ASSESSMENT OF SIMULATION BASED LEARNING AMONG UNDERGRADUATE STUDENTS IN UNIVERSITY OF BENIN, BENIN CITY, EDO STATE.

BY

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DEPARTMENT OF PUBLIC HEALTH AND COMMUNITY MEDICINE,

SCHOOL OF MEDICINE

UNIVERSITY OF BENIN, BENIN CITY, EDO STATE.

OCTOBER, 2024

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A ONE-YEAR PROJECT PRESENTED TO THE DEPARTMENT OF COMMUNITY HEALTH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF MEDICINE AND BACHELOR OF SURGERY (MBBS) DEGREE

OCTOBER, 2024

DECLARATION

I hereby declare that this project work titled **"ASSESSMENT OF SIMULATION BASED LEARNING AMONG UNDERGRADUATE STUDENTS IN UNIVERSITY OF BENIN, Benin City"** was carried out by **HOPE OSAIVBIE OSAZEE** with matriculation number **MED1505233** under the supervision of **DR. ANDREW I. OBI** and has not been submitted anywhere else in part or in full for the award of a degree or certificate.

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CERTIFICATION

This is to certify that this research study titled "**ASSESSMENT OF SIMULATION BASED LEARNING AMONG UNDERGRADUATE STUDENTS IN UNIVERSITY OF BENIN**" was carried out by **HOPE OSAIVBIE OSAZEE** with matriculation number **MED1505233** under supervision in the Department of Community Health, College of Medicine, University of Benin as part of the requirements for the award of Bachelor of Medicine, Bachelor of Surgery (MBBS) degree.

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DEDICATION

This project is dedicated to God Almighty who provided us with His grace, strength and wisdom to carry out this project from its start to completion. I also want to dedicate this work to my parents Late Mr. Johnbull Evbayiro Osazee and Mrs. Mabel Eki Osazee for their ever loving support, care and guidance through the beginning of my training and to the completion of my work.

ACKNOWLEDGEMENT

I want to express my profound gratitude to our glorious God who provided us with all the resources for the completion of this project. I remain extremely grateful to my supervisor, **DR. ANDREW I. OBI** who was very committed to teaching and guiding me all through the duration of the project. I also wish to express my gratitude to Department of Public Health and Community Medicine, University of Benin for training us in the field of public health and medical research.

My heartfelt gratitude goes to my beloved and super amazing mother **Mrs. Mabel Eki Osazee** for her unwavering love and support all through these years and to my beloved father of blessed memory, **Late Mr. Johnbull Evbayiro Osazee**, I love you daddy. My profound gratitude goes to all my siblings; **Mrs. Sandra Erhun Efosa**, **Mr. Noble Osazee**, **Mr. James Osazee,** and **Sonia Osazee** and also to my wonderful uncle; **Mr. Anthony Evbouwman,** and cousins; **Mr Webster Imasuen**, and **Mr. Felix Owadolor** who have always been there for me as a pillar of support. I remain grateful to my mentors and trainers; **Prof. Wilson Sadoh, Prof. Stanley Okugbo,** and **Prof. Nosakhare O. Enaruna** who were instrumental to the success of this project.

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Finally, I want to appreciate the Grace-Vine Chapel, REGINT Ministry and The Christian Medical and Dental Association (CMDA) for their prayers and impact in my life.

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LIST OF ABBREVIATIONS

BLS	Basic Life Support
HEMS	Helicopter Emergency Medical Service
NUC	National Universities Commission
LGAs	Local Government Areas
OSCE	Objective Structured Clinical Examination
SBL	Simulation Based Learning
UNIBEN	University of Benin
VR	Virtual Reality

DEFINITION OF TERMS

Basic Life Support: It can be defined as a variety of noninvasive emergency procedures performed to assist in the immediate survival of a patient, including cardiopulmonary resuscitation, hemorrhage control, stabilization of fractures, spinal immobilization, and basic first aid.

High-Fidelity Mannequin: A sophisticated training tool designed to simulate realistic human anatomy and physiological responses.

Immersive: in the context of technology often refers to experiences that fully engage the user's senses, creating a sense of presence within a digital or virtual environment.

Learning: It can be defined as knowledge or skill acquired by instruction or study; it is the modification of a behavioral tendency by experience (such as exposure to conditioning).

Mannequin: It is typically a life-sized model of the human anatomical figures used in education and training in healthcare.

Pedagogy: is the study of teaching methods, including the aims of education and the ways in which such goals may be achieved.

Simulation: the imitative representation of the functioning of one system or process by means of the functioning of another .

Simulation Based Learning: is a technique used in various fields such as industry, science, and education to replicate real-world events and processes under controlled conditions.

Simulated Environment: It refers to a controlled setting created to mimic real-life situations for training or educational purposes.

Standardized Patients:also known as a **sample patient**,a **simulated patient** (**SP**), or **patient instructor**, is an individual trained to act as a real patient in order to simulate a set of symptoms or problems.

Virtual Reality: is the use of computer modeling and simulation that enables a person to interact with an artificial three-dimensional (3-D) visual or other sensory environment.

ABSTRACT

Background: Simulation-based learning is essential for preparing and training undergraduate students for their professional roles and enhancing their experiences and skills. Simulation-based learning (SBL), however, has not been widespread, despite its integration in the university curriculum. There is a gap in understanding how undergraduate students perceive and engage with simulation base learning.

Objective: This study aims to assess the knowledge, attitude and practice of simulation based learning among undergraduate students in university of Benin.

Subjects and Methods: A descriptive cross-sectional study design was utilized for this study using a self-administered questionnaire administered to 620 undergraduate students of university of Benin. Data collected was analyzed using IBM Statistical Package for Social Science (SPSS) 27.0. with statistical significance set at $p<0.05$ and 95% Confidence Interval. Categorical data was presented using frequency tables. Chi-square and Fischer's Exact tests examined relationship between demographic characteristics and respondent's knowledge, attitude, practice and challenges towards simulation-based learning.

Results: The mean age and parity of respondents studied was 21.1 ± 3.1 years. In terms of sex, 54.8% of the respondents were male, and 45.2% were female.

The tribal distribution of the respondents showed Benin (34.5%) with the highest proportion. Five hundred and twenty-five (84.7%) respondents were aware of simulation-based learning with 193 (36.7%) having good knowledge of SBL. Department and academic level were significant predictors of good SBL knowledge with respondents form Medicine and 600 level students

showing a p-value of 0.042 and 1 respectively. In relation to attitude, 447 (85.1%) respondents had positive attitude towards simulation based learning while only 78 (14.9%) had negative attitude. Good knowledge and Academic level were significant predictors of attitude toward simulation-based learning with respondents from fourth-year having a coefficient of 0.836 with a p-value of 0.053, suggesting a near-significant positive influence on supportive attitudes, while respondents from sixth-year and respondents with good knowledge of SBL as reference category. In relation to practice, 53.9% (334) had participated in simulation-based learning activities, while 46.1% (286) had not. The academic level of study of respondents in their sixth year, good knowledge and attitude had a strong predictive value and significantly influenced participation of simulation-based learning.

Conclusion:

The study revealed that while awareness of simulation-based learning is high, over two-thirds of students showed limited understanding of its concepts, especially younger and less advanced students. Over four-fifths had a positive outlook on simulation-based learning, recognizing its value in enhancing knowledge and skills. Although more than half had participated in SBL activities, current engagement was lower, with only four-tenths actively involved. High-fidelity mannequins and virtual patients were commonly used, indicating a preference for realistic simulations. Notably, over one-fifth of respondents reported challenges, such as inadequate infrastructure, limited resources, technical issues, and time constraints, which hinder effective simulation-based learning implementation.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Simulation based learning has over the years emerged as a powerful educational approach that provides students with realistic and immersive learning experiences. It involves the use of virtual environments to replicate real-world scenarios, enabling students to actively engage in practical tasks and problem-solving activities.[1] This pedagogical method bridges the gap between theory and practice, equipping students with essential skills and competencies needed in their future careers.[1,2]

Simulation-based learning offers several advantages for undergraduate students: It provides a safe and controlled environment for students to practice and apply their knowledge without the fear of real-world consequences.[2] Through simulations, students can engage in authentic scenarios, make decisions, and witness the outcomes of their actions.[2] This hands-on experience enables them to gain confidence in their abilities and develop a deeper understanding of the subject matter.

Simulation-based learning also promotes active learning, which has been shown to improve knowledge retention and transfer. Active engagement in realistic simulations allows students to construct their own knowledge, analyze information, and apply theoretical concepts to practical situations.[3] This active learning approach enhances student motivation, engagement, and overall learning outcomes.[3]

It has also been found that simulation-based learning fosters the development of critical thinking and problem-solving skills among undergraduate students. By engaging in complex, real-world scenarios, students are challenged to think critically, analyze information, and make informed decisions.[4] This process of problem-solving within simulations allows students to develop their analytical skills, think creatively, and apply their knowledge in dynamic and evolving situations.

In addition, simulation-based learning facilitates the development of teamwork and communication skills. Many simulations require students to work collaboratively, promoting effective communication, teamwork, and collaboration.[5] Through these experiences, students learn to communicate ideas, delegate tasks, resolve conflicts, and effectively contribute to team dynamics. These teamwork skills are crucial for success in professional settings.[5]

The National Universities Commission (NUC) has necessitated the integration of e-learning into the process of teaching and learning. The recent revolution in Information and Communications Technology (ICT) has created tremendous opportunities for improving pedagogies in higher education institutions.[6]

The NUC, in recognition of her urgent need to mainstream modern e-learning modes in the NUS, has developed guidelines to serve as a framework for the orderly integration of e-learning into the university programmes. The commission in her monthly bulletin stated that all Medical and Dental schools must have an approved, and appropriately utilized, Clinical Skills/Simulation centre and were strongly urged to immediately review their current methods of teaching medical and dental students to include the use of IT in the delivery of courses and simulation/competency based evaluations.[7]

The University of Benin has recognized the potential of simulation-based learning and has invested in simulation facilities and resources to support its implementation. These resources include virtual reality labs, clinical simulation centers, and engineering simulators. These state-of-the-art facilities provide students with realistic and immersive learning experiences, allowing them to apply their theoretical knowledge in practical contexts.[6]

While simulation-based learning has gained recognition and implementation in various educational contexts, it is important to assess its effectiveness and impact specifically among undergraduate students at the University of Benin. Conducting an assessment of simulation-based learning in this particular setting can provide valuable insights into the strengths, challenges, and potential areas for improvement in the implementation of simulation-based learning strategies.[6]

Moreover, the assessment of simulation-based learning can provide insights into the students' perceptions, experiences, and satisfaction with this educational approach. Understanding the students' perspectives is crucial for evaluating the effectiveness of simulation-based learning and identifying areas for improvement.[8] This information can guide educators and administrators in making informed decisions about the integration of simulation-based learning in the undergraduate curriculum[8].

Simulation-based learning has the potential to significantly enhance undergraduate education at the University of Benin by providing a safe and immersive learning environment, promoting active learning, fostering critical thinking and problem-solving skills, and developing teamwork and communication abilities.[7,8] Assessing of simulation-based learning among undergraduate

students at the University of Benin is essential for optimizing the educational experience and preparing students for their future careers.

1.2 STATEMENT OF THE PROBLEM

The limited research on simulation-based learning in the context of undergraduate education at the University of Benin poses a significant gap in knowledge. While simulation-based learning has been widely studied in various educational settings, there is a lack of specific research focused on its implementation and effectiveness among undergraduate students in the University of Benin.

The effectiveness of simulation-based learning in improving student learning outcomes in undergraduate education remains unclear.[2,6] While previous studies have shown positive results in various educational contexts, it is crucial to examine its impact specifically on undergraduate students in the University of Benin. Understanding the extent to which simulation-based learning contributes to the acquisition of knowledge, skills, and competencies among undergraduate students will provide insights into its effectiveness and inform future instructional practices. Simulation-based learning provides an opportunity for students to engage in complex, real-world scenarios that require analytical thinking, decision-making, and problem-solving skills.[2] Investigating the extent to which simulation-based learning enhances these cognitive skills among undergraduate students will provide evidence of its effectiveness and inform instructional practices.[2]

Also the perceptions and experiences of undergraduate students regarding simulation-based learning need to be explored. Understanding students' attitudes, motivations, and satisfaction with this educational approach is crucial for its successful implementation.[7] By assessing

students' perceptions and experiences, this study will provide valuable insights into the acceptability and effectiveness of simulation-based learning among undergraduate students in the University of Benin.

Furthermore, the challenges and barriers to implementing simulation-based learning in the undergraduate curriculum at the University of Benin need to be identified and addressed. The successful integration of simulation-based learning requires careful planning, resource allocation, and faculty training.[8] It is essential to investigate the factors that may hinder the effective implementation of simulation-based learning and develop strategies to overcome these challenges.[8] Through this, the role of faculty in facilitating simulation-based learning and their preparedness to adopt this instructional approach need also to be examined.[4]

1.3 JUSTIFICATION FOR THE STUDY

Simulation-based learning is an emerging educational approach that has gained popularity in various disciplines, including healthcare, engineering, and business.[6] However, there is a lack of research on the implementation and effectiveness of simulation-based learning specifically among undergraduate students in the University of Benin. Conducting a study on simulation-based learning in this context will contribute to the existing literature and provide valuable insights into its application and impact in undergraduate education.

The University of Benin, like many other higher education institutions, to some extent faces challenges in providing practical and experiential learning opportunities to undergraduate students. Simulation-based learning can offers a promising solution to bridge this gap by providing a safe and controlled environment for students to practice and apply their knowledge

and skills.[9] Investigating the use of simulation-based learning in the University of Benin will help evaluate its potential as an effective pedagogical tool.

