Nile University

Faculty of Nursing

Knowledge, Attitude and Practice Regarding Dengue Fever Among Third-Year Students at ABU DHAR AL-KODA Secondary School, East Nile Locality, Khartoum State, Sudan, 2026

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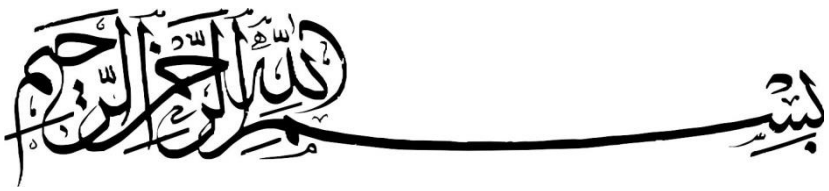
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(وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ)

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Dedication

We dedicate this research to our parents, for their unconditional love, unwavering support and constant encouragement throughout our academic and personal journey.

They have been our role models, instilling in us the values of hard work, perseverance, and dedication. Their guidance and sacrifices have been instrumental inshaping our characters and helping us achieve our goals. Thank you for being the lightthat guides us through the challenges of life.

To our siblings, for being our constant source of motivation and inspiration.

To our backbones and our friends, for their love and support and for always being therefor us, no matter what. We could not have made it this far without you.

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Abstract

Background:

In Sudan, dengue fever remains a relevant public-health concern, while local information regarding awareness and preventive behaviors among school students is limited. In particular, there is a lack of specific evidence concerning secondary school students in East Nile Locality, Khartoum State. Without reliable information about what students know, how they perceive dengue fever and its prevention, and what preventive measures they practice, it is difficult to design targeted school-based health-education and dengue-control interventions. This study aimed to assess knowledge, attitude and practice (KAP) regarding dengue fever among third-year secondary students in Abu Dher Al-Koda Secondary School at East Nile Locality, Khartoum, Sudan, 2026.

Method:

An observational descriptive cross-sectional institutional-based study was conducted. A total of 150 third-year students from Abu Dher Al-Koda Secondary School participated in this study. Data was collected using self-administered questionnaires. The data was entered and analyzed using SPSS version 27. Chi-square test was used for associations.

Results:

Among the 150 students, 75 students (50%) were male and 75 (50%) were female. Almost half of students (46%) were aged 16 years, and 58% were from urban areas and 42% were from rural areas. Regarding overall knowledge about dengue fever, 3.3% had good knowledge, 20.7% had moderate knowledge, and 76% had poor knowledge. While for attitude towards dengue fever, 67.3% demonstrated a positive attitude, and 32.7% had a neutral attitude; no participant was classified as having a negative attitude, and for the practices of students, 90% demonstrated good practice, while 10% had poor practice. Chi-square testing showed a statistically significant association between age and knowledge category (p-value = 0.002), whereas gender (p-value = 0.18), and residence (p-value = 0.15) were not significantly associated with knowledge.

Conclusion:

The study identified significant deficiencies in knowledge about dengue fever amongst third-year secondary school students in East Nile Locality regarding transmission, symptoms, and prevention, even though their attitudes were generally positive and they practiced good preventive behaviors. The results have shown the importance of carrying out health education programs in schools that target accurate knowledge of dengue transmission, identification of symptoms and warning signs, proper treatment, and mosquito control measures. The strengthening of the role of schools, teachers, health professionals, and parents in giving accurate dengue information might play an important role in filling the gap in knowledge.

مستخلص الدراسة

الخلفية:

لا تزال حمى الضنك تشكل مصدر قلق للصحة العامة في السودان، في حين تظل المعلومات المحلية المتعلقة بمستوى الوعي والسلوكيات الوقائية لدى طلاب المدارس محدودة. وعلى وجه الخصوص، هناك نقص في الأدلة المحددة التي تتناول طلاب المدارس الثانوية في محلية "شرق النيل" بولاية الخرطوم. ونظراً لغياب معلومات موثوقة حول ما يعرفه الطلاب، وكيفية إدراكهم لحمى الضنك وطرق الوقاية منها، وطبيعة التدابير الوقائية التي يمارسونها، فمن الصعب تصميم تدخلات موجه ومدرسية للتثقيف الصحي ومكافحة حمى الضنك. وقد هدفت هذه الدراسة إلى تقييم المعارف والاتجاهات والممارسات (KAP) المتعلقة بحمى الضنك لدى طلاب الصف الثالث الثانوي في مدرسة "أبو ذر الكودة" الثانوية بمحلية شرق النيل في الخرطوم، السودان، لعام 2026.

المنهجية:

أُجريت دراسة مؤسسية وصفية رصدية مقطعية، شارك فيها 150 طالباً من طلاب الصف الثالث في مدرسة "أبو ذر الكودة" الثانوية. تم جمع البيانات باستخدام استبيانات ذاتية التعبئة، ثم أُدخلت البيانات وحُللت باستخدام برنامج SPSS (الإصدار 27)، كما استُخدم اختبار "مربع كاي" (Chi-square) لدراسة الارتباطات.

النتائج :

من بين 150 طالباً، كان 75 طالباً (50%) من الذكور و75 (50%) من الإناث. بلغت نسبة الطلاب الذين تبلغ أعمارهم 16 عاماً قرابة النصف (46%)، كما كان 58% منهم من المناطق الحضرية و42% من المناطق الريفية. وفيما يتعلق بالمعرفة العامة حول حمى الضنك، كان لدى 3.3% معرفة جيدة، ولدى 20.7% معرفة متوسطة، بينما كانت معرفة 76% منهم ضعيفة. أما بالنسبة للمواقف تجاه حمى الضنك، فقد أظهر 67.3% موقفاً إيجابياً، وكان لدى 32.7% موقف محايد، ولم يُصنَّف أي مشارك على أنه يتبنى موقفاً سلبياً؛ وفيما يخص ممارسات الطلاب، أظهر 90% ممارسات جيدة، بينما كانت ممارسات 10% ضعيفة. وأظهر اختبار "مربع كاي" (Chi-square) وجود ارتباط ذي دلالة إحصائية بين العمر وفئة المعرفة (قيمة $p = 0.002$)، في حين لم يظهر ارتباط ذو دلالة إحصائية بين المعرفة وكل من الجنس (قيمة $p = 0.18$) ومكان الإقامة (قيمة $p = 0.15$).

