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Volume 39, Issue 1, (2026)

It deals with various branches of human, applied and medical knowledge

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-The submission should include a separate title page, the main article and the journal submission form.

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Preface

The First Issue of Volume 39, 2026

The Editor-in-Chief and members of the Editorial Board of the Benghazi University Scientific Journal are pleased to announce, on Tuesday, June 30, 2026, the publication of Volume 39, Issue 1 (2026).

On this occasion, the Editorial Board extends its sincere congratulations to the researchers whose papers have been published in this issue, and wishes them continued success and excellence in their future academic and scientific endeavors.

Sincerely

The Editor-in-Chief and Editorial Board

The Scientific Journal of University of Benghazi (SJUOB)

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EFL Libyan Teachers and Students' Perception toward the Use of YouTube Videos in Enhancing EFL Speaking Skills.

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ABSTRACT

This study aimed to investigate how Libyan EFL teachers and learners perceive the use of YouTube videos to improve the teaching and learning of English-speaking skills. The research employed a mixed-method approach. To gather data, the researcher conducted structured interviews with four Libyan EFL teachers who have been teaching English at the Faculty of Languages at the University of Benghazi for more than 10 years. Also, an online questionnaire was conducted. Thirty EFL students of the first semester at the Department of English at the University of Benghazi responded to the questionnaire. Data obtained from interviews were analyzed using content analysis, while data obtained from the questionnaire were analyzed descriptively using SPSS Statistics. The findings indicated that, despite facing some challenges, participants generally had a positive view towards using YouTube videos to enhance EFL speaking abilities and recognized the benefits of incorporating YouTube videos into their EFL speaking lessons..

KEYWORDS: YouTube Videos, EFL learners, EFL teachers, speaking skills.

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1.LITERATURE REVIEW

Speaking English is not an easy task for EFL learners. It is a complex process that involves both comprehending and producing English. While speaking, learners must consider various aspects, such as language chunks, simplified forms, performance issues, informal language, speaking speed, stress, rhythm, and intonation [1]. The difficulty of enhancing EFL learners' speaking abilities was highlighted by numerous researchers [2],[3]. According to Pinter [3], speaking is a complex process that requires the integration of two interrelated processes: speaking and thinking. This means that in our daily activities, we examine our speech to correct errors while also organizing our thoughts for clear and effective communication. Brown [2] pointed out that speaking English is a unique and difficult skill for many EFL students. The use of language chunks, contractions and basic words, along with the natural speed of native speakers, presents the most difficult speaking aspects among most EFL students. Nevertheless, it is a fundamental skill for language learning [4], and it is an indication of how languages are learned and practiced [5].

Because of its integrated, interrelated complex nature, speaking is perceived by many EFL teachers as one of the most challenging language skills [6]. For example, most Libyan EFL teachers find teaching speaking skills challenging because most of them graduate from university with a low level of communication skills in English [7],[8]. Therefore, most of them resort to using their L1 (Arabic) in EFL classes [6], and most of them employ outdated teaching methods [9],[10]. Also, their knowledge of the most effective practice of speaking activities in classrooms is rather weak [11]. Most of those teachers complain that the large number of students in each classroom makes it difficult for them to assess each student's speaking performance, which leads to decreased motivation, increased stress levels, and reduced opportunities to improve teaching quality [12].

Speaking English is also challenging for many Libyan EFL students. Many researchers noted that the reliance of Libyan EFL teachers on traditional teacher-centered methods rather than learner-centered methods. As a result, students become passive receivers of English with a complete reliance on their teachers [13],[14]., which negatively impacts their speaking abilities [15]. Additionally, large class size (more than 30 students per class) limits chances for students to engage in conversation or exchange speech in oral interaction [12]. As a result, Libyan EFL students often demonstrate poor command of spoken English because of a lack of immediate feedback and insufficient chances for participation in speaking lessons [16]. A study at the Faculty of Languages at the University of Zawia by Owhda [17] identified many factors that hindered Libyan students' speaking skills. These included limited vocabulary, poor accuracy of grammar, and significant psychological issues such as shyness, nervousness, and anxiety. Owhda [17] also noted that a lack of exposure to authentic English materials and great reliance on learners' first language (Arabic) had worsened this problem. Similarly, Diaab [11] stated that Libyan students at Sebha University faced difficulties in English communication skills because of linguistic and psychological barriers, as well as insufficient exposure to authentic English and frequent use of Arabic in the EFL classroom.

Due to these speaking difficulties faced by Libyan EFL teachers and learners, many researchers have constantly emphasized the importance of using authentic materials to facilitate the teaching and learning of EFL speaking skills. One effective way to present these authentic materials is through the use of YouTube videos, which offer real-life examples of spoken language, and allow students to watch and hear how native speakers use vocabulary, grammar, and pronunciation in everyday situations [18],[19]. Moreover, the visual component of these videos further enhances understanding of spoken language by enabling students to relate what they

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hear to what they see [20]. Additionally, these videos are easily accessible [18], in a way that students can explore and search for a wide range of content at their convenience [21]. Furthermore, YouTube videos create a relaxed atmosphere that helps students feel more comfortable and confident to participate in speaking activities [22],[23]. Above all, they promote independent learning since students can watch these videos and learn English on their own outside the classroom [19],[23].

Many studies showed that using YouTube videos in EFL classrooms facilitated EFL teaching, enhanced the learning of speaking skills, and increased students' engagement and participation in speaking activities [22],[21],[24]. Most notably, Lu et al. [25] examined how these videos affected Taiwanese EFL learners and discovered that they felt more comfortable, produced longer speaking responses, and their worry about speaking in English decreased when watching these videos. Muslem et al. [26] highlighted that YouTube videos could improve students' overall speaking proficiency, including vocabulary, grammar, and listening skills. Similarly, Riswandi [27] found that integrating YouTube videos with a task-based learning method significantly enhanced students' fluency and made speaking activities both enjoyable and beneficial for learners. Jensen et al. [28] also indicated that presenting YouTube videos in language lessons offered numerous opportunities to learn in a dynamic and interactive EFL classroom environment.

Because of the low level of speaking skills among Libyan EFL teachers and learners [7],[14], and the persistent demands for technology integration to enhance English speaking skills in Libya [11], [15], [17], this study sought to understand the attitudes of Libyan EFL teachers and learners towards the use of YouTube videos in EFL speaking classes. This study aimed to find out what perceptions Libyan EFL teachers and learners at the Faculty of Languages at the University of Benghazi had toward using YouTube videos in EFL speaking classes.

2.MATERIALS AND METHODS

A mixed-method research design MMR was used to adequately meet the objectives of this research. MMR combines both quantitative (e.g., a questionnaire) and qualitative (e.g., interviews) methods for data collection [29]. This method was chosen because it permits the combination of the strengths of the two methods (quantitative and qualitative) without incurring their individual drawbacks. According to Creswell and Creswell [29], a mixed-method research design enhances the validity and trustworthiness of any research. It also ensures the generalizability of any results as well as in-depth findings [29].

Participants in this study were EFL teachers and learners from the Faculty of Languages at the University of Benghazi. This decision was made because the Faculty of Languages administration aims to provide teachers with effective methods and techniques so that their students can improve their English-speaking skills. Consequently, research is highly required to inform the dean about the attitude of Libyan EFL teachers and learners towards the use of YouTube videos to enhance the teaching and learning of EFL speaking courses at the university.

In-depth structured interviews were conducted with Libyan EFL teachers since this research method enables participants to give detailed insights and perspectives on the topic [30]. Interviews are a primary method for collecting data in many research studies [31]. Questions of these interviews were designed to be close-ended, requiring more than simple yes or no responses [31]. The goal of the interviews was to reveal the views of Libyan EFL teachers regarding the use of YouTube videos in EFL speaking classes. Each of the interviewees has been teaching English as a foreign language for more than 10 years in Libya. One of them holds a PhD degree in TEFL, while the other three are at the stage of writing their PhD dissertations in the English language. Each participant was interviewed individually in an online interview that lasted

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for nearly half an hour. After taking the permission of participants, interviews were recorded and then transcribed. Data gathered from interviews were analyzed using content analysis to reveal more in-depth insights. Furthermore, an online questionnaire was conducted with 30 Libyan EFL students (10 males and 20 females) from the Department of English at the Faculty of Languages in Benghazi. Students responded to a Likert-type scale ranging from 1 (strongly agree) to 5 (strongly disagree), and their answers were analyzed using SPSS. Cronbach's Alpha was calculated using SPSS to ensure the reliability and validity of the questionnaire (see Table 1). The Cronbach's Alpha coefficient for the 10 items was .723, indicating an acceptable reliability level for this sample because it is above the .70 threshold.

Table 1: Questionnaire's Cronbach's Alpha

Cronbach's Alpha	N. of Items
723	10

3.RESULTS OF THE QUESTIONNAIRE

Table 2 below presents the results of the questionnaire. It is important to note that a score of 2.14 on average is regarded as in agreement with the facts and statements presented.

Table 2: Students' Perceptions of Using YouTube videos in EFL Speaking Classes

No.	Item	N	Mean	SD
1	Watching YouTube videos helped me improve my speaking skills.	30	2.43	.971
2	Watching videos helped me increase my vocabulary repertoire.	30	2.33	.802
3	Watching YouTube videos helped me to strengthen my understanding of effective speaking skills.	30	2.37	1.30
4	Watching YouTube videos makes my motivation and inspiration to speak higher.	30	2.23	1.14
5	When watching YouTube videos, I can pronounce words more properly when speaking.	30	2.47	1.41
6	Watching YouTube videos helped me correctly and accurately use grammar in speaking.	30	2.67	1.16
7	Watching YouTube videos helped with my choice of vocabulary in speaking.	30	2.87	1.20
8	My fluency in speaking has increased because of watching YouTube videos.	30	2.63	1.27
9	YouTube videos have increased my confidence to speak English.	30	2.60	1.16
10	Watching YouTube videos helped me to be active and participate in speaking.	30	2.57	1.07

Across items, the means ranged from 2.23 to 2.87, which suggested that, on average, students generally agreed that YouTube videos contributed to the improvement of their speaking skills and language development (since means were closer to 1 than to 5). The SD values (from .802 to 1.41) showed moderate variation in how strongly students felt about each statement. It was clear from the results that students seemed to acknowledge the benefits of YouTube videos in improving their speaking skills.

4. RESULTS OF THE INTERVIEWS

Data obtained from the interview questions in this study were as follows:

1. What is the effect of using YouTube videos to enhance students' engagement and motivation in EFL Speaking classes?

Teacher 1 emphasized that these videos had great value in speaking classes in general, and these videos could keep students more attentive, motivated, and focused. Teacher 2 said that "YouTube videos are a source of engagement for learners, and provide important and crucial visual representation of the speaking curriculum and contribute to the dynamics and changes of speaking classes." Teacher 3 and Teacher 4 noted that YouTube videos could lower worry among students, while at the same time increasing engagement, motivation, and participation.

