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ORIGINAL ARTICLE

Analysis of Dentists' Perceptions Regarding Selection of the Metallic Dental Implant Material

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ABSTRACT

Objective: To determine the perceptions of the dentist regarding most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability.

Material and methods: This descriptive study of dental implants was conducted at the LUMHS Dental department, ISRA Dental department, ADCC Hyderabad, Bhittai dental hospital Mirpur-khas. The study duration was six months. All the dentists having minimum experience of one year, both genders and of either age, were included. Data has been collected by the gathering and measuring information on target variables through a questionnaire and interviews with the dentists. All collecting all the information the data was analyzed using SPSS version 26.

Results: A total of 80 dentists from different health departments were interviewed to evaluate their perceptions of the dentist regarding most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability. Out of all females were 63.7% and remaining were males. Most of the dentists agreed with the painful dental implant procedure depending on the anesthesia choices. All the patients can remove metallic dental implants from the mouth. Gold (Au) alloys for dental implants because it is cost effective. Majority of the study subjects replied that the Cobalt-chromium alloy metallic implants cause trauma/injury to the teeth and have a higher chance of corrosion. The best synonymies the word reliable for metallic dental implant in their opinion, which is the mouth - friendly, light weighted and cost effective. The most reliable/suitable and most biocompatible metal to use as a dental implant is Titanium. According to dentists, the metals supremely carry the drying agent for a longer period are Titanium and Zirconium and they were thought that the dental implants can last a lifetime if they are taken care of properly.

Conclusion: As per study conclusion the Titanium is the most reliable/suitable and biocompatible metal to use as a dental implant, according to the study's findings, and Titanium and Zirconium are the metals that best carry the drying agent for a longer time, according to dentists. Because gold (Au) alloys are more cost effective, and Cobalt-chromium alloys metallic implants create more complications. If people take excellent care of your dental implants, they can last a lifetime.

Keywords: Metallic dental implants, dentist perceptions, mechanical stability

INTRODUCTION

Because of metallic dental implants mostly, patients experience multiple problems like infection, corrosion, osseointegration, mechanical instability, severe pain, discomfort, and gum inflammation. Rusting is the main problem of the metallic dental implant. Dentists must choose the most suitable, most biocompatible, and least corroded metallic dental implant which causes minimal infection to the host body. Biomaterial is a substance that can be used to correct or restore a damaged organ in the host body.[1] This is the outcome of the growth and assimilation of several material divisions (metals, composites, ceramics and polymers). These materials are either synthetic or natural that have been created to work and correct frailty in the organism. Mercury compound for dental filling is one of the well-known biomaterials. As a result, biomaterials-related ventures have gradually evolved during the last decade. A key element to remember is that these resources are supplied in small quantities but at a high price, and they are considered strategic products. Biomaterials and substances are used in the manufacture of Dental implants include, and variations of, metals, ceramics, carbon, polymers. Polymeric materials are laxer and more versatile compared to biomaterials of higher grades because they have poor machine- driven power/strength, rendering them vulnerable to mechanical breakages in service beneath strong arranging forces.[2] Many features of the biological compatibility profiles produced for dental implantation are demonstrated to depend upon associated biomaterials, tissue, variables of user that are linked to both surface and bulk qualities. Purity, surface tension for dampening and the type of tissue assimilation, either fibrous, osseous or combined may all be linked to in vivo user comebacks in the short- and long-term. Because the upper surface of dental implant is in direct relation with crucial hard and soft tissue and is vulnerable to both chemical and mechanical biological environments, there are important aspects for dental implant systems. Biological, mechanical and morphological compatibilities with the critical host tissues surrounding it should be included in such appliances.[3] Furthermore, under local biochemical and biomechanical conditions, the host environment has been proven to have a direct impact on the biomaterial to tissue-interfaced area, which is precise to the curative and longer-term medical features of load-bearing activities. The contact between host tissues and implanted material is restricted to some nms in the living tissues and implant surface layer. The clinical lifetime of intraoral functional units has been significantly affected by information on attachment soft and hard tissues and force allocation, resulting in stability and instability situations.[4] Although, a designed implant's processing processes significantly define its precision, surface features, and capacity to interact with surrounding tissue(s) in a given biological context.[6] Traditionally, dental implants have been made of biomedical-graded materials such as titanium (Ti) and its alloys, as well as ceramics.[7,8] The most common metallic biomaterials, as well as some of the most important existing and improving surface and bulk modification strategies for improving the biological integration, mechanical power (strength), and flexibility of metallic biomaterials, as well as their relation with the 3D printing.[6] Prolonged prognosis of the dental implants may today be regarded as reliable and expected, according to more than forty years of clinical experience around the world.[9,10] In different studies, different choices regarding dental implant material have been introduced. After taking controversies in clinical selection of metallic dental implantation due to factors including corrosion, infections, and implant failure, this study has been conducted to select most appropriate metallic biomaterials and to analyze selected materials based on their biocompatibility and mechanical stability by the dentists.

