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Effect of postoperative nursing protocol on oral health status and dental implant success among patients with partially edentulous

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Abstract

Background: Post-operative nursing protocol for patients with partially edentulous has a vital role in improving oral health status and increase dental implant success rate. **The current study aimed to** evaluate the effect of post-operative nursing protocol on oral health status and dental implant success among patients with partially edentulous. **Research design:** Posttest only nonequivalent groups design was used to utilize this study. **Setting:** The study conducted at the outpatient clinics in the Oral& Maxillofacial Surgery Department at Assuit University Dental Hospital. **Sample:** 40 Dental implant in partially edentulous patients. **Tools: Tool (I):** Oral& maxillofacial interview assessment questionnaire. **Tool (2):** Observation check list for dental implant care. **Tool (3):** Probing depth scale. **Tool (4):** Pain assessment scale (VAS). **Results:** Two thirds of the patients in the study group were female, according to this study with age range from 30 > 40yrs old and showed significant decrease in average probing depths& demonstrated significant reduction in pain intensity when compared to the control group. In addition, all implant stability in both groups were stable. **Conclusion:** Implementation of post-operative nursing protocol among patients with partial edentulous showed an improvement on their oral health status and increase dental implant success rate. **Recommendation:** Continuous implementation of post-operative nursing protocol to upgrade dental implant success rate among patients with partial edentulous. As well encourage nurses to upgrade their information regarding dental care and to get dental nursing diploma or other academic dental nursing degree.

Keywords: Dental implant, Oral health status, Post-operative nursing protocol & Patients with Partial edentulous.

Introduction

An edentulous site is a space in the oral cavity previously occupied by one tooth or more. Partial edentulism refers to the loss of some teeth in the oral cavity **(Manandhar, 2021). In 2012,** 19% of patients suffered from a partial edentulous state in the United States, and the prevalence was similar between men (18%) and women (19%) **(Dye, 2015)**

A dental implant is a popular tooth replacement option after tooth loss or extraction, it is an artificial tooth root made from titanium implants surgically implanted into patient jawbone to stabilize a crown or denture **(Carr et al., 2018).** The popularity of dental implants has been increasing over the years at a rapid rate, as it resulted successful dental restorations for over 30 years, more than 5 million dental implants are placed in the U.S. every year **(Zembic et al., 2019).**

The basic objectives of prosthodontics treatment, which include (1) the elimination of oral disease to the greatest extent possible; (2) also it preserving the health teeth relation and the oral health with para oral structures, which will enhance the partial denture design; and (3) lastly it restored the comfort ability of the oral functions that are, are esthetically pleasing, and do not interfere with the patient's speech **(Payne, 2018).**

Patients with partially edentulous undergo replacement of a missing teeth with implant retained crowns may exposed to either early dental implant failure or late dental implant failure so in this nursing protocol such group of patients receiving nursing instruction to decrease or prevent late implant failure **(Henning Staedt et al., 2020).**

Basically, the maintenance of dental implants includes professional cleaning by the dentist and oral home care by the patient itself. Good oral hygiene on the patient's part is mandatory. The patient should be recalled every 3 months during the first year and at least every 6 months thereafter **(Hema Kanathila et al., 2018).**

Daily self-care (oral hygiene) and adherence to a maintenance recall schedule are absolutely required for long-term success. Recall maintenance visits should always include the evaluation of soft and hard tissue health, the patient's level of oral hygiene compliance and plaque control, and the prosthesis

integrity and stability. Thus, coordination and effective partnership between the oral surgeon, the dental nurse, and the patient are essentially required in the postoperative period **(Hema Kanathila et al., 2018).**

The role of dental nurses in implant dentistry increased nowadays, it extends not only to preparation of the patient but also explaining the stages of the process to patient, addressing patient concerns, assisting in surgical procedure , offering postoperative care and counseling all are necessary to maximize success rates. **(Charlotte Curran, 2014).**

Significance of the study:

From researchers experience as a head nurse for 5 years at oral& maxillofacial surgery department Assuit University Dental Hospital, some of our patients having dental implants inserted suffering from certain complications (such as severe pain, swelling, gingivitis, redness in the gingiva around the implant place , looseness of the crown, foul odors) during the recall visits, this is may be due to that the patients did not comply with the postoperative nursing instructions. So, our study was conducted to evaluate the efficacy of following post-operative nursing protocol for the oral health status and dental implant success.

