical adhesives dressings was confirmed by 174 (75.7%), while 56(23.9%) did not. Assessing for discharges/redness before applying the medical adhesives was performed by 164 (72%), while 66 (28%) did not. Post application observation for allergic reaction was reported by 175 (76.1%), and 55 (23.9%) stated otherwise.

Table 6 provides a detailed analysis of the knowledge scores among nurses in the Intensive Care Unit (ICU) and the General Ward. The mean knowledge score among nurses in the ICU was found to be  $7.3 \pm 4.10$ . Conversely, nurses in the General Ward had a mean knowledge score of  $4.16 \pm 3.91$ . The calculated unpaired t-value was found to be 1.61, with a corresponding p-value of 0.05.

**Table 5:** Frequency and percentage of knowledge on practice about MARSI

Variables	Frequency	Percentage
Do you check the dressing area on every shift?		
Yes	197	85.7
No	33	14.3
The medical adhesive dressing is done every third day		
Yes	142	61.7
No	88	38.3
Do you check the dryness of the skin before applying the medical adhesives		
Yes	167	72.6
No	63	27.4
Do you check for any soakage in medical adhesives area after every shift		
Yes	142	61.7
No	88	38.3
Is medical adhesive dressing is a sterile procedure		
Yes	157	68.3
No	73	31.7
Do you use sterile gloves while handling medical adhesives dressings		
Yes	174	75.7
No	56	23.9
Do you check for any type of discharges/redness before applying the medical adhesives		
Yes	164	72
No	66	28
Do you observe for any allergic reactions after applying medical adhesives		
Yes	175	76.1
No	55	23.9

**Table 6:** Knowledge difference between the nurses of ward and ICU

Knowledge Score	Mean + SD	t value	df	p value
ICU	7.3± 4.10	1.61	228	0.054
General ward	4.16± 3.91			

Since the calculated p-value (0.05) is greater than the conventional significance level (0.05), it indicates that there is a statistically significant difference in the knowledge of nurses between the ICU and the General Ward.

The statistical significance of this difference in knowledge levels suggests that nurses in the ICU and the General Ward possess varying levels of knowledge regarding Medical Adhesive-Related Skin Injury (MARSI). In particular, ICU nurses

demonstrated a notably higher mean knowledge score compared to their counterparts in the Ward. These findings hold valuable implications for healthcare settings, emphasizing the importance of targeted educational interventions and training programs aimed at enhancing the knowledge of nurses, particularly in the General Ward, regarding MARSI. Such initiatives can contribute to improved patient care and the prevention of MARSI-related complications.

**Table 7:** Shows the association between the level of knowledge in MARSI with socio- demographic variable

Socio-demographic Factor	Level of knowledge		$\chi^2$	df	p
	Moderate (14-26)	High (27-40)			
<b>Age in year</b>					
20-25	103	6	5.02	3	0.17
26-30	71	10			
31-35	27	1			
Above 35	12	0			
<b>Gender</b>					
Male	97	7	0.12	1	0.72
Female	116	10			
<b>Educational status</b>					
Diploma in Nursing	107	7	0.53	2	0.76
Degree in nursing	94	9			
Master's in nursing	12	11			
<b>Designation</b>					
Nursing officer	41	11	3.6	6	0.73
Nursing in charge	71	30			
<b>Current working area</b>					
ICU	107	11	1.321	1	0.25
General ward	106	6			
<b>Working experience</b>					
Less than 1 year	80	5	3.26	3	0.35
1-2 years	50	5			
3-4 year	45	6			
Above 4 years	38	1			
<b>cases you have come across</b>					
Yes	169	12	0.72	1	0.39
No	44	5			
<b>Attended workshop/seminar</b>					
Yes	148	14	1.25	1	0.26
No	65	3			



