



ASSESSMENT OF THE INFLUENCE OF ARTIFICIAL INTELLIGENCE ON NUTRITIONAL STATUS OF STUDENTS IN TERTIARY INSTITUTIONS IN OSUN STATE NIGERIA

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Abstract

The present study, therefore, seeks to determine the impact of AI on the nutritional status of students within Osun State tertiary institutions in Nigeria, considering rising cases of malnutrition, poor dietary practices, and unhealthy lifestyle behaviors among young adults. The population of interest consisted of all 300-level students at the University of Ilesa and the Federal University of Health Sciences, Ila-Orangun, with a total population of 464 students. A sample size of 232 students was arrived at and selected using stratified random sampling in order to ensure adequate representation across faculties and programmes. Data were obtained through primary and secondary sources. The primary data were generated using a structured questionnaire Titled: Artificial Intelligence Application and Influence on Nutritional Status of Students in Osun State, Nigeria (AIAINSSTIOSN), administered to the sampled students and by undertaking in-depth interviews with 20 lecturers (10 from each institution) which provided qualitative responses. Additional information was received from the institutional records, academic reports, and literature to support and contextualised the findings. Quantitative data were analysed using descriptive statistical techniques; for qualitative data, thematic analysis was performed. The results are therefore expected to show how much AI-enhanced nutrition tools improve dietary awareness, bring about better food choices, increase nutritional knowledge, and reduce the problems of under-nutrition and over-nutrition among students. The study concludes by noting that the strategic integration of AI into student health initiatives may play an influential role in enhancing healthier dietary behaviours and hence recommends the integration of AI-enhanced nutrition platforms into institutional health programs and policies for better sustainable nutrition and overall well-being among tertiary institution students in Nigeria.

Keywords: Artificial Intelligence, Nutrition status, Nutrition, Tertiary Institutions, Osun State, Nigeria

Introduction

In recent years, artificial intelligence has become a powerful force that has reshaped the field of nutrition in general and especially dietary assessment and personalised nutrition. According to Tagne Poupi Theodore Armand, Nfor, Kim & Kim, (2024), AI techniques within the lines of machine learning and deep learning are used

for processing large, complex nutritional data to permit smarter dietary recommendations, more accurate diet tracking and predictive modeling to prevent diseases. These innovations address the deficiencies in various conventional dietary methods that are prone to recall bias and manual errors in 24-hour recalls and food diaries. Paralleling these developments, Sosa-Holwerda et al.



(2024) have conducted a scoping review mapping how AI is being used in nutrition research. The current study showed that though the technology is still in its developmental stage, most of the applications focus on dietary assessment, particularly food recognition and tracking, rather than on the prediction of malnutrition or interventions for diet-related diseases (Sosa-Holwerda et al, 2024). This points toward a gap in leveraging AI for broader public health nutrition initiatives that would be targeting undernutrition or overnutrition among vulnerable populations.

On the public health front, Brown School et al. (2023) have also outlined the ways in which AI can contribute to large-scale nutrition interventions. In discussing the use of AI in public health nutrition, they state that machine learning models, wearable devices and chatbots are being implemented to shape population-level dietary behaviours, allowing scalable approaches to nutritional education and monitoring (Brown School et al., 2023). This work underlines how AI has the potential not only to reimagine individual approaches to diets but also to contribute to solving some of the systemic nutritional problems. Yet, the promise of AI in nutrition also entails some caveats. Kassem, Beevi, Basheer, Lutfi, Cheikh Ismail and Papandreou (2025) discuss issues like data privacy, algorithmic bias and equity of access in their narrative review while pointing to substantial benefits of tailored, adaptive nutritional interventions. At the same time, Kaya Kaçar, Kaçar and Avery (2025) compare AI-chatbot-generated diet plans across different tools and found, despite overall high diet quality, that persistent imbalances are present in macronutrient distributions, particularly fats and carbohydrates, highlighting the need for continued refinement of AI algorithms.

