

Clinical audit on quality of record keeping of dental implant treatment performed by dental professionals

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TO CITE THIS ARTICLE

Yi HJ, Chabal TV, Shin YY, Rong TJ, Seow LL, Bapat R, Parolia A. Clinical audit on quality of record keeping of dental implant treatment performed by dental professionals. *J Osseointegr* 2023;15(3):165-173.

DOI 10.23805 /JO.2023.571

KEYWORDS Clinical audit, Dental implants, Dental records

ABSTRACT

Aims To evaluate the quality of clinical record keeping for patients who underwent dental implants placement at International Medical University (IMU) Oral Health Centre (OHC).

Materials and methods Quality of record keeping of all dental implants placed in the IMU OHC by dental faculty, dental officers, and postgraduate diploma students between January 2015 to December 2019 was evaluated retrospectively using the electronic records. Interexaminer reliability was evaluated using Fleiss kappa test ($\kappa \geq 80\%$). Each parameter was scored if it was recorded or not recorded. Frequency distributions and percentages of each parameter were calculated and tabulated.

Results The retrospective dental records revealed high accuracy of record keeping in age (99.6%), gender (100%), cone-beam computerised tomography (CBCT) (97.8%), written consent (95.1%), dental implant placement site (94%), implant diameter (93.6%), and implant length (93.4%). Low accuracy of record keeping is shown in smoking (15%), periodontal disease (17.4%), preoperative antibiotics (7.9%), preoperative analgesics (1.9%), preoperative chlorhexidine mouth rinse (7.3%), time of placement (11.4%), countersink drill for dense bone (0.9%), intraoperative radiograph with guide pin to check angulation (19.7%), hydration of bone graft particles (3.6%), ice pack (0%), postoperative chlorhexidine (17.2%), loading protocol (1.8%), disinfection of abutment and restoration (3.9%), and clean-up of residual cement for cement retained prosthesis (14.4%).

Conclusions The clinical record keeping for patients with dental implants placed at IMU OHC was low. Appropriate measures and intervention are to be implemented to enhance the record keeping.

INTRODUCTION

Dental implants have been long used in history as a support in the replacement of missing teeth and is one of the developments that has revolutionized restorative dentistry as we know it today (1,2). Data documentation in the form of record keeping has been performed together with dental implants as a procedural task to reflect and perpetually improve upon the quality of care provided to future patients. As much as dental implants have paved the way in producing ideal outcomes in terms of function and aesthetic, it is not without effective record keeping that truly makes it shine. One must always strive for continuous improvements in terms of success rates of the implants and quality of healthcare delivery. Record keeping refers to the act of continuously organizing and storing the detailed documents of patients' chief concern, history of concern, systemic history, examination, informed consent, treatment plan and management. It is essential for the dental practitioners to make the entries in or review the dental records, and then store them electronically or physically (3). These dental records reflect the course of treatment and serve as a tool for effective communication within a multidisciplinary team. Other than that, with the rising awareness of public on legal issues surrounding healthcare, these dental records play a fundamental role as defense of allegation of malpractice in a court of law (4). Clinical audit is a process with the aim to improve quality, essentially improving patient care and outcome through a systemic review of care against explicit criteria (5). While determining if the healthcare provided is in line

with standards, clinical audit also enables deficiencies and weaknesses of clinical practice to be recognized. Then, intervention can be implemented to encourage improvement in delivering better healthcare service (6). Subsequently, another round of clinical audit is performed to determine degree of improvement while highlighting shortcoming to enable further improvement. To put it briefly, the clinical audit cycle facilitates continuous improvement in the clinical practice. In fact, the employment of clinical audit in dental practice has shown to be beneficial in improving clinical practice (7,8). Thus, this study aims to evaluate the quality of clinical record keeping for patients with dental implants placed at IMU OHC.