**Table 8:** Association between knowledge on practice in MARSI with socio-demographic variable among participants

Socio-demographic factor	Knowledge on practice			$\chi^2$	df	p
	Low (0-13)	Moderate (14-26)	High (27-40)			
<b>Age in year</b>						
20-25	0	47	62	13.06	6	0.42
26-30	1	32	48			
31-35	2	8	18			
Above 35	0	2	10			
<b>Gender</b>						
Male	2	41	61	0.64	2	0.72
Female	1	48	77			
<b>Educational status</b>						
Diploma in Nursing	1	48	65	1.7	4	0.79
Degree in Nursing	2	36	65			
Master's in nursing	3	5	8			
<b>Designation</b>						
Nursing officer	1	57	87	1.17	2	0.55
Nursing In-charge	2	32	51			
<b>Current working area</b>						
ICU	1	46	71	0.394	2	0.82
General ward	2	43	67			
<b>Working experience</b>						
Less than 1 year	1	32	52	8.622	6	0.19
1-2 year	0	25	30			
3-4 year	2	22	27			
Above 4 year	0	10	29			
<b>Cases you have come across</b>						
Yes	2	74	105	1.87	2	0.39
No	1	15	33			
<b>Attended workshop/seminar</b>						
Yes	0	62	100	7.44	2	0.02*
No	3	27	38			

Table 7 illustrates the relationship between socio-demographic factors and level of knowledge among healthcare professionals. The factors considered are age, gender, educational status, designation, current working area, working experience, encountered cases, and attendance at workshops/seminars. The

knowledge levels are categorized as moderate (14-26) and high (27-40), with corresponding frequencies for each category. The table also presents the chi-square ( $\chi^2$ ) value, degree of freedom(df), and p-value for each factor, indicating the statistical significance of the associations.

The findings indicate that age is not statistically associated with knowledge levels ( $\chi^2 = 5.02$ ,  $p = 0.17$ ), and a similar result is observed for gender ( $\chi^2 = 0.12$ ,  $p = 0.72$ ) and educational status ( $\chi^2 = 0.53$ ,  $p = 0.76$ ). Designation also does not exhibit a significant association with knowledge level ( $\chi^2 = 3.6$ ,  $p = 0.73$ ). Similarly, current working area ( $\chi^2 = 1.321$ ,  $p = 0.25$ ) and working experience ( $\chi^2 = 3.26$ ,  $p = 0.35$ ) shows no statistically associations. Cases encountered and attendance at workshops/seminars also do not show a significant association with knowledge level ( $\chi^2 = 0.72$ ,  $p = 0.39$  and  $\chi^2 = 1.25$ ,  $p = 0.26$  respectively).

Table-8 presents the association between socio-demographic factors and knowledge on practice of H.pylori infection. Age group had no significant correlation with knowledge on practice ( $\chi^2 = 13.06$ ,  $df = 6$ ,  $p = 0.42^*$ ). Gender showed no significant correlation with knowledge on practice ( $\chi^2 = 0.64$ ,  $df = 2$ ,  $p = 0.72$ ). Educational status had no significant link to knowledge on practice ( $\chi^2 = 1.7$ ,  $df = 4$ ,  $p = 0.79$ ). Designation showed no significant link to knowledge on practice ( $\chi^2 = 1.17$ ,  $df = 2$ ,  $p = 0.55$ ). ( $\chi^2 = 0.394$ ,  $df = 2$ ,  $p = 0.82$ ). Working experience showed no significant link to knowledge ( $\chi^2 = 8.622$ ,  $df = 6$ ,  $p = 0.19$ ). Knowledge levels were similar for those who encountered cases ( $\chi^2 = 1.87$ ,  $df = 2$ ,  $p = 0.39$ ). Attending workshops/seminars had a significant positive link to higher knowledge ( $\chi^2 = 7.44$ ,  $df = 2$ ,  $p = 0.02^*$ ). Overall, the statistical analysis indicates that age and attending workshops/seminars appears to be a significant factor influencing higher knowledge on practice among the nurses. Other socio-demographic factors, including gender, educational status, designation, working area, and working experience, did not show significant association with knowledge on practice.