Aim of the study: The aim of this study are to evaluate the effect of a post-operative nursing protocol on oral health status & dental implant success among patients with partially edentulous.

Hypothesis:

- Dental implant success will be increased among patients with partially edentulous who receive post-operative nursing protocol.
- Oral health status among patients with partially edentulous who receive post-operative nursing protocol will be improved.

Methods:

Research design: Posttest only nonequivalent groups design was utilized to fulfill the aim of this study **(Rajiv et al., 2020).** In this design, participants in one group are exposed to a treatment, a nonequivalent group is not exposed to the treatment, and then the two groups are compared.

Setting: The patients were selected from the outpatient clinics of Oral& Maxillofacial Surgery Department at Assuit University Dental Hospital.

Sample: Convenience of 40 dental implants in partially edentulous patients were divided on random basis equally into study and control groups (20 in each), from both sexes. Patients encountered in the study possess the following criteria: Patients that are physically fit according to (American Society of Anesthesiologist 1 =normal healthy patient), from both sexes, Age range from: 20 to 60 years old and Patients with partially edentulous ridges. Exclusion criteria including patients who diagnosed with disorders affecting bone metabolism (as osteoporosis, diabetes mellitus and hyper parathyriodism), Patients with complete edentulous ridges, heavy smokers' patient (who smoke more than 10 cigarettes per day) and patient with malocclusion (abnormal tooth contact relationship).

Sample size: The sample size was 40 patients, who was selected by using the following equation according to Steven K. Thompson (2012):

$$n = \frac{N \times p(1-p)}{\left[\left[N-1\times\left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

N=total patient population size of 50 who attended at Assuit university dental hospital during September 2021 to July 2022

Z = confidence levels is 0.95 and is equal to 1.96

D= the error ratio is = 0.05

P= the property availability ratio and neutral = 0.50 **(Steven K. Thompson, 2012)**

Data collection tools:

Four tools were used in this study:

Tool (I): Oral & maxillofacial interview assessment questionnaire:

It was developed by the researcher after reviewing the current national and an extens international literatures **(Ralf Smeets et al., 2014).** It is used to assess the personal data of the patients, medical history and dental history. It comprised four parts:

Part I: Patient's demographic data: This part concerned with the patients demographic data, it included 7 items such as (age, gender, marital status, educational level, occupation, address and telephone number).

Part II: Patient medical and dental history: This part concerned with Patients medical and dental history. It included 3 items such as: Presence of any chronic disease as (DM, HTN, HIV, HD,..ect), past dental problems (such as decayed, missed, filled teeth, swelling and pain) and presence of local anesthesia complication.

Tool (2): Observation check list for dental implant patients care:

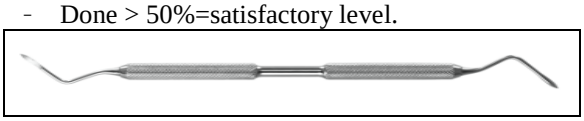
It concerned with post-operative nursing care after dental implant loading with crown. It used to assess patients practices and their adherence related to care after dental implant loading with crown.it consists of 4 items (such as oral irrigation, tooth brushing, dental flossing and using antimicrobial mouth wash).

Scoring system for practical

The total numbers of questions were 20 questions, 1 grade awarded for answer by done and zero for not

done. The total grade were 20 the total practical score was determined based on the following:

- Not done < 50%=unsatisfactory level.
- Done > 50%=satisfactory level.

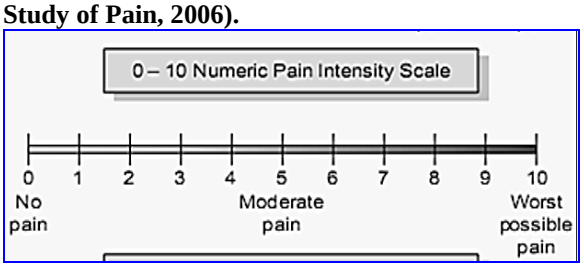


Tool (3): Probing depth scale: It adopted from **(Anders Henningsen et al., 2014)**.

