

Awareness on Application of Artificial Intelligence in Medicine among Dental Students - A Survey

Ranjana V

Saveetha Dental College and Hospitals,
Saveetha Institute of Medical and Technical Sciences (SIMATS),
Saveetha University,
Chennai, India.
Email Id: 151901051.sdc@saveetha.com

R Gayathri

Assistant Professor,
Department of Biochemistry,
Saveetha Dental College and Hospitals,
Saveetha Institute of Medical and Technical Sciences (SIMATS),
Saveetha University,
Chennai, India.
Email Id: gayathri.sdc@saveetha.com

V Vishnu Priya

Professor,
Department of Biochemistry,
Saveetha Dental College,
Saveetha Institute of Medical and Technical Sciences (SIMATS),
Saveetha University,
Chennai, India.
Email Id: vishnupriya@saveetha.com

S Kavitha

Lecturer,
Department of Biochemistry,
Saveetha Dental College and Hospitals,
Saveetha Institute of Medical and Technical Sciences (SIMATS),
Saveetha University,
Chennai, India.
Email Id: kavithas.sdc@saveetha.com

Corresponding Author:

R Gayathri

Assistant Professor,
Department of Biochemistry,
Saveetha Dental College and Hospitals,
Saveetha Institute of Medical and Technical Sciences (SIMATS),
Saveetha University,
162, PH Road, Chennai 600077,

TamilNadu, India.
Phone: +91-9710680545
Email Id: gayathri.sdc@saveetha.com

Abstract

Aim and introduction

Artificial intelligence (AI) is one of the branches of computer science, which is capable of analyzing complex medical data. This technology is helpful in diagnosing disease, treatment, and predicting outcomes in many clinical scenarios. Artificial intelligence is nothing but a natural language processor and does repetitive jobs in a timely manner. Some disadvantages of AI technology are high initial capital requirement, potential for increased unemployment, which shows that this technology has the potential to replace physicians in future. The main aim of this survey is to assess the awareness on application of artificial intelligence in medicine among dental students.

Materials and Method

Self-administrated questionnaire was designed based on awareness. The questionnaire was distributed through an online Google forms link. The study population included dental students belonging to the 18 – 26 age group. Method of representation of each output variable was in pie charts and bar graphs. The statistics done using SPSS software, chi square test was done to check the association and a p value of 0.05 was said to be statistically significant. This survey has been completed in the month of may 2020.

Result

56% of the participants were aware that artificial intelligence is the analysis of medical data without direct human input. From the survey it was evident that 57% of the participants feel that with the help of AI clinical decision and diagnosis can be revolutionized and also found that both male and female students were equally aware of the importance of application of artificial intelligence in medicine(p-value>0.05).

Conclusion

This study concludes that about 59% of the study participants were aware that Artificial Intelligence technology in medicine is beneficial to doctors and also found that both male and female students were equally aware of artificial intelligence. Since AI technology has the potential to develop into an innovative platform which is capable of analyzing more complex medical data, more awareness has to be created for better understanding and analysis of this technology.

Keywords

Artificial intelligence; awareness; dentistry; medicine; technology.

Introduction

Artificial intelligence (AI) is one of the branches of computer science, which is capable of analyzing complex medical data. This technology is helpful in diagnosing disease, treatment, and predicting outcomes in many clinical scenarios (Ramesh *et al.*, 2004). Artificial intelligence is nothing but a natural language processor and does repetitive jobs in a timely manner (B. Tran *et al.*, 2019). Artificial intelligence is also used for drug discovery (Shortliffe, 2019). Similar to Artificial intelligence, there are other emerging scientific areas such as Bionanotechnology which has a role in development of a novel therapy, applications of gold nanoparticles (AuNPs) in the treatment of cancer (Ke *et al.*, 2019). Numerous scientific studies such as, studies on the disclosure of ultraviolet (UV) radiation from the environment which causes inflammation, photoaging and skin cancer (Chen *et al.*, 2019). Studies related to cancer biology (Ma *et al.*, 2019), and various other treatments related to it are trending in the scientific arena (Gan *et al.*, 2019). Glioma is the prime cause of cancer allied mortality in adolescent people and it is responsible for about 80% of all malignant tumours (Li *et al.*, 2020). Biosynthesis of Zinc oxide nanoparticles (ZnONPs) from natural plants is a promising nano drug delivery system in cancer therapeutics (Wang *et al.*, 2019). For all these researches, when needed to be applied in the medical field, it needs an improvement in technology as well. One such promising technology which can flourish in medical sciences is artificial intelligence. There are some disadvantages also associated with AI technology. AI technology requires high initial capital requirement, potential for increased unemployment, which shows that this technology has the potential to replace physicians in future (Ahuja, 2019). Also AI has few more drawbacks like lack of privacy and security, lack of interoperability between AI solutions, lack of curated healthcare data and so on (Vellido, 2019).

It is revealed that, Inorder to improve disease management for the benefit of patients and rare disease, AI agents with cloud based platforms for multihospital collaboration are designed (Long *et al.*, 2017). Artificial intelligence has two main branches – virtual and physical. Informatics approach is included in virtual branches like electronic health record and physical branch is best represented by robots, which is used to assist surgeons (Hamet and Tremblay, 2017). AI technology is used in detection of atrial fibrillation, hypoglycemia, disease based on histopathological examination and so on (Briganti and Le Moine, 2020). Childhood obesity, a major problem of current generation affecting the child's health which is commonly due to nutritional disorder and much less because of inborn error can also be detected using AI technology (Shukri *et al.*, 2016). Also natural products, especially plants have been used in the treatment of various diseases for many years (Rengasamy *et al.*, 2018). Siberian ginseng which is a perennial herb belongs to the Araliaceae family, a traditional medicine used to treat hypertension, thrombus, inflammation and cancer (Wu *et al.*, 2019). Garcinia mangostana is also extensively used in most of the Indian herbal pharmaceuticals and nutraceuticals which has chemopreventive property that helps in reducing the tumor promoting growth factor (Priya, Jainu and Mohan, 2018). Berries including strawberry may have beneficial effects against cancer (G *et al.*, 2018). Also pineapple extract is an effective natural way in treating oral cancer instead of harmful treatments (Menon, V and Gayathri, 2016). Consumption of high dietary fat increases stored fat mass which is a main risk factor for metabolic diseases which can also be detected using AI technique (Ponnulakshmi *et al.*, 2019). AI technology also has the ability to give treatment selection with existing therapies and provide bases for domain based therapeutic

discovery (Tai *et al.*, 2019). As a whole, artificial technology has the ability to approximate optimal decisions even in complex and uncertain environments (Bennett and Hauser, 2013).