The assessment of simulation-based learning is essential for evidence-based decision-making in curriculum design and instructional practices. By examining the effectiveness of simulation-based learning among undergraduate students, this study will provide valuable insights into its impact on student learning outcomes, critical thinking skills, and professional development. Such findings can guide educators and administrators in optimizing the integration of simulation-based learning in the undergraduate curriculum.[3]

The increasing demand for graduates who possess practical skills and hands-on experience in their respective fields necessitates the evaluation of simulation-based learning. Employers are seeking candidates with real-world competencies, and simulation-based learning can help bridge the gap between theory and practice.[10] Simulation-based learning has the potential to enhance students' engagement and motivation in the learning process. By creating immersive and interactive learning experiences, simulation-based learning can foster active participation and promote a deeper understanding of concepts. Investigating the impact of simulation-based learning on student engagement will provide insights into its effectiveness as a student-centered approach.[7]

1.4 RESEARCH QUESTIONS

1. What is the knowledge of simulation-based learning among undergraduate students in the University of Benin?

2. What is the attitude towards simulation-based learning among undergraduate students in University of Benin?

3. What is the practice of simulation-based learning among undergraduate students in the University of Benin?

4. What are the challenges and barriers to the implementation of simulation-based learning among undergraduate students in the University of Benin?

1.5 GENERAL OBJECTIVES

To assess the level awareness of simulation based learning among undergraduate students in University of Benin.

1.6 SPECIFIC OBJECTIVES

1. To assess the knowledge of stimulation based learning among among undergraduate students in University of Benin.

2. To assess the attitude towards stimulation based learning among among undergraduate students in University of Benin.

3. To assess the practice of stimulation based learning among among undergraduate students in University of Benin.

4. To investigate the challenges and barriers to the implementation of simulation-based learning among undergraduate students in the University of Benin?

CHAPTER TWO

LITERATURE REVIEW

2.0 BRIEF OVERVIEW

Simulation-based learning is a form of experiential learning where learners are tasked to solve complex problems in controlled environments through replicated real-life scenario. Simulation-based experiential learning allows learners to absorb knowledge and practice skills in a realistic but simulated, safe environment.[6]

The recent WHO Simulation Initiative, outlined in a brief report looks to redress this gap by providing delegates with an innovative environment to discuss topics of global health importance, gain confidence in public speaking and develop the negotiation skills required to affect change at an institutional level.[19]

The National Universities Commission (NUC), in recognition of the urgent need to mainstream modern e-learning modes in the NUS, has developed guidelines to serve as a framework for the orderly integration of e-learning into the university programmes. The commission in her monthly bulletin stated that all Medical and Dental schools must have an approved, and appropriately utilized, Clinical Skills/Simulation centre and were strongly urged to immediately review their current methods of teaching medical and dental students to include the use of IT in the delivery of courses and simulation/competency based evaluations.[20]

In this chapter, selected research writings and works done for the assessment of simulation base learning among undergraduates across the globe were carefully reviewed in line with the specific objectives. These works were selected based on scientific publication within the last decade.

2.1 KNOWLEDGE OF SIMULATION BASED LEARNING

In a descriptive research carried out in 2021 to assess the Knowledge on Simulation based learning in Nursing Education among Nursing Fraternity in selected Nursing Institutions of India. A total of 203 nurses were recruited for the study which included Nurses who have completed their studies (B.Sc. Nursing, Post Basic B.Sc. Nursing, M.Sc. Nursing and above) these respondents were selected using Convenient sampling technique. Nurses who were not willing to participate were excluded from the study while those who have registered on two days training programme on simulation based learning were included. Data were collected using a structured knowledge questionnaire on simulation based learning in nursing education. Results obtained showed that majority had good knowledge of simulation based learning. About 88.7% has given the correct response on what OSCE stands for and majority 85.2% has given correct response on what OSCE is used for. Majority 44.8% has given correct response on what conventional way of teaching critical thinking to nursing students is and majority 74.4% has answered correctly on what is a standardized patient. Approximately 44.8% gave correct answer on how case study helps the students and majority 83.3% correctly answered on what simulation is. Majority 87.2% knows what fidelity means and 48.8% knows about the components of debriefing after simulation scenario. 72.4% has given correct answer on the important characteristic of a facilitator and 55.2% know what hybrid simulation means and 70% of nurses knows the uses of checklist and 90.1% knows about the utilization of checklist.[11]

This study however failed by using a convenient sampling technique which is not appropriate for this kind of study. Also the sample size used was not adequate as it cannot be used to make an adequate generalization of the study population. However, this study is commendable for stating the various categories of simulation based learning.

In a descriptive cross sectional study which was conducted in 2023 in health training institutions in the Northern and Upper East Regions of Ghana with the aim of describing the knowledge and practice of simulation among health tutors with a view to promoting the use of simulation among health tutors. A structured questionnaire was used to collect data from 138 health tutors who were selected for the study.[12] The result obtained showed that more than half of the health tutors 68 (56.8%) had poor knowledge of the types of simulation modalities and the activities undertaken within the various phases of a simulation session while about 49 (40.9%) of the health tutors had adequate knowledge about simulation. About 3 (2.5%) health tutors, representing the minority group, had high knowledge about simulation. This however implies that more tutors have inadequate knowledge as compared with tutors with adequate knowledge of simulation.[12]

This study is commendable, however it is limited by inadequate sample size which is otherwise too little to make concrete generalization on the entire population.

In a cross sectional study which was conducted in 2022 in College of Medicine, University of Lagos, Lagos, Nigeria among 120 medical students in both 400 and 600 level with the aim of exploring the perceptions of Nigerian medical students on manikin-based and virtual simulation training.[14] A convenience sampling method was utilized for the study from which the

respondents were chosen. From the result obtained, Only 11% of 400 level students and 21% of 600 level students were aware of the facilities for simulation-based training.[14]

2.2 ATTIDUDE TOWARDS SIMULATION BASED LEARNING

In a cross-sectional study was conducted in May 2013 in a private medical college in Mangalore, Karnataka, India to assess the perception of medical students towards simulation based learning. A total of 196 students were chosen from the fourth, sixth, eighth semester and houseman-ship through convenience sampling method so that the sample will have a representation of second, third, final phase medical students and junior doctors of the institution. The students were briefed about the objective of the study and written informed consent was taken for their participation. Only students who had prior knowledge of SBL were invited to participate in the study. A pretested self-administered semi-structured questionnaire was used for data collection which contained questions on demographic information and perception towards SBL. The result obtained from the study showed that most participants had a positive perception about SBL 72.5% (179/247) and the rest had a neutral attitude 27.5% (68/247). None of the students had poor perception towards SBL. Age of students was not influencing their perception towards SBL (P = 0.82). Favorable perception towards SBL was seen to be significantly higher among female students (P = 0.04) and senior MBBS students of sixth and eighth semesters (P = 0.05).[6]

This study is highly commendable, however it failed by using a convenient sampling technique which is not appropriate for this study, the study also failed to analyze the various levels of knowledge of the respondents towards simulation based learning as this would also help in determining the correlation between knowledge and perception of simulation based learning.

Also in a descriptive research carried out in 2021 to assess the Knowledge on Simulation based learning in Nursing Education among Nursing Fraternity in selected Nursing Institutions of India. A total of 203 nurses were recruited for the study which included Nurses who have completed their studies (B.Sc. Nursing, Post Basic B.Sc. Nursing, M.Sc. Nursing and above) these respondents were selected using Convenient sampling technique. Nurses who were not willing to participate were excluded from the study while those who have registered on two days training programme on simulation based learning were included. Results obtained showed that about 87 (42.9%) nurses who participated in the training session on simulation found the training session as excellent and 79(38.9%) responded that the training session was a good learning experience and met their expectations. Majority 115(56.7%) participants responded that the session was very relevant and 89.7% responded that they would like to attend such events in a similar medium in future and 61.1% participants did not face any technical/connectivity issue during the course proceeding.[11]

This study however failed by using a convenient sampling technique which is not appropriate for this kind of study. Also the sample size used was not adequate as it cannot be used to make an adequate generalization of the study population. However, this study is commendable for stating the various categories of simulation based learning.

In a cross sectional study which was conducted in 2022 in College of Medicine, University of Lagos, Lagos, Nigeria among 120 medical students with the aim of exploring the perceptions of Nigerian medical students on mannequin-based and virtual simulation training. A convenience sampling method was utilized for the study from which the respondents were chosen. From the result obtained, most respondents identified the advantages of simulation-based training to

include skills acquisition 75 (79%), hands-on skills practice 50 (53%), and examination purposes when patients are unavailable 49 (52%).[14]

This study is commendable; however, the study was conducted at a single institution and could be subject to response and recall bias.

2.3 PRACTICE OF SIMULATION BASED LEARNING

In a descriptive cross sectional study which was conducted in 2022 in six tertiary affiliated teaching hospitals of a medical university in Beijing, China among 342 Clinical Nursing Teachers with the aim of assessing the knowledge, attitude and practice towards simulation China and to analyze the influencing factors. The result obtained showed that participants with age ≤ 35 years old, nurses with teaching length ≤ 10 years and advanced beginner nurses presented higher practice scores of different types of simulation based learning.[13]

This study is commendable however it fails to state the sampling method which was utilized for the study

A descriptive cross sectional study which was conducted in 2023 in health training institutions in the Northern and Upper East Regions of Ghana with the aim of describing the knowledge and practice of simulation among health tutors with a view to promoting the use of simulation among health tutors. A structured questionnaire was used to collect data from 138 health tutors who were selected for the study.[12] From the result obtained, it was found that the majority (80; 66.7%) of the respondents were familiar with the use of simulation. Less than half of the respondents (50; 41.7%) indicated that they had previously been exposed to simulation through a workshop purposely organized to train them on simulation. Also, majority (69; 57.5%) of the respondents agreed that they had practiced simulation.[12]

In 2022, a cross sectional study which was conducted in College of Medicine, University of Lagos, Lagos, Nigeria among 120 medical students in both 400 and 600 level with the aim of exploring the perceptions of Nigerian medical students on mannequin-based and virtual simulation training.[14] A convenience sampling method was utilized for the study from which the respondents were chosen. From the result obtained, only one-quarter of the 600 level students had been trained in Basic Life Support (38%). it was also found that although 95% (n=90) medical students owned smartphones and 35% (n=33) were aware of VR simulation training, only 3% (n=3) of all respondents had experienced an online or VR simulation.[14]

2.4 CHALLENGES TO SIMULATION BASED LEARNING

In a qualitative study with semi-structured group interviews of 17 facilitators in Norway, 2021 which was undertaken before and after one year of simulation-based training on all HEMS bases and one Search and Rescue base with the aim of identifying factors that the local facilitators anticipated would challenge the smooth implementation of the program, and their strategies to overcome these before the national implementation of in situ simulation-based training locally, and subsequently, one year after the programme was initiated, to identify the actual challenges they had indeed experienced, and their solutions to overcome these.[15] The result showed that pedagogical issues, timing and planning, crew and faculty members' expectations, and motivation were the major challenges encountered in the course of the training.[15]

This study is highly commendable, however the number of participants in the interviews before the start of the project was higher than in the interview after one year which was however not explored rather speculation was made.[15]

In a cross sectional study which was conducted in 2022 in College of Medicine, University of Lagos, Lagos, Nigeria among 120 medical students in both 400 and 600 level with the aim of exploring the perceptions of Nigerian medical students on mannequin-based and virtual simulation training. A convenience sampling method was utilized for the study from which the respondents were chosen.[14] From the result obtained, lack of curriculum 27 (28%), instructors trained in simulation education 31 (33%) and funding 52 (55%) were perceived as challenges to mannequin-based simulation in skills-based simulation labs. Lack of awareness was found to be the greatest single challenge to online simulation 50 (53%) however, lack of infrastructure [inconsistent power supply 30 (32%) and internet access 23 (24%)] also pose significant challenges.[14]

CHAPTER THREE

METHODOLOGY

3.1 STUDY AREA

The study was carried out in University of Benin, Benin City, Edo State, Nigeria. Edo state is located at the South-South geopolitical zone of Nigeria.[16] It is one of the 36 states of the Federal Republic of Nigeria. Benin City is the capital city of Edo State. Edo State has an area of approximately 17,802 square miles (comprising 18 local governments), with a population size of 3,233,366 as at 2006, projected to be about 4,777,042 as at 2022 by the Nigerian National Population Commission. Edo State was founded August 27, 1991 when the defunct Bendel State was split into Edo and Delta States.[16]Benin City is the capital of Edo state, and is located at 6°26′ N and 5°41′ E.[16] The city is linked by roads to Sapele, Siluko, Okene, and Ubiaja and is served by air and the Niger River delta ports ofKoko and Sapele.

There are seven (7) universities in the state comprising one federal university, two (2) state universities and four (4) private universities. The University of Benin is located in Ovia-North East Local Government Area (LGA) of the state which is one of the eighteen (18) local government areas within Edo State. The University of Benin (UNIBEN) is a government owned tertiary institution, established on the 23rd of November, 1970, by the then Colonel Samuel OsaigbovoOgbemudialed military administration of Midwest State. The University was established, first as Midwest Institute of Technology.[17]

After attaining the status of a full-fledged university in line with requirements of the National Universities Commission on the 1st of July, 1971, the name was changed to the University of Benin. The Institution became a federal government owned University on the 1st of April, 1975.

The University, which commenced academic activities at the site of the Old Teachers' Training College on Ekehuan Road (which is now one of the campuses of the University – Ekehuan Campus) with 109 students, now has an estimated 60,000 student population who are spread across the campuses of the University.[17]

The university has 2 campuses; the Ugbowo Campus and the Ekenwan Campus. The campuses contain 15 faculties; 14 of the faculties are located at the Ugbowo Campus while 1 faculty is at the Ekenwan Campus. The vice chancellor as at the time of this study is Prof Lilian I. Salami. The university offers a wide range of academic programs, including undergraduate and postgraduate courses and programs leading to officially recognized higher education degrees in several areas of study.