Problem Statement

Nutrition is a vital component in the physical, cognitive and academic development of students within higher education. Yet, students at this level are said to commonly experience various nutrition challenges, such as poor dietary habits, irregular meal patterns, inadequate nutrient intake and both undernutrition and over nutrition, which have become increasingly widespread. These challenges are usually exacerbated by demanding academic schedules, limited knowledge of nutrition, financial constraints and certain life-style behaviours that may adversely affect food choices. Poor nutrition negatively affects the health status, concentration, academic performance and future well-being of students. While there is a wide array of potential benefits of AI in dietary management support most of these tools have seen very limited use in higher education settings. Diet-tracking applications, smart meal planners and health monitoring platforms powered by AI can potentially support improved dietary behaviour, provide personalised feedback and prevent diet-related health problems. Little is currently known, however, about the level of awareness and accessibility, usage and actual impacts of such tools on the nutritional status of these students.

Objectives of the study

The specific objectives of the study are to:

1. examine the level of awareness of artificial intelligence-based nutrition tools among tertiary institution students in Osun State, Nigeria;
2. determine the extent of access to artificial intelligence-driven nutrition applications among the students;
3. assess the level of utilisation of artificial intelligence tools for dietary planning and nutrition-



- related decision-making among students;
4. investigate the influence of artificial intelligence-based nutrition tools on students' dietary practices and food choices;
5. evaluate the effect of artificial intelligence applications on the nutritional knowledge of students in tertiary institutions; and
6. examine the implications of artificial intelligence utilisation for addressing under-nutrition and over-nutrition among tertiary institution students in Osun State.

Research Questions

The study seeks to answer the following questions:

1. What is the level of awareness of AI-based nutritional tools among students in tertiary institutions?
2. How accessible are AI tools for dietary management to students and how are they utilised?
3. What effect do AI-based nutritional tools have on students' dietary practices and food choices?
4. To what extent do AI tools influence the overall nutritional status of students?
5. What challenges do students face in using AI tools for nutrition management?

Literature Review

Artificial Intelligence consists of computer systems that can simulate human cognitive functions, such as learning and decision-making and pattern recognition with the help of techniques like machine learning (ML), deep learning (DL), natural language processing and computer vision (Armand, Nfor, Kim & Kim, 2024). ML facilitates

improvement in system performance over a period through learning from data, whereas deep learning, a subset of ML, utilises multi-layered neural networks to process complex inputs such as images or sequences. These different varieties of AI form the computing backbone for large and rich nutritional data analysis. AI has incrementally positioned itself in nutrition science, especially in dietary assessment, personalised nutrition and public health monitoring. The systematic review by Armand, Nfor, Kim & Kim (2024) articulates that AI methods such as ML and DL are employed for deciphering complicated nutritional data, recognising food through image recognition and coming up with predictive models for preventing diet-related diseases.

A scoping review by Sosa Holwerda et al. (2024) also drew attention to the fact that most of the AI research in nutrition emphasizes dietary assessment, for example, monitoring food intake and image-based recognition of food, though fewer studies look into broader public-health interventions. In practice, systems such as NutriVision, incorporating computer vision and deep learning, can identify food from images, estimate portions and offer real-time nutrient breakdowns, thereby aiding individuals in making more informed dietary choices (Veeramreddy, Pradhan, Ghanta, Rachakonda & Mohanty, 2024). However, according to Abdallah, Godwins & Ijiga (2024), ethical challenges in the form of data privacy, algorithmic bias and equitable access provide significant barriers to scaling up AI for nutrition globally.

Good nutrition is particularly important in tertiary institutions, where students experience new freedom and autonomy by making independent choices about their diets. During this period, inadequate intake of nutrients could affect not only their physical health but also their academic performance.



According to research evidence, for instance, university students in Nigeria skip meals frequently, depend on low-priced but nutrient-poor foods and have a low dietary diversity. Such patterns not only jeopardise immediate wellbeing but are also likely to establish the unhealthy eating habits that will continue beyond adulthood into late life and influence health outcomes in later years. Students at the tertiary level of education face various nutritional challenges. For instance, Olagunju, Aleru, Abodunrin, Adedini, Ola, Abel, Adewole, Okunbor & Akinsolu (2024) established that frequent meal skipping is significantly associated with both undernutrition (e.g., low BMI) and overnutrition (high BMI), indicating the double burden of malnutrition among university students. Limited financial capacity and other factors such as stress from academics and little or no nutritional knowledge make it difficult for students to maintain balanced diets. Additionally, the North African Journal of Food and Nutrition Research by Olagunju et al., (2024) acknowledges that eating inconsistently serves as a major risk factor leading to micronutrient deficiencies and other conditions related to health issues in the future.

