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Original Research Article

Assessment of Nurses' Knowledge and Practice for Prevention of Infection in Burn Patients at Karachi, Pakistan

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Abstract: *Burns "damage the skin or any organic tissue that is mainly caused by fire, electricity, radioactive, radiations, and chemical substances". Every year, approximately 200,000 people around the world die of burn injuries. Though, nurses are crucial for ensuring safety and leads to healthier recoveries for patients.* ***Objective:*** *The Objective of this study is to assess nurses' knowledge and evaluate their practice for the prevention of infection among burn patients.* ***Method:*** *An analytical cross-sectional study was conducted amongst 100 nurses, and an adopted questionnaire was used from July 2024 to January 2025, in burn units of 03 selected public and private hospitals of Karachi.* ***Results:*** *The majority of respondents were aged between 31-39 years (37.5%). Females constituted the majority of respondents (58.3%), who had completed mainly their Diploma (55.0%) and had 1-5 years of work experience (41.3%), Knowledge of infection control measures (82.5%), and (57.5%) consistently followed PPE protocols during emergencies. As a consequence, they have unsatisfactory information regarding the prevention of infection in burn patients. Whereas, chi square test was used in the inferential statistics where the diploma holder were unaware regarding the knowledge as compared to BSN as P value =0.025, while related to gender; Females were not adhering to the practice of hand washing as compared to male as (P value= 0.05), significantly contractual nurses were unaware about decontaminating hydrotherapy rooms 25(75.8%) as compared to permanent nurses 25(53.2%)as (P value= 0.001), and as well as contractual nurses were 17(51.5%) reported not performing the required hand hygiene, compared to permanent employees 11(23.4%) (P value=0.009) significantly.* ***Conclusion:*** *Based on the findings, it is concluded that nurses working in burn units have limited knowledge and practices regarding prevention of infections among burn patients. Therefore, hospitals are required to organize adequate training, hands-on practice, and frequent exposure in burns ward to develop unit-specific clinical infection control guidelines and protocols.*

Keywords: Burn, Nurses, Knowledge, Practice, Patient, Hospital Acquired Infection

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Introduction

Skin is the largest organ of the body, the skin spans 3,000 square inches (approximately 2 square meters) and comprises 15%) of the entire human body's weight. Burns "damage the skin or any organic tissue that is mainly caused by fire, electricity, radioactive, radiations, and chemical substances" (1). Burn injuries are among the most devastating of all injuries and major global public health problems, and it is the fourth most common type of trauma worldwide, following traffic accidents, falls and interpersonal violence and approximately (90% of burns occur in Low and Middle Income Countries (2).

Every year, approximately 200,000 people around the world die from burn injuries. Various fires, scalding agents, chemicals, electricity, and radiation are seen as the causes of burning, and all these agents cause burns of varying severity, thereby resulting in increased morbidity and mortality rates (3).

Moreover, there are several infections, but pneumonia is the most prevalent systemic infection which was observed amongst burn patients, and produces complication up to (2.2%) Primarily, patients suffering from an invasive infection have also reported the major reason of death for accounting (51%) (4 -6).

Furthermore, according to the reports, almost 252000 patients were admitted to the United States burn centers and provided medical services, though burn injuries are one of the main causes of death in US, and mostly recorded hot objects burn which are highly prevalent to bloodstream infections respectively (7).

Moreover, the mortality rate associated with burn and fire injuries in Pakistan has ranged from as low as (6.5%) to as high as (41.3%) (8).

In addition, according to the World Health Organization (WHO), burn injuries represent a major source of deaths, around 180,000 annually worldwide (9).

Likewise, data also recorded in Pakistan that the incidence of burns patients has occurred annually 1388/100000, mainly related to fire and thermal burns injuries (10).

So that health care providers must have the knowledge regarding care of burn patients, as they are more vulnerable to hospital-acquired infections (11).

Likewise, data also revealed that (75%) of burn injury fatalities are also associated from hospital-acquired infection (12).

Very few and limited number of studies on this topic; however, study have been carried out in Pakistan, where they used the home remedies for the burns first aid treatment (BFAT) by using toothpaste" (47.5%) and" cool running water"(20.3%) mainly were identified amongst the general population in Rawalpindi, Pakistan (13).