It has a student enrollment of 21,080 undergraduate full time students according to the Information and Communication Technology Unit of the University and 4,000 academic staffs according to the Information and Communication Technology/Central Processing Unit of the University. The faculties include Agriculture which has six (6) departments, Arts which has nine (9) departments, Education which has eight (8) departments, Engineering which has twelve (12) departments, Environmental Sciences which has five (5) departments, Law, Life Sciences which has seven (7) departments, Management Sciences which has eight (8) departments, Pharmacy, Physical Sciences which has seven (7) departments, Social Sciences which has six (60 departments and Veterinary Medicine and a College of Medical Sciences composed of the Schools of Basic medical Sciences which has seven (7) departments under it, School of Medicine, School of Dentistry and an Institute of Child health.

3.2 STUDY DESIGN

For this study descriptive cross-sectional study design was used.

3.3 STUDY POPULATION

The study population comprised undergraduate students of the University of Benin, Benin City, Edo State, Nigeria.

3.4 SELECTION CRITERIA

3.4.1 Inclusion criteria

1) All full-time registered undergraduate students of the University of Benin who have spent at least one semester in the university
2) All full-time registered undergraduate students of the University of Benin who consented to be part of this study.

3.4.2 Exclusion criteria

1. Students who are too ill to participate as they may not be in the best frame of mind to give correct information

3.5 DURATION OF STUDY

The study was carried out between from December 2023 to October 2024.

3.6 SAMPLE SIZE DETERMINATION

The minimum sample size (n) was calculated using the Cochran's formula for cross sectional study.[18]

$$n = \frac{z^2pq \times D}{d^2}$$

where:

n = Minimum sample size

z = Standard normal deviate

p = Estimated proportion of an attribute that is present in a population

d = Desired level of precision

D= Design effect

Z = 1.96

p = 40.9% = 0.409 from descriptive cross sectional study which was conducted in Ghana to assess the knowledge and practice of simulation among health tutors.[12]

d = 0.05

q = 1 – p

Substituting in the above formula,

$$n = \frac{(1.96)^2 \times (0.409)(0.0.591) \times 1.5}{(0.050)^2}$$

n = 558

To make room for non-response, 10% non-response rate was added to the minimum sample size, utilizing the formula for non-response rate.

$$n_f = \frac{n}{1 - nr}$$

n = Minimum sample size = 558

nrr = Non-response rate = 10% = 0.10

n_f = Final Minimum sample size

$$= \frac{558}{0.9}$$

Thus, final minimum sample size for this study is 620.

3.7 SAMPLING TECHNIQUE

Multistage sampling technique comprising of three (3) stages was used in this study to select the respondents from the study population. In University of Benin, there are 2 campuses; the Ekenwan campus and the Ugbowo campus. There are 14 faculties in Ugbowo campus and 1 faculty in Ekenwan campus so the Ugbowo campus will be used for this study because it has a variety of faculties.

Stage 1: Selection of Faculties in Ugbowo campus

Of the fourteen (14) faculties, Four (4) faculties was selected using the simple random sampling technique by balloting. The selected faculties were Medicine and Surgery, Pharmacy, Dentistry, and Basic medical science.

Stage 2: Selection of Departments

From the Four (4) selected faculties, a list of departments was gotten and for each faculty,one department was selected using the simple random sampling technique by balloting giving a total of four departments. The selected departments were Medicine and Surgery, Pharmacy, Dentistry, and and Nursing.

Stage 3: Selection of Respondents

Stratified sampling technique will be used to select the students from the four departments. The levels in the departments will serve as the basis of stratification. A class list from each level will be gotten and totaled.

S/N	Faculty	Department	Level	Number of students in each Level
1.	Basic Medical Sciences	Nursing	100	158
			200	154
			300	186
			400	166
			500	148
			Total	**812**
2.	Dentistry	Dentistry	100	34
			200	30
			300	27
			400	53
			500	51
			600	25
			Total	**220**
3.	Medicine	Medicine	100	187
			200	155
			300	154
			400	500
			500	137
			600	132
			Total	**1265**
4.	Pharmacy	Pharmacy	100	215
			200	213
			300	230
			400	225
			500	175
			600	189
			Total	**1247**
Grand Total				**3544**

Proportional allocation was done to know the number of respondents to be selected from each level and the respondents was then be selected using the simple random sampling by balloting. The sampling fraction was calculated by dividing the sample size by the total population in the selected departments.

$$\text{Sampling fraction} = \frac{\text{total sample size}}{\text{Total number of students in 4 selected department}}.$$

Sampling fraction $= \frac{620}{812 + 220 + 1265 + 1247}$.

Sampling fraction = 620/3544

The sample size for each for each department was calculated using the formula

Sample size = sampling fraction × population of undergraduate students in each department.

The table below shows the calculation of the sample size of each department

Departments	**Level**	**Number of students in each Level**	**Numbers Respondents Selected in Each Level**
Nursing	100	158	620/3544 x 158=28
	200	154	620/3544 x 154=27
	300	186	620/3544 x 186=33
	400	166	620/3544 x 166=29
	500	148	620/3544 x 148=26
	Total	812	143
Dentistry	100	34	620/3544 x 34=6
	200	30	620/3544 x 30=5
	300	27	620/3544 x 27=5
	400	53	620/3544 x 53=9
	500	51	620/3544 x 51=9
	600	25	620/3544 x 25=4
	Total	220	48
Medicine	100	187	620/3544 x 187=33
	200	155	620/3544 x 155=27
	300	154	620/3544 x 154=27
	400	500	620/3544 x 500=87
	500	137	620/3544 x 137=24
	600	132	620/3544 x 132=23
	Total	1265	221
Pharmacy	100	215	620/3544 x 215=38
	200	213	620/3544 x 213=37
	300	230	620/3544 x 230=40
	400	225	620/3544 x 225=39
	500	175	620/3544 x 175=31
	600	189	620/3544 x 189=33
	Total	1247	218
Total		**3544**	**620**

3.8 DATA MANAGEMENT

The study utilized a quantitative method of data collection with the aid of a semi-structured questionnaire.

3.8.1 DATA COLLECTION TOOL

The questionnaire was standardized and developed in line with the study objectives consisting of open ended and closed ended questions. Knowledge of simulation based learning was assessed in the following domains: awareness of simulation based learning, features of simulation based learning. Altitude of simulation based learning assessed the respondent's perception towards simulation based learning.

This study questionnaire was broadly divided into five sections:

Section A: Socio-demographic data

This section sought responses to respondents' age, sex, marital status, religion, ethnicity, faculty, department, course of study, current level.

Section B: Knowledge of simulation based learning

Here questions were asked to assess the knowledge of the respondents towards simulation based learning

Section C: Attitude towards simulation based learning

Attitude towards simulation based learning were assessed using some questions

Section D: Practice of simulation based learning

This section concentrated on questions assessing the practice of simulation based learning

Section E: Challenges to simulation based learning

This section explored questions on challenges to simulation based learning

3.8.2 METHOD OF DATA COLLECTION

The data required for the study were collected using self-administered questionnaire administered in and around the classroom to allow for privacy and for the students to be able to express themselves. The qualitative data were collected using key informant interview and analyzed under the three thematic areas which are knowledge, practice and challenges of SBL and was transcribed using an online transcription site: **https://web.descript.com**

3.8.3 PRETESTING

The questionnaire was pretested at Benson Idahosa University as the students there share some similarities with the study population of students at the Ugbowo campus of the University of Benin. Ten percent of the study sample size were pretested in this university after seeking consent from the respondents.

3.9 DATA ANALYSIS

The questionnaires were screened for completeness, coded and entered into IBM SPSS Version 27.0. Uni-variate analysis was done to assess the distribution of variables. Descriptive statistics including frequency distribution for categorical variables and summary statistics for continuous variables was used to evaluate for outliers and missing data. Bi-variate analysis will be done to determine the association between sex, age, religion, ethnicity, family structure of parents, place of residence while in school, father's highest education, mother's highest education, faculty, year of study and the knowledge, attitude, practice and challenges towards simulation based learning among the students. Test of association for categorical variables will be done using Chi-square test and Fisher's Exact Test when one or more expected values in the cells are less than 5. Results obtained will be presented using frequency tables, bar chart and pie chart.

3.10 ETHICAL CONSIDERATION

Ethical approval was obtained from the Ethical Committee of the University of Benin Teaching Hospital with **Protocol Number: ADM/E 22/A/VOL. VII/14830112944**. Approval from management of school and Heads of Departments were gotten. Informed consent was obtained from the respondents prior to recruitment into the study. Names and addresses of respondents will be omitted to ensure confidentiality. The respondents were informed that they have the right to withdraw from the study at any time and that withdrawal will not pose any loss or harm. Health education was carried out on an individual basis after the respondents fill the questionnaires.

3.11 STUDY LIMITATIONS

The data collected from the respondents was subjected to recall bias. Recall bias was overcome by the use of timelines in the questionnaire, and asking simple and clear questions helped to aid recall.

CHAPTER FOUR

RESULTS

A total of 620 respondents were recruited for the study and they all responded appropriately. This gives a response rate of 100%. The data was analyzed and the result was presented under five sections according to the specific objectives of the study as follows:

Section A: Socio-demographic Characteristics of the Respondents

Section B: Knowledge of Simulation-Based Learning

Section C: Attitude towards Simulation-Based Learning

Section D: Practice of Simulation-Based Learning

Section E: Challenges to Simulation-Based Learning

Section A: Socio-demographic Characteristics of the Respondents

Table 1: Socio-demographic Characteristics of the Respondents

Variables	Frequency (n = 620)	Percent
Age (Years)		
15-20	209	33.7
21-25	348	56.1
26-30	56	9.0
31-35	5	0.8
36-40	2	0.3
Mean Age = 21.9± 3.1		
Sex		
Male	340	54.8
Female	280	45.2
Tribe		
Benin	214	34.5
Igbo	142	22.9
Yoruba	100	16.1
Urhobo	44	7.1
Esan	32	5.2
Hausa	23	3.7
Etsako	14	2.3
Isoko	14	2.3
Ibibio	12	1.9
Afemai	5	0.8
Ijaw	4	0.6
Efik	3	0.5
Itsekiri	3	0.5
Tiv	3	0.5
Owan	3	0.5
Others *	4	0.6
Religion		
Christianity	549	88.5
Islam	45	7.3
ATR	21	3.4
Atheist	5	0.8
Marital status		
Single	596	96.1

Cohabiting	11	1.8
Married	10	1.6
Separated	3	0.5
Faculty		
Medicine	221	35.6
Pharmacy	218	35.2
Basic medical sciences	143	23.1
Dentistry	38	6.1
Department		
Medicine	221	35.6
Pharmacy	218	35.2
Nursing	143	23.1
Dentistry	38	6.1
Level		
100	105	16.9
200	97	15.6
300	105	16.9
400	164	26.5
500	89	14.4
600	60	9.7

Others* = Idoma, Igala, Ikwerre

The age of respondents ranged from 15 to 40 years, with a mean age of 21.9 years (SD = 3.1), while the majority of respondents were aged between 21 and 25 years (56.1%). In terms of sex, 54.8% of the respondents were male, and 45.2% were female. The tribal distribution of the respondents showed that the highest proportion of respondents were Benin (34.5%), majority of them were Christians (88.5%) and most respondents were single (96.1%). Regarding faculty affiliation, 35.6% of the respondents were from the Faculty of Medicine, closely followed by 35.2% from Pharmacy and the academic level of respondents was fairly distributed, with the highest proportion of respondents in their fourth year (26.5%).

Section B: Knowledge of Simulation-Based Learning.

Table 2: Respondents' awareness and source of information about Simulation-Based Learning

Variables	Frequency	Percent
Awareness of Simulation-Based Learning (n = 620)		
Yes	525	84.7
No	95	15.3
Source of Information*(n = 525)		
Social media	273	52.0
Television	159	30.3
Online articles and Journals	134	25.5
Hospital	71	13.5
Friends	7	1.3
Seminar	7	1.3
School	6	1.1
Lecturer	5	0.9
Textbook	5	0.9
Red cross	4	0.8
Classmate	3	0.6

*= **multiple response questions**

The majority of respondents (84.7%) were aware of SBL, while 15.3% were not. Among the 525 respondents who were aware of SBL, the most commonly reported source of information was social media, with 52.0% citing it as their primary source.

Table 3: Respondents' responses to knowledge questions on Simulation-Based Learning

Variables	Frequency (n = 525)	Percent
Description of simulation-based learning *		
It provides learners with a real-world- like opportunity	340	64.8
It is new form of learning	222	42.3
It uses a simulated environment	219	41.7
A form of experiential learning	208	39.6
Familiar types of simulation-based learning methods*		
Virtual reality simulations	273	52.0
High-fidelity mannequins	265	50.5
Virtual patient	232	44.2
Standardized patients	188	35.8
Others**	12	2.3

*= **multiple response questions; others**=** use of animals, practicals, imaging and animation

Regarding the description of SBL, 64.8% of respondents recognized it as providing learners with a real-world-like opportunity, 42.3% described it as a new form of learning, 41.7% stated that it uses a simulated environment, and 39.6% identified it as a form of experiential learning.

When asked about familiar types of simulation-based learning methods, 52.0% of respondents mentioned virtual reality simulations, while 50.5% identified high-fidelity mannequins. Additionally, 44.2% were familiar with virtual patients, and 35.8% reported knowing about standardized patients. A small proportion of respondents (2.3%) indicated familiarity with other forms of SBL.