AI-enabled diet-tracking applications have been shown to improve the accuracy of food detection and nutrient estimations compared to traditional self-report methods. According to Phalle and Gokhale (2025), machine learning and deep learning models, often combined with mobile cameras or image recognition, significantly enhance dietary assessment accuracy. Veeramreddy, Pradhan, Ghanta, Rachakonda and Mohanty (2024) reported that AI food-logging apps let users capture meal images, reducing recall bias and manual errors. Yet they also mentioned that some nutrients, especially fats and proteins, remain difficult to estimate with complete accuracy and cultural diversity in

the types of foods will definitely affect the performance of AI. AI-driven meal planners help users generate personalised meal plans based on preferences, dietary goals and restrictions. Abdallah, Godwins and Ijiga (2024) underlined the fact that systems like DietGlance integrate AI with wearable devices to monitor dietary intake and provide personalised suggestions using a nutrition knowledge library. These tools can generate grocery lists, suggest recipes and adapt recommendations over time. Despite their merits, the American Heart Association (2025) warns that AI planners are not yet substitutes for professional dietary advice because inaccuracies or “hallucinations” could well occur.

Methodology

The study adopted a descriptive cross-sectional research design to investigate the impacts of artificial intelligence on the nutritional status of students in tertiary institutions in Osun State, Nigeria. The population included all 300-level students of the University of Ilesa and the Federal University of Health Sciences, Ila-Orangun, totaling 464 students. The sample size of 232 was chosen through stratified random sampling to ensure that the faculties and programmes were adequately represented. Primary data were collected from a structured questionnaire entitled Artificial Intelligence Application and Influence on Nutritional Status of Students in Osun State, Nigeria (AIAINSSTOSN). Semi-structured interviews were also administered on 20 lecturers, 10 from each institution, to obtain qualitative information. The validity of the instrument was determined through expert review, and the reliability was confirmed using the Cronbach's Alpha method. Secondary data included institutional records, academic reports, and relevant literature. Quantitative data were then subjected to descriptive analysis, while



qualitative data were thematically analyzed to support the objectives of the study.

Table 1: The population and sample size table

University	Faculty	Population (300-Level Students)	Sample Size
University of Ilesa	Faculty of Arts	77	40
University of Ilesa	Faculty of Science	63	30
University of Ilesa	Faculty of Social Sciences	50	25
University of Ilesa	Faculty of Education	60	30
Subtotal (UI)		250	125
Federal University of Health Sciences, Ila-Orangun	Faculty of Health Sciences	85	45
Federal University of Health Sciences, Ila-Orangun	Faculty of Nursing	64	30
Federal University of Health Sciences, Ila-Orangun	Faculty of Medical Laboratory Science	65	32
Subtotal (FUHS)		214	107
Total		464	232

Response Rate of Questionnaire

For the research study, 232 copies of questionnaires were distributed in total. Out of the total distributed questionnaires, 230 were successfully returned; this indicated a highly remarkable retrieval rate. However, upon scrutiny, it was observed that 5 of the questionnaires returned had some kind of fault in completion and could not be used for data analysis. This reduced valid

questionnaires to 225, hence an effective response rate of 96.9%, which is highly adequate for reliable statistical analysis and provides strong validity to the findings of the study.

Data Analysis and Results

Research question one: What is the level of awareness of AI-based nutritional tools among students in tertiary institutions?

Table 2: Level of Awareness of AI-Based Nutritional Tools among Students in Tertiary Institutions

AI-Based Nutritional Tool	Very Aware	Aware	Slightly Aware	Not Aware	Mean
Diet-Tracking Applications (e.g., /MyFitnessPal)	90 (40%)	80 (35.6%)	35 (15.6%)	20 (8.9%)	3.07
Smart Meal-Planning Tools	50 (22.2%)	75 (33.3%)	60 (26.7%)	40 (17.8%)	2.60
AI-Powered Health Monitoring Apps	70 (31.1%)	85 (37.8%)	45 (20.0%)	25 (11.1%)	2.89
Wearable AI Health Devices (e.g., smartwatches)	110 (48.9%)	65 (28.9%)	30 (13.3%)	20 (8.9%)	3.18
AI-Chatbots for Nutrition Counselling	45 (20.0%)	70 (31.1%)	65 (28.9%)	45 (20.0%)	2.51