It is used to assess degree of tissue depth around the implant, normal tissue depth around the implant, as the normal tissue depth around the implant should be no more than 3mm .It is the most common parameter to use by dental clinicians, to locate and measure the soft tissue pockets. It facilitates and increases the accuracy of the diagnosis of the condition, formulating the treatment and predicting the outcome of the therapy**.**

Scoring system: The normal tissue depth around the implant should be equal/or no more than 3mm and more than 3mm consider abnormal.

Toll (4): Visual Analogue Scale for Pain assessment (VAS scale). It used to assess patients' pain after dental implant loading with crown. It adopted from (**International Association for the Study of Pain, 2006).**



Methods:

This study was conducted in three phases (preparatory phase implementation phase and evaluation phase).

Phase (1): preparatory phase includes the following:

Reviewing the current, past, local national and international related literature regarding dental implant using books, articles, references and the internet to design the study tools for data collection.

- **Content validity and reliability:** once the tools of data collection were prepared ,their face validity and content validity were judged by a panel of five experts 3 professors of Medical Surgical Nursing staff and 2 professors of dental staff who reviewed the tools for clarity, relevance and applicability, comprehensiveness and ease of implementation. in the light of their assessment, minor modifications were applied. Test reliability of the tools was confirmed by Cronbach's alpha (0.89) for tool I, part 2 and (0.97) for tool II.
- Official permission was obtained from the head of the oral& maxillofacial department, dental hospital, Assuit University.
- **Pilot study:** A pilot of study was carried out on 10% (4 patients) of the study samples to test the tools applicability and clarity. as well estimated the time needed to fill in the study tools. Patients participated in the pilot study not included in the study. The result of the data obtained from the pilot study helped in the modification of the tools and teaching materials were prepared.
- Patients in the study group requested to be in other dental department such as periodontal department for scaling (cleaning the teeth by ultrasonic machine) to avoid gingivitis and to the endodontic department to treating the roots of teeth and to prevent occurring of infection.

Phase (2): The implementation phase:

- Once permission was granted to proceed with the proposed study, the researcher-initiated data collection.
- Data collection from the outpatient clinics of the oral& maxillofacial surgery department at Assuit University Dental Hospital were done between September 2021 to July 2022.
- At the initial interview, the researcher greeted the patients, introduced herself and purpose of study was explained to patients who agreed to participate in the study prior to any data collection.
- Patients understanding implant surgery were assessed using the study tool (1) part (IV) while assessment of the patients' practice was done by using tool (2) which filled by the researcher.

Postoperative nursing protocol:

- The Postoperative nursing protocol content was prepared based on the patient's needs which were identified post analysis of the data collected. It consists of 2 items: the theoretical part and the practical part.
- **Theoretical part:** This part was designed to cover the following (anatomy of the teeth, definition of implant, indications, contraindications, complications, signs & symptoms of these complications, and postoperative nursing care).
- **The practical part:** This part consisted of 4 items which include all practices done after dental implant which help in success of the dental implant surgery and improve oral health status such as (oral irrigation- tooth brushing -dental flossing and using of antimicrobial mouth washes
- According to study group the patients requested to any other dental department such as periodontal department for scaling (cleaning the teeth by ultrasonic machine) to avoid gingivitis and endodontic department to treating the roots of teeth to prevent any infection occurring.