الخلاصة:

كشفت الدراسة عن وجود قصور ملحوظ في المعرفة المتعلقة بحمى الضنك بين طلاب الصف الثالث الثانوي في محلية شرق النيل، لا سيما فيما يخص طرق الانتقال والأعراض والوقاية، وذلك على الرغم من اتجاهاتهم الإيجابية عموماً وممارستهم لسلوكيات وقائية سليمة. وقد أظهرت النتائج أهمية تنفيذ برامج للتثقيف الصحي في المدارس تركز على تزويد الطلاب بمعلومات دقيقة حول انتقال المرض، والتعرف على الأعراض والعلامات التحذيرية، وطرق العلاج الصحيحة، وتدابير مكافحة البعوض؛ إذ من شأن تعزيز دور المدارس والمعلمين والكوادر الصحية وأولياء الأمور في تقديم معلومات دقيقة عن حمى الضنك أن يسهم بفعالية في سد هذه الفجوة المعرفية.

Chapter One

Introduction

1.1 Background:

Dengue is a viral disease transmitted by mosquitoes, caused by a virus belonging to the Flavivirus genus within the Flaviviridae family. The virus consists of four serotypes: DENV-1, DENV-2, DENV-3, and DENV-4. It is primarily spread to humans through bites from infected female mosquitoes of the Aedes aegypti and Aedes albopictus species. As the most rapidly increasing mosquito-borne viral infection worldwide, dengue cases have surged 30 times in recent decades, expanding from urban to rural locations. Approximately 50 million infections are reported each year, with around 2.5 billion people living in areas where the disease is endemic. [1, 2, 3]

The majority of people at risk for dengue—more than 70%—live in the WHO South-East Asia and Western Pacific Regions, which together contribute to nearly 75% of the global burden of the disease. In cases of a first infection, the illness is usually mild and results in lifelong immunity to that particular serotype. However, if a person is infected with a different serotype in a subsequent infection, it can lead to more severe symptoms, a situation explained by antibody-dependent enhancement. [4, 5]

Dengue can present with various symptoms, ranging from mild fever to severe complications such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). The illness typically evolves in three phases: the febrile phase, the critical phase, and the recovery (convalescent) phase. The febrile phase is marked by a sudden, high fever that lasts between 2 and 7 days, often accompanied by muscle aches, joint pain, headaches, retro-orbital pain, and a rash. The recovery phase is characterized by the resolution of fever and the onset of symptoms like itching, rash, and increased appetite. [6, 7]

Asymptomatic cases of dengue, which make up about 75% of all infections, play an unclear role in disease transmission. However, studies suggest that asymptomatic

individuals can transmit the virus to mosquitoes at a rate similar to symptomatic cases. These asymptomatic infections account for about 88% of the global spread of dengue. [8]

Laboratory confirmation of dengue infection is typically done through blood tests, either by culturing the virus or detecting specific antibodies or non-structural protein 1 (NS-1) antigen in the serum. Real-time PCR is also used to quantify the viral load. The primary diagnostic tests for dengue include hemagglutination-inhibition (HI), complement fixation (CF), neutralization tests (NT), IgM capture enzyme-linked immunosorbent assay (MAC-ELISA), and indirect IgG ELISA. [9, 10]

Dengue infections affect approximately 390 million people worldwide annually, spanning 129 nations, including those in Africa. DF epidemics have been documented in several sub- Saharan African developing nations, including Sudan. Notably, the first recorded outbreak of DENV occurred in 1986 among individuals in the Red Sea State, eastern Sudan. However, a concerning 44% of localities in 12 states (67%) reported dengue fever cases between July 2022 and April 2023. The total seroprevalence of DENV in Sudan stands at 27%, as indicated by a previous meta-analysis. The peak of illnesses is observed between September and November, aligning with the rainy season. Currently, there have been 4097 suspected cases of dengue fever and 13 related deaths since April 2023, with a significant concentration in Gadarif city, eastern Sudan. [11]

Despite this potential, there have been limited studies on students' knowledge of dengue fever in Sudan. This study specifically focuses on students due to their pivotal role in future health education related to disease prevention and control.

1.2 Problem statement:

Dengue fever is a mosquito-borne viral disease that causes nearly 390 million dengue infections annually, particularly in the tropical and subtropical regions of the world. According to the World Health Organization (WHO), 40 % of the world's population lives in these areas that are classified to be at high risk for Dengue infections. [7, 8, 10, 11]

In Sudan, dengue fever remains a relevant public-health concern, while local information regarding awareness and preventive behaviors among school students is limited. In particular, there is a lack of specific evidence concerning third-year secondary school students in East Nile Locality, Khartoum State. Without reliable information about what students know, how they perceive dengue fever and its prevention, and what preventive measures they practice, it is difficult to design targeted school-based health-education and dengue-control interventions. [12, 13]

1.3 Justification:

Dengue is a viral disease transmitted to humans by the bite of infested females of the main vector Aedes aegypti and to lesser extent Aedes albopictus mosquitoes. School students represent an important population for dengue prevention because they can be directly affected by dengue and can also contribute to health-promotion activities within their households, schools, and communities. However, having basic information about dengue fever does not necessarily mean that students have appropriate attitudes toward prevention or consistently practice recommended preventive measures. Assessing knowledge, attitudes, and practices together is therefore important for identifying gaps that may limit effective dengue prevention. [14, 15]

1.4 Research question:

What is the overall knowledge, attitude, and preventive practices regarding dengue fever among students of Abu Dher Al-Koda Secondary School, East Nile Locality, Khartoum State, Sudan in 2026?

1.5 Research Hypothesis:

- **Null Hypothesis:** Students of Abu Dher Al-Koda Secondary School were anticipated to have low overall knowledge, attitude, and preventive practices levels regarding dengue fever in 2026.
- **Alternative Hypothesis:** Students of Abu Dher Al-Koda Secondary School were anticipated to have high overall knowledge, attitude, and preventive practices levels regarding dengue fever in 2026.

1.6 Objectives:

1.6.1 General objectives:

- To assess knowledge, attitude and practice (KAP) regarding dengue fever among third-year secondary students in East Nile locality, Khartoum, Sudan, 2026.

