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Knowledge, skills, and performance in biorisk management among allied health educators in the University of Perpetual Help System Jonelta

Jamilah C. Baragona, Pedrito Jose V. Bermudo

University of Perpetual Help System Laguna

baragona.jamilah@uphsl.edu.ph, pete_bermudo@yahoo.com

Abstract. This descriptive-correlational study determined the relationship between the health educators' knowledge, skills, and performance in biorisk management in the University of Perpetual help System Jonelta. The study probed the predictive ability of knowledge and skills of the health educators' performance in biorisk management. The results of the study served as basis in developing a training program on biorisk management that was common and applicable to all allied health educators. The study, which was conducted from November 2022 to April 2023, involved 199 health educators of the University as respondents. The study results revealed that the respondents' level of knowledge on biorisk management was very high ($\bar{x} = 3.27$); level of skills was high ($\bar{x} = 2.93$), and level of performance was high ($\bar{x} = 3.08$). Significant relationships were found between the respondents' level of knowledge and level of skills; between level of knowledge and level of performance; and between level of skills and performance in biorisk management along principles and policies, assessment, safety measures, waste management, and personnel protective equipment ($p < 0.01$). Further, knowledge along safety measures ($p = .007 < .05$), waste management ($p = .0071 < .05$), and level of skills along personal protective equipment ($p = .029 < .05$), and the combination of all skills ($p = .007 < .05$) were found to be significant predictors of performance in biorisk management. It was concluded that the allied faculty members of UPHSL are highly cognizant of the effective management of risks posed by working with infectious agents and toxins; they are competent, trained, and experienced in various aspects of biorisk management in health education settings; and they enforce the use of personal protective equipment (PPE) in a health education setting and are skilled in managing the proper disposal of biological waste, among others. Likewise, the higher is their level of knowledge, the higher the level of skills on biorisk management and level of performance in biorisk management; and the higher their level of skills, the higher is the level of performance in biorisk management. Moreover, knowledge on safety measures and waste management; and skills on personal protective equipment and the combination of all the skills on principles and policies, assessment, safety measures, waste management, and personal protective equipment are predictors of performance in biorisk management

Keywords. Knowledge, skills, performance, biorisk management, allied health educators

Introduction

The present COVID-19 pandemic has brought to light the long-standing biosafety hazards in research and clinical laboratories, emphasizing the need to implement a strict biorisk

management system to avoid and address public health threats. Biorisk management has become an increasingly important issue in recent years due to the potential risks associated with handling biological agents. Effective biorisk management requires a combination of knowledge, skills, and performance to ensure these agents' safe and secure handling. Recent research has highlighted the importance of these factors in reducing the risks associated with biological agents and improving biorisk management practices.

According to the National Training Center for Biosafety and Biosecurity, the Philippines was the first country in Southeast Asia to adopt a national biosafety guideline in 2000. In addition, in 2000, the country ratified the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. The protocol was developed by the Institute of Health Policy and Development Studies to "ensure an adequate level of protection in the field of the safe transfer, handling, and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks." Governments were increasingly counting on universities to generate human resources with the correct kind of capacities, skills, and knowledge to fulfill the needs of the 21st century in a world that is changing quickly and has a variety of demands and problems.

In biorisk management, knowledge was critical in ensuring safe and effective practices. Professionals must have a comprehensive understanding of the hazards associated with biological agents and the methods for their safe handling and disposal. Sahu et al. (2021) noted that a lack of knowledge about biorisk management practices could increase the risk of exposure to hazardous biological agents, leading to potential health hazards. Therefore, developing and disseminating accurate and up-to-date information on biorisk management is crucial. Effective biorisk management also requires the development of a wide range of skills among professionals. This includes risk assessment, biosafety measures, waste management, and emergency response planning. According to Wang et al. (2020), developing these skills was critical for improving biorisk management practices and reducing the likelihood of incidents. Regular training programs and exercises helped to build the necessary skills among professionals, ensuring they were prepared to handle potential biorisk incidents. Effective biorisk management requires a high level of performance from all personnel involved in handling biological agents. This includes adherence to protocols and procedures and proper use of personal protective equipment (PPE) and other safety measures. As noted by Hwang et al. (2020), a culture of safety was essential for maintaining effective performance in biorisk management. This safety culture was fostered through employee engagement, regular training, and promoting safety as a top priority within the organization.

Furthermore, governments relied on universities to promote the transition to a knowledge-based and high-technology economy to maintain a competitive edge internationally. Universities now have a crucial role in helping young people prepare for this. Academic medical centers were home to many students, researchers, and medical specialists. The three distinct contexts of education, healthcare, and research were also present. These environments have different biosafety policies and practices. However, they all aimed to produce well-trained allied health professionals who can effectively impart their expertise to their students. An integral component of the educational experience should include biosafety and biosecurity training (Griffin et al., 2018). A strong foundation on biosafety, biosecurity, and biorisk management principles will increase safety compliance in education, clinical, and research workforces. In higher education, laboratories were often utilized to support and perform research.

