



بسم الله الرحمن الرحيم

كلية نبتة
NAPATA COLLEGE

NAPATA COLLEGE
FACULTY OF MEDICINE
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Assessment of the Effectiveness of Distance Learning During the Sudanese War for Medical Students at Napata College, Sudan, 2026

A Dissertation Submitted in Partial Fulfillment of the Requirements for MBBS Degree

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

(يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ
أُوتُوا الْعِلْمَ دَرَجَاتٍ)

"صدق الله العظيم"

Abstract

Background: The current logistical problems caused by the Sudan conflict have forced medical educators to explore the possibility of implementing online educational methods. There are concerns that the shift to online education in medical colleges could affect the long-term educational outcomes of future medical professionals. Furthermore, the effectiveness of this educational approach has not been thoroughly investigated and evaluated. Online education has several benefits for medical education. However, several challenges and barriers still exist. The aim of this study was to evaluate the effectiveness of distance learning for medical students of Napata College in Sudan during the war in 2026.

Method: An observational descriptive cross-sectional facility – based study was conducted in January 2026. A total of 193 medical students participated in this study from Napata College, Sudan. Data was collected using online self-administered questionnaires using Google forms. The data was entered and analyzed using SPSS version 27.

Results: A total of 193 medical students participated in this study, of which females (56%) were more than males (44%), and the most common age group was found to be 20-22 years (39.9%). The most common academic year was second year (23.8%), and the majority (64.8%) were located outside Sudan. The overall effectiveness of distance learning was found to be low among the majority of students (58.5%), followed by moderate (38.3%), and then high (3.1%). While the overall clinical and practical training was found to be inadequate among the majority of students (88.1%), followed by moderate (11.4%). Lack of practical training (66.8%), psychological stress due to war (58%), and poor internet connection (55.4%) were the main challenges faced by students. The majority (92.7%) reported high studying stress levels during the war. Furthermore, (39.4%) reported that their academic performance has become slightly worse compared to before the war. Regarding the overall satisfaction of distance learning, (61.6%) were dissatisfied, while only (14%) were satisfied. Furthermore, (45.1%) of students do not believe that distance learning is suitable for medical education in emergencies, while (33.2%) do. No significant association was found between overall effectiveness of distance learning and demographic characteristics of medical students ($p\text{-value} > 0.05$).

Conclusion: The findings of this study demonstrated that distance learning at Napata College during the Sudanese war was an important emergency approach to provide theoretical education, but was rated overall as being of low effectiveness by most students. Clinical and practical training was especially poor, which emphasizes the limitations of online medical education. Despite that online education ensured that education was not disrupted, it is not and cannot replace comprehensive clinical training.

Key words: Distance learning, Medical students, War (armed conflict), Academic performance, Clinical training

ملخص الدراسة

الخلفية:

أجبرت المشكلات اللوجستية الراهنة الناجمة عن النزاع في السودان القائمين على التعليم الطبي على استكشاف إمكانية تطبيق أساليب التعليم الإلكتروني. وثمة مخاوف من أن يؤثر التحول إلى التعليم الإلكتروني في كليات الطب على النتائج التعليمية طويلة الأمد للأطباء المستقبليين. علاوة على ذلك، لم يتم بحث وتقييم فعالية هذا النهج التعليمي بشكل كافٍ. يُقدم التعليم الإلكتروني العديد من المزايا للتعليم الطبي، إلا أنه لا يزال يواجه تحديات وعوائق عديدة. تهدف هذه الدراسة إلى تقييم فعالية التعلم عن بُعد لطلاب الطب في كلية نبتة بالسودان خلال الحرب عام 2026.

الطريقة:

أُجريت دراسة وصفية مستعرضة قائمة على الملاحظة في يناير 2026. شارك في هذه الدراسة 193 طالبًا من كلية الطب في كلية نبتة، السودان. جُمعت البيانات باستخدام استبيانات إلكترونية ذاتية التعبئة عبر نماذج جوجل. أُدخلت البيانات وحُللت باستخدام برنامج SPSS الإصدار 27.

النتائج:

شارك في هذه الدراسة 193 طالبًا وطالبة في كلية الطب، شكّلت الإناث منهم (56%) نسبة أعلى من الذكور (44%)، وكانت الفئة العمرية الأكثر شيوعًا هي 20-22 عامًا (39.9%). أما السنة الدراسية الأكثر شيوعًا فكانت السنة الثانية (23.8%)، وكان معظم الطلاب (64.8%) من خارج السودان. وتبين أن فعالية التعلم عن بُعد كانت منخفضة لدى غالبية الطلاب (58.5%)، تليها فعالية متوسطة (38.3%)، ثم فعالية عالية (3.1%). في حين تبين أن التدريب السريري والعملية غير كافٍ لدى غالبية الطلاب (88.1%)، يليه تدريب متوسط (11.4%). وكانت أبرز التحديات التي واجهها الطلاب هي نقص التدريب العملي (66.8%)، والضغط النفسي الناتج عن الحرب (58%)، وضعف الاتصال بالإنترنت (55.4%). وأفادت غالبية العظمى (92.7%) بارتفاع مستويات التوتر الدراسي لديهم خلال الحرب. كما أفاد (39.4%) بأن أداءهم الأكاديمي تراجع قليلًا مقارنةً بما كان عليه قبل الحرب. فيما يتعلق بالرضا العام عن التعلم عن بُعد، أعرب 61.6% من الطلاب عن عدم رضاهم، بينما أبدى 14% فقط رضاهم. علاوة على ذلك، لا يعتقد 45.1% من الطلاب أن التعلم عن بُعد مناسب للتعليم الطبي في حالات الطوارئ، بينما يعتقد 33.2% منهم ذلك. لم يُلاحظ وجود ارتباط ذي دلالة إحصائية بين الفعالية العامة للتعلم عن بُعد والخصائص الديموغرافية لطلاب الطب (قيمة الاحتمال < 0.05).

الخلاصة:

أظهرت نتائج هذه الدراسة أن التعلم عن بُعد في كلية نبتة خلال الحرب السودانية كان نهجًا طارئًا هامًا لتوفير التعليم النظري، إلا أن معظم الطلاب قيموه بأنه منخفض الفعالية بشكل عام. وكان التدريب السريري والعملية ضعيفًا بشكل خاص، مما يُبرز محدودية التعليم الطبي عبر الإنترنت. ورغم أن التعليم عبر الإنترنت ضمن استمرار العملية التعليمية، إلا أنه لا يُغني ولا يُمكنه أن يُغني عن التدريب السريري الشامل.

الكلمات المفتاحية: التعلم عن بُعد، طلاب الطب، الحرب (النزاع المسلح)، الأداء الأكاديمي، التدريب السريري

Dedication

To the souls of our parents who passed away, and to our living parents, we dedicate this work with love and gratitude.

.We thank them from the bottom of our hearts for everything they ever done
Their guidance and sacrifices have been instrumental in shaping our characters and helping us achieve our goals.

.To our dear brothers and sisters, for their continuous encouragement
To our loyal friends, who made the journey easier and were our greatest support, we
.dedicate this work

Acknowledgment

First and foremost, we would like to thank our merciful Allah for giving us strength and health to do this work

We would like to express our deepest gratitude to our supervisor, **Dr. Hadeel Ahmed**, for her invaluable guidance, support, and encouragement throughout this research project. Her expertise and insights were instrumental in shaping the direction of this study.

