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Assessment of Infection Prevention and Control Practice among Health Care Obstetrics and Gynecology Department at Benha University Hospital

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Abstract

Background: Hospital-acquired infection (HAI) remains a widespread challenge for hospitals worldwide. **Aim:** This study evaluates the knowledge and practices regarding Infection Prevention and Control (IPC) among healthcare workers (HCWs) within the Obstetrics and Gynecology Department at Benha University Hospital and identifies factors influencing their adherence to IPC best practices. **Patients and methods:** This cross-sectional observational design was employed, targeting HCWs in the department. The research used a bilingual knowledge questionnaire and an audit checklist to measure participants' understanding of IPC (covering basic guidelines, device-associated care, and occupational health) and their compliance with 11 standard procedures such as hand hygiene, PPE usage, sterilization, and urinary catheter maintenance. A scoring system was implemented to assess both knowledge and practical performance, with all procedures approved by the Ethics Committee and participants providing informed consent. **Results:** Among the 30 participants, 36% had attended IPC training. The results indicated variability in knowledge and practice levels: hand hygiene (26%), proper use of Personal Protective Equipment (32%), respiratory cough etiquette (24%), proper linen handling (34%), equipment reprocessing (32%), waste management (30%), environmental cleaning and disinfection (26%), aseptic technique (30%), prevention of sharp injuries (26%), and patient placement (28%). Additionally, 34% exhibited the availability of an IPC guideline manual, 28% had access to an Infection Prevention & Control Nurse, and 14% exhibited receiving direct input from the IPC Nurse. **Conclusion:** IPC training significantly enhanced compliance in key areas such as aseptic technique and environmental cleaning. These findings support the role of targeted IPC training in improving practice and suggest that further research across different settings is warranted.

Key words: Aseptic Technique, Compliance, HCWs, Infection Control, Training

Introduction

Hospital-acquired infection (HAI) represents a global challenge faced by hospitals worldwide. In the obstetric setting, obstetricians and maternity nurses hold a critical role in mitigating these infections. [1]

The economic impact of HAIs is significant, encompassing not only direct expenses incurred by hospitals due to extended hospital stays and readmissions but also indirect costs borne by communities and individual patients. [2] Moreover, HAIs pose a serious health burden globally; the World Health Organization reports that approximately 7.1 million HAI cases occur annually, with one in every 20 individuals affected, ultimately resulting in roughly 99,000 deaths each year and imposing an annual societal cost of $32 million. [3] Infections during pregnancy are notably common, attributed in part to alterations in cell-mediated immunity among pregnant women. [4]

Although advancements in healthcare and global efforts have led to reductions in maternal mortality, sepsis remains one of the leading preventable causes of maternal death. A significant number of postpartum infections occur after women are discharged from the hospital, typically within the first 24 hours following childbirth. [5] Sepsis accounts for approximately 10.0% of maternal deaths globally [6], and studies from developed nations have revealed an increase in sepsis-related maternal morbidity from 0.1 to 0.6 cases per 1,000 deliveries. [7]

During childbirth, there is a high risk of introducing wounds and infections in the genital tract. While the contribution of sepsis to maternal death varies across studies, one study exhibited that it was responsible for 41.9% of maternal deaths. [8]

Infections contracted during childbirth are a frequent cause of maternal illness and death. Globally, enhancing the quality of care during labor and immediately after birth could potentially prevent up to 1.49 million maternal and neonatal deaths, including stillbirths. [9]

Infection control is a top priority in labor and delivery units. [10] Infection prevention and control (IPC) includes all measures, both technical and material, aimed at preventing the introduction and spread of pathogens within the body. [10]

Across Africa, healthcare-associated infections (HAIs) pose a pressing challenge, with prevalence rates alarmingly spanning from 10.0% to 60.0%. These infections silently rank as the third leading cause of maternal deaths, the second leading contributor to early neonatal fatalities, and the foremost trigger of postoperative complications. Country-specific data paints a stark picture: 10.9% in Senegal, 12.0% in Côte d'Ivoire, 10.0% in Benin, 14.0% in Mali, and a striking 23.7% in Burkina Faso. [11] Reducing infection rates among parturient women requires the implementation of a robust IPC program. Evidence strongly supports that when qualified infection control practitioners are actively engaged within healthcare settings—and when adherence to established

precautions is ensured—patient outcomes significantly improve. [12]