- A designed nursing care protocol was conducted through one theoretical session and one practical and each session was ranged from 30 to 45 minutes.
- The nursing care protocol was given within the day of implant loading with crown and explained to each patient individually according to the time scheduled.
- The teaching materials were used to demonstrate to the patient how to care for dental implant loading with crown such as (toothbrush –dental floss- teeth model- plastic syringe and cup).
- The researcher was attended two days in the oral &maxillofacial surgery department. The first day was the day of implant loading with crown, while the second day was after three months for follow up. During this period, the researcher was contacted patients by telephone to follow up on the extent of their commitment and to ensure that they perform and implement the nursing care protocol.
- On the first day (day of implant loading with crown) the researcher instructed the patient in individually in a session about the nursing care protocol and how to re demonstrate it using the teaching materials.
- On the second day after three months from the implant loading with crown the researcher asked the patient attended to the department for follow up and get the result.
- Regarding the theoretical part: the sessions covered the following information: the objectives of the nursing care protocol, anatomy of teeth, definition of implant, indications, contraindications, complications, signs &symptoms of these complications and postoperative nursing care).
- After the theoretical part, the practical part was carried out.
- For practical part: the session was included the following procedures: teaching the correct way to oral irrigation, toothbrush, using dental floss and using antimicrobial mouth wash.

Oral irrigation:

- Fill the syringe with saline

- Bend the tip of the needle.
- Insert the needle into the interproximal space sub-gingivally between the implant and the gingiva.
- Push the plunger of the needle and flush the saline.

Tooth brush:

- Get the right tools, needed for toothpaste and a toothbrush. For most people, a soft-bristled toothbrush will be the safest choice.
- Brush in Circles.
- Brush the outer surface of the teeth & implant crowns.
- Brush the inner surface of teeth & implant crowns.
- Brush the chewing surfaces of teeth & implant crowns.
- Brush the tongue.
- Rinse.

Dental flossing

- Usually, dental floss of 18 to 24 inch is the selection of the choice.
- Hold the floss taut with the thumbs and index fingers.
- Slide the floss gently between the gingiva and the implant, the floss should be held firmly against the implant and rub along the surfaces with a gentle up and down movement.

Using anti-microbial mouth wash

- Pour the oral rinse of choice into the cup provided with the product
- Ready, set, rinse vigorously.
- Spit it out.

Phase (3): The evaluation phase:

The patient and the researcher attended at the oral & maxillofacial surgery department after three months from implant loading with crown for follow up and get the result, the researcher done the following action : Measuring the probing depth at the site of implant by put the dental probe between the crown and the gingiva.

- Implant stability was assessed by applying two metal instruments applying in Bucco-lingual direction.
- The researcher ask the patient about degree of pain, is it mild, moderate or severe.
- The researcher documented the results in each sheet according to the condition of each patient.

Ethical considerations:

- Research proposal was approved from Ethical Committee in the Faculty of Nursing, Asyut University.
- There was no risk for study subject during application of the research.
- The study was followed the common ethical principles of the clinical research.
- Oral consent was obtained from patients or guidance that was willing to participate in the study, after explaining the nature and purpose of the study.
- Confidentiality and anonymity were assured.
- The Studied patients had the right to refuse to participate and/ or to withdraw from the study without any rational and at any time.
- Studied patient's privacy was considered during data collection.

Statistical design:

Data entry and statistical analysis were done using SPSS computer program ''version 23.0'' software. The data were tested for normality using the Anderson –Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (N, %) continuous variables described by mean and standard deviation (Mean, SD) chi square test used to compare between categorical variables. T-test used to compare between continuous variables used for the numeric variable. N.s $P > 0.05$ is no significant, and $P \leq 0.05$ as a cutoff for significance.

Results:

Table (1): Distribution of demographic data for the study& control groups n=40

Demographic data	Study		Control	
	N	%	N	%
Age group				
20< 30yrs	1	5.0	0	0.0
30 < 40yrs	9	45.0	6	30.0
40 <50yrs	6	30.0	5	25.0
50 < 60yrs	4	20.0	9	45.0
Sex				
Male	6	30.0	0	0.0
Female	14	70.0	20	100.0
Marital status				
Single	2	10.0	6	30.0
Married	15	75.0	7	35.0
Widows	3	15.0	7	35.0
Education level				
Secondary education	9	45.0	5	25.0
High education	11	55.0	15	75.0
Occupation				
Manual	3	15.0	9	45.0
Intellectual	17	85.0	11	55.0
Address				
Urban	18	90.0	12	60.0
Rural	2	10.0	8	40.0

