AWARENESS AND KNOWLEDGE ABOUT ARTIFICIAL INTELLIGENCE IN HEALTHCARE AMONG DOCTORS - A SURVEY

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ABSTRACT

Artificial Intelligence is a progressive, rapidly developing field. It has the potential to ease diagnosis, treatment and care of patients. It is vital that medical professionals are aware about Artificial Intelligence and its scope in health care. Artificial Intelligence has the capability to ease diagnosis and care. The future of medicine is Artificial Intelligence based. A survey was carried to assess the awareness levels about Artificial Intelligence and its scopes in Healthcare. A questionnaire was circulated among medical and healthcare professionals. The total participation for the study was 100. The results were collected and tabulated to be analysed using SPSS windows version 20. There was an overall positive response from the participants. 92% believed that Artificial Intelligence is the future of medicine. Recent advancements have made it imperative that the healthcare workers be aware of Artificial intelligence and its scopes. Artificial Intelligence is reaching the medical field. It is a reality that a certain level of hyperbole seems to have taken over the discussion of Artificial Intelligence in healthcare. On one hand, healthcare industrialists and researchers highlight the need for high quality health data, on the other hand, physicians are still waiting for evidence of the usefulness of these tools and wonder who will be held responsible in case of an injury due to the tool, and the other ethical factors associated with it. It can be concluded that the participants had a moderate level of knowledge about Artificial Intelligence and its scopes, which can be improved.

Keywords: Artificial Intelligence; Diagnosis; Health care; Pathology; Radiology

INTRODUCTION

The term "Artificial Intelligence" was first coined by John McCarthy. He first described it as "the science and engineering of making intelligent machines". Artificial Intelligence is an important field of computer science that seeks to create complex machines with characteristics of human intelligence(Ahuja, 2019). Over the years, there has been an increase in Artificial Intelligence assisted technology everywhere(Marickar, Geetha and Neelakantan, 2014). Some of the common Artificial Intelligence technology include facial recognition, speech-to-text, etc(Davenport and Kalakota, 2019). As the world develops, humans

develop more and more. Artificial Intelligence is not one technology, but rather a collection of them(Akkus *et al* ., 2017).

Artificial Intelligence has immediate relevance to the healthcare field. Machine learning to develop neural networks and analysis of deep learning(Ahuja and Halperin, 2019). Medical Artificial Intelligence adopts a statistical approach to medicine(Pratha, Ashwatha Pratha and Geetha, 2017). It becomes more evidence based. Machine learning aids in simplification of complex associations(Vaishali and Geetha, 2018). Hence it can play a major role in diagnosis and treatment planning(Lee *e t al.*, 2018). It aids in Radiology and Pathology(Lanzetta, no date). Radiology is an Artificial Intelligence assisted development(Smiline, Vijayashree and Paramasivam, 2018). It aids in optimizing radiologic flow, facilitates quantitative radiology and in discovering genomic markers(M, Geetha and Thangavelu, 2019). It is a huge advantage in clinical diagnosis(Gupta and Malhi, 2018). Digital pathology is a developing field which aids digitalisation of histologic slides and tests(Girija *et al.*, 2019). It can increase the effectiveness of diagnosis(Dawes *e t al.*, 2017). Digitalisation of data is one of the major milestones in healthcare(Paramasivam, Vijayashree Priyadharsini and Raghunandhakumar, 2020). Treatment and drug development and drug personalisation are believed to be the forerunners in scopes of Artificial Intelligence that have huge impacts in healthcare(Vial *e t al.*, 2018). Patient monitoring and care for critical patients requiring constant care(Priyadharsini *e t al.*, 2018a). This aids in nursing and Palliative care of cancer patients(Schmidt-Erfurth *e t al.*, 2018).

Artificial intelligence is a progressive, rapidly developing field. It has the potential to ease diagnosis, treatment and care of patients.(Ashwin and Muralidharan, 2015) While medical practitioners scramble to keep up with the world(Selvakumar and Np, 2017), it is imperative that each and every essential medical worker is aware of Artificial Intelligence and its scopes(Shahana and Muralidharan, 2016). The future of medicine is Artificial Intelligence based('Evidence-Based Medicine: A Science of Uncertainty and an Art of Probability', 2013). This survey assesses Awareness about Artificial Intelligence and its scopes in healthcare.