2. What is the best time for presenting YouTube videos in speaking lessons, at the beginning, in the middle, or at the end of the lesson?

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Teacher 1 said that these videos should be played in the middle of class to help students understand the topic being discussed. In opposition, the second instructor proposed utilizing these videos as a way to introduce the lesson topic. She added that the time allotted for presenting these videos was dependent on the teaching process's dynamics. A video should be played back at the right time for an intended purpose, as stated by the fourth teacher, who suggested using these videos during introductions or practice sessions to ensure that the students get a clear picture of the lesson.

3. How does the use of YouTube videos in speaking classes affect your time?

The first teacher noted that playing videos in class serves as valuable input for students after the topic has been introduced, and it does not affect the time of the lesson. The second teacher commented that it depends on the videos' length and stressed that teachers choose videos that suit their teaching dynamics. The third and fourth teachers said that there is plenty of time in lectures to play these videos and that they do not affect their time; instead, these videos save time and directly present the intended idea of the topic.

4. How would you rate the usefulness of YouTube videos from 1 to 5 regarding speaking skill (strongly important, important, neutral, not important, strongly important?

The first teacher classified YouTube videos as strongly important. The second teacher rated them between "strongly important" and "important." The third and fourth teachers considered the videos to be important as far as there were good facilities to play them.

5. Do you have any comments or suggestions to add about using YouTube videos in EFL speaking classes?

Teacher 1 said that although she had never used YouTube videos in her speaking classes because of the lack of facilities in Libyan EFL classrooms, she stressed the importance of selecting videos that were good and culturally relevant for our Libyan EFL students. Teacher 2, as teacher 1, also stressed that selecting these videos should align with students' Islamic culture as well as their language proficiency levels. She emphasized that it was necessary for teachers to carefully prepare their video choices. Furthermore, she highlighted some difficulties for implementing these videos in Libyan EFL classes, such as the lack of internet access, the absence of equipment like data-shows, and frequent electricity outages. Teacher 3 had strongly stressed that the university should facilitate teaching job for teachers and ensure internet access in EFL classes. Teacher 4 noted that the most important thing for these videos was being interesting, engaging, and relevant to the curriculum, and they must be well-planned by the administration of the faculty itself.

5. DISCUSSION

Table 2 above indicates that most participants generally showed agreement that YouTube videos were effective in enhancing their EFL speaking skills. Most of them agreed on benefits such as appropriate grammar use, accuracy, and fluency, while some showed agreement on aspects like promoting motivation and enriching vocabulary. These findings were in line with Harmer [32], who noted that using videos in language learning could be beneficial for students. The findings were also consistent with Zaidi et al. [18], Albahlal [19], Mekheimer [33] who stated that integrating video-based materials in learning classes could improve students' overall language speaking proficiency at the university level.

Teachers' responses during the interviews of this study indicated that they considered YouTube videos to be highly engaging and motivating for students in speaking classes. They noted that there was no specific time for presenting these videos; instead, they could be used whenever the teacher or lesson context requires them. They also noted that teachers should bear in mind factors like learners' needs and their proficiency level when choosing these videos. The interviewees also stated that the challenges of limited internet access and a shortage of equipment, such as projectors,

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presented a great obstacle for incorporating these videos in classes. However, all the interviewees agreed that YouTube videos were generally effective and saved time in speaking classes. They emphasized the necessity of selecting culturally relevant videos that meet Arab non-native English speakers' needs and ideologies. These findings were in line with Alshraideh [34], whose results showed that the use of online videos had a positive influence on EFLT in general. The findings were also consistent with Zayraey [35] whose study revealed that students' engagement with watching videos improved their speaking skills, including vocabulary, motivation, pronunciation, and other related sub-skills. The findings were also compatible with González Cabañas & Núñez Mercado [36], whose study indicated that teachers had positive attitudes towards the use of authentic videos to develop students' speaking skills and understood the benefits of using authentic YouTube videos. Although partially compatible, findings of this study were in line with Albahlal [19], Balbay and Kilis [37], and Watkins and Wilkins [38], whose studies revealed that this type of video had been found to be useful to develop all four language skills.

6. CONCLUSION

Based on the findings of this study, it can be evidently concluded that Libyan EFL teachers and learners have positive attitudes towards integrating YouTube videos in EFL speaking classes. They view YouTube videos as engaging, effective, and enriching tools that can enhance the teaching of speaking skills when used thoughtfully. Today's learners are the Tech-Users generation, and incorporating these videos into English classes does increase and enhance their motivation and ambition for learning. It was also concluded that by using YouTube videos, teachers can minimize their own talking time and create a more productive learning environment.

This study contributes to the literature by looking at the views of EFL teachers and students on YouTube videos used in speaking classes. However, some limitations have to be acknowledged. Experimental research is needed to determine the practical use of these videos in classrooms and the appropriate timing for their use during classroom time. Additionally, interviewees' positive views on YouTube videos might be due to their ongoing work as PhD students at the university, so teachers in other contexts might have different views and attitudes. Future research needs to consider these issues.

In conclusion, based on the findings of this study, it is highly recommended to improve the infrastructure of EFL classrooms at the University of Benghazi. Internet access and tools like projectors should be highly incorporated in Libyan EFL classrooms.

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Investigating English Language Teachers' Readiness and Needs Regarding AI Integration through the UNESCO AI Framework.

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ABSTRACT

Artificial intelligence has recently become the focus of considerable academic discussion worldwide. While AI has been associated with several benefits, its rapid widespread use poses challenges and threatens the teacher's role. Particularly in developing contexts like Libya, adopting AI in education requires a careful, systematic approach to promote its proper use. Accordingly, this study examined English language teachers' readiness and needs for AI integration at the University of Benghazi. The investigation. The investigation was guided by the UNESCO Competency Framework for Teachers (2024) and used involoed interviews with six teachers. The results revealed that the teachers have a strong human-centered approach to AI use, basic familiarity with AI ethics, and basic knowledge and use of AI tools in the teaching process and their professional development. Nonetheless, the teachers were constrained by limited professional development opportunities and the resources needed. The findings of the study highlight a promising foundation for AI implementation, but stress the need for policy interventions in light of the UNESCO framework.

KEYWORDS: AI integration, English language teaching, UNESCO AI Competency Framework.

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1. INTRODUCTION

Artificial Intelligence (AI) has been linked to significant developments in education [1,2]. Specifically, English language teaching has been influenced by AI's numerous capabilities, which have been perceived positively by teachers and learners [3-8], such as its great potential in fostering a learner-centered, learning environment [5-10] and students' proficiency across language areas such as grammar, writing, and speaking [4,5,7,11]. Nevertheless, research conducted globally has revealed concerns about the accuracy of information provided by AI and its impact on reducing humans' reasoning ability and communication [12]. In addition, there have been reservations regarding teachers' and students' over-reliance on AI, teachers' AI knowledge and skills, academic integrity, and absence of a strong technological infrastructure [3,6,10,12-14].

In Libya, AI use in education is also a key area of current research, where research findings similarly highlighted teachers' positive perceptions [15-18], and comparable challenges, such as the need for regulations on proper AI use, lack of teachers' training, shortage of technological resources, and fear of misuse [15-20].

Thus, despite its notable advantages, the effective application of AI requires sound policies and guiding frameworks [1,2]. Correspondingly, the UNESCO AI Competency Framework for Teachers (AI CFT) was developed in 2024 as a guide for AI competencies needed by teachers and teacher-training programs [21]. It consists of the following five aspects of competency that teachers need to have to use AI successfully [21]:

A. Human-centered mindset emphasizes teachers' recognition that AI integration should be based on human control, agency, and responsibility [21].

B. The ethics of AI refers to teachers' knowledge of and adherence to the ethical considerations and regulations of AI use. [21]

C. AI foundations and skills pertain to teachers' knowledge of AI fundamentals, which enable them to choose and apply AI tools in their teaching [21].

D. AI pedagogy refers to the skills teachers need to develop to integrate AI into different aspects of teaching, such as course planning, teaching, and learning evaluation [21].

E. AI for professional development is about the competencies that teachers need to develop to be able to use AI tools to enhance their professional growth and teaching practices [21].

In addition, within the aforementioned five aspects, UNESCO established three mastery levels of competence, which range from basic to more advanced (i.e., acquire, deepen, create) [21]. It is noteworthy that there are several teacher-competency frameworks that clarify what teachers need for meaningful technology implementation, such as TPACK, which highlights the interplay of technological, pedagogical, and content knowledge [22], and SAMR, which describes four progressive stages of technology integration: Substitution, Augmentation, Modification, and Redefinition [23]. However, the UNESCO framework appears to offer a more holistic, policy and teacher-oriented view, covering multiple aspects and staged levels of teacher competence that can be adapted to specific contexts [21]. Therefore, this research aimed to examine English teachers' current readiness and needs regarding AI implementation in light of the UNESCO framework. This was particularly important because in settings like Libya, which suffer from notable deficiencies in technological infrastructure, teachers' skills [17], and the absence of regulations on AI usage [24], more research is needed across various settings to obtain information that promotes effective AI adoption [15].

Respectively, this research sought to answer the following question:

What is the current level of readiness of English language teachers for integrating AI in teaching, and what are their main needs for further development based on the UNESCO AI Competency Framework?

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2. MATERIALS AND METHODS

This study followed a qualitative research approach using interviews as the data collection tool, in which information is commonly gathered through face-to-face or telephone discussions based on a limited number of questions designed to encourage participants to share their perspectives [25]. Interviews enable researchers to obtain rich insights into participants' lived experiences and perceptions [26], which justifies their selection as the data collection method in this study, which sought to examine teachers' current AI competency.

Moreover, the study was conducted at the University of Benghazi, which is regarded as a prominent platform for English language education, offered across three of its faculties in Benghazi: the Faculty of Arts, the Faculty of Education, and the Faculty of Languages. The study participants were six English language teachers: two from the Faculty of Languages, two from the Faculty of Arts, and two from the Faculty of Education, whose teaching experience ranges from 5 to 20 years. The selection of participants from different faculties was purposeful to ensure diverse teachers' insights.

The interviews were conducted online via WhatsApp and Telegram, and were semi-structured, allowing the researcher to ask questions more flexibly and participants to express their views more freely [27]. As for ethical considerations, interviewees were assured confidentiality and anonymity. The interviews were conducted via recording applications, which were later analyzed thematically following Creswell's [25] qualitative data analysis process, which includes: (1) organizing data, (2) familiarizing data, (3) coding, (4) developing themes, (5) representing data, and (6) interpreting findings. The sample size was guided by the concept of data saturation and information power, which assumes that a smaller number of participants is sufficient when they provide repetitive, rich, and relevant information that addresses the research objectives [28]. To ensure the trustworthiness of the qualitative data, this study applied Lincoln and Guba's (1985) [29] four criteria: credibility, transferability, dependability, and confirmability. Credibility was established through in-depth interviews with experienced EFL teachers, transferability through rich contextual descriptions, dependability through transparent research procedures, and confirmability by grounding findings in participants' perspectives rather than the researchers' views.