Table (2): Comparison between study and control group regarding dental implant knowledge pre / post implementation of the nursing protocol n=40

Dental implant knowledge		Pre				post			
		Study		Control		Study		Control	
		N	%	N	%	N	%	N	%
Definition of implant	Don't know	10	50.0	7	35.0	0	0.0	7	35.0
	Incorrect	7	35.0	5	25.0	2	10.0	5	25.0
	Correct	3	15.0	8	40.0	18	90.0	8	40.0
	P. value	**.209**				**.002****			
Complication	Don't know	16	80.0	7	35.0	1	5.0	7	35.0
	Incorrect	3	15.0	8	40.0	13	65.0	8	40.0
	Correct	1	5.0	5	25.0	6	30.0	5	25.0
	P. value	**.015**				**.04***			
S&S of implant failure	Don't know	14	70.0	4	20.0	0		4	20.0
	Incorrect	6	30.0	9	45.0	3		9	45.0
	Correct	0	0.0	7	35.0	17		7	35.0
	P. value	**0.01**				**.004****			

Pearson Chi-Squar

Table (3): Comparison between study and control group regarding total dental implant knowledge pre/post implementation of the nursing protocol n=40

Total knowledge score levels	Pre				Post			
	Study		Control		Study		Control	
	N	%	N	%	N	%	N	%
unsatisfactory ≤50	18	90.0	18	90.0	2	10.0	14	70.0
Fair ≤ 50-70	2	10.0	2	10.0	2	٤0.0	4	20.0
satisfactory ≥70					16	80..0	2	10.0
P. value	**1.000**				**.001****			

Person Chi-Square

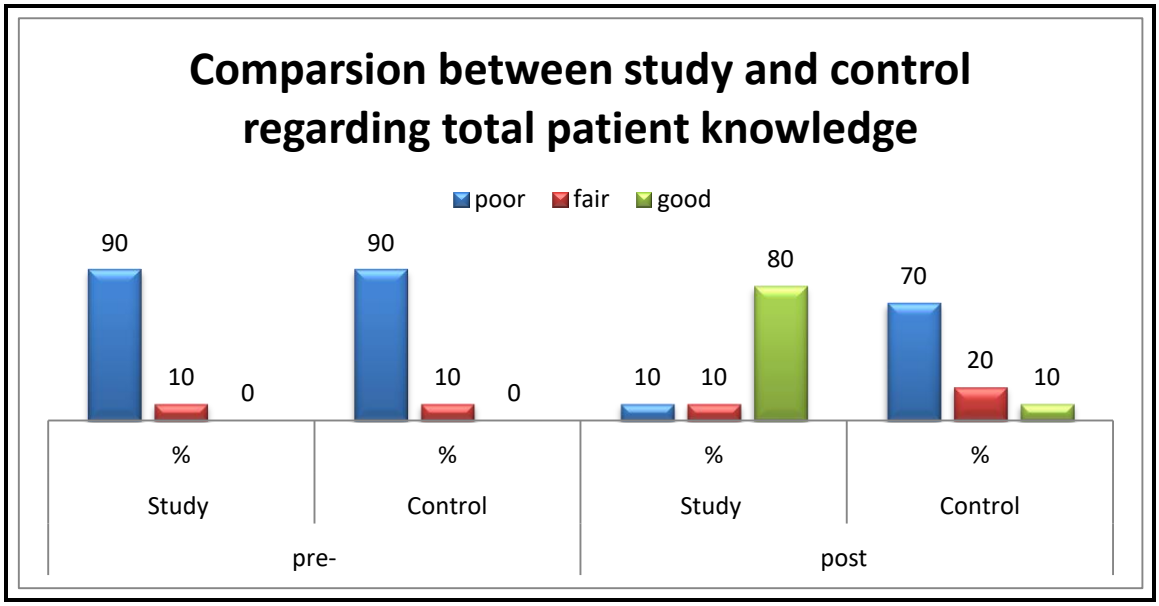


Fig (1): Showed significant increase in level of knowledge among the study group when compared to the control group with P ≤ 0.05