MATERIAL AND METHODS

This descriptive study of dental implants was conducted at the LUMHS Dental department, ISRA Dental department, ADCC

Hyderabad, Bhittai dental hospital Mirpurkhas. The study duration was six months. All the dentists having minimum experience of one year, both genders and of either age, were included. All the dentists having no proper ideas regarding dental implants material and those who refused to participate in the study were excluded. Data were collected by the gathering and measuring information on target variables through a questionnaire, interview, and the online survey form. All the dentists were interviewed regarding their perceptions of the dentist regarding most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability of four implant materials like Cobalt-chromium alloys, gold (Au) alloys, Titanium and the Zirconium. Data representations of this research by the google forms in which it was stored, processed and transmitted. Modeling data to discover useful information through SPSS software. To extract the useful information from data and make decisions based upon the data analysis after obtaining the results in percentages and frequencies.

RESULTS

A total of 80 dentists from different health departments were interviewed to evaluate their perceptions of the dentist regarding most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability. Out of all females were 63.7% and remaining were males. Most study subjects were house officers and postgraduate trainees 46.3% and 23.8% respectively, as shown in table.1

Most of the dentists agreed with the painful dental implant procedure depending on the anesthesia choices. All the patients can remove metallic dental implants from the mouth. Most of the people get knowledge about the dental implant reliability and durability through dentists. Mos of the dentists said that the people do not select gold (Au) alloys for dental implants because it is very cost effective. The perceptional analysis of these metallic dental implants leads to a wide selection of promising metallic dental implant among these four, which has the least possible chances of corrosion, infections, and implant failure. As most of the study subjects replied that the Cobalt-chromium alloy metallic implants cause trauma/injury to the teeth, it have higher chances of corrosion may cause the carcinogen. The best synonymies the word reliable for metallic dental implant in their opinion, which is the mouth - friendly, light weighted and cost effective. The most reliable/suitable and most biocompatible metal to use as a dental implant is Titanium. According to dentists, the metals supremely carry the drying agent for a longer period are Titanium and Zirconium and they were thought that dental implants can last a lifetime if take care of them properly. Other perceptions of dentists regarding the most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability are shown in table 2–4

Table 1: Gender and designation of the dentists n=80

Variables		Frequency	Percent
Gender	Males	29	36.3
	Females	51	63.7
Designation	Associate prof.	1	1.3
	Dental surgeon	11	13.8
	Dentist	6	7.5
	House officer	37	46.3
	Lecturer	6	7.5
	PG	19	23.8
	Total	80	100.0