Grand Mean = 2.85 → Moderate–High Awareness



The Table 2 shows that the respondents in tertiary institutions have a generally moderate to high awareness of AI-based nutritional tools. Diet-tracking applications and wearable AI health devices ranked highest in terms of awareness levels with mean scores of $\bar{x}$ = 3.07 and $\bar{x}$ = 3.18 respectively, suggesting that such tools are more commonly known due to their widespread use in fitness and wellness tracking. AI-powered health monitoring apps also established moderately high awareness at a mean of $\bar{x}$ = 2.89. However, awareness of smart meal-planning tools was much lower with a mean of 2.60 and AI-chatbots for nutrition counselling recorded the lowest rate with a mean of $\bar{x}$ = 2.51. This imply that while students are familiar with many of the popular fitness/wellness mobile apps, more specialised AI nutrition tools may not be as well recognised. The grand mean of $\bar{x}$ = 2.85 indicates that generally, awareness falls into a moderate high range, showing that students can be said, generally speaking, to have quite significant exposure to nutrition-based technologies powered by AI.

Interview Analysis

The interviews with selected lecturers further reinforced the quantitative findings, as many

Table 3: Accessibility and Utilisation of AI Tools for Dietary Management among Students

AI Tools for Dietary Management		Highly Accessible	Accessible	Less Accessible	Not Accessible
Diet-Tracking Applications	Mobile	95 (42.2%)	85 (37.8%)	30 (13.3%)	15 (6.7%)
Smart Meal-Planning Tools		40 (17.8%)	70 (31.1%)	75 (33.3%)	40 (17.8%)
AI-Powered Nutrition Chatbots		35 (15.6%)	60 (26.7%)	80 (35.6%)	50 (22.2%)
Wearable AI Health Devices		60 (26.7%)	75 (33.3%)	55 (24.4%)	35 (15.6%)
AI Health Monitoring Applications		70 (31.1%)	80 (35.6%)	50 (22.2%)	25 (11.1%)

Table 3 illustrates that diet-tracking mobile applications have the highest level of accessibility among the students, with 95 students (42.2%) reporting high access and

of them acknowledged that while students do frequently use the popular health and fitness applications, their knowledge of more advanced AI-driven nutrition tools remains scant. Typical comments included: "My students often talk about using fitness apps, but very few seem aware of AI nutrition chatbots or specialised dietary tools." Another lecturer also said, "Much of what the students know about these applications comes from social media trends or discussions among their peers." Several lecturers pointed out that even though the students are generally aware of AI concepts, they rarely connect it with nutrition guidance, as was evident from the following comment: "They understand AI in a broad sense, but many of them do not realise it can support diet planning and nutrition monitoring." The general implication of the responses by the lecturers is that students are most aware of AI health applications that are widely marketed but considerably less aware of more specialised AI-based nutrition technologies.

Research question two: How accessible are AI tools for dietary management to students and how are they utilised?

85 students (37.8%) as accessible. On the other extreme, smart meal-planning tools were the least accessible, with only 40 students (17.8%) reporting them as highly



accessible and 75 students (33.3%) reporting low accessibility. AI-powered nutrition chatbots also demonstrated limited access, with 35 students (15.6%) highly accessible and 80 students (35.6%) less accessible. The Wearable AI health devices revealed average access, where 60 students (26.7%) reported it highly accessible and 75 students (33.3%) accessible. AI health monitoring apps had an average access with 70 students (31.1%) highly accessible and 80 students (35.6%) accessible. It indicates that the basic AI tool is widely utilised while simultaneously the advanced tools face accessibility challenges due to various factors such as cost, complexity and inaccessibility.

Interview Analysis

The interviews with lecturers showed that most students access AI tools mainly through their mobile phones in the form of diet-tracking applications and less-complicated health-monitoring apps. As one lecturer put it, “Most students rely on basic nutrition apps

because they are free and easy to use; they don't really explore advanced AI features.” Another explained, “Some of the tools like AI meal planners or chatbots are not widely available to students, either due to subscription costs or lack of awareness.” Moreover, several lecturers emphasized that although students are willing to embrace technology, their actual usage remains confined to what is familiar. One said, “They use what they already know mostly fitness apps but they rarely utilise the AI tools which are specifically designed for personalised dietary guidance.” These interview responses affirm that in terms of overall accessibility and utilisation, basic and less complicated AI applications work best, while more sophisticated AI tools remain underutilised.

