

Health personnel practices regarding Environmental precautions in the Delivery Room

Abstract

Background: Delivery room is one of the most dangerous clinical settings. The healthcare-associated infections (HAIs) have a high incidence rate and pose a threat due to the simultaneous susceptibility of both the parturient mother and the new born.

Objective: This research was an attempt to determine the practice of health personnel in relation to delivering room environmental precautions in four Middle Euphrates teaching hospitals (Al-Najaf, Karbala, Babylon, and Diwaniyah) in Iraq and to determine substantial differences in the quality of practice in these governorates.

Method: Methods A cross-sectional study, which was descriptive in nature, was undertaken using a purposive sample. The sample size was 124 health workers in the four hospitals of the study that have delivery rooms. Data were observed with the help of a structured observation checklist with 11 environmental hygiene items scaled out of three points (1=Poor, 2=Fair, 3=Good).

Findings: Environmental practices were found to be poor in Al-Najaf (M.S = 1.636) and moderate at Babylon M.S human of environmental practices was unsatisfactory at Al-Najaf (M.S = 1.636) and satisfactory at Babylon (M.S = 1.931), Diwaniyah (M.S = 1.913), and Karbala (M.S = 2.194). The shortages were consistently observed in the cleanliness of waste receptacles, the hygiene of dispensers, and the hygiene of pillow covers. in several governorates. The score of four governorates in terms of environmental practice ($F = 147.929, p = 0.001$).

Conclusions: The study conclude the need to have standardized regional protocols, routine auditing programs and delivery room specific in-service training programs personnel.

Keywords: Health Personnel, Delivery Rooms, Environmental Health, Infection Control, Medical Waste Disposal.

Introduction

The delivery room is a highly unstable and risky clinical setting where contact with blood and body fluids is an inseparable characteristic of typical obstetrics[1]. The uncontrollable character of labor and delivery that often implies surgeries intrusive monitoring and considerable exposure to fluids provides such conditions which increase the risk of contamination and pathogen transmission[2, 3]. In that respect, the introduction of strict environmental and spillage measures is not a formal requirement but a basic element of patient safety and workplace health security[4]. These are necessary to protect the patients, the healthcare workers and support staffs against exposure to dangerous biological agents [5].

Healthcare-associated infections (HAIs) are among the largest and most avoidable risks in the contemporary hospital environment [6]. The delivery room compounds this risk because two highly susceptible patients, the parturient mother and the newborn, occupy the same environment at the same time. Delivery room environment also contains blood and body fluids potentially hosting a variety of harmful pathogens in the first place being bloodborne viruses such as hepatitis B virus (HBV), hepatitis C virus (HCV), and the human immunodeficiency virus (HIV)[7, 8]. Lack of environmental precautions and compliance with infection control may hence lead to dire and potentially fatal outcomes to both patients and health workers[9, 10].

The burden of the underlying problem is considerable. According to the World Health Organization's Global Report on Infection Prevention and Control, out of every 100 patients in acute-care hospitals approximately seven in high-income countries and fifteen in low- and middle-income countries acquire at least one healthcare-associated infection, and close to a quarter of all hospital-treated sepsis cases are healthcare-associated[11]. In the obstetric population specifically, maternal sepsis underlies roughly one in ten maternal deaths, and the WHO Global Maternal Sepsis Study estimated that about 70 pregnant or recently pregnant women per 1000 live births develop infections requiring hospital management [12, 13]. Infection acquired around the time of childbirth is therefore a leading contributor to maternal and neonatal harm, and one that is largely preventable.

Observing the set standard precautions is the primary barrier to the delivery room contamination. Such measures include the appropriate and regular use of personal protective equipment (PPE) such as gloves, gowns and masks and eye protection, safe use and disposal of sharps and immediate and effective response actions in case of blood or body fluid leakage[14-16]. Within the broader infection prevention and control (IPC) agenda, however, environmental cleaning has received comparatively little attention. The recent CLEAN Group Consensus concluded that environmental cleaning is substantially neglected in terms of knowledge, practice and capacity building, particularly in resource-limited settings, and called for urgent investment in standards, system strengthening and behaviour change [17]. Monitoring data are consistent with this conclusion. The WHO/UNICEF Joint Monitoring Program reported that in the sixty countries and territories classified as fragile

contexts, only about one third of healthcare facilities had a basic environmental cleaning service and only one quarter had basic waste-management services [18].