Table 4 : Respondents' assessment of their knowledge of Simulation-Based Learning

Variables	Frequency n = 525	Percent
Respondents assessment of their knowledge of simulation-based learning		
Very knowledgeable	158	30.0
Moderately knowledgeable	118	22.5
Slightly knowledgeable	188	35.8
Not knowledgeable	61	11.6

The respondents' self-assessment of their knowledge of simulation-based learning (SBL) was gathered from a sample of 525 individuals who are aware of SBL. Of these, 30.0% considered themselves to be very knowledgeable about SBL, while 22.5% assessed their knowledge as moderate. The largest group, 35.8%, reported being slightly knowledgeable, and 11.6% indicated that they were not knowledgeable about SBL at all.

Table 5: Correctness of respondents' responses to knowledge questions on Simulation-Based Learning

Variables n = 525	Responses	
	Correct n (%)	Incorrect n (%)
Description of simulation-based learning*		
It provides learners with a real-world- like opportunity	340 (64.8)	185 (35.2)
It is new form of learning	222 (42.3)	303 (57.7)
It uses a simulated environment	219 (41.7)	306 (58.3)
A form of experiential learning	208 (39.6)	317 (60.4)
Familiar types of simulation-based learning methods*		
Virtual reality simulations	273 (52.0)	252 (48.0)
High-fidelity mannequins	265 (50.5)	260 (49.5)
Virtual patient	232 (44.2)	293 (55.8)
Standardized patients	188 (35.8)	337 (64.2)
Others**	12 (2.3)	513 (97.7)

*= **multiple response questions; others****=** use of animals, practicals, imaging and animation

Regarding the description of SBL, 64.8% of respondents correctly identified it as providing learners with a real-world-like opportunity. Additionally, 42.3% correctly described SBL as a new form of learning and a similar trend was observed for the description of SBL as using a simulated environment, with 41.7% responding correctly.

About 39.6% of respondents correctly identified SBL as a form of experiential learning. Regarding familiarity with SBL methods, 52.0% of respondents correctly identified virtual reality simulations, and 50.5% correctly identified high-fidelity mannequins. However, fewer respondents answered correctly for virtual patients (44.2%), and standardized patients (35.8%). A very small proportion (2.3%) correctly identified other methods of SBL.

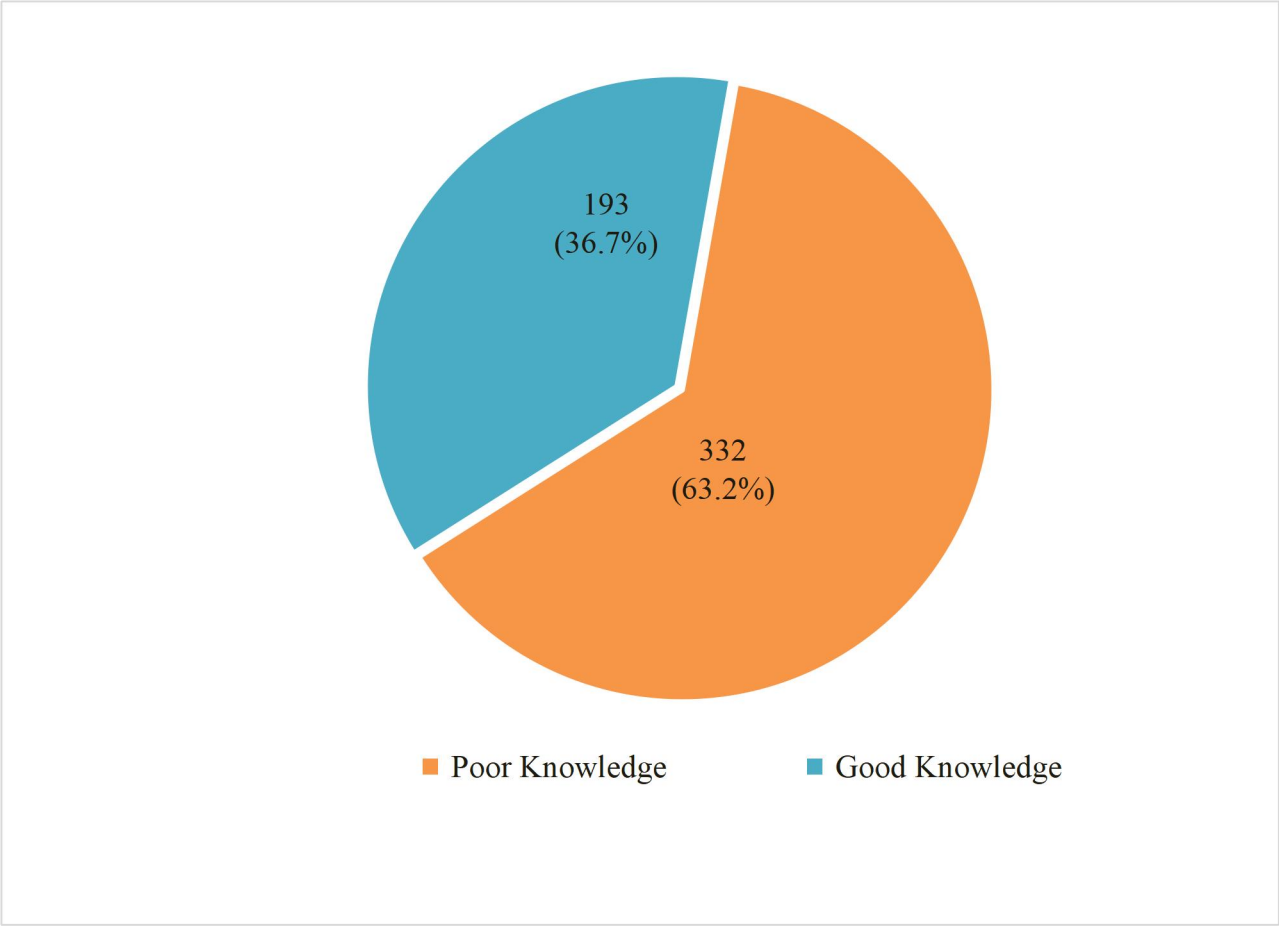

Fig 1: PIE CHART SHOWING RESPONDENT'S KNOWLEDGE OF SIMULATION BASED LEARNING

The majority of the respondents 332 (63.2%) have poor knowledge of Simulation based learning while 193 (36.7%) had good knowledge

Table 6: Factors associated with respondents' knowledge of Simulation-Based Learning

Variable	Knowledge of Simulation-Based Learning		Test statistic	p–value
	Poor (n = 332) n (%)	Good (n = 193) n (%)		
Age (years)				
15-20	129 (88.4)	17 (11.6)	χ^2 = 59.949	< 0.001*
21-25	176 (55.0)	144 (45.0)		
26-30	22 (44.3)	30 (57.7)		
31-35	3 (60.0)	2 (40.0)		
36-40	2 (100.0)	0 (0.0)		
Sex				
Male	186 (62.6)	111 (37.4)	χ^2 = 0.110	0.740
Female	146 (64.0)	82 (36.0)		
Religion				
Christianity	296 (62.7)	176 (37.3)	Fisher's Exact = 5.451	0.127
Islam	26 (78.8)	7 (21.2)		
African traditional religion	7 (46.7)	8 (53.3)		
Atheist	3 (60.0)	2 (40.0)		
Marital status				
Never Married	326 (63.4)	188 (36.6)	Fisher's Exact = 1.000	0.988
Ever Married	7 (63.6)	4 (36.4)		
Department				
Medicine	103 (49.3)	106 (50.7)	χ^2 = 33.784	< 0.001*
Pharmacy	121 (69.5)	50 (30.5)		
Nursing	88 (80.0)	22 (20.0)		
Dentistry	20 (62.5)	12 (37.5)		
Level				
100	64 (94.1)	4 (5.9)	χ^2 = 84.593	< 0.001*
200	60 (85.7)	10 (14.3)		
300	58 (66.7)	29 (33.3)		

400	94 (59.9)	63 (40.1)
500	39 (46.4)	45 (53.6)
600	17 (28.8)	42 (71.2)

***= statistically significant**

Age was found to be significantly associated with knowledge of SBL. Among respondents aged 15-20 years, 88.4% had poor knowledge, compared to 11.6% with good knowledge. In contrast, those aged 21-25 years showed a higher proportion of good knowledge, with 45.0% in the good knowledge category. The age group 26-30 years also had more respondents with good knowledge (57.7%), while all respondents aged 36-40 years had poor knowledge.

Sex was not significantly associated with knowledge of SBL. The proportion of males with good knowledge was 37.4%, while 36.0% of females had good knowledge. Religion did not show a significant association with knowledge of SBL. Among Christians, 37.3% had good knowledge, while 21.2% of Muslims and 53.3% of those practicing African traditional religion were in the good knowledge category.

Marital status was also not significantly associated with SBL knowledge as respondents who were never married made up 188 (36.6) of the good knowledge group, while 4 (36.4) of married respondents had good knowledge. Department was significantly associated with SBL knowledge. A higher proportion of respondents in Medicine had good knowledge (50.7%), compared to 30.5% in Pharmacy and 20.0% in Nursing.

Academic level was another significant factor. Respondents in their sixth year had the highest proportion of good knowledge (71.2%), with respondents in their fifth-year following the queue with a good knowledge rate of 53.6%.

Table 7: Predictors of respondents' knowledge of Simulation-Based Learning

Factors	B (regression co-efficient)	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age	0.038	1.039	0.938	1.151	0.468
Sex					
Male	-0.186	0.830	0.540	1.276	0.396
Female**		1			
Religion					
Christianity	-0.688	0.503	0.183	1.380	0.182
Islam	-1.021	0.360	0.092	1.403	0.141
ATR/Atheist**		1			
Marital status					
Never married	0.757	2.133	0.510	8.917	0.299
Ever Married		1			
Department					
Medicine	0.903	2.466	1.035	5.873	0.042
Pharmacy	-0.351	0.704	0.291	1.700	0.435
Nursing	-0.615	0.541	0.210	1.395	0.204
Dentistry**		1			
Current Level					
100	-3.748	0.024	0.006	0.091	< 0.001*
200	-2.492	0.083	0.028	0.248	< 0.001*
300	-1.418	0.242	0.104	0.566	< 0.001*
400	-1.548	0.213	0.104	0.436	0.001*
500	-0.623	0.536	0.250	1.149	0.109
600**		1			

Reference category; *= Statistically significant; R^2 = 24.7 – 31.2, **CI = Confidence interval OR = Odds ratio

Age was not a significant predictor of SBL knowledge, with a p-value of 0.468. Sex also did not significantly predict SBL knowledge, as males had a p-value of 0.396 compared to females, who served as the reference category. Religion was not a significant predictor either. Christians had a

p-value of 0.182, while Muslims had a p-value of 0.141, with African traditional religion and atheists as the reference group.

Marital status was similarly not significant, with respondents who were never married showing a p-value of 0.299 compared to those who were married (reference category). Department was a significant predictor, with respondents in Medicine showing a p-value of 0.042, indicating a higher likelihood of good SBL knowledge. Pharmacy and Nursing did not show significant associations, with p-values of 0.435 and 0.204, respectively, when compared to Dentistry (reference category).

Academic level was a strong predictor of SBL knowledge. Respondents in their first year had a p-value of less than 0.001, indicating a significantly lower likelihood of good knowledge. Second-year students also had a p-value of less than 0.001, while third-year students had a p-value of less than 0.001 and fourth-year students had a p-value of 0.001. Fifth-year students showed no significant association with a p-value of 0.109 compared to sixth-year students (reference category).

Section C: Attitude towards Simulation-Based Learning

Table 8: Respondents' attitude towards Simulation-Based Learning (n = 525)

Attitude	Strongly Agree n (%)	Agree n (%)	Indifferent n (%)	Disagree n (%)	Strongly Disagree n (%)
Simulation-based learning enhances my understanding of many academic concepts.	117 (22.3)	214 (40.8)	143 (27.2)	23 (4.4)	28 (5.3)
I believe simulation-based learning is an effective method for developing new skills	102 (19.5)	273 (52.1)	106 (20.2)	24 (4.6)	19 (3.6)
I enjoy participating in simulation-based learning activities	90 (17.1)	198 (37.7)	193 (36.8)	32 (6.1)	12 (2.3)
Simulation-based learning is a valuable supplement to traditional education methods.	102 (19.4)	256 (48.8)	125 (23.8)	29 (5.5)	13 (2.5)
Simulation-based learning improves my confidence in applying my skills	106 (20.2)	216 (41.1)	163 (31.0)	20 (3.8)	20 (3.8)
I believe that simulation-based learning better prepares me for real-life scenarios.	103 (19.6)	200 (38.1)	169 (32.2)	33 (6.3)	20 (3.8)
Simulation-based learning helps me bridge the gap between theory and practice	108 (20.6)	201 (38.3)	182 (34.7)	23 (4.4)	11 (2.1)
I find simulation-based learning sessions to be engaging	117 (22.3)	197 (37.5)	179 (34.1)	19 (3.6)	13 (2.5)
I am satisfied with the variety of simulation-based learning activities offered	94 (17.9)	170 (32.4)	180 (34.3)	51 (9.7)	50 (9.5)
Simulation-based learning adds excitement to my education	111 (21.1)	222 (42.3)	157 (29.9)	20 (3.8)	15 (2.9)

When asked whether simulation-based learning enhances their understanding of academic concepts, 22.3% strongly agreed, 40.8% agreed, 27.2% were indifferent, 4.4% disagreed, and 5.3% strongly disagreed. Regarding the effectiveness of SBL in developing new skills, 19.5% strongly agreed, 52.1% agreed, 20.2% were indifferent, 4.6% disagreed, and 3.6% strongly disagreed. Similarly, when asked if they enjoy participating in SBL activities, 17.1% strongly agreed, 37.7% agreed, 36.8% were indifferent, 6.1% disagreed, and 2.3% strongly disagreed.