Meanwhile, nurses play an important role in this regard. The nurses who provide care services for the burn patients should obtain adequate knowledge on the physiologic effects and possess the rapid analysis and decision-making on trivial changes for the patient's rehabilitation (14).

Unfortunately, the investigation indicated that there is a lack of knowledge and practice regarding infection control standards. Nursing care is crucial for ensuring safety and leads to healthier recoveries for patients. Intervention guidelines for nurses concerning infection

prevention among patients have shown positive effects on their knowledge and practices. As it is a fact that patients with burn injuries are more vulnerable to infections than other patients, the goal of this study is to assess the impact of standardized guidelines on nurses' knowledge and practices related to prevention of infection on burn patients (15).

A cross-sectional study was conducted between December 2022 and December 2023 in Odisha, India. This study was based on the Knowledge, Attitude, and Practice related to burn first aid, and the findings revealed significant gaps in knowledge regarding burn injury prevention and first aid measures among rural caregivers. For instance, while 208(39.1%) of respondents believed everyone needed to know how to treat burns, a majority, 264(49.6%) would take a minor burn injury to an herbalist rather than a health facility. Furthermore, traditional remedies such as toothpaste 404 (74.9%), and oil 64(12%) were commonly used as first aid treatments (16).

Similarly, one of the studies also highlighted the usage of traditional remedies such as toothpaste; 148 (40.7%) were commonly used as first aid treatments (17). Besides, one of the developing countries in Nigeria also used remedies like water lavage 49 (29.2%), and raw eggs in 21 (12.5%), pap in 16 (9.5%) and other materials in 48.8% correspondingly (18).

Pertaining to, descriptive study was conducted in Egypt on 35 nurses at the Burn Units at Suez Canal University and Ismailia General Hospitals to assess nurses' knowledge, and practices on 20 burns' children where results showed that mainly female nurses 32(91.4%), Registered Nurse 16(45.7%), between 25-30 18(51.4%), who had < 5 years of working experience 31(88.6%), and mostly data were recruited from Suez Canal University 25(71.4%) than other Ismailia General Hospitals 10(28.6%), who had not received any training regarding burns and hospital acquired infection 17(48.6%) from their department; therefore nurses had poor knowledge 17(48.6%), and 29(82.9%) nurses were unsatisfied in practices regarding care for burn's children, as compared to 6(17.1%) were satisfied amongst them (19).

A 10-year retrospective study was conducted at the Burn Care Centre (BCC) of Pakistan Institute of Medical Sciences (PIMS) in Islamabad, analyzing data from January 2008 to October 2017. Over 94,664 patients who were getting primary care at the center revealed that 51118(54%) of patients were male, and 43545(46%) were female, and children aged 2-12 years were the most affected group, accounting for 38842 (51.29%) of patients. Flame burns were the most common type, occurring in 94664(51.1%) of patients across all age groups and genders. Household environments were the most common site of burns, accounting for 71.3%) of cases. Burn frequency increased by (20%) during winter seasons, and the mortality rate for hospitalized patients was (26%), while the overall mortality rate was (2.8%) (20).

Burn injuries are potentially life-threatening conditions that require exceptional care. Burn patients are at high risk of complications such as sepsis, pneumonia, Acute Respiratory Distress Syndrome (ARDS), acute renal failure, lung failure, and multi-organ failure.[21] Evidence-based studies highlight the critical role of nurses in preventing infections and improving patient outcomes. To ensure optimal care, nurses must be highly skilled, well-trained and adhere strictly to established protocols. Proper training and adherence to infection prevention measures are essential for reducing complications and saving lives. This study aims to assess and evaluate the knowledge, attitudes, and practices of nurses in preventing infections among burn patients in Karachi, Pakistan.

Methodology

An analytical cross-sectional study design was conducted at Private and Public tertiary care hospitals which are residing in Karachi, Pakistan, The duration was from July 2024 to January 2025, and convenient sampling technique was used in this study.

The sample size was calculated based on the proportion of nurses working in burns units with an assumed unsatisfied in practices regarding care for burn's patients (83%) (Abdelghany et al., 2022) at 5% Level of significance and 95% of Confidence Interval. A minimum 100 sample size was required from both private and public tertiary care hospitals in Karachi, Pakistan. Raosoft.com/samplesize.html version 2007 software was used to calculate the sample size.