However, biosafety practices were limited to the selected allied health profession. With the recent pandemic, issues about biosafety, biosecurity, and biorisk management played a significant role in assessing the risk posed by the disease and identifying gaps in knowledge, skills, and performance among our allied health educators in biorisk management and developing effective training programs. Studies were reviewed that focused on determining the knowledge and practices among nurses, dentists, and medical laboratory workers. Conversely, only some types of research identified both knowledge and practices of other allied health educators. Biorisk management was a critical issue requiring knowledge, skills, and performance to ensure the safe and secure handling of biological agents. Recent research has highlighted the importance of these factors in reducing the risks associated with biological agents and improving biorisk management practices. Therefore, developing and disseminating accurate information, developing necessary skills, and promoting a safety culture were all essential for effective biorisk management.

1.1 Objective of the Study

This study was conceived with the objectives of determining the level of knowledge of allied health educators, determining their skills, measuring their performance in biorisk management, analyzing the differences and the relationship between knowledge, skills, and performance on bio-related issues, and finally, developing a holistic and multi-disciplinary training approach to biorisk management that was common and applicable to all allied health educators. Specifically, it had the following aims: (1) determine the level of knowledge, skills and performance of allied health educators in Biorisk management along with principles, assessment, safety measure, waste management and personal protective equipment. (2) evaluate if there is a significant relationship between the level of knowledge and level of skills of allied health educators in Biorisk Management, (3) determine if there a significant relationship between the level knowledge and level of performance of allied health educators in Biorisk Management (4) find out if there a significant relationship between the level skills and level of performance of allied health educators in Biorisk Management (5) finally to determine how predictive is the level of knowledge and level of skills taken singly or in combination, of the level of allied health educators ' level of performance in Biorisk Management

II. Methods

This study on the knowledge skills and performance in Biorisk Management among allied health educators utilized the descriptive-correlational research design. According to Kratochwill et al. (2023), this research design allows the researcher to describe systematically, factually, accurately, and objectively a situation, problem or phenomenon as it naturally occurs. This study specifically described the variables such as knowledge, skills, and performance in biorisk management. Moreover, the study probed the significance of relationships, through correlation, between level of knowledge and level of skills in biorisk management; level of knowledge and level of performance in biorisk management; and level of skills and level of performance in biorisk management. The population of the study consisted of 199 allied health educators from the University of Perpetual Help System Jonelta, notably 123 in Medical University, 5 in General Mariano Alvarez Campus, 21 in Pueblo de Panay Campus, 31 in Isabela Campus, and 19 in Manila Campus. Using the Raosoft calculator with a confidence level and margin of error were set at 95% and 5%, respectively, a sample size of 111 respondents was arrived at. Stratified random sampling was utilized in the actual selection of the

respondents. The data collection tool used in the investigation was a self-made questionnaire. The questions and statements were created in accordance with CWA 15793 - Laboratory Biorisk Management and the Centers for Disease Control and the World Health Organization's recommendations for biosafety, biosecurity, and biorisk management.

The questionnaire was divided into four parts, namely; Part 1 was related to the profile of the participants, such as name, level of education, years of experience in health education, campus affiliation, and the program they taught in their respective campuses Part 2 involved the level of knowledge in biorisk management, which included questions that test the participants' knowledge level on principles and policies, assessment, safety measures, waste management, and personnel protective equipment. It was composed of 3 questions per sub-variable of interest. Part 3 dealt on the level of skills in biorisk management, which assessed the participants' skills towards following the standard biorisk management practices using various questions to determine their competency in principles and policies, assessment, safety measures, waste management, and personnel protective equipment. This part consisted of 3 statements in each category; and Part 4 focused on the level of performance in biorisk management, which consisted of 15 statements regarding the level of biorisk management practice among the participants. The questionnaire used a 4-point Likert scale that evaluated the respondents' knowledge, skills, and Performance in Biorisk Management. The level of knowledge, skills, and performance in Biorisk Management among allied health educators of the University of Perpetual Help System JONELTA were assessed based on the categorical variables of Biorisk Management such as principles and policies, assessment, safety measures, waste management, and personnel protective equipment which follow the guidelines of CWA 15793 - Laboratory Biorisk Management and recommendations for biosafety, biosecurity, and biorisk management from the Centers for Disease Control and the World Health Organization.

The questionnaire was verified using face and content validity by a Certified Biorisk Officer and educators. The questionnaire contents were assessed for their suitability in collecting and measuring the necessary data on the respondents' information about the factors that this study wanted to explore. The Cronbach alpha coefficients for the knowledge, skills, and performance in biorisk management among allied health educators were found to be 0.920, 0.947, and 0.902, respectively. A Cronbach alpha value of 0.7 or higher was considered acceptable for research purposes, while a value of 0.8 or higher was considered good (Kusi et al.2021). The 4-point Likert Scale was used to evaluate allied health educators' knowledge, skills, and performance in biorisk management.

