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Monkeypox and Nursing in Pakistan: Frontline Guardians Against Emerging Infectious Diseases

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Monkeypox (mpox) is a re-emerging zoonotic viral infection caused by an Orthopoxvirus, clinically resembling smallpox but generally presenting with lower mortality. In recent years, its unexpected spread beyond endemic regions has raised global public health concerns, particularly for low- and middle-income countries with constrained health systems such as Pakistan [1].

The recent outbreak of Monkeypox has highlighted the fact that nurses have a very important role to play in controlling and preventing new infectious illnesses across the globe, including in Pakistan. Previously being regarded as a geographically constrained zoonotic disease, Monkeypox has now shown itself as a worldwide health hazard, accompanied by global travel, commerce, and altered epidemiological distributions. In Pakistan, where a healthcare system is already challenged by limited resources, population density, and uneven knowledge of overall health, nurses are in a unique position to control the disease spreading, provide maximum care to the patients, and be the forefront of community health education policies [2,3].

Monkeypox is clinically characterized by fever, headache, myalgia, lymphadenopathy, and characteristic papules which develop into vesicles and crusts. Although in most cases self-limiting, the disease may lead to serious complications in the case of immunocompromised people, and that is why it is important to tell and treat the disease in a timely manner. The nurses in Pakistan are also central in timely symptom identification, disease progression, and enabling laboratory testing, such as PCR, serological testing, and other. They have high vigilance which results in the early detection of cases, timely isolation and minimizing the spread of cases in hospital and community [1,2].

Infection control is one of the pillars in nursing practice when it comes to Monkeypox. Strict procedures undertaken by the nurses include the isolation of patients, strict hand hygiene, correct utilization of personal protective equipment (PPE), and the disinfection of the environment. In addition to these technical measures, the nurses train patients and families on prevention of infections, personal hygiene, safe use of contaminated materials and compliance with isolation measures. In Pakistan, the community sensitization of the general population to the emergent infectious diseases might be low, therefore, the outreach of nurses in form of public awareness campaign, school programs, and local health centers is very important in preventing the spread of infection [4].

The other vital nursing care components include symptom management and psychosocial support. Nurses give drugs to manage fever, pain, and secondary infections and provide good skin care to the lesions. They also respond to the emotional and psychological consequences of infection, counsel patients and family members, and alleviate anxiety, stigma, and social isolation. In Pakistan, this empathetic support and education on nurses have been found to help patients significantly improve their outcomes and the society adhere to the public health measures where stigma towards infectious diseases may impede care-seeking behaviour [2,3].

Vaccination is also another example of the role of nursing in disease prevention. Nurses do not just give vaccines but they also follow up on their effects after the vaccination, educate the community on the benefits of vaccination and organize

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immunization campaigns. Their role plays a central role in the development of herd immunity, outbreak control, and the reinforcement of social trust in preventive health care measures, especially in areas where healthcare is not accessible to all people[2,3].

Nurses have to cope with numerous challenges during the time of outbreaks, such as work-related overload, increased chances of being infected, and mental problems. Additional issues related to ethics concern issues like patient confidentiality and equal allocation of scarce resources. In Pakistan, empowering nurses to cope with these challenges in a way that could be effective is essential through strengthening nursing education, offering psychosocial support, and availability of adequate resources[2,3].

Monkeypox outbreak emphasizes the necessity of nurses in Pakistan to act as caregivers, educators, and promote health. Their experience on how to control infection, care and education to the community is the foundation of controlling outbreaks. Helping the frontline nurses are critical measures of ensuring that the country is prepared in relation to the emerging infectious diseases by incorporating them into the multidisciplinary response teams and ensuring that the effects of infectious diseases are well known to the people. Nurses in Pakistan, as custodians of the population health, remain the protectors of the people, as well as the health system, making it more resilient in confronting the changing global threats.

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Original Article

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Assessment of Knowledge, Attitude, and Practice Regarding Instrument Handling in Intraoperative Environment among Operation Theatre Staff

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ABSTRACT

In the intraoperative setting, proper handling of instruments is essential to maintain surgical efficiency and ensure patient safety. This would heavily rely on the personnel of the operating theatre (OT), such as surgeons, nurses, and technicians. Their knowledge, attitude, and practice (KAP) of working with the instruments could be evaluated, which would help identify the areas that require improvement in the outcomes of the surgery. **Objectives:** To assess the knowledge, attitudes, and practices of the operating theatre personnel related to the management of instruments during the intraoperative care, to find the gaps in the protocol compliance, and to discuss the factors that impact compliance. **Methods:** A descriptive cross-sectional study was conducted among working staff in specific hospitals operating theatres. They came up with a self-administered questionnaire that assessed their knowledge, attitudes, as well as practices in regard to instrument handling. **Results:** This study found that 113 (78%) operating theatre staff had a decent theoretical understanding of how to handle the instruments, and 116 (80%) were aware of their responsibility in preventing surgical site infection. Nevertheless, only 87 (60%) of them were adherent to proper handling protocols. In workload, time constraints, and limited resources (20%) were the main obstacles, which showed that there was a knowledge practice gap despite positive attitudes. **Conclusions:** Despite the fact that the majority of operating theatre staff showed sufficient knowledge and good attitudes to aseptic techniques and infection control, there is still a lot to be desired in decontamination, validation of sterilization, and storage of the instruments.

INTRODUCTION

Surgical instruments are specially designed to modify tissue or provide access during operations. Some common instruments used in surgery are scalpels, forceps, scissors, needles, and retractors. Handling is hence critical to safety, mobility efficiency, and prevention of tissue and instrument damage [1]. In the context of adverse events, it is noted that surgical patients have the highest risk of these events in the hospital and that many of these events result from failures of non-technical skill in the operating room. The WHO surgical checklist was developed due to this problem being recognized worldwide, leading to a decrease in surgical complications and deaths related to surgery, as well as an improvement in the communication with the surgical team and an increase in the quality of care [2]. Nosocomial infections, often known as infections contracted during hospitalization, are infections that strike patients in healthcare facilities in settings where these do not pre-exist at the time when the patient is admitted [3].

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Several pathogenic microbes are involved in the pathogenesis of this type of infection, particularly 'Pseudomonas aeruginosa', 'Staphylococcus species', and 'coagulase-negative staphylococci' [4]. One of the important and most frequent sources of infection in the hospital setting is the operating theater, where the skin barrier is penetrated and the body is exposed to easily acquire infection easily and, according to a study, ~30% of patients who undergo surgery develop post-procedural infection. In clinical practice, the appropriate application of protocols that can effectively control the rate of infection in postoperative settings plays a vital role in infection control. Sterile technique plays a big role in preventing and controlling infection in the theatre by applying the principles of sterile technique; therefore, the OR nurses must have knowledge and measures taken by health care workers to prevent the contamination of surgical wounds [5]. Despite this, adherence to the sterile technique principle is still low, and operating room nurses have a good attitude toward practicing the sterile technique [6]. However, several studies have shown that the OR nurses' clients are associated with expenses, mortality, and morbidity. One of the main concerns is that the perioperative team's antibiotics are still surgical site infections (SSIs) [7]. SSIs are responsible for 75% of deaths and have a 3% fatality rate. If aseptic and sterile procedures are not followed, bacteria can enter the wound through surgical wounds and cause SSI [8]. Every year, SSIs endanger the lives of millions of people and help promote resistance to diseases that are directly linked to them [9]. The operating room (OR) serves as a location for performing surgeries and other medical procedures. Characters and models are created by the nature of surgeries; the work of an OR nurse, or intraoperative nurse, is crucial in hospitals today and involves treating patients [10]. Their duties include more than just providing fast-paced, high-load, and variable nursing care in the operating room. Basic medical care, cleaning and circulation, anaesthetic skills, engineering, and technical skills have all advanced quickly along with medical research and technology [11]. Furthermore, the intricacy of the surgical workplace is physical, chemical, biological, ergonomic, and psychosocial, and poses a threat to the physical and mental health of intraoperative nurses. Occupational hazards and nurses' safety have been influenced by a range of occupational risks and hazards, ranging from accidents to well-being in differing degrees [12]. Recent years have seen the emergence of organizational views, all of which have the ability to impact highly significant global challenges. Related studies have also shown that OT staff should be aware of the proper handling and disposal of surgical instruments. Lack of knowledge about asepsis, sterilization, and proper instrument handling is a risk factor for cross-contamination and infection. The researchers note that OT staff typically have insufficient knowledge of infection control practices and the importance of complying with the sterilization process [13, 14]. Research showed that the majority of the staff knew general infection prevention protocols, but many did not know the specifics involved in proper instrument handling, such as which items would maintain sterility or the importance of personal protective equipment (PPE). Likewise, from their research they found surgical nurses had limited knowledge on the correct way to clean and store surgical equipment, indicating the need for further education and training [15]. The researchers also found that OT nurses who understand the importance of infection control have responsible attitudes and subsequently have better practices in maintaining sterile environments during surgical procedures. Instrument safety, in practice, is still not universally applied between hospitals or around the surgical space. Instruments are only effective to the extent that they are used routinely in practice by OT staff trained in the correct practices to ensure the best outcomes when executed by the technicians; however, poor practices and adherence only to what they think is in their best interests leave others at risk [16]. The Professionals found that high-volume hospitals with stringent protocols had staff more likely than their counterparts in smaller institutions with less formalized procedures to follow the best practices in handling instruments. They also noted that although knowledge and attitude were generally good, there were deficiencies in practice, often due to time constraints, lack of appropriate resources, or inadequate supervision. There were various deviations from standard practices, which led to increased risk of contamination and infection, including inadequate instrument sterilization, insufficient storage conditions, and not discarding instruments in a sterile way [17]. The role of the scrub A PN or surgical technologist can serve as a part of the sterile team and perform the scrub job (Association for Peri-Operative Practice, 2014:210). A scrub practitioner is responsible for designing, putting down, and managing surgical instruments, besides keeping the sterile area. Among the greatest tasks of scrub is to foresee the requirements of the surgeon and offer reactive help to ensure a smooth surgical process. The circulator is implemented along with the counting of surgical equipment and the prevention of surgical objects being held back [17]. The adequate handling of the intraoperative instruments is central to the achievement of the precision of the surgery, its sterility, and the safety of the patient. Nevertheless, the lack of consistent compliance with aseptic practices and procedural guidelines among operating theatre staff remains a triggering factor in the occurrence of surgical site infections and inefficiencies in operating theatres.

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Although proper handling of surgical instruments is critical for preventing surgical site infections and ensuring patient safety, consistent compliance with standardized intraoperative protocols remains suboptimal. Existing literature highlights adequate knowledge and positive attitudes among operating theatre staff; however, gaps between knowledge and actual practice persist, particularly in resource-limited healthcare settings. In Pakistan, limited empirical evidence is available that comprehensively evaluates the knowledge, attitudes, and practices of OT personnel regarding intraoperative instrument handling. This lack of context-specific data underscores the need for systematic assessment to identify practice gaps and influencing factors. To evaluate their knowledge, attitude, and practice, strengthen institutional compliance frameworks.

METHODS

The study involved a descriptive cross-sectional study carried out in the Operating Theatres of Chaudhry Muhammad Akram Teaching and Research Hospital, Lahore, in the period between October 2024 and April 2025, to assess the knowledge, attitudes, and practices of operating theatres personnel with reference to instrument handling. The research was conceived by the Institutional Review Board (IRB) of Superior University with reference number SU/IRB/FAHS/MS/S100345 and informed consent was signed by the participants. The sample size was determined based on the standard formula of estimating proportions in a finite population with an assumption of prevalence of 50, 95% confidence level (Z = 1.96), and 8 percent margin of error; a sample size of 150 was obtained; however, considering non-response, the sample was reduced to 145. The sampling was purposive non-probability, in which operating consultants, collaborating surgeons, scrub nurses, and OT technicians were recruited, and pre- and post-recovery staff, sterilization staff, storekeepers, and helping staff were not. Intraoperative teams were the subject of the data collection conducted in the form of structured surveys, interviews, and observations. IBM SPSS Statistics version 29 was used to analyze data, in which descriptive statistics, including frequencies, percentages, mean, standard deviation, and median, were used to summarize the data.