Inclusion and Exclusive Criteria: All RN, BSN nurses who were working in burn units for at least six months were included in this study setting and those who were not involved in direct patient care e.g. Clinical Instructors nurse Managers, and nurses who have worked for less than six months in the Burns Unit were excluded.

Ethical Consideration: Ethical approval was obtained from the Ethical Review Committee (ERC) of the College of Nursing Female Dr. Ruth K.M PFAU, Civil Hospital Karachi. Participants were informed about the purpose of the Study, and written informed consent was taken.

•They have been informed that each participant has the right to withdraw from the study at any time without any consequences.

•Anonymity and confidentiality were absolutely assured throughout the study.

Data Collection: Data was collected through adopted questionnaire by visiting the selected hospitals and formal permission were granted through official correspondence. As well as, out of 100 sample, data were recruited from 80 nurses and rest of the 20 (15 nurses were on leave and 05 were refused) within it.

Data Analysis: The collected data was coded, tabulated and analyzed using Statistical Package of Social Science (SPSS) V-16 software. Percentages and Frequencies were used to describe socio-demographic characteristics while the Chi-Square test was used to identify the association between independent variables. The tools was adopted and formal permission was granted by the correspondence author (Bibi, et al., 2022) and Cronbach's alpha was 0.88 respectively.

Results

The majority of respondents in table # 1 were aged between 31-39 years (45.25%), followed by those aged 21-30 years (32.25%). Smaller proportions of respondents were in the 40-49 years (17.5%), while the least represented group was 50-60 years (5.0%). Females constituted the majority of respondents 47(58.5%), while males accounted for 33(41.5%). A little over half of the respondents were married 42 (52.50%), 35(43.80%) of respondents were unmarried, and 3 (3.70%) belonged to other categories. The majority of respondents had completed a Diploma 44 (55.0%), while 36 (45.0%) held a bachelor's degree. 47(58.7%) of respondents were employed permanently, while 33 (41.3%) were working part-time. Most respondents had 1-5 years of work experience 33(41.3%), followed by those with 6-10 years 29(36.3%), and smaller proportions had 11-15 years 15(18.7%) or more than 15 years of experience 3(3.7%).

The summary of table# 02 to evaluate the survey of knowledge, attitude, and practices related to infection control among healthcare providers working with burn patients. Key findings are summarized as follows:

Knowledge of Infection Control Measures: A majority (82.5%) recognized the need for additional infection control precautions for burn patients. Only (37.5%) were aware of the recommendation to use chlorhexidine gluconate for handwashing. While (60.0%) understood that factors like high antibiotic pressure and immunosuppression contribute to antibiotic resistance in burn patients, awareness of the difficulty in decontaminating hydrotherapy rooms was lower (46.3%).

Attitude towards Infection Prevention: The importance of preventive practices, such as handwashing, barrier nursing, and decontamination, for MRSA prevention was acknowledged by (61.3%) of participants. However, 45.0%) incorrectly believed that all burn patients are contagious unless their infections are confirmed.

Hygiene And PPE Compliance:

While (65.0%) performed hand hygiene before and after burn patient care, only (57.5%) consistently followed PPE protocols during emergencies. Practices like immediate handwashing after contact with bodily fluids

were observed by (60.0%), and (56.3%) reported wearing protective suits during procedures with a risk of fluid spray.

Practical Infection Control Measures: Proper disposal of sharp objects in designated containers was followed by (61.3%). Adherence to aseptic measures during dressing (48.8%) and allowing antiseptic solutions to dry before catheter placement (47.5%) were reported less frequently.

Visitor and Equipment Disinfection:

The majority (66.3%) disinfected medical equipment after encounters with burn patients, and (57.5%) followed visitor policies in burn units.

Overall Insight: While there is reasonable awareness and adherence to many infection control measures, gaps remain in areas like handwashing, PPE use, aseptic techniques, and understanding the role of antiseptics, highlighting the need for targeted education and training programs to improve compliance and patient safety outcomes.

Chi Square test showed significant as p value < 0.05.