There is no proper research or survey that has been done previously on the awareness of application of artificial intelligence in medicine among medical students. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Ariga *et al.*, 2018; Basha, Ganapathy and Venugopalan, 2018; Hannah *et al.*, 2018; Hussainy *et al.*, 2018; Jeevanandan and Govindaraju, 2018; Kannan and Venugopalan, 2018; Kumar and Antony, 2018; Manohar and Sharma, 2018; Menon *et al.*, 2018; Nandakumar and Nasim, 2018; Nandhini, Babu and Mohanraj, 2018; Ravinthar and Jayalakshmi, 2018; Seppan *et al.*, 2018; Teja, Ramesh and Priya, 2018; Duraisamy *et al.*, 2019; Gheena and Ezhilarasan, 2019; Hema Shree *et al.*, 2019; Rajakeerthi and Ms, 2019; Rajendran *et al.*, 2019; Sekar *et al.*, 2019; Sharma *et al.*, 2019; Siddique *et al.*, 2019; Janani, Palanivelu and Sandhya, 2020; Johnson *et al.*, 2020; Jose, Ajitha and Subbaiyan, 2020). The main aim of this survey is to create awareness on application of artificial intelligence in medicine among dental students.

Materials and method

Self-administrated questionnaire was designed based on awareness of artificial intelligence. The questionnaire contained 13 questions which were shared through Google forms link. The study population included 100 dental students belonging to the 18 – 23 age group. The participants were explained about the purpose of study in detail. The questions were carefully studied and the participants marked the corresponding answers. Measures were taken to minimize the sampling bias. Validity was checked both internally and externally. Sample method carried out was simple random sampling. Method of representation of each output variable was in pie charts and bar graphs. The statistics done using SPSS software, chi square test was done to check the association and a p value of 0.05 was said to be statistically significant. The survey has been completed in the month of may 2020.

Result

Survey on awareness on artificial intelligence in medicine was done. The study population included dental students. The survey results were collected and statistically analyzed. 100% participants actively responded to the questions. There were different age groups participating in the survey. 51% of the study population were female and 49% were male. 57% were aware that with artificial intelligence, even a smart phone selfie could become a powerful diagnostic tool [Figure 1]. 48% think definitely AI causes job cuts on a larger scale, 32% thinks so and 20% thinks definitely not [Figure 2]. 51% think definitely AI can take over the medical industry, 23% think maybe, 26% think definitely not [Figure 3]. 57% think AI as a course to be added to our curriculum [Figure 4]. 62% as a whole support artificial intelligence [Figure 5]. When asked about the opinion on artificial intelligence in the medical industry as a beneficial tool to doctors, 34 out of 51 females and 25 out of 49 males strongly believe that artificial intelligence is beneficial. Though statistically not significant, females have a stronger opinion that artificial intelligence in the medical industry is beneficial to doctors than males. [Figure 6]. When asked about the opinion on whether AI be a threat to the medical industry, 30 out of 51 females and 19

out of 49 males strongly believe that artificial intelligence technology is a threat. Results were statistically significant. Hence females have a stronger opinion that artificial intelligence technology is a threat than male [Figure 7]. When analysed the association between gender and their opinion on AI as a tool in revolutionizing the clinical decision and diagnosis, 28 out of 51 females and 29 out of 59 males strongly believe that clinical decision and diagnosis with the help of AI can be revolutionized. Though statistically not significant, males seem to have a better awareness towards diagnosis of a clinical condition [Figure 8]. When analysed the association between gender and their opinion on the role of artificial intelligence as a tool in the analysis of medical data without direct human input, 25 out of 51 females and 31 out of 49 males strongly believe that artificial intelligence is a tool in the analysis of medical data without direct human input. Though statistically not significant, males seem to have a better awareness on the role of artificial intelligence towards diagnosis and analysis of medical data [Figure 9]. The association between gender and their opinion on whether learning AI may become essential in the future, 35 out of 51 females and 27 out of 49 males strongly believe that learning AI may become essential in the future. Though statistically not significant, females seem to have a better awareness towards learning a new technique [Figure 10]. As a whole, the majority of male participants were aware of the technology and majority of the female participants wanted to learn and implement the technology in the medical field.

Discussion

In the research done previously, it was revealed that the potential to create a revolutionary way of practicing evidence based personalized medicine is being offered by the combination of AI, big data and massively parallel computing methods (B. X. Tran *et al.*, 2019). Whereas in this survey, 57% of the participants feel that with the help of AI clinical decision and diagnosis can be revolutionized. AI based systems are unlikely to replace the traditional physician – patient relationship and will augment physicians (Wu *et al.*, 2018). In this survey, 48% think definitely AI causes job cuts on a larger scale. There are specific issues related to artificial techniques such as fairness, explain ability, privacy, ethics and legislation (Vuong *et al.*, 2019)(Rengasamy, G., Jebaraj, D.M., Veeraraghavan, V.P., Mohan, S.K., 2016). In this survey, 49% feels AI technology is a threat. Deep learning algorithms can deal with an increasing amount of data provided by wearable, smartphones and other mobile monitoring sensors in different areas of medicine (Hashimoto *et al.*, 2018). Here, 57% were aware that with artificial intelligence, even a smart phone selfie can become a powerful diagnostic tool. AI technology promises to provide high quality patient care and has the potential to revolutionize the way surgery is taught and practiced (Dilsizian and Siegel, 2014). But, if a disease is not diagnosed and treated properly at an early stage, and if progresses to the end stage it might be difficult to cure the problem completely (Mohan, Veeraraghavan and Jainu, 2015). In this survey, 59% think artificial intelligence in the medical industry is beneficial to doctors. Most of the results from the previous literature are more or less similar to the result of this survey. There is no proper research or survey that has been done previously on the awareness of artificial intelligence in medicine among medical students. Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019;

Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

Conclusion

This study concludes that about 59% of the study participants were aware that Artificial Intelligence technology in medicine is beneficial to doctors and also found that both male and female students were equally aware of artificial intelligence. Since AI technology has the potential to develop into an innovative platform which is capable of analyzing more complex medical data, more awareness has to be created for better understanding and analysis of this technology.

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Authors contribution

Ranjana V done literature search, data collection, analysis, manuscript writing. Dr. R Gayathri helped in data verification, manuscript drafting. Dr. V Vishnu Priya and Dr. S kavitha contributed to the title discussion.