1.6.2 Specific Objectives:

- To assess the level of knowledge of third-year secondary school students regarding dengue fever, including its transmission, symptoms, complications, treatment, and prevention.
- To assess students' attitudes toward dengue fever and its prevention and control.
- To assess the preventive practices of students related to dengue fever, including measures to reduce mosquito breeding and prevent mosquito bites.
- To determine the overall levels of knowledge, attitude, and practice regarding dengue fever among the study participants.

- To examine the association between students' demographic characteristics and their overall knowledge, attitudes, and practices regarding dengue fever.

Chapter Two

Literature Review

2-1 Background:

Dengue fever is an important health issue in the world that constitutes an important group of viral mosquito-borne diseases, particularly in tropical and sub-tropical areas. This infection is a result of an infection by dengue virus (DENV), which is transmitted to humans by a bite from infected mosquitoes, especially the species Aedes mosquitoes, including the Aedes aegypti. The infection may be asymptomatic or mild in some people but it can also cause complications such as haemorrhage, plasma leakage, shock, organ dysfunction and even death. In the past several decades, the incidence of dengue infections in the world has greatly increased with WHO estimating more than 14.6 million cases in 2024. [8, 11, 16]

The increasing trend in mosquito-borne diseases is caused largely by anthropogenic factors such as climate change factors including high temperature and excess rainfall that affect the bionomics of mosquitoes. However, specific human intervention and modification of behavior can significantly limit the spread of dengue. Health education and awareness campaigns on vector control change attitudes and behavior. [12, 14, 16]

KAP survey is a significant instrument in the evaluation of how people think about dengue disease and conversion of the knowledge into preventive behavior. Knowledge of how the dengue is transmitted, its symptoms, warning signs, treatment and preventive measures will result in positive attitudes toward controlling the disease and therefore the proper preventive behavior. Knowledge alone is insufficient for regular preventive behavior and it is crucial to evaluate the knowledge, attitude and practice altogether. [17]

The school students are an important part of the target population for preventing dengue. The students are exposed to the mosquitoes both at home, at schools, and within the communities. The activities of the students will also impact the environment in which

mosquitoes can breed. Moreover, the students can be a source of information regarding health issues both at home and within the communities. [18]

Dengue fever continues to be a critical health issue in Sudan especially given the recurrent nature of outbreaks and the humanitarian crisis that the country is undergoing. A study carried out among Sudanese medical students found out that while 58% had good knowledge and 74.1% held positive attitudes toward dengue fever, only 46.7% had good preventive practices and there was a significant relationship between knowledge and attitude. [19] Another study among physicians who were operating in Port Sudan revealed relatively high levels of positive attitudes and preventive practices, despite knowledge gaps. [20] This suggests that dengue-related KAP varies significantly depending on the population, level of education and prevailing circumstances.

It is however important to note that there is little information concerning dengue fever related KAP among secondary school students, especially in the East Nile Locality of Khartoum State. For this reason, it is important to review the literature surrounding dengue KAP among students and other populations.

2-2 Previous studies:

1- Suwanbamrung et al. (2021):

A study was conducted in southern Thailand by Suwanbamrung et al. (2021) to assess and compare knowledge, attitudes, and practices (KAP) regarding dengue prevention among primary school children with and without previous dengue infection. A cross-sectional study was carried out among 1,979 children aged 8–13 years from 50 public primary schools in Kanchanadit district. The findings revealed that only 12.3% of participants had good knowledge of dengue, while 41.6% demonstrated good attitudes and 25.9% reported good preventive practices. Teachers (73.6%) and parents (68.5%) were the main sources of dengue-related information. Although no statistically significant differences in mean KAP scores were found between children with and without previous dengue infection, previous infection was significantly associated with good preventive practices (OR = 1.34, 95% CI: 1.03–1.75, p = 0.031). Furthermore, positive correlations were observed between

attitudes and preventive practices in both groups ($p < 0.001$). The authors recommended strengthening school-based dengue health education to improve children's knowledge and preventive practices. [21]

- **Similarities:** Both studies focus on students within an educational school environment and assess their Knowledge, Attitudes, and Practices (KAP) regarding dengue prevention.
- **Differences:** Suwanbamrung et al.'s study targeted primary school children (aged 8–13 years) in Thailand, whereas the current study targets third-year secondary school students in Sudan.

2- Rahman et al. (2022):

A cross-sectional study was conducted in 2022 by Rahman et al. to assess knowledge, attitudes, and practices (KAP) regarding dengue fever among university students in Dhaka City, Bangladesh. The study aimed to evaluate students' understanding of dengue transmission, symptoms, prevention, and control, as well as their attitudes and preventive practices. The findings highlighted the importance of improving dengue-related knowledge and strengthening preventive practices among university students. The study also emphasized the role of awareness and appropriate preventive behaviours in dengue control. [22]

- **Similarities:** Both studies share the objective of evaluating students' KAP regarding dengue transmission, symptoms, and the importance of preventive behaviors.
- **Differences**: Rahman et al. was conducted among university students in an urban setting in Bangladesh, whereas the current study investigates secondary school students in East Nile Locality, Khartoum State, Sudan.

3- Rahman et al. (2023):

A study was conducted in 2023 by Rahman et al. to assess knowledge, attitudes, and practices (KAP) regarding dengue fever among slum dwellers in Dhaka City, Bangladesh. The study focused on participants' understanding of dengue transmission, symptoms, prevention, and control, as well as their attitudes and preventive practices. The findings provide insight into dengue-related awareness and preventive behaviours among residents of densely populated urban communities. The study highlighted the importance of health

education and appropriate preventive measures to improve dengue prevention and control among vulnerable populations. [23]

- **Similarities:** Both studies aim to assess community and group awareness and the significance of preventive measures against dengue fever.
- **Differences:** Rahman et al. focused on slum dwellers in a densely populated urban community, whereas the current study targets a structured institutional sample of secondary school students.

4- Ahmed et al. (2024):

In Sudan, another study was carried out by Ahmed et al. in 2024 to assess the knowledge, attitude, and practice (KAP) of medical students regarding Dengue Fever (DF) during its current outbreak in Sudan. Of 694 medical students, 11% reported a previous infection with DF. Among the participants, 58% demonstrated good knowledge, 74.1% exhibited a positive attitude, and less than half (46.7%) demonstrated good preventive practices. There was a positive correlation between knowledge and attitude levels with the practice level ($p < 0.001$). Gender, age, and previous DF infection emerged as significant predictors ($p < 0.05$) of the overall KAP level in multiple logistic regression. [27]

- **Similarities:** Both studies are conducted in Sudan and evaluate correlations across the knowledge, attitude, and practice domains.
- **Differences:** Ahmed et al. focused on medical students who have advanced health education, whereas the current study assesses general secondary school students without specialized medical training.