3. RESULTS

The interview thematic analysis was conducted in light of the five components of the UNESCO framework. Within these components, some subthemes were identified as follows:

3.1. HUMAN-CENTERED MINDSET

3.1.1. Human judgment

All six participants emphasized that they do not rely entirely on AI, but use it as a supporting tool, as they reported: "As teachers, you cannot copy-paste the information from AI. I use them to help me polish my work because I don't trust AI tools 100%" (P 3). Also, the participants stressed the importance of being selective regarding the content generated by AI tools: "I don't take what AI tools provide me as it is, I add my own touch and what suits my students" (P 4).

Moreover, all participants were aware that the content provided by AI tools might not be accurate, as one participant noted, "I don't just accept all AI content; I double check the sources to ensure the information is reliable" (P 2).

3.1.2. Human interaction and classroom management

Most participants highlighted that AI tools cannot replace the teacher-student connection: "AI cannot provide emotional support or understand the facial expression of your students" (P 4).

Furthermore, participants agreed that AI tools cannot replace teachers' skills in classroom management: "In certain activities, you have to put your students in groups or in pairs. I would lead such activities myself.

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I wouldn't use AI" (P 5).

3.2. AI ETHICS

3.2.1. Basic AI ethical awareness

All participants reported practices related to basic responsible and ethical AI usage. They noted that they do not rely on AI to make a subjective or final assessment of students: "I could seek the opinion of AI when I am having difficulty assessing a student, but I would never rely on it 100%" (P 4). In addition, the participants were aware of AI's limitations in providing accurate information: "AI can hallucinate a lot. So, I always check the main source of the information" (P 1). Nevertheless, most participants stressed that they use AI tools ethically, shaped by the limited access to free AI tools: "I am satisfied with the way I use AI tools, but I am not sure if I am using them appropriately since we only have access to free ones" (P 5).

3.2.2. Lack of AI institutional Guidelines

Five of the six participants affirmed the absence of institutional regulations that reinforce responsible AI usage, as noted by one participant: "up until now, I could not find a source that tells students and teachers how to use AI properly" (P 4).

In this respect, the participants expressed their desire for an urgent solution to the absence of AI guidelines: "We don't have guidelines, we use AI randomly. Policymakers should consider formulating rules based on well-known universities" (P 1).

3.3. AI FOUNDATIONS

3.3.1. Teacher's awareness of basic AI tools and their use

Collectively, all six participants confirmed that they are knowledgeable about common AI tools and employ them selectively and wisely for teaching purposes: "When I prepare my lessons, I usually ask ChatGPT for help, not to generate lesson plans but only to provide me with new ideas" (P 4). Moreover, most participants indicated that providing AI with suitable prompts is key to gaining the required information: "The information you receive is more reliable when you ask AI the right questions" (P 2).

Moreover, participants recognized that AI tools serve different purposes: "I usually use Napkin for generating PowerPoint presentations, and ChatGPT for lesson planning" (P 3).

3.3.2. Teachers' awareness of AI benefits and limitations

All interviewees agreed on the positive impact that AI tools have on teaching practices, such as in lesson preparation, providing extra materials and worksheets: "AI tools help me a lot, especially in polishing my lesson plans and suggesting a variety of teaching practices" (P 3).

Moreover, most participants highlighted that AI tools save their time and increase students' engagement: "Using AI tools eases my lecture preparation, and most students feel motivated and become attentive when I use it" (P 5).

However, all six participants pointed out that these tools have limitations, such as students' overreliance and misuse: "Students have started relying on AI for almost 90% of their assignments and homework" (P1).

3.4. AI PEDAGOGY

3.4.1. Using AI for preparation

All participants stated that their primary use of AI in teaching occurs when they plan their lessons. Respectively, the participants noted various purposes for which they use AI, such as to obtain more information about the content they are going to teach: "I like to be prepared for any questions from the students. So, before I teach, I go to AI to understand more about the topic" (P 3). In addition, the participants noted that they use AI for creating activities, "I went to Gemini and asked it to prepare an activity with scenarios for me to teach students different teaching methods. The students love the ideas" (P 1).

Moreover, the participants explained that they use AI to enhance students' understanding of the lesson: "AI is great for providing clarifications and illustrations to explain the lesson" (P 5).

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3.4.2. Using AI in the classroom

The participants commonly agreed that they do not use AI inside the classroom for several reasons. The main reason is that the classrooms are not equipped with internet access or technological devices: "It would be a great helping tool to use AI in the class, but we still do not have labs, laptops, or internet connection" (P 3). Another reason reported by the participants was that they did not feel confident or trained to use it professionally: "I rely heavily on AI at home for different teaching purposes, but I do not use it inside the classroom because I am afraid it might fail me" (P 5).

3.4.3. Using AI for evaluation

The participants collectively reported that they do not use AI for evaluating students' work. However, they noted that if they had access to appropriate AI tools, they would use them for certain types of assessments: "If I knew of suitable AI tools, I might use them to mark grammar, MCQ, something objective, but I would never use them for marking writing, for example" (P 3).

Notably, one participant described an instance where she once resorted to AI to help her in making a fair assessment of a student's work:

"I was marking the paper of a student who was active and punctual in class. Surprisingly, he did not do well on the test. I asked AI to help me mark his paper, to be fair. AI gave me ideas that I was familiar with when I was training teachers in the past, but I forgot those ideas when I was marking. I was surprised that AI knew these techniques. It was really helpful for me". (P 4)

3.5. AI FOR PROFESSIONAL DEVELOPMENT

3.5.1. AI for advancing knowledge and teaching practices

Most participant reported relying heavily on AI to promote their professional growth, noting they use it to advance and deepen their understanding of the content they teach. "I like to know in-depth information about what I am teaching. AI helps me to increase my knowledge of the subject. It enables me to answer my students' questions" (P 1).

Moreover, the participants stated that they largely use AI in lesson planning to suggest recent teaching methods: "Although I have been teaching for more than 15 years, using AI made me more professional" (P 4).

4. DISCUSSION

Generally, the participants in this study expressed positive attitudes towards AI and its use in various teaching-related tasks. This finding is consistent with previous studies reporting generally positive perceptions among English language teachers globally [5,9,11] and in Libya [15,16,19,20,30]. This consensus supports the evidence that AI is associated with improved English language teaching outcomes and suggests that future AI integration efforts may be facilitated.

Moreover, the study participants strongly emphasized the importance of maintaining the teacher's role and human judgment. This finding supports UNESCO's human-centered AI perspective and is consistent with previous studies reporting English teachers' preference for AI as a supportive rather than a replacement tool [31]. Such views indicate teachers' awareness of the importance of human agency.

Furthermore, participants expressed concerns about academic integrity and students' misuse. These concerns reveal consciousness of ethical considerations emphasized within the UNESCO framework. Comparable reservations have been widely reported in studies on AI adoption in education globally [32,33] and in Libya [16,18,20]. This observation highlights that this issue is common globally and locally.

In addition, participants demonstrated basic familiarity with AI tools and their mechanisms, although their understanding was often limited. This suggests partial attainment of the UNESCO competency related to foundational AI knowledge. Similar views have been reported in previous studies, where teachers showed basic awareness of AI technologies but lacked deeper conceptual understanding [30,32]. This finding suggests

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that awareness may be developing faster than comprehensive AI literacy and emphasizes the need for foundational training.

Moreover, participants reported using AI primarily for lesson planning and material preparation, while classroom-based applications were limited. This finding suggests that teachers have begun to recognize the practical value of AI but have not yet been able to apply more advanced forms of pedagogical integration envisioned by the UNESCO framework. Previous studies revealed that teachers' use of AI was largely confined due to limited training, resources, and implementation support [15,16,19,20,32,33]. This finding indicates that teachers may require greater institutional support and pedagogical guidance to translate AI use from planning tasks to classroom implementation.

Finally, participants emphasized the value of using AI as a tool to advance their knowledge and teaching practices. This reflects the UNESCO competency related to professional learning, which encourages teachers to use AI to support continuous professional development. This finding is consistent with previous research highlighting that AI can serve as an effective tool for teacher development [34]. This finding also suggests that teachers view AI not only as an instructional tool but also as a resource for ongoing learning. It may also indicate that AI has the potential to address the challenges of a lack of professional development opportunities.

The importance of this study lies in its examination of teachers' perceptions of AI at the University of Benghazi, focusing on three different faculties. By doing so, the study responds to the recommendations of Almashrgy and Alburki [15] by exploring further settings, and complements that of Hadaga and Elfalfal [30], which examined teachers' perceptions at the Faculty of Languages quantitatively. Furthermore, this study provides more in-depth information about teachers' perceptions through the comprehensive UNESCO framework. The findings of this study are promising, as they highlight a good foundation among the teachers in this setting.

Nonetheless, the study recommends that the University of Benghazi seek foreign and specialized experts to train teachers in AI integration guided by the UNESCO framework. In addition, it recommends that the university equip the classrooms with adequate tools and internet access to promote successful AI implementation.

Respectively, future researchers are recommended to investigate the impact of training teachers on AI following the UNESCO framework, and to conduct classroom observations to follow teachers' progress and needs.

5. CONCLUSION

This study investigated English teachers' readiness and needs for adopting AI at the University of Benghazi. The findings demonstrated great potential among the teachers, while also uncovering several contextual constraints within this environment, reflected in the need for structured teacher-training programs and the provision of fundamental technological tools and internet access at the university.

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The Psychosocial Impact of Tinea Capitis on Quality of Life in Libyan Schoolchildren: A Cross-Sectional Study.

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ABSTRACT

Tinea capitis, the most common fungal infection in school-aged children, causes significant psychosocial impact. However, data on its effect on quality of life (QOL) in Libyan children is limited. This study aimed to assess its impact on the quality of life of affected children and determine the relationship between QOL scores and epidemiological factors like age, sex, disease duration, and clinical type. It was a hospital based cross-sectional study of 50 Libyan children (aged 6-12 years) diagnosed with tinea capitis. Each patient underwent a detailed history, clinical examination, and KOH testing. The Children's Dermatology Life Quality Index (CDLQI) questionnaire was administered to assess QOL. Data were analyzed using t-tests, Mann-Whitney U tests, and chi-square tests. The mean CDLQI score was 11.5 ± 4.5. A significant psychosocial impact (CDLQI score ≥6) was found in 48% of patients. Factors significantly associated with higher QOL impairment were female gender, longer disease duration, and the inflammatory kerion variant. The most severely affected QOL aspects were "symptoms and feelings" and "school." Age and socioeconomic status did not show a significant correlation with QOL scores. Tinea capitis causes a significant psychosocial impact on affected children's life. Management should extend beyond antifungal therapy to include psychological support, especially for girls, those with long-standing disease, and those with severe inflammatory presentations.