MATERIALS AND METHOD:

The study is an online based Cross- Sectional survey. An online survey questionnaire containing 15 questions pertained to Artificial Intelligence and its scopes in healthcare was distributed to medical students and professionals. 100 medical professionals, who were selected based on simple random sampling. This is done to minimise bias. The questionnaire had 2 parts. The first part contained questions asking about their general information like Name, Age, Gender, Educational Qualification. The second part asked questions related to artificial intelligence and its scopes in the medical field.The results were tabulated and analysed using Windows version SPSS version 20. Frequency and Chi-Square test was done for the data obtained. Pie charts and bar graphs were used to depict the results.

RESULTS AND DISCUSSION

The results were tabulated and analysed using Windows version SPSS version 20. Upon analysing, the following results were obtained.Fig. 1 explains the responses related to the general principles related to artificial intelligence. About 71% of the participants were aware of the basic definition of artificial intelligence.Fig. 2 depicts the responses related to the uses of artificial intelligence. 55% were aware of the uses of artificial intelligence in the medical field. Fig. 3 explains the responses related to diagnostic tools like Radiology and Imaging. 64% were aware of the specific functions of artificial intelligence especially in radiology and imaging. Fig. 4 depicts the number of participants to have used digital pathology tools. 69% of the participants have used artificial intelligence related tools in digital pathology. There were confused responses for other uses. 54% agreed on drug personalisation.

Fig. 7 and 8 depict the participants' thoughts on whether Artificial intelligence can improve diagnosis and treatment planning. 52% believe that artificial intelligence can improve treatment planning and diagnosis. Fig. 5 depicts the willingness of the participants to learn tools related to Artificial Intelligence. 62% of the participants were enthusiastic about using artificial intelligence to improve patient care. 71% were aware that data digitalisation comes under artificial intelligence. 74% of the participants prefer digital data over physical data. Fig. 6 represents the percentage of participants who believe that Artificial Intelligence is the future of medicine. 92% of the participants believe that artificial intelligence is the future of medicine. The responses were cross tabulated and correlated using the Chi-Square test. There was no statistically significant association which is depicted in Fig.9-13 .

The trends in research determine the outcomes and improvements in the field(Shahzan *e t al.*, 2019). Artificial intelligence has been a sought-after research and due to it's virtually limitless potential(Booth *e t al.*, 2012). Every country would have at least one artificial intelligence-based breakthrough in their portfolio(Priyadharsini *e t al.*, 2018b). A survey conducted by Santos et al in 2019(Pinto Dos Santos *et al.*, 2019) concluded a low level of information of medical students about artificial intelligence that is in contradiction with the present study (Fig. 1 & 2). This can be attributed to the university curriculum as the participants in the previous study responded that they receive more information about artificial intelligence from the mainstream media(Rajkomar *e t al.*, 2018).

The current study aims to understand the awareness levels about the basic understanding of the principles of artificial intelligence. We also studied whether the participants were aware about the common nomenclature associated with artificial intelligence (Fig. 3 & 4) . A survey conducted by Lai et al in 2020 studied the perceptions of artificial intelligence in healthcare among actors in France(Laï, Brian and Mamzer, 2020) (Schmidt-Erfurth *e t al.*, 2018)(Laï, Brian and Mamzer, 2020). It concluded that 26% of the participants are willing to learn new programs for artificial intelligence. This contradicts the current study (Fig. 5). France is not considered to be a pioneer in artificial intelligence for health. Thus, French people were bound to respond negatively(Gong *e t al.*, 2019).

Healthcare applications with artificial intelligence embedded in them are currently being developed worldwide and they bring with them a number of professional, societal and ethical questions(Langlotz, 2019). Doctors have an ethical imperative that they should provide the best care possible. Hence despite their enthusiasm for artificial intelligence, they remained pragmatic and sceptical over whether it will provide an effective treatment(Lanzetta, no date). A study conducted by Sit C et al believe that artificial intelligence will play an important role in health care in the future(Sit *e t al.*, 2020). The similarity with the current study might be due to similar awareness levels and technological development (Fig. 6). Artificial intelligence tools are reaching the medical field. It is a reality that a certain level of hyperbole seems to have taken over the discussion of artificial intelligence and healthcare(Haenssle *e t al.*, 2018). On one hand, healthcare industrials and researchers highlight the need for high-quality health data and on the other hand physicians are still waiting for evidence of the usefulness of these tools and wonder who will be held responsible in case of an injury due to the tool(Esteva *e t al.*, 2017). Combining big data and artificial intelligence in healthcare could lead to an important breakthrough for patients and professionals but it is a developing field and there are many things that should be considered(Erlich *e t al.*, 2018). A study by Oh et al in 2019 has concluded that 43.9% of its participants believe that artificial intelligence is diagnostically superior to human doctors. This has a deeper meaning as it concludes that artificial intelligence is believed to be far more effective and error less when compared to human doctors(Oh *e t al.*, 2019). This is in acceptance with the current study (Fig. 7 & 8).