Table (4): Comparison between study and control group regarding oral hygiene demonstration pre / post implementation of the nursing protocol and during follow up n=40

Oral hygiene demonstration	Steps	Pre		Post		Follow up	
		N	%	N	%	N	%
Oral irrigation	Done	4	20.0	4	20.0	18	90.0
	Not done	16	80.0	16	80.0	2	10.0
	P. value	**.001****					
Tooth brush	Done	10	50.0	17	85.0	19	95.0
	Not done	10	50.0	3	15.0	1	5.0
	P. value	**0.001****					
Dental flossing	Done	2	10.0	6	30.0	19	95.0
	Not done	18	90.0	14	70.0	1	5.0
	P. value	**.001****					
Using anti-microbial mouth wash	Done	9	45.0	20	100.0	20	100.0
	Not done	11	55.5	0	0.0	0	0.0
	P. value	**.001****					

Table (5): Comparison between study and control group regarding mean average of probing depth n=40

probing depth	Mean ±SD		P- value
	Study	Control	
Mean average probing depth	2.35±.489	4.55±.998	.001

F. test

Table (6): Comparison between study and control group regarding pain assessment and implant stability n=40

Variables	Study		Control		P- value
	N	%	N	%	
of Pain 1.Assessment					.001
Mild pain	19	95.0	4	20.0	
Moderate pain	1	5.0	16	80.0	
2.Implant stable	20	100.0	20	100.0	

Pearson Chi-Square

Table (1): This table showed that**;** the highest percentage among the study and control groups, their ages ranged between 30 > 40yrs old for the study group and (50 < 60yrs) for the control group. More than half of studied patients were females in study and control group (70% & 100% respectively). As regard the marital status, the majority of patients in study and control groups were married (75% &35% respectively) Concerning the patient's educational level, among the study and control group most patients had high education (55% and 75% respectively). In relation to patients' occupation, among the study and control group more than fifty percent of patients were occupy intellectual work (85%% and 55% respectively), finally, the highest percentages of patients among the study and control group were come from urban area. (90% and 60% respectively)

Table (2): Showed that, there was a statistical significant difference between the study and control group regarding dental implant knowledge pre/post implementation of the nursing protocol with P= value ≤.05.

Table (3): Showed that, there are statistical significant differences between study and control group regarding total dental implant knowledge post implementation of the nursing protocol with P= value ≤.05.

Fig (1): Showed significant increase in level of knowledge among the study group when compared to the control group with P = value ≤ 0.05

Table (4): It was apparent from this table that, there are statistically significant differences between study and control group regarding oral hygiene demonstration pre / post implementation of the nursing protocol and follow up with value P= ≤.05.

Table (5): This table reported that, there are statistically significant differences between study and

control group regarding mean average of probing depth with value ≤.05

Table (6): This table stated that, there was highly statistical significant difference between study and control group regarding pain assessment and implant stable with value P= ≤.05.

Discussion:

Dental implant failures could be classified into early and late failure based on the time when the abutment was connected: early failures occurred before the application of the functional loading, while the late failures occurred after applying occlusal loading or the first removal of the provisional restoration in cases of immediate implant loading. **(Esposito et al., 1998)**

The success of implants requires an interdisciplinary approach where in the dental implant specialists' team including an oral surgeon, prosthodontists, periodontist, and dental nurse participate in the planning, execution, and maintenance of the implants to ensure the best possible outcome. Routine maintenance and recall evaluations are necessary to ensure the long life of these restorations, and this necessitates that the dental implant specialists' team should be well-versed with the implant maintenance procedures which are usually performed at selected intervals to assist the patient in maintaining oral implant health. Moreover, patients are considered co-therapists in the maintenance therapy and their contribution are indispensable; Hence the long-term success of implants is fundamentally dependent upon both the patient's maintenance of effective home care and the dental team's administration of professional prophylaxis procedures in the dental office. The dental nurse's role is central to these processes and nurses are rightly recognized as a major part of the dental care team. Care of patients after the implant procedure is just as important as during the surgery. The dental nurse's role is to communicate and to give an instructions to the patients about the possible complications effectively whilst reassuring them **(Esposito et al., 1998), & (R. E. Cohen, 2003)**

Our study aimed to evaluate the effect of a post-operative nursing protocol on oral health status & dental implant success among patients with partially edentulous.