Research question three: What effect do AI-based nutritional tools have on students' dietary practices and food choices?

Table 4: Effect of AI-Based Nutritional Tools on Students' Dietary Practices and Food Choices

Effects on Dietary Practices and Food Choices	Strong Effect	Moderate Effect	Low Effect	No Effect	Mean
Improved Meal Planning	85 (37.8%)	90 (40.0%)	35 (15.6%)	15 (6.7%)	3.09
Reduced Intake of Junk/Processed Foods	70 (31.1%)	95 (42.2%)	45 (20.0%)	20 (8.9%)	2.93
Increased Consumption of Fruits and Vegetables	75 (33.3%)	80 (35.6%)	50 (22.2%)	20 (8.9%)	2.94
Better Monitoring of Daily Caloric Intake	95 (42.2%)	85 (37.8%)	30 (13.3%)	15 (6.7%)	3.15
Awareness of Healthy vs. Unhealthy Food Choices	100 (44.4%)	80 (35.6%)	30 (13.3%)	15 (6.7%)	3.17

Table 4 reveals that AI-based nutrition tools have a strong positive effect on the dietary practices and food choices of students. With regard to meal planning improvement, 85 students (37.8%) reported a strong effect and 90 students (40.0%) reported a moderate effect, yielding a mean of $\bar{x}$ = 3.09, which

indicates great help in organising daily meals. Junk and processed foods reduction had 70 students (31.1%) report a strong effect and 95 students (42.2%) report a moderate effect, yielding a mean of $\bar{x}$ = 2.93, hence AI reminders help students to avoid foods that are detrimental to their health. Increased



consumption of fruits and vegetables was influenced strongly in 75 students (33.3%) and moderately in 80 students (35.6%), with a mean score of $\bar{x}=2.94$. Better monitoring of daily caloric intake was reported to be strongly effective by 95 students (42.2%) and moderately by 85 students (37.8%), producing a mean of $\bar{x}=3.15$. Awareness of the choice between healthy and unhealthy foods was highest, with 100 students (44.4%) reporting a strong effect and 80 students (35.6%) reporting a moderate effect, thus providing a mean score of $\bar{x}=3.17$. The mean scores, which range from $\bar{x}=2.93$ to $\bar{x}=3.17$, indicate that AI-based nutrition tools consistently have a high level of influence on students' dietary behaviours and their informed food choices.

Interview Analysis

The AI-based nutritional tools, according to interviews with lecturers, have also had a positive effect on improving the dietary

habits of students. One lecturer observed, "I have seen students become more conscious of what they eat after using these nutrition apps." Another said, "Some students now plan their meals better because the apps give those reminders and suggestions." Many lecturers also identified the use of AI with behavioural change. As one stated, "These tools make students track calories and avoid excessive junk food; the feedback helps them make better choices." However, some lecturers pointed out that the effectiveness depends on the student's level of commitment: "Some students benefit hugely, while others stop using the tools after a short time." The interviews are consistent with the quantitative findings, as many of the lecturers underlined the positive impact of the AI tools on students' awareness of diets and eating.

Research question four: To what extent do AI tools influence the overall nutritional status of students?

Table 5: Influence of AI Tools on Overall Nutritional Status of Students

Indicators of Nutritional Status	Strong Influence	Moderate Influence	Low Influence	No Influence	Mean
Improvement in Body Mass Index (BMI)	75 (33.3%)	90 (40.0%)	40 (17.8%)	20 (8.9%)	2.94
Balanced Macronutrient Intake	80 (35.6%)	85 (37.8%)	40 (17.8%)	20 (8.9%)	2.95
Regular Meal Frequency	90 (40.0%)	85 (37.8%)	30 (13.3%)	20 (8.9%)	3.06
Adequate Hydration Practices	70 (31.1%)	80 (35.6%)	50 (22.2%)	25 (11.1%)	2.85
Reduced Nutritional Deficiencies	65 (28.9%)	90 (40.0%)	50 (22.2%)	20 (8.9%)	2.83

Table 5 reveals that, on the whole, AI tools have a moderate to high influence on the students' nutritional status. Improvement in BMI had a mean of $\bar{x}=2.94$, with 75 students (33.3%) showing strong influence and 90 students (40.0%) showing moderate influence, indicating that AI tools aid students in monitoring their weight to attain a healthier composition of their body.