KEYWORDS: Tinea Capitis, quality of life, Psychosocial, schoolchildren.

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1. INTRODUCTION

Tinea capitis is a superficial fungal infection of the scalp caused by dermatophytes. These dermatophytes belong to the genera Trichophyton and Microsporum. It is the most common cutaneous mycosis in children but it's uncommon among adults. [1,2] Clinical presentation of this infection varies from non-inflammatory scaling and hair loss to the highly inflammatory kerions, which can lead to permanent scarring. [3]

While clinical manifestations and epidemiological aspects are well documented, the psychological and social impact of this condition is less studied. Social stigma and isolation, ridicule, bullying by peers and possible disruption of the learning process and academic performance can all result from this disease. [4,5] Because of the nature of this disease being non-life-threatening, there was a general neglect of its psychological consequences.

The World Health Organization defines quality of life (QOL) as an individual's perception of their position in life relative to their culture, values, and expectations. In children with skin diseases, tools like the Children's Dermatology Life Quality Index (CDLQI) are needed for estimating this impact. [6]

This study aimed to identify and classify the grade of the psychosocial impact of tinea capitis in Libyan schoolchildren. It also aimed to determine its association with sociodemographic and clinical characteristics.

2. MATERIALS AND METHODS

2.1. Study Design and Population:

This was a hospital-based cross-sectional study. The study sample included all consecutive Libyan children (n=50) aged 6–12 years who were diagnosed with tinea capitis at the Dermatology Department in Benghazi Medical Center in the time period between January 2022 and July 2023 (18 months). Children were excluded if they or their parents refused to participate. Written informed consent was obtained from parents or guardians and the study was approved by the institution's ethics committee.

2.2. Data Collection:

For each patient, we collected a detailed history. It included possible risk factors, disease duration, and contact with family members or animals. A complete dermatological examination was performed by dermatologists in the outpatient department. The diagnosis of tinea capitis was made both clinically and by potassium hydroxide (KOH) examination. Clinical types were classified as (grey patch, black dot, kerion, etc.).

2.3 Quality of Life Assessment:

Quality of life was calculated using the Children's Dermatology Life Quality Index (CDLQI), which is validated for children aged 4–16 years. The questionnaire was translated into Arabic. Parents helped younger children answer the questionnaire if needed. The CDLQI consisted of 10 questions that cover: symptoms and feelings, leisure, school, personal relationships, sleep, and treatment. Each question is scored 0–3, giving a total score of 0–30, with higher scores indicating higher impairment. Scores were categorized as: 0–1 (no effect), 2–5 (small effect), 6–10 (moderate effect), 11–20 (large effect), and 21–30 (extremely large effect).

2.4. Statistical Analysis:

Data were analyzed using SPSS version 26. Descriptive statistics were used for demographics and clinical features. We tested the distribution of CDLQI scores for normality. Independent-sample t-test was used for continuous variables, and chi-square or Fisher's exact tests were used for categorical variables. A p-value <0.05 was considered statistically significant.

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3. RESULTS

3.1. Demographics and Clinical Profile:

The study included 50 patients with males being more than females (68% n=34 male, 32% n= 16 female). (see Table 1)

Table1: Gender distribution of schoolchildren

Gender	Frequency	Percentage
Male	34	68%
Female	16	32%

The most common affected age group was 11-12 years (40%, n=20), followed by 9-10 years (38%, n=19). Less affected age group were 6-8 years, they were 11 cases (22%).

The most common clinical type was grey patch tinea capitis (50%, n=25), followed by diffuse scale (20%, n=10) and black dot (18%, n=9). Inflammatory types (kerion, diffuse pustular) were less common (8% , n= 6 combined). (see Table 2)

Table 2: Frequency of clinical presentation of tinea capitis in school-age children.

Clinical presentation	Frequency	Percentage
Kerion	2	4%
Grey patch	25	50%
Favus	1	2%
Black dot	9	18%
Cicatricial alopecia	1	2%
Diffuse Scales	10	20%
Diffuse pustular	2	4%

It was found that eleven (22%) of affected children were either diabetic, had atopic dermatitis or asthmatic patients on corticosteroid therapy, and thirty-nine (78%) of patients had no chronic illness.

Associated factors identified were: animal contact (68%, n= 34 of patients) (see Figure 1), family history of infection (44%, n= 22), and living in a rural area (66%, n= 33).

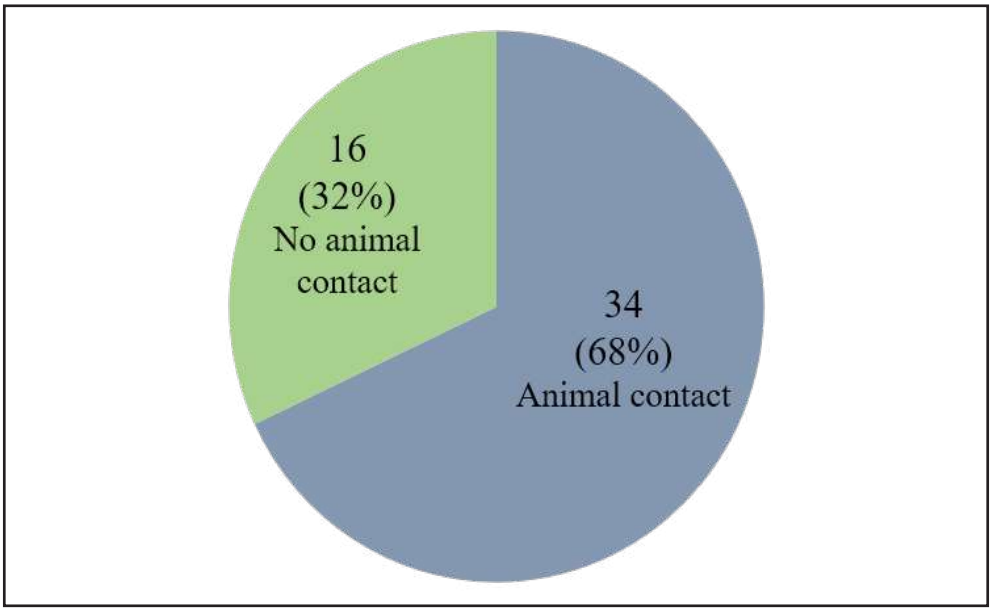


Figure 1: Distribution of study sample according to contact with animals

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3.2 Quality of Life Impact

The mean CDLQI score was 11.5 (±4.5), pointing to a moderate effect on QOL.

The categories of the severity of QOL impact were: no effect (16%, n=8), small effect (36%, n= 18), moderate effect (40%, n=20), large effect (4%, n=2), and extremely large effect (4%, n=2). (see Figure 2). The most affected aspects were "symptoms and feelings" (Q1 & Q2) and "school" (Q7) (see Figure 3).

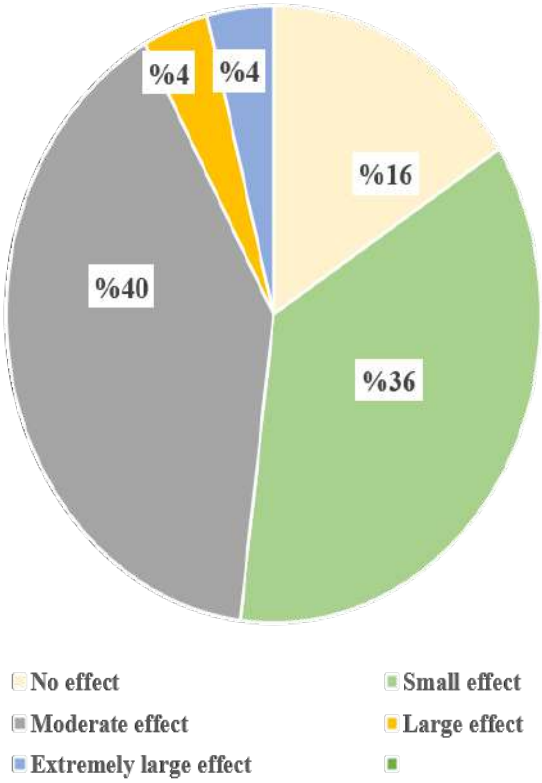


Figure 2: Percentage of severity of cases of tinea capitis on school age children

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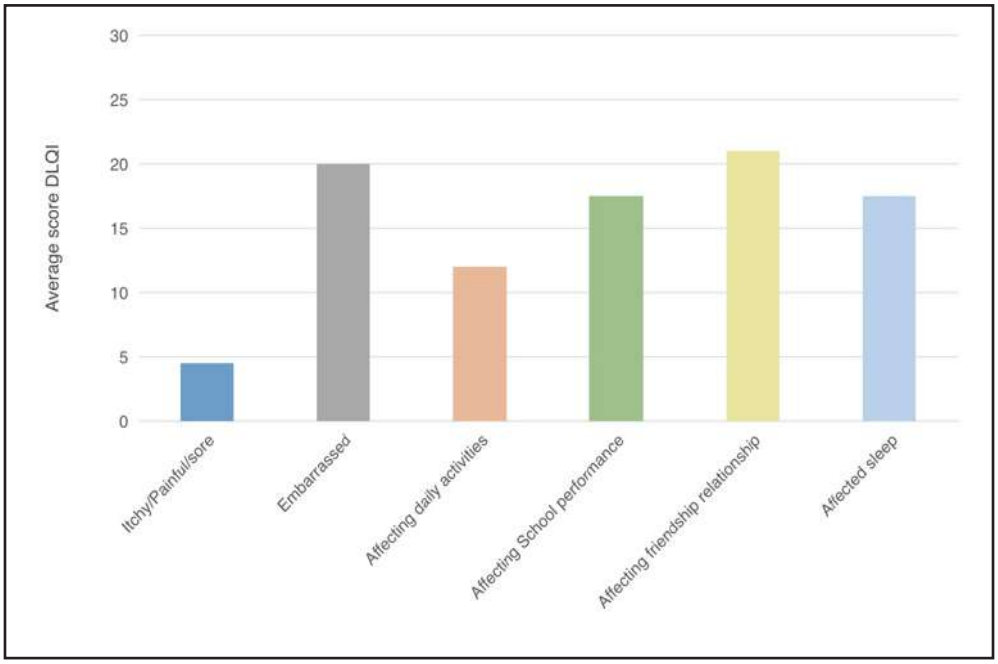


Figure 3: Distribution of study cases in categories of life quality index score

3.3. Correlations with QOL

Gender: Female patients were twice affected and had higher psychosocial impact than males.