The success of environmental and spillage precautions is eventually based on the knowledge, attitudes and practices of health personnel who operate in the delivery room. Frequent education on the best practices in infection prevention and control (IPC) with clear institutional policies and oversight by the supervisors are key requirements needed to reach and maintain high compliance levels[15, 19]. Healthcare organizations and policymakers should therefore invest in on-going professional development initiatives that would prepare the delivery room staffing (midwives, nurses, physicians) with the skills to meet the environmental safety standards in a challenging clinical environment [20, 21].

Although the significance of environmental precautions in the delivery room is well established, the results based on the low- and middle-income countries (LMICs), such as Iraq, indicate that the adherence to the IPC guidelines is still uneven in most healthcare facilities. The resource limitations, lack of workforce, inadequate training, and institutional control have been defined as the major obstacles to adoption of proper environmental hygiene practices in the obstetric environment. To resolve these issues, the systematic and context-specific evaluation of the existing practices among health personnel should be conducted to identify the gap and guide the specific quality improvement initiatives.

In Iraq specifically, the available evidence remains fragmented: previous local studies have examined delivery-room waste management [22], hand hygiene among nurse-midwives [22] and the infection-prevention knowledge of midwifery staff [23], but almost all have been confined to a single hospital or a single governorate and have relied predominantly on self-reported rather than directly observed practice. To the best of our knowledge, no published study has used a standardized direct-observation instrument to compare delivery-room environmental practice across several governorates simultaneously. Policymakers are consequently unable to determine whether observed shortfalls are facility-specific problems, amenable to local managerial correction, or system-wide deficiencies requiring a national response. This distinction has direct implications for how limited resources should be targeted.

The present study was designed to address that gap. Its aim was to assess health personnel practices regarding environmental precautions in the delivery rooms of the Middle Euphrates Teaching Hospitals (Al-Najaf, Karbala, Babylon and Al-Diwaniyah governorates). The specific objectives were: (i) to describe, by direct observation, the level of environmental precautionary practice among physicians and midwives working in these delivery rooms; (ii) to identify the specific environmental hygiene items on which performance is weakest, and to determine whether the same items recur across governorates; and (iii) to test the null hypothesis that there is no statistically significant difference in the mean overall environmental practice score among the four governorates. By comparing practice across institutions and identifying the principal gaps, the study contributes to the evidence base for

advancing maternal and neonatal safety in Iraqi obstetric care and offers actionable recommendations for policymakers, hospital administrators and clinical educators.

Methodology

Study Design

The design of the study was a descriptive cross-sectional. The given design was deemed reasonable due to the purpose of the study, which was to determine and describe the existing practices of health staff in terms of environmental precautions in the delivery room at a specific point in time without any experimental manipulation of the variables. Following ethical approval obtained on June 12, 2025, data were gathered from a sample of 120 health staff across four hospitals in different provinces, spanning a period from September 1, 2025, to January 31, 2026."

Study Setting

The current study was done in four Maternity and Child Health Teaching Hospitals in the Middle Euphrates Region of Iraq. These are large referral hospitals in their respective governorates where obstetric/neonatal care is provided and are connected to local academic medical centers. There were four study sites: Al-Najaf Teaching Hospital, Karbala Teaching Hospital, Babylon Teaching Hospital and Al-Diwaniyah Teaching Hospital. Data collection was conducted in the delivery rooms of each of the facilities used as the specific clinical setting.

Study Sample

The sampling strategy adopted was the total coverage; the entire midwives and physicians actively engaged in the delivery rooms of the four study hospitals were enrolled in the study. This method was chosen to prevent the selection bias, as well as to obtain a complete representation of the healthcare workforce in the study settings. The target population of the final study sample was 124 health personnel (N=124), who were spread across the four governorates Al-Najaf (n=20, 16.1%), Al-Diwaniyah (n=25, 20.2%), Babylon (n=33, 26.6%), and Karbala (n=46, 37.1%). The main sample was not included in the participants of the pilot study.

Sample size

No sample-size formula was applied, as no sampling was performed. Instead, a total population (census) approach was utilized, enrolling every physician and midwife assigned to the delivery rooms who met the study's inclusion and exclusion criteria across the four hospitals during the study period (N = 124).

Method of Data Collection

Two complementary methods were used to collect data. The direct structured interviews with the participating physicians and midwives provided the socio-demographic

information and were conducted by the researcher using the designed questionnaire. Systematic direct observation of the respondents in the course of the routine clinical practice within the delivery room was used to gather data related to the health personnel practices with the help of the structured observational checklist. This two-fold strategy made sure that both self-reported demographic data and objective data of behavior were taken correctly and consistently.