MATERIALS AND METHODS

The retrospective clinical audit was carried out by retrieving the dental records on electronic practice management software system (Open Dental) of all dental implants placed in the IMU OHC, Kuala Lumpur, Malaysia by dental faculty, dental officers, and postgraduate diploma in implant dentistry students between January 2015 to December 2019. Total number of 282 patients aged 20 years and above who had received dental implant placement in the OHC, IMU during the mentioned period were identified. Among these patients, 558 dental implants had been placed in the OHC, IMU during the mentioned period. A detailed audit checklist regarding the parameters of record keeping in the presurgical, surgical and prosthetic procedures of dental implant placement (Table 1) was formulated based on guidelines done by surgical and prosthetic safety checklist for dental implants (9). The presence or absence of recording of each parameter was examined. If the parameter was absent in the record, score 1 was placed; if the parameter was present in the record, score 2 was placed. There are certain situations where a parameter had to be omitted. In the stage of surgical procedure of dental implant, the use of cover screw and surgical re-entry were not considered if a one-stage surgery was planned. In the event which tissue punch was used instead of incision, the use of suture was not considered in the evaluation. In the stage of prosthetic procedure of dental implant, if a screw-retained prosthesis was planned and placed, cleaning up of residual cement would be omitted. At the same time, if a cement retained prosthesis was planned and placed, filling the abutment screw hole with impervious material like polytetrafluoroethylene and covering the abutment hole with composite were omitted. Examiners underwent training to assess the quality of record keeping using the audit checklist (Table 1) prior to the study. Following the training, the examiners independently screened 24 dental implants using the audit checklist (Table 1). Inter-examiner re-

liability was evaluated using Fleiss Kappa Analysis. A final consensus was reached when the inter-examiner agreement kappa value was found to be within almost perfect agreement ($\kappa \geq 80\%$). These 24 dental implants were not included in the study. Records of the remaining 534 dental implants were then examined by the examiners. The data was collected and entered in a template checklist made in Microsoft Excel 2021. Frequency distributions of the data of each parameter was calculated and analyzed.

RESULTS

From January 2015 to December 2019, 534 dental implants were placed in the OHC, IMU. Each dental implants record was assessed using the audit checklist (Table 1) in this study, which comprises 53 parameters. The frequency and percentage of records of each parameter are presented in Table 2. From the records of pre-surgical procedures assessed, the parameters that are found to be consistently recorded are age (99.6%), gender (100%), use of cone-beam computed tomography systems (CBCT) (97.8%), and written consent (95.1%) (Fig. 1,2). Meanwhile, the parameters that may require more attentions are smoking history of patient (15%), presence of periodontal disease of patient (17.4%), prescription of pre-operative antibiotics (7.9%), prescription of preoperative analgesics (1.9%), and usage of pre-operative chlorhexidine mouth rinse (7.3%) (Fig. 1,2). Evaluation of the surgical procedural records indicates that dental implant placement site (94%), implant diameter (93.6%), and implant length (93.4%) are routinely logged into the Open Dental system (Fig. 1,2). Nevertheless, the collected data reveals some significant deficiencies in record keeping which are worth looking into. The parameters include time of placement of the dental implant (11.4%), use of countersink drill for dense bone (0.9%), use of intra-operative radiograph with guide pin to check angulation (19.7%), hydration of bone graft particles (3.6%), advice on ice pack (0%), and prescription of post-operative chlorhexidine (17.2%) (Fig. 1,2). According to the prosthetic procedural records, the parameter that is routinely recorded is the type of prosthesis placed on the dental implant (86%) (Fig. 1,2). On the other hand, the parameters which are not frequently recorded include loading protocol of the prosthesis (1.8%), disinfection of abutment and restoration (3.9%), and clean-up of residual cement for cement retained prosthesis (14.4%) (Fig. 1,2).

