

# AWARENESS, KNOWLEDGE AND ATTITUDE OF COMPUTER-AIDED DESIGNING AND COMPUTER-AIDED MANUFACTURING AMONG DENTAL SURGEONS IN LAHORE, PAKISTAN

<sup>1</sup>KHADIJA IMRAN, <sup>2</sup>AAQIL MALIK, <sup>3</sup>USMAN YOUSAF, <sup>4</sup>HAMNA HOOR, <sup>5</sup>MUHAMMAD AFZAL,  
<sup>6</sup>GULREZ AMIN

## ABSTRACT

*The application, knowledge, and attitude dentists towards CAD / CAM technology in Pakistan showed very few publications.*

**Objective:** *The purpose of this study was to evaluate the awareness, knowledge, and attitude towards CAD and CAM among postgraduate dental students and practitioners in Pakistan.*

**Methodology:** *A cross-sectional questionnaire-based survey was conducted at various institutions including University College of Dentistry UOL, Fatima Memorial Hospital, private clinics throughout Lahore that focused on postgraduate students, private dental practitioners, and teaching faculty. Data was collected from September 2022 to November 2022. SPSS version 20.0 software was used to analyze the data collected through a Chi-square test to determine if there were any significant correlations between questionnaire items and practitioner type with a p-value significance level set at 0.05.*

**Results:** *The study had 220 participants. 118 (53.6%) house surgeons, 39 (17.7%) postgraduates, 26 (11.8%) private practitioners and 37 (16.8%) were teaching faculty. About 70% of the participants believed that CAD/CAM technology could be applied to implant restorations while 60 (27.3%) knew about its use for digital impressions; 40 (18.2%) acknowledged its superior precision as compared to conventional methods. In addition to this, the study found that 122 (55.5%) participants deemed less chair-side time required by CAD/CAM advantageous in clinical scenarios.*

**Conclusion:** *This study showed that awareness about CAD / CAM does exist among dentists; however, they have very scarce knowledge about its applications to clinical settings and an urgent need at the undergraduate and post graduate level is needed.*

**Key Words:** *CAD / CAM, Awareness, Knowledge, Attitude, Dentists*

---

**This article may be cited as:** Imran K, Malik A, Yousaf U, Hoor H, Afzal M, Amin G. Awareness, knowledge and attitude of computer-aided designing and computer-aided manufacturing among dental surgeons in Lahore, Pakistan. *Pak Oral Dent J* 2024; 44(1):44-50.

---

<sup>1</sup> Dr Khadija Imran ; (Corresponding Author); BDS, University College of Medicine and Dentistry, The University Of Lahore Email: imrankhadija202@gmail.com Address: House no.47A, Block H-2, Johar Town, Lahore Contact: +92334991241

<sup>2</sup> Dr Aaqil Malik; BDS, M.Sc. Implantology, University Sains Malaysia, MSc. Digital Dentistry, UK Email: aaqilmalik@gmail.com Address: 672 X Sector, St 17, Ph 3, DHA, Lahore Contact: +92332327462

<sup>3</sup> Dr Usman Yousaf ; BDS, FCPS(Orthodontics), Assistant Professor, Department Of Orthodontics, University College of Medicine and Dentistry, The University Of Lahore Email: drusmanyousaf@hotmail.com Address: 384-B2, Johar Town, Lahore Contact: +923324755770

<sup>4</sup> Dr Hamna Hoor ; BDS, University College of Medicine and Dentistry, The University Of Lahore Email: hamnahoor83@gmail.com Address: 73-C, DHA Rahbar Lahore Contact: +923234385134

<sup>5</sup> Dr Muhammad Afzal ; BDS, FCPS, Associate Professor(Prosthodontics), Institute of Dentistry, CMH Lahore Medical College Email: m.afzal.74@gmail.com Address: House no.360, Street 7, Sector D, Askari 10, Lahore Cantt Contact: +923214692278