Table 2: Perceptions regarding general practice of dental implant n=80

Questions		Frequency	%
Is there any resource available which can give financial assistance to the patient who needs dental implants?	Yes	4	5.0
	No	76	95.0
Are insurance cover dental implants?	More companies are realizing need for these procedures	27	33.8
	No	53	66.3
Factors make metallic dental implants more expensive	Cost of the Materials Used	9	11.3
	Dental Implant is cosmetic and complex process	21	26.3
	All of the above	50	62.5
Is the dental implant procedure painful?	Depend on anesthesia choices	42	52.5
	Moderate	37	46.3
	Severe	1	1.3
Select the term which best synonymies the word reliable for metallic dental implant in your opinion?	Cost effective	17	21.3
	Light weight	1	1.3
	Mouth friendly	18	22.5
	All of above	44	55.0
How people get knowledge about the dental implant reliability and durability?	Through dentist/surgeon	71	88.8
	Through internet	5	6.3
	Through observation	2	2.5
	Through random people	2	2.5
factor/factors that influence biocompatibility is/are	Material composition	19	23.8
	Others	61	76.3
properties/property makes a metal biocompatible	Binding sites	3	3.8
	Hydrophobicity	1	1.3
	Surface texture	7	8.8
	All of above	69	86.3
Is the dental implant procedure painful?	Depend on anesthesia choices	42	52.5
	Moderate	37	46.3
	Severe	1	1.3
Can patient remove metallic dental implants from mouth?	Yes	-	--
	No	80	100.0
How people get knowledge about the dental implant reliability and durability?	Through dentist/surgeon	71	88.8
	Through internet	5	6.3
	Through observation	2	2.5
	Through random people	2	2.5
Does It is important for a dental implant to be biocompatible because entire biological systems become non-functional due to toxicity	Agree	16	20.0
	Disagree	14	17.5
	Strongly	50	62.5

Table 3: Perceptions regarding rejection and complications of dental implant n=80

Questions		Frequency	%
Why people do not select gold (Au) alloys for dental implants?	Aesthetics	17	21.3
	Expensive	23	28.7
	All of the above	40	50.0
Does most of dental problem are caused by hypersensitivity?	Yes	9	11.3
	No	71	88.8
Which metallic implant causes trauma/injury to the teeth?	Cobalt-chromium alloys	57	71.3
	Gold (Au) alloys	3	3.8
	Zirconium	20	25.0
Which implant may cause the carcinogen	Cobalt-chromium alloys	53	66.3
	Titanium	12	15.0
	Zirconium	15	18.8
Nominate the metal which has higher chances of corrosion?	cobalt-chromium alloy	44	55.0
	Gold (Au) alloys	2	2.5
	Titanium	6	7.5
	Zirconium	28	35.0
Due to which reason titanium implant can be rejected?	Bone loss	73	91.3
	Carcinogen	1	1.3
	Corrosion	3	3.8
	Hives an	3	3.8
Select a metal which will discolor the teeth more due to devastation of metals?	cobalt-chromium alloy	67	83.8
	Gold (Au) alloys	1	1.3
	Titanium	1	1.3
	Zirconium	11	13.8
Which metal is more impervious/resistant to corrosion	cobalt-chromium alloy	3	3.8
	Gold (Au)alloys	14	17.5
	Titanium	59	73.8
	Zirconium	4	5.0

Table 4: Questions regarding susceptibility and effectiveness of the implants n=80

Questions		Frequency	%
Select the term which best synonymies the word reliable for metallic dental implant in your opinion?	Cost effective	17	21.3
	Light weight	1	1.3
	Mouth friendly	18	22.5
	All of above	44	55.0
Which metal is most reliable/suitable to use as a dental implant?	Cobalt-chromium alloys	2	2.5
	Gold (Au) alloys	12	15.0
	Titanium	64	80.0
	Zirconium	2	2.5
As a dentist what do you think metallic dental implants can be reliable for lifespan?	Maybe	32	40.0
	No	10	12.5
	Yes	38	47.5
Specify the most biocompatible metal?	Cobalt-chromium alloys	10	12.5
	Gold (Au) alloys	15	18.8
	Titanium	54	67.5
	Zirconium	1	1.3
Which of these metals supremely carry the drying agent for longer time period?	Cobalt-chromium alloys	7	8.8
	Gold (Au) alloys	10	12.5
	Titanium	31	38.8
	Zirconium	32	40.0
How Long Implants Last?	Dental implants can last a lifetime if you take care of them properly	31	38.8
	Depend on eating habits	2	2.5
	All of above	47	58.8