DISCUSSION

The present study serves as an initiation to strive for continuous improvement in clinical practice and in-

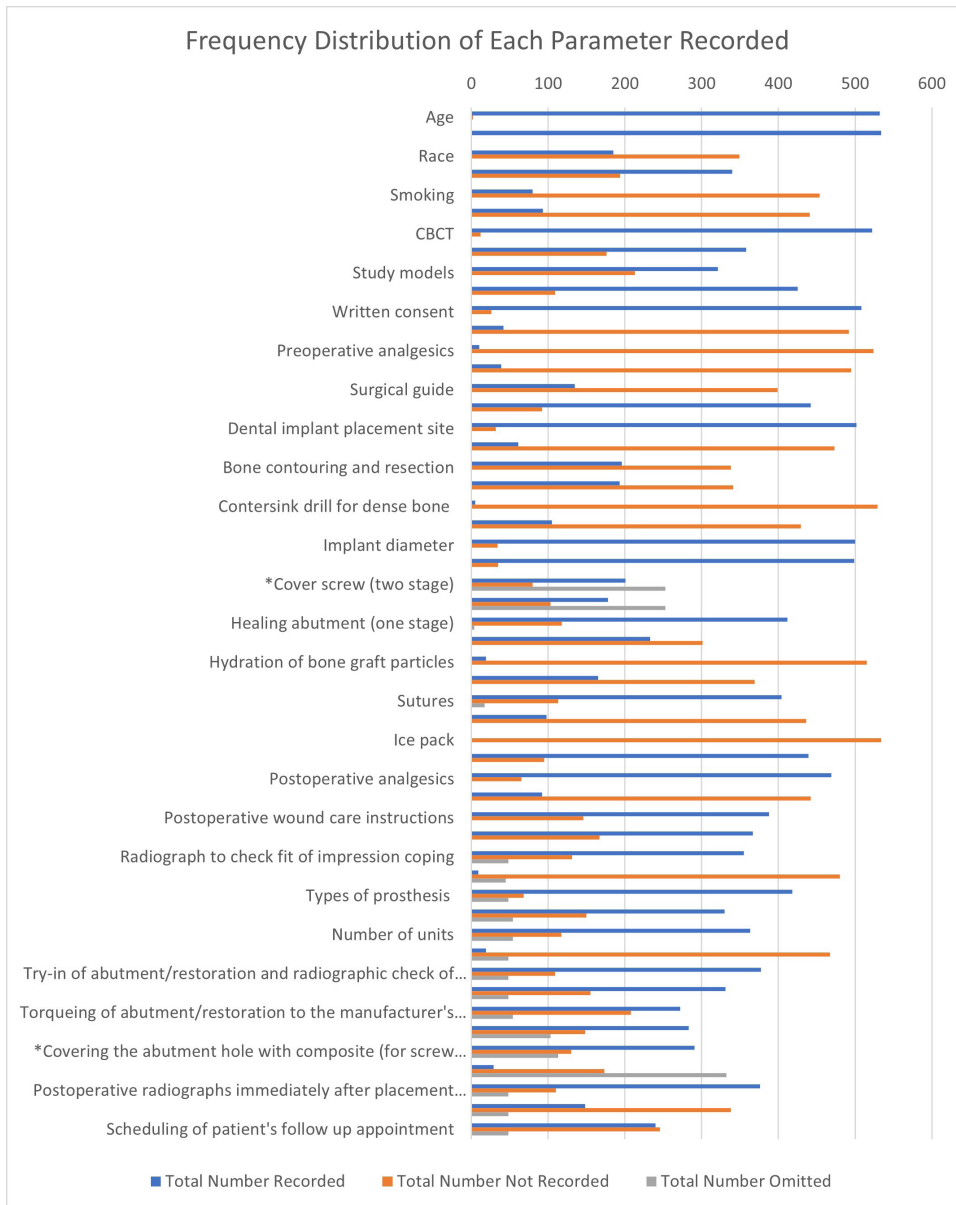


FIG. 1 Frequency distribution of each parameter of the records.