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Chapter One:

Introduction

1.1 Background:

The conflict in Sudan has a great impact on the education and social interactions of students, families, and infrastructure, leading to displacement both inside and outside the boundaries of Sudan. [1, 2, 3, 4]

Online learning is defined as the dissemination of information through various electronic media, such as the internet, audio, and video. Online learning in medical education was adopted several years before the outbreak of the Coronavirus (COVID-19) pandemic. Various factors need to be taken into account to achieve the total benefits of online learning, such as the teacher's expertise, the readiness of the learners, technology, and learning design. [3, 4, 5]

At present, many learning institutions offer distant or online education as a way of obtaining a degree. The technology incorporated into the distant learning system has enabled students to reach higher learning institutions that were unattainable due to geographical constraints. [6]

However, arguments have been discovered asserting that traditional learning is more effective in terms of students' engagement and interaction, pointing out the limitation of online learning in relation to the interaction between students and lecturers, which has been a concern. [7, 8]

On the other hand, some researches have been found claiming that online learning can be done flexibly and endlessly in combination with traditional learning (for example, role-playing with standardized patients), allowing students to gain experience alternatively. For lecturers, this learning process can save time, effort, and space; automatically record students' learning process; and gain feedback from students. [9]

Being said, this study will be conducted with the aim of comparing the effectiveness between distance learning and traditional education for medical students of Napata College, in order to reach a conclusion and end the debate. However, to the best of our knowledge, no such local study had been conducted regarding this topic in Sudan, and the results of this study would provide new perspectives on this topic, that can benefit both universities and medical students.

1.2 Problem statement:

The current logistical problems caused by the Sudan conflict have forced medical educators to explore the possibility of implementing online educational methods. There are concerns that the shift to online education in medical colleges could affect the long-term educational outcomes of future medical professionals. [3, 5]

According to global literature, the education of more than 127 million students from crisis-affected nations are interrupted, thus underscoring the huge impact of armed conflicts on education across the globe. [10, 11]

In response to the disruptions that are associated with conflicts, distance learning has been used as a quick fix for addressing the problem of academic disruptions. Although distance learning is effective in facilitating learning, several studies have indicated that it is associated with a number of challenges, especially in

developing nations. For instance, a lack of good internet connectivity, electricity, and interaction between students and instructors are some of the challenges that are associated with distance learning, which are very significant in medical education, where students are required to be hands-on. Furthermore, the effectiveness of this educational approach has not been thoroughly investigated and evaluated. Online education has several benefits for medical education. However, several challenges and barriers still exist. [4, 10, 11]

1.3 Justification:

According to literature, online learning saves time, reduces costs, offers a variety of multimedia content suited to different learning types, allows students to learn anywhere and anytime outside the classroom, solves the problem of faculty shortages, and has the potential to revolutionize the learning paradigm from passive and teacher-centered to active and learner-centered. Thus, online learning is considered a vital element of the learning strategy by most institutions of higher learning. It is important to assess and analyze the effectiveness of online courses in medical education. The equality of knowledge and competency in patient care requires an assessment of the effectiveness of online learning in medical education to guide its use in the future. [12, 13]

1.4 Research question:

- ❖ What is the effectiveness of distance learning during the Sudanese war for medical students at Napata College?
- ❖ What is the impact of distance learning on the academic performance of medical students at Napata College?

1.5 Research Hypothesis:

- ❖ **Null Hypothesis:** Distance learning during the Sudanese war is ineffective for medical students at Napata College.
- ❖ **Alternative Hypothesis:** Distance learning during the Sudanese war is effective for medical students at Napata College.

1.6 Objectives:

1.6.1 General objectives:

- ❖ To assess the effectiveness of distance learning for medical students of Napata College in Sudan during the war in 2026.

1.6.2 Specific Objectives:

1. To identify the adequacy of clinical and practical training.
2. To identify major technical, psychological, and environmental challenges.

3. To determine student satisfaction with distance learning.
4. To identify the academic performance of students during distance learning.
5. To identify the association between overall effectiveness of distance learning and demographic characteristics of medical students.

Chapter Two:

Literature Review

2.1 Background:

Distance learning is a learning concept in which learners and educators are not in close proximity and communicate in a virtual environment. Unlike conventional learning methods, distance learning makes use of electronic communication tools such as video conferencing, learning management systems, recorded lectures, and learning resources. With the rapid evolution of information and communication technology, there is a significant increase in the flexibility and accessibility of learning, and learners are able to access learning resources regardless of their geographical locations and time barriers. Distance learning is thus a significant concept in higher learning institutions in various parts of the world in times of crises such as pandemics, natural calamities, and wars. [5, 8, 9]

It is noted that distance learning is not the same as it was in past decades. Traditionally, distance learning was achieved through correspondence courses in which materials were dispatched through postal services. However, with the advent of internet technologies and various digital technologies, distance learning is currently focused more on internet and technology-based systems of learning and communication. Different universities are making use of various digital technologies such as learning management systems, virtual classroom technology, and mobile technology to facilitate learning and teaching processes. [4, 6, 8]

On a general note, distance learning can be classified under two major categories: synchronous and asynchronous learning. “When students and tutors learn or interact in real time through internet-based media such as video conferencing, virtual lectures, or online discussions, then synchronous distance learning is said to take place.” This mode of learning offers students and tutors an interactive platform, thus creating an environment similar to face-to-face conventional learning. On the other hand, asynchronous distance learning refers to situations where students can learn or access learning materials independently of tutors or other students. This can be exemplified by online lectures, textbooks, or discussions, among other independent assignments. [8, 9, 10]

Apart from these two main types of learning, another type of learning that is commonly used in modern times is known as blended or hybrid learning. Blended learning is a commonly used type of learning in modern times. Blended learning is a mixture of traditional face-to-face learning and online learning. This type of learning is recommended for use in medical fields because it allows for the acquisition of knowledge

through online learning while at the same time allowing for hands-on learning in the actual field. [10, 11, 12]

There are various benefits associated with distance learning in higher learning institutions. First of all, distance learning makes it easier for students to access learning in higher learning institutions. Secondly, it provides flexibility in terms of timing for learning. Finally, it helps in the development of independent learning skills among students. These benefits of distance learning have made it effective in ensuring that learning continues in emergency situations where traditional classroom learning is impossible. [11, 12]

However, despite all the advantages that distance learning provides, it has a number of disadvantages and challenges of its own, particularly when it comes to subjects that require practice and training, such as medicine. For example, there may be a lack of interaction with the teacher, technology may not function properly, and cooperative learning may not be fully facilitated. There may also be problems of internet accessibility, lack of digital devices, and electricity supply. Such problems may be even more pronounced when it comes to conflict zones where there is a total lack of infrastructure and educational systems. [12, 13]

In medicine, distance learning is especially challenged when it comes to hands-on practice. While theoretical knowledge may be imparted through online mediums, hands-on practice is not easily supported. For instance, when it comes to medicine, there is a direct interaction with patients. Such direct interaction may not be fully supported through virtual mediums. It is thus suggested by many educational experts that a hybrid system of learning be adopted wherein online mediums of learning may be supported with hands-on practice. [11, 13, 14]

In the context of crises such as the Sudanese war, distance learning has emerged as an important strategy for the continuity of educational services. In such critical conditions, there has been greater dependence on distance learning through digital technology for the continuity of university teaching activities, even when physical access to university premises is restricted or unsafe. However, the effectiveness of such emergency distance learning is subject to several factors, and it is important to understand these factors for the development of robust educational services that can function even in critical conditions. [14, 15]

2.2 Previous Studies:

Lyu et al. conducted a study in China in 2024 to assess the impact of synchronous distance education and traditional face-to-face education on the learning results of undergraduate medical students. Sixty-nine students (SDE n = 39, TE n = 30) engaged in the result evaluations. The average score of the otolaryngology and dermatology courses in the SDE group exceeded that of the TE group ($P < .05$). The other courses and the total grades for the five courses shown no statistical differences between the two groups. Out of the 12 self-assessment learning objectives, 10 exhibited substantially higher favorable outcomes in the SDE group compared to the TE group. No statistically significant difference was seen between the two groups concerning student satisfaction. The SDE group exhibited greater engagement than the TE group throughout the subsequent departmental apprenticeship after the theory class. The attendance rate and focus in the SDE group were equivalent to those in the TE group. Students in the SDE group engaged more frequently in class and exhibited a superior level of student–teacher communication compared to the TE group. The SDE serves as an instructional instrument that can substitute for TE in the theoretical instruction of medical courses. [14]