Regarding the demographic data, forty dental implants were randomly allocated among patients with partially edentulous in both groups where two third of patients were females and one third of patients were males represented the study group whereas the control group was represented by female patients only. Moreover, In the study group, only one patient was between 20 – 30 years old of age, nine patients were between 30 – 40 years old, six patients were between 40-50 years old and only four patients were above 50 years old. In the control group, all patients were above 30 years old where six patients were between 30 – 40 years old , five patients were between 40 – 50 years old and nine patients were above 50 years old greater than those representing the study group.

Our study is in accordance with many other demographic studies in which the selection of age groups suitable for dental implant placements was between 20 to 60 years old **(Canan et al., 2013), (Staedt et al., 2020).**

With regards to the educational level, half of patients were shown to have a high educational level among the study group which is considered less than those in the control group where two third of patients presented with high education.

In a same line with these findings, a study was done among 155 participants aimed to evaluate the level and source of information, and the patient's expectations about implant dentistry prior to treatment and showed that more than half of participants were educated possess a university level or higher **(Enas Mesallum, 2018).**

The evaluation phase in the present study was done after 3 months post implant loading with crowns and it included 3 means of assessment, evaluation of the probing depth by measuring the soft tissue depth and degree of attachments around the implants, pain intensity using the Visual Analogue Scale (VAS scale) and implant stability.

Many studies revealed that the Clinical Probing Depth is an important and reliable diagnostic parameter in the longitudinal monitoring of peri-implant soft tissues. The safety of probing around implant restorations has been well established, and this procedure does not seem to jeopardize the integrity of the oral implants. Moreover, **(C.E Misch ,2007)** stated that Probing is an appropriate method to assess the potential deleterious changes in the peri-implant environment and should be performed every 3 to 4 months for 1 year after prosthesis delivery **(Etter, 2002), (Humphrey, 2006), (Misch, 2007), (Lindhe et al., 2008) & (Berglundh et al. 2018)**

A comparison between the study and control group was done regarding the mean average probing depth of the peri-implant soft tissues, the study group demonstrated a mean average probing depth of 2.35 mm compared to the control that demonstrated a mean average probing depth of 4.55 mm. There was a statistically significant difference between the study and control group regarding the mean average probing depth with a value (P=< 0.05). These findings suggest a healthier preimplant soft tissue for

all patients who received the postoperative nursing protocol in the study group.

Our results are totally comparable with other studies, these studies showed that the probing depths for conventionally placed implants, generally range between 2 and 4 mm if the tissues are healthy. Increases in both clinical probing depth and bleeding on probing over time are usually associated with loss of attachment and bone which should be viewed as signs of peri-implant disease. Hence, Successful implants generally have a probing depth of 3 mm, whereas a pocket of 5 mm or more serves as a protected niche for the bacteria and could exhibit signs of peri-implantitis **(Etter, 2002), (Chen and Darby, 2003), (Humphrey, 2006), (Martin et al., 2009), (Berglundh et al. 2018) & (Renvert et al. 2018).**

Regarding the evaluation of the pain intensity, a Comparison between the study group who received the post-operative nursing protocol, and the control group showed a high statistically significant difference between them with (P value=< 0.05). In the study group, more than two third of patients presented with only mild pain according to the (VAS scale) while only one patient showed a moderate type of pain. While two third of patients in the control group presented with moderate pain and only 4 patients presented with mild pain. Many studies support our findings, regarding pain which should not be associated with dental implants once primary healing is achieved. The absence of pain or discomfort or any negative subjective sensation remains one of the implant success criteria. Furthermore, success also requires the absence of any recurrent peri-implant mucositis and/or peri-implantitis accompanied by swelling, redness, and pain of the peri-implant mucosa. Pain does not occur unless the implant is either mobile or surrounded by inflamed tissue, in addition, pain during function is a subjective principle that refers to implant failure **(Misch et al., 2007)**, **(Alouf et al., 2011), (Meijie Wang et al., 2019) & (Tingting Mai et al., 2021).** In the present study, Implant stability was assessed by applying metal instruments in the Bucco-lingual direction. All forty implants were stable either among the study or the control group with no significant difference between them. The techniques to assess rigid fixation are similar to those used for natural tooth mobility.