RESULTS

This descriptive cross-sectional study provided some intriguing results regarding the overall theoretical knowledge about the handling of the instruments by the personnel in the operating theatre (OT), identifying a strong variation at the level of the consistency of the procedures. Fifty percent (50.3%) reported that they could only accept sterile areas of surgical instruments and 37.3% participants thought that it was okay to handle any clean area, and 12.4% did not know. Even though 60 percent of them checked the instruments as clean after each use, the percentage of those who did it less frequently is significant, which indicates the lack of full compliance with the guidelines on infection control. The majority of the participants (78.5) have found the use of autoclaving as the best type of sterilization, but 21.5% have found sub-optimal options like alcohol swabs or dry heat. Positively, 85.4 percent reported that dirty equipment ought to be substituted right away, whereas a minority would proceed or were uncertain, and this left a relative risk of practice. More than that, only 43 percent of them knew how to pass instruments correctly without violating sterility, and there were gaps in their procedures despite sufficient knowledge. On the attitudinal level, the subjects of the study were positive and safety-oriented. Almost one out of every ten (89) respondents thought that proper handling of instruments was of the utmost importance to patient safety, and 69.9% of the respondents felt that they received sufficient training. Confidence levels were very high, with 47.6 percent of them saying that they were very confident and 39.9 percent being somewhat confident. A majority of 88.8% responded that safety measures should be strictly adhered to, whereas 80% responded that mishandling of instruments is a factor that leads to complications of surgery. These reactions are indications of a positive professional demeanor, which is in congestion with the principles of patient safety and the awareness of the personnel regarding their clinical roles. Practical compliance with these principles, on the contrary, was a bit vague. Though 81.8% said they always adhered to the standard procedures, 14% said they only did so occasionally, and 4.2% said that they never or hardly ever did it. Where the sterility of an instrument was in doubt, 62.2% of the respondents put the instrument away and took another one, and 29.4% would ask another colleague before doing so. A minimal number chose to check or reuse without verification, which is indicative of lapses that may result in the impairment of sterility. Only less than half (44.8>25% of participants attended refresher courses regularly, and 15.3% had never attended because of limited opportunities. On an optimistic note, the percentage of people who took safety tools or devices was 76.2 percent, and 87.4 percent kept their operating environment clean and orderly, which showed that the general level of procedural discipline was rather high (Table 1).

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Table 1: Knowledge Assessment, Attitude Assessment, and Practice Assessment of Operation Theatre Personnel (n=145)

Questions	Response	n (%)
Knowledge Assessment		
Correct Technique for Handling Surgical Instruments	Hold Instruments by Sterile Part Only	73 (50.3%)
	Hold By Any Clean Part	54 (37.3%)
	Not Sure	18 (12.4%)
Frequency of Inspection Before Use	After Every Use	87 (60.0%)
	Once Daily	35 (24.1%)
	Occasionally	23 (15.9%)
Appropriate Method of Sterilization	Autoclaving	114 (78.5%)
	Alcohol Swabs	15 (10.4%)
	Dry Heat or Others	16 (11.1%)
Response to Contaminated Instruments	Replace With Sterile Instrument	124 (85.4%)
	Continue Using	10 (6.9%)
	Unsure	11 (7.7%)
Correct Way to Pass Instruments	Hand Without Touching Sterile Part	62 (43.0%)
	Pass by Handle Directly	46 (32.0%)
	Other/Unsure	37 (25.0%)
Attitude Assessment		
Importance of Proper Instrument Handling for Patient Safety	Extremely Important	129 (89.0%)
	Moderately Important	13 (9.0%)
	Slightly Important	3 (2.0%)
Adequacy of Training	Adequately Trained	101 (69.9%)
	Need More Training	41 (28.0%)
	Unsure	3 (2.1%)
Confidence in Proper Handling	Very Confident	68 (47.6%)
	Somewhat Confident	57 (39.9%)
	Not Confident/Not Sure	18 (12.6%)
Belief About Safety Protocols	Should be strictly followed	127 (88.8%)
	Useful but flexible	4 (2.8%)
	Not necessary/unsure	12 (8.4%)
Belief That Mishandling Causes Complications	Yes	115 (80.0%)
	No	9 (6.0%)
	Maybe	19 (13.0%)
Practice Assessment		
Following Standard Protocols	Always	117 (81.8%)
	Sometimes	20 (14.0%)
	Rarely/Never	8 (4.2%)
Action When Sterility is Uncertain	Discard and replace	89 (62.2%)
	Ask colleague	42 (29.4%)
	Check personally	9 (6.3%)
	Use without asking	3 (2.1%)
Participation in Refresher Courses	Regularly	65 (44.8%)
	Occasionally	58 (39.9%)
	Never/No opportunity	22 (15.3%)
Use of Safety Tools/ Devices	Always	110 (76.2%)
	Sometimes	22 (15.4%)
	Never	13 (8.4%)
Maintaining a Clean, Organized Environment	Always	127 (87.4%)
	Most of the time	11 (7.7%)
	Rarely	7 (4.9%)

Collectively, these findings highlight a strong foundational knowledge and positive attitude among OT staff but reveal partial gaps in consistent practice. Strengthening routine training, supervision, and institutional policy enforcement could bridge the existing knowledge–practice divide and further enhance patient safety within the intraoperative setting.

DISCUSSION

The modern environment has come with certain challenges to the safety of surgery, which require continuous training to successfully overcome these complicated processes. Antibiotic resistance, alteration, and enhancement. The evolving nature of surgical procedures, including the advanced ones that require strict follow-up of sterile guidelines and tactical planning of using antibiotics [18]. The risk of dealing with infections in surgical facilities is quite high because the number of aged individuals, who have several other medical conditions at the same time, increases. Such surgical techniques as robotic surgery, laparoscopy complicate the situation where surgical teams have to make decisions preoperative. This will require tailored measures to minimize risks, effective errors, resolution of problems caused by communication malfunctions, complicated processes, antibiotic resistance, and numerous improvements in surgical safety. The motivation levels of the healthcare community to maintain the highest standards of patient care manifest in the ability to evolve and address the past achievements and present-day challenges in surgical standards, including the World Health Organization (WHO) Surgical Safety Checklist, which enables reducing medical conditions among patients to an insignificant level, and the necessity of improvement [19]. It is necessary to enhance communication, coordination, and coordination in surgical teams to guarantee patient safety. Standard continuous training, judicious antibiotic therapy, and tailored preoperative testing are all safe measures [20]. Based on the results, three-quarters of the OT staff were knowledgeable enough regarding the policy of infection control, aseptic practices, and sterilization of instruments. The areas of decontamination methods, storing of instruments, and monitoring of sterilization were indicated as deficient, however. To avoid infection and ensure the safety of patients, the knowledge about the right way to handle instruments should be very basic among the OT staff members. The decrease in the chances of contamination involves a sufficient knowledge of aseptic methods, sterilization procedures, and proper storage of instruments. Studies have indicated that many OT staff members have varying levels of knowledge on sterilization procedures, which has been a problem in the ability to effectively implement infection control procedures. This knowledge gap can be caused by a high

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turnover rate in healthcare organizations, the absence of continuous education, and inadequate training [21]. The attitude of the majority of the OT staff was good; 80 percent of them concurred that proper handling of instruments reduces surgical site infections (SSIs). Nevertheless, compliance remained affected by such factors as workload, time limitation, and lack of resources. The attitudes of OT staff members towards the instruments and infection control influence their work in the operating room significantly. To keep the level of care high, it is necessary to have good attitudes towards infection prevention, the knowledge of the importance of adhering to sterile procedures, and the desire to participate in further education programs. OT professionals, with a strong and safety-oriented mentality, would be more cautious with surgical tools, communicate better with other team members, and adhere to procedures more strictly [22]. But 60 percent of the staff never followed through with the proper procedures of handling the instruments, even when they had positive attitudes and high degrees of knowledge. Among the most common shortcomings of practice were inappropriate changing of gloves, failure to dry an instrument before sterilization, and failure to use aseptic transfer methods. The actual instrument handling practice between the OT professionals is tested on knowledge and attitude. Time limitations, workload of the staff, and environmental aspects, such as the OR arrangement, can affect the actual practice of maintaining a sterile field, working with a surgical instrument, and obeying sterilization rules, despite having all the necessary information and a positive attitude [23].

This study is limited by its cross-sectional design and purposive sampling, which may restrict generalizability and prevent causal interpretations. Data were collected from a single healthcare setting and relied partly on self-reported practices, introducing the possibility of response bias. Future studies should adopt multicenter, longitudinal, or interventional designs to better assess compliance trends over time. Additionally, evaluating the impact of structured training programs, supervision, and institutional policy enforcement could enhance adherence to standard instrument-handling protocols and improve surgical safety outcomes.

CONCLUSIONS

The research concluded that there is a significant disparity between the knowledge of the operating theatre staff and their practice. The majority of the participants were well aware of the aseptic methods, sterilization, and infection prevention, but there were still some gaps in decontamination, monitoring of sterilization, and storage of instruments. Even after demonstrating an attitude of being good in the handling of instruments that are safe, many of them did not engage in proper procedures because of high workload, time pressure, and lack of resources. The findings demonstrate that continuous training, improvement of supervision, and institute policies can help guarantee consistent compliance and enhance the results of surgical safety.

Authors' Contribution

Conceptualization: IUDK, MM, LM, MMA
Methodology: MM, LM, T, MMA, TT
Formal analysis: IUDK, MM, TT
Writing and Drafting: IUDK, ASR, LM, T, MMA, TT
Review and Editing: IUDK, ASR, LM, T, MMA, TT, MM

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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Critical Care Nurses Knowledge, Practice, and Associated Factors Regarding Non-pharmacological Pain Management in Tertiary Care Hospitals, Pakistan

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ABSTRACT

Pain ranks as one of the top three symptoms experienced globally, particularly concerning for patients in critical care units (CCU). It is managed through both pharmacological means (medications) and various non-pharmacological therapies, which help reduce medication side effects. **Objectives:** To evaluate the knowledge and practices of nurses in critical care regarding non-pharmacological pain management (NPPM) and the factors influencing their practices. **Methods:** The study design was cross-sectional analytical and was conducted among critical nurses from July to September 2024. The sample size of the participants was 184. They were extracted as strata from the study setting, and then the convenience sampling technique was used for data collection. Data were collected through a structured questionnaire, while data was analyzed through SPSS version 27.0, and informed consent was taken from each participant. The study was approved by the ethical review committee. **Results:** The total participants of the study were 184, where female were n=98 (53.3%), nurses in the age group 24-29 were 132 (71.1%), and those having the qualification of a 3-year Registered Nurse (RN) diploma were n=115 (62.4%). The results show that a higher number of nurses have poor knowledge (n=91, 49.5%) and average practices (n=80, 43.5%). Factors such as no official policy, no experience in critical care, and no NPPM use affect nurses' knowledge and practices. **Conclusions:** On the basis of results, the study established that extensive education and intervention are required to implement the NPPM in the regular practices of nurses for better outcomes.

INTRODUCTION

Pain is defined by the International Association for the Study of Pain as an unpleasant sensory and emotional experience linked to actual or potential tissue damage [1]. It is also recognized as existing whenever the patient claims it does. In critically ill patients, pain is associated with adverse physiological and psychological outcomes and negatively affects their quality of life upon discharge from the ICU [2]. Despite advancements in pain assessment and management in critical care, addressing pain in these patients remains a challenging issue. The prevalence of pain globally is rising, with the IASP estimating that one in five people experience pain and one in ten are diagnosed with chronic pain [3]. According to international human rights law, receiving appropriate and efficient pain management is a basic human right and a critical first step in improving the patient's quality of life [4]. Pain management has emerged as a major healthcare issue and an important field of research in recent decades. Despite the significant growth of the body of knowledge, the availability of guidelines, technological advancements,

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and pharmacologic and non-pharmacologic pain treatment approaches, all forms of pain are still underestimated and under-treated [5]. Additionally, pain management not only promotes patient comfort by reducing their suffering, but also reduces hospital stay and enhances wound healing. In the health care sector, pain is mostly treated through medication such as analgesics, while pain is caused through physical and psycho-social factors; therefore, sometimes it does not respond to medication, a wide range of alternatives should be available for the management of pain, which should include non-pharmacological therapies that effectively manage pain [6]. Non-pharmacological pain management is an alternative type of therapy to treat and manage pain, that contain neuro-stimulation, counseling, comfort, and physical therapies [7]. The effectiveness of non-pharmacological pain relief techniques has been recognized due to their lower side effects and complications. However, challenges persist globally, primarily attributed to care provider attitudes and knowledge gaps. Research indicates that non-drug pain management methods can reduce pain perception and distress, enhance coping abilities, and empower patients and families [8]. Nurses are responsible for the care of hospital patients; they play a vital role in the monitoring and treatment of pain while enhancing patient comfort and minimizing the suffering of pain, that required knowledge and practice regarding the management of pain [9]. Effective pain management requires healthcare providers, especially nurses, to have a strong understanding and positive outlook concerning pain management. Nurses, who interact most frequently with patients, play a crucial role in pain assessment, greatly influencing patient experiences during hospitalization [10]. Pakistan's healthcare system, particularly public hospitals, struggles with overcrowding, staff shortages, and restricted access to advanced medications [11]. Non-pharmacological pain interventions, such as relaxation techniques and music therapy, are effective, low-cost, and safe, particularly for critically ill patients who cannot communicate their pain verbally. Despite strong global evidence favoring these techniques, nurses primarily depend on medications, and non-drug methods are seldom used.

