**Adherence to Infection Prevention and Control Measures among Nursing Students at Rivers State University, Nigeria**

**Abstract**

**Background:** Infection prevention and control (IPC) is a global health priority, especially in low- and middle-income countries where healthcare-associated infections are common. Nursing students, as future healthcare providers, are frequently exposed to clinical settings and must adhere strictly to IPC measures to prevent infection transmission.

**Objective:** This study assessed the level of adherence to IPC measures and examined factors influencing adherence among clinical nursing students at Rivers State University, Nigeria.

**Methods:** A descriptive research design was used, involving all 222 clinical nursing students from 300 to 500 levels through census sampling. Data were collected using a structured questionnaire (AIPCMNSQ) based on a validated standard precaution scale, with responses measured on a 4-point Likert scale. Data were analyzed using SPSS version 25, employing descriptive statistics (mean and standard deviation) and inferential statistics (simple regression and Pearson correlation).

**Results:** The study found a high overall adherence to IPC measures (Mean = 3.11 ± 1.04). Students regularly practiced hand hygiene, used gloves, and disposed of sharps properly. However, lapses were noted in recapping needles, reusing disposable PPE, and handwashing with water only. Influencing factors such as availability of materials, workload, supervision, and training were rated positively (Grand Mean = 2.89 ± 0.97). Despite this, no significant relationship was found between these factors and adherence level (r = 0.086, p = 0.202), suggesting other unmeasured factors may influence behavior.

**Conclusion:** Clinical nursing students showed high adherence to IPC measures, though some unsafe practices persist. As the identified factors did not significantly affect adherence, targeted interventions such as regular IPC training before each clinical posting and greater institutional support are recommended to strengthen compliance and safety in clinical practice.

**Keywords:** Adherence, Infection Prevention and Control, Nursing Students, Influencing Factors, Clinical Practice, Rivers State University

**Introduction**

**Introduction**
Infection refers to the invasion and multiplication of microorganisms in body tissues, which may be asymptomatic or cause localized tissue damage [8]. For centuries, infections have been among the leading causes of death and disability, and they continue to pose a significant threat to health and social progress globally [18, 21]. They are generally caused by bacteria, viruses, fungi, or parasites and can be transmitted directly from person to person or indirectly through vectors, animals, insects, or contaminated objects such as bedding, bedpans, and urinals. Clinical manifestations vary depending on the pathogen involved. While some infections are asymptomatic, common symptoms often include fever, fatigue, and other mild to severe signs [16]. According to the World Health Organization (WHO), infections remain the most frequent adverse events in healthcare service delivery, endangering both patients and healthcare workers. These infections lead to increased mortality and significant financial burdens on health systems [19]. Globally, in acute-care hospitals, seven out of every 100 patients in high-income countries and 15 in low- and middle-income countries acquire at least one healthcare-associated infection during their hospital stay. On average, one in every ten affected patients will die from such infections [22]. In Africa, limited data exist on the true burden of infections. However, available studies suggest that the prevalence is significantly higher than in developed countries [1]. In Nigeria, due to the complexity of diagnosing infections and the resource-intensive nature of surveillance and intervention efforts, the actual burden is often underreported or unknown [9]. Nevertheless, these infections can be prevented through strict adherence to evidence-based Infection Prevention and Control (IPC) measures [11]. IPC measures encompass strategies and practices designed to minimize the spread of infectious diseases in healthcare settings [23]. The Centers for Disease Control and Prevention (CDC) recommends key practices such as proper hand hygiene, use of universal precautions, cleaning and disinfection, sterilization of equipment, aseptic techniques, safe waste disposal, and patient isolation [4]. These practices are critical in safeguarding both healthcare workers and patients. The International Federation of Infection Control emphasizes that IPC is an essential component of healthcare systems, and adherence to standard guidelines by health personnel is strongly recommended [15]. Adherence refers to the degree of consistency in following prescribed protocols to achieve desired outcomes. In the context of IPC, adherence is vital to preventing healthcare-associated infections and ensuring the safety of both patients and healthcare workers [7]. Global data suggest that a well-implemented IPC program can reduce healthcare-associated infections by up to 70% [22]. Nursing students represent a vital part of the future healthcare workforce. During their clinical training, they spend substantial time interacting with patients, increasing their exposure to infectious risks [6]. Therefore, it is essential for nursing students to consistently follow IPC protocols. This not only protects them and their patients but also enhances their competence and preparedness as future healthcare providers. Despite the importance of IPC adherence, data on the level of compliance among nursing students at Rivers State University, Nigeria, is lacking. Furthermore, there is a general paucity of research on this topic in the region, particularly in the context of emerging and re-emerging infectious diseases. This gap underscores the need to investigate IPC adherence among nursing students at Rivers State University.