<sup>6</sup> Dr Gulrez Amin ; BDS, MPhil, PhD, Associate Professor, Biochemistry Department, University College of Medicine and Dentistry, The University Of Lahore Email: gulrezamin27@gmail.com Address: 816 Z, Phase 3, DHA, Lahore Contact: +923034460042

**Received for Publication:** Aug 21, 2023

**Revised:** Feb 12, 2024

**Approved:** Feb 16, 2024

## INTRODUCTION

Digital dentistry is no longer a pipe dream for the distant future; it is here and now. Computer-aided design and computer-aided manufacture (CAD/CAM) technology was launched in 1960's for the purpose of aircraft and automotive industry.<sup>1</sup> Now widely being used in vast branches of dentistry including crown and bridge fabrication, implant surgery planning and guides, aligners, orthognathic surgery planning, orthognathic surgery, guide for mini plates, inlay, onlay, overlay fabrication.<sup>2</sup>

Western countries have adopted CAD/CAM into their routine dental practices delivering more durable, marginally adaptive, more esthetically pleasing and faster restorations as compared to the conventional ones.<sup>3</sup> However in Pakistan only a few dental surgeons use CAD/CAM in their regular workflow. Despite being aware of CAD/CAM technology only a limited fraction

of them acknowledge its use and benefits.

The digital workflow allows for better precision and accuracy of restorations. This begins with the imaging technologies which have emerged including Cone beam Computed tomography (CBCT) which allows for precise images. In a study done on accuracy and reproducibility of CBCT it was found that measurements of mean difference were less than 0.5mm in all planes where voxel size was 0.15mm, this meant that CBCT provided a valuable measuring tool in various fields of view (FOV).<sup>4</sup> In comparison conventional radiography in the form of Periapical Xrays and Orthopantomograms(OPG) have distortion and magnifications to deal with. In a study it was noted that in the vertical dimension 10.8% to 13% of magnification was noted in the maxilla and 7.09% and 5.96% was noted in the mandible.<sup>5</sup> A similar problem can be found with distortion in OPG where in a study it was found to be less than 30% and as high as 50%.<sup>6</sup>

Its value can be appreciated in different studies where CBCT has been used in endodontics.<sup>7</sup> For the detection of periapical lesions, root lengths where an apex locator is unable to detect the length due to a lesion in the apex, all forms of resorption be it internal, external and apical. Missed canals, intracanal foreign body material or broken instruments. They can also be used for apical periodontitis and also surgical planning of endodontically compromised teeth.<sup>8</sup>

Technological advancement now can enable guided endodontics where non surgical endodontic treatment is considered. Detection of calcified canals and more importantly detection of close proximity of vital anatomical structures close to surgical sites.<sup>9</sup> An astounding development has been the use of Artificial Intelligence (AI) for the detection of periapical lesions<sup>10</sup>, in another study for the detection of crown and root fracture detection.<sup>11</sup> The detection of a crown or a root fracture was anecdotal a great improvement due to digital technologies.

Another advancement in the digital front was the scanning technology which converts a physical object into a 3D object which can be edited, modified and a prosthesis designed, fabricated according to the need of the patient.<sup>12</sup> Conventional impressions are no longer required Intraoral scanners (IOS) provide impressions which are directly digitized and sent to a software, there is no need for impression trays, impression materials. An added advantage is patients who have a gag reflex when impressions no longer have to face this problem, in a study of patient preferences computer aided impressions were the preferred modality.<sup>13</sup> With the help of a digital impression the workflow results in a time efficient impression to fabrication process.

The CAD/CAM process has revolutionized the dental prosthetic and surgical workflow. Guided surgery for endodontics, Implantology, maxillofacial surgery has made it possible to attain the same accuracy with which it is planned in software, benefits of 3D printing are utilized in surgery in this way.<sup>14</sup> The benefits of which are long term longevity in prosthesis fabrication.