The cross tabulations and correlations were done between Age, Gender and Educational Qualification to various responses garnered in the study. None of the correlations were statistically significant. The correlation between Gender and the responses to the question "Would you rather use digital data or physical data?" is depicted in Fig. 9. The Chi- square test resulted with the p value being 0.287, which is statistically insignificant. The correlation between Gender and the Definition of Artificial Intelligence is depicted in Fig. 10. The Chi- square test resulted with the p value being 0.351, which is statistically insignificant.

The correlation between Gender and the responses to the question "Do you think Artificial Intelligence can improve diagnosis?" is depicted in Fig.11 . The Chi- square test resulted with the p value being 0.445, which is statistically insignificant. The correlation between Educational Qualification and the responses to the question "Would you rather use digital data or physical data?" is depicted in Fig. 12. The Chi- square test resulted with the p value being 0.224, which is statistically insignificant. The correlation between Educational Qualification and the responses to the question "Do you think Artificial Intelligence is the future of medicine" is depicted in Fig. 13. The Chi- square test resulted with the p value being 0.149, which is statistically insignificant.

One of the major limitations of this survey is the small sample size and the other one is the unwillingness of the respondents to answer specific questions honestly.

CONCLUSION

Within the limits of the study, awareness of scope of artificial intelligence was evaluated. Upon evaluation, it was found that the medical professionals had moderate levels of knowledge about artificial intelligence, which can be improved. Extensive research and knowledge about artificial intelligence and its scope in the medical field is gaining importance in the current situation.

AUTHOR CONTRIBUTIONS:
Samyuktha P S contributed to the Survey formulation, data collection and data analysis. Samyuktha P S and Dr. R V Geetha contributed to the Manuscript writing. Dr. R V Geetha[2] and Dr. Jayalakshmi S contributed to the critical revision of the article.

CONFLICT OF INTEREST:
The authors declare no conflict of interest.

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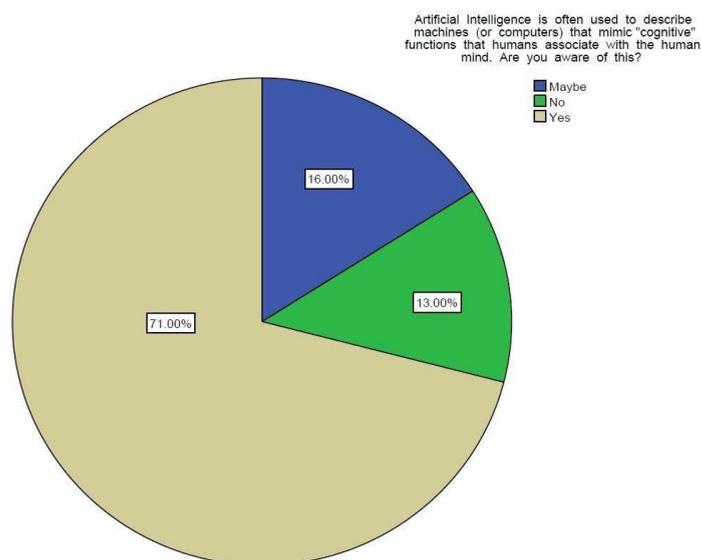
Fig. 1. Pie chart depicting the responses related to the General Principles of Artificial Intelligence. The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 71% responded positively; 13% responded negatively, while 16% were confused.
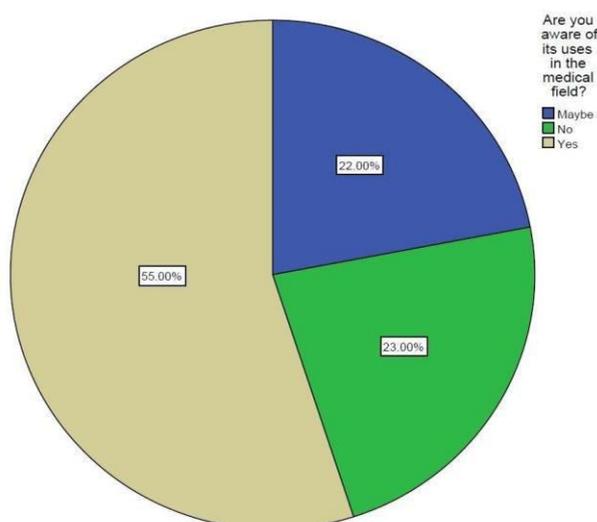
Fig. 2. Pie chart depicting the responses to the questions related to the uses of Artificial Intelligence in the medical field. The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and