**Materials and Methods**

The methodology used for the study are explained under the following headings:

**Research Design**

The study adopted a descriptive research design. This design allows the investigator to describe specific variables related to the population under study without manipulating any independent variables.

**Area of the Study**

The study was conducted in the Department of Nursing Sciences, Rivers State University, a government-owned institution located at Nkpolu-Oroworukwo, Port Harcourt, the capital of Rivers State in Southern Nigeria.

**Population of the Study**

The target population comprised all 222 nursing students in the 300–500 levels of study at the Department of Nursing Sciences, Rivers State University, during the 2023/2024 academic session. These students were in the clinical phase of the nursing program, with a distribution of 93 in 300 level, 74 in 400 level, and 55 in 500 level.

**Sample Size/Sampling techniques**

A sample size comprising all 222 nursing students in the 300–500 levels of study at the Department of Nursing Sciences, Rivers State University, during the 2023/2024 academic session was utilized in the study using a census sampling technique. This represented 100% of the total population. This approach enhanced generalizability and eliminated sampling error and bias. The criteria for applying the census sampling technique are outlined under the inclusion criteria.

**Inclusion criteria**

1. Clinical nursing students in 300-500 levels of study at the Department of Nursing Sciences, Rivers State University.
2. Clinical nursing students willing and available to participate in the study.
3. Clinical nursing students not too ill to participate.

**Instruments for Data Collection**

A self-structured instrument titled Adherence to Infection Prevention and Control Measures among Nursing Students’ Questionnaire (AIPCMNSQ) was developed. The AIPCMNSQ consists of two main sections: A and B. Section A gathered demographic information from the respondents, while Section B focused on adherence to infection prevention and control (IPC) measures among nursing students in the Department of Nursing Sciences, Rivers State University.

Section B was further divided into two distinct sub-sections. The first sub-section contained 20 items (Items 1–20) assessing the level of adherence to IPC measures, while the second sub-section included 10 items (Items 1–10) evaluating the factors influencing adherence. Items 1–20 were rated using a 4-point Likert scale: Always (4 points), Sometimes (3 points), Seldom (2 points), and Never (1 point). Items 1–10 were rated on a different 4-point Likert scale: Strongly Agree (4 points), Agree (3 points), Disagree (2 points), and Strongly Disagree (1 point). Notably, Items 1–20 in Section B were adapted from an existing standard precaution scale [14].

The level of adherence to IPC measures was determined using a weighted mean score and interpreted as follows: Very High: 3.26 – 4.00, High: 2.51 – 3.25, Moderate: 1.76 – 2.50, Low: 1.00 – 1.75

**Methods of Data Collection**

Data were collected through face-to-face interactions following ethical approval from the Rivers State University Ethics Committee. Informed consent was obtained from all participants, and detailed instructions on completing the questionnaire were provided.

**Method of Data Analysis**

The collected data were analyzed using both descriptive and inferential statistical tools with the aid of the Statistical Package for the Social Sciences (SPSS), version 25. Demographic data were analyzed using simple percentages. Mean and standard deviation were used to answer research questions one and two. A simple regression model summary was employed to address research question three. The hypothesis was tested using the Pearson Product Moment Correlation Coefficient (PPMC) at a 0.05 level of significance.

**Results**

The results of the analysis of data are presented in Tables 1 to 5 below.