On the value of SBL as a supplement to traditional education methods, 19.4% strongly agreed, 48.8% agreed, 23.8% were indifferent, 5.5% disagreed, and 2.5% strongly disagreed. When considering whether SBL improves their confidence in applying skills, 20.2% strongly agreed, 41.1% agreed, 31.0% were indifferent, and 3.8% disagreed or strongly disagreed. Respondents also expressed their belief that SBL better prepares them for real-life scenarios, with 19.6% strongly agreeing, 38.1% agreeing, and 32.2% being indifferent.

In terms of bridging the gap between theory and practice, 20.6% strongly agreed, 38.3% agreed, and 34.7% were indifferent. When evaluating the engagement of SBL sessions, 22.3% strongly agreed, 37.5% agreed, and 34.1% were indifferent. Regarding satisfaction with the variety of SBL activities offered, 17.9% strongly agreed, while 32.4% agreed, and 34.3% were indifferent, with 9.7% disagreeing and 9.5% strongly disagreeing. About 21.1% strongly agreed that SBL adds excitement to their education, with 42.3% agreeing and 29.9% being indifferent.

Table 9: Appropriateness of the response to the attitude of Simulation-Based Learning

Variables n = 525	Responses	
	Correct (%)	Incorrect (%)
Simulation-based learning enhances my understanding of many academic concepts.	331 (63.0)	194 (37.0)
I believe simulation-based learning is an effective method for developing new skills	375 (71.4)	150 (28.6)
I enjoy participating in simulation-based learning activities	288 (54.9)	237 (45.1)
Simulation-based learning is a valuable supplement to traditional education methods.	358 (68.2)	167 (31.8)
Simulation-based learning improves my confidence in applying my skills	322 (61.3)	203 (38.7)
I believe that simulation-based learning better prepares me for real-life scenarios.	303 (57.7)	222 (42.3)
Simulation-based learning helps me bridge the gap between theory and practice	309 (58.9)	216 (41.1)
I find simulation-based learning sessions to be engaging	314 (59.8)	211 (40.2)
I am satisfied with the variety of simulation-based learning activities offered	264 (50.3)	261 (49.7)
Simulation-based learning adds excitement to my education	333 (63.4)	192 (36.6)

A majority, 63.0%, indicated that SBL enhances their understanding of academic concepts, while 37.0% did not support this view. Regarding the effectiveness of SBL in developing new skills, 71.4% of respondents expressed supportive opinions, compared to 28.6% who were non-supportive. When asked about enjoyment in participating in SBL activities, 54.9% of

respondents were supportive, whereas 45.1% were not. Additionally, 68.2% believed that SBL is a valuable supplement to traditional education methods, while 31.8% disagreed with this statement.

In terms of confidence in applying skills, 61.3% reported that SBL improves their confidence, with 38.7% holding a non-supportive view. Regarding preparation for real-life scenarios, 57.7% felt that SBL better prepares them, while 42.3% did not support this assertion. When considering whether SBL helps bridge the gap between theory and practice, 58.9% were supportive, and 41.1% were not. Furthermore, 59.8% found SBL sessions to be engaging, while 40.2% disagreed. Opinions about the variety of SBL activities offered were more evenly split, with 50.3% expressing satisfaction and 49.7% being non-supportive. Lastly, 63.4% believed that SBL adds excitement to their education, while 36.6% did not support this viewpoint. Overall, the findings indicate a generally supportive attitude toward simulation-based learning among the respondents.

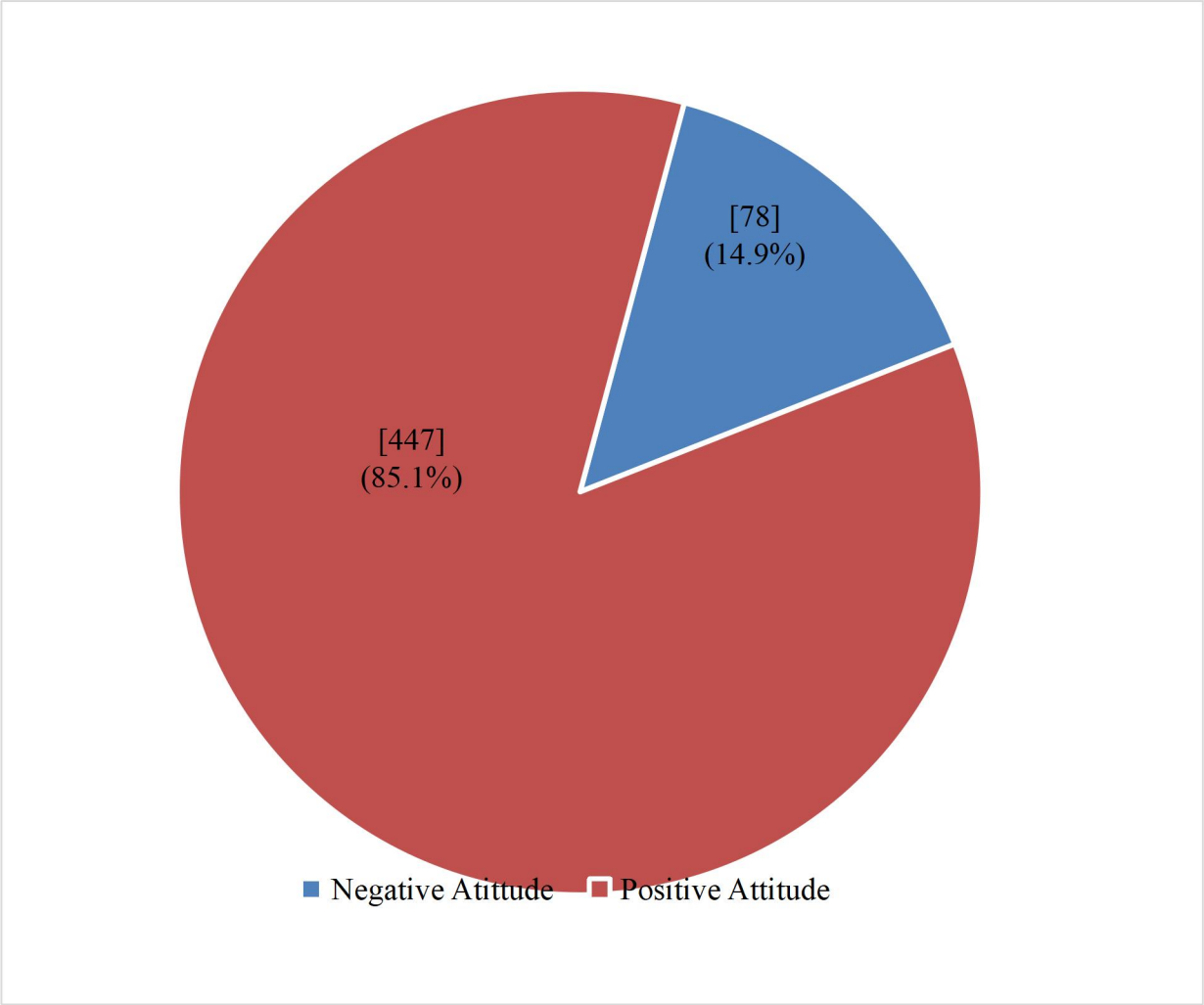

Fig 2: PIE CHART SHOWING RESPONDENTS' ATTITUDE TOWARDS SIMULATION-BASED LEARNING

A significant majority 447 (85.1%) of the respondents had positive attitude towards simulation based learning while only 78 (14.9%) had negative attitude.

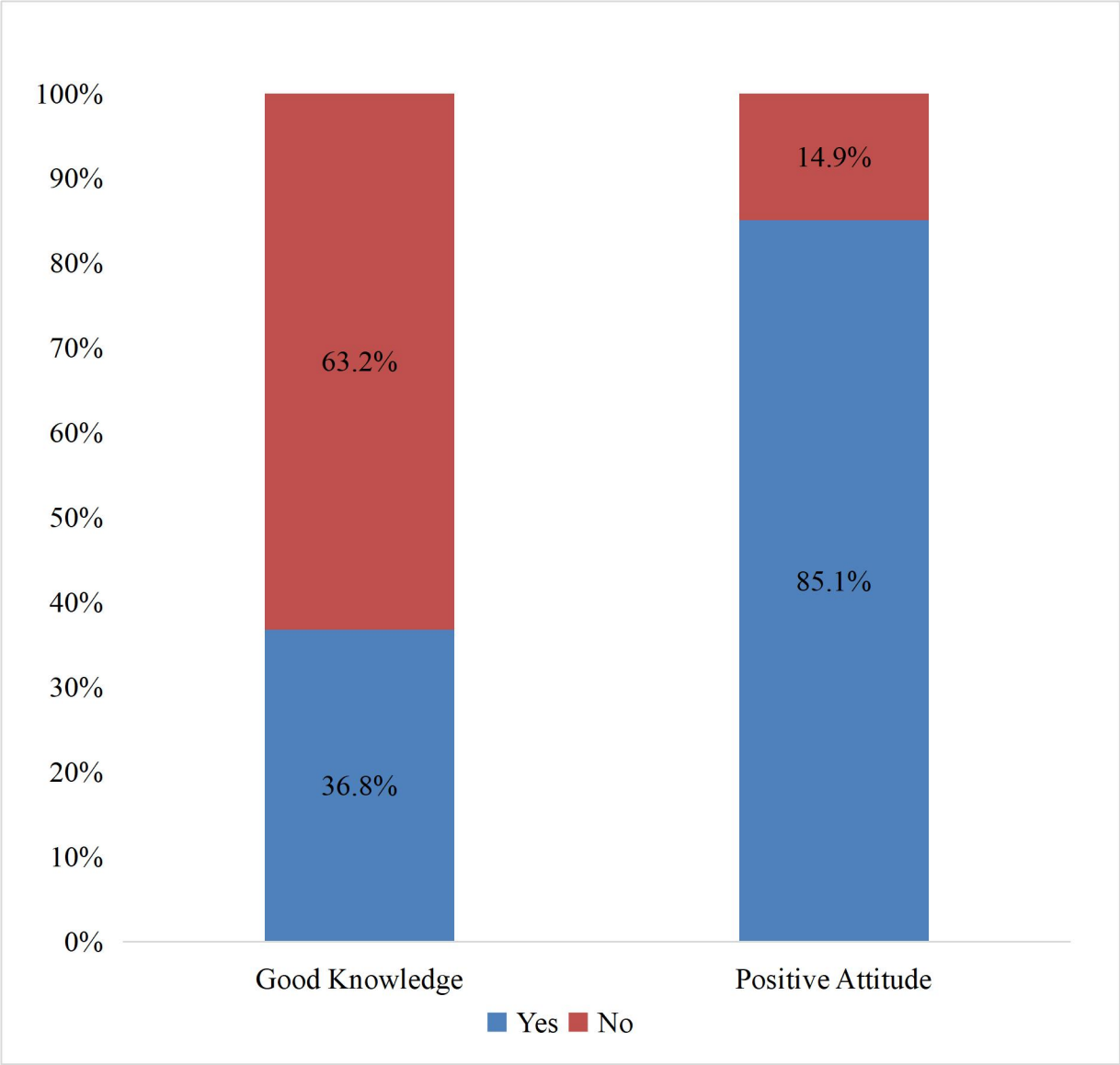

Fig 3: BAR CHART SHOWING RESPONDENTS' ATTITUDE TOWARDS SIMULATION-BASED LEARNING

About two-third of the respondents had poor knowledge of simulation based learning while a significant majority had positive attitude towards simulation based learning.

Table 10: Factors associated with respondents' attitude towards Simulation-Based Learning

Variable	Attitude towards Simulation-Based Learning		Test statistic	p–value
	Negative (n = 78) n (%)	Positive (n = 447) n (%)		
Age (years)				
15-20	23 (15.8)	123 (84.2)	Fisher's Exact = 4.868	0.257
21-25	43 (13.4)	277 (86.6)		
26-30	11 (21.2)	41 (78.8)		
31-35	0 (0.0)	5 (100.0)		
36-40	1 (50.0)	1 (50.0)		
Sex				
Male	48 (16.2)	249 (83.8)	χ^2 = 0.920	0.377
Female	30 (13.2)	198 (86.8)		
Religion				
Christianity	69 (14.6)	403 (85.4)	Fisher's Exact = 2.187	0.506
Islam	7 (21.2)	26 (78.8)		
African traditional religion	1 (6.7)	14 (93.3)		
Atheist	1 (20.0)	4 (80.0)		
Marital status				
Never Married	77 (15.0)	437 (85.0)	Fisher's Exact = 1.000	0.587
Ever Married	1 (9.1)	10 (90.9)		
Department				
Medicine	25 (12.0)	184 (88.0)	χ^2 = 3.857	0.277
Pharmacy	31 (17.8)	143 (82.2)		
Nursing	19 (17.3)	91 (82.7)		
Dentistry	3 (9.4)	29 (90.6)		
Level				
100	11 (16.2)	57 (83.8)	χ^2 = 7.326	0.198

200	11 (15.7)	59 (84.3)		
300	17 (19.5)	70 (80.5)		
400	16 (10.2)	141 (89.8)		
500	10 (10.2)	74 (88.1)		
600	13 (22.0)	46 (78.0)		
Knowledge of SBL				
Poor knowledge	59 (17.7)	274 (82.3)	$\chi^2 =$ 5.890	**0.015**
Good knowledge	19 (9.9)	173 (90.1)		

***= statistically significant**

In terms of age, the majority of respondents aged 15-20 were supportive (84.2%), with a non-supportive percentage of 15.8%. For those aged 21-25, 86.6% were supportive, while 13.4% were non-supportive. The 26-30 age group showed a higher non-supportive percentage of 21.2%, with 78.8% supportive. No respondents aged 31-35 were non-supportive, while among those aged 36-40, half were supportive.