Furthermore, in China, Jiao et al. participated in a study in the year 2022 on the same topic. Most medical students expressed the view that offline learning was superior to online learning in terms of effectiveness, efficiency, and atmosphere. However, online learning was better in terms of the acquisition of learning resources and flexibility. The attitudes of medical undergraduates and postgraduates participating in this research were largely similar ($P > 0.05$); however, undergraduates placed a higher value on offline learning than postgraduates ($P < 0.05$). [15]

Avilova et al. performed a study in both Ukraine and South Africa in the year 2022 to investigate student's perspectives about distance education. 395 students at Kharkiv National Medical University (KNMU) and among 124 students of University of Cape Town (UCT) participated in this study. At KNMU, most students (72.2%, n=285) agreed that the main advantages of distance education were the extra time they had to prepare for classes and revise study materials whereas the major challenge they faced while having distance education was the lack of clinical approach to patients (69.1%, n=273). At UCT, students found that the most helpful aspect of distance learning was pre-recorded lecture videos (66.9%, n=83). [16]

Another study was conducted by Alkalash et al. in the year 2022 to assess perceptions among undergraduate medical students toward distance learning and its effects on their

academic performance during the COVID-19 pandemic at Al-Qunfudhah College of Medicine, Umm Al-Qura University, KSA. A sample of 223 undergraduates responded to an online survey, with a response rate of 74.3%; female students represented 54.3%. Blended education was preferred by most students (73.1%). Moreover, 72.2% of students perceived that distance learning saved their time, and approximately two-thirds (61.4%) were stimulated by the availability of lecture recordings. Approximately 59% and 54% reported that distance learning was more comfortable and improved their technology skills, respectively. Poor communication (66%) and network problems (61.4%) were the most common challenges in distance learning. Nonetheless, a substantial increase ($P = 0.001$) in students' grade point averages was observed with distance learning. [17]

Meanwhile, in Egypt, a study was done by Ahmed et al. in the year 2021 to compare distance and traditional learning among university students during COVID-19. Results exposed statistically significant variances in the students' total perception toward traditional and distance learning 53.46 ± 12.21 , 56.23 ± 14.18 respectively, 41.9% of the students have moderate perception level toward distance learning, 53.2% of the students have high perception level, and 61.1% of the studied students face a high level of obstacles. [18]

Also, a study was carried out by AlQhtani et al. in Saudi Arabia in the year 2021 to measure the effectiveness of e-learning during the COVID-19 pandemic, as well as medical students' preferences regarding e-learning and classroom teaching, and the possibility of applying it post-pandemic. e-learning was more or equally effective in four parameters such as assignment submission and meeting individual needs, but less effective in six parameters, including building skills and knowledge, and interaction level. Satisfaction was either high or neutral in all five parameters. [19]

Locally, a recent study was carried out in Sudan in 2025 by Ahmed et al. to evaluate the satisfaction of Sudanese medical students with online learning and its association with psychological distress issues, including anxiety, depression, and stress, during the current Sudan war. Among the 1,891 medical students surveyed, the mean satisfaction score for online learning was 26.2 out of 40. Mild to moderate depression was reported by 59.4% of students, while 62% experienced mild to moderate anxiety, and 21% reported high stress levels. Lower satisfaction was significantly associated with higher levels of depression, anxiety, and stress (all $p < 0.001$). [20]

Another recent study was conducted in Sudan in 2025 by Taha et al. to examine how the Faculty of Medicine, University of Gezira (FMUG), employs adaptive strategies, crisis

management, and collaboration to sustain education, research, and community engagement while addressing evolving health challenges during the Sudan conflict. Document analysis identified five themes: curriculum innovation, technology use, community service, collaboration, and research-driven policy. Interviews with faculty and administrators further highlighted five themes on FMUG's adaptive strategies: impact on education, crisis management, flexible learning, implementation challenges, and sustainability. [21]

Elmahdy et al. performed a study in Sudan in 2024 to evaluate an Open and Distance Learning (ODL) program that aimed to continuously support English as a Foreign Language (EFL) students at the University of Khartoum during Sudan's war in 2023. The conclusions of this study are: the majority of students found that the program design effectively catered to their learning requirements and fostered pertinent abilities. Most students considered the course content and readings to be pertinent to their experiences, enhancing their comprehension and offering solace amongst the battle. In terms of delivery methods and technological concerns, the majority of students had a neutral position about the appropriateness of online delivery during conflicts and whether these issues impeded or facilitated their participation in continuing education. The key recommendations conclude enhancing technology infrastructure and support to mitigate the challenges that impede the participation of 60% of students. [22]

Chapter Three:

Methodology

3.1 Study Design:

The study was conducted as a descriptive, cross-sectional, facility-based study.

3.2 Study Area:

Data was collected from Napata College. Napata University College is one of the private higher education institutions in Sudan. It was founded by Professor Al-Zubair Bashir Taha, accompanied by Professor Babakir Al-Hajj Musa, Dr. Abdul-Rahman Ibrahim Al-Khalifa, and Professor Muhammad Al-Amin Ahmed, in 2014. Student admission and training began in the academic year 2015-2016. It was named after the city of Napata, the center of the historic ancient Nubian kingdom in northern Sudan. The college is located in two complexes: Riyadh Complex which includes pharmacy, computer science, and information technology programs, and is located in the Riyadh area in the capital, Khartoum, at the intersection of Al-Mashtal Street and Obaid Khatam Street, Square 10, Building No. 151, (2) Kafouri Collection, which includes programs in medicine and surgery, dental medicine and surgery, medical laboratory sciences, nursing, administrative and financial sciences, and is located in the Khartoum Bahri area - Kafouri, North of Qantara, Square 11, Building No. 117, and Kafouri Complex (B): This building was added to accommodate students of the new programs, and includes a dental clinic, a student activity space, study halls, and administrative offices. [23]

3.3 Study Population:

The study population for this study consisted of medical students of Napata College.

3.3.1 Inclusive Criteria:

Male and female medical students, of any age, at first, second, third, fourth, and fifth-year, who accepted to participate in the study.

3.3.2 Exclusive Criteria:

Medical students who refused to participate in this study.

3.4 Variables:

3.4.1 Dependent variables:

Clinical and practical training.

Access to distance learning.

Effectiveness of distance learning.

Academic performance and overall satisfaction.

Challenges faced by students

3.4.2 Independent variables:

Sociodemographic characteristics (Gender, Age, Academic Year, Current location).

3.5 Period of Study:

January - April 2026.

3.6 Sampling Technique and sample size:

Convenience sampling technique was used in this study.

The following equation was used to calculate the sample size:

$$n = \frac{N}{1 + N(d)^2} \quad \text{Where:} \quad n = \text{sample size.}$$

N= Total number of first, second, third, fourth, and fifth-year medical students

N= represent estimated number students from first to fifth-year = 385

d= degree of precision (0.05%)

n= 193

Therefore, the sample size of 193 students was used.

3.7 Data collection:

The data was collected using online, structured, self-administered questionnaires using Google Forms, based on demographic information. The questionnaire consisted of closed-ended questions to collect quantitative data. It was modified from previously done studies [18, 20, 21, 22] to capture information relevant to the specific objectives and variables of interest. The questionnaire consisted of 7 sections, as follows: 1) demographic characteristics of medical students such as gender, age, academic year, etc., 2) Methods of access to distance learning, 3) Assessment of the effectiveness of distance learning, 4) Evaluation of the clinical and practical training, 5) The challenges faced by students, 6) The academic performance of students during distance learning, and lastly, 7) The satisfaction levels of students regarding distance learning.