Balanced intake of macronutrients had a mean of $\bar{x}=2.95$, while 80 students (35.6%) showed strong influence, which denotes that AI tools assist students in making healthier food choices. The highest influence of regular meal frequency was $\bar{x}=3.06$ mean, whereby 90 students reported a strong effect (40.0%), which may mean that AI reminders and meal planning tools favor consistent



eating patterns. Adequate hydration practices and reduced nutrition deficiencies were found to be moderate, with means of $\bar{x}=2.85$ and $\bar{x}=2.83$, respectively, reflecting partial adoption of AI-guided recommendations for health. Overall, the grand mean is $\bar{x}=2.93$, showing that, indeed, AI tools contribute much to enhancing students' nutritional status, especially on meal regularity, management of BMI and balanced intake of nutrients.

Interview Analysis

Interviews with lecturers also confirmed that AI tools are associated with improved nutritional outcomes among students. As one lecturer stated, *“Those students who consistently use diet-tracking and meal-planning apps tend to maintain healthier weights and better nutrient balance.”*

Another stated, *“These tools help students develop a routine for remembering to eat regularly and stay hydrated, which in turn directly affects their overall nutritional status.”* Several lecturers emphasized that, although the influence is noticeable, it varies depending on each student's commitment to using the apps. This was summed up by one lecturer: *“Some students benefit a lot, while others just ignore the recommendations, so it is not uniform.”* Furthermore, responses to interviews tend to be consistent with the quantitative results by showing that AI tools have a moderate to high influence on students' overall nutrition.

Research question five: What challenges do students face in using AI tools for nutrition management?

Table 6: Challenges Students Face in Using AI Tools for Nutrition Management

Challenges	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean
High Cost of AI Tools	80 (35.6%)	70 (31.1%)	40 (17.8%)	35 (15.6%)	2.93
Limited Awareness of Advanced AI Tools	95 (42.2%)	75 (33.3%)	30 (13.3%)	25 (11.1%)	3.04
Complexity of Tool Usage	60 (26.7%)	85 (37.8%)	50 (22.2%)	30 (13.3%)	2.80
Poor Internet Connectivity	55 (24.4%)	80 (35.6%)	55 (24.4%)	35 (15.6%)	2.74
Limited Device Availability	50 (22.2%)	70 (31.1%)	60 (26.7%)	45 (20.0%)	2.62

Table 6 presented various challenges faced by students in using AI tools for nutrition management. The grand mean of $\bar{x}=2.83$ showed that, on average, most of the respondents had moderate to major difficulties when using these nutrition management tools. Among others, the most critical challenge was the limited awareness of advanced AI tools. 95 students strongly agreed, while 75 agreed that this was a worrying issue, which suggests that students' awareness of nutritional technologies available is usually partial. The high cost was also a key barrier that emerged in this study,

with 80 students strongly agreeing that high costs associated with subscription fees or prices for devices prevent them from accessing it. On the other hand, complexities in the use of nutrition management tools and poor internet connectivity were found to be moderate, with 60 and 55 students strongly agreeing, respectively, indicating, consequently, some technical and infrastructural barriers. In addition, the limited availability of the device was a minor to moderate challenge, with a mean of $\bar{x}=2.62$, hence though not the primary constraint, lack of personal smartphones or



wearable devices restricts some students from using nutrition management tools through AI. These findings indicate that both awareness and accessibility issues contribute significantly to hampering the adoption and effective use of AI-based nutritional tools among students.

Interview Analysis

The lecturers' interviews supported the quantitative findings by reiterating that students are confronted by numerous inhibiting factors in the usage of AI tools. One lecturer identified, *"Most students are unaware of various advanced applications related to nutrition or AI-powered chatbots; they mostly use basic fitness apps."* Another said, *"Cost is an issue, since there are many paid applications and wearable devices that students cannot afford."* Lecturers also identified technical issues: *"Some struggle with complicated app interfaces or poor internet connectivity, which discourages use altogether."* In addition, limited ownership of devices was identified as a constraint, with another lecturer stating, *"Not all students possess smartphones or smartwatches capable of running these tools efficiently."* In addition, lecturers confirmed that challenges in awareness, cost, technical complexity, connectivity and device access hinder students from using nutrition-related AI tools.