5- Bhandari et al. (2024):

Lastly, a study was done by Bhandari et al. in Nepal in 2024 to assess the KAP and their associated factors of dengue among non-health undergraduate students of Nepal to identify gaps and suggest appropriate interventions. Around half of the participants were female (50.3%). The majority of participants were between 22 to 37 years, unmarried, and belonged to the Brahmin/Chhetri ethnic group. This study demonstrated a significant gap in KAP. Only 15.2% of participants had good knowledge while 25.9% and 68.3% of participants exhibited good attitudes and practices respectively. Marital status (AOR = 3.32, CI: 1.32-8.34), third-year educational level (AOR = 3.59, CI:1.34-9.57), and fourth-year educational level (AOR = 4.93, CI:1.88-12.94) were significantly associated with knowledge regarding dengue. Age (AOR = 1.73, CI: 1.10-3.01) was significantly

associated with preventive practice regarding dengue. None of the demographic or socio-economic characteristics of respondents was associated with attitude on dengue. The knowledge-attitude (rka = 0.01), knowledge-practice (rkp = 0.22), and attitude-practice (rap = 0.01) were positively correlated in this study. [28]

- **Similarities:** Both studies assess non-medical student groups and highlight similar gaps where participants maintain good attitudes or practices despite limited deep knowledge.
- **Differences:** Bhandari et al. surveyed non-health undergraduate university students in Nepal, whereas the present study focuses on secondary school students in Khartoum State, Sudan.

6- Usmani et al. (2025):

In Bangladesh, a study was done in 2025 by Usmani et al. on the same topic. Around one-third (30.40%) of the university students had good knowledge of DF, while just over one-third (35.90%) had good practices and nearly three-fourths (72.30%) demonstrated a higher attitude towards DF. Participants who had a dengue-related subject in their curriculum were more likely to have higher knowledge (AOR: 1.7, 95% CI: 1.18-2.45) and a positive attitude (AOR: 1.55, 95% CI: 1.07-2.28) toward dengue fever. Participants who encountered dengue cases within their family members (AOR: 1.68, 95% CI: 1.18-2.4) showed significant preventive practices. However, the likelihood of adopting preventive practices was lower when dengue cases were reported among neighbors (AOR: 0.57, 95% CI: 0.37-0.88). Moreover, robust preventive practices were significantly associated with good knowledge levels (OR: 1.75, 95% CI: 1.25-2.46), while a partially significant relationship was observed between preventive behaviors and a positive attitude among participants (OR: 1.47, 95% CI: 1.00-2.16). [26]

- **Similarities:** Both studies examine student populations and explore how educational factors or personal experiences influence dengue-related KAP.
- **Differences:** Usmani et al. focused on university students in Bangladesh, while the current study focuses on secondary school students in Sudan.

7- Ahmed et al. (2026):

A recent study was carried out in Sudan in 2026 by Ahmed et al. to assess knowledge, attitudes, and practices (KAP) related to dengue fever prevention and control during the

2025 outbreak in Sudan. A total of 459 adult participants from seven outbreak-affected states. Overall awareness of the dengue outbreak was high (96.5%). The majority of participants demonstrated good knowledge (96.5%), positive attitudes (99.8%), and good preventive practices (91.3%). However, substantial misconceptions persisted, particularly regarding transmission: 77.3% of respondents incorrectly believed dengue could be spread through contaminated food or water. Knowledge and practice scores were significantly associated with age, gender, and educational level, with older adults, males, and individuals with lower formal education exhibiting poorer outcomes. Attitudes toward dengue prevention were uniformly positive across all demographic groups ($p > 0.05$). [24]

- **Similarities:** Both studies share the same national context (Sudan) and investigate awareness, preventive practices, and potential knowledge misconceptions regarding dengue fever transmission.
- **Differences:** Ahmed et al. surveyed adult participants across multiple outbreak-affected states, whereas the current study specifically focuses on third-year secondary school students in a single school in East Nile Locality, Khartoum State.

8- Yakasaem et al. (2026):

Another recent study was conducted in Bangkok in 2026 by Yakasaem et al. to From June to August 2024, 937 participants were enrolled, with a mean (SD) age of 11 (1.6) years; 67% were aged 10-12 years, and 33% were aged 13-15 years. The seroprevalence of dengue was 28.1% (95% CI 25.2-31.0), while that of chikungunya was 6.3% (95% CI 4.7-7.9). KAP assessments revealed a high level of awareness regarding symptoms and transmission; however, notable deficiencies in preventive behaviors were identified. Only 14.8% of respondents reported consistent use of mosquito repellent, and 17.5% routinely inspected and removed mosquito larvae from their homes. [25]

- **Similarities:** Both studies target students within school settings and evaluate the relationship between awareness and practical preventive behaviors.
- **Differences:** Yakasaem et al. was conducted in Bangkok, Thailand, and included seroprevalence testing for children, whereas the current study is a questionnaire-based assessment among senior secondary school students in Sudan.

2-3 Summary and Research Gap :

Comparison: Most previous studies (e.g., among medical students, university students, and adults) showed varying levels of knowledge and practices, often influenced by academic background, direct exposure to outbreaks, or age. While some adult populations demonstrated high awareness during outbreaks, school children and non-health students frequently exhibited significant knowledge gaps regarding transmission vectors and symptoms, despite holding positive attitudes.

The Research Gap: Although several studies have been conducted globally and locally in Sudan regarding dengue fever KAP among medical personnel, university students, and adults, there is a **notable scarcity of specific research addressing secondary school students**, particularly within the **East Nile Locality of Khartoum State**.

Value of Current Study: Therefore, the current study bridges this local evidence gap by assessing the knowledge, attitudes, and practices of third-year secondary school students at Abu Dher Al-Koda Secondary School, aiming to establish foundational data for targeted school-based health interventions.

Chapter Three

Methodology

3.1 Study Design:

The study was conducted as an observational descriptive cross-sectional institutional-based study.