## Discussion

The discussion surrounding Medical Adhesive-Related Skin Injuries (MARSIs) underscores the critical role of healthcare personnel's knowledge and practice in preventing skin damage resulting from incorrect adhesive handling. A retrospective audit highlighted cases of skin damage, such as blisters, skin sluffing, and rash, known as Medical Adhesive Related Skin Injury (MARSIs), due to improper handling of medical adhesives (12). Similarly, a

scoping review aimed at mapping scientific evidence on preventing MARSIs in adults. Research across multiple databases yielded 30 relevant studies out of 209 initially identified. Prevention strategies focus on identifying risk factors, proper adhesive selection, and correct application and removal. Health education and documentation of adhesive-related injuries are crucial. Preventive measures should encompass multi-factorial approaches, including educating healthcare professionals, patients, and communities about MARSIs (13). However, despite increasing awareness, many health professionals across various clinical settings still lack a comprehensive understanding of MARSIs. Incorrect application and removal of medical adhesive products often lead to unintended skin damage (14). Considering MARSIs as a preventable injury is crucial. Organizations should implement educational processes in acute and community facilities to prevent MARSIs, including the use of products like medical adhesive removers (14). Further, research in adult intensive care units found a significant incidence of MARSIs, with factors like advanced age, prolonged hospitalization, and adhesive type correlating with its occurrence. In a prospective cohort study conducted across adult intensive care units in two Brazilian university hospitals, a comprehensive examination of 439 catheters among 150 patients was carried out. Daily scrutiny of skin exposed to catheter fixation adhesives, including central venous, nasogastric, nasoenteral, and indwelling urinary catheters, was conducted by four proficient researchers. The study found a 42% incidence of MARSIs, with 8.64 MARSIs per 100 patients/day. Factors like advanced age, prolonged hospitalization, dry skin, and adhesive removal were associated with MARSIs. Dry skin increased the likelihood by 5.21 times, while each point on the Braden Scale reduced it by 31%. Nasoenteral catheters and adhesives with natural rubber had higher MARSIs rates. Mechanical MARSIs types predominated, including skin stripping (41.3%), skin tear (26.1%), and tension injury or blister (2.9%) (15). Medical adhesives play a crucial role in securing wound dressings and medical devices to the skin, aiding in wound healing and monitoring vital signs. However, commonly used adhesives like

acrylate, hydrocolloid, and silicone can contribute to Medical Adhesive-Related Skin Injury (MARSIs). MARSIs not only compromise skin integrity but also lead to pain, delayed wound healing, and increased infection risk, impacting patients' quality of life and treatment outcomes. To address this issue, researchers are exploring new-generation adhesives based on natural biomaterials (bio-adhesives) and innovative adhesion mechanisms inspired by nature, such as hydrogen bonds and van der Waals interactions. This review highlights advancements in medical adhesives aimed at preventing MARSIs and addressing associated health complications like skin infections and impaired skin regeneration (16).

In neonatal care, adhesive tapes pose a risk for MARSIs, emphasizing the need for heightened awareness, better practices, and product selection. Adhesive tapes pose a risk for MARSIs in premature newborns, although the severity is generally low. Increased awareness can lead to better practices, protocols, professional training, and selection of gentler tapes for neonates. Recognizing the risk of adhesive tapes in newborns enables healthcare services to address the issue effectively by implementing improved practices, protocols, and product selection (17). Additionally, while nurses may acknowledge the importance of MARSIs prevention, their behavior may not align with this awareness, indicating a need for improved training and guidance. The survey revealed high scores in nurses' attitudes but only medium scores in MARSIs prevention behavior. This suggests that while some medical staff recognize the importance of learning, their actions may be influenced by other factors. Nursing managers should focus on training nurses in MARSIs knowledge and guide them to align their attitudes with preventive behaviors for improved compliance (18).

Innovative approaches like applying liquid dressing before adhesive use can mitigate skin damage during adhesive removal. Applying liquid dressing before adhesive use creates a protective layer between the adhesive and skin upon drying. Upon adhesive removal, this layer is removed instead of skin keratinocytes, minimizing skin cuticle damage (19). To gather scientific evidence on preventing medical adhesive-related skin injuries in adult intensive care

patients, a scoping review was conducted following PRISMA-ScR and Joanna Briggs Institute guidelines. Searches across multiple databases yielded 1,329 studies, with nine selected for analysis, including consensus reports, case studies, cross-sectional studies, prospective cohorts, and literature reviews. Synthesized evidence highlights healthcare measures for injury prevention, emphasizing the importance of professionals recognizing adhesive-related skin injuries and implementing preventive strategies (20).