Clinical Type: Patients with kerion had the highest CDLQI scores (score of 25), indicating severe impact. Favus also showed a high impact (score of 20). Non-inflammatory types like grey patch and diffuse scale had lower scores (7 and 4, respectively).

Disease Duration: A strong positive correlation (Spearman's rank correlation) was observed. Longer duration of illness was associated with higher CDLQI scores ($p<0.05$). The duration of illness had the greatest effect on the patients' quality of life. The least duration was 0.5 months while the longest duration was 48 months which had a high CDLQI score of 23. The mean duration of illness in this study was 22.3 months and standard deviation was 3.12 months (see Table 3).

Table 3: Mean score of quality of life in relation to patient age and duration of illness

Variable	Minimum	Maximum	Mean	STD
Deviation				
Age (years)	6	12	9	3
Duration of illness in (months)	Weeks 2	Months 48	Weeks 97	days 95
Score of dermatology life quality index	0	23	11.5	11.5

Age and Socioeconomics: No statistically significant correlation was found between QOL scores and the patient's age or socioeconomic status.

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4. DISCUSSION

The results of this study showed that tinea capitis had a significant impact on affected children psychologically. Nearly half of the affected children (48%) experienced impact on their quality of life. The results also showed that females were more psychologically affected than males which agrees with global studies. [7,8] This was likely due to the social pressure on girls regarding their physical appearance especially their hair. The strong correlation found between inflammatory variants and higher scores was expected. After all, inflammatory types were more painful, exudative and are more likely to cause alopecia which usually causes embarrassment, shame and social withdrawal. There was also the significant correlation between longer disease duration and a worse quality of life. This correlation illustrates the negative consequences of delayed diagnosis, inadequate treatment or re-infection. It also highlighted the need for effective interventions and patient education to ensure early, complete recovery.

Age had no significant correlation with outcome and quality of life. This suggested that children across the ages of 6-12 years are equally affected and are equally vulnerable to the stigma and discomfort caused by tinea capitis.

The mean CDLQI score in our study was higher than many values reported for other pediatric skin diseases. Globally, most childhood dermatoses caused mild to moderate psychological impact on the quality of life (Average CDLQI scores range 4-10). [9] As for tinea capitis, the CDLQI was reported to be 6.01± 4.17 in a recent Indian study of 134 outpatient children. This was lower than our observation. [10]

Tinea capitis remains highly prevalent among African children. A systematic review and meta-analysis reported a pooled prevalence of 23% among children under 18 years in 17 African countries [11]. Ethiopian school-based surveys found prevalence rates of t. capitis between 25% and 30%, [12,13] and one rural district study reported 32.3% [12]. These studies indicate the magnitude and impact of the disease. The impact is expected to be higher in endemic regions such as Libya.

The risk factors identified in our study include animal contact, rural residence and family history. These results are consistent with findings from studies in other countries. An Ethiopian meta-analysis showed that younger age (less than 10 years) and poor hygiene increased the risk while frequent hair washing was protective. [12] A cross-sectional survey from Côte d'Ivoire also found strong associations with sharing combs or towels, keeping pets, and limited access to clean water [14].

It was found that the psychological and social impact of tinea capitis is strongly affected by the duration and the severity of the disease. In India, longer duration was associated with worse CDLQI scores [10]. In our study, kerion subtype and prolonged duration of illness were associated with greater impact. This suggests that delayed diagnosis and treatment increase the psychosocial burden. Therefore, early management, patient education and compliance are highly recommended. Our study also agrees with various studies that reported girls are likely to be psychologically and socially affected than boys. This is likely due to social expectations of girls' appearance overall and regarding their hair. Similar results have been described in other dermatological conditions that affect visible body parts. [10,11]

This study has several limitations. The sample which consisted of all consecutive patients diagnosed over a period of 18 months remains small and based on a single center. This results in the limitation of the statistical power of subgroup analyses and therefore their generalizability. Multiple regional studies reported similar limitations. [10,11] In addition, the lack of a control group of healthy children prevents comparison of the quality of life. Finally, we used a generic dermatology quality of life instrument rather than a

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disease-specific tool for tinea capitis. Despite these limitations, our findings provide important baseline data for Libya, where little research exists on the psychosocial impact of dermatophytosis.

Given the high prevalence and the high psychosocial impact of tinea capitis, public health strategies are needed. School health programs, health education campaigns for parents and teachers, and improved access to antifungal treatment are essential. Collaboration with mental health professionals could help reduce the social stigma and support affected children. Future multicenter studies with larger samples and follow-up are needed to confirm these findings and to assess the psychological effects of early treatment.

5. CONCLUSION

Tinea capitis significantly affects the quality of life of schoolchildren. The factors associated with the psychosocial impact are female gender, severe inflammatory disease (kerion), and longer illness duration. Clinicians should not only prescribe antifungal agents, but also be prepared to address the psychological effect associated with the condition, provide counseling, and consider referrals to mental health professionals to prevent the long-term impact on a child's well-being.

The following is recommended:

1. To establish collaboration between dermatologists and mental health workers – particularly for children with longer disease duration and inflammatory variants such as kerion, who had the highest CDLQI scores in this study- to assess the psychosocial issues associated with tinea capitis among school-aged children.

2. Further research should focus on adapting and validating international QOL tools for the Libyan cultural and community.

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FIGURE AND TABLE LEGENDS

Table 1: Demographic characteristics of the study population showing gender distribution of Libyan schoolchildren with tinea capitis (N=50).

Table 2: Clinical profile and frequency of different clinical variants of tinea capitis among the studied schoolchildren.

Table 3: Descriptive statistics for patient age, duration of illness, and Children›s Dermatology Life Quality Index (CDLQI) scores.

Figure 1: Pie chart showing the distribution of the study sample based on history of animal contact, a key identified risk factor for tinea capitis.

Figure 2: Pie chart illustrating the distribution of cases according to the severity of impact on quality of life, as measured by CDLQI score categories.

Figure 3: Bar chart depicting the distribution of mean scores for the most affected CDLQI domains (‹Symptoms and Feelings› and ‹School›) in children with tinea capitis.

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Assessment of Nutritional Knowledge, Eating Habits, and Body Mass Index Among Healthcare Workers in Selected Polyclinics in Benghazi.

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ABSTRACT

Nutrition knowledge plays an important role in improving the eating habits of individuals, families and communities. Consequently, poor nutritional knowledge especially among healthcare workers affects their ability to provide accurate and comprehensive nutritional advice to patients. This study is aimed to assess the level of nutritional knowledge and eating habits, and to determine the body mass index among healthcare workers in Benghazi, Libya. A descriptive cross-sectional study was conducted, with 177 participants from four randomly selected polyclinics between March and May 2025. Data were collected by self-administered questionnaire. Additionally, anthropometric measurements were recorded to calculate the body mass index. Data were entered and analyzed by SPSS. Chi-square ($\chi 2$) test was used to assess any significant associations, if $p<0.05$ was considered statistically significant. The study revealed a high nutritional knowledge score (73.4%) among respondents. However, knowledge regarding the daily serving sizes of major food groups was quite low. There was no any significant association between nutritional knowledge score and all socio-demographic variables. Furthermore, the majority of the participants (75.7%) scored poorly on eating habits characterized by frequent consumption of fast-foods, sugary beverages, alongside a high prevalence of overweight and obesity. The study revealed a significant association between occupation and eating habits($p=0.036$). Implementing in-service continuous nutrition education programs and training is essential to improve knowledge and translate it into dietary practices that improve nutritional status.

KEYWORDS: Body Mass Index, Eating habits, Healthcare workers, Libya, Nutrition knowledge level.

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1. INTRODUCTION

Nutrition is a fundamental determinant of health and development; the World Health Organization (WHO) emphasizes that enhanced productivity, reduced mortality, and improved overall quality of life are related to adequate nutrition. In contrast, insufficient nutrition can lead to malnutrition, hinder infant growth, weaken immune function, and increase incidence of chronic diseases1)). However, nutrition knowledge is one of the factors that affect the nutritional habits of individuals, families and communities (2). It encompasses an understanding of essential information regarding food and nutrients, alongside an awareness of their physiological impacts (3). According to the latest Dietary Guidelines for Americans (2020 to 2025), published by The U.S. Department of Agriculture (USDA) and the Health and Human Services (HHS), there are four core principles designed to maintain health and prevent chronic diseases throughout the lifespan: (I) following a healthy dietary pattern; (II) choosing the nutrient-rich foods; (III) achieving a balanced diet comprising all kinds of food groups and stay within calorie limits; (IV) restricting alcohol and limit foods and beverages rich in added sugar, saturated fat and sodium (4). Furthermore, unhealthy dietary habits result in increased mortality due to non-communicable diseases (NCDs) both imposing a greater burden in terms of health care demand and cost on the global economy (5). According to the study carried out in Libya, Benghazi (2022); which revealed that the presence of a significant association between prevalence of obesity and unhealthy eating habits among Libyan adults (6).

Primary health care is the first place people go for care, outside of hospitals. It usually involves one-on-one meetings between patients and health professionals. Additionally, the primary health care sector is a key source for dietetic consultations, and this area is growing quickly (7). Moreover, the healthcare workers (HCWs) are accessible to a large proportion of the population, they have a very important role to discuss nutrition-related issues, facilitate dietary behavior changes, and support patients in maintaining these changes over the long term (8). It is essential for all health care professionals to know and use nutrition knowledge and skills in all areas of patient care (9). According to larger cross-sectional study carried out by Wang et al. in Wuhan, China (2023); which included 21599, the study revealed that nutrition health knowledge scores were inversely associated with diabetes/hyperglycemia, hypertension, coronary heart disease, and stroke, as well as the number of chronic diseases in the whole population (10). Another study conducted in Palestine in (2023); the study found that inadequate knowledge was perceived as a barrier to effective nutrition care to the patient (11). additionally, it must necessary to identifying unhealthy behaviors in healthcare organizations and their effects on physical, mental and occupational performance provides crucial data for health policy and decision-makers to implement effective preventive and health promotion measures (12). Since there is no published data regarding the nutritional knowledge of healthcare workers in Libya. Therefore, this study aimed to investigate their nutritional knowledge and eating habits, as well as, the body mass index.

2. METHODOLOGY

2.1. Study Design and Setting

This is a cross-sectional study and the data was collected from four polyclinics randomly selected (Al-Sabri polyclinic, Bu atni Polyclinic, Al-Salawi polyclinic, and Ras Obeida polyclinic).

2.2. Study Period

The data was collected between March 2025 and May 2025.

2.3. Study Participants

A convenience sampling method was used; all healthcare workers available during the data collection period participated, resulting in an estimated sample size of 177 participants

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2.3.1. Inclusion Criteria

The study included all healthcare workers who provided informed consent for the study.