3.2 Study Area:

Abu Dher Al-Koda Secondary School for Boys is located in Al-Huda neighborhood, Al-Aylafoun Street, East Nile Locality, Khartoum State, Sudan. To the east, the school faces Al-Aylafoun paved road, beyond which lies the Central Market. To the north are the Saudi Supermarket complex and the former Taxation Building. A street lies to the west of the school, while another street separates the school from a closed building to the south.

3.3 Study Population:

The study population was secondary school students of Abu Dher Al-Koda Secondary School.

3.3.1 Inclusive Criteria;

The study included:

1. Third-year secondary school students enrolled at Abu Zar Al-Koda Secondary School during the 2026 academic year.
2. Students who were present at the school during the data collection period.
3. Students who agreed to participate in the study.

3.4 Period of Study:

August and September 2026.

3.5 Sampling Technique and Sample Size:

3.5.1 Sampling Technique:

The main sampling method chosen for this research was simple random sampling.

3.5.2 Sample size:

The target population comprised 240 third-year secondary school students at Abu Dher Al-Koda Secondary School.

The sample was calculated using the following equation:

n = z2. [p*q]/ d2

Where:

n= sample size

z= confidence level = 95%= 1.96

p= estimate proportion of the study variable = 70%

q= 1-p = 30%

d = margin of error =5%

Therefore, the sample size was found to be 150 students.

3.6 Study Variables:

3.6.1 Dependent variables:

Knowledge, attitude, and preventive practices regarding dengue fever.

3.6.2 Independent variables:

Sociodemographic characteristics (Gender, Age, etc.).

3.7 Data collection tools:

Structured, self-administered KAP questionnaire (Knowledge, Attitude measured by 5-point Likert scale, and Practice) + demographics and source of information.

3.8 Data management and analysis plan:

The collected data which retrieved from the questionnaires was exported into Microsoft Excel and then imported into the Statistical Package for Social Sciences (SPSS) version 27. Descriptive percentage was calculated by (Frequency*100/Sample size) and was presented in tables. Chi square test was used to assess correlations.

3.9 Ethical Consideration:

Permission and approval were sought from the University's committee, as well as the administration of Abu Dher Al-Koda Secondary School. Informed consent was taken from students' parents before data collection. The participants had the right to privacy and confidentiality. Investigation results were classified. The data collection process did not cause any interruption to the participants.

Chapter Four

Results

4.1Results:

Among the 150 students, 75 students (50%) were male and 75 (50%) were female. Almost half of students (46%) were aged 16 years, and 58% were from urban areas and 42% were from rural areas.

Regarding overall knowledge about dengue fever, 3.3% had good knowledge, 20.7% had moderate knowledge, and 76% had poor knowledge. The strongest areas were recognition that dengue is a viral disease and the importance of fluids, rest, and seeking medical care when warning signs occur; substantial gaps were observed in mosquito transmission, symptoms, and prevention-related knowledge. Friends and family (51.3%) were the most frequently reported sources of dengue information, followed by health workers (10%).

Regarding attitude towards dengue fever, 67.3% demonstrated a positive attitude, and 32.7% had a neutral attitude; no participant was classified as having a negative attitude under the specified scoring system. While for the practices of students, 90% demonstrated good practice, while 10% had poor practice.

Chi-square testing showed a statistically significant association between age and knowledge category (p-value = 0.002), whereas gender (p-value = 0.18), and residence (p-value = 0.15) were not significantly associated with knowledge.

However, no statistically significant association was observed between gender, age, or place of residence and overall attitude level or overall practice level ($p > 0.05$). Positive attitudes and good practice predominated across all demographic groups. Knowledge was also not significantly associated with attitude (p-value = 0.3), or practice (p-value = 0.24).

Table (1): Demographic characteristics of students.

Variable	Category	Count	Percentage
Gender	Male	75	50%
	Female	75	50%
Age	15 years	14	9.3%
	16 years	69	46%
	17 years	31	20.7%
	18 years or older	36	24%
Place of residence	Urban	87	58%
	Rural	63	42%
Total		**150**	**100%**

Table (2): Knowledge regarding dengue fever.

Knowledge question	Response	Count	Percentage
Dengue fever is what type of disease?	Virus Bacteria Fungi Don't know	126 13 1 10	84% 8.7% 0.7% 6.7%
How is dengue fever mainly transmitted to humans?	Bite of the Aedes mosquito Contaminated water Contaminated food Don't know	4 14 29 103	2.7% 9.3% 19.3% 68.7%
What is the main mosquito that transmits dengue fever?	Aedes Anopheles Don't know	58 6 86	38.7% 4% 57.3%
Can dengue fever be transmitted from one person to another through handshaking and direct contact?	True False Don't know	2 97 51	1.3% 64.7% 34%
Can a person get dengue fever more than once?	True False Don't know	15 18 117	10% 12% 78%
Does dengue fever become more common in places where stagnant water is available for mosquitoes to breed?	True False Don't know	40 15 95	26.7% 10% 63.3%
Is high fever a common symptom of dengue fever?	True False Don't know	44 94 12	29.3% 62.7% 8%
Can dengue fever cause headache and muscle and joint pain?	True False Don't know	45 49 56	30% 32.7% 37.3%
Can severe pain behind the eyes occur during dengue fever?	True False Don't know	26 39 85	17.3% 26% 56.7%
Can a skin rash appear in some people with dengue fever?	True False Don't know	15 110 25	10% 73.3% 16.7%
Can bleeding occur in severe cases of dengue fever?	True False Don't know	40 89 21	26.7% 59.3% 14%
Can severe and persistent abdominal pain or repeated vomiting be warning signs of dengue fever?	True False Don't know	59 31 60	39.3% 20.7% 40%

Can dengue fever be serious and lead to severe complications?	True False Don't know	31 21 98	20.7% 14% 65.3%
Is there currently no specific antiviral drug for the treatment of dengue fever?	True False Don't know	87 48 15	58% 32% 10%
Does drinking enough fluids help prevent dehydration during dengue fever?	True False Don't know	139 2 9	92.7% 1.3% 6%
Is rest important during dengue fever?	True Don't know	140 10	93.3% 6.7%
Should a person with suspected or confirmed dengue fever seek medical care when warning signs appear?	True Don't know	135 15	90% 10%
Are antibiotics effective for treating dengue fever virus?	True False Don't know	117 17 16	78% 11.3% 10.7%
Should medications be avoided without consulting a doctor or health worker when dengue fever is suspected?	True False Don't know	115 13 22	76.7% 8.7% 14.7%
Does eliminating stagnant water help reduce mosquito breeding?	True False Don't know	39 22 89	26% 14.7% 59.3%
Does covering water tanks and water containers help prevent mosquito breeding?	True False Don't know	32 12 106	21.3% 8% 70.7%
Does maintaining a clean environment and disposing of waste help reduce mosquito breeding sites?	True False Don't know	23 18 109	15.3% 12% 72.7%
Can using mosquito repellent help reduce exposure to mosquito bites?	True False Don't know	25 14 111	16.7% 9.3% 74%
Does wearing clothing that covers the arms and legs help reduce exposure to mosquito bites?	True False Don't know	33 16 101	22% 10.7% 67.3%
Does reducing mosquito breeding sites at home and at school help prevent dengue fever?	True False Don't know	47 18 85	31.3% 12% 56.7%
Total		**150**	**100%**

Table (3): Attitudes towards dengue fever prevention.