The study on biorisk management among allied health educators of the University of Perpetual Help System JONELTA was conducted between November 2022 to April 2023. The researcher obtained permission to gather the population and collected data through a well-designed questionnaire. An informed consent form preceded the survey questionnaire. The respondents were made aware that their participation would not impact their employment or any assessments or reports relating to their place of employment. These respondents were free to opt out of the study whenever they want, free from any consequences. Under Republic Act No. 10173, generally known as the Data Privacy Act of 2012, the respondents' and study participants' privacy and confidentiality maintained and given the utmost attention. Although the responders' names and email were requested for identification and verification, they were not made public. Access to the responses to the survey was only given to the researcher and thesis adviser. The questionnaire was pre-tested with 18 allied health educators to identify any issues or misunderstandings and ensure that it was straightforward to understand. The researcher surveyed 111 allied health educators through a self-made survey questionnaire

translated and disseminated through Google Forms and face to face survey. The data collected from surveys was transferred into Excel, and the researcher created a spreadsheet to enter each participant's responses. The responses were evaluated using a 4-point Likert Scale.

The researcher achieved an 80% retrieval rate by working closely with the university's administration and faculty members to encourage participation and emphasize the importance of the study. Online data collection and face to face data gathering were used to accommodate the preferences of the participants and increase the likelihood of response. The respondents' privacy was emphasized, and they were given the option to proceed or not to the study by selecting "yes or no" in the survey questionnaire. The statistical tools used in the treatment of data were (1) Weighted mean which was used to determine level of knowledge, level of skills, and level of performance in biorisk management. (2) Pearson Product Moment Correlation was used in determining the relationships between level of knowledge and level of skills in biorisk management; level of knowledge and level of performance in biorisk management; and level of skills and level of performance in biorisk management. (3) Stepwise regression analysis was conducted to establish the predictive ability of level of knowledge and level of skills of the Allied Health educators' level of performance in biorisk management.

III. Results and Discussion

Table 1

Respondent's Level of Knowledge on Biorisk Management

Indicators	Weighted Mean	Verbal Interpretation	Rank
Principles and policies			
1. I understand biorisk management as a health educator	3.18	High	
2. I understand the importance of incorporating biorisk management principles and practices in allied health education curriculum	3.30	Very High	
3. I am conversant of the legal and regulatory requirements related to biorisk management in a health education setting	2.99	High	
Average	3.16	High	4
Assessment			
1. I am knowledgeable in assessing biological risks in a health education setting	3.05	High	
2. I am familiar on identification of hazards and characterization of risks in health education setting	3.06	High	
3. I understand the difference between hazards and risks.	3.32	Very High	
Average	3.14	High	5
Safety Measures			

1. I am competent about the effective mitigation control measures on biological risks in a health education setting	2.99	High	
2. I am familiar with the common infectious diseases, their modes of transmission and chain of infection	3.40	Very High	
3. I am well-versed with the strategies to prevent the spread of infectious diseases	3.26	Very High	
Average	3.22	High	3
Waste management			
1. I am cognizant of the proper disposal of biological waste in a health education setting	3.36	Very High	
2. I am aware of effective segregation of mixed waste in a health education setting	3.38	Very High	
3. I am familiar in minimizing waste production.	3.30	Very High	
Average	3.35	Very High	2
Personal Protective Equipment			
1. I am aware of different types of personal protective equipment (PPE) in biorisk management in a health education setting	3.50	Very High	
2. I am acquainted with the use of PPE and other biorisk management measures in health education activities	3.48	Very High	
3. I understand how to identify proper personal protective equipment (PPE) in reference to the result of identified biological risks	3.43	Very High	
Average	3.47	Very High	1
Overall Weighted Mean	3.27	Very High	

Table 1 presents the level of knowledge of the Allied Health faculty members at UPHSL on Biorisk Management. The respondents had a "very high" level of knowledge on biorisk management with an overall weighted mean of 3.27 along principles and polices, assessment, safety measures, waste management, and personal protective equipment. Personal Protective Equipment. The level of knowledge of the Allied Health faculty members at UPHSL on biorisk management along personal protective equipment was 'very high' with an average weighted mean of 3.47 (Rank 1). Indicator 1 stating that the respondents know different types of PPE in biorisk management in a health education setting got a weighted mean of 3.50 and was verbally interpreted as "very high". Indicator 2 pertaining to the acquaintance of respondents with the use of PPE and other biorisk management measures in health education activities with weighted mean of 3.48 and verbally interpreted as "very high" Indicator 3 affirming that the respondents understand how to identify proper PPE with reference to the result of identified biological risks and obtained the lowest weighted mean of 3.43 but still verbally interpreted as "very high." This implies that faculty members had a reasonably good degree of knowledge in this area.

Waste Management. The level of knowledge of the Allied Health faculty members at UPHSL on biorisk management along waste management was ‘very high’ with an average weighted mean of 3.35 (Rank 2). In particular, Indicator 1 revealed that the respondents are aware of effective segregation got a weighted mean of 3.38 and verbally interpreted as “very high” Indicator 1 states that respondents were cognizant of the proper disposal of biological waste in a health education setting obtained a weighted mean of 3.36 and verbally interpreted as “very high”. Among the three indicators, respondents' familiarity with minimizing waste production has the lowest weighted mean of 3.30 but is still interpreted as "very high." This indicates that faculty members have a rather strong degree of understanding of this area in biorisk management.

