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Perception of Artificial Intelligence in Nutrition among Students

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ABSTRACT

As the world is becoming more and more fitness-conscious, there is an increasing scope for disruptive technological solutions such as Artificial intelligence (AI) to provide various health-based solutions. The present study was aimed to measure the knowledge, attitude and practice towards AI among the students of food and nutrition field. A questionnaire with knowledge attitude and practice based questions was framed in google form and the link was shared to the students undergoing postgraduation in nutrition at Coimbatore through online platform. Around 121 students submitted the forms completely and incomplete forms were exclude from the study. Among the nutrition postgraduate student participants only 79% were familiar with AI and they came across some applications of AI. It was noteworthy that 61% recognized machine learning and deep learning. Nearly 82% recorded that AI could be useful and 83% reported that it will leads to major advance in nutrition field. However 51% were worried that AI in nutrition will replace them at their job in future. Almost 84% were not run-through any application of AI and 90% informed that currently they were not in practice of any AI application in their field. Among the total participants 82% were not in practice of internet of Things (IoT). Only 10% of the participants reported that they came across with applications like Healthify me, Fitgenie, My fitness pal, diet cal, NTutive, and nano pack. It was also found that the knowledge of postgraduate student participants was significantly higher than attitude and practice ($P < 0.05$). The effect and practice of the AI application was still in the early stage, inspite of high interest shown by the students to invite AI further to improve the health outcomes. Currently there remain gaps to address and potentialize this emerging field of food and nutrition. Further research is needed to identify areas where AI deliver added value compared with traditional approaches.

Keywords: Artificial intelligence, Internet of Things, Machine learning, Nutrition

1. Introduction

John McCarthy (1927-2011) an American scientist, Computer science department in 1955 discovered the term “Artificial Intelligence” in the research project proposal, which was carried out the following year at Dartmouth College in Hanover, New Hampshire [McCarthy J., et al, (2020) and Nilsson, N.J, (2010)]. Artificial intelligence (AI) as a branch of computer science, the purpose of which is to imitate thought processes, learning abilities and knowledge management, finds more and more applications in experimental and clinical medicine. In recent decades, there has been an expansion of AI applications in medicine and biomedical sciences [Jarosław Sak., et al, (2021)]. Artificial Intelligence has a possibilities in medical field to diagnose risk prediction and support of therapeutic techniques. The use of AI in ophthalmological [Ting, D.S.W., et al, (2018)], radiological [Yasaka, K.,et al, (2018)] and cardiac [Johnson, K.W., et al, (2018)] diagnostics, measurable clinical benefits have been obtained. AI was used in research on new pharmaceuticals [Hessler, G., et al, (2018)]. The development of AI also provides new opportunities for research on nutrients and medical sensing technology [Heydarian, H., et al, (2019)].

Artificial neural networks (ANNs) are a set of technologies often encompassed with artificial intelligence that attempt to simulate the function of the human brain. From the past two years ANNs have been applied in every aspects of food science and although most of the applications are in development stage. For food safety and quality analyses, ANNs will be a useful tool for modeling of microbial growth and from this predicting food safety, interpreting spectroscopic data, and predicting physical, chemical, functional and sensory properties of various food products during processing and distribution. ANNs hold a great deal of promise for modeling complex tasks in process control and simulation and in applications of machine perception including machine vision and electronic nose for food safety and quality control [Yiqun huang., et al, (2007)].

Machine Learning (ML) is an AI area related to algorithms that improve automatically through experience. ML algorithms have the potential to create mathematical models for decision making. The process of creating these models is based on large sets of training data, without programming. The popularization of the use of ML algorithms took place in the last decade of the 20th century in search engine applications. In the following decades, there were high hopes for significant discoveries in the field of organic synthesis with the use of increasingly advanced ML algorithms [Szymkuć, S., et al, (2016)]. Despite the fact that these hopes have not been fully met, this area of AI has important applications both in biomedical sciences and in clinical medicine. Machine learning—both supervised and unsupervised—can be applied to clinical datasets to develop risk models [Deo, R.C, (2015)]. It can significantly support the analysis of data obtained from the patient [Rajkomar, A., et al, (2019)]. There are suggestions that ML is the future of computer-assisted diagnostics, biomedical research and personalized medicine [Handelman, G.S., et al, (2018)]. Machine learning techniques are becoming more and more popular in diabetes research: in blood glucose prediction and in the development of the so-called artificial pancreas (a closed-loop system) [Woldaregay, A.Z., et al, (2019)]. The use of ML algorithms in research on the gut microbiota is postulated, especially because of the large datasets

collected in these studies [Danneskiold-Samsøe, N.B., et al, (2019)]. In a recent report, Liu et al. proved that an ML algorithm integrating baseline microbial signatures of the intestinal microbiota can accurately predict the patient's glycemic response to physical effort [Liu, Y., et al, (2020)]. Deep learning (DL) is a subtype of ML. It is an AI domain that has found its applications especially in the techniques of image and voice recognition and foreign language translation. DL also has an important use in medical diagnostics. The significant advantage of DL over supervised ML is expressed in the autonomy of the program in the area of building sets of features used in recognition.