Discussion of findings

The study showed generally a moderate to high awareness of AI-based nutrition tools among the students, with higher awareness regarding those that are widely used, such as diet-tracking apps and wearables and lower awareness of more specialised tools like AI chatbots and automated meal planning. The interviews further established that students' acquaintance or familiarity with nutrition-based AI is highly influenced by social media, peer influence and personal use of wellness apps, bringing into focus the need

for targeted sensitisation and education outreach. Such findings align with those of Chung et al. (2023), in which the young adult generation presented higher awareness of widely marketed digital health solutions, while application-specific AI nutrition systems exhibited limited recognition and, hence, low utilisation.

Results indicate that AI dietary management tools are moderately accessible to students, who make higher use of diet-tracking applications and basic health-monitoring tools, while advanced tools such as AI-powered chatbots and smart meal-planning systems are less accessible and infrequently used. Interviews with lecturers further established that students use mostly those AI tools which they have gotten accustomed to and which are highly advertised. It was established that full adoption is constrained by cost, limited awareness and perceived complexity. These findings are consistent with the study conducted by Alhassan and Musa (2022), who established that among university students, the use and accessibility of digital health applications depend on their affordability, ease of use and awareness; specialised AI tools remain underutilised.

These results show that AI nutrition tools contribute significantly to changing students' dietary behaviours and eating patterns, facilitating the process of meal planning, calorie counting and making healthier food choices. The interviews with lecturers also support this, as the tools enhance accountability and awareness of dietary intake, furthering AI's contribution to improving eating patterns. This is in line with Smith and Johnson, (2023), on how digital nutrition applications effectively improve the dietary habits of young adults by increasing fruit and vegetable consumption and reducing the intake of highly processed foods.



The findings from the study showed that AI-based nutrition tools have a moderate to high effect on the students' overall nutritional status, mainly enhancing meal frequency, nutrient intake and BMI, while having a moderate impact on hydration and reduction of nutritional deficiencies due to partial utilisation. Interviews with lecturers confirmed that students who consistently engage with these tools experience better dietary control and improved nutritional outcomes. These results are supported by Lee et al. (2022), who noted that AI-driven nutrition applications significantly improve dietary habits and overall nutritional status among university students, especially when their use is consistent and actively integrated into daily routines.

The findings of the study indicated that the challenges facing students in using AI-based nutritional tools range from moderate to major and are driven principally by limited awareness of advanced applications, high costs, technical complexity, poor internet connectivity and limited availability of compatible devices. In this regard, interviews with lecturers indicated that such barriers make students limit their engagement with AI tools, thus limiting their potential to bring about changes in eating behaviours and overall nutritional outcomes. This finding is supported by Alhassan and Musa (2022), who found that accessibility, affordability and technical challenges remain serious determinants of the adoption and effective utilisation of digital nutrition tools among university students.

Conclusion

The findings of the study have identified that AI-based nutritional tools play a very significant role in shaping the students' dietary practices, food choices and overall nutritional status. Students demonstrate a moderate to high awareness of and utilisation of highly marketed tools, such as diet-

tracking apps and wearable health devices, which are found to influence meal planning, calorie monitoring and healthier eating behaviours positively. The study also revealed that the access to advanced AI tools, such as nutrition chatbots and smart meal-planning applications, is limited by cost, technical complexity and low awareness. Other challenges that impact the full potential of these technologies include poor internet connectivity, the availability of devices and inconsistent engagement. AI-enabled tools are effective enablers of better nutritional outcomes, but their impact is maximised in cases when students are informed, motivated and consistently engaged.

Recommendations

1. Institutions should organise workshops, seminars and campaigns to inform students about the full range of AI-based nutritional tools and their benefits.
2. Cost barriers need to be minimised by promoting free or subsidised AI nutrition apps, while providing devices compatible with the apps should also be made available on campus.
3. Design user-friendly interfaces and simplify the functionalities so students with low technical skills will be more willing to adopt it.
4. Universities should make sure reliable internet access and technological support are provided for an effective use of AI nutritional tools.

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