Safety Measures. The level of knowledge of the Allied Health faculty members at UPHSL on biorisk management along safety measures was ‘high’ with an average weighted mean of 3.22 (Rank 3). Indicator 2 has a weighted mean of 3.40, which was verbally interpreted as "very high," showing that respondents were familiar with the common infectious diseases, their modes of transmission, and chain of infection. Indicator 2 stating that the respondents are well-versed with the strategies to prevent the spread of infection got a weighted mean of 3.26 and verbally interpreted as "very high" Indicator 1 under the sub-variable Safety Measures has the lowest weighted average of 2.99, which determined that respondents were competent about the effective mitigation control measure on biological risk in a health education setting; despite the lowest average among the three indicators, it still verbally interpreted as "high."

Principles and Policies. The level of knowledge of the Allied Health faculty members at UPHSL on biorisk management along principles and policies was ‘high’ with an average weighted mean of 3.16 (Rank 4). Indicator 2 got a weighted mean of 3.30, verbally interpreted as "very high," corresponds to the understanding of allied health faculty members in the importance of incorporating biorisk management principles and practices in the allied health education curriculum. Indicator 1 averred that the allied faculty understands biorisk management as a health educator with a weighted mean of 3.18 and verbally interpreted as “high”. Indicator 3 got a weighted mean of 2.99 but was still verbally interpreted as "high," this implies that the respondents as being conversant in legal and regulatory requirements related to biorisk management in a health education setting,

Assessment. The level of knowledge of the Allied Health faculty members at UPHSL on biorisk management along assessment was ‘high’ with an average weighted mean of 3.14 (Rank 5). Indicator 3 got a weighted mean of 3.32 verbally interpreted as "very high," stating that allied health educators understand the difference between hazard and risk. Indicator 2, which pertains to the respondents' familiarity on identification of hazards and characterization of risk in health education setting with a weighted mean of 3.06 was verbally interested as “high” Indicator 1 on the other hand, which pertains to respondents' understanding of assessing biological risks in a health education setting, has the lowest weighted mean of 3.05 among the indicators but is nonetheless verbally interpreted as "high." This denotes that despite having the lowest weighted mean, allied health faculty members have a high level of understanding in this subject area since the verbal interpretation indicates "High."

The overall results that the respondents had a “very high” level of knowledge on biorisk management, with an overall weighted mean of 3.27 means that the allied faculty members of UPHSL were highly cognizant of the effective management of risks posed by working with infectious agents and toxins, particularly of the practices and procedures to ensure the biosecurity and biosafety in the workplace. The findings also indicate that members of the UPHSL Allied Health faculty had a very high level of expertise in biorisk management;

however, certain areas may require additional attention and improvement. The results that were shown in "Personnel Protective Equipment" and "Waste Management" suggest that the members of the UPHSL Allied Health faculty are well-informed about the significance of using appropriate protective equipment and are aware of the correct methods of waste management to minimize the risks that are associated with biorisk management.

In the study of Jamshidi et al. (2022), the results of this study are supported by the fact that allied health educators comprehended biorisk management principles linked to the use of personal protective equipment (PPE) and infection control techniques. Additionally, the findings are validated by Tolentino et al (2021), indicating that the Filipino population possesses superior biosafety awareness. The information that was acquired directly contradicts the findings of the study that was conducted by Alasmari et al. (2020), which stated that there were knowledge gaps in waste management and disinfection methods.

Table 2
Respondents Level of Skills on Biorisk Management

Indicators	Weighted Mean	Verbal Interpretation	Rank
Principles and policies			
1. I am competent in developing biorisk management plans for health education settings	2.71	High	
2. I am proficient in implementing biorisk management measures in a health education setting	2.86	High	
3. I am Experienced in communicating biorisk management procedures and policies to students and other stakeholders in a health education setting	2.78	High	
Average	2.78	High	5
Assessment			
1. I am capable to conduct risk assessments	2.85	High	
2. I efficiently determine the characterization and level of biological risks in the health education setting	2.82	High	
3. I am competent in performing the procedures of biorisk assessment	2.86	High	
Average	2.84	High	4
Safety Measures			
1. I can develop mitigation strategies for infection prevention and control	2.92	High	
2. I am competent in responding to biorisk incidents in a health education setting	2.88	High	
3. I am experienced in implementing appropriate biosafety practices to prevent the spread of infectious disease	2.85	High	
Average	2.88	High	3

Waste management			
1. I am skilled in managing the proper disposal of biological waste in a health education setting	3.11	High	
2. I am capable to provide lectures about proper waste management	3.05	High	
3. I am confident to differentiate the categories and methods of waste handling disposal.	3.08	High	
Average	3.08	High	1
Personal Protective Equipment			
1. I am qualified in developing and delivering training on the proper use of personal protective equipment (PPE) in a health education setting	2.95	High	
2. I am skilled in proper utilization of PPE in a health education setting	3.08	High	
3. I am proficient in determining different types of personal protective equipment (PPE), their uses, limitation and proper maintenance	3.09	High	
Average	3.04	High	2
Overall Weighted Mean	2.93	High	