Milling by CAD/CAM workflow can produce crowns, bridges and implant prosthesis with a mean gap at the marginal opening was 15 (+/- 7)  $\mu$ m and 9 (+/- 5)  $\mu$ m.<sup>15</sup> This high quality of prosthesis ensures remakes are not required and single visit prosthesis are now fabricated in chairside clinical settings.<sup>16</sup> Teeth in a day are now possible thanks to this technology which has been around for half a decade.

The speed with which advancements have taken place in digital dentistry in foreign countries has not been compared to developed cities in Pakistan. Surveys have been done regarding the awareness and perception of undergraduate dental students regarding CAD/CAM and its role in the future of dentistry.<sup>17</sup> However, the research to investigate awareness, knowledge and attitude of CAD/CAM among postgraduate dental students and dental practitioners in Pakistan was scarce. Moreover, there was a need to assess the level at which basic knowledge about CAD/CAM should be given to make the the students and fresh graduated accustomed to digital dentistry. Hence this study was undertaken with an intent to assess awareness, knowledge and attitude of CAD/CAM among dental surgeons.

## MATERIALS AND METHODS

This was a cross-sectional questionnaire-based study conducted at University college of dentistry, University of Lahore, Fatima memorial hospital and private clinics which focussed on postgraduate students, private dental practitioners and teaching faculty from across Lahore. The study duration was data was 2 months from September 2022 to November 2022.

The sample size was calculated using OpenEpi, with confidence level of 95% and 5% error margin. The sample size for this study was calculated as 220 participants.

The research involved postgraduate students, teaching staff from various dental institutions, and private practitioners. Those who declined to participate were not included, and undergraduate students were also excluded. A previously validated questionnaire from a prior publication was utilized.<sup>18</sup> The questionnaire was then designed using web based electronic software (Google forms) and was distributed using social media platform (Whatsapp) and face to face. The questionnaire was comprised of 21 questions, 19 were closed ended and 2 were open ended. It was divided into 4 parts; the

demographic details (Q no.1-5), awareness based (Q no. 6-9), knowledge based (Q no. 10-14), attitude-based questions (Q no. 15-21).

The responses from all participants were compiled in an MS Excel spreadsheet. Statistical analysis was conducted using SPSS software version 20.0, employing the Chi-square test to determine any significant associations between questionnaire items and practitioner type, with a significance level set at p-value <0.05.

## RESULTS

A total of 220 participants filled the questionnaire out of which 118 (53.6%) respondents were house surgeons, 39 (17.7%) were postgraduate students, 26 (11.8%) were private practitioners and 37 (16.8%) were teaching faculty. Most of the participants were practicing as a general dental surgeon (Table 1).

When asked about the awareness regarding CAD/CAM technology in dentistry, most of the participants were aware (95%) however they were not aware of

any CAD/CAM system but CEREC (37.3%) selected by private practitioners (65%) with the p value 0.002. 67.3% of participants were aware of zirconia as CAD/CAM material and 46% of private practitioners were aware of metal and composite with a p value of 0.009 and 0.047 respectively (Table 2).

Regarding the application of the CAD/CAM in dentistry, a greater number of respondents (70.5%) thought it was applicable in implant restorations and only 60 (27.3%) participants had knowledge of CAD/CAM's application in invisible orthodontics. About the use of CAD/CAM, 133 (60.5%) participants had knowledge of digital impressions as its major use, though some were of the opinion that it could be used in shade matching (23.6%) and intraoral scanner (42.7%). (Table 3) also shows the knowledge of the participants regarding the advantages of CAD/CAM having digital data flow as the most preferred option (58.2%) while only 40 (18.2%) participants thought it to be more precise as compared to the conventional method.