Statement	Response	Count	Percentage
I believe that dengue fever is a serious health problem that students should be concerned about.	Strongly agree Agree Neutral Disagree Strongly disagree	53 50 30 10 7	35.3% 33.3% 20% 6.7% 4.7%
I believe that preventing mosquito breeding around homes and schools is an important responsibility of students.	Strongly agree Agree Neutral Disagree Strongly disagree	45 62 26 14 3	30% 41.3% 17.3% 9.3% 2%
I believe that students can play an important role in preventing the spread of dengue fever in their community.	Strongly agree Agree Neutral Disagree Strongly disagree	44 60 28 10 8	29.3% 40% 18.7% 6.7% 5.3%
I believe that people with symptoms suggestive of dengue fever should seek medical care promptly.	Strongly agree Agree Neutral Disagree Strongly disagree	50 56 22 17 5	33.3% 37.3% 14.7% 11.3% 3.3%
I believe that schools should regularly provide students with education about dengue fever prevention.	Strongly agree Agree Neutral Disagree Strongly disagree	49 65 26 7 3	32.7% 43.3% 17.3% 4.7% 2%
Total		**150**	**100%**

Table (4): Dengue fever prevention practices.

Practice question	Response	Count	Percentage
How often do you remove or help remove stagnant water from around your home?	Always	27	18%
	Often	57	38%
	Sometimes	38	25.3%
	Rarely	16	10.7%
	Never	12	8%
How often do you keep water containers covered to prevent mosquitoes from breeding?	Always	33	22%
	Often	51	34%
	Sometimes	39	26%
	Rarely	21	14%
	Never	6	4%
How often do you use mosquito repellent or other mosquito-bite prevention methods?	Always	24	16%
	Often	47	31.3%
	Sometimes	50	33.3%
	Rarely	20	13.3%
	Never	9	6%
How often do you wear clothing that covers your arms and legs to reduce mosquito bites, especially when mosquitoes are common?	Always	41	27.3%
	Often	53	35.3%
	Sometimes	32	21.3%
	Rarely	16	10.7%
	Never	8	5.3%
How often do you participate in cleaning activities at home or school to reduce places where mosquitoes can breed?	Always	33	22%
	Often	56	37.3%
	Sometimes	34	22.7%
	Rarely	15	10%
	Never	12	8%
Total		**150**	**100%**

Table (5): Sources of information and dengue prevention education preferences.

Variable	Category	Count	Percentage
Main source of information	Friends	39	26%
	Family	38	25.3%
	Health workers	15	10%
	School/teachers	11	7.3%
	Internet	2	1.3%
	Social media	8	5.3%
	Television/radio	3	2%
	Other	34	22.7%
Would like more dengue health education	Yes	117	78%
	No	33	22%
Support dengue awareness programs in schools	Yes	123	82%
	No	27	18%
Believe students can contribute to prevention	Yes	130	86.7%
	No	20	13.3%
Total		**150**	**100%**

Table (6): Overall knowledge, attitude and practice regarding dengue fever.

Domain	Category / score range	Count	Percentage
Knowledge	Good (19–25)	5	3.3%
	Moderate (13–18)	31	20.7%
	Poor (0–12)	114	76%
Attitude	Positive (19–25)	101	67.3%
	Neutral (12–18)	49	32.7%
	Negative (5–11)	0	0%
Practice	Good (15–25)	135	90%
	Poor (5–14)	15	10%

Table (7): Association between demographic characteristics and overall knowledge level.

Variable	Category	Good n (%)	Moderate n (%)	Poor n (%)	P-value
Gender	Male	3 (4.0%)	11 (14.7%)	61 (81.3%)	0.18
	Female	2 (2.7%)	20 (26.7%)	53 (70.7%)	
Age	15 years	0 (0.0%)	3 (21.4%)	11 (78.6%)	**0.002***
	16 years	0 (0.0%)	7 (10.1%)	62 (89.9%)	
	17 years	1 (3.2%)	11 (35.5%)	19 (61.3%)	
	18 years or older	4 (11.1%)	10 (27.8%)	22 (61.1%)	
Place of residence	Rural	0 (0.0%)	14 (22.2%)	49 (77.8%)	0.15
	Urban	5 (5.7%)	17 (19.5%)	65 (74.7%)	

Table (8): Association between demographic characteristics and overall attitude level.

Variable	Category	Positive attitude	Neutral attitude	p-value
Gender	Male	50 (66.7%)	25 (33.3%)	1.0
	Female	51 (68.0%)	24 (32.0%)	
Age	15 years	12 (85.7%)	2 (14.3%)	0.465
	16 years	44 (63.8%)	25 (36.2%)	
	17 years	21 (67.7%)	10 (32.3%)	
	18 years or older	24 (66.7%)	12 (33.3%)	
Place of residence	Urban	58 (66.7%)	29 (33.3%)	0.977
	Rural	43 (68.3%)	20 (31.7%)	

Table (9): Association between demographic characteristics and overall practice level.

Variable	Category	Good practice	Poor practice	p-value
Gender	Male	67 (89.3%)	8 (10.7%)	1.0
	Female	68 (90.7%)	7 (9.3%)	
Age	15 years	11 (78.6%)	3 (21.4%)	0.154
	16 years	60 (87.0%)	9 (13.0%)	
	17 years	29 (93.5%)	2 (6.5%)	
	18 years or older	35 (97.2%)	1 (2.8%)	
Place of residence	Urban	82 (94.3%)	5 (5.7%)	0.078
	Rural	53 (84.1%)	10 (15.9%)	

Table (10): Association between overall knowledge level and overall attitude and practice.