3.8 Plan for data analysis:

The collected data which was retrieved from the questionnaires was then exported into Microsoft Excel, and then imported into the Statistical Package for Social Sciences (SPSS) version 27. Descriptive percentage was calculated by $(\text{Frequency} \times 100 / \text{Sample size})$ & was presented in tables. Chi-square test was used to assess associations.

3.9 Ethical consideration:

Permission and approval were sought from the University's committee. Informed consent was taken before data collection. The participants had the right to privacy and confidentiality. Investigation results were classified. The data collection process did not cause any interruption to the participants.

Chapter Four:

Results

4.1.1 Demographic characteristics:

A total of 193 medical students participated in this study, of which females (56%) were more than males (44%), and the most common age group was found to be 20-22 years (39.9%). The most common academic year was second year (23.8%), followed by third year (21.8%), and the majority (64.8%) were located outside Sudan, while (35.2%) were inside Sudan.

4.1.2 Access to distance learning:

Smartphone (67.9%) was the most commonly used device for distance learning. Internet access was rated as moderate (32.1%), followed by poor (23.8%). While electricity problems were reported by (61.2%) of students.

4.1.3 Overall effectiveness of distance learning and clinical and practical training:

The overall effectiveness of distance learning was found to be low among the majority of students (58.5%), followed by moderate (38.3%), and then high (3.1%). While the overall clinical and practical training was found to be inadequate among the majority of students (88.1%), followed by moderate (11.4%).

4.1.4 Challenges faced by students:

Lack of practical training (66.8%), psychological stress due to war (58%), and poor internet connection (55.4%) were the main challenges faced by students. The majority (92.7%) reported high studying stress levels during the war.

4.1.5 Academic performance and overall satisfaction of students:

(39.4%) reported that their academic performance has become slightly worse compared to before the war. Regarding the overall satisfaction of distance learning, (61.6%) were dissatisfied, while only (14%) were satisfied. Furthermore, (45.1%) of students do not believe that distance learning is suitable for medical education in emergencies, while (33.2%) do.

4.1.6 Associations and correlations:

No significant association was found between overall effectiveness of distance learning and demographic characteristics of medical students ($p\text{-value} > 0.05$).

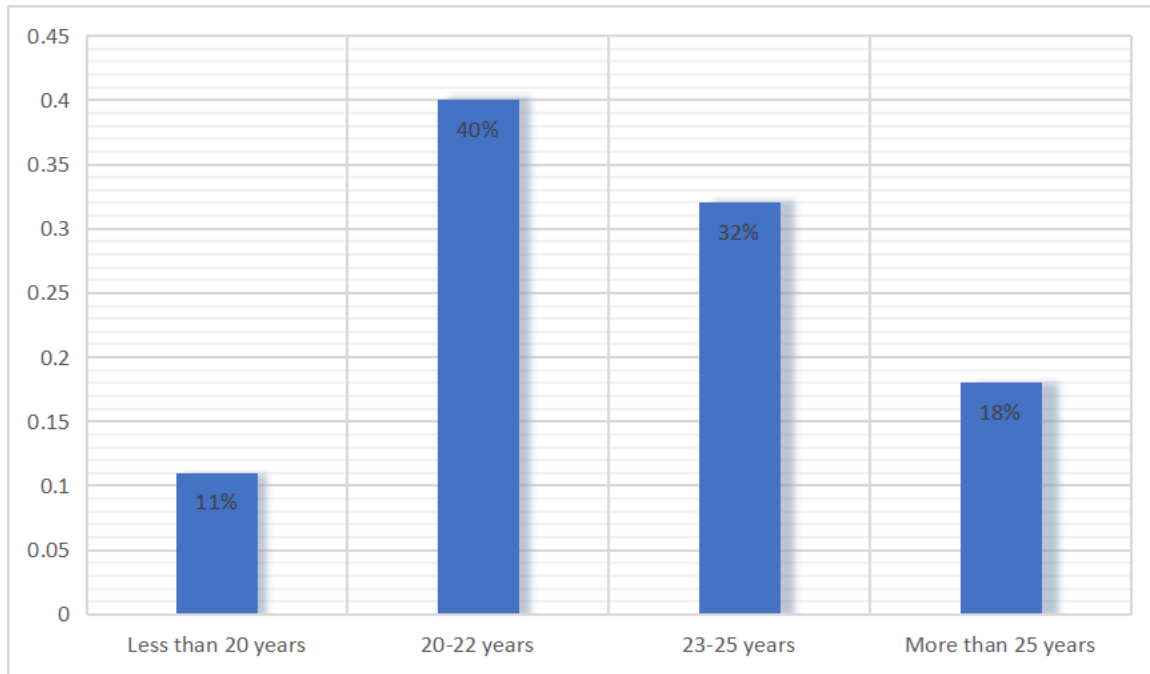


Figure No (1): Age of medical students at Napata College in 2026 (n=193)

As shown in Figure 1, A total of 193 medical students participated in this study, most common age group was found to be 20-22 years (39.9%) followed by 23-25 (31.6%).

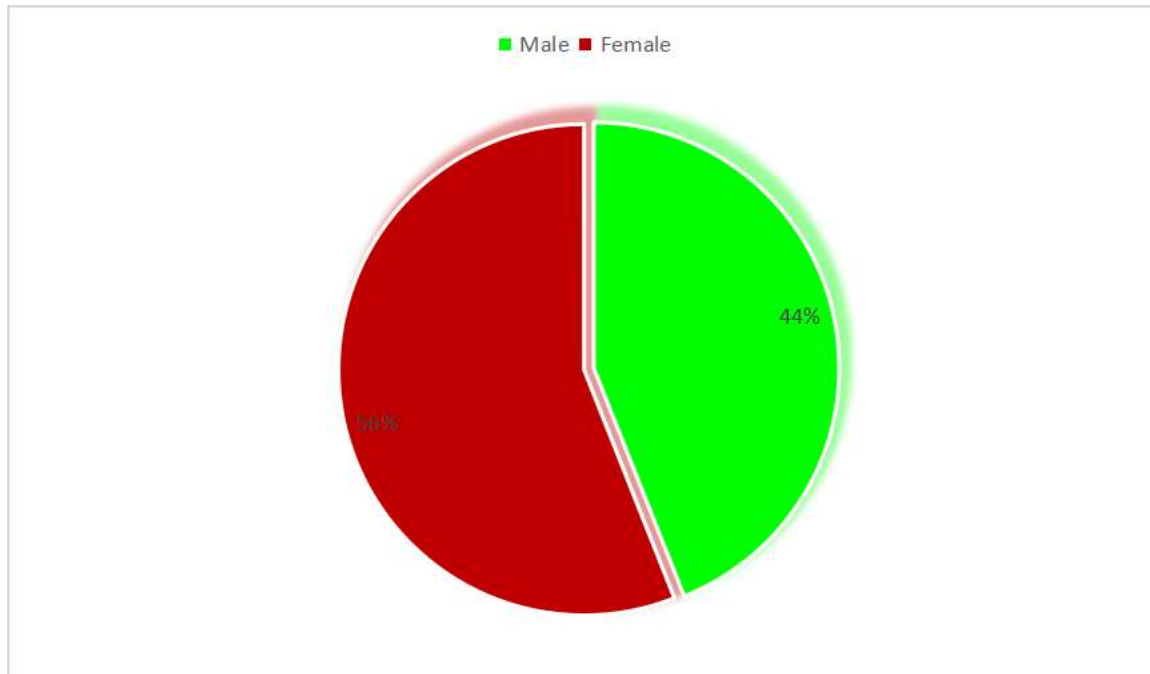


Figure No (2): Gender of medical students at Napata College in 2026 (n=193)