It is therefore essential that healthcare workers (HCWs) possess the necessary knowledge and skills to uphold high standards of care. This includes the consistent application of thorough infection control practices throughout the delivery process to ensure safe and effective maternal care. Given that women in labor and delivery units are particularly vulnerable to HAIs, strict compliance with IPC protocols is crucial. Among these, hand hygiene stands out as the most effective measure for preventing HAIs. [13]

A systematic review of procedures, workflows, and infection control practices within delivery units is essential to uncover contributing factors to infection development. Such insights are invaluable for shaping strategies to prevent HAIs among laboring women. [14]

Accordingly, this study evaluated IPC knowledge and practices among HCWs in the obstetrics and gynecology department at Benha University, and to identify key factors influencing their compliance with best IPC practices.

Patients and Methods

This study was conducted as a cross-sectional observational investigation targeting healthcare professionals in the Obstetrics and Gynecology Department at Benha University Hospital From 2024 to 2025. The study population included physicians and nurses working within the department. Throughout the research process, ethical considerations were carefully observed. All collected data were kept strictly confidential, and participant identities were anonymized in all documentation and reports. Prior to participation, each individual received a clear explanation of the study's aims and procedures, and informed consent was obtained accordingly. Additionally, ethical approval was secured from the Ethics Committee**(MS 52-1-2023)** of the Faculty of Medicine at Benha University.

To collect data, the researchers employed two primary tools. The first was a structured knowledge questionnaire, which was prepared in both Arabic and English to accommodate participants' language preferences. This questionnaire consisted of two main sections. The first section gathered demographic and professional details such as participants' age, gender, place of residence, job title (e.g., specialist or consultant), years of work experience, and prior attendance at IPC training sessions. The second section was designed to assess the participants' theoretical knowledge related to IPC measures. It was developed by the research team based on relevant literature to ensure that essential aspects of infection control were thoroughly addressed. This part included questions on disinfection, sterilization, waste management, hand hygiene practices (timing and techniques), isolation precautions, and the correct use of personal protective equipment (PPE), including gloves, gowns, masks, protective eyewear, and boots. It also covered safe

handling of contaminated materials, disposal of waste, and prevention of device-associated infections such as catheter-associated urinary tract infections (CAUTIs). Additional items assessed occupational health measures for HCWs, such as recommended vaccinations and personal protection from infection, along with IPC protocols specific to the antenatal, intrapartum, and postpartum periods—including the use of antiseptics during vaginal and instrumental procedures and guidelines for antibiotic prophylaxis.

Participants' responses were scored using a simple binary method, where each correct answer received one point, and incorrect or "don't know" responses received zero. The total knowledge score was calculated by summing the number of correct answers out of 26 possible, then converting this score into a percentage by dividing the sum by 26 and multiplying by 100.

The second tool used in the study was an observational audit checklist that evaluated actual clinical practices related to IPC. This checklist encompassed 11 key procedural areas relevant to infection control. The observation criteria included the proper technique and timing of hand hygiene, the use of gloves and protective gowns, appropriate donning of face masks and eyewear, and the wearing of protective footwear during labor. The tool also assessed practices related to equipment sterilization—specifically ensuring the use of a clean instrument set for each patient—as well as perineal hygiene techniques, proper disposal of sharps and general waste using a hands-free method, safe umbilical cord care using antiseptics prior to clamping, and the aseptic stabilization of cannulas. Furthermore, the tool included observation of pre-cleaning of contaminated tools and surfaces using either soap or disinfectant solutions.

Particular attention was given to urinary catheter insertion and maintenance, given the procedure's high infection risk in labor and delivery settings. The checklist assessed several indicators of best practice: confirming the medical necessity of catheterization, maintaining aseptic technique during insertion, properly securing the catheter to minimize urethral trauma, positioning the drainage bag correctly below the bladder and off the floor, ensuring unobstructed urine flow, and practicing hand hygiene before and after patient contact. Observers also recorded whether labeled individual collection containers were used and whether daily reviews were conducted to assess the continued need for catheterization.