Domain	Category	Good knowledge	Moderate knowledge	Poor knowledge	p-value
Attitude	Poor	73 (64.0%)	41 (36.0%)	0 (0.0%)	0.3
	Moderate	24 (77.4%)	7 (22.6%)	0 (0.0%)	
	Good	4 (80.0%)	1 (20.0%)	0 (0.0%)	
Practice	Poor	100 (87.7%)	0 (0.0%)	14 (12.3%)	0.24
	Moderate	30 (96.8%)	0 (0.0%)	1 (3.2%)	
	Good	5 (100.0%)	0 (0.0%)	0 (0.0%)	

Chapter Five

Discussion

5.1 Discussion:

- The present study evaluated knowledge, attitudes, and practices (KAP) relating to dengue fever among 150 third-year secondary school students in East Nile Locality, Khartoum State. The primary findings reveal a distinct imbalance across the KAP domains: an overwhelming majority (76%) demonstrated poor knowledge, whereas 67.3% held positive attitudes, and 90% exhibited good preventive practices. Demographic analysis revealed that age was significantly associated with knowledge ($p = 0.002$), while gender ($p = 0.18$) and residence ($p = 0.15$) were not. Furthermore, no statistically significant associations were identified between demographic variables and overall attitude or practice levels ($p > 0.05$).
- Regarding knowledge, substantial gaps were identified concerning dengue transmission vectors, symptom recognition, and preventive measures. Although 84% recognized dengue as a viral infection, only 2.7% knew it is transmitted via the bite of an *Aedes* mosquito, and only 38.7% correctly named *Aedes* as the primary mosquito species. Knowledge regarding warning signs and specific prevention strategies was similarly lacking. This low knowledge level directly contrasts with the findings of Ahmed et al. (2026), who reported that 96.5% of adult Sudanese participants possessed good knowledge during an outbreak, though 77.3% maintained the misconception that dengue could spread through contaminated food or water. The discrepancy between the two Sudanese studies can be attributed to differences in age, formal education, and direct exposure to outbreak communications among general adult populations versus adolescent students.
- The high proportion of poor knowledge among secondary students in this study (76%) aligns closely with findings from non-medical and younger student populations

internationally. For instance, Suwanbamrung et al. (2021) observed that only 12.3% of primary school children in Thailand had good knowledge regarding dengue prevention. Similarly, Bhandari et al. (2024) reported that only 15.2% of non-health undergraduate students in Nepal demonstrated good knowledge, and Usmani et al. (2025) found that only 30.4% of university students in Bangladesh possessed adequate knowledge. These comparisons emphasize that students who lack health-specific curricula or direct medical training generally exhibit low baseline awareness regarding vector-borne diseases.

- Despite their knowledge deficiencies, 67.3% of the participants exhibited a positive attitude, and 32.7% demonstrated a neutral attitude, with no students classified as having a negative attitude. This overall favorable mindset mirrors the positive attitudes documented across literature, including the 99.8% positive attitude rate among Sudanese adults reported by Ahmed et al. (2026), 74.1% among Sudanese medical students by Ahmed et al. (2024), and 72.3% among Bangladeshi university students by Usmani et al. (2025). It also reflects higher positive attitudes compared to primary children in Thailand (41.6%) studied by Suwanbamrung et al. (2021) and Nepalese non-health undergraduates (25.9%) by Bhandari et al. (2024). In agreement with Bhandari et al. (2024) and Ahmed et al. (2026), demographic variables such as gender, age, and residence showed no significant correlation with student attitudes, indicating a uniformly supportive stance toward dengue control across student demographics.
- In terms of preventive practices, 90% of students demonstrated good practices, such as removing stagnant water, covering water containers, and wearing protective clothing. This high level of reported practice exceeds the 46.7% observed among Sudanese medical students by Ahmed et al. (2024), the 25.9% reported among primary children in

Thailand by Suwanbamrung et al. (2021), the 35.9% among Bangladeshi university students by Usmani et al. (2025), and the 68.3% among Nepalese undergraduates by Bhandari et al. (2024). It is comparable to the 91.3% good practice rate reported among Sudanese adults during outbreaks by Ahmed et al. (2026). However, as highlighted by Yakasaem et al. (2026) in Bangkok, Rahman et al. (2022) among university students in Bangladesh, and Rahman et al. (2023) among slum dwellers, self-reported practices in questionnaire surveys may reflect routine household hygiene or social desirability rather than specific, mosquito-targeted larval control.

- Crucially, this study found no statistically significant association between knowledge levels and preventive practices ($p = 0.24$) or attitudes ($p = 0.3$). While Ahmed et al. (2024) and Usmani et al. (2025) identified significant positive correlations between knowledge and preventive practice scores, the lack of association in the present study aligns with the weak correlations noted by Bhandari et al. (2024). This suggests that among secondary school students in Sudan, preventive actions (such as covering water containers or cleaning surroundings) are largely driven by family habits and household routines rather than individual biomedical understanding of dengue transmission.
- Finally, the study highlighted significant educational demand: 78% of students desired more dengue health education, 82% favored school-based awareness programs, and 86.7% believed students can play an active role in community prevention. Friends and family were the main source of information for 51.3% of students, whereas schools and teachers accounted for only 7.3%. Similar to the recommendations by Suwanbamrung et al. (2021), Rahman et al. (2022), and Usmani et al. (2025), these findings demonstrate an urgent need to incorporate formal dengue education into school curricula, empowering

students with accurate scientific knowledge to complement their existing positive attitudes and preventive behaviors.

Chapter Six

Conclusion and Recommendation

6.1 Conclusion:

The study identified significant deficiencies in knowledge about dengue fever amongst third-year secondary school students in East Nile Locality regarding transmission, symptoms, and prevention, even though their attitudes were generally positive and they practiced good preventive behaviors. The results have shown the importance of carrying out health education programs in schools that target accurate knowledge of dengue transmission, identification of symptoms and warning signs, proper treatment, and mosquito control measures. The strengthening of the role of schools, teachers, health professionals, and parents in giving accurate dengue information might play an important role in filling the gap in knowledge.

6.2 Recommendations:

Based on the findings of this study, it is politely recommended to:

- Strengthening of the schools' curriculum by providing updated educational content related to the common diseases in Sudan, such as dengue fever, covering all aspects of the disease.