creasing quality of dental care delivery. With this study, strengths and deficiencies of the records were identified and recommendations were made to help in improvement of professional skills and enhancing quality of healthcare delivery. With sufficient and adequate intervention that aims for positive changes, another round of clinical audit is recommended to be conducted to complete the audit-cycle whilst determining any improvement made (3,6). Based on the results obtained in this study, the most recorded overall parameter is gender (100%) while the least overall recorded parameter is advice of ice pack (0%). Among the 15 parameters in pre-surgical procedure, the most recorded parameter is gender (100%). This is believed to be bestowed by its necessity to be reported during registration at the front desk at OHC, IMU. The parameter that shows quite the opposite is the prescription of

preoperative analgesic (1.9%). The prescription of preoperative analgesic may be effective in postoperative pain control (10,11). However, it may not be prescribed routinely to all patients preoperatively. This parameter may be overlooked, and it is not explicitly mentioned in the records, resulting in incomplete records. There are 23 parameters evaluated in the surgical procedure of dental implants. Among these parameters, the most frequently recorded parameter is the dental implant placement site (94%). This may be achieved by the essential role of the dental implant placement site in planning and deciding length and diameter of the dental implant to be used throughout the treatment. On the other hand, the least frequently recorded parameter in the surgical procedural records is the advice of ice pack (0%). The application of ice packs may prevent or limit edema after dental implant surgery