Conflict of interest: None declared

Reference

1. Ahuja, A. S. (2019) "The impact of artificial intelligence in medicine on the future role of the physician," *PeerJ*, 7, p. e7702.
2. Ariga, P. *et al.* (2018) "Determination of correlation of width of Maxillary Anterior Teeth using Extraoral and Intraoral Factors in Indian Population: A systematic review," *World journal of dentistry*, 9(1), pp. 68–75.
3. Basha, F. Y. S., Ganapathy, D. and Venugopalan, S. (2018) "Oral hygiene status among pregnant women," *Journal of advanced pharmaceutical technology & research*, 11(7), p. 3099.
4. Bennett, C. C. and Hauser, K. (2013) "Artificial intelligence framework for simulating clinical decision-making: A Markov decision process approach," *Artificial Intelligence in Medicine*, 57(1), pp. 9–19.
5. Briganti, G. and Le Moine, O. (2020) "Artificial Intelligence in Medicine: Today and Tomorrow," *Frontiers in Medicine*, 7. doi: 10.3389/fmed.2020.00027.
6. Chandrasekar, R. *et al.* (2020) "Development and validation of a formula for objective assessment of cervical vertebral bone age," *Progress in orthodontics*, 21(1), p. 38.
7. Chen, F. *et al.* (2019) "6-shogaol, a active constituents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating Nrf2 signaling in human epidermal

- keratinocytes (HaCaT cells),” *Journal of photochemistry and photobiology. B, Biology*, 197, p. 111518.
8. Dilsizian, S. E. and Siegel, E. L. (2014) “Artificial Intelligence in Medicine and Cardiac Imaging: Harnessing Big Data and Advanced Computing to Provide Personalized Medical Diagnosis and Treatment,” *Current Cardiology Reports*, 16(1). doi: 10.1007/s11886-013-0441-8.
 9. Duraisamy, R. *et al.* (2019) “Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments,” *Implant dentistry*, 28(3), pp. 289–295.
 10. Ezhilarasan, D., Apoorva, V. S. and Ashok Vardhan, N. (2019) “Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells,” *Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*, 48(2), pp. 115–121.
 11. Gan, H. *et al.* (2019) “Zingerone induced caspase-dependent apoptosis in MCF-7 cells and prevents 7,12-dimethylbenz(a)anthracene-induced mammary carcinogenesis in experimental rats,” *Journal of biochemical and molecular toxicology*, 33(10), p. e22387.
 12. Gheena, S. and Ezhilarasan, D. (2019) “Syringic acid triggers reactive oxygen species-mediated cytotoxicity in HepG2 cells,” *Human & experimental toxicology*, 38(6), pp. 694–702.
 13. G, R. *et al.* (2018) “CYTOTOXICITY OF STRAWBERRY EXTRACT ON ORAL CANCER CELL LINE,” *Asian Journal of Pharmaceutical and Clinical Research*, 11(9), p. 353.
 14. Hamet, P. and Tremblay, J. (2017) “Artificial intelligence in medicine,” *Metabolism*, 69, pp. S36–S40.
 15. Hannah, R. *et al.* (2018) “Awareness about the use, ethics and scope of dental photography among undergraduate dental students dentist behind the lens,” *Journal of advanced pharmaceutical technology & research*, 11(3), p. 1012.
 16. Hashimoto, D. A. *et al.* (2018) “Artificial Intelligence in Surgery,” *Annals of Surgery*, 268(1), pp. 70–76.
 17. Hema Shree, K. *et al.* (2019) “Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma - a Systematic Review with Meta Analysis,” *Pathology oncology research: POR*, 25(2), pp. 447–453.
 18. Hussainy, S. N. *et al.* (2018) “Clinical performance of resin-modified glass ionomer cement, flowable composite, and polyacid-modified resin composite in noncarious cervical lesions: One-year follow-up,” *Journal of conservative dentistry: JCD*, 21(5), pp. 510–515.
 19. Janani, K., Palanivelu, A. and Sandhya, R. (2020) “Diagnostic accuracy of dental pulse oximeter with customized sensor holder, thermal test and electric pulp test for the evaluation of pulp vitality: an in vivo study,” *Brazilian dental science*, 23(1). doi: 10.14295/bds.2020.v23i1.1805.
 20. Jeevanandan, G. and Govindaraju, L. (2018) “Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial,” *European archives of paediatric dentistry: official journal of the European Academy of Paediatric Dentistry*, 19(4), pp. 273–278.

21. Johnson, J. *et al.* (2020) "Computational identification of MiRNA-7110 from pulmonary arterial hypertension (PAH) ESTs: a new microRNA that links diabetes and PAH," *Hypertension research: official journal of the Japanese Society of Hypertension*, 43(4), pp. 360–362.
22. Jose, J., Ajitha and Subbaiyan, H. (2020) "Different treatment modalities followed by dental practitioners for Ellis class 2 fracture – A questionnaire-based survey," *The open dentistry journal*, 14(1), pp. 59–65.
23. Kannan, A. and Venugopalan, S. (2018) "A systematic review on the effect of use of impregnated retraction cords on gingiva," *Journal of advanced pharmaceutical technology & research*, 11(5), p. 2121.
24. Ke, Y. *et al.* (2019) "Photosynthesized gold nanoparticles from *Catharanthus roseus* induces caspase-mediated apoptosis in cervical cancer cells (HeLa)," *Artificial cells, nanomedicine, and biotechnology*, 47(1), pp. 1938–1946.
25. Kumar, D. and Antony, S. D. P. (2018) "Calcified canal and negotiation-A review," *Journal of advanced pharmaceutical technology & research*, 11(8), p. 3727.
26. Li, Z. *et al.* (2020) "Apoptotic induction and anti-metastatic activity of eugenol encapsulated chitosan nanopolymer on rat glioma C6 cells via alleviating the MMP signaling pathway," *Journal of photochemistry and photobiology. B, Biology*, 203, p. 111773.
27. Long, E. *et al.* (2017) "An artificial intelligence platform for the multihospital collaborative management of congenital cataracts," *Nature Biomedical Engineering*, 1(2). doi: 10.1038/s41551-016-0024.
28. Manohar, M. P. and Sharma, S. (2018) "A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists," *Indian journal of dental research: official publication of Indian Society for Dental Research*, 29(6), pp. 716–720.
29. Mathew, M. G. *et al.* (2020) "Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: Randomized controlled trial," *Clinical oral investigations*, pp. 1–6.
30. Ma, Y. *et al.* (2019) "Sesame Inhibits Cell Proliferation and Induces Apoptosis through Inhibition of STAT-3 Translocation in Thyroid Cancer Cell Lines (FTC-133)," *Biotechnology and Bioprocess Engineering*, 24(4), pp. 646–652.
31. Menon, A., V. V. P. and Gayathri, R. (2016) "PRELIMINARY PHYTOCHEMICAL ANALYSIS AND CYTOTOXICITY POTENTIAL OF PINEAPPLE EXTRACT ON ORAL CANCER CELL LINES," *Asian Journal of Pharmaceutical and Clinical Research*, p. 140.
32. Menon, S. *et al.* (2018) "Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism," *Colloids and surfaces. B, Biointerfaces*, 170, pp. 280–292.
33. Mohan, S. K., Veeraraghavan, V. P. and Jainu, M. (2015) "Effect of pioglitazone, quercetin and hydroxy citric acid on extracellular matrix components in experimentally induced non-alcoholic steatohepatitis," *Iranian journal of basic medical sciences*, 18(8), pp. 832–836.
34. Nandakumar, M. and Nasim, I. (2018) "Comparative evaluation of grape seed and cranberry