- Dissemination of knowledge through social media that were found to be among the main sources of information regarding dengue fever.

- Involving students in community-based interventions such as health education campaigns and vector control campaigns to enhance public awareness about dengue prevention.

- Increasing practical training regarding methods of mosquito control and personal preventive behaviors that can help in bridging the knowledge-practice gap.

- Collaboration between the school and health authorities to conduct educational programs for the prevention of dengue in outbreak seasons.

- Multicentered longitudinal studies in various regions of Sudan, to assess knowledge, attitude, and practices of dengue fever in Sudan.

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Appendices

DENGUE FEVER KAP QUESTIONNAIRE
Nile University
Faculty of Nursing

For 3rd Grade Secondary School Students at Abou Tharr Al-Kouda School – 2026

Dear Student,

This questionnaire aims to assess your Knowledge, Attitudes, and Practices (KAP) regarding Dengue Fever. The collected data will be used strictly for scientific research purposes and handled with complete confidentiality. Please read each question carefully and select the response you believe is correct without consulting external sources. **Note: Select only one answer per question.**

SECTION I: DEMOGRAPHIC INFORMATION

1. Age:
○ 15 years ○ 16 years ○ 17 years
○ 18+ years

2. Gender:
○ Male ○ Female

3. Residence:
○ Urban ○ Rural

4. Have you ever heard of dengue fever?
○ Yes ○ No

5. Have you or any family member been infected with dengue fever?
○ Yes ○ No ○ Don't know

SECTION II: GENERAL KNOWLEDGE ABOUT DENGUE

6. Dengue fever is an illness caused by a:
○ Virus ○ Bacteria ○ Fungus ○ Don't know

7. Dengue virus is mainly transmitted to humans via:
○ Bite of an infected Aedes mosquito
○ Contaminated food ○ Contaminated water ○ Air
○ Don't know

8. The primary mosquito species transmitting dengue fever is:
○ Aedes mosquito ○ Anopheles mosquito ○ Houseflies
○ Don't know

9. Dengue fever can spread from person to person through handshakes and direct contact.
○ True ○ False ○ Don't know

10. A person can get dengue fever more than once in their lifetime.
○ True ○ False ○ Don't know

11. Dengue spread increases in areas with stagnant water where mosquitoes breed.
○ True ○ False ○ Don't know

SECTION III: KNOWLEDGE OF SIGNS & SYMPTOMS

12. High fever is a common symptom of dengue fever.
○ True ○ False ○ Don't know

13. Dengue fever can cause severe headaches, muscle pain, and joint pain.
○ True ○ False ○ Don't know

16. Bleeding may occur in severe cases of dengue fever.
○ True ○ False ○ Don't know

17. Severe abdominal pain and persistent vomiting can be warning signs of severe dengue.
○ True ○ False ○ Don't know

18. Dengue fever can be dangerous and lead to severe complications.
○ True ○ False ○ Don't know

SECTION IV: KNOWLEDGE OF TREATMENT & MANAGEMENT

19. There is currently no specific antiviral cure for dengue virus.
○ True ○ False ○ Don't know

20. Drinking adequate fluids helps prevent dehydration during dengue infection.
○ True ○ False ○ Don't know

21. Adequate rest is important during dengue fever recovery.
○ True ○ False ○ Don't know

22. Patients should seek immediate medical care if warning signs appear.
○ True ○ False ○ Don't know

23. Antibiotics are effective in curing dengue virus infections.
○ True ○ False ○ Don't know

24. Medications should not be taken without consulting a doctor/healthcare worker.
○ True ○ False ○ Don't know

SECTION V: KNOWLEDGE OF DENGUE PREVENTION

28. Using mosquito repellent helps reduce the risk of mosquito bites.
○ True ○ False ○ Don't know

29. Wearing long-sleeved clothes and trousers reduces exposure to mosquito bites.
○ True ○ False ○ Don't know

30. Reducing mosquito breeding spots at home and school aids in dengue prevention.
○ True ○ False ○ Don't know

31. What is your primary source of information regarding dengue fever?
○ School / Teachers ○ Family ○ Healthcare Workers ○ Internet / Social Media ○ TV / Radio ○ Other

SECTION VI: ATTITUDES TOWARDS DENGUE FEVER PREVENTION

#	Attitude Statement	Strongly Agree	Agree	Neutral / Unsure	Disagree
1	I believe that dengue fever is a serious health problem that students should be concerned about.	○	○	○	○
2	I believe that preventing mosquito breeding around homes and schools is an important responsibility of students.	○	○	○	○
3	I believe that students can play an important role in preventing the spread of dengue fever in their community.	○	○	○	○
4	I believe that people with symptoms suggestive of dengue fever should seek medical care promptly.	○	○	○	○
5	I believe that schools should regularly provide students with education about dengue fever prevention.	○	○	○	○

SECTION VII: PREVENTIVE PRACTICES AGAINST DENGUE FEVER

#	Behavior / Practice Statement	Always	Sometimes	Rarely	Never
1	How often do you remove or help remove stagnant water from around your home?	○	○	○	○
2	How often do you keep water containers covered to prevent mosquitoes from breeding?	○	○	○	○
3	How often do you use mosquito repellent or other mosquito-bite prevention methods?	○	○	○	○
4	How often do you wear clothing that covers your arms and legs to reduce mosquito bites, especially when mosquitoes are common?	○	○	○	○
5	How often do you participate in cleaning activities at home or school to reduce places where mosquitoes can breed?	○	○	○	○

SECTION VIII: EDUCATIONAL NEEDS & SUGGESTIONS

32. Would you like to receive more health information and education about dengue fever?

○ Yes ○ No

33. Do you support introducing dengue awareness programs in schools?

○ Yes ○ No

34. What suggestions do you have to improve dengue awareness and prevention at school?

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Knowledge Scoring Key

Knowledge Questions: 6-30 (25 items)

- Correct Answer = 1 point
- Incorrect / Don't Know = 0 points

Total Knowledge Score: 25 points

Knowledge Classification:

- Good Knowledge (≥ 75%): 19–25 pts
- Moderate Knowledge (50%–<75%): 13–18 pts
- Poor Knowledge (<50%): 0–12 pts

Thank you very much for your cooperation!

Map:

Abu Dhar Al-Kuda Secondary School East Nile Locality

