Knowledge and Education about Artificial Intelligence among Medical Students from Teaching Institutions of India: A Brief Survey

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Abstract

Objectives: To assess the knowledge and education about artificial intelligence (AI) among medical students in India.

Materials and methods: A web-based questionnaire was designed using Survey Monkey and sent via WhatsApp to second and third-year medical students of three premier medical institutions of India. The questionnaire consisted of ten questions aiming to assess the knowledge and education related to AI and computer language in medical field. The inclusion was voluntary with prior intimation that the results can be used for analysis.

Results: A total of 226 students responded to the survey, out of these 115 were boys and 111 were girls with a median age of 20 years. Majority of the students had heard about AI (62.5%) and internet was the main source of information for them. Unfortunately, none wanted to pursue their career in AI. 85.9% students showed interest to learn more about AI, although knowledge about any computer language was lacking in 73% students. 73.4% students were also unaware about journals and publications going on in the field of AI. However, 89.1% students were optimistic about scope of integration of AI in medicine. For all the responses, there was no significant difference between boys and girls.

Conclusion: This brief survey highlights that although our medical students are not fully aware about AI and its applications, yet they are keen to learn more about AI and its associated computer logistics. They also understand the potential of AI in medical science which is why the present medical curriculum needs to be AI-oriented.

Keywords: Artificial intelligence; medical students; medical curriculum; python
Introduction

Artificial Intelligence (AI) is one of the newest fields in science and technology and has been aptly referred to as "The Stethoscope of the 21st Century", that implies it is an essential tool for the medical fraternity (Mesko, 2017). AI refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions (Russell and Norvig, 2018). The beauty of AI is its ability to rationalize and take actions to achieve a specific goal. Without our knowing, AI has penetrated almost all spheres of our day to day lives, starting from the virtual assistants like Amazon's Alexa and Apple's Siri, face recognition, healthcare system, self-driven cars, robotics etc. When we talk of AI in health care delivery, the advancement is more theoretical than practical. Any new technology in health care is considered optimal and beneficial only when it benefits the patients and the treating doctors at large. Unfortunately, this is not the case of AI in health care. To obtain the desired results, we must target at the root level of medical education which are the budding medical students, our future health care providers (Park et al., 2019). To gain more insight, we conducted an online survey to assess the knowledge and education about AI in medical school students of India.

Methods

A web based online survey using Survey Monkey web-application was conducted among the second and third year medical students of three premier medical colleges of India, namely Government Medical College and Hospital, Chandigarh, the All India Institute of Medical Sciences, New Delhi and Bhopal. The survey was floated on social media (WhatsApp) among the students and they were informed that the results of the survey might be used for analysis and medical publication. The participation was voluntary with no compulsion of any kind. The respondents' anonymity was ensured.

The questionnaire consisted of ten questions which included four questions on general information and demographics, and five questions about knowledge and future career prospects of AI in health care. One question also assessed the knowledge of computer language in medical students.

Results/Analysis

A total of 226 medical students responded to the questionnaire over a two-week period (Table 1). Out of these, 115 were boys and 111 were girls with a median age of 20 years. 16.37% of students had parents who were doctor by profession and medical profession as career was chosen by parenteral guidance in 20.8 %. However, 69.47% of students chose medical profession as their own will. When asked about the future plans after graduation, 58.15% students wanted to do postgraduation with medicine and surgery as speciality each by 29.2% students. Whereas, the speciality of postgraduation remained undecided in 20.7% of students and none opted for AI as profession.

Majority of the students responded that they had some knowledge about AI (62.5%) and internet was the main source of information (67.4%). Interestingly, 85.9% students wanted to learn more about AI, although knowledge about any computer language such as Python or C ++ was lacking in 73% students. 73.4% students were also unaware about journals and publications going on in the field of AI. However, 89.1% students were optimistic about scope of integration of AI in medicine. For all the responses, there was no significant difference between boys and girls.