Regarding sex, 83.8% of males were supportive compared to 86.8% of females, showing no significant difference between groups. In terms of religion, 85.4% of Christians were supportive, while 14.6% were non-supportive. Among Muslims, 78.8% were supportive with 21.2% non-supportive. The African traditional religion and atheist groups had supportive percentages of 93.3% and 80.0%, respectively.

Marital status did not show any significant difference, as 437 (85.0%) of respondents who were never married were supportive, compared to 10 (90.9%) respondents who were married. Department-wise, 88.0% of those in Medicine were supportive, as were 82.2% in Pharmacy, 82.7% in Nursing, and 90.6% in Dentistry. Academic level showed varied results; while 83.8% of first-year students were supportive, this percentage increased to 89.8% among fourth-year students. However, 22.0% of sixth-year students were non-supportive.

Table 11: Predictors of respondents' Attitude towards Simulation-Based Learning

Factors	B (regression co-efficient)	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age	-0.069	0.934	0.833	1.046	0.236
Sex					
Male	-0.278	0.757	0.445	1.288	0.305
Female**		1			
Religion					
Christianity	-0.377	0.686	0.148	3.177	0.630
Islam	-0.690	0.502	0.088	2.861	0.437
ATR/Atheist**		1			
Marital status					
Never Married	-0.611	0.543	0.068	4.363	0.566
Ever Married**		1			
Department					
Medicine	-0.276	0.759	0.211	2.733	0.673
Pharmacy	-0.596	0.551	0.154	1.970	0.359
Nursing	-0.797	0.451	0.122	1.670	0.233
Dentistry**		1			
Level					
100	-0.025	0.975	0.301	3.157	0.967
200	0.114	1.120	0.356	3.529	0.846
300	-0.007	0.993	0.386	2.558	0.988
400	0.836	2.308	0.989	5.382	0.053
500	0.728	2.071	0.810	5.293	0.128
600**		1			
Knowledge of SBL					
Poor knowledge	-0.673	0.510	0.294	0.885	<**0.017**
Good knowledge		1			

Reference category; * = Statistically significant; R^2 = 28.3 – 35.2, **CI = Confidence interval OR = Odds ratio

Age was not a significant predictor, with a regression coefficient of -0.069 and a p-value of 0.236, indicating no meaningful association. Sex also did not show a significant relationship, as the coefficient for males was -0.278, resulting in a p-value of 0.305, with females serving as the reference group.

In terms of religion, Christians had a coefficient of -0.377 with a p-value of 0.630, and Muslims had a coefficient of -0.690 with a p-value of 0.437, both suggesting no significant differences compared to the reference group of those adhering to African traditional religion or atheism. Marital status revealed a coefficient of -0.611 for single or cohabiting respondents, with a p-value of 0.566, indicating no significant influence on attitudes compared to the married or separated group.

Regarding department, respondents in Medicine had a coefficient of -0.276 ($p = 0.673$), Pharmacy showed a coefficient of -0.596 ($p = 0.359$), and Nursing had a coefficient of -0.797 ($p = 0.233$), with Dentistry as the reference group, indicating no significant effects of department on attitudes toward SBL. The coefficient for first-year students was -0.025 ($p = 0.967$), while second-year students showed a coefficient of 0.114 ($p = 0.846$). Third-year students had a coefficient of -0.007 ($p = 0.988$), whereas fourth-year students had a coefficient of 0.836 with a p-value of 0.053, suggesting a near-significant positive influence on supportive attitudes. Fifth-year students had a coefficient of 0.728 ($p = 0.128$), indicating no significant association compared to sixth-year students, the reference category.

Section D: Practice of Simulation-Based Learning

Table 12: Respondents' practice of simulation-based learning

Variables	Frequency	Percent
Have you ever participated in simulation-based learning activities (n = 620)		
Yes	334	53.9
No	286	46.1
Have you recently participated in simulation-based learning activities (n = 620)		
Yes	312	50.3
No	308	49.7
Are you currently participating in simulation-based learning activities (n = 620)		
Yes	250	40.3
No	370	59.7
Types of simulation-based learning activities participated in (n = 334) *		
High-fidelity mannequins	161	48.2
Virtual patients	159	47.6
Standardized patients	145	43.4
Virtual reality simulations	113	33.8
Other**	5	1.5
Frequency of simulation-based learning activities in the respondent's coursework (n = 334)		
Regularly	35	10.5
Occasionally	141	42.2
Rarely	105	31.4
Never	53	15.9
Frequency of active participation in simulation-based learning activities (n = 334)		
Always	59	17.7
Often	81	24.3
Occasionally	65	19.5
Rarely	82	24.6
Never	47	14.1
Level of engagement during simulation-based learning activities (n = 334)		
Not at all engaged	42	12.6
Slightly engaged	42	12.6
Moderately engaged	137	41.0

Very engaged	102	30.5
Extremely engaged	11	3.3

It was found that 53.9% (n = 334) reported having participated in simulation-based learning activities at some point, while 46.1% (n = 286) indicated they had not. Regarding recent participation, 50.3% (n = 312) of respondents confirmed they had participated in SBL activities recently, whereas 49.7% (n = 308) reported they had not. When asked about current participation, only 40.3% (n = 250) were engaged in SBL activities, while the majority, 59.7% (n = 370), were not.

Among those who had participated in SBL activities (n = 334), the most common types reported included high-fidelity mannequins (48.2%), virtual patients (47.6%), and standardized patients (43.4%). Virtual reality simulations were reported by 33.8% of respondents, with a small percentage (1.5%) engaging in other types of simulation activities.

In terms of the frequency of SBL activities within respondents' coursework, 10.5% (n = 35) reported engaging in these activities regularly, 42.2% (n = 141) occasionally, 31.4% (n = 105) rarely, and 15.9% (n = 53) stated they never engaged in SBL activities. Overall, the data reflect a significant level of engagement with simulation-based learning among the respondents, albeit with a notable proportion not currently participating.

In terms of frequency of active participation, 17.7% (n = 59) reported they always engaged in SBL activities, while 24.3% (n = 81) stated they often participated. Additionally, 19.5% (n = 65) indicated they participated occasionally, and 24.6% (n = 82) reported rare participation.

About 14.1% of the respondents stated they never participated in these activities. Regarding the level of engagement during SBL activities, responses varied significantly. A total of 12.6% (n = 42) felt not at all engaged, and another 12.6% (n = 42) felt slightly engaged. In contrast, 41.0%

(n = 137) described themselves as moderately engaged, while 30.5% (n = 102) reported being very engaged. A small fraction, 3.3% (n = 11), claimed to be extremely engaged during the activities.

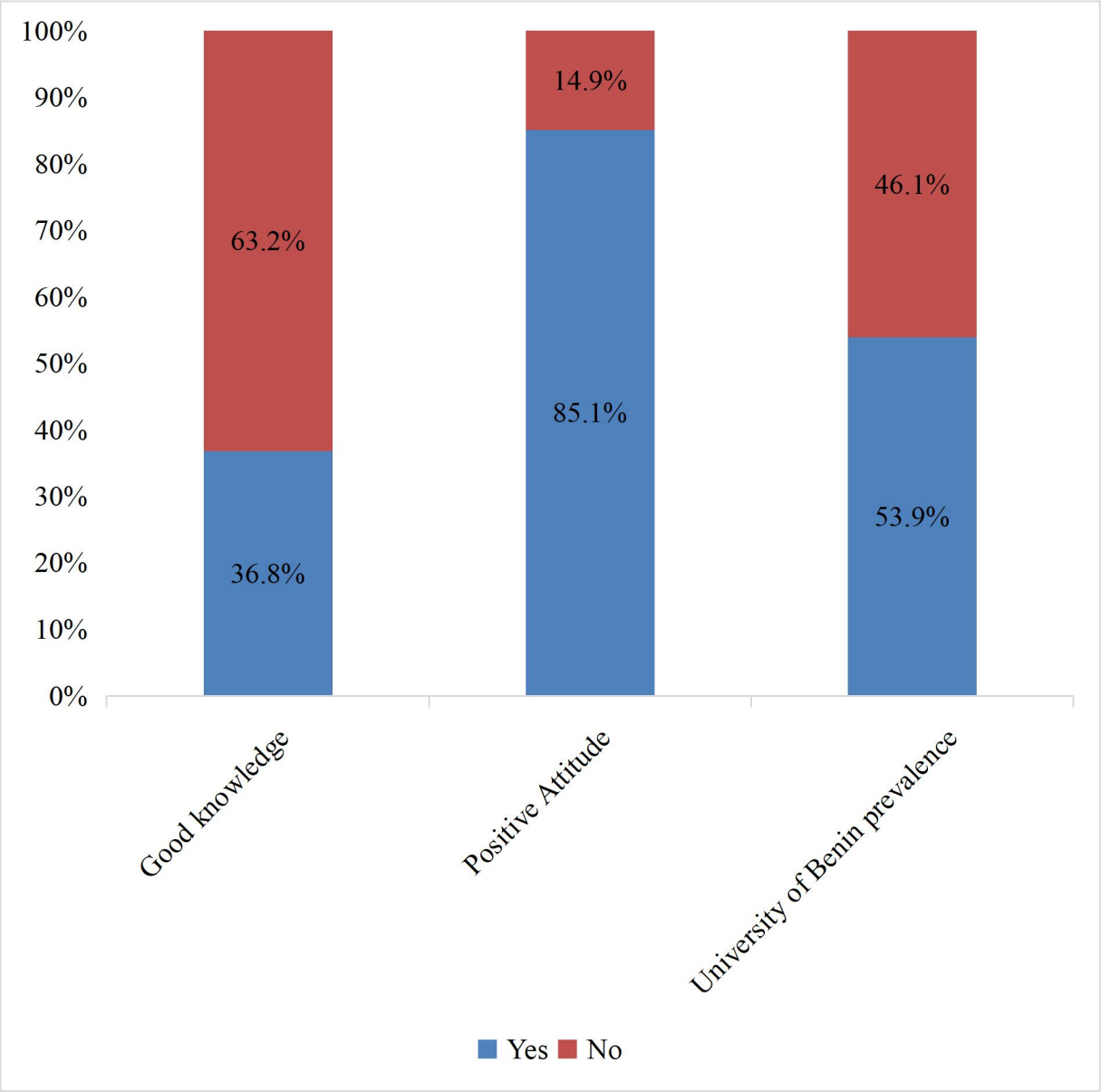

Fig 4: BAR CHART SHOWING RESPONDENTS' KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS SIMULATION-BASED LEARNING

About two-third of the respondents had poor knowledge of simulation based learning while a significant majority had positive attitude towards simulation based learning. More than half of the respondents had participated in simulation based learning in University of Benin

Table 13: Factors associated with respondents' practice of Simulation-Based Learning.

Variable	Had simulation-based learning activities during undergraduate studies		Test statistic	p–value
	Ever (n = 334) n (%)	Never (n = 286) n (%)		
Age (years)				
15-20	81 (38.8)	128 (61.2)	Fisher's Exact = 31.999	< 0.001*
21-25	209 (60.1)	139 (39.9)		
26-30	40 (71.4)	16 (28.6)		
31-35	3 (60.0)	2 (40.0)		
36-40	1 (50.0)	1 (50.0)		
Sex				
Male	197 (57.9)	143 (42.1)	χ^2 = 5.019	0.025*
Female	137 (48.9)	143 (51.1)		
Religion				
Christianity	301 (54.8)	248 (45.2)	Fisher's Exact = 1.859	0.602
Islam	21 (46.7)	24 (53.3)		
African traditional religion	10 (47.6)	11 (52.4)		
Atheist	2 (40.0)	3 (60.0)		
Marital status				
Never Married	345 (56.8)	262 (43.2)	Fisher's Exact = 1.000	0.829
Ever Married	7 (53.8)	6 (46.2)		
Department				
Medicine	135 (61.1)	86 (38.9)	χ^2 = 15.119	0.002*
Pharmacy	119 (54.6)	99 (45.4)		
Nursing	58 (40.6)	85 (59.4)		
Dentistry	22 (57.9)	16 (42.1)		
Level				
100	35 (33.3)	70 (66.7)	χ^2 = 45.629	< 0.001*

200	39 (40.2)	58 (59.8)		
300	56 (53.3)	49 (46.7)		
400	105 (64.0)	59 (36.0)		
500	53 (59.6)	36 (40.4)		
600	46 (76.7)	14 (23.3)		
Knowledge of SBL				
Poor Knowledge	192 (57.7)	141 (42.3)	$\chi^2 =$ 33.256	**<0.001**
Good Knowledge	158 (82.3)	34 (17.7)		
Attitude towards SBL				
Poor Attitude	53 (67.9)	25 (32.1)	$\chi^2 =$ 0.068	0.795
Good Attitude	297 (66.4)	150 (33.6)		

***= statistically significant**

Among the respondents who had ever engaged in SBL activities (n = 334) compared to those who had never participated (n = 286), age emerged as a significant factor. Specifically, 38.8% of respondents aged fifteen to twenty had participated, while a higher percentage of those aged twenty-one to twenty-five (60.1%) and twenty-six to thirty (71.4%) had also engaged in SBL, indicating a strong association ($p < 0.001$). Sex also showed a notable association, with 57.9% of male respondents having participated in SBL activities compared to 48.9% of female respondents ($p = 0.025$).