**Analysis of Demographic Data**

**Table 1: Percentage Distribution of Respondents by Gender, Age, Year of Study, Programme of Study, Religion and Marital Status**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Demographic details** | **Frequency** | **Percentage** |
|  | **Gender** |  |  |
| **1** | Male | 48 | 22 |
| **2** | Female | 174 | 78 |
|  | **Age** |  |  |
| **3** | 18-23 years | 138 | 62 |
| **4** | 24-29 years | 75 | 34 |
| **5** | 30-35 years | 9 | 4 |
|  | **Year of Study** |  |  |
| **6** | Year 3 | 93 | 42 |
| **7** | Year 4 | 74 | 33 |
| **8** | Year 5 | 55 | 25 |
|  | **Programme of Study** |  |  |
| **9** | Generic  | 211 | 95 |
| **10** | Post Basic | 11 | 5 |
|  | **Religion** |  |  |
| **11** | Christianity | 213 | 96 |
| **12** | Islam | 6 | 3 |
| **13** | Traditional | 3 | 1 |
| **14** | Others | 0 | 0 |
|  | **Marital Status** |  |  |
| **15** | Single | 209 | 94 |
| **16** | Married | 13 | 6 |
| **17** | Divorced | 0 | 0 |
|  | **Total** | **222** | **100** |

The data presented in Table 1 indicates that 48 (22%) of the total respondents were male and 174 (78%) were female nursing students. This implies that female nursing students were more in number than their male counterparts in the study. The data presented also shows that 138 (62%) of the total respondents were within 18-23 years, 75 (34%) were within 24-29 years and 9 (4%) were within 30-35 years of age. This implies that nursing students within 18-23 years of age were more in number than their other respondents in the study. The data further reveals that 93 (42%) of the total respondents were in year 3, 74 (33%) were in year 4 and 55 (25%) were in year 5 nursing students. This implies that nursing students in year 3, were more in number than their other colleagues in the study. The data presented still indicates that 211 (95%) of the total respondents were in generic and 11 (5%) were in a post basic programme of study. This implies that nursing students in the generic programme of study were more in number than those in the post basic programme of study. It was also revealed that, 213 (96%) of the total respondents were of Christianity, 6 (3%) were from Islamic religion, 3 (1%) were of Traditional religion and 0 (0%) were in other forms of religion. This implies that nursing students from Christianity religion were more in number than their other categories of respondents in the study. Finally, the data presented indicates that 209 (94%) of the total respondents were single, 13 (6%) were married and 0 (0%) were divorced/separated marital status nursing students. This implies that nursing students with single marital status were more in number than the other respondents in the study.

**Table 2: Mean and standard deviation scores of** **respondents on the level of adherence to IPC measures among nursing students**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **Level of adherence** | **Mean** | **SD** | **Decision** |
| **1** | I wash my hands between patients' care.  | 3.46 | .77 | Sometimes |
| **2** | I change gloves between patients' care. | 3.29 | .70 | Sometimes |
| **3** | I decontaminate my hands after patients care. | 3.62 | .66 | Always |
| **4** | I only use water for hand washing. | 2.73 | 1.10 | Sometimes |
| **5** | I use alcoholic hand rub as an alternative to soap and water if my hands are not visibly soiled. | 3.04 | .83 | Sometimes  |
| **6** | I cover my wound with waterproof dressing before caring for patients. | 2.92 | 1.17 | Sometimes  |
| **7** | I take a shower in case of extensive splashing even after I have put on personal protective equipment. | 2.54 | 1.21 | Sometimes |
| **8** | I wear gloves when I am exposed to body fluid, blood products and any excretion of patients. | 3.72 | .61 | Always  |
| **9** | I wear a face mask alone and sometimes in combination with goggles, face shield and apron whenever there is a possibility of splash or splatter. | 3.12 | .90 | Sometimes  |
| **10** | I wear a protective gown and apron when exposed to blood, body fluids and any patient excretion.  | 3.09 | 1.04 | Sometimes  |
| **11** | My mouth and nose are covered when I wear a mask. | 3.50 | .87 | Always  |
| **12** | I reuse a surgical mask and disposable personal protective equipment.  | 2.78 | 1.13 | Sometimes  |
| **13** | I remove personal protective equipment in a designated area. | 2.95 | 1.01 | Sometimes  |
| **14** | I decontaminate surfaces and devices after use. | 3.39 | .74 | Sometimes  |
| **15** | I wear gloves to decontaminate used equipment with visible soils. | 3.40 | .87 | Sometimes  |
| **16** | I clean up spillage of blood or other body fluids immediately with disinfectants. | 3.50 | .80 | Always  |
| **17** | I recap the needle after giving an injection. | 2.72 | 1.22 | Sometimes  |
| **18** | I put used needles and scalpels in a sharps box. | 3.58 | .70 | Always  |
| **19** | The sharp box is disposed of when it is full. | 1.54 | .75 | Seldom  |
| **20** | Waste contaminated with blood, body fluids, secretion and excretion are placed in red plastic bags irrespective of the patient’s infectious status. | 3.18 | .97 | Sometimes  |
|  | **Grand Mean/SD** | **3.11** | **1.04** | **High**  |