To further support compliance with infection control protocols, a urinary catheter maintenance documentation form was utilized. This form included seven core bundle elements: clear documentation of the catheter's indication, presence of an intact tamper-evident seal, use of a securement device, performance of hand hygiene before patient interaction, daily hygiene of the meatal area with soap and water, proper technique in emptying the drainage bag using a clean container, and verification of continuous unobstructed urine flow. Each of

these elements was recorded as either "Yes" or "No," with the overall assessment guiding decisions about whether to retain or remove the catheter.

Statistical Analysis:

The collected data were carefully revised, checked for completeness, and subsequently coded for statistical analysis. The analysis was performed using the Statistical Package for Social Sciences (SPSS), version 21. Descriptive statistics, including the mean and standard deviation, were applied to summarize the data. For testing the significance of associations and differences between variables, appropriate statistical tests such as the Chi-square test, Monte Carlo's Exact test, and the Wilcoxon test were employed. A p-value of ≤ 0.05 was considered the threshold for statistical significance.

To identify predictors influencing the total post-intervention practice score among obstetricians, logistic regression analysis was conducted. The odds ratio (OR) and corresponding 95% confidence intervals (CI) were used to estimate the strength and precision of associations. Variables that showed statistical significance in the bivariate analysis were included in the regression model to determine their independent predictive value on practice outcomes.

Results

The participants in this study had an average age of 28.57 years, with a standard deviation of 6.81 years. In terms of gender distribution, 63% were male (19 individuals), while the remaining 37% were female. The residence data revealed an equal distribution, with 50% of participants residing in urban areas and 50% in rural regions. The average duration of professional experience was 5.8 years, accompanied by a standard deviation of 6.36 years (**Table 1**).

When assessing participants' knowledge and application of proper IPC practices, varying levels of adherence were observed. Correct hand hygiene practices were exhibited by 43.3% of participants, while 53.3% demonstrated appropriate use of PPE. Only 40% adhered to recommended respiratory cough etiquette, and 57% practiced proper handling of linen. Reprocessing of equipment was appropriately conducted by 53.3% of participants, and 50% followed correct waste management protocols. Additionally, 43.3% complied with environmental cleaning and disinfection guidelines, and 50% exhibited adherence to aseptic techniques. Prevention of sharp injuries was observed in 43.3%, and 47% appropriately addressed patient placement measures. Furthermore, 46.7% acknowledged the presence of an IPC guideline manual at their workplace, 36.7% exhibited having an Infection Prevention & Control Nurse in their facility, and only 16.6% indicated they had received guidance or input from such personnel (**Table 2**).

Regarding perceived barriers to effective IPC, 33.3% of participants identified lack of knowledge as a primary impediment. Other obstacles included lack of equipment (26.7%), lack of time (23.3%), forgetfulness (6.7%), and limited resources (10%) (**Table 3**).

The impact of IPC training was notable. Participants who had attended IPC-related training demonstrated significantly better practices in several key areas. These included respiratory cough etiquette (p = 0.0337*), proper handling of linen (p = 0.0359*), environmental cleaning and disinfection (p = 0.0151*), aseptic technique (p = 0.0251*), and prevention of sharp injury (p = 0.0151*). Although improvements in hand hygiene, PPE usage, equipment reprocessing, and waste management were also observed among trained individuals, these differences did not reach statistical significance. Notably, the presence of IPC-related structural supports, such as the guideline manual or access to an Infection Prevention & Control Nurse, showed no significant difference in influencing practice between trained and untrained groups (**Table 4**).

One of the most compelling findings was the significant reduction in lack of knowledge as a perceived barrier among those who had received IPC training (p = 0.0001*). Other exhibited barriers—including lack of time, equipment, forgetfulness, and inadequate resources—did not differ significantly between trained and untrained participants. This underscores the value of targeted IPC training in mitigating knowledge-related obstacles and enhancing adherence to infection prevention practices among HCWs (**Table 5**).