TABLE 1: PROFESSIONAL STATUS, GENDER, YEARS OF PRACTICE AND STAGE IN DENTAL CAREER

	N	%
1. What is your professional status?		
Undergraduate	8	3.6%
Postgraduate student	39	17.7%
House officer	110	50%
Private practitioner	26	11.8%
Teaching faculty	37	16.8%
2. Gender		
Male	71	32.3%
Female	149	67.7%
3. How many years of clinical experience do you have?		
<5 Years	130	59.1%
5-10 Years	43	19.5%
>10 Years	32	14.5%
N/A	15	6.8%
4. Location of practice		
Teaching hospital	137	62.3%
Private clinic	42	19.1%
Hospital (Govt./Private)	34	15.5%
N/A	7	3.2%
5. At what stage are you in your professional status?		
Student	21	9.5%
PG	43	19.5%
GD	118	53.6%
SD	38	17.3%

TABLE 2: AWARENESS ABOUT DIGITAL TECHNOLOGY USE IN DENTISTRY.

6. Are you aware of CAD/CAM technology in dentistry?		
Yes	209	95%
No	11	5%
7. Are you aware of the use of digital technology in dentistry?		
Yes	198	90%
No	22	10%
8. Are you aware of different CAD/CAM systems used in dentistry?		
Lava	27	12.3%
DCS precedent (CEREC)	22	10%
Procera	82	37.3%
No idea	22	10%
	113	51.4%
9. Are you aware of different materials used with CAD/CAM in dentistry?		
E Max	114	51.8%
Zirconia	148	67.3%
Metals	48	21.8%
Composite	56	25.5%
No idea	43	19.5%

TABLE 3: APPLICABILITY, KNOWLEDGE AND ADVANTAGES OF CAD/CAM IN DENTISTRY.

	n	%
10. Where do you think CAD/CAM is applicable?		
Crown and bridge fabrication	94	42.7%
Implant restorations	155	70.5%
Impression making Maxillofacial prosthesis	98	44.5%
Maxillofacial prosthesis	90	40.9%
Surgical reconstruction	87	39.5%
Smile designing	65	29.5%
Invisible orthodontics	60	27.3%
None of the above	35	15.9%
11. What is your knowledge regarding the use of CAD/CAM in dentistry?		
Intraoral Scanning	94	42.7%
Digital impressions	133	60.5%
Shade matching	52	23.6%
Computer aided manufacturing by lab	81	36.8%
Computer aided designing by lab	83	37.7%
12. What do you think are the advantages of CAD/CAM in dentistry? *		
Reduce number of appointments	106	48.2%
Digital data flow	128	58.2%
Less chair side time	122	55.5%
More precise as compared to conven- tional methods	40	18.2%
Others	11	5%



TABLE 4: QUESTIONS REGARDING ADVANTAGES AND SHORTCOMINGS OF CAD/CAM

13. What do you think are the advantages of CAD/CAM in clinical scenario?	N	%
Eliminate the problem associated with impression making	123	55.9%
Can review your preparation and modify it at the same time	107	48.6%
Immediate data transfer and retrievability of scan data at any point	126	57.3%
Ease in laboratory authorization and communication	142	64.5%
Accurate and precise fit of restoration/orthodontic appliance	10	45.5%
Accurate and precise orthodontic tooth movement	59	26.8%
14. What do you think are shortcomings of use of CAD/CAM in your practice?		
High cost	191	86.8%
Lack of infrastructure	90	40.9%
Prefer conventional method	34	15.5%
No laboratory Support	54	24.5%
Not applicable	6	2.7%