"Maybe" is denoted by Blue. 55% were aware of their uses, 23% were not aware, 22% had confused responses.
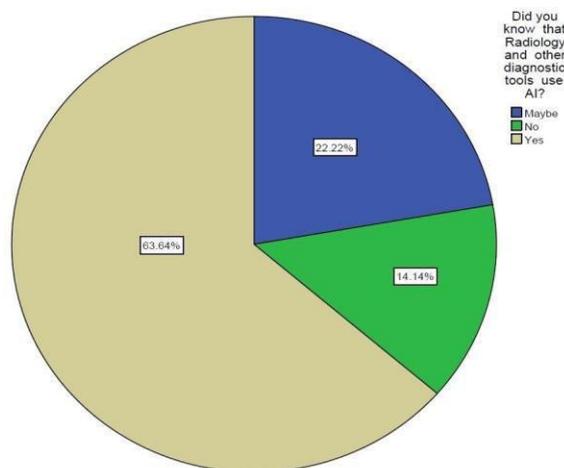

Fig. 3. Pie chart depicting the responses related to the Diagnostic tools like Radiology and other Imaging softwares. The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 64% were aware about the diagnostic tools; 14% were not aware of the uses and 22% responded "Maybe"
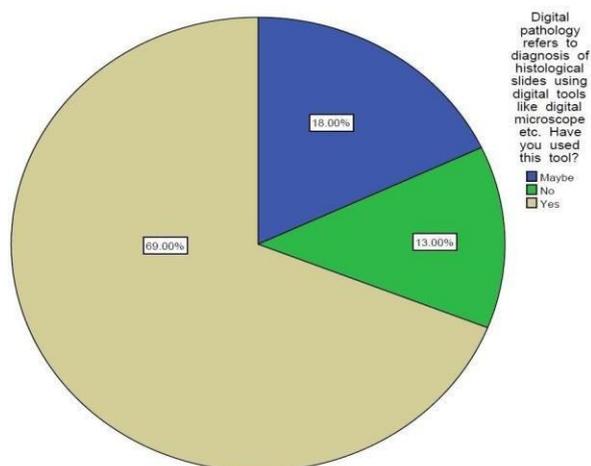

Fig. 4. Pie chart depicting the responses given to the questions related to Digital Pathology and other Histopathological diagnostic tools that Artificial Intelligence offers. The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 69% responded that they have used digital pathology tools before, 18% said maybe while the rest have not used it.
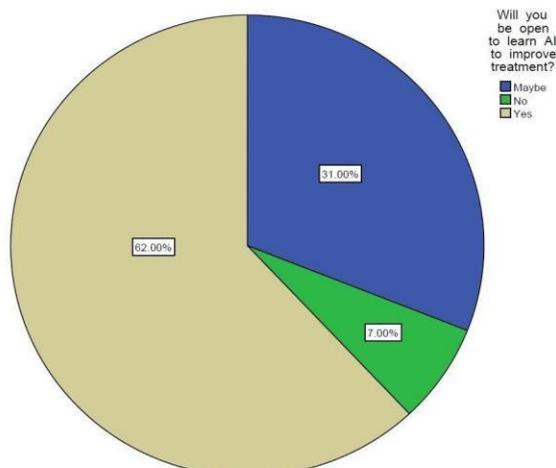
Fig. 5. Pie chart depicting the responses to the question "Will you be open to learning Artificial intelligence related tools?". The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 62% are willing to learn; 7% are not willing to learn tools.
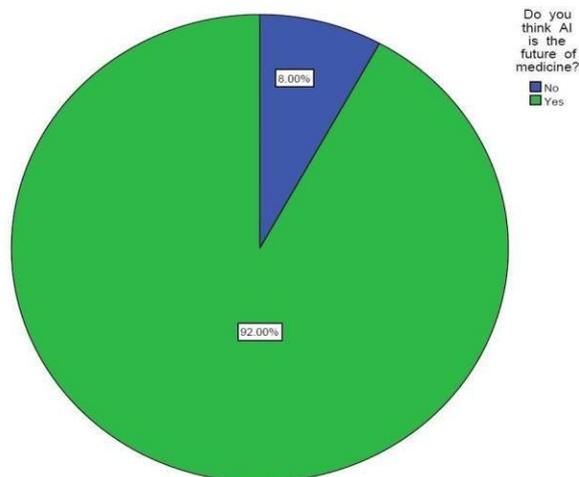