Despite strong global evidence supporting the effectiveness of non-pharmacological pain management (NPPM) in critical care settings, its integration into routine nursing practice remains limited, particularly in low- and middle-income countries. In Pakistan, empirical data examining critical care nurses' knowledge, practices, and influencing factors related to NPPM are scarce. Existing studies largely emphasize pharmacological approaches, with minimal focus on nurses' preparedness and institutional barriers affecting NPPM use. This lack of context-specific evidence highlights a critical research gap that warrants systematic investigation. This study aimed to assess the level of knowledge, attitude, and associated factors among nurses working in the critical care unit regarding non-pharmacological management of pain.

METHODS

The cross-sectional descriptive research design was adopted to examine the knowledge and practice of nurses in the area of non-pharmacological pain management in the critical care unit of three major hospitals: a private tertiary teaching hospital in Islamabad (Shifa International Hospital, Islamabad) and two tertiary care hospitals in Peshawar (Hayatabad Medical Complex and Rehman Medical Institute, Peshawar). Ethics approval was granted by Shifa International Hospital, Islamabad (IRB # 246-24), with permission from participating hospitals. Confidentiality was maintained, and informed consent was obtained in writing. The study was conducted between July and September 2024, while the population of the study included registered nurses who work in adult ICUs, CCUs, HDUs, and step-down units and were directly engaged in patient care. The following were the eligibility criteria: nurses having at least three months of experience in critical care were included, but not nursing managers and nurses on leave. Utilizing the online software Open-Epi with the sample size formula, the required sample size was estimated using the following parameters: 5% marginal error and 95% confidence interval (alpha = 0.05), the sample size calculated was 154. Then additionally, a 20% attrition rate was incorporated to account for potential non-responses. Consequently, the final sample size of the study was 184 participants [12]. The sample size formula is: n = N . Z2 . p . (1-p)/e2 . (N-1) + Z2 . p . (1-p). For 20% attrition rate: To account for potential non-response or dropouts, increase the sample size by 20%: nfinal = n ÷ (1–attrition rate) = 154 ÷ (1–0.2) = 154÷0.8=192. Rounded to nearest feasible number, the adjusted sample size = 184. To ensure that every critical care unit within the three hospitals had an equal opportunity for inclusion. The stratification of the participants was made as 94 taken from 131 total nurses from Shifa International Hospital, Islamabad, 49 out of 53 from HMC, and 51 out of 70 nurses from RMI, through a formula of proportionate sample size of ICUs, CCUs, HDUs, and step-down units [13], that are calculate below: nh = Nh/N × n. nh = sample size for stratum h, Nh = population size for stratum h, N = total population size, n = overall sample size. The data was collected in two sections: section (a) contain demographic data while section (b) knowledge questionnaire that contain 10 questions with dichotomous response of correct/incorrect, participant having (<6 points) were considered poor knowledge, (6-7.99 points) were average score, and (8-10 points) were good

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knowledge [14]. The practices were evaluated through 13 items having a Likert scale from "not at all" to "always. Participants who scored 80% or above were considered good practices, those who scored 60-79% were considered average practices, and those who scored 60% or less were considered poor practices [14]. The study established content validity through high indices (CVI = 0.99) from two ICU nurse educators, two ICU specialists, and one pain management physician. Reliability testing showed a Cronbach alpha of 0.73 based on a pilot sample. Data were analyzed using SPSS version 27.0, calculating descriptive statistics for categorical variables (frequency and percentages) and continuous data (mean and standard deviation). An ordinal logistic regression test was applied to evaluate factors associated with critical care nurses' knowledge and practices regarding non-pharmacological pain measures.

RESULTS

The total number of participants were 184, where majority of the participants were age group 24-29 years 132 (71.7%), female nurses 98 (53.3%), 3 years diploma 115 (62.5%), 1-5 years' experience 108 (58.7%), working in MICU/MHDU 84 (45.7%), no training regarding NPPM n-128 (69.6%), and having ratio 1:2 patient were 77 (41.8%) (Table 1).

Table 1: Demographic Data of the Participants (n=184)

Description	Frequency (%)
Age of Participants	
18-23	23 (12.5%)
24-29	132 (71.7%)
30-35	25 (13.6%)
More than 35	4 (2.2%)
Total	184 (100%)
Gender	
Male	86 (46.7%)
Female	98 (53.3%)
Total	184 (100%)
Qualification	
Diploma In Nursing (RN)	115 (62.5%)
Degree (Post RN/BSN)	69 (37.5%)
Years of Experience	
<1 Year	62 (33.7%)
1-5 Years	108 (58.7%)
6-10 Years	14 (7.6%)
Total	184 (100%)
Working Area	
MICU/MHDU	84 (45.7%)
SICU/SHDU	61 (33.2%)
CCU	39 (21.2%)
Total	184 (100%)
Training Regarding NPPM	
No	128 (69.6%)
Yes	56 (30.4%)
Seminar	10 (5.4%)
Workshop	17 (9.2%)
Nursing Education Services	29 (15.8%)
Total	184 (100%)
Nurse-Patient-Ratio	
1:1	77 (41.8%)
1:2	87 (47.3%)
1:3	20 (10.9%)
Total	184 (100%)

The majority of participants demonstrated poor knowledge (49.5%), followed by average knowledge (36.4%), and good knowledge (14.1%) regarding NPPM. A significant number of nurses (64.1%) recognized NPPM's role in reducing muscle tension and pain, while 54% understood its role in inflammation, and 58.7% identified the types of therapies used in NPPM (Figure 1).

Figure 1: Overall knowledge of the critical care nurses

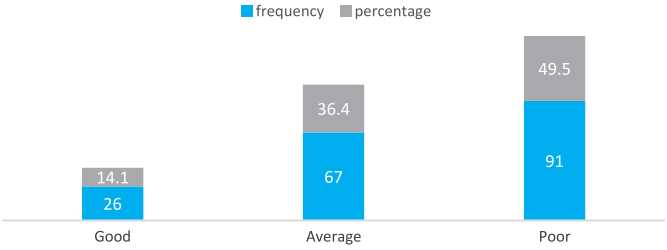

Figure 1: Overall, Knowledge Level (n=184)

43.5% of critical care nurses demonstrated average practices, while 40.8% had poor practices, and only 15.8% exhibited good practices. The study found that 48.4% of nurses practiced positioning for patient comfort, 41.3% used breathing techniques and guided imagery occasionally, and 40.2% employed therapeutic touch regularly. Additionally, 48.2% frequently recited holy verses for patients, and 45% used hot and cold packs sometimes (Figure 2).

Figure 2: Practices of nurses regarding NPPM

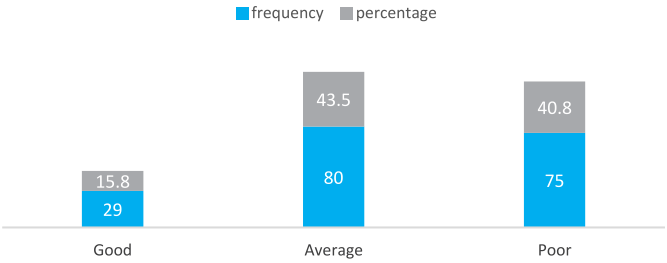

Figure 2: Overall Practices of Nurses Regarding NPPM (n=184)

Ordinal regression analyzed the predictors of knowledge about NPPM, showing that "poor knowledge" (B = -0.205, p=0.439) was not significant, while "average knowledge" (B=1.719, p<0.001) was significant. The lack of policy for non-pharmacological interventions and its absence did not impact knowledge. Significant predictors included "Human Resource Availability (Not sure)" (B = -1.285, p = 0.016),

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indicating reduced knowledge, while other resource availability and technique effectiveness were not significant.

Table 2: Associated Factors with Knowledge

Parameters	Estimate (B)	SD Error	Wald	df	p-value	(95% CL) OR
Threshold						
Poor Knowledge	-0.205	0.265	0.598	1	0.439	(0.72 -0.31) 0.81
Average Knowledge	1.719	0.304	31.97	1	p <0.001*	(1.12 - 2.31) 5.58
Hospital Lacks Policy of NPPM						
Not sure	0.742	0.423	3.080	1	0.079	(0.92 - 4.81) 2.10
No	0.358	0.350	1.045	1	0.307	(0.72 - 2.84) 1.43
Yes	–	–	–	0	–	–
Availability of Sufficient Human Resources (Nurses)						
(Not sure)	-1.285	0.534	5.792	1	0.016*	(0.10 - 0.79) 0.28
(No)	-0.389	0.389	0.997	1	0.318	(0.32 - 1.45) 0.68
Yes	–	–	–	0	–	–
Effectiveness of the Techniques						
(Not Sure)	0.306	0.479	0.409	1	0.523	(0.53 - 3.47) 1.36
(No)	-0.458	0.309	2.200	1	0.138	(0.35 - 1.16) 0.63
Yes	–	–	–	0	–	–

p-values * means statistical significance

The study presents factors influencing critical care nurses' practices related to non-pharmacological pain management (NPPM). Ordinal regression analysis indicates that increased workload (-1.591, p =0.006), absence of hospital policy (-1.031, p=0.012), and lack of interdisciplinary collaboration (-1.061, p=0.008) negatively predict the use of NPPM techniques. Other factors, like time management and resource availability, were not significant predictors (Table 3).

Table 3: Association of Practice with Factor Variables

Parameters	Estimate (B)	SD Error	Wald	df	p-value	(95% CL) OR
Threshold						
Poor Practice	-1.978	0.513	14.840	1	p<0.001*	(0.72 - 0.31) 0.14
Average Practice	0.489	0.496	0.972	1	0.324	(1.12 - 2.31) 1.63
Time Management						
Not sure	1.314	1.192	1.215	1	0.270	(0.36 - 38.4) 3.72
No	-0.533	0.383	1.934	1	0.164	(0.28 - 1.24) 0.59
Yes	0	–	–	0	–	–
Workload						
(Ref= No)	0	–	–	0	–	–
(Yes)	-1.591	0.584	7.414	1	0.006*	(0.06 - 0.64) 0.20
Hospital Lacks Policy of NPPM						
(Not sure)	-0.821	0.516	2.527	1	0.112	(0.16 - 1.21) 0.44
(Yes)	-1.031	0.410	6.337	1	0.012*	(0.16 - 0.80) 0.36
No	0	–	–	0	–	–
Availability of Sufficient Human Resources (Nurses)						
(Not sure)	-0.735	0.535	1.889	1	0.169	(0.17 - 1.37) 0.48
(Yes)	-0.095	0.426	0.049	1	0.824	(0.39 - 2.10) 0.91
No	0	–	–	0	–	–
Severity of Pain						
(Not sure)	-0.516	0.846	0.373	1	0.541	(0.21 - 1.14) 0.60
(Yes)	0.112	0.349	0.104	1	0.747	(0.57 - 1.79) 1.12
No	0	–	–	0	–	–
Patient Cooperation						
(Not sure)	0.394	0.750	0.276	1	0.599	(0.10 - 1.86) 1.49
(Yes)	-0.743	0.369	4.060	1	0.044*	(0.23 - 0.98) 0.48
No	0	–	–	0	–	–
Opposite Gender						
(Not sure)	-2.246	1.176	3.646	1	0.056	(0.45 - 1.59) 0.11
(Yes)	-0.136	0.349	0.151	1	0.698	(0.81 - 1.54) 0.87
No	0	–	–	0	–	–
Effectiveness of the Technique						
(Not sure)	-0.839	0.554	2.290	1	0.130	(0.19 - 0.84) 0.43
(Yes)	0.245	0.327	0.564	1	0.453	(0.39 - 1.88) 1.28
No	0	–	–	0	–	–
Availability of the NPP Control Tool						
(Not sure)	-0.155	0.459	0.114	1	0.735	(0.10 - 1.74) 0.86
(Yes)	0.100	0.365	0.075	1	0.784	(0.60 - 1.81) 1.11
No	0	–	–	0	–	–
Nurses' Autonomy in NPPM Decision						
(Not sure)	-0.463	0.591	0.613	1	0.434	(0.16 - 0.69) 1.28
(Yes)	0.128	0.373	0.117	1	0.733	(0.16 - 0.76) 0.35
No	0	–	–	0	–	–
Inter-Disciplinary Collaboration						
(Not sure)	0.246	0.478	0.265	1	0.607	(0.69 - 1.18) 1.28
(Yes)	-1.061	0.399	7.084	1	0.008*	(0.16 - 0.76) 0.35
No	0	–	–	0	–	–