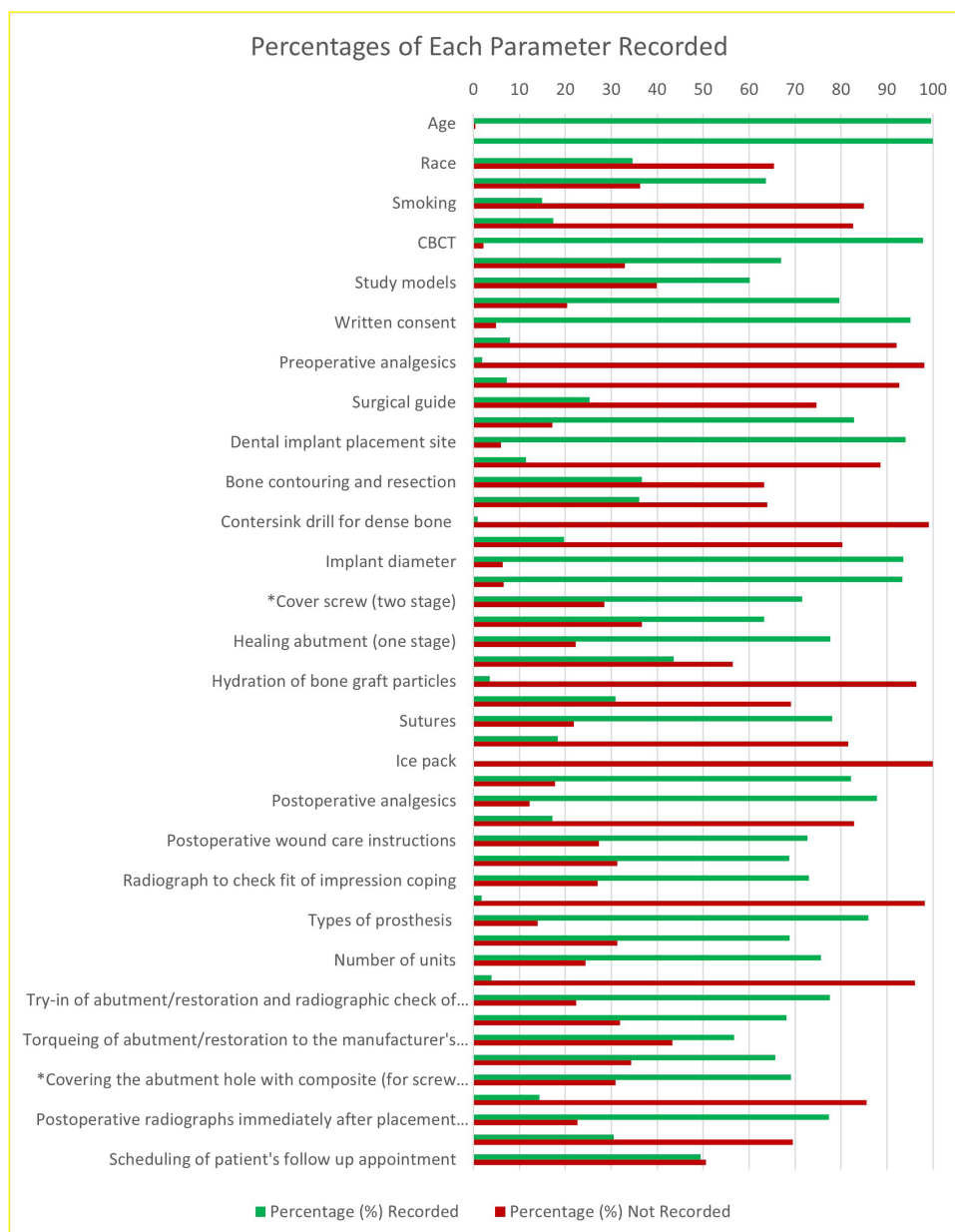


FIG. 1 Frequency distribution of each parameter of the records.

FIG. 2 Percentages of each parameter of the records.

(12,13). Its use may be included during post-operative instructions delivery, yet no sufficient records indicate the context of post-operative instructions given to each patient. Hence, as the use of ice packs is not mentioned in the record, it is appraised as not recorded in this study. In the prosthetic procedure of dental implant, 15 parameters have been assessed. The most regularly recorded parameter in the prosthetic procedural records is the type of prosthesis (86%). Type of prosthesis include crown, bridge, or removable denture. The prosthesis is used to replace the missing teeth and is discussed before the treatment is initiated. Hence, it is frequently noted down in the records. Meanwhile, the least frequently recorded parameter in this stage is loading protocol (1.8%). Loading protocols include immediate loading of prosthesis and delayed loading of

prosthesis after implant placement. Even with the given gap between date of placement of dental implant and loading of prosthesis, the loading protocol is not explicitly mentioned in the record, hence it is evaluated as not recorded. From the results obtained in this study, the standard of record keeping in dental implant placement at the OHC, IMU was low. This can be contributed by multiple factors such as lack of reinforcement and time-consuming documentation process. Nevertheless, it is necessary to highlight those clinical records may contribute to errors and substandard care as concluded by the Ombudsman's Review (14). Use of dental implants in the attempt to restore oral function and esthetics of patients requires a multi-disciplinary team approach of specialists (15). The role of patients' records is critical to enable effective communication

Patient: _____ ID: _____	Screened by: _____
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(Note- encircle the score)

ITEM	SCORE	INFERENCE
Pre-surgical procedure		
Age	1	Not recorded
	2	Recorded
Gender	1	Not recorded
	2	Recorded
Race	1	Not recorded
	2	Recorded
Systemic disorders	1	Not recorded
	2	Recorded
Smoking	1	Not recorded
	2	Recorded Non- smoker/Smoker/ Years/Number of cigarettes
Periodontal disease (BPE score)	1	Not recorded
	2	Recorded
CBCT	1	Not recorded
	2	Recorded
Photographs	1	Not recorded
	2	Recorded
Study models	1	Not recorded
	2	Recorded
Discussion of treatment options with the patient	1	Not recorded
	2	Recorded
Written consent	1	Not recorded
	2	Recorded
Surgical Procedure		
Surgical guide	1	Not recorded
	2	Recorded
Preoperative antibiotics	1	Not recorded
	2	Recorded
Preoperative analgesics	1	Not recorded
	2	Recorded
Preoperative chlorhexidine mouth rinse	1	Not recorded
	2	Recorded
Local anesthesia	1	Not recorded
	2	Recorded (Type of technique, concentration, ingredients)
Dental implant placement site	1	Not recorded
	2	Recorded
Time of placement	1	Not recorded
	2	Recorded
Surgical Re-entry	1	Not recorded
	2	Recorded
Implant diameter	1	Not recorded
	2	Recorded