A significant association was observed between education level and knowledge about the common cause of fever in burn patients being a systemic inflammatory response rather than a pathogenic action of microorganisms (p = 0.025). Among diploma holders, only 17(38.6%) were aware of this, compared to 23(63.9%) of those with a bachelor's degree. A majority of diploma holders 27(61.4 %;) lacked this knowledge, while a smaller proportion of bachelor's degree holders 13(36.1 %;) were unaware. There was no statistically significant difference in responses between diploma holders and bachelor's degree holders regarding knowledge about the importance of handwashing, barrier nursing, efficient cleaning, and decontamination of hospital equipment for preventing MRSA (p = 0.068). Among diploma holders, 23 (52.2%) were aware, compared to 26(72.2%) of bachelor's degree holders. A larger proportion of diploma holders 21(47.7%) were unaware compared to bachelor's degree holders 10(27.8%).

The data highlights the association between gender and the practice of always washing hands immediately after contact with blood, body fluids, secretions, excretions, or dirty substances of burn patients. Although the difference approaches significance (p = 0.052), it does not meet the conventional threshold for statistical significance (p < 0.05). A higher proportion of males 24(72.7%) reported consistently adhering to this practice compared to females 24(51.1%). Conversely, a higher proportion of females 23(48.9%) reported not adhering to this practice compared to males 9 (27.3%).

A significantly higher proportion of respondents in the employment status where nurses who were permanently 22(46.8%) were aware of the recommendation compared to contractual nurses 8(24.2%) (p = 0.04). Conversely, the majority of contractual nurses 25(75.8%) were unaware, compared to just over half of those with permanent nurses 25(53.2%). A significantly larger proportion of respondents with permanent nurses 30(63.8%) acknowledged the difficulty in decontaminating hydrotherapy rooms compared to contractual nurses (21.2%; 7) (p < 0.001). On the other hand, the majority of contractual nurses 26(78.8%) were unaware of the challenge, compared to a smaller proportion of permanent nurses 17(36.2%).A significantly higher proportion of permanent employees 36(76.6%) reported performing the required hand hygiene compared to contractual employees 16(48.5%) (p = 0.009).On the other hand, a greater percentage of contractual nurses 17(51.5%) reported not performing the required hand hygiene, compared to permanent employees 11(23.4%).A significantly higher percentage of permanent employees 36(76.6%) agreed with the proper disposal practice compared to contractual employees 13(39.4%) (p = 0.009).Conversely, a larger proportion of contractual employees 20(60.6%) disagreed with the practice, compared to permanent employees 11(23.4%).

Table 1: Socio-Demographic Data:

Variables	Characteristics	Frequencies (n)	Percentages (%)
Age (years)	21–30	26	32.25%
	31–39	35	45.25%
	40–49	14	17.50%
	50–60	5	5.00%
Gender	Male	33	41.50%
	Female	47	58.50%
Marital Status	Married	42	52.50%
	Unmarried	35	43.80%
	Others	3	3.70%
Professional Education	Diploma	44	55.00%
	Bachelor's Degree	36	45.00%
Employment Status	Permanent	47	58.70%
	Part-time	33	41.30%
Work Experience	1–5 years	33	41.30%
	6–10 years	29	36.30%
	11–15 years	15	18.70%
	More than 15 years	3	3.70%

Table 2: Assess Knowledge, Attitude, and Practices amongst Burns Nurses

S.No	Variables	Response	Frequencies	Percentages
	Knowledge:			
01	Do you know that the burn patients required additional infection control precautions?	Yes	66	82.50%
		No	14	17.5%
02	Do you know that specific antiseptic such as chlorhexidine gluconate recommended for hand washing?	Yes	30	37.5%
		No	50	62.5%
03	Do you think that it is essential to soak the burn in cool water and then treat with the skin care product like aloe Vera cream or an antibiotic ointment?	Yes	32	40.0%
		No	48	60.0%