Data Collection Instrument

A structured instrument that was created by the researcher after a comprehensive examination of the corresponding scientific literature and the corresponding published researches was used in the collection of data. The tool was made up of two sections: A. Part One - Socio-Demographic Characteristics: The part included six questions that were aimed at capturing the personal and professional background of every participant, such as age, marital status, educational level, general work experience years and years of delivering experience in a delivery room environment. B. Part Two — Observational Checklist of Environmental Practices: An observational checklist with a structure was applied to assess the compliance of healthcare providers with environmental safety measures in the delivery room. This checklist was divided into two major areas, the first one covered the management of biological hazards such as bloodborne pathogens and fluid spillages (including 5 criteria), the second one covered the areas of general environmental maintenance and hygiene (including 11 criteria). The measurement of practice proficiency was done on a modified three-point likeness scale (Yes = 3, No = 2 and No/Applicable [N/A] = 1). In order to determine reliability of the observations, every participant was observed on three different episodes of clinical conditions, with the last score displaying the average of the three observations.

Validity of the Instrument

Two consecutive processes were carried out to determine the validity of the study instrument. To begin with, translation of the items of the questionnaire was done by a professional translator who had specialized knowledge in health survey instruments. A back-translation of the translated version to English by another independent translator was then done to get any discrepancy corrected so that conceptual equivalence can be established between the versions of the language. Second, a panel of twelve experts including academic and clinical health professions was used to evaluate the content validity of the instrument. The expert panel was invited to evaluate each item for clarity, relevance, and adequacy in achieving the study objectives. Feedback from the panel was systematically reviewed, and appropriate modifications were incorporated into the final version of the instrument prior to data collection.

Pilot Study

A pilot study was conducted prior to the commencement of the main data collection phase to test the feasibility and adequacy of the research instrument. A purposive sample of ten health personnel was selected from Al-Zahra Teaching Hospital for Maternity and Pediatrics

in Al-Najaf Governorate. Participants in the pilot study were subsequently excluded from the main study sample.

The pilot study was designed to achieve the following objectives:

1. To verify the clarity and content adequacy of the study instrument and identify any items requiring revision.
2. To determine the reliability of the instrument prior to full-scale administration.
3. To estimate the average time required for each interview and observation session; each interview was found to require approximately 15 to 25 minutes, while the observation component required an unlimited and variable duration depending on clinical activity.
4. To identify any logistical or procedural barriers that might be encountered during the main data collection process.

Reliability of the Instrument

Cronbach alpha coefficient was used to measure the internal consistency of the study instrument because it is already a well-known index of reliability of multi-item assessment instruments. The alpha coefficient of Cronbach of the practices subscale of the instrument was $r = 0.78$. This is an acceptable range of reliability in health and social science studies ($r \geq 0.70$) showing that the instrument had good internal consistency and thus could be used in the primary study. The reliability statistics are presented in Table 1.

Ethical consideration

Ethical approval was taken from the ministry of health in Iraq .Participants were assured that participation was totally voluntary and that they will not be affected in any way if they choose not to participate in the study. They were also assured that information obtained will be treated with utmost confidentiality.

Results

The largest proportion of participants were from Karbala Teaching Hospital (46, 37.1%), followed by Babylon, Al-Diwaniyah, and Al-Najaf. The result illustrate that the majority (42.7, $n=53$) were between 31-40 years old. In the other hand the highest percentage of study participant of the participants were secondary midwifery school graduates (80, 64.5%), while the physicians were (30, 24.2%). As shown in table (1)

Table 1. Distribution of Study Subjects According to Their Demographic Data (N=124)

Demographic Data	Rating and Intervals	Frequency	Percent (%)
Hospital	Al-Najaf	20	16.1
	Al-Diwaniyah	25	20.2

Age / Years	Babylon	33	26.6
	Karbala	46	37.1
	Less than 20	3	2.4
	20-30	28	22.6
	31-40	53	42.7
	41-50	27	21.8
	More than 50	13	10.5
Level of Education	Physician	30	24.2
	Secondary midwifery school	80	64.5
	Secondary nursing school	9	7.3
	Diploma of nursing	5	4.0
Marital Status	Single	18	14.5
	Married	101	81.5
	Divorced	3	2.4
	Widowed	2	1.6
Years of Experience	Less than 5 years	53	42.7
	5-10 years	26	21.0
	More than 10 years	45	36.3
Years in Delivery Room	Less than 5 years	59	47.6
	5-10 years	28	22.6
	More than 10 years	37	29.8