TABLE 1 Clinical audit on quality of record keeping of dental implant treatment performed by dental professionals

Implant length	1	Not recorded
	2	Recorded
Bone contouring and resection	1	Not recorded
	2	Recorded
Intraoperative radiograph with guide pins to check for angulation	1	Not recorded
	2	Recorded
Countersink drill for dense bone	1	Not recorded
	2	Recorded
Drilling speed and torque for implant placement	1	Not recorded
	2	Recorded
Cover screw (two stage)	1	Not recorded
	2	Recorded
Healing abutment (one stage)	1	Not recorded
	2	Recorded
Type of Bone graft particles	1	Not recorded
	2	Recorded
Hydration of bone graft particles	1	Not recorded
	2	Recorded
Membrane	1	Not recorded
	2	Recorded
Sutures	1	Not recorded
	2	Recorded
Attainment of Hemostasis	1	Not recorded
	2	Recorded
Icepack	1	Not recorded
	2	Recorded
Postoperative antibiotics	1	Not recorded
	2	Recorded
Postoperative analgesics	1	Not recorded
	2	Recorded
Postoperative chlorhexidine mouth rinse	1	Not recorded
	2	Recorded
Written postoperative wound care instructions	1	Not recorded
	2	Recorded
Scheduling of follow-up visit	1	Not recorded
	2	Recorded
Prosthetic procedure		
Loading protocol	1	Not recorded
	2	Recorded
Type of prosthesis	1	Not recorded
	2	Recorded
Mode of retention	1	Not recorded
	2	Recorded
Number of units	1	Not recorded
	2	Recorded
Radiograph to check fit of impression coping	1	Not recorded
	2	Recorded
Disinfection of abutment and restoration	1	Not recorded

TABLE 1 Clinical audit on quality of record keeping of dental implant treatment performed by dental professionals

	2	Recorded
Try-in of abutment/ restoration and radiographic check of complete seating	1	Not recorded
	2	Recorded
Try-in of restoration to confirm passive fit, marginal adaptation, proximal contacts, esthetics, and occlusion	1	Not recorded
	2	Recorded
Torquing of abutment/restoration to the manufacturer's instructions	1	Not recorded
	2	Recorded
Filling abutment screw hole with impervious material like polytetrafluoroethylene (for screw retained prosthesis)	1	Not recorded
	2	Recorded
Covering the abutment hole with composite (for screw retained prosthesis)	1	Not recorded
	2	Recorded
Clean up of residual cement (for cement retained prosthesis)	1	Not recorded
	2	Recorded
Postoperative radiographs immediately after placement of prosthesis	1	Not recorded
	2	Recorded
Postoperative patient instructions for professional and at-home maintenance	1	Not recorded
	2	Recorded
Scheduling of patient's follow up appointment	1	Not recorded
	2	Recorded
Postoperative radiographs 1 year after placement of prosthesis	1	Not recorded
	2	Recorded

TABLE 1 Clinical audit on quality of record keeping of dental implant treatment performed by dental professionals

within the team (16). Even though the adequacy of dental care is not represented by good records, these records allow the dental practitioners to evaluate the case and reflect for improvements, which poor records do not (17). In the current study, the importance of producing and maintaining accurate dental records may need to be emphasized as these dental records are crucial for good quality patient care while serving as a defense in the event of a malpractice claim at legal court (18). In this study, the audit sampling population is rather large, and the parameters evaluated are comprehensive. Nevertheless, the limitation of this study is that a clinical audit-feedback was not conducted.

CONCLUSION

In the light of the results of this audit, the record keeping may be low. The results in this study serve as baseline information regarding the quality of record-keeping at the OHC, IMU. Improvement may be achieved if awareness of the importance and benefits of keeping records is raised among the dental prac-

tioners. A workshop on implant placement record keeping may be conducted to train and educate on the importance of keeping record. Another cycle of clinical audit-feedback may be conducted to assess the improvement on record keeping.