Table 2 presents the level of skills of the Allied Health faculty members at UPHSL on Biorisk Management. The respondents had a "high" level of skills in biorisk management with an overall weighted mean of 2.93 along principles and polices, assessment, safety measures, waste management, and personal protective equipment

Waste Management. The faculty members' level of skills on biorisk management along waste management was "high" with an average weighted mean of 3.08 (Rank 1). Indicator 1 showed that allied health faculty was skilled in managing the proper disposal of biological waste in a health education setting with a weighted mean of 3.11 and verbally interpreted as "high". Indicator 3 stating that the respondents were confident to differentiate the categories and methods of waste handling disposal had a weighted mean of 3.08 and verbally interpreted as "high" Indicator 2 revealed that educators were capable to provide lectures on proper waste management presented the lowest weighted mean of 3.05 among the indicators but verbally interpreted as "high"

Personal Protective Equipment. The faculty members' level of skills on biorisk management along personal protective equipment was "high" with an average weighted mean of 3.04 (Rank 2). Indicator 3 with a weighted mean of 3.09 and verbally interpreted as "high" showed that faculty members demonstrate proficiency in determining different types of personal protective equipment (PPE), their uses, limitation and proper maintenance. Indicator 2 stating that the respondents had a high level of competency in proper utilization with a weighted mean of 3.08 as verbally interpreted "high". Indicator 3 denotes that respondents were qualified in developing and delivering training on the proper use of personal protective equipment in health education setting got the lowest weighted mean of 2.95 but interpreted also as "high"

Safety Measures. The faculty members' level of skills on biorisk management along safety measures was "high" with an average weighted mean of 2.88 (Rank 3). Indicator 1 with a weighted mean of 2.92 and verbally interpreted as "high:" showed that respondents can develop mitigation strategies for infection prevention and control. Indicator 2 corresponds to the competency of allied health educator in responding to biorisk incidents in health education setting got a weighted mean of 2.88 and verbally interpreted as "high" Conversely, educators' experienced in implementing appropriate biosafety practices to prevent the spread of infectious disease exhibited a lowest weighted mean on 2.85 but still verbally interpreted as "high"

Assessment. The faculty members' level of skills on biorisk management along assessment was "high" with an average weighted mean of 2.84 (Rank 4). Indicator 3 showed that respondents were competent in executing biorisk assessment processes, with a weighted mean of 2.86 and a verbal interpretation of "high." With a weighted mean of 2.85 and verbally evaluated as "high," indicator 1 indicates that respondents were capable of doing risk assessments. Indicator 2, on the other hand, had the lowest weighted mean of 2.82, which corresponds to allied health educators' abilities to efficiently evaluate the characterization and amount of biological dangers in the health education context, but it is still verbally interpreted as "high."

Principles and Policies. The faculty members' level of skills on biorisk management along principles and policies was "high" with an average weighted mean of 2.78 (Rank 5). Indicator 1 has the highest weighted mean of 2.86, which is verbally translated as "high," signifying that faculty were skilled in implementing biorisk management procedures in a health education setting. Indicator 2 revealed that respondents had experience conveying biorisk management methods and policies to students and other stakeholders in a health education environment, with a weighted mean of 2.78 and a verbal interpretation of "high." Indicator 3, which indicates that faculty were competent in designing biorisk management strategies for health education settings, received the lowest weighted mean of 2.71 but was nevertheless assessed as "high"

The overall results that the respondents had a high level of skills on biorisk management with an overall weighted mean of 2.93 implies that that the allied faculty members of UPHSL were competent, trained, and experienced in various aspects of biorisk management in health education settings. They were proficient in managing the proper disposal of biological waste in a health education setting, delivering lectures on proper waste management, and differentiating between waste categories and disposal methods.

The outcomes of this research provide credence to the findings of Ali et al (2021), which found that allied educators possessed high levels of proficiency in the use of personal protective equipment and methods of waste management. Similar to what was discovered in this analysis, Arnett et al. (2021) showed that allied health educators had a solid understanding of the ideas underlying biorisk management but lacked the skills necessary to put this understanding into practice, which is another evidence that supports the findings of this investigation. In contrast, Chen et al. (2020) reported that allied health educators lacked specialized abilities in biorisk management, including risk assessment, control measures, and waste management.