- extracts in preventing enamel erosion: An optical emission spectrometric analysis,” *Journal of conservative dentistry: JCD*, 21(5), pp. 516–520.
35. Nandhini, J. S. T., Babu, K. Y. and Mohanraj, K. G. (2018) “Size, shape, prominence and localization of gerdy’s tubercle in dry human tibial bones,” *Journal of advanced pharmaceutical technology & research*, 11(8), p. 3604.
 36. Pc, J., Marimuthu, T. and Devadoss, P. (2018) “Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study,” *Clinical implant dentistry and related research*. Available at: <https://europepmc.org/article/med/29624863>.
 37. Ponnulakshmi, R. *et al.* (2019) “In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats,” *Toxicology Mechanisms and Methods*, 29(4), pp. 276–290.
 38. Priya, V. V., Jainu, M. and Mohan, S. K. (2018) “Biochemical Evidence for the Antitumor Potential of *Garcinia mangostana* Linn. On Diethylnitrosamine-Induced Hepatic Carcinoma,” *Pharmacognosy magazine*, 14(54), pp. 186–190.
 39. Rajakeerthi and Ms, N. (2019) “Natural Product as the Storage medium for an avulsed tooth – A Systematic Review,” *Cumhuriyet Üniversitesi Diş Hekimliği Fakültesi dergisi*, 22(2), pp. 249–256.
 40. Rajendran, R. *et al.* (2019) “Comparative evaluation of remineralizing potential of a paste containing bioactive glass and a topical cream containing casein phosphopeptide-amorphous calcium phosphate: An in vitro study,” *Pesquisa brasileira em odontopediatria e clinica integrada*, 19(1), pp. 1–10.
 41. Ramadurai, N. *et al.* (2019) “Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial,” *Clinical oral investigations*, 23(9), pp. 3543–3550.
 42. Ramesh, A. *et al.* (2018) “Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study,” *Journal of periodontology*, 89(10), pp. 1241–1248.
 43. Ramesh, A. N. *et al.* (2004) “Artificial intelligence in medicine,” *Annals of The Royal College of Surgeons of England*, 86(5), pp. 334–338.
 44. Ravinthar, K. and Jayalakshmi (2018) “Recent advancements in laminates and veneers in dentistry,” *Journal of advanced pharmaceutical technology & research*, 11(2), p. 785.
 45. Rengasamy, G. *et al.* (2018) “Cytotoxic and apoptotic potential of *Myristica fragrans* Houtt. (mace) extract on human oral epidermal carcinoma KB cell lines,” *Brazilian Journal of Pharmaceutical Sciences*, 54(3). doi: 10.1590/s2175-97902018000318028.
 46. Rengasamy, G., Jebaraj, D.M., Veeraraghavan, V.P., Mohan, S.K. (2016) “Characterization, partial purification of alkaline protease from intestinal waste of *scomberomorus guttatus* and production of laundry detergent with alkaline protease additive,” *Indian Journal of Pharmaceutical Education and Research*, 50(2s), pp. S59–S67.
 47. R, H. *et al.* (2020) “CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene,” *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, pp. 306–312. doi: 10.1016/j.oooo.2020.06.021.

48. Samuel, S. R. (2021) "Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life?," *International journal of paediatric dentistry / the British Paedodontic Society [and] the International Association of Dentistry for Children*, 31(2), pp. 285–286.
49. Sekar, D. *et al.* (2019) "Methylation-dependent circulating microRNA 510 in preeclampsia patients," *Hypertension research: official journal of the Japanese Society of Hypertension*, 42(10), pp. 1647–1648.
50. Seppan, P. *et al.* (2018) "Therapeutic potential of *Mucuna pruriens* (Linn.) on ageing induced damage in dorsal nerve of the penis and its implication on erectile function: an experimental study using albino rats," *The aging male: the official journal of the International Society for the Study of the Aging Male*, pp. 1–14.
51. Sharma, P. *et al.* (2019) "Emerging trends in the novel drug delivery approaches for the treatment of lung cancer," *Chemico-biological interactions*, 309, p. 108720.
52. Shortliffe, E. H. (2019) "Artificial Intelligence in Medicine: Weighing the Accomplishments, Hype, and Promise," *Yearbook of medical informatics*, 28(1), pp. 257–262.
53. Shukri, N. M. M. *et al.* (2016) "Awareness in childhood obesity," *Research Journal of Pharmacy and Technology*, 9(10), p. 1658.
54. Siddique, R. *et al.* (2019) "Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi," *Journal of conservative dentistry: JCD*, 22(1), pp. 40–47.
55. Sridharan, G. *et al.* (2019) "Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma," *Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*, 48(4), pp. 299–306.
56. Tai, A. M. Y. *et al.* (2019) "Machine learning and big data: Implications for disease modeling and therapeutic discovery in psychiatry," *Artificial Intelligence in Medicine*, 99, p. 101704.
57. Teja, K. V., Ramesh, S. and Priya, V. (2018) "Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study," *Journal of conservative dentistry: JCD*, 21(6), pp. 592–596.
58. Tran, B. *et al.* (2019) "Global Evolution of Research in Artificial Intelligence in Health and Medicine: A Bibliometric Study," *Journal of Clinical Medicine*, 8(3), p. 360.
59. Tran, B. X. *et al.* (2019) "Characterizing Artificial Intelligence Applications in Cancer Research: A Latent Dirichlet Allocation Analysis," *JMIR Medical Informatics*, 7(4), p. e14401.
60. Vellido, A. (2019) "Societal Issues Concerning the Application of Artificial Intelligence in Medicine," *Kidney diseases (Basel, Switzerland)*, 5(1), pp. 11–17.
61. Vijayashree Priyadharsini, J. (2019) "In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens," *Journal of periodontology*, 90(12), pp. 1441–1448.

62. Vijayashree Priyadharsini, J., Smiline Girija, A. S. and Paramasivam, A. (2018) "In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species," *Archives of oral biology*, 94, pp. 93–98.
63. Vuong, Q.-H. *et al.* (2019) "Artificial Intelligence vs. Natural Stupidity: Evaluating AI readiness for the Vietnamese Medical Information System," *Journal of Clinical Medicine*, 8(2), p. 168.
64. Wang, Y. *et al.* (2019) "Synthesis of Zinc oxide nanoparticles from *Marsdenia tenacissima* inhibits the cell proliferation and induces apoptosis in laryngeal cancer cells (Hep-2)," *Journal of photochemistry and photobiology. B, Biology*, 201, p. 111624.
65. Wu, F. *et al.* (2019) "Biologically synthesized green gold nanoparticles from Siberian ginseng induce growth-inhibitory effect on melanoma cells (B16)," *Artificial cells, nanomedicine, and biotechnology*, 47(1), pp. 3297–3305.
66. Wu, J. T. *et al.* (2018) "Behind the scenes: A medical natural language processing project," *International Journal of Medical Informatics*, 112, pp. 68–73.

Figure Legends

Figure 1 represents the distribution of participants based on awareness that with AI, even a smart phone selfie could become a powerful diagnostic tool, where 57% (Red) of the participants were aware and 43% (Blue) were not aware of it.

Figure 2 represents the distribution of participants based on opinion that AI may cause job cuts on a larger scale, where 48% (Blue) responded to definitely, 20% (Red) responded to definitely not, 32% (Green) have no opinion on it.