 N = 222; Weighted mean categories: “Very high: 3.26 - 4.00, High: 2.51 - 3.25, Moderate: 1.76 - 2.50, and Low: 1.00 - 1.75”.

The data presented in Table 2 reveals that, respondents’ always adhere to the items with mean scores of 3.62, 3.72, 3.50, 3.50 and 3.58. Regarding items with mean scores of 3.46, 3.29, 2.73, 3.04, 2.92, 2.54, 3.12, 3.09, 2.78, 2.95, 3.39, 3.40, 2.72, and 3.18, respondents affirmed adhering to these levels sometimes. Meanwhile, the respondents seldom adhere to the item statement with a mean score of 1.54. However, on the whole, the data revealed a grand mean score of 3.11. This implies that there exists a high level of adherence to IPC measures among nursing students at Rivers State University, Nigeria. Hence, the grand mean score of 3.11 falls within the high adherence range.

**Table 3: Mean and standard deviation scores of** **respondents on the factors influencing adherence to IPC measures among nursing students**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **Factors influencing Adherence** | **Mean** | **SD** | **Decision** |
| **1** | Unavailability of infection prevention and control materials  | 3.29 | .77 | Agree |
| **2** | Tasking nature of hand washing | 2.43 | .96 | Disagree |
| **3** | There is not enough time to practice IPC measure  | 2.64 | .98 | Agree |
| **4** | Unavailability of colour codes for waste disposal in the wards | 3.09 | .93 | Agree |
| **5** | Increased workload | 3.12 | .80 | Agree |
| **6** | Inconvenient location of washing hand stand and alcohol-based hand sanitizer | 2.66 | .95 | Agree |
| **7** | Lack of knowledge and training on infection prevention control measures before clinical posting  | 2.56 | 1.12 | Agree |
| **8** | Lack of superior support and supervision on infection prevention and control guidelines  | 3.03 | .89 | Agree |
| **9** | Negative role modelling from health personnel  | 3.02 | .90 | Agree |
| **10** | Poor nurse/patient ratio  | 3.01 | .95 | Agree |
|  | **Grand Mean/SD** | **2.89** | **.97** | **Agree** |

Cut-off average = 2.50; N = 222;

The data presented in Table 3 reveals that, all item mean scores except item 22 were greater than the cut-off mean score of 2.50 with mean scores of 3.29, 2.43, 2.64, 3.09, 3.12, 2.66, 2.56, 3.03, 3.02 and 3.01 respectively. This further implies that all items were accepted as factors influencing adherence to IPC measures except that of item 22. However, on the whole, the grand mean score of 2.89 was also greater than the cut-off mean score of 2.50 which implies that there exist positive factors influencing adherence to IPC measures among nursing students in the department of nursing sciences, Rivers State University.