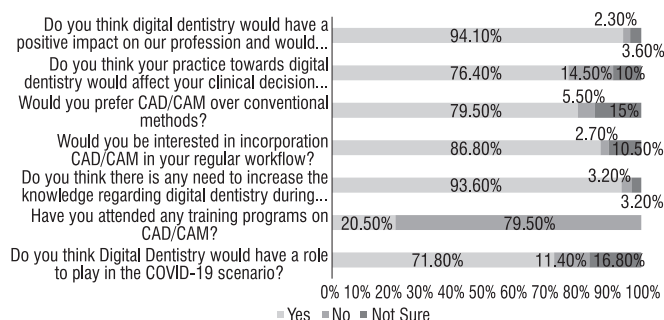


TABLE 5: Attitude of participants towards CAD/CAM dentistry

Regarding advantages and shortcomings, (55.9%) participants thought that problems of impression making would be eliminated with CAD/CAM. (64.5%) of participants thought ease in laboratory authorization and communication was an advantage of cad cam in clinical scenario and (56.4%) of the participants thought lack of the knowledge as a shortcoming of CAD/CAM which was second to the option of high cost (86.8%) being the number one reason for adopting CAD/CAM as a new modality according to our study (Table 4).

The attitude of the participants was assessed in with 94.1% of the respondents in favor of digital dentistry’s positive impact on our profession in future having a p value of 0.026 with highest percentage of house surgeons. A great number of participants thought that their practice towards digital dentistry would affect their clinical decision making ability in contrast with the 14.50% who disagreed with it. Majority of them would prefer CAD/CAM over conventional methods and showed interest in incorporating it in their regular workflow. About 93.6% people showed positive attitude regarding the need to increase the knowledge about digital dentistry

at undergraduate and postgraduate levels. When asked about attending any training programs an alarming percentage (79.5%) of the participants never attended any related program. 71.8% of them were affirmative of the role of CAD/CAM in COVID-19 scenerio however 16.8% were not confident.

DISCUSSION

Most of our participants had knowledge of the CAD/CAM system in dentistry (95%) compared to the study by Nayakar et al in which (96.6%) had knowledge about the use of CAD/CAM, moreover regarding different systems in the market the Indian study showed (67.41%) of the respondents being aware about the world popular CEREC system while our study showed (37.3%) having knowledge about it. One noteworthy aspect in our study was that over (50.4%) had no knowledge about any CAD/CAM systems existence compared to (22.2%) by Nayakar<sup>18</sup>

The applicability of CAD/CAM is a starting point, and the knowledge of our participants showed the majority thought it was used in implant prosthesis fabrication (70.5%) and crown and bridge fabrication (42.7%) and (44.5%) thought it was used in impressions for maxillofacial prosthesis. Another shocking revelation was that (15.9%) of our participants thought it was not applicable in any of the mentioned workflows. In comparison the Nayakar study showed awareness above (63%) being the least awareness percentage in the application of CAD/CAM and (86.6%) knowing full well the application of crown and bridge fabrication with digital impressions application at (63.3%) to mention a couple.

Other studies done in Karachi recently in 2022 have shown students’ knowledge of CAD/CAM among

undergraduate students was dismal with students thinking that waxes, metals and zirconium are all used in CAD/CAM, as these materials are used in 3d printing, however the participants in this study that have never seen or do not know about CAD/CAM were (87.3%) and only (12.2%) had knowledge about it.<sup>17</sup>

According to our study most of the participants (64.5%) thought that ease in laboratory authorization and communication was advantage of CAD/CAM compared to the survey conducted by Nayakar et al<sup>18</sup> where participants were of opinion immediate data transfer and retrievability of scanned data at any point was an advantage.

Considering the significant advantages, one of the key issues in adapting the recent technologies in developing countries like Pakistan is financial and economic instability, when asked about the shortcomings of CAD/CAM, 86.8% dental surgeons considered high cost according to our survey. Similar results were seen in a study conducted in UK (United Kingdom) where majority of the dental surgeons thought high initial costs and lack of perceived advantages over conventional restorations were the major shortcomings of CAD/CAM system.<sup>19</sup> A contradiction was seen in another study where the participants considered lack of knowledge as major shortcomings.<sup>18</sup>