As shown in Figure 2, A total of 193 medical students participated in this study, of which females (56%) were more than males (44%)

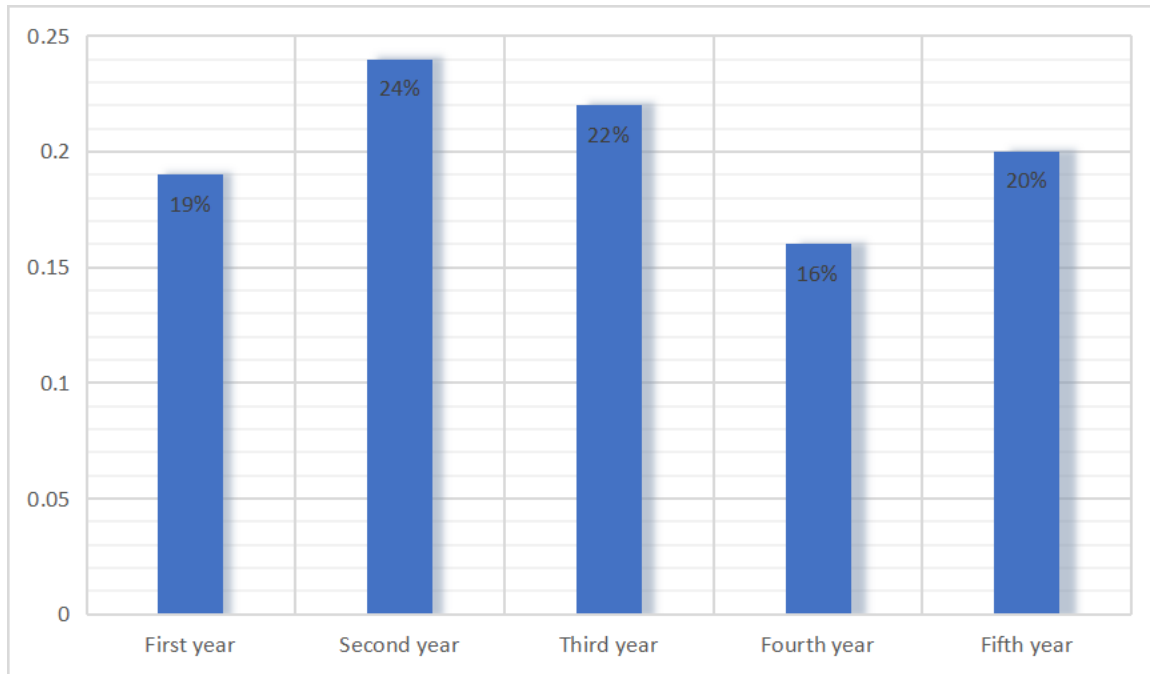


Figure No (3): Academic year distribution of medical students at Napata College in 2026 (n=193)

As shown in Figure 3, A total of 193 medical students participated in this study, The most common academic year was second year (23.8%), followed by third year (21.8%).

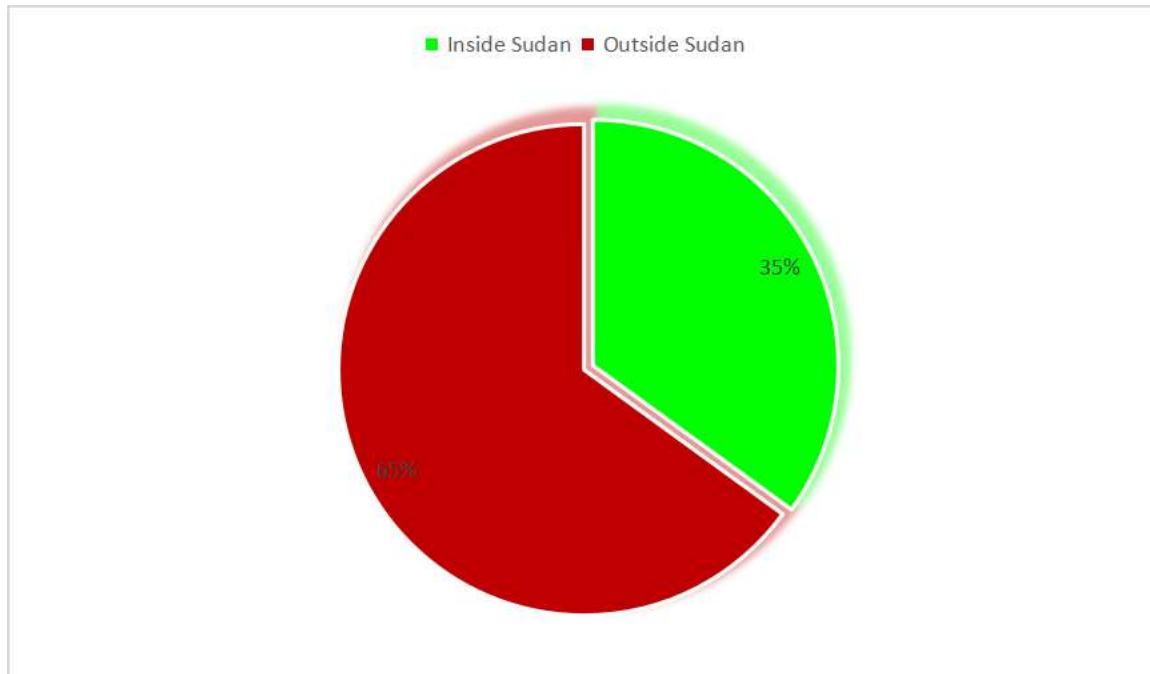


Figure No (4): Current location of medical students at Napata College in 2026 (n=193)

As shown in Figure 4, A total of 193 medical students participated in this study, and the majority (64.8%) were located outside Sudan, while (35.2%) were inside Sudan.

Table (1): Access to distance learning.

Variables	Category	Count	Percentage
Device mainly used	Smartphone	131	67.9%
	Laptop	39	20.2%
	Tablet	13	6.7%
	Desktop computer	10	5.2%
Internet access rating	Very good	22	11.4%
	Good	42	21.8%
	Moderate	62	32.1%
	Poor	46	23.8%
	Very poor	21	10.9%
Electricity problems frequency	Never	24	12.4%
	Rarely	47	24.4%
	Sometimes	48	24.9%
	Often	44	22.8%
	Always	30	15.5%
Total		193	100%

As shown in Table 1, Smartphone (67.9%) was the most commonly used device for distance learning. Internet access was rated as moderate (32.1%), followed by poor (23.8%). While electricity problems were reported by (61.2%) of students.

Table (2): Effectiveness of distance learning.

Variables	Category	Count	Percentage
Distance learning helped me continue my studies during the war.	Strongly agree	25	13%
	Agree	49	25.4%
	Neutral	53	27.5%
	Disagree	45	23.3%
	Strongly disagree	21	10.9%
The online lectures were clear and understandable.	Strongly agree	29	15%
	Agree	42	21.8%
	Neutral	48	24.9%
	Disagree	32	16.6%
	Strongly disagree	42	21.8%
I was able to interact effectively with instructors.	Strongly agree	16	8.3%
	Agree	37	19.2%
	Neutral	44	22.8%
	Disagree	67	34.7%
	Strongly disagree	29	15%
I had equal access to learning materials as before the war.	Strongly agree	12	6.2%
	Agree	42	21.8%
	Neutral	44	22.8%
	Disagree	56	29%
	Strongly disagree	39	20.2%
Distance learning improved my theoretical	Strongly agree	19	9.8%
	Agree	51	26.4%

knowledge.	Neutral	39	20.2%
	Disagree	58	30.1%
	Strongly disagree	26	13.5%
I could manage my study time effectively during distance learning.	Strongly agree	16	8.3%
	Agree	29	15%
	Neutral	52	26.9%
	Disagree	54	28%
	Strongly disagree	42	21.8%
Total		193	100%

Table (3): Clinical and practical training.