The symbol "*" means statistical significance

DISCUSSION

In Pakistan, there are limited studies on NPPM, while study focused on the nurses' domain are rare that evaluated nurses' awareness and practice; therefore, this study was conducted to explore the level of awareness and practices of critical care nurses regarding NPPM. Moreover, the study also examined the factors that affect the level of knowledge and practices among critical care nurses. The study indicated that a majority of nurses (49.5%) had poor knowledge regarding NPPM, with 36.4% having average knowledge and only 14.1% demonstrating good knowledge. The lack of awareness appears linked to the absence of NPPM coverage in their curriculum, particularly among diploma nurses. Contrasting results were noted in Nigeria, where higher knowledge levels were reported, likely due to formal education, and over half of Ethiopian nurses were found to possess the necessary expertise [15-17]. Additionally, 69.6% of participants in this study lacked NPPM training, highlighting the need for structured educational initiatives [18]. Regular training and practical sessions are essential for enhancing nurses' NPPM skills. In

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the present study, 43.5% of critical care nurses in this study showed average practices of NPPM that suggest improvement in the practices of CCN, 40.8% poor practices, and only 15.8% strong practice, and 48.4% of nurses encouraged patients to recite Holy Verses. The average and poor level indicated that NPPM is very beneficial for the patient, but it requires skills, knowledge and support from regulatory authorities and the government. These results are comparable with those of [4], who stated that their lack of expertise and experience led to irregular NPPM use. Similar to this, a significant obstacle in this study was a lack of awareness and training. The most popular strategy (48.4% "always") was positioning, which is consistent with a study that found it to be a favored method because of its ease of use [19, 20]. On the other hand, methods such as temperature regulation and massage were used less frequently, which is in line with, who found low utilization rates of 18.8% and 23.4%, respectively [15]. The present study revealed that due to the recent transition from study to practice, the nurses aged 18-23 years not only have good knowledge but also have good practices that are associated with their education. Factors such as a shortage of staff and a higher number of patients, a lack of NPPM policy, and poor interaction in the form of organizational barriers affect their implementation. In other studies, education was associated with practices, while duty ward, qualification, years of experience, and knowledge had different associations, but limited time and patient workload were major barriers among nurses [20]. Moreover, it was also revealed by a study that socio-demographic data affects the level of awareness but has a low impact on practices; therefore, it is recommended to explore systematic issues that affect the transition of knowledge into practices [19].

This study is limited by its cross-sectional design and use of convenience sampling, which restrict causal inference and generalizability of the findings. Data were self-reported and collected from selected tertiary care hospitals, potentially introducing response and selection bias. Future research should employ longitudinal and interventional designs across diverse healthcare settings to better understand causality and practice change. Additionally, evaluating the impact of structured training programs and institutional policies may support effective implementation of NPPM in critical care nursing.

CONCLUSIONS

This study examined critical care nurses' knowledge and practices regarding (NPPM) in tertiary care hospitals, revealing generally low levels of both knowledge and average practice. Diploma holders exhibited lower practice levels compared to degree holders. Identified challenges to effective NPPM included high workloads, absent hospital policies, poor interdisciplinary teamwork, and insufficient knowledge. The study suggests that targeted educational interventions and institutional policy changes are necessary to enhance NPPM implementation and improve patient outcomes. Future research should focus on these elements across various demographics and settings.

Authors' Contribution

Conceptualization: BU, AZ
Methodology: BU, SFK, SI
Formal analysis: SFK
Writing and Drafting: SI
Review and Editing: SI, BU, SFK, AZ

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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Original Article

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Impact of Rotating Shift on Nurses' Health Outcomes: An Analytical Cross-Sectional Study at MMC Mardan

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ABSTRACT

The rotating shift work is widely practiced in healthcare facilities in order to provide 24/7 patient care; however, it is known to disrupt circadian rhythms and adversely influence the physical, psychological, and general well-being of the nurse. **Objectives:** The study aimed to investigate the impact of the rotating shift work system on the physical, mental, and general health of MMC, Mardan, KPK nurses. **Methods:** A cross-sectional study was conducted on 142 RN who worked at least one year on rotating shifts. The convenience sampling was adopted. A validated structured questionnaire with a Cronbach's alpha of 0.70 was used to gather the data. The Kruskal-Wallis and Mann-Whitney U tests were used to determine the demographic factors and health outcomes associations; the descriptive statistics summarized demographic and health-related variables. **Results:** The majority of the participants were aged between 25 and 29 (74.6) and female (72.5). Fatigue, sleep disturbances, emotional exhaustion, and stress were also reported as common characteristics of the issues. Almost 50 percent (45.1%), but above half (54.2%), did not feel disheartened because of rotating shifts. There was no substantial correlation between the health outcomes and gender and work area ($p>0.050$). **Conclusions:** The practice of rotating shift work at MMC Mardan has a negative impact on the physical and psychological well-being of nurses and especially on their fatigue levels, sleep quality, emotional distress, and overall well-being.

INTRODUCTION

A rotating shift system refers to a work schedule in which nurses and other medical professionals switch their shifts regularly. They work various shifts, such as day, evening, and night, rather than working the same shift at all times. This system is applied by hospitals to ensure the presence of staff throughout the day and night, which makes people continue varying their sleep patterns and body clock (1, 2). The shifts can go from day to evening to night (forward rotation) or from night to evening to day (backward rotation). Nursing literature defines rotating shifts as work schedules where employees take turns working day, evening, and night shifts instead of being fixed to just one shift (3-5). Previous Studies have repeatedly shown that having irregular or poorly organized work schedules can harm nurses' health in various aspects (6, 7). These include trouble sleeping, long-lasting tiredness, stomach problems, pain in muscles and joints, and a higher chance of heart issues due to certain physiological changes (8-10). Chiang et al. reported that hospital nurses' work schedules were significantly associated with their lifestyle habits, particularly dietary practices (11). Apart from this, nurses who work different shifts have a much higher chance of getting irritable bowel syndrome and stomach problems than nurses who work regular daytime hours (12). Psychologically, rigid or stressful schedules are strongly linked to burnout, emotional exhaustion, anxiety, and decreased job satisfaction (13, 15). Also, problems with balancing work and home life can cause family arguments

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and make it harder to get along with others. Ultimately, the state of ill health in nurses is not only detrimental to them, but it also has an impact on patient safety and the quality of care as well as the effectiveness of healthcare systems (16). This is a rotating shift system in Mardan Medical Complex (MMC), Hospital Mardan, Khyber Pakhtunkhwa, and it is affecting the normal circadian rhythms of nurses and can adversely affect their physical, mental, and social health. Although the world has provided evidence to support the harmful health effects of shift work, like fatigue, sleeping disorders, and stress, very little research has been carried out in the local setting of Mardan, KPK, and Pakistan. Rotating shift work is an essential component of nursing services; however, it poses substantial risks to nurses' physical, mental, and overall health due to disruption of circadian rhythms. While international literature has extensively documented these adverse effects, evidence from local healthcare settings in Pakistan, particularly in Khyber Pakhtunkhwa, remains limited. Moreover, few studies have simultaneously examined multiple health domains among nurses working rotating shifts using standardized measures. This lack of localized, comprehensive data highlights a critical research gap that warrants systematic investigation. The study aimed to examine how the rotating shift work system affects the physical, mental, and overall health of nurses at MMC, Mardan, KPK.

METHODS

An analytical cross-sectional study was conducted from June 2025 to September 2025 among registered nurses at Mardan Medical Complex (MMC) Hospital, Mardan. Nurses who had completed at least one year of experience in rotating shift duties were included using convenience sampling. A sample of 142 nurses was calculated using the single population proportion formula $n= Z^2p\ (1 - p)/d^2$, assuming a 50% prevalence, 94% confidence level, 6% margin of error, with an estimated population of 300 nurses. Although the sample size appears modest for an analytical study, it represents nearly half of the accessible nursing population at MMC Mardan and is comparable to similar hospital-based cross-sectional studies conducted in resource-limited settings. Written informed consent was taken. Data were collected through a structured questionnaire consisting of demographic variables and a health outcomes scale adapted from [17]. For assessing the health outcomes questionnaire comprised of 8 items was used. To record the responses Likert scale (1=Never, 2=Rarely, 3=Sometimes, 4=Often, and 5= Always) was used. The physical health domain included four items with a score range of 4–20, the mental health domain included three items with a score range of 3–15, and overall health was assessed using one item with a score range of 1–5. Higher scores indicated poorer perceived health status. Composite scores were obtained from calculated the mean of item responses within each domain. Reliability was assessed using Cronbach's alpha ($\alpha = 0.70$). The collected data were analyzed by using SPSS version 27.0. Frequencies and percentages were found for Descriptive statistics. The Shapiro–Wilk test and inspection of histograms were performed to check the normality of the data, which shows a non-normal distribution. Due to the ordinal nature of Likert-scale data and non-normal distribution, non-parametric tests (Mann–Whitney U and Kruskal–Wallis) were applied, and p value less than 0.050 was considered statistically significant.

RESULTS

A total of 142 nurses from MMC Mardan participated in the study. Most respondents were between 25 and 29 years of age (74.6%), with smaller proportions in the age groups 30-34 years (18.3%), 35-39 years (4.9%), and above 40 years (2.1%). Females made up the majority of the sample (72.5%), while 27.5% were male. Half of the nurses were single (50.7%), and 46.5% were married. Nearly half were working in general wards (48.6%), followed by 36.6% in critical areas and 14.8% in emergency departments. All respondents were staff nurses, and more than half had one to three years of experience (57.0%), while only 3.5% had more than ten years of experience. Every participant was working under a rotating shift schedule, as required in MMC Mardan (Table 1).

Table 1: Demographic Characteristics of Participants

Sr. No.	Variables	n (%)
Age in Years		
1	25-29	106 (74.6%)
	30-34	26 (18.3%)
	35-39	7 (4.9%)
	Above 40	3 (2.1%)
Gender		
2	Male	39 (27.5%)
	Female	103 (72.5%)
Marital Status		
3	Single	72 (50.7%)
	Married	66 (46.5%)
	Divorced	3 (2.1%)
	Separated	1 (0.7%)
Working Area		
4	General Ward	69 (48.6%)
	Critical	52 (36.6%)
	Emergency	21 (14.8%)
Current Role		
5	In charge Nurse	0 (0%)
	Nursing supervisor	0 (0%)
	Others	0 (0%)

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Working Experience (Years)		
6	1 To 3 Years	81 (57.0%)
	4 To 6 Years	46 (32.4%)
	7 To 9 Years	10 (7.0%)
	More than 10 Years	5 (3.5%)

Fatigue was commonly reported, with 42.3% sometimes and 21.8% often feeling fatigued after their shifts. Although most nurses did not regularly rely on medication, 22.5% reported sometimes using medicine to manage health issues, and 12.7% reported frequent or constant use. Gastrointestinal discomfort was also reported, with 21.8% sometimes experiencing indigestion or nausea after shifts, although 46.5% denied such symptoms. Sleep disturbances were significant, as 23.9% sometimes, and 23.2% often, and 28.2% always woke up frequently during sleep or earlier than intended. Emotional exhaustion due to rosters was reported by 31.7% sometimes and 20.5% often or always. Stress was also evident, with 28.2% sometimes and 28.9% often or always feeling stressed while working rotating shifts. Despite these issues, more than half of the nurses (54.2%) reported never feeling demotivated. Regarding overall health, 21.1% sometimes and 24% often or always felt that their health had deteriorated since working rotating shifts (Table 2).

Table 2: Impact of Rotating Shift on Nurses' Health Outcomes

Sr. No.	Variables	Never	Rarely	Sometimes	Often	Always
1	I feel physically fatigued after completing my shift.	18 (12.7%)	14 (9.9%)	60 (42.3%)	31 (21.8%)	19 (13.4%)
2	I regularly consume medicine to manage my health issues.	57 (40.1%)	35 (24.6%)	32 (22.5%)	12 (8.5%)	6 (4.2%)
3	I experience stomach problems (indigestion, nausea after my shift.)	66 (46.5 %)	24 (16.9%)	31 (21.8%)	11 (7.7%)	10 (7.0%)
4	I wake up frequently during sleep or too early in the morning.	14 (9.9%)	21 (14.8%)	34 (23.9%)	33 (23.2%)	40 (28.2%)
5	I feel emotionally exhausted because of my duty roster.	47 (33.1%)	21 (14.8%)	45 (31.7%)	12 (8.5%)	17 (12.0%)
6	I feel stressed while working under a rotating shift.	39 (27.5%)	22 (15.5%)	40 (28.2%)	24 (16.9%)	17 (12.0%)
7	I feel demotivated due to my work schedule.	77 (54.2%)	13 (9.2%)	33 (23.2%)	13(9.2%)	6 (4.2%)
8	Overall, my health has worsened since the rotating shift system.	42 (29.6%)	36 (25.4%)	30 (21.1%)	22 (15.5%)	12 (8.5%)

The below non-parametric test has been applied, which showed no statistically significant differences in physical health, mental health, or overall health across working areas (Kruskal-Wallis, $p>0.050$) or between male and female nurses (Mann-Whitney U, $p>0.050$). These results indicate that although nurses report fatigue, stress, sleep disturbances, and worsening health, these effects do not vary by gender or department (Table 3).