Efficiency concerns may lead medical staff to neglect standardized protective measures, highlighting the importance of managers procuring suitable adhesive products. To enhance work efficiency, medical staff may neglect standardized protective measures due to a lack of availability of necessary items in the department. Nurses often rely on the adhesive tape provided by the department without considering its characteristics or clinical application. This indicates a gap in nurses' knowledge about adhesive products. Managers should procure adhesive products tailored to the types of fixed catheters in the department to meet clinical needs effectively (21, 22). Age significantly influences MARSIs cognition, with older nurses exhibiting higher scores in MARSIs knowledge, attitude, and behavior. Increased age correlates with richer clinical experience, leading to deeper understanding of MARSIs and consequently higher scores. Additionally, nurses who have undergone MARSIs training demonstrate higher scores in knowledge, attitude, and behavior compared to those who have not received such training (23,24).

Hospital managers play a crucial role in enhancing medical staff's awareness and understanding of Medical Adhesive-Related Skin Injuries (MARSIs). They should prioritize learning and training initiatives focused on MARSIs-related knowledge to promote skin protection awareness among staff. Standardizing protective behaviors is essential to ensure consistent and effective prevention strategies. Ultimately, achieving a harmonious unity of knowledge, attitude, and behavior regarding MARSIs is key to providing high-quality patient care (3,22,25). Various studies have proposed measures to prevent and identify MARSIs in different clinical settings, including intensive care units, neonatal

care, surgical departments, and cancer care. These studies emphasize the importance of education, adherence to best practices, and product selection to mitigate the risk of MARSIs and improve patient outcomes (26-28).

However, it's essential to acknowledge the limitations of individual studies and the need for broader research to capture the universality of MARSIs occurrences across diverse healthcare settings. Future investigations involving multiple cities and hospitals of varying levels will provide a comprehensive understanding of MARSIs prevention strategies.

### **Limitation of the study**

Because purposive sampling relies on the judgement of the researchers, it may add selection bias into the study. Therefore, for increased representativeness, random sampling techniques such as cluster or stratified sampling should be taken into consideration. Although Yamane's formula was used to calculate the sample size and account for possible dropouts, sensitivity analyses could improve robustness. Generalizability may be limited if nurses who work only in administrative and outpatient settings are excluded; including them and making the necessary adjustments in data analysis may provide a more complete picture. A weighted scoring approach could offer a more complex assessment of nurses' knowledge than the dichotomous scoring method, which may oversimplify their comprehension. While t-tests and descriptive statistics are appropriate, using more complex statistical methods like structural equation modelling or regression analysis may provide deeper understanding of the variables affecting MARSIs.

### **Conclusion**

This comprehensive review provides insights into the diverse aspects of MARSIs research, including its incidence, risk factors, prevention strategies, and interventions. While the present study found no statistically significant difference in knowledge about medical adhesives between ICU and general ward nurses, it is essential to consider the broader context of MARSIs research to develop effective

prevention and management strategies for this skin injury in healthcare settings. Future research should continue to explore and address the multifaceted nature of MARSIs to enhance patient care and outcomes.

### **Abbreviation**

Medical Adhesive-Related Skin Injury (MARSIs); Intensive Care Unit (ICU).

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### **Author Contributions**

Concepts: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Design: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Definition of intellectual content: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Literature search: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Data acquisition: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Data analysis: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Statistical analysis: Soumya Swaroop Patra, Mamata Swain, Susan Konda

Manuscript preparation: Mamata Swain, Susan Konda

Manuscript editing: Mamata Swain, Susan Konda

Manuscript review: Mamata Swain, Susan Konda

### **Conflict of Interest**

The authors declare no conflict of interest.

### **Ethics Approval**

Ethical approval was taken from the ethical committee of institute vide letter no. Ref.no/IEC/IMS.SH/SOA/2022/363 date 18<sup>th</sup> May, 2022. All the participants were well informed on the purpose of online and all their obtained information was kept confidential. And informed written consent was obtained from all participants.

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