Table 3
Respondents' Level of Performance of on Biorisk Management

Indicators	Weighted Mean	Verbal Interpretation	Rank
Principles and policies			
1. I consistently follow biorisk management procedures and policies in a health education setting	3.17	High	
2. I am compliant with the regulations and guidelines related to biorisk management	3.23	High	
3. I coordinate and communicate with other stakeholders in a health education setting regarding biorisk management	3.04	High	
Average	3.14	High	3
Assessment			
1. I assess biorisks in a health education setting	2.88	High	
2. I disseminate the findings in biorisk assessment to relevant stake holders	2.79	High	
3. I update biorisk assessments based on new information gathered	2.81	High	
Average	2.83	High	5
Safety Measures			
1. I evaluate potential biorisks in my workplace	2.85	High	
2. I respond to biorisk incidents in a health education setting	2.98	High	
3. I use effective infection prevention and control measures in daily work	3.19	High	
Average	3.01	High	4
Waste management			
1. I manage the proper disposal of biological waste	3.24	High	
2. I practice decontamination of waste in daily work	3.19	High	
3. I communicate proper hazardous waste management practices to relevant stakeholders in a education settings.	3.13	High	
Average	3.19	High	2
Personal Protective Equipment			
1. I enforce the use of personal protective equipment (PPE) in health education setting	3.36	Very High	
2. I conduct orientation on proper usage of PPE in a health education setting	3.17	High	

3. I review and update my knowledge and skills in relation to the appropriate use and disposal of personal protective equipment (PPE)	3.18	High	
Average	3.24	High	1
Overall Weighted Mean	3.08	High	

The level of performance of UPHSL Allied Health Faculty Members on Biorisk Management is presented in Table 3. The respondents had a "high" level of performance in biorisk management with an overall weighted mean of 3.08 along principles and polices, assessment, safety measures, waste management, and personal protective equipment

Personal Protective Equipment. The respondents' level of performance in biorisk management along personal protective equipment was "high" with an average weighted average of 3.24 (Rank 1). With a weighted average of 3.36, Indicator 1 had the highest weighted average of the three indicators and is verbally interpreted as "very high." It indicates that respondents enforced the use of personal protective equipment in health education settings. Indicator 3 refers to respondents' performance in reviewing and updating their knowledge and abilities in regard to the proper use and disposal of personal protective equipment and received a weighted mean of 3.18 and was verbally referred to as "high." Despite the fact that Indicator 2 had the lowest weighted mean of the three indicators (3.17) it was still evaluated as "high." This still implies that respondents can provide orientation on correct PPE usage in a health education setting.

Waste Management. The respondents' level of performance in biorisk management along waste management was "high" with an weighted average mean of 3.19 (Rank 2). Indicator 1 received a weighted mean of 3.24 and was verbally evaluated as "high" for faculty members' performance in managing proper disposal of biological waste. Indicator 2, which denoted that the respondents had a high degree of performance in waste decontamination in daily work with a weighted mean of 3.19 and was verbally evaluated as "high" The indicator with the lowest weighted mean of 3.13 but still rated as "high" verbally was performance in conveying effective hazardous waste management techniques to relevant stakeholders in an educational setting

Principles and Policies. The respondents' level of performance in biorisk management along principles and policies was "high" with an average weighted mean 3.14 Rank 3). The highest weighted mean of 3.23 was considered as "high" for Indicator 2, which states that faculty members were complying with biorisk management regulations and procedures. Indicator 1 had a weighted mean of 3.17 and was assessed as "high," indicating that the allied professors apply biorisk management procedures and policies consistently in a health education settings. However, respondents' performance in biorisk management coordination and communication with other stakeholders in a health education setting obtained the lowest weighted mean of 3.04 but was still interpreted as "high."

Safety Measures. The respondents' level of performance in biorisk management along safety measures was "high" with an average weighted mean of 3.01 (Rank 4). Indicator 3 had a weighted mean of 3.19, relating to educators' performance in using effective infection prevention and control techniques in daily work, and is verbally interpreted as "high." Indicator 2 at 3.19 weighted mean stated that the allied health faculty responds to biorisk incidents in a health education setting and was verbally interpreted as "high," whereas Indicator 1 stated that the allied health faculty members performance in evaluating potential biorisk in their workplace received the lowest weighted mean of 2.85 but was still interpreted as "high."

Assessment. The respondents' level of performance in biorisk management along assessment was "high" with a weighted mean of 2.83 (Rank 5). Indicator 1 displayed the highest weighted mean of 2.88, interpreted as "high" performance of faculty in assessing biorisk in a health education setting. Indicator 3 pertaining to faculty members' performance in the dissemination of biorisk assessment findings to relevant stakeholders received a 2.79 weighted score and was interpreted as "high," whereas Indicator 2 pertaining to respondents' performance in disseminating biorisk assessment findings to relevant stakeholders had the lowest mean of 2.79 but was still verbally interpreted as "high."

The overall results that the respondents had a high level of performance in biorisk management with an overall weighted mean indicates that the faculty members of UPHSL allied health educators enforce the use of personal protective equipment (PPE) in a health education setting and are skilled in managing the proper disposal of biological waste, practice decontamination of waste in their daily work, and communicate proper hazardous waste management practices to relevant stakeholders in an education setting.

According to the results of the research carried out by Khan et al. (2021), most allied health educators demonstrated strong performance in biorisk management, demonstrating a high degree of adherence to predetermined protocols and procedures which supported the outcome of this investigation. In addition, the findings of the research conducted by Gurevich et al. (2020), which discovered that allied health educators in Israel possessed good knowledge of biorisk management methods but need assistance with the implementation of these practices in real-world settings, contradict the findings of this research.