Departmental differences were significant as well; 61.1% of respondents from the Medicine department reported engaging in SBL, compared to 54.6% from Pharmacy, 40.6% from Nursing, and 57.9% from Dentistry ($p = 0.002$). Additionally, the level of study significantly influenced participation. Only 33.3% of first-year students reported engaging in SBL, but this percentage increased with each successive year, reaching 76.7% among sixth-year students ($p < 0.001$).

Table 14: Predictors of respondents' Practice of Simulation-Based Learning

Factors	B (regression co-efficient)	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age	0.033	1.033	0.944	1.130	0.477
Sex					
Male	0.150	1.162	0.822	1.643	0.394
Female**		1			
Religion					
Christianity	0.251	1.286	0.557	2.968	0.556
Islam	0.278	1.320	0.476	3.660	0.593
ATR/Atheist**		1			
Marital status					
Never Married	0.418	1.519	0.465	4.959	0.489
Ever Married**		1			
Department	0.093	1.097	0.526	2.286	0.805
Medicine	-0.128	0.879	0.422	1.831	0.731
Pharmacy	-0.507	0.603	0.282	1.288	0.191
Nursing	0.093	1.097	0.526	2.286	0.805
Dentistry**		1			
Level					
100	-1.544	0.214	0.085	0.533	0.001
200	-1.265	0.282	0.115	0.694	0.006
300	-0.767	0.464	0.211	1.023	0.057
400	-0.535	0.586	0.291	1.177	0.133
500	-0.636	0.529	0.250	1.119	0.096
600**		1			
Knowledge of SBL					
Poor knowledge	-1.247	0.287	0.187	0.443	**< 0.001**[#]
Good knowledge		1			
Attitude towards SBL					
Negative attitude	0.239	1.270	0.747	2.157	0.378
Positive attitude		1			

Reference category; [#] = Statistically significant; R^2 = 25.8– 32.6, **CI = Confidence interval OR = Odds ratio

The regression coefficient for age was positive (B = 0.033), but the odds ratio (OR = 1.033) indicated no significant effect on participation (p = 0.477). Male respondents showed a slightly higher likelihood of participation (B = 0.150, OR = 1.162), but this was not statistically significant (p = 0.394). Both Christian (B = 0.251, OR = 1.286) and Muslim respondents (B = 0.278, OR = 1.320) displayed higher odds of participation compared to other religions, though neither was statistically significant (p = 0.556 and p = 0.593, respectively).

There was no significant association found with marital status (p = 0.489). The coefficients indicated no significant differences across departments, with all departments showing no significant impact on SBL practice (e.g., Medicine: B = -0.128, OR = 0.879, p = 0.731). The level of study significantly influenced participation.

Respondents in their first year (B = -1.544, OR = 0.214, p = 0.001) and second year (B = -1.265, OR = 0.282, p = 0.006) were much less likely to engage in SBL compared to those in their sixth year. Having a negative attitude towards SBL (B = 0.385, OR = 1.470) was not statistically significant (p = 0.153). Knowledge had a strong predictive value; those with poor knowledge of SBL were significantly less likely to participate (B = -1.190, OR = 0.304, p < 0.001).

SECTION E: CHALLENGES TO SIMULATION-BASED LEARNING

Table 15: Respondents' challenges with simulation-based learning activities

Variables	Frequency	Percent
Had faced challenges when participating simulation-based learning activities (n = 620)		
Yes	144	23.2
No	476	76.8
The main challenges encountered (n= 144)		
Non-response	30	20.8
Poor service	19	13.2
Power shortage	19	13.2
Out-dated facilities	16	11.1
Faulty equipment	14	9.7
Overpopulation	10	6.9
Lack materials	7	4.9
No resources	6	4.2
Time consuming	5	3.5
Under staff	4	2.8
Financial constraints	4	2.8
Unavailability of staff	3	2.1
No facilities	3	2.1
Lack of facilities	2	1.3
No access	1	0.7
No materials	1	0.7
Rate accessibility of facility (n= 620)		
Excellent	10	1.6
Good	70	11.3
Average	175	28.2
Poor	205	33.1
Very poor	160	25.8
Had faced difficulty accessing the facility(n= 620)		
Yes	423	68.2
No	197	31.8
Believe simulation resources are enough (n= 620)		
Yes	90	14.5

No	530	85.5
Having challenge allocating time to simulation-based learning activities		
Yes	403	65.0
No	217	35.0
Had ever felt that time used for simulation-based learning activities should be used for other academic activities		
Yes	314	50.6
No	306	49.4
Level of satisfaction with support provided for engaging in simulation-based learning activities		
Very satisfied	50	8.1
Satisfied	59	9.5
Neutral	129	20.8
Dissatisfied	114	18.4
Very dissatisfied	268	43.2
Had experience challenge in receiving guidance from your faculty		
Yes	137	22.1
No	483	77.9
Had faced technical issues during simulation-based learning activities		
Yes	130	21.0
No	490	79.0

Out of 620 participants, 23.2% reported encountering challenges during these activities, while 76.8% did not. Among the 144 respondents who indicated they had faced challenges, the most frequently cited issues included non-response (20.8%), poor service (13.2%), and power shortages (13.2%). Other challenges included outdated facilities (11.1%), faulty equipment

(9.7%), and issues related to overpopulation (6.9%), among others. A smaller number of respondents noted challenges such as lack of materials (4.9%) and financial constraints (2.8%).

Regarding the accessibility of facilities, only 1.6% rated it as excellent, while 11.3% rated it as good. The majority rated it as average (28.2%), poor (33.1%), or very poor (25.8%). Furthermore, a substantial 68.2% of participants reported difficulties accessing the facilities.

When asked about the adequacy of simulation resources, a significant 85.5% responded negatively, indicating that they did not believe there were enough resources available. A majority of respondents (65.0%) also reported challenges in allocating time for simulation-based learning activities. Additionally, 50.6% felt that the time spent on these activities should instead be allocated to other academic pursuits.

Participants expressed varied levels of satisfaction with the support provided for engaging in simulation-based learning. A notable 43.2% reported being very dissatisfied, while only 8.1% were very satisfied. In terms of guidance from faculty, 22.1% reported having experienced challenges, and 21.0% indicated that they faced technical issues during simulation-based learning activities.

Key Informant Interview

The key informant interview was carried out on three professors from the university of Benin

Section A: Knowledge of Simulation-Based Learning

In understanding the concept of SBL, key informants highlighted that SBL enhances understanding through practical engagement. They posited that it also promotes hands-on experience while learning in a simulation based environment which allows for better retention of knowledge through acquired pyschomotor skills. when asked about the meaning of simulation-based learning during the course of the interview, the informants described it as; "Simulation based learning applied to medicine... is about practical skills to x-ray the knowledge you have in managing patients" (Key Informant 1). "In simulation based learning, it's also an organized way in which learning can occur through the use of scenarios where human beings or mannequins are substituted in the place of humans" (Key Informant 2). "Simulation is when you create a life-like scenario where people can safely practice and learn to acquire psycho-motor skills" (Key Informant 3). "If you participate in any activity by doing it, you recall more" (Key Informant 1).

Section B: Attitude towards Simulation-Based Learning

The attitudes of students and faculty towards simulation-based learning are crucial for its acceptance and effectiveness. There may be some resistance to SBL due to student's perception of SBL, but awareness is growing. This will help in boosting the acceptance of SBL as as a tool for increasing confidence in clinical skills. The interviewees stated that "Some people are so

condemned to conservatism that they do not see the need to move to a new ground" (Key Informant 1). "Simulation goes in the same direction... it's an activity-based situation where one would expect that because you've done it, you're more likely to retain that knowledge" (Key Informant 1). "For University of Benin students, they will benefit immensely... it gives them opportunity to acquire confidence skills in certain very sensitive procedures" (Key Informant 2). "You want people to be able to learn in an environment where they can make mistakes and they can learn before they can come into the clinical setting" (Key Informant 3). "The immersive nature of the simulation lab helps to suspend disbelief, making the learning experience feel real" (Key Informant 1).

Section C: Practice of Simulation-Based Learning

Practical application of knowledge through SBL was emphasized by the key informants, as it allows students to practice vital clinical skills safely. The incorporation of SBL into the curriculum is essential for improving practical training. The informants posited that; "You can then practice... in a simulation lab where these high fidelity mannequins are available" (Key Informant 2). "It's an immersive system where you can act like it's real... you can fix IV lines, you can give infusions" (Key Informant 1). "Increasingly, the medical curriculum is such that... we are increasingly concerned about the skills; clinical skills and psycho-motor skills of students" (Key Informant 3). "Simulation provides the average student an opportunity to do some extra learning outside of human-human interaction" (Key Informant 2). "The kind of simulation lab we have at University of Benin now is something that will be of immense benefit" (Key Informant 1).

Section D: Challenges to Simulation-Based Learning

There are various factors that may hinder the incorporation of SBl into the curriculum of universities. These factors are; resource constraints, maintenance and sustainability of SBL which is a major concern due to funding limitations, cultural resistance to new methods poses a challenge to its implementation , student engagement and motivation to participating fully in SBL. The informants outlined areas of import that were to be addressed in other to tackle the challenges which has ravaged the proliferation and growth of simulation based learning; an informant said "A time will come when the university will obviously have to take up the challenge of continuing funding" (Key Informant 1). "Right now we have limited number of rooms... six rooms can only handle so many students" (Key Informant 2). "One of the biggest challenges is... getting high fidelity mannequins, especially with the downturn of the economy" (Key Informant 3). "You want people to be able to learn in an environment where they can make mistakes" (Key Informant 3). "The hospital is a bit far from where the simulation lab is, so that could be discouragement" (Key Informant 2). "The perception of innovation can be a barrier, as some may resist new approaches like simulation training" (Key Informant 1)

CHAPTER FIVE

DISCUSSION

In medical education, simulation-based learning enables healthcare professionals to acquire knowledge and skills in an educationally oriented, safe, low-stress environment. Skills acquired through simulation-based activities can be cross-pollinated into clinical practice, resulting in improved patient outcomes.[22]

A total of 620 respondents participated in the study. The survey revealed a mean age of 21.9 years among the respondents, with more than half aged between 21 to 25 years. The predominance of younger respondents may be attributed to increased access to higher education and the growing interest in health professions among this age group.

The survey reveal that younger respondents (aged 15-20) exhibited poorer knowledge levels, while sixth-year students demonstrated the highest competence. This observation may be attributed to the fact that most respondents were between their 400-600 level of their studies, and the study specifically targeted undergraduates, who predominantly fall within this age group and is in keeping with age of undergraduate students. They also had a high proportion of good knowledge of Simulation-based learning (45.0%) after those in age range of 26 - 30 who had the highest proportion (57.7%). This suggests that students in the 21–24 age and 26 - 30 age range are more likely to have gained exposure to SBL during their studies, possibly due to being

further along in their educational programs and may also be due to the fact that medical students constitute a larger proportion of the sample size.

This knowledge finding is in keeping with a survey on simulation-based training administered to a convenience sample of 120 medical students in the 4th year (400 level) and final year (600 level) at the College of Medicine, University of Lagos, Lagos, Nigeria and respondents were mostly 21-30 years 95 (81%).[14]

The study findings showed that a high proportion of the respondents 332 (63.2%) had poor knowledge of simulation based learning while 193 (36.7%) had good knowledge, with respondents of age range between 15 - 20 years recording the highest proportion 129 (88.4) of poor knowledge of SBL. This insufficient knowledge of SBL could impede the effective application of simulation techniques in clinical training, ultimately affecting the competencies of future healthcare providers. This gap underscores the importance of incorporating robust training modules focused on SBL into the healthcare curriculum. Curricula should be revised by the school authorities to include comprehensive training on SBL, emphasizing hands-on experience and practical applications. They should also foster collaborations with healthcare facilities to facilitate immersive simulation experiences.

From the Key Informant Interview (KII) that was carried out, the key informants unanimously highlighted that SBL is a valuable approach to enhance understanding through practical engagement. Through experiential learning and immersive practice, students are better equipped to retain information by actively engaging in clinical scenarios. According to Key Informant 1, SBL allows students to “x-ray the knowledge” necessary for patient management, focusing on practical applications rather than rote memorization.

The respondents with poor knowledge (332) may be due to limited exposure to SBL activities as a majority of respondents in this category were within the age ranges (15-20) of students who were within 100 - 300 level of study, limited access to social media which has become a significant platform for spreading awareness and information about simulation-based learning, as well as the fact that simulation-based learning has not yet become fully integrated into their training, though it is gradually gaining traction.

This knowledge findings is in line with a similar study which was conducted in College of Medicine, University of Lagos, Lagos, Nigeria among 120 medical students which reveal that less than one-fifth of the respondents had good knowledge of SBL,[14] however, this is in contrast to a study conducted in Fraternity in selected Nursing Institutions in India which found that a significant majority of the respondents had good knowledge of SBL.[11]

The analysis of socio-demographic factors in relation to knowledge of simulation-based learning shows significant associations between certain demographics and levels of awareness. Respondents in higher academic levels (500 and 600 levels) elicited greater knowledge of simulation-based learning compared to those in lower levels. This disparity may be attributed to their consistent exposure to clinical scenarios over time, giving them a broader understanding and perspective of practical applications and a greater likelihood of encountering simulation during their studies. This is further supported by a survey conducted among 120 medical students in the 400 and 600 levels at the College of Medicine, University of Lagos, which showed that 600-level students had a better understanding, particularly regarding the advantages of simulation-based training.[14]

The study revealed that there was improvement in the knowledge of SBL of respondents as they advanced in their academic level. The level of exposure to clinical and practical based activities suggest that students are introduced to SBL activities according to the knowledge acquired while studying overtime. With this advancement in level, the respondents had had enough time to integrate and apply the knowledge gained from simulation into their studies along with being exposed to more advanced coursework and clinical scenarios.