Fig. 6. Pie chart depicting the responses to the Question "Do you think Artificial Intelligence is the future of medicine?". The response "Yes" is denoted by the colour Green, "No" is denoted by Blue. 92% responded positively.
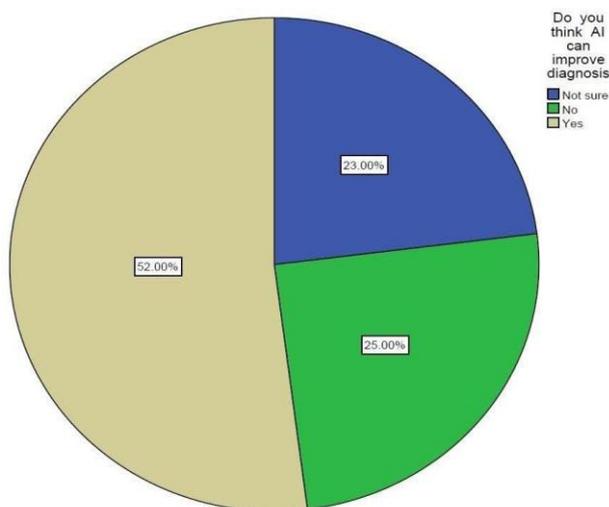
Fig. 7. Pie chart depicting the responses to the question "Do you think Artificial Intelligence can improve Diagnosis?". The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 52% responded positively, while 23% were not sure and 25% responded negatively.
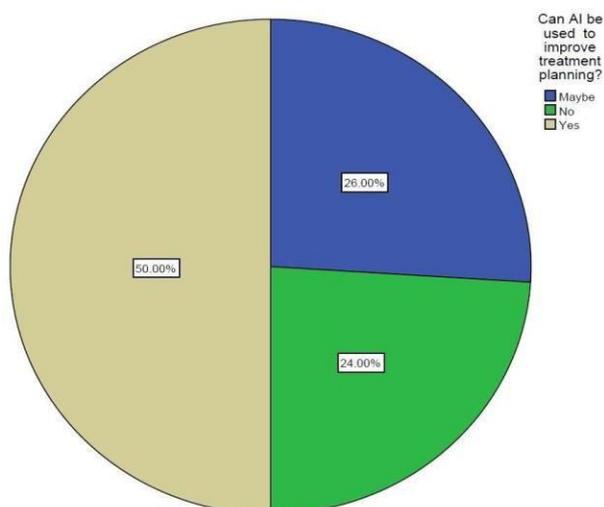
Fig. 8. depicting the responses to the question "Can Artificial Intelligence be used to improve treatment planning?". The response "Yes" is denoted by the colour Yellow, "No" is denoted by Green and "Maybe" is denoted by Blue. 50% responded positively; 24% responded negatively and the rest were not sure.
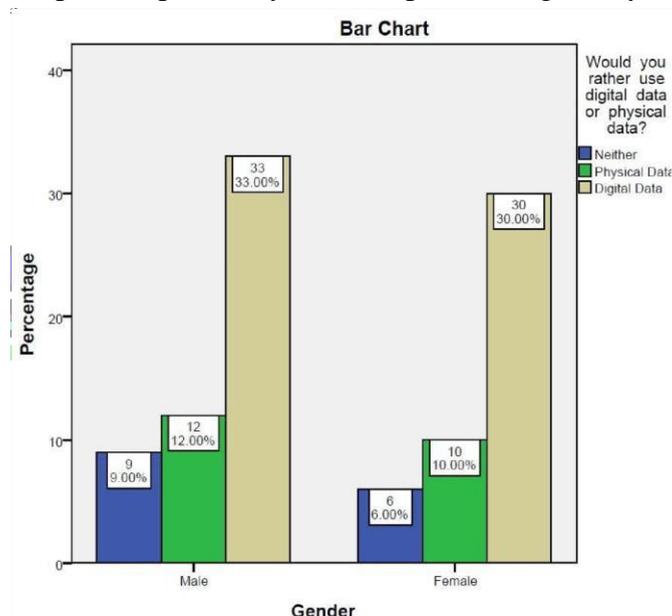