Variables	Category	Count	Percentage
Distance learning provided adequate clinical knowledge.	Strongly agree	6	3.1%
	Agree	12	6.2%
	Neutral	37	19.2%
	Disagree	72	37.3%
	Strongly disagree	66	34.2%
I received sufficient practical or clinical exposure.	Strongly agree	5	2.6%
	Agree	7	3.6%
	Neutral	27	14%
	Disagree	61	31.6%
	Strongly disagree	93	48.2%
I feel confident in my clinical skills after this period.	Strongly agree	13	6.7%
	Agree	23	11.9%
	Neutral	28	14.5%
	Disagree	56	29%
	Strongly disagree	73	37.8%
Total		193	100%

Table (4): Challenges faced by students.

Variables	Category	Count	Percentage
Main challenges faced by students	Poor internet connection	107	55.4%
	Lack of electricity	93	48.2%
	Lack of devices	35	18.1%
	Psychological stress due to war	112	58%
	Financial difficulties	83	43%
	Lack of practical training	129	66.8%
	Poor teaching methods	68	35.2%
Studying stress level during the war	Not stressful	3	1.6%
	Slightly stressful	11	5.7%
	Moderately stressful	46	23.8%
	Very stressful	81	42%
	Extremely stressful	52	26.9%
Total		193	100%

As shown in Table 4, Lack of practical training (66.8%), psychological stress due to war (58%), and poor internet connection (55.4%) were the main challenges faced by students. The majority (92.7%) reported high studying stress levels during the war.

Table (5): Academic performance and overall satisfaction of students.

Variables	Category	Count	Percentage
Academic performance compared to before the war	Much better	2	1%
	Slightly better	14	7.3%
	The same	43	22.3%
	Slightly worse	76	39.4%
	Much worse	2	1%
Overall satisfaction of distance learning	Very satisfied	5	2.6%
	Satisfied	22	11.4%
	Neutral	47	24.4%
	Dissatisfied	62	32.1%
	Very dissatisfied	57	29.5%
Distance learning is suitable for medical education in emergencies	Yes	64	33.2%
	No	87	45.1%
	Not sure	42	21.7%
Total		193	100%

As shown in Table 5, (39.4%) reported that their academic performance has become slightly worse compared to before the war. Regarding the overall satisfaction of distance learning, (61.6%) were dissatisfied, while only (14%) were satisfied. Furthermore, (45.1%) of students do not believe that distance learning is suitable for medical education in emergencies, while (33.2%) do.

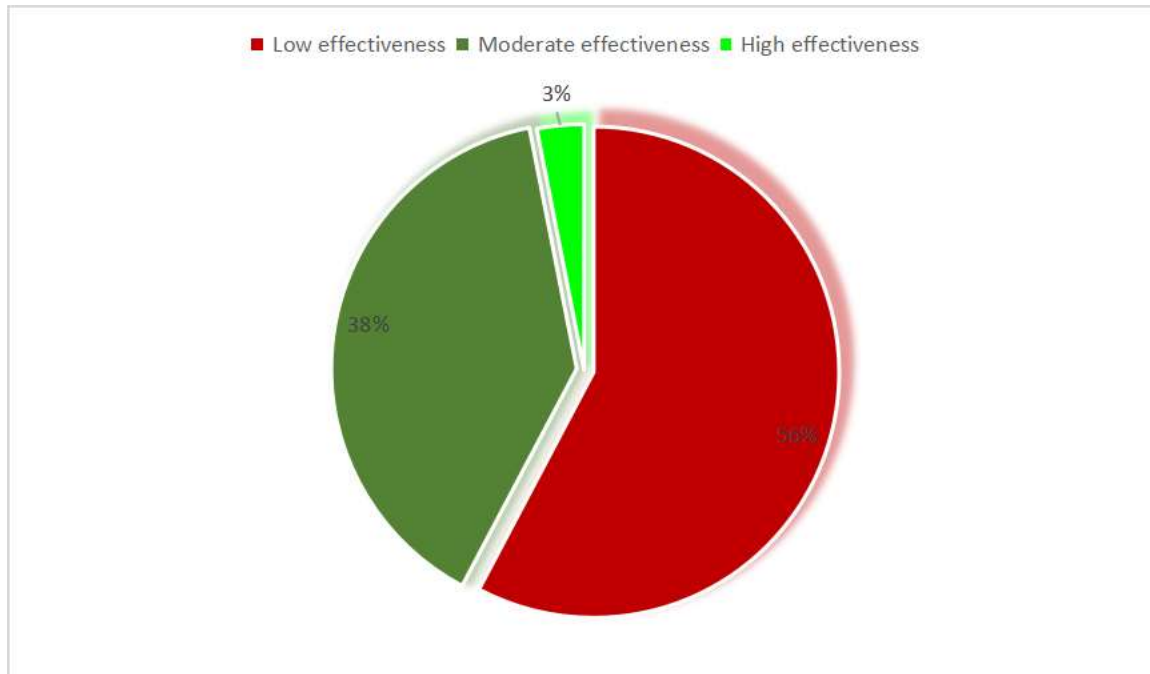


Figure No (5): Overall effectiveness of distance learning among medical students at Napata College in 2026 (n=193)

As shown in Figure 5, The overall effectiveness of distance learning was found to be low among the majority of students (58.5%), followed by moderate (38.3%), and then high (3.1%).

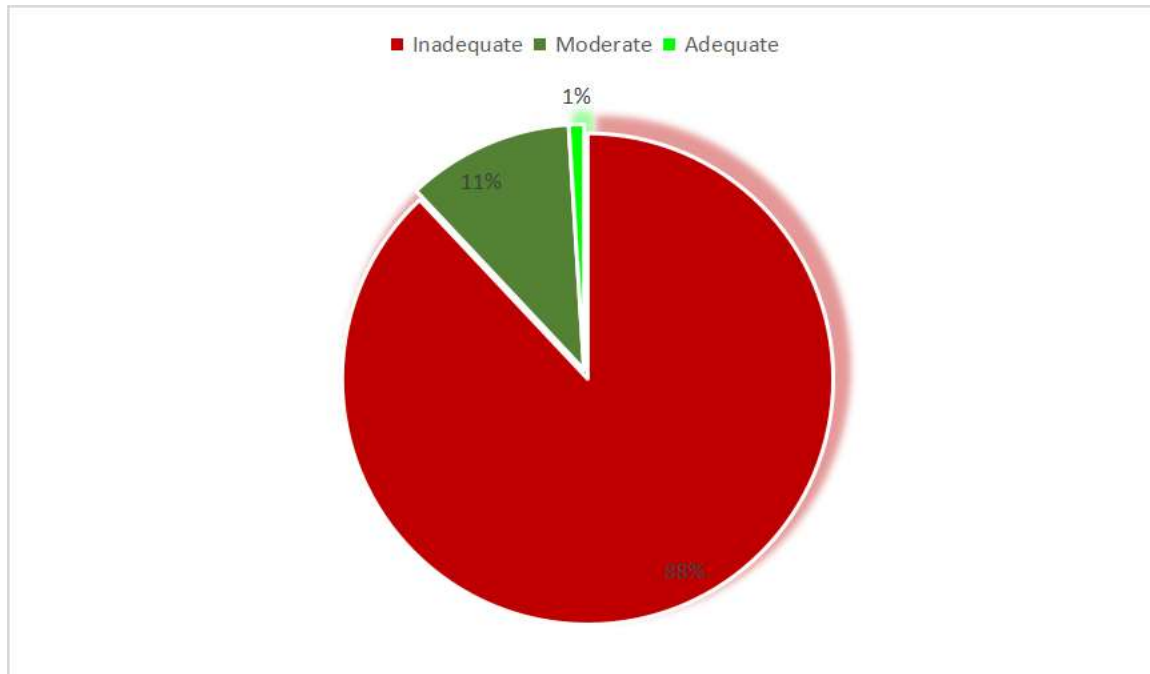


Figure No (6): Overall clinical and practical training among medical students at Napata College in 2026 (n=193)

As shown in Figure 6, The overall clinical and practical training was found to be inadequate among the majority of students (88.1%), followed by moderate (11.4%).