Table 3: Comparison of Health Domain Scores by Gender using the Mann-Whitney U Test

Health Domain	U-value	p-value
Physical Health	1864.0	0.500
Mental Health	1891.0	0.606
Overall, Health	1946.5	0.775

*Note: A p-value < 0.050 was considered statistically significant. *

DISCUSSION

This study examined the impact of rotating shift work on the physical, mental, and overall health of nurses working at Mardan Medical Complex (MMC), Mardan. Consistent with research, nurses in this study reported various health problems such as fatigue, sleep disturbances, emotional exhaustion, stress, and gastrointestinal issues, similar to the evidence presented in earlier studies (18). Santana et al. reported that the prevalent symptom is physical fatigue, reported by participants, aligns with a previous study that the major issue with shift work was fatigue; many individual participants commonly discussed feelings of tiredness and the effect this had on their ability to function and focus at work. It turned out that exhaustion was evident in all aspects of their life (19). Also, Circadian rhythm disruption and insufficient time of rest between shifts are considered to be the common causes of Fatigue in rotating shifts. On the same note, the gastrointestinal symptoms as noted by certain nurses are in line with previous reports, and it is possible that rotating shifts disrupts the normal digestive activity and predisposes an individual to develop indigestion and nausea (11). Along with fatigue, the topic of Sleep disturbances was also very high, as almost 3/4 of the nurses reported frequent or constant disruptions in sleep or early waking. Mao *et al.* reported that nurses working rotational shifts are more likely to experience circadian rhythm disruptions, which may lead to chronic sleep disorders and impaired cognitive function. (14). Moreover, Ko *et al.* underlined that the shift employees are subject to sleep-wake disturbances and consequent fatigue and sleep disruption because daytime sleep is not as restorative as nighttime sleep (17). Likewise, other psychological factors like emotional exhaustion and stress were also raised by a significant number of the participants. These results correspond with the results that report that the shift work was linked with the increased levels of work-family conflict and the risk of burnout, anxiety, and lower job satisfaction among nurses who work in the condition of the high-demand rotating schedule (4). It is important to note that over 50 percent of the nurses also reported never being demotivated, even with fatigue and stress. This was a sign of high professional

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commitment, job security, or a culture that ensured resilience among nurses in Pakistan. It may also imply a coping or adaptation to rotating shift systems that are popular in government hospitals. Moreover, in this study, the initial four questions focused on physical health, three questions focused on mental health, and the last question addressed overall health. We examined the association of these factors with gender and working area, but Statistical analysis revealed no significant differences in health outcomes by gender or working area. This study showed that rotating shift has similar health issues across different demographic groups and working areas at MMC, Mardan. The consistency in the shift system across the hospital may lead to these findings, as all nurses experience similar rotation patterns regardless of unit assignment. Overall, the results showed that rotating shifts hurts nurses' well-being, particularly in terms of sleep quality, fatigue, and psychological strain. These findings emphasize the global literature indicating that shift work is a significant occupational health concern in nursing, need specific interventions such as improved scheduling practices; sleep hygiene education, adequate rest intervals, and supportive workplace policies as stated in (20), that Institute of Medicine (IOM), the Joint Commission and many professional nursing organizations have emphasized the importance of reducing work related fatigue among nurses as a priority issue. Furthermore, this association may be improved through appropriate shift work scheduling. At least 2 days off, avoidance of a schedule containing 7 consecutive work days, and increased participation in arranging work shifts might be able to reduce work stress.

This study is limited by its cross-sectional design and convenience sampling, which restrict causal inference and generalizability beyond the study setting. Data were collected from a single tertiary care hospital and relied on self-reported measures, potentially introducing response bias. Future research should employ multicenter, longitudinal, or interventional designs to better assess long-term health outcomes associated with rotating shifts. Additionally, evaluating the effectiveness of optimized scheduling, rest intervals, and workplace wellness interventions could guide evidence-based policy development.

CONCLUSIONS

This analytical cross-sectional study demonstrated a significant association between rotating shift work and adverse health outcomes among nurses at MMC Mardan. The primary reported issues were frequent fatigue, sleep disturbances, emotional exhaustion, and stress, with nearly half of the participants perceiving a decline in their overall health. However, no statistically significant differences in these outcomes were found based on gender or clinical working area. These findings underscore that rotating shifts are a pervasive occupational health concern in this setting, uniformly affecting nurses across demographics. To mitigate these risks, institutional interventions—such as optimized scheduling, sleep hygiene support, and workplace wellness programs are recommended to safeguard nurse well-being and, in turn, promote sustained quality of patient care.

Authors' Contribution

Conceptualization: AR
Methodology: SK, ZS, MG, MA
Formal analysis: AU
Writing and Drafting: SK
Review and Editing: AR, SK, ZS, MG, MA, AU

All authors approved the final manuscript and take responsibility for the integrity of the work.

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Original Article

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Patient Satisfaction and Determinants of Nursing Care Quality in a Tertiary Care Hospital in Pakistan: A Cross-Sectional Study

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ABSTRACT

The patient's satisfaction with the provided care is an indicator of healthcare quality. A significant part of the literature on patient satisfaction in healthcare is focused on the quality of nursing care. **Objectives:** To assess patients' satisfaction with nursing care quality and examine its association with sociodemographic factors at a tertiary care hospital in Swat, Pakistan. **Methods:** A cross-sectional design was implemented with a tool of Patient Satisfaction with Nursing Care Quality Questionnaire (PSNCQQ) for data collection. A sample size of 225 was taken from the accessible population of medical wards, and questionnaires were included according to the inclusion criteria. All data were collected through interview-based questions for patient convenience. **Results:** On analysis of data, 136(60%) were male, and 89 (40%) were female participants of the study. A majority of Patients revealed high satisfaction as "Very Good 122 (54%)" and "Excellent 99(44%). The nurses' response to the patient needs, and their skills and competence, were aligned with the highest patient satisfaction. **Conclusions:** Patients reported a high level of satisfaction with nursing care quality, largely attributed to nurses' skills, competence, and responsiveness. Strengthening the nursing workforce and enhancing professional development may further improve patient satisfaction and quality of care.

INTRODUCTION

Patient satisfaction with healthcare quality is the Sustainable Development Goal of good health for all [1]. Its evaluation identified areas for retaining and revising care guidelines for better results. Given the results of worldwide scientific studies, universal health care acknowledges the best practices and policies for health [2]. In every healthcare facility, the patient is the key aspect of the system [3]. Patient satisfaction with the care provided is the primary indicator of the quality of health care [4]. "Patient Satisfaction" refers to the difference between the patient's ideal care and the care they actually received [5]. Within this satisfaction of the patient, the nurses play a key role because of more exposure than any healthcare worker [6]. On looking back at the literature, patient satisfaction was documented in different regions and settings of the health system [7-9]. Within these, a systematic review and meta-analysis were also conducted in some countries [10, 11]. Nursing care quality was reported as an essential factor in patient satisfaction by the researcher in an integrative study [12]. Similarly, a study in Greece reported patient

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satisfaction with nursing care quality in surgical patients [13]. Additionally, the same results in the same setting were reported by scholars in Turkey and Nigeria [14]. While in other settings, oncology units, the highest satisfaction has been reported in palliative care from the nurses [15]. Among these, most of the studies in the same domain used a descriptive cross-sectional design [16, 17]. Also, the PSNCQQ (Patient Satisfaction with Nursing Care Quality Questionnaire) scale was utilized in the local and other regions [18, 19]. In addition to this, some studies were found where the public and private hospitals were compared to assess patient satisfaction [20]. In the Asian region, literature reported satisfaction at a moderate level by most of the participants (68.9%) during the COVID-19 pandemic [5]. Interestingly, the same result at different settings was reported within the region by other scholars [21, 22]. Contrary to this, a systematic review revealed gaps in factors that influence patient satisfaction and recommends sociodemographic association for further studies [23]. In Iraq, the same tool and study design of the present study were used in the literature review [20]. Also, in Pakistan, the study that was conducted in Karachi with the same tool and study design points out high patient satisfaction with the nursing care quality [24]. While the only literature here in the local region of Khyber Pakhtunkhwa reported bariatric patients' satisfaction with a positive judgment [17]. Yet, the same study showed high satisfaction from participants and summarized areas of improvement. Additional scientific studies with different methodologies were needed to document patient satisfaction with the nurses' care quality for better outcomes [25]. The study provided an overview of the effectiveness of Nurses' quality care on patients in a tertiary care hospital in Swat, Pakistan. The study covered the following primary objective: To assess the level of patient satisfaction with nurses' care quality in Saidu Teaching Hospital, Swat. The secondary objective was to identify the association between patient satisfaction and sociodemographic factors of the participants. The research questions of the study that were answered in the discussion were as follows: 1) What is the level of patient satisfaction with nursing care quality in a tertiary care hospital? And 2) Is there an association between patient satisfaction and the sociodemographic data of the patient? The findings not only helped to fill existing knowledge gaps but also provided valuable insights for both public awareness and professional practice regarding the quality of nursing care.

Patient satisfaction with nursing care is a key indicator of healthcare quality; however, evidence regarding its determinants remains inconsistent across different healthcare settings. Although several international and national studies have assessed patient satisfaction using standardized tools, limited data are available from tertiary care hospitals in Khyber Pakhtunkhwa, particularly examining the association with sociodemographic factors. Moreover, existing literature highlights variability in reported satisfaction levels and influencing factors across regions. This gap underscores the need for a context-specific assessment of patient satisfaction with nursing care quality in this setting. The present study employed a descriptive design to evaluate patient satisfaction with nursing care, generating up-to-date empirical evidence to support evidence-based nursing practice and inform theoretical frameworks in nursing care quality.

METHODS

The study employed a descriptive cross-sectional design from non-experimental epidemiological methodologies. All admitted patients in tertiary care hospitals were counted in the study population. The study duration was from May 2025 to September 2025. Also, verbal permission and assistance were taken from the concerned ward in-charges for data collection. The study population consisted of patients admitted to the Medical Ward at Saidu Teaching Hospital, Swat. The sample data were acquired through the non-probability convenience sampling technique. The accessible population conforms to the average monthly patient admissions in the selected hospital medical units. The sample size was calculated through Raosoft Calculator as follows: Margin of error 05%, confidence level 95%, and population size 540. Through this, the sample size was calculated to be 225. The target population followed the mentioned sampling criteria: Inclusion criteria contained patients from the medical wards of the mentioned hospital. Age ranges from 18 to 47. Hospitalized for 2 or more days. Literate of at least matric and in good condition for response. Exclusion criteria included those not in the mentioned wards, critical patients, patients from other than the selected hospital, those not meet the age criteria, and those who refused to willingness with cooperate in data filling. For data collection, the tool, "Patient Satisfaction with Nursing Care Quality Questionnaire (PSNCQQ)", was adapted for the study [26]. The PSNCQQ has 22 items, of which 19 relate to patient satisfaction with nursing care quality, whereas the last 3 evaluate the overall quality of the healthcare facility during hospitalization. In addition, a hospital recommendation from the patient was also taken during data collection. The scale was adapted to the local context, and a sociodemographic section was added, including gender, age, educational level, financial status, and date of admission. The reliability was then reassessed for the study population and setting of the tool through Cronbach's α, calculated as 0.89. After providing a detailed purpose of the data collection, written informed consent was taken from the data provider, and the questionnaire was filled out

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by the participant through interview-based questions for convenience. After completion of the questionnaire, the invigilator proceeded to the next participant. All the data were analyzed through SPSS version 26.0 and MS Excel 2021. The result of the data analysis was then mentioned in tabulation and figures.