Regarding the overall evaluation of health staff environmental practices by governorate which shown in table (۷) the result demonstrate that Al-Najaf recorded a poor overall rating, with all 20 participants (100%) falling within the poor category. While Karbala achieved a fair overall rating with 84.8% rated as fair. In the other hand Babylon also achieved a fair rating with 87.9% fair. Also, Diwaniyah likewise recorded a fair evaluation with all participants in the fair category. None of the studied governorates achieved a good overall rating, underscoring a region-wide gap in the implementation of recommended infection prevention standards within delivery room settings.

Table ۷. Overall Environmental Practices Evaluation by Governorate

Governorates	Levels	Frequency	Percent (%)	M.S	Evaluation
Al-Najaf	Poor	20	100	1.63	Poor
	Total	20	100	1.63	
Karbala	Good	7	15.2	2.19	Fair
	Fair	39	84.8	2.19	
	Total	46	100	2.19	
Babylon	Fair	29	87.9	1.93	Fair
	Poor	4	12.1	1.93	
	Total	33	100	1.93	

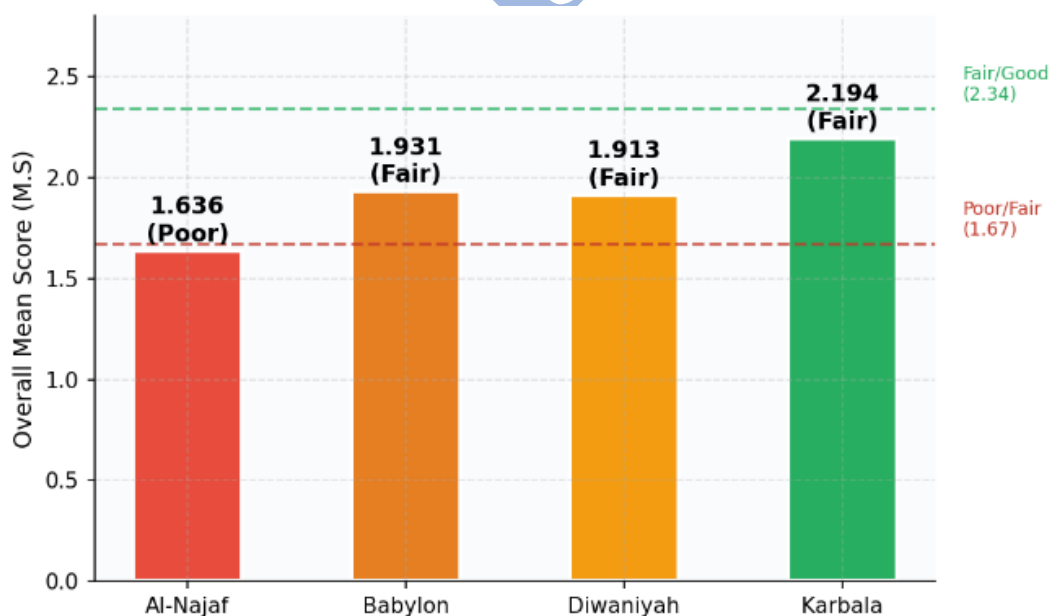
Diwaniyah	Fair	25	100	1.91	Fair
	Total	25	100	1.91	

The one-way ANOVA were used to comparing mean environmental practice scores across the four governorates as shown in table (۳) The results reveled a highly statistically significant difference between all hospitals, Where Karbala recorded the highest mean, followed by Babylon, Diwaniyah, and Al-Najaf. These findings are visually presented in Figure 1. This most considerable statistical difference validates the fact that the quality of environmental precautionary practices is significantly different in hospitals in the Middle Euphrates region. This variation indicates the differences in management of the hospitals, the availability of the resources, the training of the staff, the supervision and highlights the critical importance of the unified regional framework on the delivery room environmental hygiene.