Table (1): Demographic data of participants.

	Value (N = 30)
Age (Years)	28.57 ± 6.81
Gender	
Male	19 (38%)
Female	11 (22%)
Residence	
Urban	15 (50%)
Rural	15 (50%)
Years of experience (Years)	5.8 ± 6.36

Table (2): Standered precautions knowledge among HCWS at ob/gy departments.

	Value (N = 30)
Hand hygiene	13 (43.3%)
Proper use of PPE	16 (53.3%)
Respiratory cough etiquette	12 (40%)
Proper handling of linen	17 (57%)
Reprocessing of equipment	16 (53.3%)
Waste management	15 (50%)
Environmental cleaning and disinfection	13 (43.3%)
Aseptic technique	15 (50%)
Prevention of sharp injury	13 (43.3%)
Patient placement	14 (47%)
Presence of IPC program at ob/gy department	
Presence of Infection Prevention & Control (IPC) guideline manual	14 (46.7%)
Presence of Infection Prevention & Control Nurse	11 (36.7%)
Input from Infection Prevention & Control Nurse	5 (16.6%)

Table (3): Self-exhibited factors impeding proper infection control practice

	Value (N = 30)
Lack of knowledge	10 (33.3%)
Physicians	6 (20%)
Nurses	5 (16.6%)
Lack of time	7 (23.3%)
Physicians	4 (13.3%)
Nurses	3 (10%)
Lack of equipment	8 (26.7%)
Physicians	3 (10%)
Nurses	6 (20%)
Forgetfulness	2 (6.7%)
Physicians	1 (3.3%)
Nurses	1 (3.3%)

Lack of resources	3 (10%)
Physicians	2 (6.6%)
Nurses	1 (3.3%)

Table (4): Comparison between attendance of IPC training and not regarding Knowledge.

	Attended IPC training (N = 18)	Not attended IPC training (N = 12)	P. Value
Knowledge and proper practice			
Hand hygiene	8 (44.44%)	5 (41.67%)	0.8855
Proper use of PPE	11 (61.11%)	5 (41.67%)	0.3121
Respiratory cough etiquette	10 (55.56%)	2 (16.67%)	0.0337*
Proper handling of linen	13 (72.22%)	4 (33.33%)	0.0359*
Reprocessing of equipment	12 (66.67%)	4 (33.33%)	0.0775
Waste management	8 (44.44%)	7 (58.33%)	0.4734
Environmental cleaning and disinfection	11 (61.11%)	2 (16.67%)	0.0151*
Aseptic technique	12 (66.67%)	3 (25%)	0.0251*
Prevention of sharp injury	11 (61.11%)	2 (16.67%)	0.0151*
Patient placement	10 (55.56%)	4 (33.33%)	0.2467
Presence of IPC			
Presence of Infection Prevention & Control (IPC) guideline manual	8 (44.4%)	6 (50%)	0.765
Presence of Infection Prevention & Control Nurse	6 (33.3%)	5 (41.7%)	0.642
Input from Infection Prevention & Control Nurse	4 (22.2%)	1 (8.3%)	0.317

Table (5): Comparison between attendance of IPC training and not regarding Factors impeding proper infection control practice

	Attended IPC training (N = 18)	Not attended IPC training (N = 12)	P. Value
Factors impeding infection control practice			
Lack of knowledge	**2 (11.11%)**	**9 (75%)**	**0.0001***
Lack of time	**4 (22.22%)**	**3 (25%)**	**0.866**
Lack of equipment	**5 (27.78%)**	**4 (33.33%)**	**0.7552**
Forgetfulness	**2 (11.11%)**	**0 (0%)**	**0.2467**
Lack of resources	**2 (11.11%)**	**1 (8.33%)**	**0.8119**

Discussion

Nosocomial infections remain a critical global health issue, significantly contributing to elevated patient morbidity, mortality, and healthcare costs. This concern is particularly pronounced in obstetric care, where nosocomial infections are a leading cause of maternal deaths. This study, conducted in the OB/GYN department of Benha University, sought to evaluate the knowledge and practices of healthcare workers (HCWs) concerning infection prevention and identify the factors influencing their adherence to infection control protocols. The study revealed that the average age of the participants was 28.57 years, with a standard deviation of 6.81 years. A majority of the participants (63%) were male, accounting for 19 individuals, while 37% were female. The residential distribution was well-balanced, with 50% living in urban areas and the other 50% residing in rural regions. The average years of professional experience among the HCWs was 5.8 years, with a standard deviation of 6.36 years.