04	Do you know that the common cause of fever in burn patient is systemic inflammatory response not a pathogenic action of microorganisms?	Yes No	40 40	50.0% 50.0%
05	Do you know aquatic environment of hydrotherapy room is difficult to decontaminate?	Yes No	37 43	46.3% 53.7%
06	Do you know that the burns wound cellulitis is most common infection in burn patients?	Yes No	42 38	52.5% 47.5%
07	Do you know that the chlorhexidine bath and its suggested frequency in burns patients for prevention of infection in burns patients?	Yes No	45 35	56.3% 43.7%
08	Do you know that the factor including high antibiotic pressure, high colonization pressures, need for intensive medical and surgical therapy and a vulnerable immune compromised patient lead to acquisition of antibiotic resistant organism in burn patient?	Yes No	48 32	60.0% 40.0%
09	Do you know that the preparation of the isolation room or area ensure that appropriate handwashing facilities and hand hygiene supplies are available?	Yes No	55 25	68.7% 31.3%
10	Do you know that the precautions such as hand washing and barrier nursing, efficient cleaning and decontamination of hospital equipment's, are most important for prevention for MRSA in burn patient?	Yes No	49 31	61.2% 38.8%
	Attitude:			
1	Do you perform hand hygiene required before and after burns patients care?	Yes No	52 28	65.0% 35.0%
2	Do you follow PPE during burns emergency?	Yes No	46 34	57.5% 42.5%
3	Do you disinfect medical equipment before and after encounter with burns patients?	Yes No	53 27	66.2% 33.8%
4	Do you think all burns patient can be contagious unless their infection has been confirmed?	Yes No	36 44	45.0% 55.0%
	Practice:			
1	Do you think needles, blades, or any other single use sharp objective in a sharp disposable container after use?	Yes No	49 31	61.3% 38.7%
2	Do you always wear protective suits or Gown when performing 1operations procedure that might induce spraying of blood, body fluid secretion, and excretion?	Yes No	45 35	56.3% 43.7%
3	Do you always washes hands immediately after contacting any blood, body fluid, secretion, excretion or dirty substances of burns patients?	Yes No	48 32	60.0% 40.0%
4	Does burns unit nurses obey patient's visitor's policy?	Yes No	46 34	57.5% 42.5%
5	Do you prepare clean skin with an antiseptic before peripheral venous catheter insertion?	Yes No	46 34	57.5% 42.5%
6	Do you allow antiseptics solution to dry prior to placing the catheter?	Yes No	38 42	47.5% 52.5%
7	Do you apply transparent and semi permeable dressing?	Yes No	30 50	38.5% 61.5%
22	Does aseptic measure followed during dressing?	Yes No	39 41	48.8% 51.2%

Table 3: Association between Independent and Dependent Variable.

Characteristics Variable	Responses		Diploma	Bachelors	P Value
Educational qualification	Do you know that the common cause of fever in burn patient is systemic inflammatory response not a pathogenic action of microorganisms?	YES NO	17 (38.6%) 27(61.4%)	23 (63.9%) 13(36.1%)	0.025
	Do you know that the precautions such as hand washing and barrier nursing, efficient cleaning and decontamination of hospital equipment's, are most important for prevention for MRSA in burn patient?	Yes No	23(52.2%) 21 (47.7%)	26 (72.2%) 10 (27.8%)	0.068
	Do you think all burns patient can be contagious unless their infection has been confirmed?	Yes No	15 (34.1%) 29 (65.9%)	21 (58.3%) 15 (41.7%)	0.030
Gender			Male	Female	
	Do you always washes hands immediately after contacting any blood, body fluid, secretion, excretion or dirty substances of burns patients?	Yes No	24 (72.7%) 9 (27.3%)	24 (51.1%) 23 (48.9%)	0.052
Employment status			Contractual	Permanent	
	Do you know that specific antiseptic such as chlorhexidine gluconate recommended for hand washing	Yes No	8 (24.2%) 25 (75.8%)	22 (46.8%) 25 (53.2%)	0.04
	Do you know aquatic environment of hydrotherapy room is difficult to decontaminate?	Yes No	7 (21.2%) 26(78.8%)	30(63.8%) 17 (36.2%)	<0.001
Work Experience	Do you perform hand hygiene required before and after burns patients care?	Yes No	16 (48.5%) 17 (51.5%)	36 (76.6%) 11 (23.4%)	0.009
	Do you think needles, blades, or any other single use sharp objective in a sharp disposable container after use?	Yes No	13(39.4%) 20(60.6%)	36(76.6%) 11(23.4%)	0.001

Discussion

The findings of the study provide valuable insights into the knowledge, attitudes, and practices of healthcare professionals regarding infection control measures for burn patients. While there is evidence of reasonable awareness and adherence to infection prevention protocols. According to the findings of present study, majority of respondents were aged 31–39 years, followed by those aged 21–30 years, indicating a predominantly younger and mid-career workforce. A similar study on the intervention incorporated age group of 25-40 years' nurses (23).