2.3.2. Exclusion Criteria

Employees who were on leave or absent during data collection period, as well as pregnant and lactating women, were excluded from the study.

2.4. Study Tools and Method of Data Collection

self-administered questionnaires were designed based on the previous studies with some of modification relevant to the objectives of the study (13,14,15,16). The questionnaire was divided into of four sections. The first section about socio-demographic characteristics, such as; age, gender, education level, type of occupation and duration of work experience. The second section regarding anthropometric measurements; assess weight and height to all participants, which were used to calculate Body Mass Index (BMI). Body mass index was calculated by weight in kilograms divided by the square of height in meters (kg/m^2). participants were then categorized according to World Health Organization (WHO) criteria for adult and defined as (17):

1. Underweight: If BMI <18.
2. Normal Weight: BMI between 18.5 to 24.9.
3. Overweight: BMI between 25 to 29.9.
4. Obese: If BMI ≥30.

The third section contained 17 questions about nutrition-related knowledge; which addressed topics on a balanced diet, the types and sources of nutrients, and some health benefits of the diet, and finally the fourth section regarding the eating habits.

2.4.1.Measurement of Nutrition Knowledge Scores

All correct answers related to knowledge-questions were allocated a score of +1, while incorrect answers were allocated a score of zero. Respondents' nutritional knowledge was categorized as high if they scored 50% or higher. Conversely, scores below 50% were classifies as poor or low nutritional knowledge.

2.4.2 Measurement of Eating Habits Scores

Respondents' eating habits were assessed according to their answers, participants received one point for each healthy response. Those who scored ≥50% of total answers were correct classified as having healthy eating habits, while those who scored below 50% classified as having unhealthy eating habits.

2.5 Statistical Analysis

Performed by Statistical Package Social Science (SPSS) version 23. Descriptive statistics were performed in the form of frequencies and percentages. Chi-square test (χ^2) were used to assess any differences between categorical variables, and statistically significance was set to 0.05 or less.

2.6 Ethics

Ethical clearance/approval for conducting this study were received from Faculty of Public Health at the Benghazi University. Permission was obtained from the managers of each polyclinic included. Furthermore, verbal consent was obtained from all participants.

3. RESULTS

A total of 177 respondents were interviewed. Majority of participants were female, aged from 30 to 49 years, and with higher education level (59.9% university or more). In terms of occupation; the predominant groups were nurses (29.9%), followed by doctors (18.1%). Approximately three quarters of participants (72.9%) fall into middle income level, and most of them had an experience ten years or more (Table 1).

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Table (1): Socio-demographic characteristics of participants

Variable name	Variable specification	N (%)
Age (years)	20-29	12 (6.8%)
	30-39	85 (48%)
	40-49	56 (31.6%)
	50 or more	24 (13.6%)
Gender	Female	155 (87.6%)
	Male	22 (12.4%)
Education level	Primary	3 (1.7%)
	Secondary	68 (38.4%)
	University or more	106 (59.9%)
Occupation	Nurses	53 (29.9%)
	Doctors	32 (18.1%)
	Pharmacist	21 (11.9%)
	Lab. Technician	26 (14.7%)
	Dentists	18 (10.2%)
	Dietitians	8 (4.5%)
	Others	19 (10.7%)
Income (Monthly)	<1500	37 (20.9%)
	2000-3000	129 (72.9%)
	>3000	11 (6.2%)
Work experience	<5 years	27 (15.3%)
	5-10 years	44 (24.9%)
	>10 years	106 (59.9%)

Table (2): After measuring the height and weight to all participants to classify their BMI according to standard guidelines; the results indicate that the majority of participants have abnormal Body Mass Index values: (42.4% are obese), (38.4% are overweight), and (2.3% are underweight), while only 16.9% have a normal body weight

Table (2): Body Mass Index of participants

Classification of Body Mass Index	N (%)
Underweight	4 (2.3%)
Normal weight	30 (16.9%)
Overweight	68 (38.4%)
Obesity	75 (42.4%)

Tables (3): regarding to the participants' response to nutrition related knowledge questions; the results show few correct responses regarding the recommended daily servings of major food groups (whole grains, fruits and vegetables, and dairy products), in contrast, there is a higher percentage of correct answers related to type and source of nutrients, as well as regarding to health benefits of diets.

In terms of nutritional knowledge score; the study indicates the majority of respondents had a higher nutritional knowledge score (73.4%), while (26.6%) scored lower.

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Table (3): Nutrition-related knowledge of participants

Variable	Correct n (%)	Incorrect n (%)
Recommended daily servings of whole grains	5 (2.8%)	172 (97.2%)
Recommended daily servings of fruits and vegetable	29 (16.4%)	148 (83.6%)
Recommended daily servings of dairy products	47 (26.6%)	130 (73.4%)
Recommended daily salt intake	87 (49.2%)	90 (50.8%)
Beverages that reduce Iron absorption	131 (74%)	46 (26%)
Foods with the highest concentration of vitamin B_{12}	97 (54.8%)	80 (45.2%)
Protein-rich foods	164 (92.7%)	13 (7.3%)
Hydrogenated fats compared to unprocessed vegetable oils contain	76 (42.9%)	101 (57.1%)
Healthy fat is polyunsaturated fatty acids	97 (54.8%)	80 (45.2%)
Nutrients prevents neural tube defect in pregnant women	147 (83.1%)	30 (16.9%)
Skipping meals, a good way to lose weight	105 (59.3%)	72 (40.7%)
Omega 3 is beneficial to prevent thrombosis	82 (46.3%)	95 (53.7%)
Excessive of salt intake lead to high blood pressure	161 (91%)	16 (9%)
Is potassium necessary of regulating and maintaining normal blood pressure?	131 (74%)	46 (26%)
Soft drinks are harmful to health	167 (94.4%)	10 (5.6%)
Fast foods contain unhealthy additives	159 (89.8%)	18 (10.2%)
BMI value <25 indicate obesity	68 (38.4%)	109 (61.6%)
Total nutritional knowledge score: High nutritional knowledge score Low nutritional knowledge score	(73.4%) (26.6%)	

Although more than half of respondents correctly identifies number of main meals, a prevalence some of unhealthy eating habits remain clear. Furthermore, approximately three-quarters of respondents (75.7%) exhibit unhealthy eating habits, while less than half of them 24.3% maintain healthy eating habits, as shown in table (4).

Table (4): Eating habits of participants

Variable	Correct n (%)	Incorrect n (%)
Number of main meals per day	107 (60.5%)	70 (39.5%)
Consumption of fast-foods	37 (20.9%)	140 (79.1%)
Skip of main meals	37 (20.9%)	140 (79.1%)
Frequency of soft drinks consumption	63 (35.6%)	114 (64.4%)
Add sugars to hot drinks	71 (40.1%)	106 (59.9%)
Summary of eating habits: Healthy eating habits Unhealthy eating habits	(24.3%) (75.7%)	

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Table (5): examine the association between nutritional knowledge score and socio-demographic characteristics; there is no significant relationships between nutritional knowledge score and socio-demographic characteristics, because all *p* values are more than 0.05

Regarding to the association between eating habits score and socio-demographic variable, the result demonstrates that the occupation (p=0.036) is significantly linked to eating habits score as shown in table (6).

Table (5): Association between nutrition knowledge level and socio-demographic variables

Socio-demographics variables	Low nutrition knowledge score	High nutrition knowledge score	P value
Age			
20-29	(21.1%)	10 5.6%))	0.698
30-39	23 (13%)	62 (35.0%)	
40-49	17 (9.6%)	39 (22%)	
50 or more	5 (2.8%)	19 (10.7%)	
Gender			
Female	40 (22.6%)	115 (65%)	0.550
Male	(74%)	158.5%))	
Education level			
Primary	0 (0%)	3 (1.7%)	0.255
Secondary	22 (12.4%)	46 (26%)	
University or more	25 (14.1%)	81 (45.8%)	
Occupation			
Nurses	15 (8.5%)	38 (21.5%)	0.407
Doctors	6 (3.4%)	26 (14.7%)	
Pharmacist	6 (3.4%)	15 (8.5%)	
Lab. Technician	11 (6.2%)	15 (8.5%)	
Dentists	3 (1.7%)	15 (8.5%)	
Dietitians	1 (0.6%)	7 (4%)	
Others	5 (2.8%)	14 (7.9%)	
Work experience			
<5 years	4 (2.3%)	23 (13%)	0.320
6-10 years	13 (7.3%)	31 (17.5%)	
>10 years	30 (16.9%)	76 (42.9%)	

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Table (6): Association between eating habits level and socio-demographic variables

Socio-demographics variables	Unhealthy eating habits	Healthy eating habits	P value
Age			
20-29	12 (6.8%)	0 (0%)	0.090
30-39	63 (35.6%)	22 (12.4%)	
40-49	44 (24.9%)	12 (6.8%)	
50 or more	15 (8.5%)	9 (5.1%)	
Gender			
Female	118 (66.7%)	37 (20.9%)	0.728
Male	(169%)	63.4%))	
Education level			
Primary	2 (1.1%)	1 (0.6%)	0.792
Secondary	50 (28.8%)	18 (10.2%)	
University or more	82 (46.3%)	24 (13.6%)	
Occupation			
Nurses	38 (21.5%)	15 (8.5%)	0.036*
Doctors	25 (14.1%)	7 (4%)	
Pharmacists	18 (10.2%)	3 (1.7%)	
Lab. Technician	21 (11.9%)	5 (2.8%)	
Dentists	17 (9.6%)	1 (0.6%)	
Dietitians	3 (1.7%)	5 (2.8%)	
Others	12 (6.8%)	7 (4%)	
Work experience			
<5 years	22 (12.4%)	5 (2.8%)	0.748
6-10 years	33 (18.6%)	11 (6.2%)	
>10 years	79 (44.6%)	27 (15.3%)	

4. DISCUSSION

The present study aimed to explore nutritional knowledge, eating habits. In addition to, determine the BMI among HCWs. The result of the study revealed that the total nutritional knowledge score was relatively high among HCWs (73.4%). This finding was similar to the study conducted in Gulf Cooperation Council (GCC) countries that was published in 2023; which found that good nutrition knowledge score (18), and in line with study carried out in Nigeria by Banwat et al. (2018) (19), and agreed with study in Saudi Arabia in (2021) by Al Shammari et al. (20). Our findings were opposite to the result of Tanzanian study; which reported that 59.4% of HCWs had a low nutritional knowledge score (21). This may be explained by fact that the Tanzanian participants had fewer years of experience when compared to our study.

In terms of the statistical analysis; the present study indicated that there was no significant association between nutritional knowledge score and socio-demographics (all p-values greater than 0.05), with the dietitians had a higher nutritional knowledge score compared with other professionals. Additionally, participants with higher education level exhibited higher nutritional knowledge scores. This finding was different from the study by Munuo et al., that was conducted in 2016; which indicated that a significant association was found between occupation and nutritional knowledge score (21).