When asked about the role of digital dentistry (94.10 %) of the dental surgeons recommended that it would have a positive impact on our profession and would be the future of dental practice. However most of them (79.50%) agreed that they did not attend any training programs on CAD/CAM which pretty alarming in this digital era. Most of the respondents (93.6%), mainly house surgeons acknowledged that there was a need to increase the knowledge regarding digital dentistry during undergraduate and postgraduate levels thus enhancing and encouraging the future dental surgeons to cope with this age of technology. A study by Tran D et al., suggested incorporation of CAD/CAM technology into continuing dental education programs so that evidence based courses are taught in university based programs.<sup>19</sup>

Studies done in Saudi Arabia showed (85.9%) of the interns and (95.6%) of the students were aware of the CAD/CAM technology, showing that the curriculum had recently incorporated digital technology. The participants were all aware that CAD/CAM restorations superiority to conventional methods and its inclusion into the teaching was suggested.<sup>20</sup>

In a study conducted in India about digital dentures the awareness about them was found to be (95.3%) out of this group (60.1%) do not use the digital workflow, (27%) and (9.5%) were not confident in practicing the

workflow.<sup>21</sup>

In a separate study where awareness about CAD/CAM was 73.6%, our study showed 95% awareness however when it came to use of the technology about 39.7% of participants had used CAD/CAM system in their clinical practice which was a significantly higher than the participants in our study where (20.5%) had formal training in CAD/CAM.<sup>22</sup>

Hence, in Pakistan there needs to be incorporation of digital dentistry at all levels where knowledge, skill are taught to the dentists. This needs to be done not only at the undergraduate and postgraduate level but also for continuing dental education which must be compulsory for a higher quality of dental practice.

## CONCLUSION

With digitalization of the world in dentistry, it has become a necessity to incorporate the latest systems to meet the better esthetic needs of the patients with better-fitting, more durable and more natural looking (multi-colored and translucent, similar to natural teeth) restorations. For this purpose it is necessary that CAD/CAM courses should be introduced at undergraduate level whereas workshops and hand-on courses should be incorporated at post graduate levels. This will help the future dental surgeons to get accustomed to the recent technologies and stay up to date with the latest information.

## REFERENCES

- 1 Susic I, Travar M, Susic M. The application of CAD / CAM technology in Dentistry. IOP Conference Series: Materials Science and Engineering. 2017;200(1):012020.
- 2 Miyazaki T, Hotta Y, Kunii J, Kuriyama S, Tamaki Y. A review of dental CAD/CAM: current status and future perspectives from 20 years of experience. Dent Mater J. 2009;28(1):44-56. Epub 2009/03/14.
- 3 Samra A, Morais E, Mazur R, Vieira S, Rached R. CAD/CAM in dentistry – a critical review. Revista Odonto Ciência. 2016;31:140.
- 4 Moshfeghi M, Tavakoli MA, Hosseini ET, Hosseini AT, Hosseini IT. Analysis of linear measurement accuracy obtained by cone beam computed tomography (CBCT-NewTom VG). Dent Res J. 2012;9(Suppl 1):S57-62.
- 5 Tang Z, Liu X, Chen K. Comparison of digital panoramic radiography versus cone beam computerized tomography for measuring alveolar bone. Head & Face Medicine. 2017;13(1):2.
- 6 Choi JW. Assessment of panoramic radiography as a national oral examination tool: review of the literature. Imaging Sci Dent. 2011;41(1):1-6.
- 7 Chan F, Brown LF, Parashos P. CBCT in contemporary endodontics. Aust Dent J. 2023;68(1):S39-S55.
- 8 Setzer FC, Lee SM. Radiology in Endodontics. Dent Clin North Am. 2021;65(3):475-86.
- 9 Hawkins TK, Wealleans JA, Pratt AM, Ray JJ. Targeted endodontic microsurgery and endodontic microsurgery: a surgical simulation comparison. International Endodontic Journal. 2020;53(5):715-22.