Table (6): The association between overall effectiveness of distance learning and demographic characteristics of medical students at Napata college in 2026 (N=193)

		Overall effectiveness of distance learning			
Variables	Category	Low	Moderate	High	P-value
Gender	Male	52 (61.2%)	29 (34.1%)	4 (4.7%)	0.3
	Female	61 (56.5%)	45 (41.7%)	2 (1.9%)	
Age	Less than 25 years	12 (57.1%)	9 (42.9%)	0 (0%)	0.9
	20-22 years	45 (58.4%)	29 (37.7%)	3 (3.9%)	
	23-25 years	37 (60.7%)	22 (36.1%)	2 (3.3%)	
	More than 25 years	19 (55.9%)	14 (41.2%)	1 (2.9%)	
Academic year	First year	21 (58.3%)	13 (36.1%)	2 (5.6%)	0.8
	Second year	29 (63%)	17 (37%)	0 (0%)	
	Third year	22 (52.4%)	18 (42.9%)	2 (4.8%)	
	Fourth year	19 (63.3%)	11 (36.7%)	0 (0%)	
	Fifth year	22 (56.4%)	15 (38.5%)	2 (5.1%)	
Current	Inside Sudan	37	29	2	0.7

location		(54.4%)	(42.6%)	(2.9%)	
	Outside Sudan	76 (60.8%)	45 (36%)	4 (3.2%)	

Chi-square test was performed, $p\text{-value} > 0.05$, $p\text{-value}$ is insignificant

According to Table 6, No significant association was found between overall effectiveness of distance learning and demographic characteristics of medical students ($p\text{-value} > 0.05$).

Chapter Five

Discussion

The aim of this research was to assess the effectiveness of distance learning among medical students at Napata College during the Sudanese war in 2026. The results showed that the students generally believed the overall effectiveness of distance learning to be low, with only a very small percentage of students believing the effectiveness to be high. This result suggests that although distance learning helped to ensure continuity in education during the war, it did not live up to the academic expectations of the students. The dominance of the low effectiveness group may be due to the extraordinary nature of the challenges posed by the war, which affected the learning experience of the students. [14, 15]

In terms of theoretical effectiveness, while distance education allowed students to continue their education, they experienced moderate to low levels of clarity, interaction, and equality of access to learning resources. The findings are partially consistent with those of Ahmed et al. (2025), who found a mean satisfaction score of 26.2 out of 40 among Sudanese medical students, suggesting moderate satisfaction with distance education. However, lower satisfaction with distance education was strongly related to higher levels of depression, anxiety, and stress ($p < 0.001$), suggesting that psychological distress has a significant impact on perceived educational effectiveness. The current findings also suggest a war-related situation where psychological stress may have impacted students' engagement and academic perceptions. [14]

Conversely, Taha et al. (2025) emphasized the adaptive approaches adopted at the Faculty of Medicine, University of Gezira, such as innovation in curricula, the use of technology, and crisis management, which ensured continuous learning processes despite the conflict environment. Although the resilience of the institution was stressed in their qualitative results, our study reveals that, from the students' point of view, the effectiveness was still suboptimal. This could be attributed to the differences between the adaptation of the institution and the experiences of the students, especially in colleges where technology and infrastructure development might not be as advanced as in larger institutions. [15]

The relevance of clinical and practical training was found to be the most important deficiency in the study. A vast majority of students felt that the clinical training was not adequate. This is in line with the findings of Avilova et al. (2022), where 69.1% of students felt that the lack of clinical experience was the most important drawback of distance learning. Similarly, AlQhtani et al. (2021) found that the effectiveness of e-learning was compromised in terms of skill

development and interaction, which is an important aspect of online learning platforms, as they lack the ability to provide practical clinical training. [19, 22]

International comparisons also help to better understand our findings. Lyu et al. (2024) showed that synchronous distance learning in China had similar or better results compared to traditional learning in theoretical disciplines without significant differences in satisfaction. However, their environment was characterized by stable infrastructure and planned implementation of synchronous technologies. The Sudanese war environment is very different, with unstable electricity and internet, as well as displacement of students, which can influence their participation in learning. Therefore, distance learning can be considered a substitute for traditional learning in a stable environment, but it is less effective in a conflict environment. [17] Likewise, research carried out during the COVID-19 pandemic in Saudi Arabia and Egypt showed more positive perceptions of distance learning. Alkalash et al. (2022) found improved GPA ($p = 0.001$) and time-saving advantages, while Ahmed et al. (2021) found moderate to high levels of perceptions towards distance learning despite the presence of high obstacles. Nevertheless, these studies were carried out in the context of a public health crisis and not in the context of war, where the infrastructure and systems are still in place. The Sudanese war environment poses much more drastic challenges, which is why the current study found relatively lower levels of effectiveness. [18, 21]

Technical issues were also evident in the current study, especially among students within Sudan who showed mostly poor to moderate internet connectivity and power outages. These results are in line with Elmahdy et al. (2024), who concluded that technological issues were a major hindrance for about 60% of students enrolled in an Open and Distance Learning course during the Sudan war. Although some students in the cited study had a neutral perception of online learning, technological issues were still a major drawback, similar to the current study. [16]

Psychological stress was also identified as a significant issue. The study conducted by Ahmed et al. (2025) showed that the prevalence of depression (59.4%), anxiety (62%), and stress among Sudanese medical students was high during the war, and the negative associations were very strong with satisfaction ($p < 0.001$). The results of the study support this finding as dissatisfaction and lack of effectiveness were prevalent. The psychological stress caused by the war might have affected the concentration and motivation of the students, thus mediating the effectiveness of distance learning. [14]

Regarding academic achievement, most students in the current study reported a slight deterioration or a significant deterioration in academic achievement compared to the pre-war period. This is in contrast to the findings of Alkalash et al. (2022), who found that GPA was improved during distance learning in a non-conflict situation. This highlights the dependency of distance learning outcomes on the context in which distance learning is conducted, such that improvements in performance occur when distance learning is conducted in stable conditions with access to resources, whereas performance deteriorates in conditions of instability and trauma. [18]

The analysis of the relationship between demographic factors and overall efficacy did not show any statistically significant differences in relation to gender, age, year of study, and region. This suggests that the perceived limitations of distance education were systemic rather than subgroup-specific. Similar findings were revealed by Jiao et al. (2022), who found that opinions about online and offline learning were mostly the same for undergraduate and postgraduate students, suggesting that structural factors can overcome demographic factors in shaping opinions. [20]

In general, the results of the study conclude that the distance learning system in the Sudanese war scenario served as a necessary intervention in the emergency situation, but not as an effective substitute for education. It maintained theoretical continuity but could not provide adequate clinical training and was limited by infrastructural and psychological factors. In comparison to the global literature, the effectiveness of the distance learning system seems to be highly dependent on the context in which it is being implemented. It is able to perform satisfactorily in a peaceful scenario but is limited in an armed conflict scenario. [15, 19, 22]

Chapter six:

6.1 Conclusion

6.2 Limitations

6.3 Recommendations

6.1 Conclusion:

The findings of this study demonstrated that distance learning at Napata College during the Sudanese war was an important emergency approach to provide theoretical education but was rated overall as being of low effectiveness by most students. Clinical and practical training was especially poor, which emphasizes the limitations of online medical education.

The major difficulties were poor internet connectivity, power outages, and high psychological stress, which all had a negative effect on satisfaction and performance. These results are in agreement with previous studies in Sudan that showed that war-related distress and instability of infrastructure are associated with decreased effectiveness of education.