Fig. 9: Bar chart depicting the association between gender and responses to the question, "Would you rather use Digital data or Physical data?''. X axis represents Gender and Y axis represents the Participants' responses. The yellow bar represents the response "Digital data", the green bar represents the response "Physical data" and the blue bar represents the response "Neither". 33% of the male respondents chose Digital data over physical data, while 30% of the female respondents chose digital data over physical data. Chi-square analysis (Chi- square value= 9.945) did not show any statistical significance with p value- 0.287 (p> 0.05). There is more awareness among males than females though it is not statistically significant.
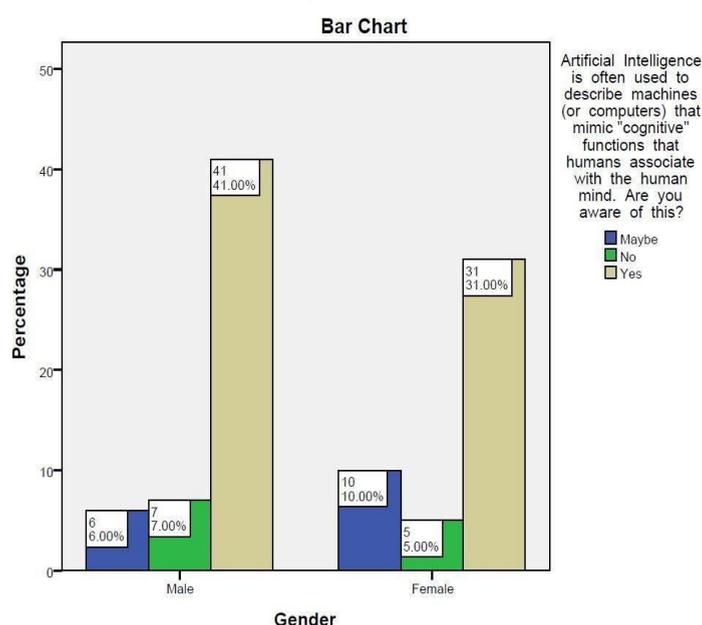

Fig. 10: Bar chart depicting the association between the gender and the responses to the Definition of Artificial Intelligence. X axis represents Gender and Y axis represents the Participants' responses. The yellow bar represents the response "Yes", the green bar represents the response "No" and the blue bar represents the response "not sure". 41% of the male population were aware of the definition of AI, while among the female population only 31% responded positively.Chi square analysis (Chi square value =

2.096) did not show any statistical significance with p value- 0.351(P>0.05).There is more awareness among males than females though it is not statistically significant.
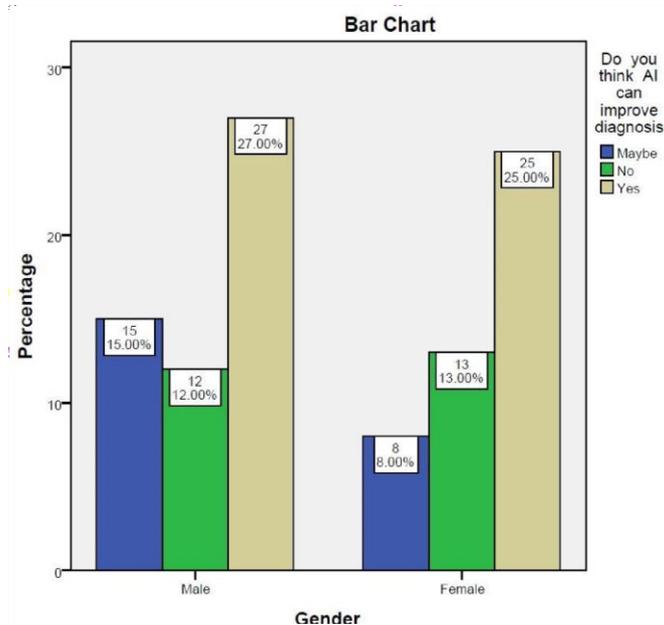