RESULTS

The provided data was analyzed to assess the patient satisfaction with nursing care quality. After examining the 225 filled PSNCQQ Questionnaires, Results show the sociodemographic characteristics of the participants. Most of them were male, 136 (60%), while 89 (40%) female participants also had a great part in the study. The analysis showed the majority of the data providers were literate at the matric 88 (39%) and intermediate 85 (38%) level of education. The financial status revealed the middle-class as the majority, 88 (39%) of the willing participants of this study. Additionally, 71 (32%) participants marked their status as poor, and 66 (29%) called themselves in a state of better income. Furthermore, a greater part 105 (47%) of the participants were between 18 and 27 years of age (Table 1).

Table 1: Sociodemographic Data of the 225 Participants

Variables	Frequency (%)
Gender	
Male	136 (60%)
Female	89 (40%)
Total	225 (100%)
Educational Level	
Matric	88 (39%)
Intermediate	85 (38%)
Graduate	47 (21%)
Master/MPhil	05 (2%)
Total	225 (100%)
Financial Status	
Poor	71 (32%)
Middle Class	88 (39%)
Better Income	66 (29%)
Total	225 (100%)
Age	
18-27	105 (47%)
28-37	82 (36%)
38-47	38 (17%)
Total	225 (100%)

The overall perception of the participants about the healthcare facility is shown. 119(53%) marked the overall health care they received as "Very Good". While with the same suggestion of two group participants with slight changes, called the health care as Excellent 5 6(25%) and Good 50 (22%). Patient revealed high satisfaction with overall nursing care quality ranges from "Very Good 122 (54%)" to "Excellent 99 (44%). Only 4 (2%) of them categorized nursing care quality as "Good" while none of them are seen to be "Fair" or "Poor" category. Likewise, patient perceived overall health condition "Very Good 126 (56%)" after 2 or more days of hospitalization and treatment (Table 2).

Table 2: Overall Perception of Health Care Facility by the study Participants

Items	Excellent	Very Good	Good	Fair
Overall Health Service Quality	56 (25%)	119 (53%)	50 (22%)	0 (0%)
Overall Nursing Care Quality	99 (44%)	122 (54%)	4 (2%)	0 (0%)
Self-Reporting of Health Perception	37 (16%)	126 (56%)	58 (26%)	4 (2%)

The mean and standard deviation of patient satisfaction with Nursing Care Quality are analyzed. The nurses' responsed to the patient call (4.49 ± 0.519) and the nurses' skills and competence (4.45 ± 0.589) were considered the most satisfactory factors marked by the participants. Meanwhile, the nurses' coordination of patient care after discharge (3.75 ± 0.605), explanation regarding procedures to patients (3.39 ± 0.63), adjusting the schedule to patient needs (3.97 ± 0.62), and nurses' coordination of patient care within the hospital (3.99 ± 0.52) were categorized as good yet lack of standardization and protocol (Table 3).

Table 3: Nursing Care Mean and Standard Deviation

Item Summary	Mean ± SD
Nurses' explanation about the test and treatment	4.01 ± 0.559
Nurses explaining about tests and other procedures	3.93 ± 0.627
Nurses answering your questions	4.33 ± 0.612
Nurses' communication to you, attendants, and doctors	4.27 ± 0.641
Nurses giving information about your condition and needs	4.12 ± 0.667
Attendant allowing to provide you with care	4.43 ± 0.587
Courtesy and respect for you by nurses	4.13 ± 0.602
Nurses keep checking on you	4.07 ± 0.710
Nurses ask for opinions and value your choices	4.07 ± 0.701
Flexibility of nurses to meet your needs	4.11 ± 0.673
Nurses adjusting schedule to your needs	3.97 ± 0.622
Nurses make you comfortable and assure you	4.13 ± 0.645
Nurses' response to your call	4.49 ± 0.519
Skills and competence of nurses	4.45 ± 0.589
Nurses' coordination of your care	3.99 ± 0.526
Respectful atmosphere provided by nurses	4.18 ± 0.651
Nurses providing privacy to you	4.24 ± 0.614
Nurses instructing you about discharge	4.04 ± 0.577
Nurses' coordination of your care after discharge	3.75 ± 0.605

The relationship between patient satisfaction and sociodemographic factors is summarized. The independent samples t-test was applied to the gender variable, while the one-way ANOVA was applied to the educational level and income status variables. The gender (p-value=0.358) and income status (p-value=0.175) variables showed no significance in patient satisfaction. Also, the educational level (p-value=0.053) showed no

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significance in patient satisfaction, yet the p-value was close to the significance threshold of 0.05 (Table 4).

Table 4: Association between Patient Satisfaction and Sociodemographic Factors

Variables		Total	Mean ± SD	p-value
Gender	Male	136	4.1606 ± 0.28493	0.358
	Female	89	4.1141 ± 0.41611	
Educational Level	Matric	88	4.1459 ± 0.35000	0.053
	Intermediate	85	4.0768 ± 0.34298	
	Graduate	47	4.2464 ± 0.31120	
	Master/MPhil	05	4.2105 ± 0.32444	
Income	Poor	71	4.0815 ± 0.33391	0.175
	Middle Class	88	4.1585 ± 0.32645	
	Better Income	66	4.1858 ± 0.36850	

Significant threshold <0.050 Independent sample t-test and One-Way ANOVA applied

DISCUSSION

The study summarized the literature and employed the cross-sectional observational scientific approach to patient satisfaction with the nursing care quality. Through analysis, the result reveals that the patient had high satisfaction with nursing care quality in Saidu Group of Teaching Hospital, Swat, Pakistan. The factors that were more attractive to the participants in nursing care were the nurses' responsiveness to patient needs and their skills and competence. On the other hand, lack of standardization and protocol are evaluated in the domains of nurses' care coordination after the discharge, as well as within the hospital, schedule adjustment for patient care, and procedure explanation to the patient. Furthermore, no such relationship is found between patient satisfaction and their sociodemographic variables. Going back to the existing literature to validate the interpreted findings of the study. The high satisfaction with nursing care was supported by a vast study in different regions [13, 19]. While the study in Turkey and Palestine reported a moderate level of patient satisfaction [21, 22]. The previous studies witness and support the point of no association between patient satisfaction and their sociodemographic variables [27]. Contrary to this, a Nigerian scholar documented a significant association between satisfaction and sociodemographic variables of the participants [15]. The high satisfaction factor of nurses' response to the patient's need is parallel to the previous study in Ethiopia [28]. In contrast, the comparatively low satisfaction of participants with the nurses' care coordination after discharge was reported with high satisfaction (2.31 ± 1.33) in Saudi Arabia [29]. The high satisfaction of participants with the nursing care, yet nurses need to implement the best practices in the care coordination of patients. To improve standardization and protocol, the study findings suggest to maximize healthcare workforce to increase the effectiveness of patient care coordination within the hospital as well as after their discharge. The hospital administration needs to reassess the nurses' allocation and nurse-patient ratio for better managing the scheduling of their patients' needs [30]. Additionally, when the nurse-patient ratio improves, it provides sufficient time to nurses to reassure patients about the procedure explanation and other healthcare implementations [31]. The present study generates the literature for the local context and policymakers to direct the resources and attention toward further improvement in nursing quality care for their patients.

This study is limited by its cross-sectional design and use of convenience sampling, which restrict causal inference and generalizability of the findings. Data were collected from a single tertiary care hospital and relied on patient self-reports, which may introduce response bias. Future studies should adopt multicenter and longitudinal designs to better explore trends and determinants of patient satisfaction over time. Additionally, interventional research evaluating nursing workforce optimization and care coordination strategies may further enhance nursing care quality and patient outcomes.

CONCLUSIONS

In conclusion, the study demonstrates a high level of patient satisfaction with nursing care, with most participants rating their experience as "Very Good" to "Excellent." No significant associations were observed between satisfaction and patients' sociodemographic characteristics. Nurses' responsiveness, skills, and competence were identified as key strengths, while areas for improvement include time management, care coordination, and clear communication of procedures. These findings underscore the importance of supporting and optimizing nursing practices to enhance patient-centered care.

Authors' Contribution

Conceptualization: SUR
Methodology: SUR, IU, BI
Formal analysis: SUR, SA, AUS
Writing and Drafting: SUR, IN, IU, SA, AUS, BI
Review and Editing: SUR, IN, IU, SA, AUS, BI

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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Original Article

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Factors Associated with Sleep Patterns Among Nursing Students: A Cross-Sectional Analysis of Public and Private Colleges

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ABSTRACT

Sleep is a worldwide public health concern and a cost to society. Sleep deprivation can affect people of all ages and demographics. **Objectives:** To analyze the factors associated with sleep patterns among nursing students at a public and private sector nursing college, Karachi. **Methods:** A cross-sectional analytical study design was used to conduct this study in public and private sector nursing schools. A stratified random sampling technique by lottery method was used. The sample size was calculated by using the software "PASS", Version 2021. The calculated sample size was 264, with 80% of power, and 95% confidence interval, and 5% margin of error. This study involved BS Nursing students because they are representative of the target population. To maintain consistency and focus, post-RN and midwifery students were excluded. The study was completed in three months, from July to October, 2025. The Sleep Hygiene Index was utilized to gather the data. The 13 items are scored on a five-point Likert scale ranging from 0 to 4, with higher scores denoting poor sleep hygiene. Every item represents a certain sleep-related activity. **Results:** The majority of participants (72.7%) fall into the good category (23.1%). Individuals were categorized as having normal sleep hygiene, indicating a moderate level of adherence to sleep hygiene guidelines. Only (4.2%) reported poor sleep hygiene, which is indicative of inadequate sleep-related practices. **Conclusions:** There is a difference in sleep patterns in terms of gender and age, and poor sleep affects their academic performance and health quality.

INTRODUCTION

Sleep is a worldwide public health concern and a cost to society. Sleep deprivation can affect people of all ages and demographics. The reversible condition of decreased reactivity to outside stimuli, marked by an altered level of consciousness and unique patterns of brain activity [1]. Sleep is one of the fundamental biological necessities, as essential as food, drink, and air [2]. The individual timing for going to bed and waking up is referred to as the sleep pattern. Furthermore, a circadian rhythm is an internal, natural mechanism that is regulated by a circadian clock that repeats approximately every 24 hours and controls the cycle of sleep and wakefulness [3, 4]. Quality of sleep is an essential component of a healthy sleep schedule, and chronic sleep deprivation is linked to poorer health among teenagers and young college students. Medical sciences students, who have stress due to exams, suffer serious consequences to their health [5]. Inadequate sleep causes more weariness, irritation, and dysfunction during the day [6]. 40–55% of medical and nursing students self-report having sleep issues [7]. Widespread sleep issues are among medical students in China, 25%, and in Iran, at about 58% [8, 9]. Europe has been found to have the worst sleep quality of any continent [10]. Multiple research studies have been conducted in Pakistan, including Karachi, Peshawar,

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and Islamabad, reported the prevalence (>76%), (52.8%), (69.1%), respectively [11, 12].

Sleep disturbances and poor sleep hygiene are increasingly recognized as significant concerns among nursing students due to academic stress, irregular schedules, and lifestyle factors. Although several international studies have examined sleep patterns in medical and nursing students, evidence comparing sleep hygiene across public and private nursing institutions in Pakistan remains limited. Furthermore, the influence of demographic and educational factors on sleep patterns has not been sufficiently explored using standardized assessment tools. Addressing this gap is essential to inform targeted interventions that support students' academic performance and overall well-being. This study aimed to analyze the factors affecting sleep patterns among nursing students at public and private nursing colleges in Karachi, Pakistan.

METHODS

A cross-sectional analytical study was conducted at both public and private sector nursing colleges. A stratified random sampling was utilized by using a lottery-style randomization process. The sample size was calculated by using the software "PASS." Version 2021, using a one-sample t-test with 80% power, 95% CI, 5% margin of error, with a mean score of 32.63 ± 7.05. Assuming a mean score of 34, the calculated sample size was 210. By adding 20%, the final sample size was 264, divided into two equal strata. This study included BS Nursing students who were willing to participate, and post-RN and midwifery students were excluded. The study was finished in three months, from July to October, 2025. The (SHI) was utilized to gather the data. This tool was developed by Shahid A in 2006 and has been widely used. The 13 items were scored on a five-point Likert scale and had 3 categories. Scores below 26 are considered good, 27-34 are considered normal, and scores above 35 are considered a poor sleep hygiene score and show adequate validity and reliability (Cronbach's alpha of 0.64–0.89). For the current sample, Cronbach's alpha is 0.706. Permission was granted from the IRBs of designated institutes, and written informed consent was obtained from the study participants. The data were analyzed by using SPSS version 26.0, and descriptive statistics were summarized by frequency and percentage. Kolmogorov-Smirnov test was applied, reported (p=0.091) for homogeneity of variance, Levene's test was used, categories in continuous data, so an independent t-test, and one-way ANOVA was used.