In terms of the gender participation female respondents constituted the majority, reflecting gender representation in healthcare professions. Over half of the participants were married, which could imply greater life stability that may impact professional behaviors positively. Educational attainment revealed a balanced mix, with holding diplomas and possessing bachelor's degrees. Employment status and work experience further showed that most respondents were permanently employed and had over 3 years of experience, suggesting a relatively less experienced yet stable workforce that may require additional training to build advanced infection control competencies. These demographic attributes constitute with the findings by Bibi et al., which reflects that nursing is considered to be a female oriented profession for which they are in majority and most of the females are graduate having a diversified work experience and comes from different backgrounds bringing in to vast knowledge and practice, it is observe that education level is associated with attitude and there is a continuous need of training to overcome practice gap (24). The results of this study show a mixed level of knowledge among respondents. While a significant majority understood the need for additional infection control precautions for burn patients, few participants were aware of the use chlorhexidine gluconate for handwashing. These findings are similar to a study that highlights a substantial gap in knowledge of evidence-based practices, emphasizing the need for focused education on appropriate antiseptic use (25).

Furthermore, the role of factors like high antibiotic pressure and immunosuppression in contributing to antibiotic resistance, only few understood the challenges of decontaminating hydrotherapy rooms. These results are evident in past studies that suggest an uneven understanding of infection control complexities, particularly regarding environmental contamination and resistance management (26). The attitudes of respondents toward infection prevention reflect a general acknowledgment of its importance, but with some misconceptions. The finding reveals that participants mistakenly believed that all burn patients are contagious unless their infections are confirmed. A similar study showed that misconceptions could lead to inconsistent application of infection control measures and underscores the need for clear, evidence-based guidelines to correct misunderstandings (27). The present study

shows that adherence to personal protective equipment (PPE) protocols was lower, with only (57.5%) consistently following PPE guidelines during emergencies. This gap is concerning, given the high risk of cross-contamination in burn units. Practices like immediate handwashing after contact with bodily fluids and wearing protective suits during procedures with fluid spray risks were observed by a little over half of the respondents, suggesting the need for reinforced training and stricter monitoring to improve compliance; this is consistent with the suggestion proposed by (28). Additionally, proper disposal of sharp objects in designated containers was practiced by moderate number of participants, showing reasonable adherence to this critical safety measure. However, adherence to aseptic techniques during dressing changes and allowing antiseptic solutions to dry before catheter placement were notably low. Comparable conclusion was drawn from the study that critical safety practices are essential for minimizing infection risks, particularly in vulnerable burn patients (29). The current study postulates that, majority of respondents (66.3%) disinfected medical equipment after patient encounters, and (57.5%) followed visitor policies in burn units, reflecting some awareness of infection prevention. However, greater efforts are needed to achieve universal compliance, particularly in high-risk areas like burn units (30). Encouragingly, 66.3% of respondents reported disinfecting medical equipment after patient encounters, a critical step in preventing cross-contamination. Similarly, (57.5%) adhered to visitor policies in burn units, ensuring that unnecessary exposure to patients is minimized. A degree of awareness of infection prevention and greater efforts are needed to achieve universal compliance, particularly in high-risk areas like burn units suggested in a study by (31).

Conclusion

It is concluded that nurses working in burn units of three hospitals of Karachi have low knowledge and practices regarding prevention of Infections among burn patients. This gap in understanding and implementation poses a significant risk to patient safety and overall healthcare quality. Therefore, hospitals are required to organize adequate training, hands-on practice, and frequent exposure in the burns ward to develop unit-specific clinical infection control guidelines and protocols.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-NCKHHR-34-24)
Consent for publication
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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Manuscript drafting, Study Design,
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Review of Literature, Data entry, Data analysis, and drafting article.
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Conception of Study, Development of Research Methodology Design,
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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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