Figure 3 represents the distribution of participants based on opinion that AI can take over the medical industry, where 51% (Blue) responded to definitely, 26% (Red) responded to definitely not and 23% (Green) have no opinion on it.

Figure 4 represents the distribution of participants based on opinion that AI as a course to be added to curriculum, where 57% (Red) think it needs to be added and 43% (Blue) think it's not needed.

Figure 5 represents the distribution of participants based on opinion that supports AI in the medical field, where 62% (Red) support and 38% (Blue) do not support.

Figure 6: Bar chart representing association between gender and opinion on beneficial role of artificial intelligence in the medical industry. X axis represents gender and Y axis represents the number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that artificial intelligence is beneficial than males, however, it is statistically not significant (Pearson's chi square value = 2.529, df = 1, p value = 0.112(>0.05)).

Figure 7: Bar chart representing association between gender and opinion on whether artificial intelligence technology is a threat in the Medical industry. X axis represents gender and Y axis represents the number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that artificial intelligence technology is a threat than males and it is statistically significant (Pearson's chi square value = 4.019, df = 1, P value = 0.045(<0.05)).

Figure 8: Bar chart showing the association between gender and their opinion on revolutionizing the clinical decision and diagnosis with the help of AI. X axis represents Gender and Y axis represents number of participants who responded 'yes' (Red) and 'no' (Blue). Males strongly

believe that clinical decision and diagnosis with the help of AI can be revolutionized than females, however, it is statistically not significant (Pearson's chi square value = 0.187, df = 1, P value = 0.665(>0.05)).

Figure 9: Bar chart showing the association between Gender and their opinion on the role of artificial intelligence as a tool in the analysis of medical data without direct human input. X axis represents Gender, Y axis represents number of participants who said 'yes' (Red) and 'no' (Blue). Males strongly believe that artificial intelligence is a tool in the analysis of medical data without direct human input than females, however, it is statistically not significant (Pearson's chi square value = 2.058, df = 1, P value = 0.151(>0.05)).

Figure 10: Bar chart showing the association between Gender and their opinion on whether learning AI may become essential in the future. X axis represents Gender, Y axis represents number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that learning AI may become essential in the future than males, however, it is statistically not significant (Pearson's chi square value = 1.940, df = 1, P value = 0.164(>0.05)).

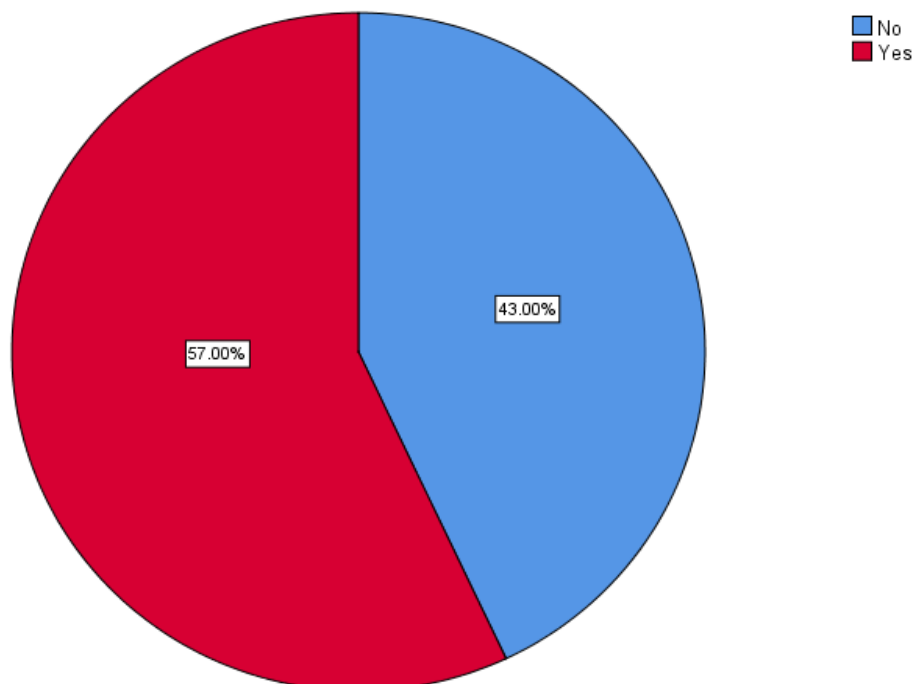


Figure 1 represents the distribution of participants based on awareness that with AI, even a smart phone selfie could become a powerful diagnostic tool, where 57% (Red) of the participants were aware and 43% (Blue) were not aware of it.

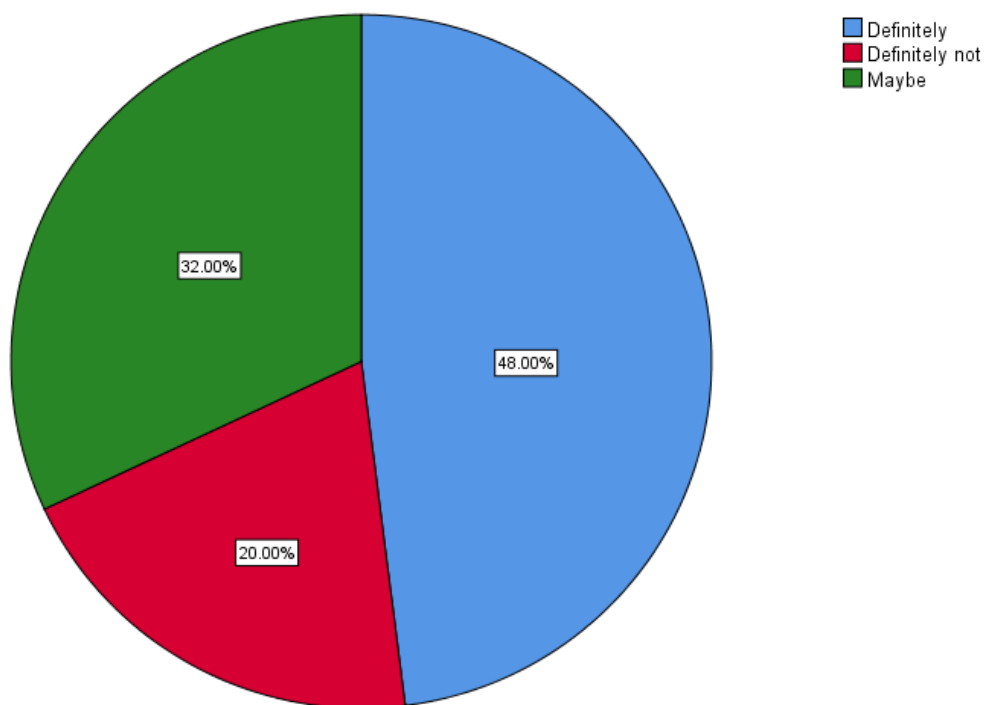


Figure 2 represents the distribution of participants based on opinion that AI may cause job cuts on a larger scale, where 48% (Blue) responded definitely, 20% (Red) responded definitely not, 32% (Green) have no opinion on it.