Table 1: Questionnaire about knowledge and education related to Artificial Intelligence (AI)

| S.no | Questions | Options | Percentage (%) |
|------|-----------|---------|----------------|
Parents occupation

| Profession   | Percentage |
|--------------|------------|
| Doctor       | 16.37      |
| Business     | 24.34      |
| Others       | 59.29      |

Medical profession chosen by

| Guidance      | Percentage |
|---------------|------------|
| Own will      | 69.47      |
| Parent’s guidance | 20.80   |
| Sibling’s guidance | 5.79    |
| Others        | 3.98       |

Future plan after MBBS

| Plan            | Percentage |
|-----------------|------------|
| Post-graduation | 58.15      |
| USMLE           | 14.98      |
| Business        | 1.32       |
| Job             | 0.44       |
| Not decided     | 25.11      |

Field of specialization

| Specialization | Percentage |
|----------------|------------|
| Surgery        | 29.25      |
| Medicine       | 29.25      |
| Radiology      | 7.55       |
| Orthopedics    | 4.25       |
| Eye/ENT        | 2.83       |
| Gynecology     | 6.13       |
| Artificial Intelligence (AI) | 0          |
| Others         | 20.75      |

Any knowledge about AI

| Knowledge      | Percentage |
|----------------|------------|
| Yes            | 62.56      |
| No             | 37.44      |

Source about AI

| Source          | Percentage |
|-----------------|------------|
| Internet        | 67.43      |
| Friends/Family  | 11.93      |
| Others          | 20.64      |

Would you like to learn more about AI

| Want to Learn | Percentage |
|---------------|------------|
| Yes           | 85.9       |
| No            | 14.1       |

Any knowledge about any computer language

| Knowledge      | Percentage |
|----------------|------------|
| Yes            | 26.99      |
| No             | 73.01      |

Any scope of integration of AI in medicine

| Scope of Integration | Percentage |
|----------------------|------------|
| Yes                  | 89.19      |
| No                   | 10.81      |

Any knowledge about AI related journals

| Knowledge          | Percentage |
|--------------------|------------|
| Yes                | 26.55      |
| No                 | 73.45      |

Discussion

Online surveys related to AI in health care and education are sparse in the literature. To our knowledge, this is the first of its kind web-based survey enrolling second- and third-year medical students assessing their general knowledge related to AI. Santos et al conducted a survey relating to the attitude of medical students about AI more specifically to AI in radiology and medicine (Pinto Dos Santos et al., 2019). The survey results are similar to our survey as far as the knowledge about AI in students and their optimism in healthcare is concerned with 71% respondents agreed on the need for AI to be included in medical curriculum. Our survey highlighted the fact that 37.4% of medical students are in dark about the knowledge and prospects of AI in health care. This figure is high in the times of easy accessibility of internet and smart phones at hand. However, for students who were aware about AI, internet was the source of information in 67.4% and 11.9% learnt about AI from friends and family. Nevertheless, the quest to learn more about AI persists in the majority of students (85.9%), with the general agreement that incorporation of basic training in AI into undergraduate medical curriculum is strongly needed. No doubt that the present generation is tech-savvy with explicit visions and goals. With dramatic improvement in computer software and increasing access to large datasets, it is no wonder that AI will surpass the brainpower of a
human being by 2023 as predicted by Ray Kurzweil, a Google AI expert (Kurzweil, 2006).

It is now beyond any debate that AI should be incorporated into medical curriculum for undergraduates (Kolachalama and Garg, 2018). Many articles have proved it that introducing AI at an earlier point in medical career helps to shape the students better. A study by Shin et al demonstrated that problem-based learning increases the overall learning of medical undergraduates as compared to the traditional curriculum (Shin et al., 1993). The same applies to AI as it enhances the problem-based learning of the students and justifies its incorporation in medical curriculum. However, implementation of AI in medical field is full of challenges. In an integrative review article of 37 articles by Chan and Zary, 34 articles described the challenges of AI implementation in medical education and the two main reasons identified were difficulty in assessing the effectiveness of AI in medical education and the technical challenges of developing AI applications (Chan and Zary, 2019). The other hurdles include limited digitalization, lack of expertise, non-availability of data and financial constraints (Jiang et al., 2017). We think that the health officials should first be convinced themselves and believe that the technology is going to bring about a major leap in our health care and the fact that this technology is going to stay long. Only then a change can be positive.