**Table 4: Model summary of simple regression analysis of the correlation between level of adherence and factors influencing adherence to IPC measures among nursing students’**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **N** | **R** | **R2** |
| Level of adherence  | 222 | .086 | 0.0074 |
| Factors influencing adherence |  |  |  |

The data presented in Table 4 shows a correlation coefficient r-value of 0.086 with a correlation coefficient square (r2) value of 0.0074. This implies that the r-value of 0.086 depicts a weak positive correlation while the R2 value of 0.0074 indicates that .74% of the total variance of factors influencing adherence can be attributed to the level of adherence to IPC measures among nursing students. Consequent upon the relationship between the two variables, the Pearson Product Moment Correlation coefficient (PPMC) analysis was carried out in order to authenticate if the relationship is significant or not (see Table 5).

**Table 5: Pearson Product Moment Correlation coefficient (PPMC) analysis of the relationship between level of adherence and factors influencing adherence to IPC measures among nursing students’**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Level of****adherence** | **Factors influencing** **adherence**  |
| Level of adherence | Pearson Correlation | 1 | .086 |
|  | Sig. (2-tailed) |  | .202NS |
|  | N | 222 | 222 |
| Factors influencing adherence | Pearson Correlation | .086 | 1 |
|  | Sig. (2-tailed) | .202NS |  |
|  | N | 222 | 222 |

NS = Not Significant at 0.05 alpha level; Degree of Freedom (df) = 220; N = 222

The data presented in Table 5 reveals that, the Pearson Product Moment Correlation coefficient (PPMC) analysis is not significant at p < 0.05 alpha level, because the calculated p-value of .202 is greater than the criterion p-value of 0.05 alpha level with 220 degrees of freedom and correlation coefficient r-value of .086. Therefore, the null hypothesis, which states that, there is no significant relationship between level of adherence and factors influencing adherence to IPC measures among nursing students in the department of nursing sciences, Rivers State University is accepted.

**Discussion**

#### ****Level of Adherence to IPC Measures among Nursing Students****

Table 2 revealed a high level of adherence to infection prevention and control (IPC) measures among nursing students, with an overall mean score of 3.11 indicating strong compliance. This supports the conclusion that nursing students significantly contribute to infection control efforts. Common adherence practices reported as “always” performed included: decontaminating hands after patient contact, wearing gloves when exposed to bodily fluids, using masks properly, cleaning blood or fluid spills with disinfectants, and disposing of sharps in designated containers. Practices reported as sometimes performed included: washing hands between patients, changing gloves between patients, using water or alcohol-based rubs for hand hygiene, covering wounds before patient care, showering after extensive exposure even when wearing PPE, and using masks with goggles or face shields when necessary. Some students also noted occasional reuse of PPE, removing PPE in designated areas, decontaminating equipment after use, and wearing gloves when handling visibly soiled tools. However, proper disposal of full sharps boxes was seldom observed. These findings are consistent with previous studies: Kaushal and Clement [13] reported an 89.8% compliance rate; Bekele et al. [4], Mutaru et al. [17], and Bouchoucha et al. [5] found adherence rates of 61.08%, 65.8%, and 80%, respectively; and Kacan [12] noted a strong adherence mean of 65.63 ± 4.92. Collectively, these affirm that nursing students generally exhibit a commendable level of IPC adherence, reinforcing the importance of integrating IPC into clinical education. In contrast, Olorunfemi et al. [20] reported low compliance (mean = 14.17 ± 2.80), potentially due to differences in study population and scope. Their study focused on students in burn and surgical units and assessed only hand hygiene, while this study involved all clinical students and evaluated broader IPC practices. Akinwaare et al. [1] similarly reported low adherence (43%), which may reflect varying institutional practices or support systems. These discrepancies may stem from differences in sample size, data collection methods (interview guide vs. questionnaire), participant demographics, or institutional contexts. Ayele et al. [3] also found low compliance, possibly influenced by fewer institutions and different academic levels of students involved. These differences underscore the need for context-specific IPC training and evaluation strategies across diverse educational and clinical settings.