RESULTS

The study included a total of 264 participants; 100% response rate was observed. In terms of the sector, (50.4%) of the respondents were from private institutions, and nearly half (49.6%) were from public institutions. Approximately (8.0%) of participants were older than 25, while (92.0%) of participants were 25 years of age or younger. According to gender, there were more female participants (64.0%) than male participants (36.0%). The participants were distributed equally among the first, second, third, and fourth years of the academic year (25.0%)(Table 1).

Table 1: Socio-demographic Characteristics of the Participants

Characteristics	n (%)
Sector	
Public	131 (49.6%)
Private	133 (50.4%)
Age	
≤ 25 Years	243 (92.0%)
> 25 Years	21 (8.0%)
Gender	
Male	95 (36.0%)
Female	169 (64.0%)
Academic Year	
1st Year	66 (25.0%)
2nd Year	66 (25.0%)
3rd Year	66 (25.0%)
4th Year	66 (25.0%)
Family Type	
Single Parent	42 (15.9%)
Nuclear Family	114 (43.2%)
Joint Family	108 (40.9%)
Marital Status	
Single	234 (88.6%)
Married	30 (11.4%)

The Sleep Hygiene Index (SHI) scores of the research participants are shown in the figure. Three categories, good, normal, and poor sleep hygiene, are used to classify the data. The majority of participants (72.7%) fall into the good category, demonstrating that they continue to follow good sleep habits. A smaller subset of (23.1%) individuals were categorized as having normal sleep hygiene, indicating a moderate level of adherence to sleep hygiene guidelines. Only (4.2%) people reported poor sleep hygiene, which is indicative of inadequate sleep-related practices. (Figure 1).

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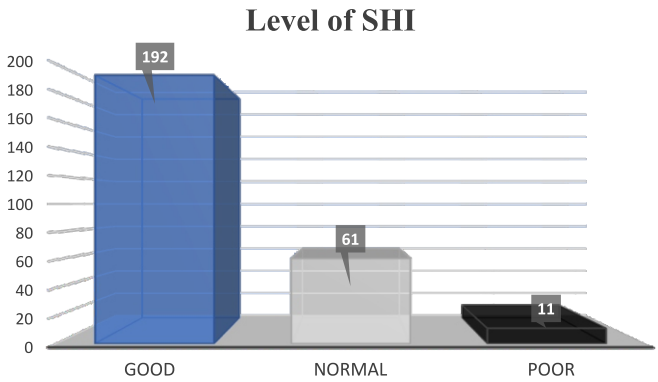

Figure 1: Displays the Level of Sleep Hygiene Index of the Participants

There were no statistically significant differences found when mean scores were compared across participant characteristics. The scores of students from public colleges (21.09 ± 7.25) and colleges that are private colleges (21.42 ± 9.07) were similar (p=0.74). Male had a slightly higher mean score than female, but gender differences were similarly not statistically significant (p=0.07). Students from single-parent households (19.88 ± 9.43), nuclear families (21.21 ± 7.35), and joint families (21.83 ± 8.55) demonstrated comparable results, and family type did not significantly affect the scores (p=0.42). Similarly, marital status did not correlate with significant differences (p=0.14) (Table 2).

Table 2: Comparison of Mean Scores Across Participant Characteristics

Characteristics	Mean ± SD	p-value	Mean Diff (95% CI)	Cohen's d/η2
Sector				
Public	21.09 ± 7.25	0.74†	-0.33 (-2.32-1.66)	0.040
Private	21.42 ± 9.07			
Age				
≤ 25 Years	21.42 ± 8.15	0.27†	2.03 (-1.63-5.71)	0.249
> 25 Years	19.38 ± 8.76			
Gender				
Male	22.57 ± 9.46	0.07†	2.04 (-1.69-4.26)	0.251
Female	20.52 ± 7.34			
Family Type				
Single Parent	19.88 ± 9.43	0.42‡	–	–
Nuclear Family	21.21 ± 7.35			
Joint Family	21.83 ± 8.55			
Marital Status				
Single	21.52 ± 8.07	0.14†	2.32 (-0.80-5.45)	0.283
Married	19.20 ± 9.08			

† Independent t-test, ‡ One-way ANOVA

DISCUSSION

This study assessed factors affecting sleep among nursing students, in terms of demographic characteristics, 64% were female, 36% were male. Similar results were reported in a previous study, where 68% of participants were female [13]. In this study, male had a slightly higher mean score (22.57 ± 9.46) than females (20.52 ± 7.34). Another study found that 73% of male students had poor sleep quality, suggesting that male and female students may experience different sleep disturbances [14]. The age distribution appeared to have an impact on sleep habits. 80% of undergraduate students on sleep hygiene and factors influencing sleep were between the ages of 18 and 24, which is similar to the findings of the present study, which is 92% [15]. On the other hand, another study found that participants over the age of 25 had poor sleep, suggesting that sleep disturbances may appear differently in different age groups [16]. Family type did not significantly affect the scores (p=0.42). A study found that the majority, 43.2% of participants, were from nuclear families and proposed that the family environment may influence stress levels and lifestyle choices, which may have an effect on sleep [17]. Conversely, a study found that students from joint families slept poorly and were more stressed than those from nuclear families [18]. In this study marital status did not correlate with significant differences (p=0.14), while the mean score of single participants was slightly higher (21.52 ± 8.07) than that of married participants (19.20 ± 9.08), similarly study agreeing with the current research, discovered that most students 88.5% were unmarried and that marital status had no obvious impact on sleep quality [19]. In contrast, another investigation found that 46.8% of single students had poor sleep quality compared to 21.4% of married students [20]. Although the current study's results differed from previous research, which discovered that nearly 55% of nursing students had moderate to poor sleep hygiene, in contrast to the bar chart's typically high-quality levels [21].

This study is limited by its cross-sectional design, which prevents causal interpretation of associations between demographic factors and sleep patterns. Data were collected from nursing colleges in a single city and relied on self-reported measures, which may be subject to recall and response bias. Future studies should employ longitudinal or multicenter designs to better capture changes in sleep behavior over time. Additionally, interventional research focusing on sleep hygiene education and stress management programs may help improve sleep quality among nursing students.

CONCLUSIONS

The findings of the study conclude that there is a difference in sleep patterns in terms of gender; male participants reported poorer sleep quality, and age has also affected sleep quality, and this poor sleep affects their academic performance and health quality.

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Authors' Contribution

Conceptualization: SK
Methodology: SG, SJ, NG
Formal analysis: SK, RS, SG
Writing and Drafting: SK, RS, NY, KM, NG
Review and Editing: RS, NY, SK, SG, KM, SJ, NG

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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Systematic Review

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Balancing Work and Motherhood: A Scoping Review on the Experiences and Challenges of Breastfeeding Working Mothers in Pakistan

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ABSTRACT

Breastfeeding is an essential public health practice that supports optimal well-being among mothers and infants. **Objectives:** To map current evidence on working mothers' experiences, challenges, and facilitators related to breastfeeding in Pakistan, and to identify successful workplace interventions and policy gaps. **Methods:** This systematic literature search was conducted in PubMed, CINAHL, Scopus, Web of Science, and Google Scholar for studies published between 2019 and 2024. Following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews), qualitative, quantitative, and mixed-method empirical studies were included, while reviews, commentaries, and non-peer-reviewed articles were excluded. Fifteen studies met the inclusion criteria after screening 1,727 records. **Results:** Four major themes were identified: (1) structural and institutional barriers such as short maternity leave, lack of lactation rooms, and rigid work schedules; (2) cultural and social constraints including stigma and awkwardness in the workplace; (3) organizational and supervisory support, including managerial backing, flexible work policies, and child-care facilities; and (4) policy and advocacy gaps caused by weak enforcement of labor laws and limited employer awareness. Only 20–25% of establishments provided lactation support, and most mothers discontinued exclusive breastfeeding within 8 to 12 weeks after returning to work. **Conclusions:** Institutional, cultural, and policy-level determinants affect breastfeeding continuation among working mothers in Pakistan. Policy enforcement, work accommodations, and organizational support practices are essential. A multi-sectoral effort with policy reform, education, and advocacy can foster breastfeeding-supportive work environments and enhance maternal and child health.

INTRODUCTION

Breastfeeding is widely recognized as one of the most cost-effective interventions to promote child and maternal health globally [1]. It offers the best nutrition and boosts immunity, which minimizes infant morbidity and mortality. Nevertheless, one of the greatest factors in the early breastfeeding cessation is the possibility of returning to work [2]. In many low- and middle-income countries, including Pakistan, structural, cultural, and workplace barriers hinder working mothers from maintaining breastfeeding [3]. International agencies like the WHO and UNICEF suggest exclusive breastfeeding for the first six months of the life of an infant, and additional breastfeeding with complementary feeding until two years of age or more [4]. Even with these well-defined guidelines, most women fail to maintain breastfeeding because of early workforce re-entry and insufficient support systems in the workplace. This is worsened by restrictive maternity leave policies, non-availability of breast pump facilities, and no provision

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for milk storage facilities in the workplace [5]. Employers often believe that accommodations made for breastfeeding mothers will cost them more in productivity and money and overlook the numerous benefits to maternal-infant health and organization productivity, including better employee retention rates, less absenteeism because of child illness, and improved maternal mental health, all of which contribute to higher overall productivity. The World Health Organization recommends exclusive breastfeeding for the first six months of life [6, 7]. In Pakistan, even with national policies encouraging maternal and child health, the enforcement of breastfeeding-friendly workplace practices is not consistent. Most workplaces have no designated areas, flexible working schedules, or managerial accommodation [8]. The discrepancy between policy and practice points to the importance of evidence-based interventions and better enforcement of current labor protections. International evidence indicates that effectively designed lactation programs, good maternity protection legislation, and organizational cultures that support these practices have been shown to increase breastfeeding duration and improve mothers' satisfaction [9]. But in South Asia, and indeed in Pakistan, gender norms, economic pressures, and the general lax enforcement of labor legislation remain major challenges [10]. This scoping review intends to integrate qualitative and quantitative literature to chart existing evidence on breastfeeding working mothers' experiences and challenges in Pakistan, in the context of global and regional situations. The review is particularly interested in knowing the barriers, facilitators, and policy-related determinants of breastfeeding continuation and which workplace interventions are effective in supporting working mothers. The purpose of the review was to synthesize the literature on the issue and reveal the problems working mothers have regarding the continuation of exclusive breastfeeding after work, the role of workplace policies, and the interventions that can be used to assist them. The review outcomes to be achieved included: Delve into the issues of working women who struggle to continue with exclusive breastfeeding after going back to work. Evaluate the effects of workplace attributes on breastfeeding continuity, including maternity leave, lactation services, and work flexibility. Determine workplace interventions and policy programs that can be effective in encouraging, protecting, and assisting working mothers to breastfeed.

Despite growing recognition of breastfeeding's health benefits, working mothers in Pakistan face substantial structural, cultural, and policy-related barriers that hinder exclusive breastfeeding continuation. Existing literature is limited, often urban-focused, and predominantly cross-sectional, providing insufficient insights into long-term experiences and the effectiveness of workplace interventions. There is a clear need to synthesize current evidence to identify gaps in policy implementation, organizational support, and cultural practices affecting breastfeeding among working mothers. This review aimed at synthesizing available literature on the experience, difficulties, and facilitators of this process for the continuation of exclusive breastfeeding done by working mothers in Pakistan.

METHODS

The literature review was conducted to locate the relevant studies that would answer the given research question on the experience, challenges, and enablers of breastfeeding among working mothers in Pakistan. The PRISMA-ScR was used to develop the search strategy so that it would be methodologically transparent and reproducible. The systematically searched electronic databases were PubMed, CINAHL, Scopus, Web of Science, and Google Scholar, where peer-reviewed literature published during 2019 to 2024 was searched. It was searched with the following Boolean operator (changed according to the syntax of each database): (breastfeeding) OR (exclusive breastfeeding), or (lactation), and (working mother* OR employed women) or (working mother* OR employed women) or (nursing mother* OR employed women) or (program* OR maternity leave). Some other Medical Subject Headings (MeSH terms) like Breastfeeding, Working Women, and Employment were added in PubMed and Scopus to further increase the search. Empirical studies that utilized qualitative, quantitative, or mixed-method designs and were in the English language were filtered. Non-peer-reviewed articles, such as editorials, commentaries, reviews, and so on, were eliminated. The first search gave 1,727 records, and after the elimination of duplicates, 1,130 articles were left. Title and abstract screening narrowed down to 572 studies related to the topic, where 55 full-text articles were evaluated as eligible. Only 20–25% of establishments provided lactation support, as reported in included studies by Gebrekidan et al. and Jiravisitkul et al. [11, 12]. After a careful selection using inclusion criteria, 15 studies were incorporated into the ultimate synthesis. A PRISMA flow diagram illustrates the stepwise process of article identification, screening, eligibility assessment, and inclusion (Figure 1).