Another challenge in learning AI in medical students is their lack of computer knowledge as computer science is not taught as a subject in pre-medical school for students pursuing medicine. It is clearly evident from our survey that 73% of students were not aware about it. Computer languages most commonly used in AI are Python, C++. Python was developed by Guido Van Rossum in 1991 and is the most popular computer language (Guido, 1993). It is required for coding and making algorithms. Python is also a general-purpose programming language which can be used across many domains and technologies. As the enthusiasm to learn AI is seen in our students, so the same can be translated for learning computer languages as well. Time has come that the medical schools strengthen their medical curriculum and include machine learning, deep learning and data management and computer languages along with traditional classes (Ahuja, 2019). This will also create students’ interest in choosing AI as future career prospect which is currently not considered as an option by even a single student in this survey.

The knowledge of our responders about AI related journals and publications is limited in our survey (73.4%). It can be easily augmented by upgrading the institutions libraries with the recent scientific publications in AI (Loh, 2018). Also, the students can be given AI-related projects as part of thesis, promoting them to attend conferences and CMEs related to AI at a national and international level.

The survey questionnaire was kept very simple as we conducted this online survey at a basic level of second and third year medical students who are just recently sensitized about the sub-specialties of medical field and are not thorough with AI related journals and publications (73.45%). This can be the limitation of our study. The results could have been different if final year undergraduates or postgraduate students were included in this survey. It would be potentially worthwhile to conduct a different survey at a senior level so as to obtain their viewpoint also and get better idea about the scenario. Nevertheless, the results of this survey can be perceived on a larger scale as the three institutions involved in this survey are the among the topmost of our country.

Conclusion

This brief and simple survey highlights the fact that although our medical students are not fully aware about AI and its applications, yet they are desirous to gain more knowledge and learn about AI. They understand the potential of AI in medical science. The stethoscope of AI needs to be used well to obtain desired results. Then only will the prediction of Kurzweil that AI will surpass our brainpower will hold true. The need of the hour is development of a multidisciplinary team of educational experts, physicians for clinical aspect, data scientists for data computation so that the gap in the knowledge between engineers and physicians can be bridged (Patel et al., 2009). The role of
medical students as future health care providers is enormous and for this AI should be incorporated in medical school curriculum as early as possible.

Take Home Messages

- Medical students are tech-savvy and keen to learn computer languages and algorithms related to artificial intelligence.
- Traditional medical curriculum can be integrated with technology and applications related to artificial intelligence for better sensitization of medical students.
- The challenge to implement the knowledge of artificial intelligence in medical education can be overcome by development of a multidisciplinary team of data scientists, physicians and educational experts in medical colleges.

Notes On Contributors

Ankush Jindal is a third year medical student at Government Medical College and Hospital, Chandigarh, India. He has keen interest in artificial intelligence and its application in health care.

Manishi Bansal is Senior Consultant Radiation Oncology at Mayo Super Speciality Hospital, Mohali, India. She is MD in Radiation Oncology from All India Institute of Medical Sciences, New Delhi, India.

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**Appendices**

None.

**Declarations**

The author has declared that there are no conflicts of interest.

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**Ethics Statement**

Institutional review board approval was not required because this study involved no clinical and patient data. Participation in the questionnaire was voluntary and had no relation to the students curricular activities. Informed consent was taken from the participants. Respondents were informed on the nature and purpose of the questionnaire and anonymity was guaranteed. The authors have followed the Declaration of Helsinki 2013 in their processes.

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