Table 4

Relationship between the Respondents' Level of Knowledge and Level of Skills in Biorisk Management

Indicator	Pearson r	p-value	Interpretation
Principle and policies	0.628** Moderate correlation	0.000	Significant
Assessment	0.678** Moderate correlation	0.000	Significant
Safety measures	0.714** Moderate correlation	0.000	Significant
Waste management	0.749** Moderate correlation	0.000	Significant
Personnel protective equipment	0.650** Moderate correlation	0.000	Significant

**Significant @ 0.01

Table 4 shows the relationship between the respondents' level of knowledge and level of skills in Biorisk Management. As shown, there was a moderate positive

correlation between the level of knowledge and level of skills of UPHSL Allied Health Faculty Members in biorisk management along principles and policies ($r=0.628$; $p<0.01$), assessment ($r=0.678$; $p<0.01$), safety measures ($r=0.714$; $p<0.01$), waste management ($r=0.749$; $p<0.01$), and personnel protective equipment ($r=0.650$; $p<0.01$). This means that the higher the level of knowledge, the higher the level of skills on biorisk management. Further, the finding implies that knowledge serves as a foundation for the development of skills, and faculty members who have a better understanding of the principles, policies, assessment, safety

measures, waste management, and personnel protective equipment related to biorisk management are more likely to effectively implement these practices in their workplace.

Arnett et al. (2021) concluded that allied health educators had high knowledge of biorisk management principles but lacked the abilities to transfer this knowledge into practical applications. The outcomes of this research corroborate the statements made by Arnett et al. (2021). The findings of Abdul-Mutakabbir et al. (2022), who found that allied health educators required to learn skills in recognizing and assessing potential biorisks in their workplace, support the results of this research.

Table 5

Relationship between Respondents' Level of Knowledge and Level of Performance in Biorisk Management

Indicator	Pearson r	p-value	Interpretation
Principle and policies	0.620** Moderate correlation	0.000	Significant
Assessment	0.587** Moderate correlation	0.000	Significant
Safety measures	0.628** Moderate correlation	0.000	Significant
Waste management	0.711** Moderate correlation	0.000	Significant
Personnel protective equipment	0.715** Moderate correlation	0.000	Significant

**Significant @ 0.01

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Table 5 presents the relationship between the respondents' level of knowledge and level of performance in Biorisk Management. As indicated, there was a moderate positive correlation between the level of knowledge and level of performance of UPHSL Allied Health Faculty Members in biorisk management along principles and policies ($r=0.620$; $p<0.01$), assessment ($r=0.587$; $p<0.01$), safety measures ($r=0.628$; $p<0.01$), waste management ($r=0.711$; $p<0.01$), and personnel protective equipment ($r=0.715$; $p<0.01$). This means that the higher the level of knowledge, the higher the level of performance in biorisk management. Further, this implies that faculty members who possess higher levels of knowledge in biorisk management are more likely to exhibit higher levels of performance in implementing biorisk management practices in their daily work. This may be due to the importance of fostering a comprehensive approach to biorisk management that encompasses both knowledge and performance.

Table 6

Relationship between Respondent's Level of Skills and Level of Performance in Biorisk Management

Indicator	Pearson r	p-value	Interpretation
Principle and policies	0.623** Moderate correlation	0.000	Significant
Assessment	0.675** Moderate correlation	0.000	Significant

Safety measures	0.747**	0.000	Significant
	Moderate correlation		
Waste management	0.776**	0.000	Significant
	Moderate correlation		
Personnel protective equipment	0.707**	0.000	Significant
	Moderate correlation		

**Significant @ 0.01

Table 6 reveals the relationship between the respondents' level of skills and level of performance in Biorisk Management. As seen, there was a moderate positive correlation between the level of skills and level of performance of UPHSL Allied Health Faculty Members in biorisk management along principles and policies ($r=0.623$; $p<0.01$), assessment ($r=0.675$; $p<0.01$), safety measures ($r=0.747$; $p<0.01$), waste management ($r=0.776$; $p<0.01$), and personnel protective equipment ($r=0.707$; $p<0.01$). This means that the higher the level of skills, the higher the level of performance in biorisk management. Further, this implies that faculty members who possess higher levels of skills in biorisk management are more likely to exhibit higher levels of performance in implementing biorisk management practices in their daily work; that having adequate skills, such as technical proficiency, competency in using equipment, and ability to apply procedures and protocols, is crucial for effective implementation of biorisk management practices.