A labiolingual force applied by two rigid instruments. some studies reported that although the measurement of implant mobility may be precise, but still not a sensitive clinical indicator for identifying Osseointegration loss, but it is more likely identify the last stage of osseointegration and, therefore, represents a late implant loss **(Salvi & N. P. Lang, 2004), (Misch et al., 2007) & (Thanh An Do et al., 2020).**

Based on a comparison between the study and the control group regarding patients' general level of knowledge about dental implants before and after the implementation of the nursing protocol. The finding of the current study showed that, before the nursing protocol, there was no statistically significant difference between the two groups since more the highest percentage of the patients in both groups resaved unsatisfactory level regarding the general knowledge about dental implants surgery. However, there was a statistically significant difference between the study and control group post the implementation of the postoperative nursing protocol. In which the highest percentage of patients among the study group received satisfactory level regarding the general knowledge about dental implants ,whereas two third of patients among the control group resaved unsatisfactory level of knowledge and awareness about dental implants. These findings suggest that the nursing protocol had a positive impact on improving patients with dental implant level of knowledge and awareness regarding oral health status.

Comparable to the previous findings, a study was done among 155 participants aimed to evaluate the level and source of information, and the patient's expectations about implant dentistry prior to treatment. The results of this study indicated that public awareness and acceptance of implant treatment were moderate since out of the 155 dental patients, more than two third of participants need more information about dental implants. As patients' awareness was limited to general information, and there were a need for more awareness about dental implants. The study also concluded that friends and/ or family were the most common source of patients` information less than half and dentists should play a role in promoting community awareness about dental implants as they are becoming a more popular treatment modality **(Enas Mesallum, 2018)**

Moreover, some studies also reported that the contribution of dentists to patients` knowledge was relatively low; and most patients had their knowledge about dental implants from friends and /or family. (**Kaptein et al., 1998) & (Vermylen et al., 2003)**

On the other hand, other studies revealed that the dentist continues to be the most important source of information about dental implants **(Pommer et al., 2011), & (Simensen et al., 2015)**

Patients' general knowledge about dental implants could be correlated with their the oral health status of the patients and implant success. Since more than two third of patients among the study group resaved satisfactorily level of general knowledge about dental implants, also most of them presented with an

average probing depth of 2.35 mm and experienced no or mild pain during follow-up sessions after 3 months. These findings suggest that increasing the level of knowledge and awareness about dental implant home care, well also increase the success rate of dental implants as shown during assessing, the probing depth, and the VAS scale of pain intensity among the patients post implementation of the nursing protocol.

Finally, based on our results and previous discussion, we could claim that the nursing role in dental implant treatment should not stop when the surgery is done and the patient leaves the practice as post-operative communication to monitor patients' perception regarding the treatment, well improve patients' awareness about proper oral hygiene, maintaining oral hygiene measures as well checking up the patient during the healing period over the next months are essential for a long predictable time and successful treatment outcomes of dental implants. So, from our point of view as researchers we could assume that our post-operative dental implant nursing protocol was vital in ascertaining and increasing the implant success rate for all our patients.

Conclusion:

Based on the findings of the current study, dental implant success had been increased and oral health status had been improved among patients with partially edentulous under study after the implementation of the post-operative nursing protocol.

Recommendations:

Based on the findings of the current study, the following items are recommended:

- Consistent application of nursing protocols to keep staff members and patients, as well informed about the new nursing care concerns their condition will improve their performance.
- Reapplication of the study on a large sample from different geographical areas for data generalizability are recommended.
- Encouraging the work of more studies and multi-disciplinary research between the fields of nursing and dentistry, such as developing a dental nursing diploma well showed a positive impact on the both field and on the patients outcome as well.

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