Table ۳. Mean Differences in Overall Environmental Practices Across Governorates (ANOVA)

Governorates	N	Mean	Std. Deviation	Std. Error	F	p-value
Al-Najaf	20	1.636	0.001	0.001	147.929	0.001 HS
Karbala	46	2.194	0.118	0.017	147.929	0.001 HS
Babylon	33	1.931	0.140	0.024	147.929	0.001 HS
Diwaniyah	25	1.913	0.018	0.004	147.929	0.001 HS

Figure 1. Overall Mean Environmental Practice Score by Governorate



Discussion:

The results of the current research have critical information on the activities of health staffs with respect to environmental precautions in the delivery room of the Middle Euphrates Teaching Hospitals. The demographic information of the research sample (n=124) demonstrates that most of the participants (42.7% of the total) belonged to the age range of 31-40 years. This age distribution aligns with the workforce distribution in the given healthcare setting and other comparable healthcare settings in developing countries in which mid-career professionals are the majority of clinical personnel (Al-Lami et al., 2020). The high percentage of secondary midwifery school graduates (64.5) indicates the current education facility in the area, with the secondary level midwifery programs being the main entry to the maternity care. This is in line with results of other governorates in Iraq, whereby such educational trends have been observed among obstetric health workers[24].

In marital status, the majority of the participants (81.5) were married, which is a typical demographic attribute among the Iraqi healthcare workforce and may be a cultural and social response of the region. Also, the sample size showed 42.7 percent less than five years of professional experience, whereas 47.6 percent less than five years of working experience in the context of the delivery room environment. The comparatively high percentage of lower-experienced employees is another important factor to be considered because previous studies have shown a high correlation between clinical experience and compliance with the practice of infection control and environmental hygiene[25]. Novice healthcare workers may be less familiar with standardized protocols and institutional guidelines, underscoring the need for structured orientation programs and ongoing training.

Novice healthcare employees might not be as conversant with standard procedures and institutional rules, which emphasize the importance of pre-orientation programs and continuous training. In terms of the precautionary measures put towards the environment, the findings of Table 3 revealed that there was a variation in the four governorates examined. The general environmental practices were rated to be poor (M.S = 1.636) in Al-Najaf, and poor scores were recorded on the items concerning tidiness and cleanliness of the overall environment, dispensers and holders, waste receptacles, and pillow covers. Those gaps are of specific clinical interest, as poorly maintained delivery room settings are linked with high rates of healthcare-associated infections (HAIs), such as puerperal sepsis and neonatal infections[26]. The low quality of work in Al-Najaf could be explained by the lack of resources, staffing shortage, and lack of institutional control over the environmental hygiene standards. By comparison, Karbala had more favorable environmental practices (M.S = 2.194, Fair), with good scores achieved on the items regarding the overall outlook of the environment, the condition of floors, the freshness of fabrics, and the care and upkeep of

medical equipment. The findings indicate that the healthcare institutions in Karbala can be improved by more organized cleaning procedures or resource distribution to address environmental hygiene. Nonetheless, at Karbala, there were still shortcomings in the issues of cleanliness of pillow covers which was rated lowly. This is especially interesting considering the fact that poorly covered pillows may also act as a source of pathogens and lead to cross-contamination of patients [27]. The results of the study highlight the necessity of standard practices across all the governorates, and in particular, high touch surfaces and items that contact patients.

The level of environmental practice quality was similar in Babylon (M.S = 1.931, Fair) and Diwaniyah (M.S = 1.913, Fair) and fair scores were found in most of the items evaluated. Nonetheless, Diwaniyah made low scores on items referring to dispensers and holders and the cleanliness of waste receptacles, which reflects the areas of weakness of Al-Najaf. Inadequate waste management within clinical facilities is identified as one of the risk factors of environmental pollution and the dissemination of multidrug-resistant organisms (MDROs) [28]. The problem of poor performance in waste management in several governorates appears to be systemic and therefore needs focused policy intervention.

The general assessment in Table 3 establishes that the health staff practices in Al-Najaf on environmental precautions were rated as poor and Babylon, Diwaniyah and Karbala as rated as fair. These results align with the general evidence in the Eastern Mediterranean and Middle Eastern areas, where researchers have reported moderate to low adherence rates to the environmental hygiene standards in the labor and delivery departments [29]. The fact that the fair ratings in three out of four governorates are the minimal compliance standards, however, does not meet the requirements suggested by the international organizations such as the World Health Organization and the Centers for Disease Control and Prevention, as both organizations propose strict adherence to the terms of environmental cleaning within high-risk clinical units such as delivery rooms[5, 26]

The statistical analysis provided in Table 4 indicated that the difference in the health staff environmental practices in the four governorates under study was highly significant ($F = 147.929$, $p < 0.01$). This statistically significant difference indicates the effect of the institutional, geography, and resource-based factors on the practices of the clinical environment. The difference in governorates can indicate the variation in the quality of management of hospitals, accessibility of cleaning materials and equipment, the level of training of the staff, and the level of supervisory control. The same inter-institutional variability in infection control practices has been reported in other settings in the low- and middle-income countries, with healthcare quality indicators being significantly affected by local governance and resource allocation [30] These results point to the necessity to adopt a unified national model of environmental hygiene in Iraqi maternity care facilities.