Davies et al., (2021) in their study they developed a machine learning approach for automated and systematic prediction of fiber content using nutrient information commonly available on packaged products. An Australian packaged food dataset with known fiber content information was divided into training (n = 8986) and test datasets (n = 2455). Utilization of a k-nearest neighbors machine learning algorithm explained a greater proportion of variance in fiber content than an existing manual fiber prediction approach (R 2 = 0.84 vs. R 2 = 0.68). It was concluded that the opportunity to use machine learning to efficiently predict the fiber content of packaged products on a large scale.

Internet of Things (IoT) The term IoT was first used by British entrepreneur and startup founder Kevin Ashton in 1999, in the sense of a network of connected objects. This is the concept that objects (devices) can directly or indirectly collect, process or exchange data via a computer network or intelligent electrical installation. The term Internet of Everything (IoE) is used to describe a network of people, processes, data and things connected to the Internet. In clinical medicine, IoT has a significant application in relation to telemedicine procedures [Li, J.-P.O., et al, (2020) and Sadoughi, F., et al, (2020)], which are becoming more and more widely used, especially during the COVID-19 pandemic. Important applications of IoT can also be seen in the provision of detailed information on food products available on the market [Jæger, B., et al, (2020)]. Kumar and Premagowri, (2022) reports that smartphone apps may be an innovative medium for delivering individual health behaviour change intervention en masse, for treating certain medical condition of patients, delivering important health information and giving education to the general population. It was already proved that smart phone apps are popular with nutrition student population as they develop various apps for their work progress but there is a need to assess their perception towards artificial intelligence. Hence the present study was conducted to measure the knowledge, attitude and practices towards AI in nutrition among the students of relevant field. The present study was conducted to measure the knowledge, attitude and practices towards AI in nutrition among the students of relevant field.

2. Materials and Methods

This short research was conducted by formulating a questionnaire based on Knowledge Attitude Practice (KAP) towards Artificial Intelligence in nutrition. A survey is a quantitative method that provides access to quantitative and qualitative information. In our study a questionnaire with 10 questions were framed to assess the approach towards AI in nutrition. The questionnaire comprises of three knowledge based, four attitude based and three practice based questions. The questionnaire was framed in google form and the link was shared to the students undergoing postgraduation in nutrition at Coimbatore through online platform. Around 121 students submitted the forms completely and incomplete forms were exclude from the study. The association between knowledge, attitude and practice were also examined and the results were analysed using PSPP 1.6.2 statistical tool.

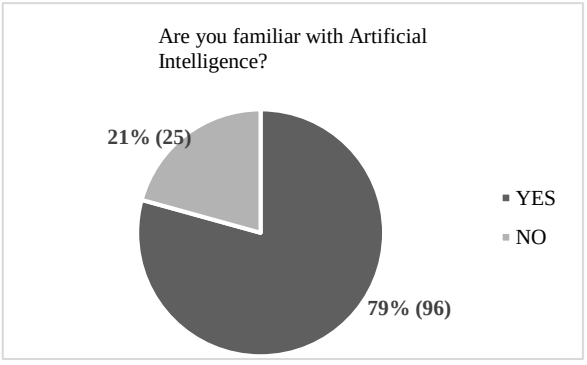
3. Results and Discussion

3.1Background

Around 121 postgraduate participants related to nutrition field were completed the AI survey. Among them 90% (n=109) participants were female and 10% (n=12) were male. The course in Food and Nutrition provides all the learning and skills required to research, process and preserve components of nutrition.

3.2 Knowledge on AI in nutrition among selected students

In the field of clinical nutrients research, AI techniques have been used in projects intended at creating tools supporting dietary activities and in supplementation, as well as in the diagnosis and prediction of the risk of chronic diseases. In the present study the knowledge about AI in nutrition among the selected students were discussed below.