DISCUSSION

Adequate implant biomaterial choosing is a critical aspect in implant long-term success. Because the biological environment cannot tolerate any material entirely, implants should be chosen to minimize the negative biological responses while preserving acceptable function.[11] Every clinician should have a solid understanding of the various biomaterials used in dental implants.[11] In this study, a total of 80 dentists from different health departments were interviewed to evaluate their perceptions of the dentist regarding most appropriate metallic biomaterials and selected materials based on their biocompatibility and mechanical stability. Out of all females were 63.7% and remaining were males. Most study subjects were house officers and postgraduate trainees 46.3% and 23.8% respectively. In this study, the best synonymies the words reliable for metallic dental implant in their opinion, which is Mouth friendly, light weighted and cost effective. The most reliable/suitable and most biocompatible metals to use as dental implants are titanium and zirconium. W Nicholson J et al[12] observed that the because titanium alloys have outstanding biological and mechanical qualities, chances of success regarding dental implants comprising these materials are extremely high and further they reported that Several studies have mentioned that indicate exceptionally low failure rates over long periods, while implants survive for at least 89 percent of the time, and often 97–99 percent of the time, depending on the study and the materials utilized.[12] According to dentists, the metals supremely carry the drying agent for a longer period are Titanium and Zirconium and they were thought that the dental implants can last a lifetime if they are taken care of properly. Consistently, Borgonovo AE et al[13] during a 10-year follow-up evaluated the survival and effectiveness rates of zirconia implants, as well as marginal bone loss (MBL) and periodontal indices, and they observed that the One-piece zirconia dental implants are known for their high biocompatibility, low plaque adherence, and lack of microgap, all of which contribute to their clinical success. In another study reported by Borgonovo AE et al[14] reported that the marginal bone maintenance of zirconia

implants was good, which could be attributed to the one-piece form and features of zirconia implants. In this study most of the dentists agreed with the painful dental implant procedure depending on anesthesia choices, all the patients can remove metallic dental implants from their mouth and most of the people get knowledge about the dental implant reliability and durability by dentist/surgeon. On other hand Costa RS et al[15] demonstrated that the anxiety plays a role in dental pain, and that pain is linked to local anesthetic techniques. There is evidence suggests that attitudes of the dentists influence pain levels.

In this series, the perceptional analysis of these metallic dental implants leads to a wide selection of promising metallic dental implant among these four, which has the least possible chances of corrosion, infections, and implant failure. As most study subjects replied that the Cobalt-chromium alloy metallic implants cause trauma/injury to the teeth, it has higher chances of corrosion, also discolor the teeth more due to the devastation of metals and may cause the carcinogen. Inconsistently Teigen K et al[16] reported that the clinical performance of implant-supported FDPs composed of type 3 gold or cobalt-chromium frameworks with ceramic or prefabricated acrylic teeth is comparable. Individual implant success and survival appear to be unaffected by biomaterial combinations. This may be because in this study patients were not followed up for a long time but only a dentist's perceptional study and in this study most of the dentists were house officers and posts graduate, so the perception cannot be recommended for implementing against long-term follow-up studies. Recently focused on ceramic materials new generation such as zirconia, which has better mechanical properties. Furthermore, zirconia dental implants have a high biocompatibility and low plaque adherence and various animal studies have demonstrated long-term osseointegration and a bone-to-implant link comparable to titanium.[13,17,18] Zirconia can be employed successfully in cases of thinner biotypes or soft tissue recessions due to its excellent aesthetic qualities. There were several limitations in the study, it was a small sample size and mostly contained lower experienced dentists' perceptions. Thus, further large-scale studies should be done to evaluate the perceptions of the dentists having a minimum experience of 10 years.

CONCLUSION

As per study conclusion the Titanium is the most reliable/suitable and biocompatible metal to use as a dental implant, according to the study's findings, and Titanium and Zirconium are the metals that best carry the drying agent for a longer time, according to dentists. Because gold (Au) alloys are more cost effective, and Cobalt-chromium alloys metallic implants create more complications. If people take excellent care of your dental implants, they can last a lifetime. The clinical selection of metallic dental implantation is still in controversy due to factors including corrosion, infections, and implant failure. Several metallic dental implants have become commercially available in recent year. The current study had several limitations, more large-scale studies on this topic are recommended.

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