Table 7

Multiple Regression Analysis between Level of Knowledge and Level of Skills of Respondents' Level of Performance in Biorisk Management

Predictor	Dependent Variable	R ²	F	p-value	β	t	p-value
Knowledge Principle and policies					0.045	0.608	0.544
Knowledge assessment	Overall Level of	0.785	36.449	0.000	0.148	1.595	0.118
Knowledge safety measures	Performance in Biorisk				-0.279	-2.743	0.007*
Knowledge waste management	Management				0.314	3.276	0.001*
Knowledge PPE					0.142	1.785	0.077
Skills Principle and policies					-0.273	-1.697	0.093
Skills assessment					-0.156	-1.084	0.281
Skills waste management					-0.065	-0.464	0.643
Skills PPE					-0.298	-2.215	0.029*
Overall skills					1.320	2.757	0.007*

*Significant @ 0.05

Table 7 presents the multiple regression analysis between level of knowledge and level of skills of respondents' level of performance in biorisk management. The results of the analysis examining the relationship between the level of knowledge, level of skills, and the overall level of performance in biorisk management among UPHSL Allied Health Faculty Members revealed that the overall R² value of 0.785 indicates that the predictors (knowledge and skills) explain the variance in the overall level of performance in biorisk management among faculty members. This indicates that both knowledge and skills play significant roles in predicting the performance of faculty members in implementing biorisk management practices. Among the individual predictors, knowledge of waste management ($\beta = 0.314$, $p = 0.001$) and skills in overall biorisk management ($\beta = 1.320$, $p = 0.007$) were found to be significant predictors of performance at the 0.05 significance level. This specifies that faculty members who have higher levels of knowledge in waste management and overall skills in biorisk management are more likely to exhibit better performance in implementing biorisk management practices in their work. Additionally, knowledge of safety measures ($\beta = -0.279$, $p = 0.007$) and skills in personnel protective equipment (PPE) ($\beta = -0.298$, $p = 0.029$) were also found to be significant predictors of performance, although at a slightly higher significance level of 0.05. This suggests that faculty members with higher levels of knowledge in safety measures and skills in using PPE may also have an impact on their performance in biorisk management, albeit to a slightly lesser extent. On the other hand, knowledge of principles and policies, knowledge of assessment, skills in principles and policies, skills in assessment, skills in waste management, and skills in PPE were not found to be significant predictors of performance in biorisk management. These findings suggest that while both knowledge and skills are important in predicting the performance of faculty members in biorisk management, not all specific areas of knowledge and skills have the same level of impact. Knowledge of waste management and overall skills in biorisk management appear to have a stronger influence on performance, while other areas such as principles and policies, assessment, and skills in other areas may not have a significant predictive value.

The findings of this research supports the study of Khan et al. (2021) and Alasmari et al. (2020) found that most allied health educators performed well in biorisk management, with high adherence to established protocols and procedures. However, the studies identified some areas for improvement, particularly in waste management and disinfection practices

IV. Conclusion and Recommendation

The allied faculty members of UPHSL are highly cognizant of the effective management of risks posed by working with infectious agents and toxins, particularly of the practices and procedures to ensure the biosecurity and biosafety in the workplace. They are competent, trained, and experienced in various aspects of biorisk management in health education settings and are proficient in managing the proper disposal of biological waste in a health education setting, delivering lectures on proper waste management, and differentiating between waste categories and disposal methods. Furthermore the allied health educators, enforce the use of personal protective equipment (PPE) in a health education setting and are skilled in managing the proper disposal of biological waste, practice decontamination of waste in their daily work, and communicate proper hazardous waste management practices to relevant stakeholders in an education setting. The higher the level of knowledge, the higher the level of skills on biorisk management. Faculty members who have a better understanding of the principles, policies, assessment, safety measures, waste management, and personnel protective equipment related to biorisk management are more likely to effectively implement these

practices in their workplace. The higher the level of knowledge, the higher the level of performance in biorisk management. Faculty members who possess very high level of knowledge in biorisk management are more likely to exhibit higher level of performance in implementing biorisk management practices in their daily work. Moreover, the higher the level of skills, the higher is the level of performance in biorisk management. Faculty members who possess high level of skills in biorisk management are more likely to exhibit high levels of performance in implementing biorisk management practices in their daily work; that having adequate skills, such as technical proficiency, competency in using equipment, and ability to apply procedures and protocols, is crucial for effective implementation of biorisk management practices.

The following recommendations are based on the findings and conclusion of this study:

The administrators should conduct continuous education and training programs to ensure that faculty members are well-prepared to manage biorisks effectively in their roles as Allied Health professionals. The deans of each allied health program and human resource department of each campus should provide their faculty with professional development opportunities, continuous monitoring and evaluation, trainings, and seminars on biorisk management principles and policies to improve their understanding and application of biorisk management concepts and ensure consistency in the development and implementation of biorisk management plans across health education settings. Training facilitators should conduct continuous surveillance and evaluation of biorisk management practices, particularly in the areas of assessment and communication of biorisk findings, in order to facilitate continuous improvement efforts in health education settings. Future researchers should conduct a more in-depth analyses to investigate potential mediating or moderating factors that may explain why some areas of knowledge and skills have a higher predictive value than others. Focus on identifying potential causality or mediating or moderating factors that may influence the relationship between knowledge and skills in biorisk management among allied health educators. Moreover future research could examine the applicability of these findings to populations or settings other than UPHSL allied health faculty members, such as allied health educators in other regions or countries, with different levels of education or professional experience, or in other healthcare settings. The researcher suggests that future research investigate the specific areas within each sub indicator (principles and policies, assessment, safety measures, waste management, and personal protective equipment) and increase the number of parameters to evaluate to identify where the relationship between skills and performance is particularly strong or weak, as well as the potential causes of these differences.

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