Research indicates that increased awareness of patient safety, along with recent technological advancements, will lead to a broader acceptance of simulation for evaluating clinical competencies. This, in turn, will enhance understanding and knowledge of simulation-based learning.[21]

The survey revealed that more than four-fifth of respondents exhibited a positive attitude towards SBL. It was found, that about two-third of the respondents believe SBL enhances their understanding of academic concepts, with more than two-third affirming its effectiveness in skill development. Interestingly, while a little above half reported enjoyment in participating in SBL activities. The positive attitude towards SBL can be attributed to its effectiveness in promoting active learning, which is well-supported in educational psychology and medical practice.

This findings on the attitude of respondents is consistent with a previous study which showed that about three-fourth of the respondents had positive attitude towards simulation based learning while about one-fourth had neutral attitude. None of the respondents had negative attitude towards simulation based learning.[6] While the positive attitude towards SBL is promising, the significant portion of students expressing indifference or negativity could undermine the implementation of effective health education strategies. If students perceive SBL as merely an

adjunct to traditional methods rather than a core component, it may hinder the development of essential skills needed in clinical practice, ultimately affecting patient care and public health outcomes. School authorities should increase investment in SBL resources, ensuring diverse and engaging learning opportunities and also provide training for educators in the effective implementation of SBL.

Regarding the attitude towards SBL, Key Informant 1 mentioned a "condemnation to conservatism," a sentiment reflecting the hesitancy often seen in adopting new educational approaches. However, increased awareness and exposure to SBL are improving its acceptance, particularly in scenarios involving high-risk, sensitive procedures. Key Informant 2 noted that SBL enables students to build confidence through repeated practice as lack of acceptance may slow the development of competent healthcare providers, resulting in professionals less prepared to handle complex cases.

The survey also found that more than half of the respondents have participated in SBL activities, but only four-tenth are currently engaged. Among the most frequently reported include high-fidelity mannequins and virtual patients. The decline in current participation could be influenced by several factors, including resource availability and curriculum design. The prevalence of high-fidelity mannequins and virtual patients suggests an inclination towards more advanced forms of simulation, reflecting a desire for realistic training environments.

This findings on the practice of SBL is in agreement with a similar study conducted in Northern and Upper East regions of Ghana which found that the majority of the respondents were familiar with the use of simulation and a significant majority of the respondents agreed that they had practiced simulation in the past.[12] The under-utilization of SBL could have dire implications for

public health, If future healthcare professionals are not adequately prepared for real-world scenarios, this could lead to sub-optimal patient care, increased medical errors, and diminished healthcare outcomes. The gap between students' positive attitudes and their actual engagement raises concerns about the efficacy of training methods currently in place. School management should develop standardized SBL curricula that include regular engagement opportunities. They should also enhance collaboration between educational institutions and healthcare facilities to create more opportunities for real-world application of SBL.

Key Informants emphasized the importance of simulation labs with high-fidelity mannequins for skill-based learning as the incorporation of SBL in medical education has the potential to reduce errors in real-life clinical practice, improving patient safety and health outcomes. Without these practical learning opportunities, students risk entering the field underprepared, which could lead to decreased care quality and increased risks to patient safety.

The survey revealed that a little above one-fifth (144) of the respondents reported facing challenges during simulation-based learning activities which suggests a significant minority of students are experiencing issues that could affect their learning outcomes. These challenges may stem from systemic issues within educational institutions, including inadequate infrastructure and support systems. The most frequently stated challenges among those who reported difficulties were non-response to poor service and power shortages. More than four-fifth (530) of respondents believed that simulation resources were insufficient. A significant majority (403) reported difficulties allocating time for simulation-based activities while more than half (314) felt that this time should be redirected to other academic pursuits. About one-fifth (130) of the respondents reported facing technical issues during simulation activities, which can severely disrupt learning. These challenges reflect broader issues in Nigerian healthcare and educational

infrastructure, including inconsistent power supply and lack of maintenance for existing resources.

The challenges observed in this study is in consonance with a similar study which was conducted in College of medicine University of Lagos where it was found that lack of curriculum, instructors trained in simulation education and funding were perceived as challenges to manikin-based simulation in skills-based simulation labs. Lack of awareness was found to be the greatest single challenge to online simulation however, lack of infrastructure inconsistent power supply and internet access also pose significant challenges.[14] Insufficient training can lead to poorly prepared healthcare professionals, adversely impacting the quality of care provided to patients. Poor infrastructure can lead to inadequate training of health professionals, contributing to systemic inefficiencies in healthcare delivery. School management should prioritize investment in SBL infrastructure to enhance learning experiences and outcomes. Improving infrastructure, particularly ensuring reliable power supply and upgrading facilities, is essential for effective SBL.

Also from the KII, the primary challenges identified were funding limitations, resource scarcity, and cultural resistance to non-traditional learning methods. Key Informant 3 pointed out that "economic downturns have made acquiring necessary high-fidelity mannequins challenging", while Key Informant 2 noted that "the limited space of six rooms restricts student access to SBL resources". Limited access to adequate SBL facilities can in many ways result in an uneven distribution of skills among healthcare professionals. This scarcity of practical training resources ultimately impacts patient care quality, as medical professionals may not be uniformly prepared for real-world scenarios.

CONCLUSION

The study found that the respondents were predominantly young, with a slight male predominance and majority being Christians and of Benin tribe.

Although awareness of SBL was high, only a minority demonstrated strong knowledge, particularly among younger students. Most respondents had a positive attitude toward SBL, recognizing its value for skill development, though some showed indifference.

While many students had previous SBL experience, current participation was limited, likely due to resource and curriculum constraints. Key challenges included funding, limited infrastructure, and technical issues, which restrict effective SBL access.

RECOMMENDATIONS

1. To Federal Ministry of Education

1. Establish national standards and guidelines for simulation-based learning (SBL) to ensure consistency and quality across educational institutions.
2. Allocate specific funding and grants for educational institutions to invest in SBL resources, including infrastructure, technology, and training programs.
3. Implement national training programs focused on SBL for educators to improve teaching methodologies and facilitate effective learning experiences.
4. Foster partnerships between educational institutions and healthcare facilities to provide practical simulation experiences for students.
5. Launch awareness campaigns to promote the importance of SBL in healthcare education and its impact on patient care and public health outcomes.

2. To University Authorities

1. Revise the curriculum to incorporate SBL modules that emphasize hands-on experience and practical applications relevant to students' fields of study.
2. Invest in modern simulation facilities, including high-fidelity mannequins and virtual simulation technologies, to enhance learning environments.

3. Encourage interdisciplinary collaboration between departments to develop comprehensive SBL programs that address various aspects of healthcare training.
4. Provide ongoing training and professional development for faculty on the effective implementation of SBL and the use of simulation technologies.
5. Establish feedback mechanisms for students to evaluate SBL activities, allowing continuous improvement based on students' experiences and suggestions.

3. To Academic Staff

1. Participate in workshops and training sessions focused on the latest SBL methodologies and technologies to improve teaching effectiveness.
2. Utilize active learning strategies within SBL activities to promote student engagement and enhance the learning experience.
3. Conduct research on SBL practices to identify best practices and share findings with colleagues to foster a culture of continuous improvement.
4. Establish mentor-ship programs for junior faculty members, providing guidance on effectively implementing SBL in their courses.
5. Collaborate with other faculty members to design and implement SBL activities that meet the diverse learning needs of students.

4. To Students

1. Actively engage in SBL activities and take advantage of available resources to maximize learning opportunities.
2. Provide constructive feedback on SBL experiences to faculty and university authorities, helping to identify areas for improvement.

3. Collaborate with peers to form study groups that focus on SBL techniques, sharing knowledge and experiences to enhance understanding.
4. Advocate for the allocation of more resources for SBL within the university by participating in student governance and organizations.
5. Leverage technology and online resources to supplement SBL experiences, enhancing learning through additional practice and information.

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APPENDIX

DEPARTMENT OF PUBLICHEALTH AND COMMUNITY MEDICINE, UNIVERSITY OF BENIN, BENIN CITY

ASSESSMENT OF SIMULATION BASED LEARNING AMONG UNDERGRADUATE STUDENTS IN UNIVERSITY OF BENIN, BENIN CITY

I am a 600L medical students of the University of Benin, Benin City conducting a research project on assessment of simulation based learning among undergraduate students in university of Benin, Benin city. Please answer all questions as accurately as possible, as all information given will be treated with utmost confidentiality.

Thank you. Date: _____

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

1. Age (as at last birthday) _____
2. Gender: Male [ ] Female [ ]
3. Ethnic Group: Hausa [ ] Igbo [ ] Yoruba [ ] Benin [ ] Others (Specify)_____
4. Religion: Christianity [ ] Islam [ ] African Traditional Religion [ ] Others (Specify)_____
5. Marital status : Single [ ] Married [ ] Cohabiting [ ] Separated [ ] Divorced [ ] Widowed [ ]

6. Faculty_____
7. Department_____
8. Course of study_____
9. Current level_____

SECTION B: KNOWLEDGE OF SIMULATION BASED LEARNING

Please tick as appropriate. Multiple responses may be given where appropriate.

10. Have you heard of the term “simulation based learning"? Yes [ ] No [ ]
11. What is your source of information? (a) Television [ ] (b) Social media [ ] (c) Online articles and Journals [ ] (d) Hospital [ ] (e) Others (Specify)_____
12. What describes simulation based learning to you? (a) a form of experiential learning (b) it provides learners with a real-world- like opportunity [ ] (c) It uses a simulated environment (d) It is new form of learning [ ] (e) others specify_____
13. How would you rate your knowledge of simulation-based learning? [ ] (a) Very knowledgeable (b) Moderately knowledgeable [ ] (c) Slightly knowledgeable [ ] (d) Not knowledgeable at all [ ]
14. What types of simulation-based learning methods are you familiar with? (Select all that apply) (a) Virtual patients [ ] (b) High-fidelity mannequins [ ] (c) Standardized patients [ ] (d) Virtual reality simulations [ ] Other (please specify)_____

SECTION C: ATTITUDE TOWARDS SIMULATION BASED LEARNING

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
15.	Simulation-based learning enhances my understanding of many academic concepts					
16.	I believe simulation-based learning is an effective method for developing new					

	skills					
17.	I enjoy participating in simulation-based learning activities.					
18.	Simulation-based learning is a valuable supplement to traditional education methods.					
19.	Simulation-based learning improves my confidence in applying my skills					
20.	I believe that simulation-based learning better prepares me for real-life scenarios.					
21.	Simulation-based learning helps me bridge the gap between theory and practice					
22.	I find simulation-based learning sessions to be engaging.					
23.	I am satisfied with the variety of simulation-based learning activities offered					
24.	Simulation-based learning adds excitement to my education					

SECTION D: PRACTICE OF SIMULATION BASED LEARNING

25. Have you ever in your entire lifetime participated in simulation-based learning activities? (a) Yes [ ] (b) No [ ]
26. If you have ever participated in simulation-based learning activities, have you had any one recently? (a) Yes [ ] (b) No [ ]
27. If yes, are you currently having any classes using a simulation-based learning method? (a) Yes [ ] (b) No [ ]
28. Have you participated in any simulation-based learning activities during your undergraduate studies? (a) Yes [ ] (b) No [ ].
29. If yes, please specify the types of simulation-based learning activities you have participated in. (Select all that apply) (a) Virtual patients [ ] (b) High-fidelity mannequins [ ] (c) Standardized patients [ ] (d) Virtual reality simulations [ ] Other (please specify)_____
30. How frequently are simulation-based learning activities integrated into your coursework? (a) Regularly [ ] (b) Occasionally [ ] (c) Rarely [ ] (d) Never [ ]
31. How often do you actively participate in simulation-based learning sessions? (a) Always [ ] (b) Often [ ] (c) Occasionally [ ] (d) Rarely [ ] (e) Never [ ].
32. How engaged do you feel during simulation-based learning activities? (a) Not at all engaged [ ] (b) Slightly engaged [ ] (c) Moderately engaged [ ] (d) Very engaged [ ] (e) Extremely engaged [ ]

SECTION D: CHALLENGES TO SIMULATION BASED LEARNING

33. Have you faced any challenges in participating in simulation-based learning activities during your studies? (a) Yes [ ] (b) No [ ]
34. If yes, please specify the main challenges you have encountered_____
35. How would you rate the accessibility of simulation facilities or resources for your studies? (a) Excellent [ ] (b) Good [ ] (c) Average [ ] (d) Poor [ ] (e) Very Poor [ ]
36. Have you ever faced difficulties in accessing necessary materials or equipment for simulation-based learning? (a) Yes [ ] (b) No [ ].
37. Do you believe there are enough simulation resources available to meet the demands of all students? (a) Yes [ ] (b) No [ ].

38. Do you find it challenging to allocate sufficient time for simulation-based learning activities within your schedule? (a) Yes [ ] (b) No [ ].
39. Have you ever felt that the time spent on simulation-based learning could be better utilized for other academic activities? (a) Yes [ ] (b) No [ ].
40. How satisfied are you with the support provided by faculty and staff in facilitating your engagement with simulation-based learning? (a) Very Satisfied [ ] (b) Satisfied [ ] (c) Neutral [ ] (d) Dissatisfied [ ] (e) Very Dissatisfied [ ].
41. Have you experienced any challenges in receiving guidance or assistance from faculty or staff during simulation-based learning activities? (a) Yes [ ] (b) No [ ].
42. Have you faced any technical issues or difficulties related to the technology used in simulation-based learning? (a) Yes [ ] (b) No [ ]

APPENDIX IIII