These findings are consistent with those of **Wahdan and colleagues** [15] who assessed infection control knowledge and practices among obstetricians working in maternity hospitals. In their study, the participants had an average age of 29.85 years, with a standard deviation of 3.46 years. The gender distribution among the participants was 52.6% male and 47.4% female. The study also found that the average years of professional experience were 2.81 years, with a standard deviation of 4.60 years. Similarly, our findings are comparable to those of **Geberemariyam and colleagues** [16] , who evaluated the knowledge and practices of HCWs regarding infection prevention in healthcare settings. This study included 648 HCWs, with a notable response rate of 95.3%. The average age of participants in their study was 28.23 years (±5.2), with a majority of 68.8% male and 31.2% female. Furthermore, our findings are

in agreement with the work of **Sari and colleagues** [17], who investigated the knowledge, attitudes, and adherence to Universal Precautions (UP) among HCWs in the OB/GYN department of an Indonesian teaching hospital. This cross-sectional study included 524 HCWs, with an average participant age of 30.1 years and a standard deviation of 11.24 years. The gender distribution in their study revealed that 66% of the participants were male, and 34% were female.

In our study, the knowledge and adherence to proper infection prevention practices among participants were as follows: hand hygiene (43.3%), proper use of PPE (53.3%), respiratory cough etiquette (40%), handling of linen (57%), equipment reprocessing (53.3%), waste management (50%), environmental cleaning and disinfection (43.3%), aseptic technique (50%), prevention of sharp injuries (43.3%), and patient placement (47%). Furthermore, 46.7% of participants exhibited having access to an IPC guideline manual, 36.7% had an Infection Prevention & Control Nurse, and 16.6% received input from the IPC Nurse.

These results are in agreement with those of **Gul and colleagues** [18] half of their study participants (96 individuals) had undergone training in infection control practices. Among this group, a substantial 89.1% exhibited a strong understanding of hand hygiene protocols. Their research also revealed that 83.3% of healthcare workers (HCWs) were familiar with infection control guidelines, while an impressive 96.6% were knowledgeable about standard precautions. More specifically, 89.0% of healthcare professionals demonstrated comprehension of hand hygiene procedures, with 56.7% displaying an understanding of the correct techniques for handwashing. Furthermore, 58.9% of the participants were well-versed in cleaning and disinfection methods, while 81.8% were informed about proper waste disposal practices. On the other hand, awareness regarding sharp and needle stick injuries was relatively low, with only 20% of participants demonstrating knowledge in this area. Similarly, knowledge about PPE usage (30%) and safe injection practices (37%) was also limited. In alignment with these findings, our results are consistent with those from**Mutaru and colleagues** [19], who investigated the knowledge and factors influencing IPC compliance among nurses. They exhibited that 86.6% of participants had attended IPC training, and 79.9% demonstrated proper use of PPE. Our results also coincide with the work of **Aarthy and colleagues** [20], who assessed the knowledge and practices regarding IPC. They noticed that 134 students possessed adequate knowledge of standard precautions and hand hygiene, 143 had sufficient knowledge of cough etiquette and respiratory hygiene, and 115 understood the proper use of PPE. However, only 21 students consistently followed all 8 steps of handwashing.

In our study, 33.3% of the 30 participants identified lack of knowledge as a barrier, 23.3% exhibited a lack of time, 26.7% mentioned insufficient equipment, 6.7% attributed it to forgetfulness, and 10% pointed to a lack of resources.