That being said, despite that online education ensured that education was not disrupted, it is not and cannot replace comprehensive clinical training. The answer to making medical education more resilient in a crisis lies in improving infrastructure, a hybrid model, and psychological support.

6.2 Limitations

- The cross-sectional design limits the ability to establish causality between conflict-related factors and perceived academic performance.
- The use of self-administered questionnaires may introduce recall bias and social desirability bias, affecting the accuracy of responses.
- The convenience sampling method limits the generalizability of the findings to all Sudanese medical students.
- Variation in respondents' locations (inside vs. outside Sudan) may have influenced results due to differences in infrastructure and learning conditions.
- The study relied on subjective measures of performance and competence without using objective indicators such as GPA or exam results.

6.3 Recommendations:

Based on the results of this study, it is recommended

1. that adopt a context-adaptive hybrid learning model combining online theoretical teaching with structured clinical and simulation-based training to restore practical competencies.
2. Strengthen digital infrastructure through affordable internet access, sustainable power solutions, and improved learning management systems with recorded content.
3. Integrate mental health support services (counseling, peer support, stress management) to address the impact of psychological distress on learning outcomes.
4. Implement faculty development programs to enhance digital teaching skills, focusing on interactive and student-centered approaches.
5. Develop resilient, crisis-responsive education systems with flexible curricula, emergency preparedness plans, and inter-university collaboration.
6. Establish national emergency education policies to ensure continuity and quality of medical education during conflicts.

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Appendices:

- 1. Questionnaire**
- 2. Informed consent**
- 3. Map**
- 4. Picture**

Questionnaire:

Informed consent:

I have read and I understand the provided information and have had the opportunity to ask questions.

I understand what the aim of this research and I understand the benefits of this research, and I understand that this information may be published and I agree with that, and I know there's will not be any material return of my participation.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Dear Participant,

Your Consent on answering this questionnaire is very appreciated. All the information collected is anonymous and confidential.

Do you consent to participate in this study? *

Yes

No

Section A: Demographic information:

Gender:

Male

Female

Age:

Under 20 years

20–22 years

23–25 years

Above 25 years

Academic level:

First year

Second year

Third year

Fourth year

Fifth year

Current location:

Inside Sudan

Outside Sudan

Section B: Access to distance learning:

What device did you mainly use for distance learning?

Smartphone

Laptop

Tablet

Desktop computer

How would you rate your internet access during distance learning?

Very good

Good

Moderate

Poor

Very poor

How often did electricity problems affect your studies?

Never

Rarely

Sometimes

Often

Always

Section C: Effectiveness of distance learning:

Distance learning helped me continue my studies during the war.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

The online lectures were clear and understandable.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

I was able to interact effectively with instructors.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

I had equal access to learning materials as before the war.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

Distance learning improved my theoretical knowledge.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

I could manage my study time effectively during distance learning.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

Section D: Clinical and practical training:

Distance learning provided adequate clinical knowledge.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

I received sufficient practical or clinical exposure.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

I feel confident in my clinical skills after this period.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

Section E: Challenges faced by students:

What were the main challenges you faced? (Multiple answers allowed)

Poor internet connection

Lack of electricity

Lack of devices

Psychological stress due to war

Financial difficulties

Lack of practical training

Poor teaching methods

Other:

How stressful was studying during the war?

Not stressful

Slightly stressful

Moderately stressful

Very stressful

Extremely stressful

Section F: Academic Performance:

Compared to pre-war education, your academic performance was:

Much better

Slightly better

The same

Slightly worse

Much worse

Section G: Overall satisfaction:

Overall, how satisfied are you with distance learning during the war?

Very satisfied

Satisfied

Neutral

Dissatisfied

Very dissatisfied

Do you think distance learning is suitable for medical education in emergencies?

Yes

No

Not sure

الاستبيان:

،المشارك العزيز

نشكرك على المشاركة في هذا الاستبيان .جميع المعلومات التي تقدمها سرية ومجهولة .هل توافق على المشاركة في هذه الدراسة؟

☐ نعم

☐ لا

:القسم أ :المعلومات الديموغرافية

:الجنس -

☐ ذكر

☐ أنثى

:العمر -

☐ أقل من 20 سنة

☐ سنة 20-22

☐ سنة 23-25

☐ فوق 25 سنة

:المستوى الأكاديمي -

☐ السنة الأولى

☐ السنة الثانية

☐ السنة الثالثة

☐ السنة الرابعة

☐ السنة الخامسة

:الموقع الحالي -

☐ داخل السودان

☐ خارج السودان

:القسم ب :الوصول إلى التعلم عن بعد

ما الجهاز الذي استخدمته بشكل رئيسي للتعلم عن بعد؟ -

☐ الهاتف الذكي

☐ الكمبيوتر المحمول

☐ الكمبيوتر اللوحي

☐ الكمبيوتر المكتبي

كيف تقيم وصولك إلى الإنترنت أثناء التعلم عن بعد؟ -

☐ جيد جدًا

☐ جيد

☐ معتدل

☐ ضعيف

☐ ضعيف جدًا

كم مرة أثرت مشاكل الكهرباء على دراستك؟ -

☐ أبدًا

☐ نادرًا

☐ أحيانًا

☐ غالبًا

☐ دائمًا

:القسم ج:فعالية التعلم عن بعد

(أوافق بشدة, 2 =أوافق, 3 =محايد, 4 =لا أوافق, 5 =لا أوافق بشدة = 1)

1. ساعدني التعلم عن بعد في مواصلة دراستي خلال الحرب.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

2. كانت المحاضرات عبر الإنترنت واضحة ومفهومة.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

3. كنت قادرًا على التفاعل بفعالية مع المدربين.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

4. حصلت على مواد تعليمية متساوية كما قبل الحرب.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

5. حسن التعلم عن بعد معرفتي النظرية.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

6. أستطيع إدارة وقت دراستي بفعالية أثناء التعلم عن بعد.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

:القسم د:التدريب السريري والعملي

1. وفر التعلم عن بعد المعرفة السريرية الكافية.

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

2. تلقيت تعرضًا عمليًا أو سريريًا كافيًا.

1 □ 2 □ 3 □ 4 □ 5 □

3. أشعر بالثقة في مهاراتي السريرية بعد هذه الفترة .

1 □ 2 □ 3 □ 4 □ 5 □

:القسم هـ :التحديات التي تواجه الطلاب

ما هي التحديات الرئيسية التي واجهتها؟ (يمكن اختيار أكثر من إجابة)

☐ ضعف اتصال الإنترنت

☐ نقص الكهرباء

☐ نقص الأجهزة

☐ الإجهاد النفسي بسبب الحرب

☐ الصعوبات المالية

☐ نقص التدريب العملي

☐ طرق التدريس السيئة

☐ أخرى: _____

:القسم و :الأداء الأكاديمي

ما مدى تأثير الحرب على دراستك؟ -

☐ غير مرهق

☐ قليلاً

☐ مرهق قليلاً

☐ مرهق بشكل معتدل

☐ مرهق جدًا

مقارنة بالتعليم قبل الحرب، كان أداؤك الأكاديمي -

☐ أفضل بكثير

☐ أفضل قليلاً

☐ نفس الشيء

☐ أسوأ قليلاً

☐ أسوأ كثيرًا

:القسم ز: الرضا العام

بشكل عام، ما مدى رضاك عن التعلم عن بعد خلال الحرب؟ -

☐ راض جدًا

☐ راض

☐ محايد

☐ غير راض

☐ غير راض جدًا

هل تعتقد أن التعلم عن بعد مناسب للتعليم الطبي في حالات الطوارئ؟ -

☐ نعم

☐ لا

☐ غير متأكد

4. Map



5. Photo