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The World Health Organization (WHO) states that one of its recommendations for a healthy diet is to eat a variety of foods daily, including vegetables, fruits, legumes, nuts and whole grains in recommended portion to prevent malnutrition as well as range of non-communicable disease (22). In light of our findings, despite higher nutritional knowledge score, but certain areas showed a significant decline was observed in percentage of correct answers regarding the recommended daily servings of major food groups (2.8% for whole grains, 16.4% for fruit and vegetables, and 26.6% for milk and dairy groups). This could be attributed to the lack of nutrition awareness programs. This result was agreed with a cross-sectional study reported by Abouelezz et al. (2024) in Egypt; where half of participant did not adhere to the recommended amounts for the same main food groups (23), similar result reported by Utter et al. (2023) in Australia; which indicated that only 15% of HCWs meet recommended intake of fruits and vegetables (24).

Regarding the source of nutrient-related knowledge; the current study indicated that the most of participants correctly identified the source of vitamin B_{12}. In addition to this, a significant proportion agreed that potassium plays an important role in regulating blood pressure. The study's findings were similar to the result of multiple studies including; those reported by Al Shammari et al.20)), Naser et al. (25), and Al-Zahrani & Al-Raddadi (26). On the other hand, a study conducted in Croatia by Dumic et al. that was published in 2018; revealed that less than a quarter of participants (14%) correctly identified the most concentrated source of vitamin B_{12} (16). These differences may be due to lower nutritional knowledge scores observed in the Croatian study when compared to our study. Moreover, our findings revealed that the majority of respondents were aware of the protective roles of folic acid against neural tube defects, this finding was in line with other studies, such as by Alzaben et al. in (2023) (18), and by Al-Zahrani & Al-Raddadi in (2006) (26). These agreements between studies may be explained by the fact that the majority of participants in the mentioned studies were female; women generally exhibit greater awareness than men regarding the physiological importance of nutrition during the prenatal period, especially concerning folic acid.

According to BMI standards, the present study revealed that a significant proportion were categorized as overweight or obese as indicated in (table 2), this may be attributed to the fact that majority of them lacked awareness regarding recommended amounts of healthy foods, especially daily serving size of fruits and vegetables. These foods are high in fiber, which contributes to improving body weight. Additionally, more than half of the participants (61.6%) were unaware or exhibit incorrect response regarding the knowledge question about the BMI categories as shown in the results section, this result was consistent with previous studies in Palestine by Younis et al. (27), and in Kenya by Ondicho et al. (28). These similarities between previous studies and our result may be correlated with the fact that participants in the mentioned studies were mostly sampled from public healthcare facilities. These environments often offer limited healthy food choices, leading to unhealthy eating patterns among healthcare workers. While, these figures were inconsistent with findings reported in a study conducted in Turkey by Sari et al. (2023) (29). These differences may be related to variations in eating patterns among the study populations.

Furthermore, the current study found that approximately three-quarters of HCWs adopt unhealthy eating habits (75.7%). This could be due to unavailability or limited access of healthy food options at the workplace, and this further supported by the higher prevalence of overweight and obesity observed among the study population. This result was similar to Pakistani study by Bibi et al. (2024); which showed that only

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25% were exhibit healthy eating behavior (30). In addition to, this result was agreed with study conducted in Poland by Znyk & Kaleta in (2024) (31).

Regarding the statistical analysis; the present study showed that there was a significant association between occupation and eating habits (p=0.036), with dentists were more likely to follow unhealthy eating habits compared to other professionals, this finding was disagreed with other study carried out by Nnadozie et al. (2021) in Southeast Nigeria (32).

Breakfast is often considered a crucial meal, given its potential to stabilize energy balance and influence metabolic functions. Moreover, breakfast consumption patterns could provide economically viable approaches to prevent obesity, diabetes, cardiovascular diseases, and cognitive deterioration (33). Unfortunately, breakfast was the most frequently skipped meal in our survey. This may be related to a lack of breaks due to workload. Similar observations have also been reported in other studies conducted in Ghana (2021) by Nsiah-Asamoah et al. (34), and in South Africa (2017) by Kunene et al. (35).

5. CONCLUSIONS AND RECOMMENDATIONS

The current study revealed that high nutrition related knowledge score among HCWs personnel. Additionally, the knowledge about recommended daily serving sizes of main food groups was quite low. Regarding the eating habits; the findings indicated that a majority of participants demonstrated poorly scored. These poor scores were validated by the high prevalence of overweight and obesity within the study population. Occupation was significantly associated with eating habits, with dentists were more likely exhibit unhealthy eating patterns compared to other professionals. These findings highlight substantially unhealthy eating habits among participants; therefore, there is a need to design interventions aimed at improving eating patterns to promote better nutritional status. In addition to this, there is need further research to explore the gaps and barriers to following healthy eating patterns

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7. LIMITATIONS

Firstly, these findings were difficult to generalized to all general population, because this study was carried out among HCWs, therefore the finding can only be generalized to same group. Secondly, data collection was constrained, because number of major polyclinic including the Garyouns, Al-Fuwayhat, Al-Oroba, and Benghazi Al-Gadedah polyclinics which were undergoing extensive maintenance at the time of study.

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The Predictive Value of Normothermic Cardiopulmonary Bypass Protocol for Early Neurological Complications: A Dual-Center Study in Benghazi.

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ABSTRACT

The early neurological complications (ENCs), including stroke, seizure, hemiparesis, and delirium, represent a major cause of morbidity in patients who undergo cardiac surgeries for congenital heart disease (CHD), as the immaturity of the central nervous system (CNS) in infants and small children increases the risk of brain insult during cardiac surgeries. Intra-operative risk factors of neurological complications include cerebral air embolism, longer duration of cardiopulmonary bypass (CPB) time, degree of hypothermia, and the strategy of brain neuroprotection to control cerebral perfusion to reduce these risks. This study aims to evaluate the incidence of ENCs and compare outcomes of different hypothermic protocols utilized by three surgical teams. Methods: We conducted a retrospective review of 380 patients undergoing cardiac surgery by three surgical teams, utilizing different hypothermic protocols. Data were analyzed to determine the ENC risks, including age, cardiac complexity, bypass time, and intraoperative temperature. The frequency of (ENCs) was 3.4%. Variation was observed between the surgical teams ($p = 0.036$). The normothermic protocol team had the highest rate of ENCs (7.7 %), while the other teams had 2.2 % and 1.9%. The normothermic protocol revealed an increased risk of (ENCs) by 2.4 times compared to other teams, which highlights the importance of neuroprotection of hypothermia control during cardiac surgery in centers with limited continuous neurological monitoring.

KEYWORDS: Early Neurological Complications (ENCs), cardiac surgery, Libya.

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1. INTRODUCTION

One of the most common birth defects is congenital heart disease (CHD), with an incidence of 0.8% to 1.3% in every live birth neonate. With improvement in cardiac surgery services, including intraoperative and intensive care unit (ICU) care, Survival rates of patients with CHD, including those with complex lesions, have significantly improved along with a decline in mortality rates[7]. There is an emphasis on reduced morbidity and enhancement of long-term outcomes; neurological complications of cardiac surgery result in a significant effect on the quality of life of patients [14,15.] (ENCs) occurring in post-cardiac surgeries of patients with CHD included convulsion, stroke, and delirium, which may contribute to a long-term neurodevelopmental deficit; their incidence was between 2 and 50%, as reported in previously published studies [2, 12]. The infants and small children are more susceptible to brain ischemia and neurologic insult during cardiac surgeries [1]. The degree of hypothermia and duration of cardiopulmonary bypass (CPB) time, aortic clamp time, and cerebral air embolism contributed to the intraoperative risk of ENCs, whereas mechanical ventilator and low cardiac output were associated with increased postoperative stroke and delirium [4, 11]. In comparison with an increasing number of multicenter research studies on ENCs in other countries that have advances in their healthcare facilities, perioperative management, surgical practices, and postoperative care, we still have a considerable gap in local data regarding early neurological complications in post- cardiac surgery in patients with CHD.

This study aims to evaluate the incidence of ENCs and compare outcomes of normothermic, moderate, and deep hypothermia protocols as utilized by three surgical teams in two hospitals in Benghazi.

2. METHODOLOGY

A retrospective observational study was conducted at the Benghazi Cardiac Center and Benghazi Medical Center to evaluate the incidence, types of ENCs, and risk factors in 380 patients who underwent cardiac surgery for congenital heart disease between 2020 and 2025. Patients who suffer from Severe preoperative neurological conditions were excluded from this study. Data were collected from patients' medical records. The demographic variables included gender, age, and patients' addresses. Congenital heart diseases are divided into two Groups based on anatomical cardiac defects: Acyanotic and cyanotic CHD. The intraoperative data included the degree of hypothermia during cardiopulmonary bypass time(CPB), cardiopulmonary bypass time (CPBT), aortic cross-clamp time (ACCT), cardiac surgeries, including open and closed cardiac surgeries, ENCs, including convulsion, hemiparesis, and delirium, that occurred before patients' discharge or within 30 days of surgery. Temperature during cardiopulmonary bypass (CPB) was monitored via the nasopharyngeal route and classified into three protocols: normothermic (36.0–37.0°C), moderate hypothermic (32.0–34.0°C), and deep hypothermic (28.0–32.0°C), These temperature ranges were routinely used in the participating centers. The data were analyzed using IBM SPSS Statistics version 27, including the Pearson Chi-square test, the independent samples t-test, and the Mann-Whitney U test. P-value < 0.05, Odds Ratios (ORs), and 95% Confidence Intervals (CIs) were used to determine risk factors for ENCs.

3. ETHICAL CONSIDERATIONS

This study is a retrospective descriptive observation study conducted using anonymized medical data, with official approval from the heads of the departments at Benghazi Medical Center and Benghazi Cardiac Center. Given the non-interventional nature of the study and the absence of direct patient contact, the requirement for informed consent was waived.

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4. RESULTS

(66.6%) of the patients were in the child age group, followed by infants (31.2%), while adolescents and young adults constituted (2.1%). 53.2 % were male, 46.8 % were female. 86.6% of patients are from Benghazi and Eastern Region,48.4% of the patients had intermediate hypothermia during bypass. Table.1

Table 1. Clinical Characteristics and Demographics of patients (N = 380).