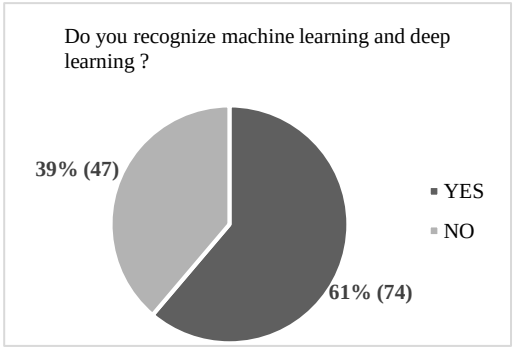


Fig. 1- Knowledge on AI in nutrition among selected students

Table. 1- Knowledge on nutrition AI apps among the selected students

Knowledge on nutrition AI apps	**No.of participants (n=79)**
Diet Cal	15 ± 2.02
Nutri Cal	32 ± 4.12
Healthify Me	53 ± 3.61
Fitgene	44 ± 1.45
My Fitness pal	36 ± 2.16
Nano packaging	64 ± 3.41

The above figure-1 depicts that among the nutrition postgraduate student participants only 79% (96) participants were familiar with Artificial intelligence (AI) and they came across some application of AI such as Diet cal (15 ± 2.02), Nutri Cal (32 ± 4.12), Healthify Me (53 ± 3.61), Fitgene (44 ± 1.45), My Fitness pal (36 ± 2.16), Nano packaging (64 ± 3.41) which was discussed in table-1. It was noteworthy that 61% (74) of total participants can recognize machine learning and deep learning. It was unpleasant that 21% (25) participants were not familiar with AI and 39% (47) of the respondents were unable to recognize machine learning and deep learning.

3.3 Attitude towards AI in Nutrition among student participants

Students are aware of the potential applications and implications of AI in food and nutrition and it will be encouraged in future among the people. When we investigate the attitude of the participants towards AI in nutrition, the majority of the participants 82% recorded that AI could be useful and 83% reported that it will leads to major advance in nutrition field. However the most of the participants (51%) were worried that AI in nutrition will replace them at their job in future and 78% of them reported that they will encourage AI in future as mentioned in below figure.

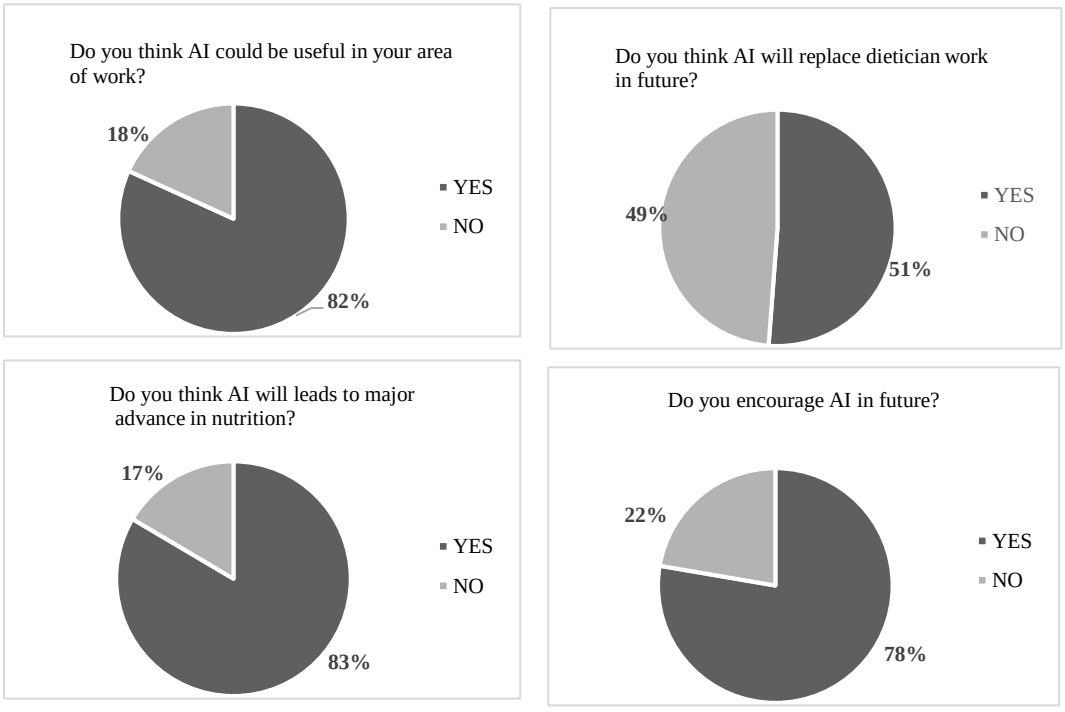


Fig. 2 -Attitude towards AI in Nutrition among student participants

3.4 Practice of AI in nutrition among student participants

From the below figure it was clear that the majority of the participants (84%) were not run-through any application of Artificial Intelligence in nutrition field and 90% informed that currently they were not in practice of any AI application in their field. But 10% of the participants reported that they came across with applications like Healthify me, Fitgenie, My fitness pal, diet cal, NTutive, and nano pack. Among the total participants 82% were not in practice of Internet of Things (IoT) and only 18% were experienced IoT.