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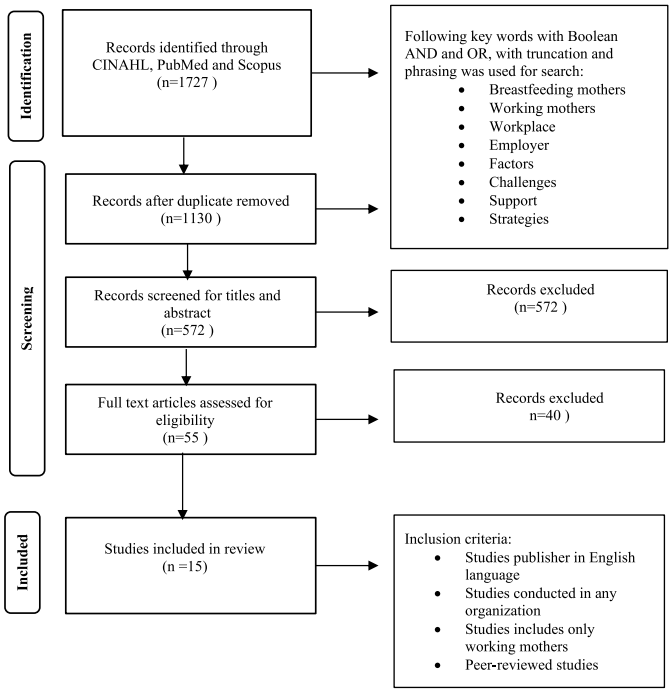

Figure 1: PRISMA Flow Diagram

Data Extraction Process

An extraction form was designed, which was standardized to maintain consistency and accuracy among included studies. The form has included author, year, study design, population, setting, sample size, methodology, and main findings about the experiences and challenges of breastfeeding among working mothers. In the case of qualitative and mixed-method research, thematic aspects were also coded with an existing coding framework. Two reviewers were used to extract the data, and any disagreements were discussed to achieve reliability.

Quality Appraisal

Even though a formal quality appraisal is not required in scoping review, a crude methodological rigor evaluation was done to enhance the plausibility of the synthesis. Qualitative studies were done using the Critical Appraisal Skills Programme (CASP) checklist, whereas quantitative and mixed-method designs were assessed by the Mixed Methods Appraisal Tool (MMAT). Only studies fulfilling minimum methodological transparency, ethical, and data reporting criteria were incorporated into the final synthesis.

Quantitative Summary

Even though the majority of the incorporated articles were qualitative, quantitative outcomes have been summarized in a systematic manner to determine the numerical trends and patterns. Quantitative results like exclusive breastfeeding rates, breastfeeding support in the workplace, and post-working periods. Indicatively, research by Jiravisitkul et al. and Gebrekidan et al. [11, 12] has indicated that merely 20-25% of workplaces had lactation facilities and about 65-80% of mothers did not continue to breastfeed exclusively during the 8-12 weeks they returned to work. These numerical variables give us a brief picture of the tangible effects of workplace variables on breastfeeding continuation.

RESULTS

A total of one thousand seven hundred and twenty-seven records were initially identified through database searches (PubMed, CINAHL, Scopus, Web of Science, and Google Scholar). After the elimination of 597 duplicates, 1,130 distinct records were left to screen. After title and abstract screening, 572 studies were considered as being relevant and were subjected to full-text evaluation. Among them, 15 studies passed the inclusion criteria and were incorporated in the final synthesis. The reasons the other studies were excluded were that they lacked focus on working mothers (n=18), were not based in a non-Pakistani setting(n=11), were not empirical(n=6), and the study lacked methodological rigor or duplication (n=5). Among the 15 included studies, 8 were identified as qualitative designs (in-depth interviews, focus groups, phenomenology), 4 were quantitative cross-sectional surveys, and 3 adopted both mixed-method designs. The research was published between 2019 and 2024; most of the research was conducted in the cities of Karachi, Lahore, and Islamabad, where the majority of women are employed in healthcare, education, and private office settings. The sample sizes were between 20 and 400 respondents. The vast majority of the research focused on those mothers who returned to work within 36 months after giving birth, and not all of them excluded employers or supervisors to obtain organizational views. Popular methods included structured questionnaires on breastfeeding duration, workplace support, and maternal satisfaction, as well as qualitative research on the lived experiences and sociocultural restrictions(Table 1).

Table 1: Summary of Studies

Sr. No.	References	Study Designs	Setting / Participants	Key findings
1	[3]	Mixed-method	Garment Workers, Bangladesh	Low early initiation and EBF continuation
2	[4]	Qualitative Study	Nurses, Pakistan	Explored breastfeeding experiences after returning to clinical duty
3	[11]	Quantitative Study	Hospital Workplace	Support is strongly linked with longer breastfeeding duration

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4	[12]	Systematic Review	LMIC-Employed Mothers	Only 20–25% workplaces provided support
5	[13]	Qualitative Study	Employed Mothers	Explored enablers/barriers for continuation
6	[14]	Systematic Review	Global	Interventions improved breastfeeding rates
7	[15]	Dissertation	Nairobi	Workplace support influences EBF
8	[16]	Mixed Method	Maldives	Weak maternity leave enforcement
9	[17]	Review	Global	Workplace factors affect milk expression
10	[18]	Mixed Study	Pakistan	Breastfeeding is not supported in most workplaces
11	[19]	Qualitative Study	Qatar	Cultural barriers identified
12	[20]	Qualitative Study	Usa	Managerial attitudes affect breastfeeding
13	[21]	Quantitative Study	Healthcare Workers	Workplace support increased satisfaction
14	[22]	Qualitative Study	Pakistan	Maternity leave policy implementation issues
15	[23]	Cross-sectional Study	Malaysia	Knowledge gaps regarding lactation areas

Theme 1: Structural and Institutional Barriers

In most of the research, the primary structural obstacles were noted to be short maternity leave, absence of lactation rooms, and rigid work hours [11]. It was found that the lactation support was given in only 20-25 % of the workplaces and that employees in the private sector had more difficulties than those working in a governmental facility. These limitations tended to make mothers quit exclusive breastfeeding in 8-12 weeks after they went to work.

Theme 2: Cultural and Social Constraints

Some of the barriers to continuation of breastfeeding were reported to include cultural conservatism and social expectations. Most mothers were ashamed or deemed breastfeeding in the workplace to be unprofessional [12]. Stigma and guilt, along with the pressure to adapt to family and peer expectations, were all factors that led to stress in working mothers. Female colleagues and supervisors were also supportive and reduced such issues, and encouraged breastfeeding.

Theme 3: Organizational and Supervisory Support

Breastfeeding practices were highly affected by organizational culture. Consistently, enablers were positive managerial attitudes, flexible working hours, and the availability of exclusive lactation areas. Research also showed that on-site childcare and paid lactation breaks could get mothers to extend their breastfeeding to a maximum of six months after childbirth [13].

Theme 4: Gaps in Policy and Advocacy

The Labor Code of Pakistan has provided 12 weeks of maternity leave, a mandatory provision, although it is not fully enforced, particularly in the private sector. Legally, there is no provision for breastfeeding breaks or lactation rooms [13]. The lack of advocacy and poor awareness of the employers also contribute to the inability to implement policy [24]. India and Bangladesh have provided comparative evidence to demonstrate that policy compliance may be enhanced by government-backed incentives and employer education efforts. The literature worldwide also indicates that workplace accommodation, paid leave, and childcare centers improve maternal satisfaction and length of time breastfeeding [25, 26].

DISCUSSION

The scoping review offers an integrative insight into the complex experiences of breastfeeding working mothers in Pakistan. The review serves as a synthesis of the research findings published in the last five years (2019-2024), which can help understand the effect of institutional structure, sociocultural norms, organizational support, and policy implementation on the capacity of mothers returning to work to maintain breastfeeding. In the literature reviewed, the lack of proper maternity leave, lactation space, and strict work hours always stood out as the primary obstacles to the continuation of exclusive breastfeeding. It is consistent with the results of other low- and middle-income nations (LMICs), where workplace infrastructure and policy enforcement remain low [14, 27]. In Pakistan, the lack of long maternity leaves after the legally required 12 weeks usually drives mothers to go back to work too soon, which invalidates the WHO advice of six months of exclusive breastfeeding. These findings are also reflected in India and Bangladesh, where policy-practice gaps also exist despite the existence of maternity protection systems in the country [28]. The consequences are enormous: the rates of breastfeeding cessation are insurmountably high when a mother returns to the rigid workplaces in the lack of lactation support, amounting to around 8-12 weeks after birth. Such structural inadequacy not only impacts maternal confidence but also reduces the child's health outcomes, which are immunity and growth [29-31]. Workplace stigma and cultural conservatism were also identified as obstacles to breastfeeding. Most mothers viewed breastfeeding in the workplace as unprofessional or inappropriate, creating psychological discomfort and guilt. These obstacles reflect reports from other patriarchal cultures, where professional norms and modesty are pitted against mothers' needs [20]. Supervisor and peer encouragement were found to facilitate these obstacles, highlighting the value of manager and peer support networks to normalize breastfeeding activities. Organizational culture became an imperative factor when it comes to determining breastfeeding continuation. Generous management, work arrangements, and the availability of personal areas were associated with extended breastfeeding periods [21]. The international studies also support this finding by

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confirming that organizational support, not individual motivation, is a predictor of successful results in breastfeeding [32]. Such programs as on-site childcare, lactation breaks, and supervisor training were also discovered to create inclusive settings that promote the well-being of mothers and infants. There is a significant restriction in terms of inconsistent policy enforcement on maternity protectors. Even though the Labor Code of Pakistan provides 12 weeks of maternity leave, it is not well implemented, particularly in the private organizations [22, 33]. There is also the lack of mandatory breaks to breastfeed and specially designated lactation zones, which makes the problem even more severe. A lack of coordination between health, labor, and social welfare sectors slows down translation of policies [34, 35]. Existing comparative data of South Asia indicate that government-based programs of incentives and certification of employers, to become breastfeeding-friendly, can achieve a high level of compliance and satisfaction. Pakistan can also follow the same models by having public-private partnerships and enhanced advocacy. Engaging knowledge gaps were also found during the review. The majority of research was cross-sectional and concentrated in urban settings, which did not offer a lot of information about the rural setting. The future studies ought to use longer-term oriented designs and mixed-method designs to test the impacts of workplace interventions in the long-term, as well as include the opinion of employers and policymakers. On the policy front, policy-makers are invited to incorporate the aspects of breastfeeding support in the labor legislation- the availability of lactation rooms, flexibility of time schedules, and paid breastfeeding breaks. Also, the sociocultural stigma should be removed by including national education and awareness efforts to empower working women via mentorship and peer-support channels. Although this review has its strong points in pulling together existing national and international evidence, there are a few limitations that need to be noted. First, there can be potential publication bias because only the English-language, peer-reviewed studies were incorporated, and this could have omitted the local or grey literature. Second, the evaluation of studies written in languages other than English was not conducted, which might restrict the level of evidence. Third, even though the independent validation was conducted in the process of data extraction and synthesis, the qualitative themes interpretation process could not but presuppose the use of subjective judgment, which could lead to reviewer bias. Lastly, the urban-biased nature of studies limits the externalization of the study to rural residents. These limitations are important to identify to contextualize findings and priorities in future research.

This review is limited by its focus on English-language, peer-reviewed studies, predominantly conducted in urban areas, which may not reflect rural experiences. Future research should adopt longitudinal and mixed-method designs, include rural populations, and assess the long-term impact of workplace interventions. Policymakers and organizations could benefit from studies evaluating the effectiveness of breastfeeding-friendly policies and culturally sensitive programs to support working mothers nationwide.

CONCLUSIONS

This scoping review emphasizes that continuation of breastfeeding among working mothers in Pakistan is affected by interrelated institutional, cultural, and policy-related determinants. In spite of the common awareness of the benefits of breastfeeding, insufficient workplace facilities, poor enforcement of policies, and sociocultural impediments exist. Increasing the enforcement of labor laws, promoting health-enhancing work environments, and encouraging employer support are essential to perpetuate breastfeeding practices. An integrated, multi-sectoral strategy involving policy reform, education, and organizational commitment is needed to promote maternal and child health outcomes.

Authors' Contribution

Conceptualization: AGA, SC
Methodology: AGA, SC
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Writing and Drafting: AGA, SC, AAA, YT
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All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

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