These findings are in agreement with, **Chpfuwa and colleagues** [21] , who studied infection control practices in the maternity ward at Bindura Provincial Hospital. In their study, 22% of HCWs cited lack of knowledge as a barrier, while 17% exhibited lack of time, another 22% indicated lack of equipment, 2% attributed it to forgetfulness, 20% to lack of resources, and 17% to staffing shortages.

Furthermore, our results are consistent with those of **Kaur and colleagues** [22], who explored the barriers to IPC adherence. A majority of participants (56%) identified lack of training as a significant barrier, followed by issues such as unavailability of necessary infrastructure and equipment (37%), constantly changing guidelines (18%), high patient load (17%), lack of time to read lengthy guidelines (13%), difficulty remembering the guidelines (13%), and the perception that the guidelines were irrelevant (6%).

Our results were also consistent with the study by**Okon and colleagues** [23] , who assessed the availability of IPC protocols and facilities, the level of practice, and barrier perceptions among HCWs. They identified lack of knowledge (72.9%) and lack of resources (72.9%) as the most prevalent barriers to proper IPC practices, followed by lack of time (70.5%) and lack of equipment or materials (68.8%). Similarly, **Hassanin and colleagues** [24] studied infection control measures practiced by nurses in obstetric departments and noticed that 54.3% of nurses exhibited lack of time as a barrier, 71.4% mentioned lack of motivation, 60% indicated the absence of an infection control team, and more than half exhibited inadequate facilities.

In our study, participants who attended IPC training showed a significant improvement in practices related to respiratory cough etiquette ($p = 0.0337$), proper handling of linen ($p = 0.0359$), environmental cleaning and disinfection ($p = 0.0151$), aseptic technique ($p = 0.0251$), and prevention of sharp injury ($p = 0.0151$). Additionally, they exhibited higher percentages of knowledge and proper practice in hand hygiene, proper use of PPE (PPE), reprocessing of equipment, and waste management, although these differences were not statistically significant. The presence of IPC-related factors, such as an IPC guideline manual, the Infection Prevention & Control Nurse, and input from the Infection Prevention & Control Nurse, did not reveal significant differences between the two groups.

Our findings align with those of, **Shafea and colleagues** [25] who investigated the impact of an on-job training program on nurses' compliance and satisfaction with infection control measures in obstetric operating rooms. They noticed statistically significant improvements in HCWs' knowledge about infection control, handwashing, wearing protective clothing, safe injection practices, handling sharp instruments, waste disposal, disinfection, and sterilization after the training ($p \leq 0.001$). Similarly, **Wahdan and colleagues** [15] also noticed that participants who attended training demonstrated higher levels of knowledge and proper practice in areas like hand hygiene, PPE use, equipment

reprocessing, and waste management, with statistically significant results (p = 0.000).

In our study, the most notable finding was the significant reduction in the lack of knowledge as an impediment among those who had not attended training (p = 0.0001). However, other factors, such as lack of time, lack of equipment, forgetfulness, and lack of resources, did not show significant differences between the two groups. This underscores the potential impact of IPC training in overcoming knowledge-related barriers to proper infection control practices.

Our results also agreed those of Atalla and colleagues [26] , who exhibited significant differences between the groups in relation to knowledge gaps. They noticed a positive correlation between knowledge of infection prevention measures and adherence to these practices both immediately after and during follow-up. Similarly, Sannathimmappa and colleagues [27] noticed that IPC training led to a significant increase in participants' knowledge scores, with a marked improvement post-training (p < 0.001).

Conversely, Okon and colleagues [23] noticed no significant differences between groups regarding lack of knowledge, lack of time, and lack of resources, but noted a significant reduction in the lack of equipment. In their study, IPC practices were higher among participants who perceived these barriers as obstacles, possibly due to their belief in the magnitude of adhering to protocols using available resources.

Conclusion

IPC training led to significant improvements in certain aspects of practice, particularly in respiratory cough etiquette, proper handling of linen, environmental cleaning and disinfection, aseptic technique, and prevention of sharp injury. Therefore, we conclude that IPC training can significantly enhance infection control practices. Future investigation is recommended to verify these observations across various populations and clinical settings.

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