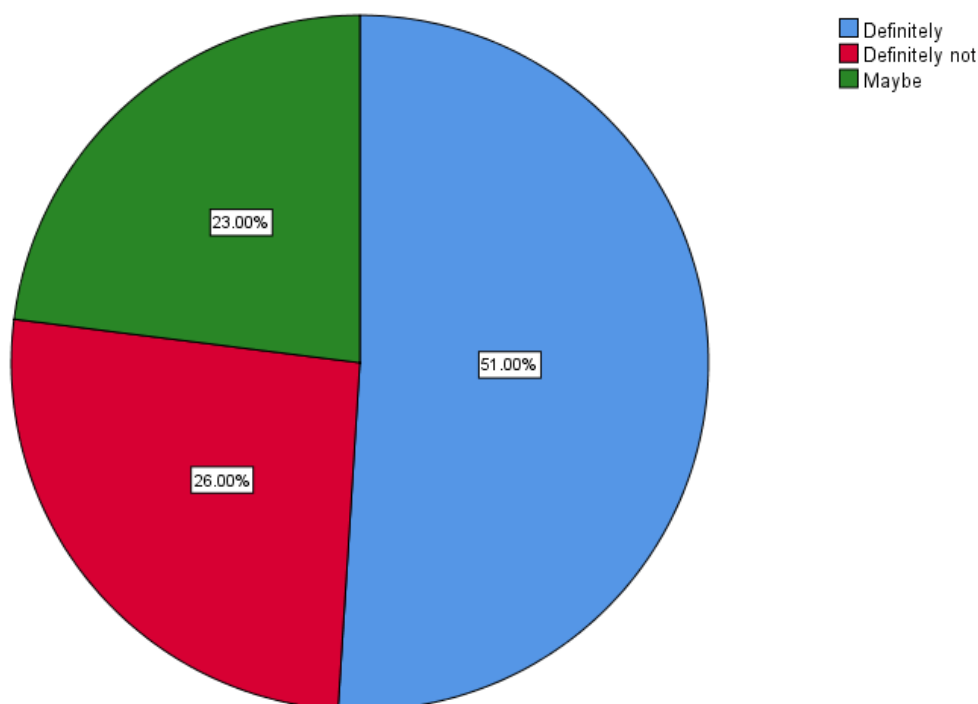


Figure 3 represents the distribution of participants based on opinion that AI can take over the medical industry, where 51% (Blue) responded definitely, 26% (Red) responded definitely not and 23% (Green) have no opinion on it.

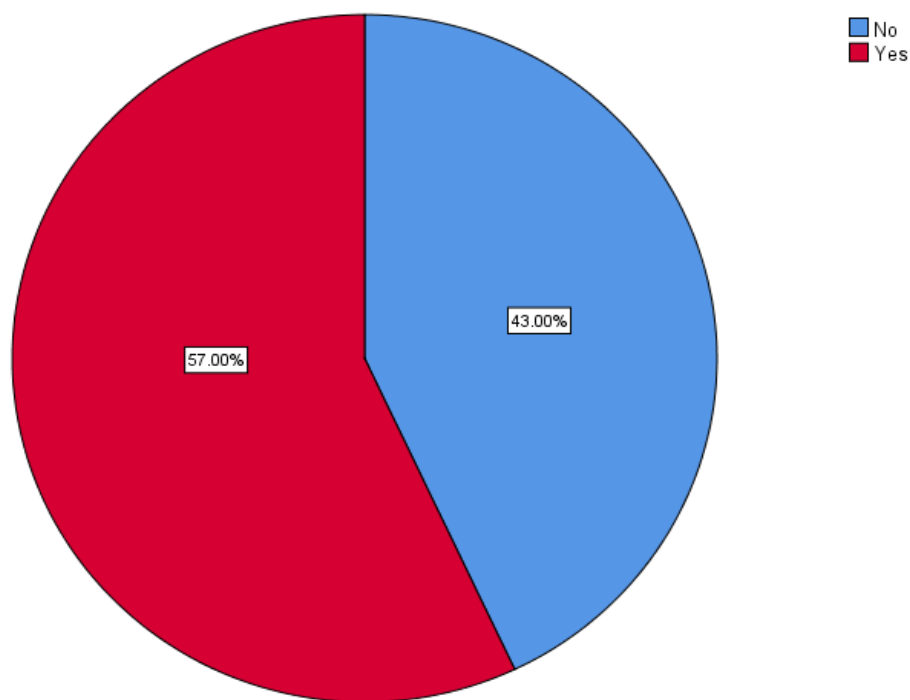


Figure 4 represents the distribution of participants based on opinion that AI as a course to be added to curriculum, where 57% (Red) think it needs to be added and 43% (Blue) think it's not needed.

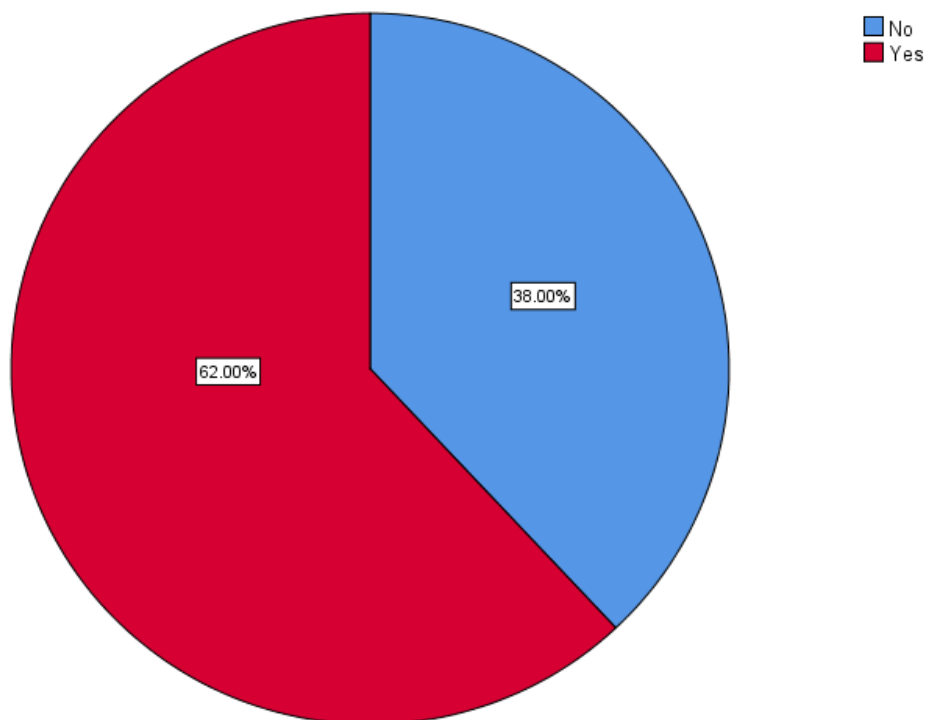


Figure 5 represents the distribution of participants based on opinion that supports AI in the medical field, where 62% (Red) support and 38% (Blue) do not support.