As shown in Table 5 the statistical result indicated that there was a very significant difference in the health staff environmental practices between the four analyzed governorates ($F = 147.929$, p less than 0.01). This statistically significant difference shows that institutional, geographic, and resource-based factors have an impact on clinical environmental practices. The gap between governorates could be the variation in the quality of hospital management, cleaning supplies and equipment, level of staff training, and supervisor level. This inter-institutional variation in infection control has also been found to be similar in other low- and middle-income country environments where the quality indicators of healthcare are closely linked to local governance and resource distribution [30]. These results highlight the need to have a uniform national model of environmental hygiene in Iraqi maternity care facilities.

Limitations

1. Geographical and Institutional Scope: The research was limited to four teaching hospitals in the Middle Euphrates region (Al-Najaf, Karbala, Babylon, and Diwaniyah). Therefore, the results may not be fully representative of environmental hygiene standards in non-teaching hospitals, rural primary healthcare centers, or other regions of Iraq.
2. The study utilized a structured observation checklist with 11 specific environmental hygiene items. While comprehensive, this tool may not have captured every nuance of infection control, such as the quality of chemical disinfectants used or the frequency of air filtration maintenance.

Future Scope

1. Future studies should investigate the direct correlation between environmental hygiene scores and the incidence of healthcare-associated infections (HAIs), specifically focusing on neonatal sepsis and maternal puerperal fever in the Middle Euphrates region.
2. Conducting longitudinal research could determine if the "fair" and "poor" practices observed are consistent over time or if they fluctuate based on seasonal hospital admissions and staffing shifts.
3. Qualitative research involving interviews with midwives and physicians could identify the specific socio-economic or psychological barriers—such as burnout, lack of resources, or insufficient institutional support—that hinder adherence to international standards.
4. There is a scope for developing a standardized national framework for delivery room environmental hygiene in Iraq, aligning local practices with World Health Organization (WHO) and CDC guidelines.

Conclusion:

The general assessment of the health staff practices in terms of environmental precautions in the delivery room was poor in the Al-Najaf (M.S = 1.636), fair in

Babylon (M.S = 1.931), Diwaniyah (M.S = 1.913), and Karbala (M.S = 2.194). The overall rating of all the studied governorates was not very good, which means that the level of environmental precautionary practices is not as high as it should be in the study area. Certain gaps were always traced in various governorates, especially in terms of the cleanliness of waste receptacles, the preservation of dispensers and holders, and the utilization of washable impervious pillow covers. The statistical difference among the four governorates was found to be very high ($F = 147.929$, p under 0.01), which confirmed the role of the institutional and resource-related factors in the performance of environmental hygiene. The percentage of less than five years of work in the delivery room is also quite significant, thus, there is a necessity of systematic training and supervision to fill the gaps in environmental hygiene compliance.

Ethical consideration

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was officially obtained from the Institutional Review Board / Ethics Committee at the Scientific Affairs Department, University of Alkafeel, Najaf, Iraq (Approval No. UAK/EC/5/2017, Project No. 140, dated June 12, 2025).

Official administrative permissions were also secured from the Directorate General of Health in the Middle Euphrates Governorates and the administrations of the participating teaching hospitals.

Prior to data collection, written informed consent was obtained from all participating health personnel after thoroughly explaining the study's objectives, benefits, and the voluntary nature of participation. Participants were assured that their responses would remain strictly confidential and anonymous, used solely for scientific research purposes, and that they maintained the right to withdraw from the study at any time without any negative consequences.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Authors' Contribution

1. The main idea and manuscript writing methodologist, who is responsible for designing the research, has contributed to the methodological section of the piece through their efforts.
2. The individual responsible for crafting the first section of the piece is referred to as the introduction writer, the individual responsible for the analysis of the data presented in the article, as well as the formulation of the findings section, is the data analyst.
3. The discussion author, who was tasked with composing the discussion section of the article, is the individual under consideration.

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