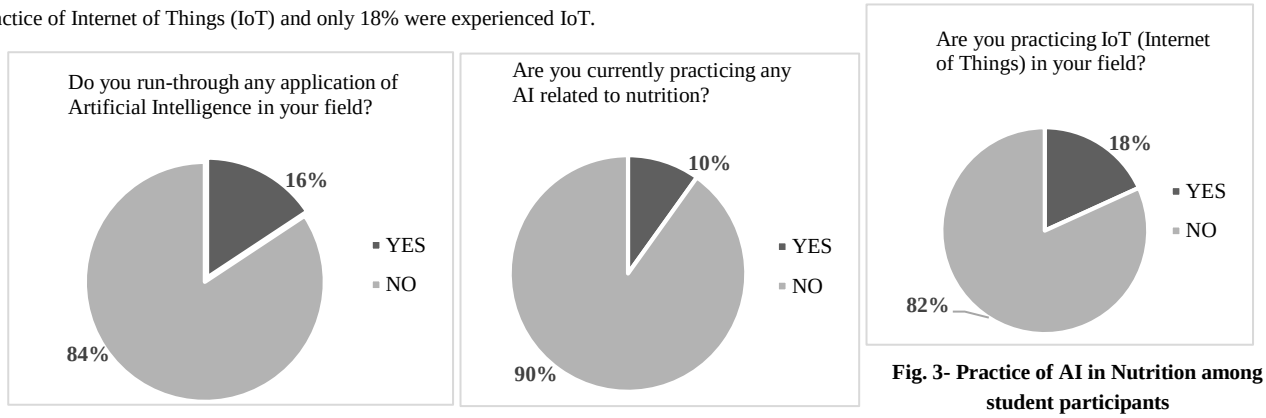


Fig. 3- Practice of AI in Nutrition among student participants

3.5 Association between Knowledge, Attitude and Practice of AI in nutrition among the student respondents

Deep learning (DL) algorithms prevailed in a group of research works on clinical nutrients intake. The development of dietary systems using AI technology may lead to the creation of a global network that will be able to both actively support and monitor the personalized supply of nutrients. The below table shows the association between knowledge, attitude and practice of AI in nutrition among the student respondents.

Table.2- Association between Knowledge, Attitude and Practice

		Knowledge	***Attitude***	***Practice***
Knowledge	*Pearson Correlation Sig. (2-tailed)*	1.00	.14	.33
			.119	.000
	N	121	121	121
Attitude	*Pearson Correlation Sig. (2-tailed)*	.14	1.00	.22
		.119		.017
	N	121	121	121
Practice	*Pearson Correlation Sig. (2-tailed)*	.33	.22	1.00
		.000	.017	
	N	121	121	121

Level of significance, α=0.05

Currently available programs perform nutrient analysis of dietary intakes, menus, and recipes, offer simple forms of nutritional assessment, and provide creative educational applications. From the above table it was found that postgraduate student respondents knowledge was significantly higher than attitude and practice ($P < 0.05$).

AI is a disruptive technology that is utilized to understand more about personalized diet in nutrition and wellness. As the world is becoming more and more fitness-conscious, there is an increasing scope for disruptive technological solutions such as AI to provide various health-based solutions hence students need an exposure and practice towards AI.

4. Conclusion

Artificial intelligence (AI) is a rapidly evolving area that offers unparalleled opportunities of progress and applications in food and nutrition fields. AI algorithms may help better understand and predict the complex and non-linear interactions between nutrition-related data and health outcomes, particularly when large amounts of data need to be structured and integrated, such as in metabolomics. AI-based approaches, including image recognition, may also improve dietary assessment by maximizing efficiency and addressing systematic and random errors associated with self-reported measurements

of dietary intakes. But the present study shows the effect and practice of the AI application was still in the early stage, inspite of high interest shown by the students to invite AI further to improve the health outcomes. There remain gaps to address and potentialize this emerging field of food and nutrition. Further research is needed to identify areas where AI deliver added value compared with traditional approaches.

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