Fig. 11: Bar chart depicting the association between gender and responses to the question, "Do you think Artificial Intelligence can improve diagnosis?". X axis represents Gender and Y axis represents the Participants' responses. The yellow bar represents the response "Yes", the green bar represents the response "No" and the blue bar represents the response "Maybe". 27% of the male population responded positively, while 25% of the female population responded positively. The majority of the responses were positive, irrespective to their gender. But, the males showed a slightly greater awareness than females. But, there is no statistically significant correlation between gender and the responses. Chi square analysis (Chi square value = 1.618) did not show any statistical significance with p value- 0.445(P>0.05).
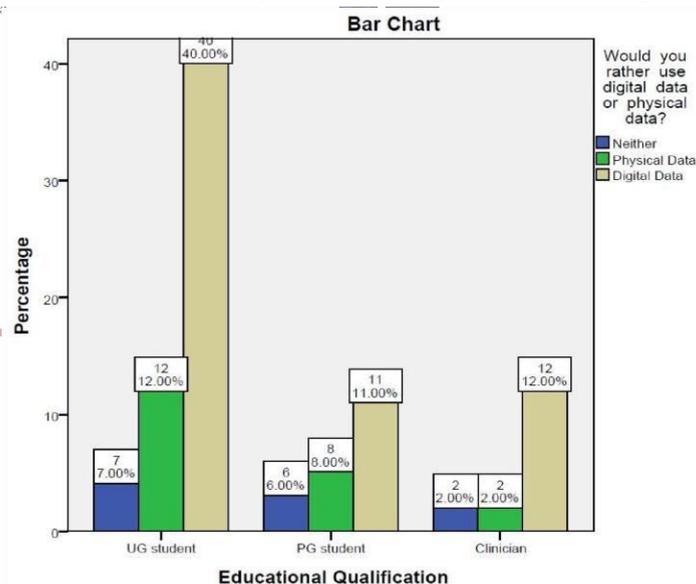

Fig. 12: Bar chart depicting the association between Educational Qualification and response to the question, "Would you rather use Digital data or Physical data"". X axis represents Educational Qualification and Y axis represents the Participants' responses. The yellow bar represents the response "Digital data", the green bar represents the response "Physical data" and the blue bar represents the response "Neither". 40% of the UG students prefered digital data, while only 11% of the PG students preferred digital data. There's a vast difference in the responses given by UG students and PG students. This indicates that the UG students show more awareness than PG students or clinicians, yet it is not statistically significant. There is no significant correlation between Educational Qualification and the

responses. Chi square analysis (Chi square value = 5.684) did not show any statistical significance with p value- 0.224(P>0.05).
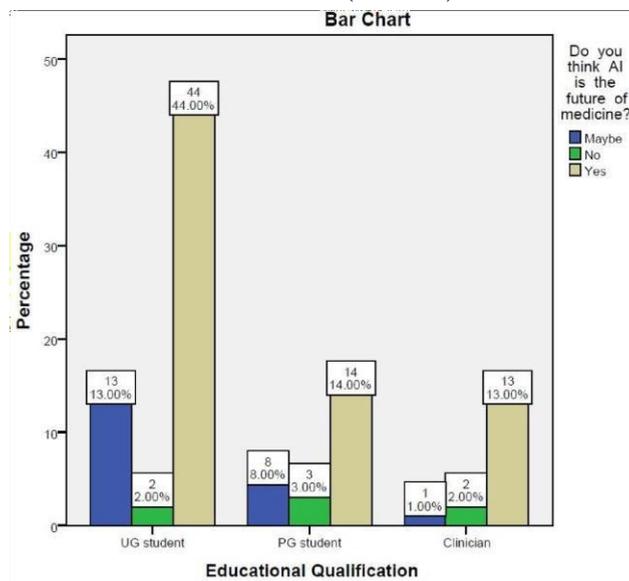

Fig. 13: Bar chart depicting the comparison of responses based on Educational Qualification to the question, "Do you think Artificial Intelligence is the future of medicine?". X axis represents Educational Qualification and Y axis represents the Participants' responses. The yellow bar represents the response "Yes", the green bar represents the response "No" and the blue bar represents the response "Maybe". 44% of the UG students responded positively, while only 14% of the PG students responded positively. The UG students show more awareness than PG students or clinicians. There is no significant correlation between Educational Qualification and the responses. Chi square analysis (Chi square value = 6.759) did not show any statistical significance with p value- 0.149(P>0.05).