Acknowledgements:

None

Source of financial support or funding

Grant from International Medical University Joint-Committee of the Research and Ethics Committee, Kuala Lumpur, Malaysia. Grant No: BDS I-01/2020(15).

Conflict of interest:

None

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Item	Total Number		Percentage (%)		
	Recorded	Not Recorded	Omitted	Recorded	Not Recorded
Presurgical procedure					
Age	532	2	0	99.6	0.4
Gender	534	0	0	100	0
Race	185	349	0	34.6	65.4
Systemic disorders	340	194	0	63.7	36.3
Smoking	80	454	0	15	85
Periodontal disease	93	441	0	17.4	82.6
CBCT	522	12	0	97.8	2.2
Photographs	358	176	0	67	33
Study models	321	213	0	60.1	39.9
Discussion of treatment options with patient	425	109	0	79.6	20.4
Written consent	508	26	0	95.1	4.9
Preoperative antibiotics	42	492	0	7.9	92.1
Preoperative analgesics	10	524	0	1.9	98.1
Preoperative chlorhexidine mouth rinse	39	495	0	7.3	92.7
Surgical Procedure					
Surgical guide	135	399	0	25.3	74.7
Local anesthesia	442	92	0	82.8	17.2
Dental implant placement site	502	32	0	94	6
Time of placement	61	473	0	11.4	88.6
Bone contouring and resection	196	338	0	36.7	63.3
Drilling speed and torque for implant placement	193	341	0	36.1	63.9
Countersink drill for dense bone	5	529	0	0.9	99.1
Intraoperative radiograph with guide pin to check angulation	105	429	0	19.7	80.3
Implant diameter	500	34	0	93.6	6.4
Implant length	499	35	0	93.4	6.6
Cover screw (two stage)	201	80	253	71.5	28.5
Surgical re-entry	178	103	253	63.3	36.7
Healing abutment (one stage)	412	118	4	77.7	22.3
Type of bone graft particles	233	301	0	43.6	56.4
Hydration of bone graft particles	19	515	0	3.6	96.4
Membrane	165	369	0	30.9	69.1
Sutures	404	113	17	78.1	21.9
Attainment of hemostasis	98	436	0	18.4	81.6
Ice pack	0	534	0	0	100
Postoperative antibiotics	439	95	0	82.2	17.8
Postoperative analgesics	469	65	0	87.8	12.2
Postoperative chlorhexidine	92	442	0	17.2	82.8
Postoperative wound care instructions	388	146	0	72.7	27.3
Scheduling of follow-up visit	367	167	0	68.7	31.3
Prosthetic procedure					
Radiograph to check fit of impression coping	355	131	48	73	27
Loading protocol	9	480	45	1.8	98.2

TABLE 2 Frequency distribution and percentages of each parameter of the records

Types of prosthesis	418	68	48	86	14
Mode of retention	330	150	54	68.8	31.3
Number of units	363	117	54	75.6	24.4
Disinfection of abutment and restoration	19	467	48	3.9	96.1
Try-in of abutment/restoration and radiographic check of complete seating	377	109	48	77.6	22.4
Try-in of restoration to confirm passive fit, marginal adaptation, proximal contacts, esthetics, and occlusion	331	155	48	68.1	31.9
Torquing of abutment/restoration to the manufacturer's instructions	272	208	54	56.7	43.3
Filling abutment screw hole with impervious material like polytetrafluoroethylene (for screw retained prosthesis)	283	148	103	65.7	34.3
Covering the abutment hole with composite (for screw retained prosthesis)	291	130	113	69.1	30.9
Removal of residual cement (for cement retained prosthesis)	29	173	332	14.4	85.6
Postoperative radiographs immediately after placement of prosthesis	376	110	48	77.4	22.6
Postoperative patient instructions for professional and at-home maintenance	148	338	48	30.5	69.5
Scheduling of patient's follow up appointment	240	246	48	49.4	50.6

TABLE 2 Frequency distribution and percentages of each parameter of the records

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