Age Group	Frequency (n)	(%)
Age		
Infants	119	31.2%
Children	253	66.6%
Adolescents/Adults	8	2.1%
Sex		
Male	202	53.2 %
Female	178	46.8 %
Address (Region)		
Benghazi & Eastern Region	330	86.6%
Other Regions (South/West)	50	13.1 %
Surgical Team		
Normothermic Team	91	23.6%
Intermediate hypothermic Team	184	48.4%
Deep hypothermic Team	105	27.6%

23.9% of patients had genetic syndromes; 20 % of patients had Down syndrome. For CHD, 69% were Acyanotic; VSD was the most common defect (44.2%), and 31% had cyanotic defects, and TOF was the most common defect (44%).Table.2

Table 2. Clinical and Genetic Profile (N=380)

Patients Clinical profile	Frequency (n)	%
Genetic Syndromes		
Normal (Non-syndromic)	289	76 %
Down Syndrome	76	20 %
Williams Syndrome	7	1.8%
Other Syndromes*	8	2.1%
Classification of CHD		
Acyanotic CHD	262	69%
Cyanotic CHD (CCHD)	118	31%
Acyanotic CHD		
Ventricular Septal Defect (VSD)	116	44.2%
Atrial Septal Defect (ASD)	51	19.2%

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Atrioventricular Canal (AVC) Defects	38	14.5%
Aortic stenosis (AS), Coarctation of Aorta (COA), Patent ductus (PDA)	57	21.8%
Common Cyanotic CHD (CCHD)		
Tetralogy of Fallot (TOF)	51	43.2 %
Single Ventricle Physiology	25	21.2%
Pulmonary Stenosis/Atresia	11	9.3%
Transpostion Great Artery(TGA) & Double outlet right ventricle(DORV)	16	13.5%
Others	15	12.7%

The incidence of (ENCs) complications was 3.4% (n=13). Convulsions were the most prevalent manifestation, occurring in 2.1% of the total operated patients, followed by delirium (0.8%) and hemiparesis (0. 5%).Table.3

Table 3. Early Neurological Complications (ENCs) (N = 380)

ECNs	Frequency (n)	(%)
Complications	13	3.4%
Type of Complication		
Convulsions	8	2.1 %
Delirium	3	0.8 %
Hemiparesis (Stroke)	2	0.5%
No CNS Complications	367	96.6 %
Total	**380**	**100%**

The highest operation performed in 2024 (n=127). No significant association was found between the year of surgery and the occurrence of ENCs (p = 0.587).

Table 4. Year of Operation

Year of Operation	Total, n (%)	ENCs, n (%)	P-value
2021	42 (11.0%)	1 (2.4%)	
2022	78 (20.5%)	4 (5.1%)	
2023	63 (16.6%)	3 (4.8%)	0.0.587
2024	127 (33.4%)	2 (1.6%)	
2025	70 (18.4%)	3 (4.3%)	
Total	380 (100%)	13 (3.4%)	

The normothermic team had the shortest bypass and cross-clamp durations compared to other teams ($p < 0.05$); however, the highest ENC rate occurred in the patient operated by the normothermic team (7.7%, $p = 0.037$). Table 5

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Table 5.Comparison of Operative Parameters and Neurological Outcomes between Surgical Teams:

Team	NT Team (n=91)	IH Team (n=184)	DH Team (n=105)	p-value
ENCs Rate, n (%)	7 (7.7 %)	4 (2.4%)	2 (1.9%)	0.037*
Odds Ratio (OR)	2.4	1.00	--	
95% Confidence Interval (CI)	1.054 – 5.667	--	--	
Operative Parameters				
Bypass Time (min)				
Mean (SD)	2.81 (1.05)	3.31 (1.27)	2.86 (1.25)	0.001*
Mean Rank	171.3	211.7	168.7	
Cross-clamp Time (min)				
Mean (SD)	1.71 (0.60)	2.05 (0.75)	1.89 (0.68)	0.001*
Mean Rank	161.10	207.26	184.96	
Normothermic Bypass, %	100%	23.5%	19.0%	< 0.001*

NT (Normothermic), IH (Intermediate hypothermic), DH (Deep hypothermic). CPB mean (Mean: 1=less than 30min,2=30-60min,3=60-90 min,4= more than 90min.Cross-clamp times mean (1=less 25min,2=more than 25min). IH (Reference Group)

The normothermic team's protocol was the sole independent predictor of ENC (OR: 2.4, 95% CI: 1.054 – 5.667, p = 0.037). while patient age, lesion type, and bypass duration were not associated with increased neurological risk (p > 0.05) -Table 6.

Table 6. Predictors Risk Factors for Neurological Complications:

Predictive variable	Odds Ratio (OR)	95% Confidence Interval	P-value
Patient Age	1.34	0.95 – 1.89	0.086
Bypass Duration	01.02	0.58 – 1.80	0.929
Cross-clamp Time	1.34	0.47 – 3.84	0.575
Congenital Heart Defect	1.51	0.44 – 5.12	0.506

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5. DISCUSSION

We focused on early neurological complications following cardiac surgery for CHD. There was a wide range in age groups from infancy to adulthood, according to the type of CHD and the availability of the surgical teams' mission schedule. Neurological complications included stroke, seizure, hemiparesis, and delirium, as the immaturity of the central nervous system (CNS) in infants and small children increases the risk of brain insult during cardiac surgeries, compared to findings in other studies, where the most affected was the infant age group as reported by Melnychenko. and Yılmaz et al.[14,16]. At the same time, in our setting, there was no association between age and ENCs, indicating that the higher proportion of young patients at high risk did not affect the outcomes in our setting, brain growth is most rapid during the first year of life. Head circumference increases by 12 cm from birth to one year (35 cm to 47 cm), but only 8 cm from two to 18 years (49 cm to 57 cm). Since our study found no association between age and neurological complications, the corrective cardiac surgery for congenital heart disease should be performed as early as possible to protect brain development and prevent complications, including cyanotic spells. The peak of surgeries was in 2024 (33.3%); the year of surgery was not associated with an increased rate of ENCs, suggesting that the higher complication rates observed with some protocols remained consistent over time and were not the result of a particular year of poor performance.

Down syndrome (DS) was observed in 20 % of patients; the result of our analysis suggested the presence of a syndrome was not an independent predictor of early neurological complications (ENCS). This finding is crucial and not aligned with other studies by Starr et al and Bashir et al[1,7] demonstrated associations between DS and ENCs, as it supports the hypothesis that the observed neurological morbidity was primarily due to surgical protocols rather than preexisting genetic susceptibility. According to the types of CHD operated on in this study, 31% of patients had cyanotic CHD, mainly Tetralogy of Fallot (43.2%) and other complex CHD, and this spectrum of CHD needs advanced management during cardiac surgeries and manipulation of cardiopulmonary bypass (CPB). Despite the complexity of this type of CHD, there is no significant difference in ENCs rates between Acyanotic and cyanotic CHD groups ($p = 0.506$). This observation is consistent with the results of Shams-Malkara et al [2], suggesting that when uniform neuroprotection is applied, the anatomical complexities of the defect become secondary compared to the effectiveness of the cooling strategy. The high prevalence of ventricular septal defects (44.2%) and atrial septal defects (19.2%) provided a solid basis for comparing surgical performance. In these relatively routine procedures, the high complication rate recorded by the normothermic protocol becomes even more striking. This suggests that even in low-risk morphological repairs, neglecting cooling exposes the developing brain to unnecessary risks, which is consistent with what Starr et al. [1] and Raj et al[9]. reported regarding long-term neurodevelopmental outcomes in children with heart disease. ENCs rate in this conducted study was 3.4 %, which is consistent with findings reported in previous pediatric cardiac surgery literature. Starr et al.[1] and Hobara et al.[8] reported that seizures were the most common sign of early brain insult in the early recovery phase after cardiac surgery; our finding regarding postoperative seizures is consistent with previous studies. While the most severe focal deficits, such as hemiplegia, were (0.5%), the presence of delirium was observed in (0.8%) of patients, this is consistent with previous studies conducted by Schumann et al.[4] and Wolf et al.[10], who reported that postoperative delirium is an ENC and may affect long-term cognitive outcomes. The low rate of hemiplegia compared to convulsions suggests that many cases may be related to reversible metabol-

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ic disturbances Lin Set et al [6] and Silva et al.[12] suggested that even transient neurological events during the neonatal and childhood periods affect long-term neurodevelopment outcomes, necessitating strict neuroprotective strategies. In this study, our analysis supports that normothermic protocol during cardiac surgery was a predictor for ENCs. The normothermic protocol team had the highest rate of NECs at 7.7 %, compared with the moderate hypothermic team (2.4%) and the deep hypothermic team (1.9 %). Particularly, the normothermic protocol revealed shorter bypass and aortic clamp times in comparison with the corresponding groups. Our observations focus on the significant variation in neurological outcomes between the three different surgical teams, which is described as the "Efficiency-Protection Paradox." The normothermic team showed the shortest median bypass and cross-clamp times, respectively, revealing a high surgical speed; however, this procedural velocity was not transformed into brain protection during surgery. On the contrary, they exhibited the highest rate of ENCs (%, a frequency nearly 2.4 times that of the Deep hypothermic protocol team (p=0.037), our data indicate that for vulnerable pediatric brains, metabolic suppression through cooling is a more decisive determinant of outcome than the speed of surgery. Under normothermia, cerebral metabolic rate for oxygen (CMRO2) remains at its physiological peak, offering no 'buffer' against micro-emboli or extracorporeal circulation-associated systemic inflammatory response syndrome (SIRS)[2,3,8]. This result reinforces what Staar et al.[1] and Shayan et al.[13] have demonstrated, that the 'thermal shield' provided by cooling constitutes a strong neurological defense that effectively eliminates the risks associated with prolonged bypass periods.

Our analyses showed that the normothermia protocol was a strong risk factor for ENCs (odds ratio: 2.4, p=0.037), supporting the assertion by Shams-Molkara et al.[2] that neuroprotection standards should not be compromised for expedited surgery. Furthermore, the high incidence of postoperative seizures in the normothermic protocol group most likely indicates acute cerebral stress that could have been minimized through moderate to deep hypothermia, which raises the threshold for neuronal injury during critical stages of cardiac repair.[10,11]

6. LIMITATIONS

Due to a lack of availability of postoperative neuroimaging (MRI/CT) in some cases and continuous EEG monitoring, diagnosis depended mainly on clinical manifestations of ENCs, which might have resulted in an underestimation of "silent" or subclinical brain injuries in this study.

7. CONCLUSIONS AND RECOMMENDATIONS

The normothermic cardiopulmonary protocol with shorter bypass times was a predictor of increased risk of early neurological complications (ENCs) in the post-cardiac intensive care unit. The optimization of temperature management strategies is strongly recommended, with at least moderate hypothermia required during cardiopulmonary bypass, to provide adequate brain protection during cardiac surgery. This highlights the importance of neuroprotection of hypothermia control in centers with limited continuous neurological monitoring. This study focuses mainly on early neurological complications; future studies are needed to assess the long-term neurodevelopmental effects of these protocols on the brains of operated patients.

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There are no conflicts of interest

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