- 10 Setzer FC, Shi KJ, Zhang Z, Yan H, Yoon H, Mupparapu M, et al. Artificial Intelligence for the Computer-aided Detection of Periapical Lesions in Cone-beam Computed Tomographic Images. *Journal of endodontics*. 2020;46(7):987-93. Epub 2020/05/14.
- 11 Shah H, Hernandez P, Budin F, Chittajallu D, Vimort JB, Walters R, et al. Automatic quantification framework to detect cracks in teeth. *Proc SPIE Int Soc Opt Eng*. 2018;10578(10):12.
- 12 Blum IR. Digital Dentistry: The New State of the Art for General Dental Practice? *Primary dental journal*. 2022;11(4):4. Epub 2022/12/20.
- 13 Vavrickova L, Kapitan M, Schmidt J. Patient-reported outcome measures (PROMs) of digital and conventional impression methods for fixed dentures. *Technol Health Care*. 2023;24(10):THC-230277.
- 14 Lin HH, Lonic D, Lo LJ. 3D printing in orthognathic surgery - A literature review. *J Formos Med Assoc*. 2018;117(7):547-58.
- 15 Beuer F, Naumann M, Gernet W, Sorensen JA. Precision of fit: zirconia three-unit fixed dental prostheses. *Clinical oral investigations*. 2009;13(3):343-9.
- 16 Marchesi G, Camurri Piloni A, Nicolin V, Turco G, Di Lenarda R. Chairside CAD/CAM Materials: Current Trends of Clinical Uses. *Biology*. 2021;10(11).
- 17 Memon L. AZ, Faraz M., Arif S., Kumar B. and Haider I. Knowledge and Awareness of Digital Dentistry among the Dental Students of Karachi, Pakistan: Cross-Sectional Study10.9734/jpri/2022/v34i44A36330. *Journal of Pharmaceutical Research International*. 2022;34(44A):29-39.
- 18 Nayakar R SP, Killedar S, Patil A, Kakodker M. Knowledge, Awareness and Practices of the use of Digital Technology in Dentistry among Postgraduate Students and Dental Practitioners in India: A Cross-sectional Study *J Clin of Diagn Res*. 2022;16((2)).
- 19 Tran D, Nesbit M, Petridis H. Survey of UK dentists regarding the use of CAD/CAM technology. *Br Dent J*. 2016;221(10):639-44.
- 20 Shetty DK ABD, M Hamdi DSS, Aloufi DGT, Abdullah Amer DN. Awareness Among the Undergraduate Dental Students Regarding Computer Aided Design and Computer Aided Manufacturing Technology in Various Universities at Makkah Region, Saudi Arabia- A Questionnaire-Based Study. *Life Sciences-Dental Science Int J Life Sci Pharm Res*. 2022;12(5):L103-L9.
- 21 Sri H, Maiti S, Sasanka K. Knowledge, attitude, and practice of digital dentures among dentists. *Journal of advanced pharmaceutical technology & research*. 2022;13(Suppl 2):S519-S24. Epub 2023/02/18.
- 22 Mandar Todkar RN, Tabassum Sayyad, Afreen Fatima Siddiqui, Firdous Jahan Sayed, Samrin Katanghar. Awareness, attitude and knowledge of computer aided design/computer aided manufacturing (cad/cam) among dental professionals. *Int J Appl Dent Sci*. 2022;Vol. 8 (1):376-81.

#### CONTRIBUTIONS BY AUTHORS

- |                          |   |
|--------------------------|---|
| <b>1 Khadija Imran:</b>  | Data collection, Literature search, Methodology, Manuscript Writing and Result Analysis |
| <b>2 Aaqil Malik:</b>    | Topic selection, Supervision, Manuscript Writing, editing, and Proof Reading            |
| <b>3 Usman Yousaf:</b>   | Proof Reading   |
| <b>4 Hamna Hoor:</b>     | Data collection   |
| <b>5 Muhammad Afzal:</b> | Literature search   |
| <b>6 Gulrez Amin:</b>    | Proof reading   |