#### ****Factors Influencing Adherence to IPC Measures****

As shown in Table 3, several positive factors influenced IPC adherence among students, with a grand mean of 2.89, exceeding the 2.50 benchmark. Key influencing factors included: lack of IPC materials, time constraints, absence of waste disposal color codes, high workload, poorly positioned handwashing and sanitizing stations, inadequate pre-clinical training, weak supervision, negative role models, and poor nurse-patient ratios. Interestingly, the difficulty of handwashing was not considered a major barrier. These results align with Bekele et al. [4], who identified resource shortages and staffing issues as key barriers. Appiah et al. [2] and Hamed et al. [10] similarly highlighted increased workload, lack of support, and inconvenient PPE locations as common challenges. These findings reflect global healthcare workforce shortages and inconsistent resource availability, particularly in low-resource settings. Akinwaare et al. [1] also identified resource shortages, time limitations, and poor waste segregation systems as influential factors, although they included handwashing complexity as a barrier possibly due to differences in healthcare facility settings.

#### ****Relationship Between Level of Adherence and Influencing Factors****

Table 4 revealed a weak positive correlation (r = .086) between IPC adherence and influencing factors, indicating a very low association. Although adherence levels slightly increased with higher influencing factor scores, the relationship lacked statistical significance (p = .202 > 0.05, df = 220), as shown in Table 5. This finding aligns with Bouchoucha et al. [5] and Mutaru et al. [17], who also reported no significant relationship between adherence levels and influencing factors. However, Ayele et al. [3] reported a significant positive relationship, possibly due to their larger sample size (n=423) and inclusion of students from four institutions, compared to this study’s 222 participants from a single university. The coefficient of alienation (0.9926) and coefficient of determination (r² = 0.0074 or 0.74%) further underscore the weak predictive power between these variables. Only 0.74% of the variance in adherence can be explained by the influencing factors, leaving 99.26% unexplained suggesting the presence of other significant but unmeasured variables. Therefore, while several barriers to IPC adherence exist, their direct influence on overall compliance appears limited. This highlights the need for future studies to explore additional determinants such as individual motivation, institutional culture, and experiential learning that may more strongly predict IPC adherence.

**Conclusion**

Based on the results, the following conclusions were drawn: There is a high level of adherence to infection prevention and control (IPC) measures among nursing students in the Department of Nursing Sciences, Rivers State University. However, certain gaps were identified, particularly in practices such as recapping needles and scalpels after use, reusing surgical masks and disposable personal protective equipment (PPE), and washing hands with water only. It is essential to emphasize that used needles should never be recapped to avoid needle-stick injuries. Similarly, disposable surgical masks and PPE should not be reused, as this can increase the risk of infection transmission. Handwashing with water alone is insufficient; where soap and water are unavailable, alcohol-based hand sanitizers should be used. Optimal adherence to IPC measures is vital for the safety of both healthcare workers and patients. The study also found that factors influencing adherence include the availability of essential IPC materials, lack of color-coded waste disposal systems in wards, increased workload, and insufficient supervisory support and enforcement of IPC guidelines. Finally, the study concludes that the level of adherence does not have a statistically significant relationship with the identified influencing factors among nursing students in the Department of Nursing Sciences, Rivers State University.

**Recommendation**

The following recommendations are proposed:

1. Nursing students should undergo regular training on all levels of infection prevention and control (IPC) measures before the start of clinical postings each semester, regardless of their year of study. This will help ensure optimal adherence to IPC protocols.
2. The hospital management board, primary healthcare board, academic institutions with clinical programs, and other relevant stakeholders should collaborate to implement effective strategies that address the factors influencing IPC adherence among nursing students.
3. Nursing students should consistently maintain adherence to IPC measures, even though the identified influencing factors may not significantly affect their level of compliance.

**Ethical Approval**
An application letter and a copy of the research proposal were submitted to the Ethical Committee of Rivers State University for approval prior to the commencement of data collection. Ethical approval was granted with reference number RSU/FBMS/REC/24/051. All ethical principles were strictly adhered to throughout the duration of the study.

**CONSENT**

Census sampling technique was employed, and all participants provided written informed consent prior to their inclusion in the study.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The author(s) hereby declare that no generative AI technologies, such as Large Language Models (e.g., ChatGPT, Copilot) or text-to-image generators, were used in the writing or editing of this manuscript.

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