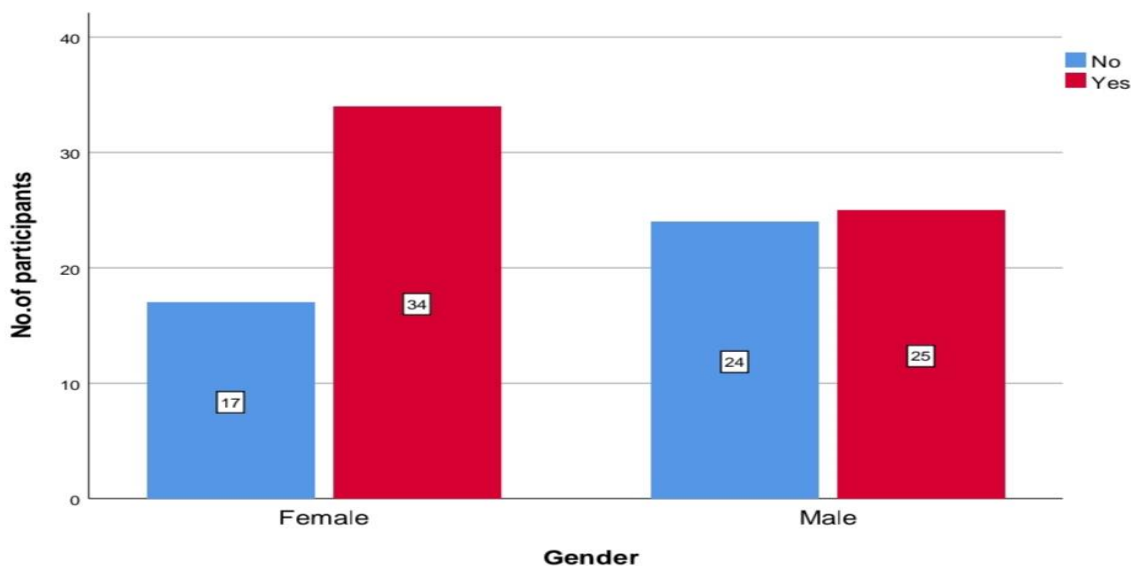


Figure 6: Bar chart representing association between gender and opinion on beneficial role of artificial intelligence in the medical industry. X axis represents gender and Y axis represents the number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that artificial intelligence is beneficial than males, however, it is statistically not significant (Pearson's chi square value = 2.529, df = 1, p value = 0.112(>0.05)).

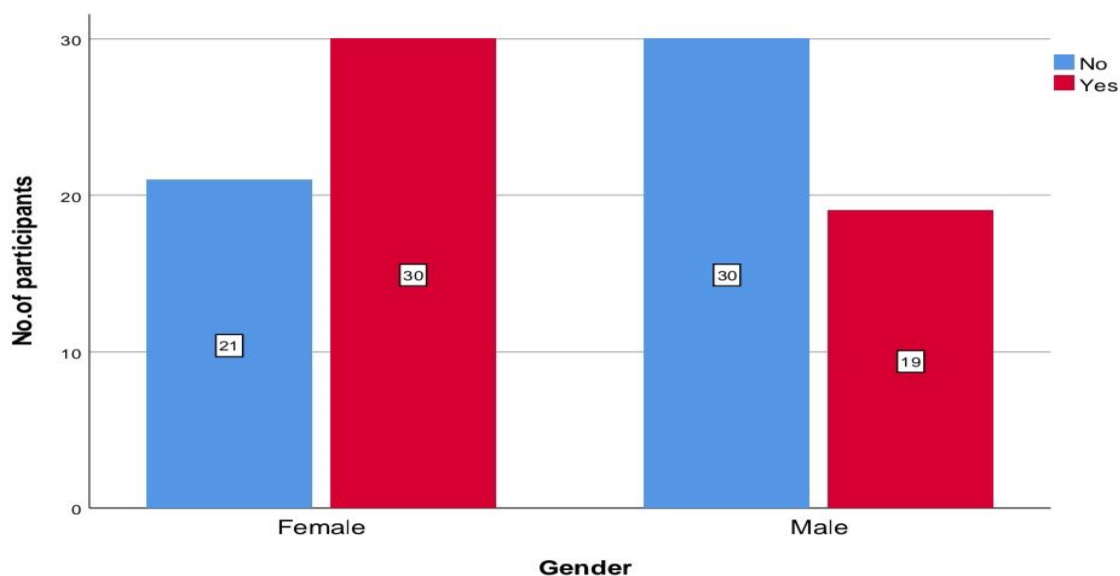


Figure 7: Bar chart representing association between gender and opinion on whether artificial intelligence technology is a threat in the Medical industry. X axis represents gender and Y axis represents the number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that artificial intelligence technology is a threat than males and it is statistically significant (Pearson's chi square value = 4.019, df = 1, P value = 0.045(<0.05)).

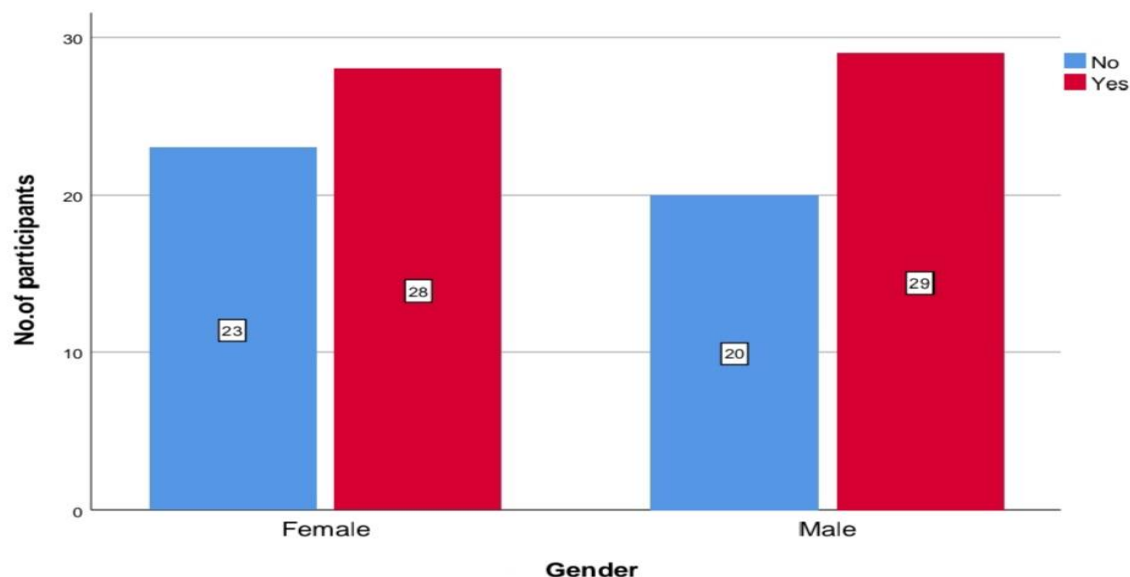


Figure 8: Bar chart showing the association between gender and their opinion on revolutionizing the clinical decision and diagnosis with the help of AI. X axis represents Gender and Y axis represents number of participants who responded 'yes' (Red) and 'no' (Blue). Males strongly believe that clinical decision and diagnosis with the help of AI can be revolutionized than females, however, it is statistically not significant (Pearson's chi square value = 0.187, df = 1, P value = 0.665(>0.05)).

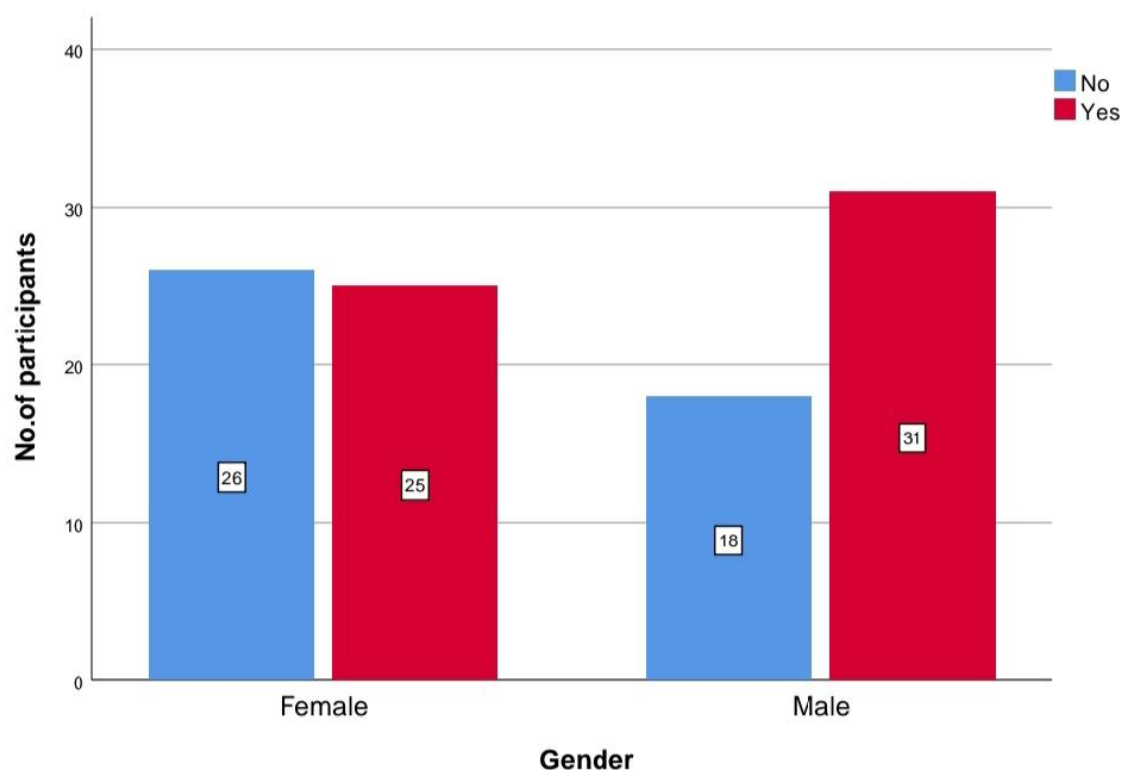


Figure 9: Bar chart showing the association between Gender and their opinion on the role of artificial intelligence as a tool in the analysis of medical data without direct human input. X axis

represents Gender, Y axis represents number of participants who said 'yes' (Red) and 'no' (Blue). Males strongly believe that artificial intelligence is a tool in the analysis of medical data without direct human input than females, however, it is statistically not significant (Pearson's chi square value = 2.058, df = 1, P value = 0.151(>0.05)).

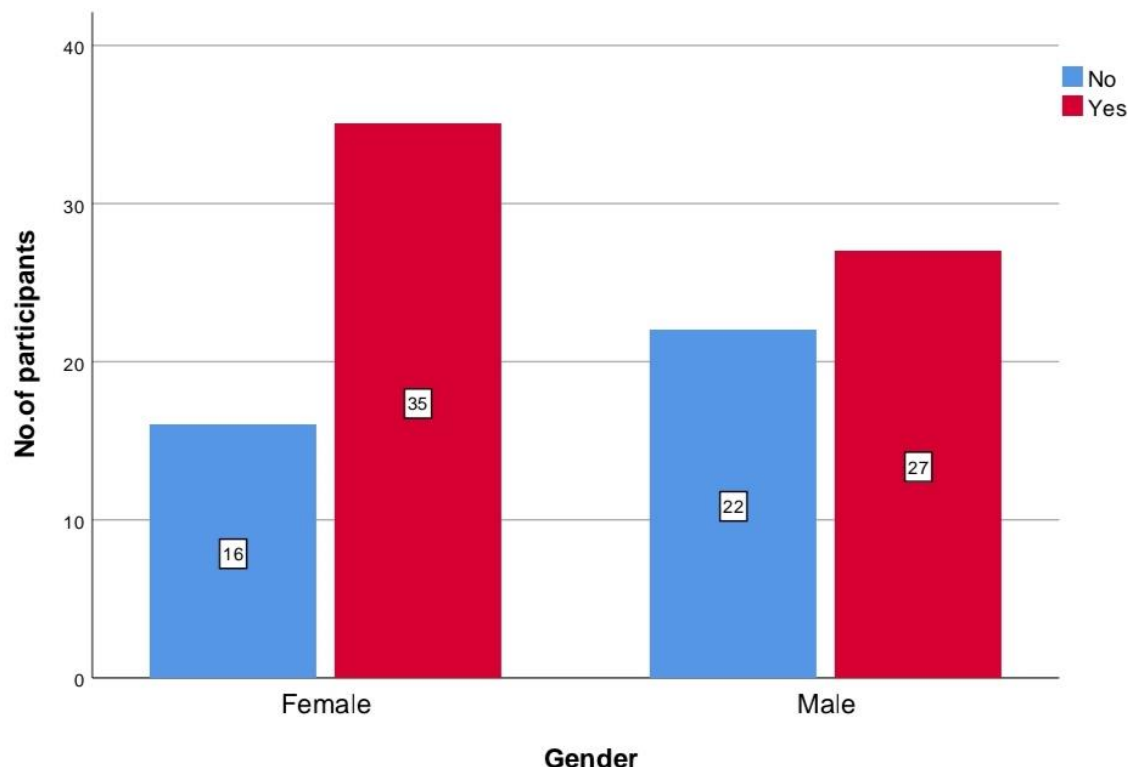


Figure 10: Bar chart showing the association between Gender and their opinion on whether learning AI may become essential in the future. X axis represents Gender, Y axis represents number of participants who responded 'yes' (Red) and 'no' (Blue). Females strongly believe that learning AI may become essential in the future than males, however, it is statistically not significant (Pearson's chi square value = 1.940, df = 1, P value = 0.164(>0.05)).