



**Original Research**

**Awareness About Dental Crowns As Dental Evidence In  
Forensic Dentistry**

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**Abstract**

Dental crowns are one of the most important objects used as evidence in forensic dentistry. Today's technical breakthroughs make it much easier to locate a victim or a missing person. Here, forensic issues and evidence finding were taken into mind. This study can thus reaffirm the necessity of a planned and deliberate approach to the preservation of dental records since they serve as trustworthy identity proof. Dental crowns are available in a wide range of materials and styles, including gold, porcelain fused metal, titanium, ceramic-metal, metallic, all-metal, all-porcelain, zirconia, and e-max.

**Keywords:** *Dental crowns; tensile strength; restorations; damaged teeth.*

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## **INTRODUCTION**

A dental crown is a useful tool for restoring a tooth's appearance and functionality. These tooth-shaped caps make you smile better while supporting tooth restoration. The most frequent reasons for getting a dental crown are to realign your bite, strengthen teeth that have been severely damaged by decay or cavities, cover implants, replace large fillings, repair or replace natural teeth that have been broken or cracked, replace teeth that have had root canals (especially posterior teeth), strengthen teeth that have been severely damaged by severe decay or cavities, and strengthen teeth that have been compromised by severe decay or cavities.

Metal-ceramic crowns are used to restore molars and premolars that have undergone endodontic treatment. Over 1100 degrees Celsius, the tooth entirely disintegrates, but the crowns show how remarkable of a contribution it made to forensic research. Dental crowns are available in a wide range of materials and styles, including gold, porcelain fused metal, titanium, ceramic-metal, metallic, all-metal, all-porcelain, zirconia, and e-max [1]. Porcelain-fused-to-metal (PFM) crowns have long been recognised as the gold standard for restoring fractured teeth. PFM crowns have good mechanical properties, satisfactory aesthetic results, and an acceptable biological quality needed for periodontal health. However, PFM crowns have some limitations that may limit their use. The metal structure and the covering of opaque porcelain required to cover the underlying greyish metal hue limit the aesthetic appeal of PFM crowns. PFM has recently been economically less appealing because to the sharp increase in the price of precious metals [2].

Over the past forty years, all-ceramic crowns have been employed as an alternative to PFM crowns to get around their aesthetic drawbacks. Titanium has great biocompatibility due to the formation of a very strong passivating oxide layer in oxygen-containing environments. Different types of ceramic can be used to create all-ceramic crowns, and not all ceramic materials have the same physical and aesthetic qualities. In the past, resin-based crowns were the first metal-free crowns to be utilised, but due to their poor fracture resistance, they were discontinued. More and more modern metal-free crowns, such as those composed of zirconia, leucite-reinforced glass, lithium disilicate, and glass-infiltrated alumina, are being employed in dental practises [3].

Copper is mixed with other metals, such as nickel or chromium, to create gold crowns. The strength and longevity of gold crowns are their key advantages. Depending on each patient's demands, some dentists may advise a gold crown as the best choice for back restorations. Due to their hue and appearance, gold crowns aren't a very common choice today. They are perfect for posterior restorations (back teeth), especially second molars, as they are strong and highly resistant, last a long period with good care, and wear down relatively slowly [4,5]. They don't look like natural teeth. Some people may be affected by gold alloy crowns and have negative side effects like swelling or allergic responses. The melting range should be as narrow as possible when casting gold alloys. To ensure that the cast framework does not droop during firing, alloys for porcelain veneers must have a solidus temperature that is at least 100K higher than the firing temperature of the dental porcelain that is being used. Low fusing porcelains are fired at a maximum temperature of 800°C, but high fusing porcelains require firing temperatures between 900 and 980°C. In addition to being influenced by the solidus temperature, palladium concentration has a significant impact on sag resistance. It is advised that high gold alloys contain a minimum of 5%Pd [6].

The most common type of crown used today is porcelain. They are totally constructed of porcelain. The best and most natural-looking crowns are made of porcelain or ceramic. They are biocompatible, which means no metal is utilised, so they are toxic-free, and they match the shape, size, and colour of the teeth around them

[7]. They are not as sturdy as metal crowns, though. Although porcelain crowns may be more expensive than other types of crowns, including metal crowns, they can last for a very long time with proper maintenance.

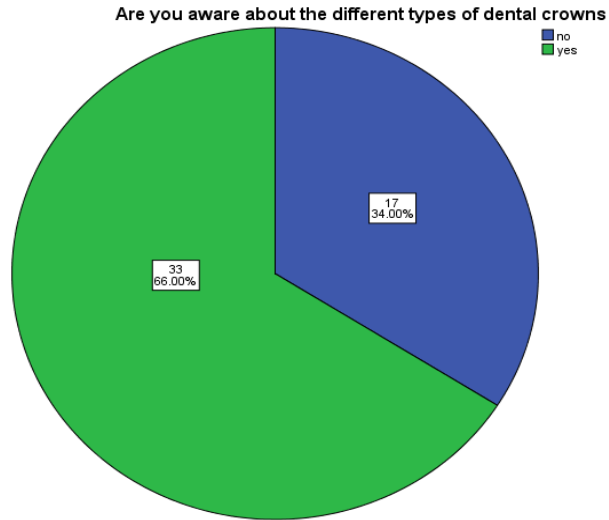
Another common kind of dental crown is one made of porcelain fused to metal (PFM). Due to their metal construction, they offer both strength and aesthetic appeal (due to the porcelain coat that covers the cap). They are less expensive than crowns made entirely of porcelain and offer excellent cosmetic and durability. The metal in these crowns, however, could result in a grey line at the gumline. This sort of crown might not produce an entirely attractive appearance as all-porcelain crowns do, and for persons who clench their teeth, it might wear down more quickly against the neighbouring teeth [8]. Porcelain can bear compressive loads that are higher than tensile stresses, hence it is preferable for the alloy's thermal expansion to be a little higher than that of the porcelain. The porcelain shell experiences compressive stresses as a result of this during cooling. In contrast to a metal or alloy, porcelain's thermal expansion is not a function of cooling pace. Greater thermal expansion of porcelain is caused by delayed cooling after firing, which allows for a higher CTE of the alloy to be balanced [4]. High fusing porcelains provide the majority of the balance for the CTEs of high gold/platinum alloys. Only high gold/silver/PGM alloys are available for low fusing porcelain. Metals have greater oxide layers due to the decreased gold and PGM content, which results in unsatisfactory aesthetics and, in severe situations, fractures and break-offs in the porcelain veneer [9].

Zirconium crowns are durable, robust, and offer excellent aesthetics (fewer possibilities of chipping or breaking). Due of its resilience, zirconia crowns are less prone to deteriorate over time. The biggest drawback of zirconium crowns is that they can be challenging to adjust and can cause the teeth they bite against to wear down quickly due to their strength. The methods that mix a strong core material (such as zirconia or alumina) with fragile veneering glass-ceramic materials are still up for dispute due to their fragility and low tensile strength. Zirconia exhibits a markedly greater fracture strength value in restorations supported by implants [9,10]. E-Max crowns are now the newest form of crowns used in dentistry. It is a particular variety of lithium disilicate-based all-ceramic crown (which is also light and thin). Both front and back teeth can benefit from them, and they can be strong and long-lasting. However, they might be more expensive, especially for the dentist (who may or may not pass that cost on to you), and some dental professionals have reported failures when using EMax for posterior teeth, especially when performing multiple units [11]. This study was done to determine how well-known dental crowns as proof of dental work are.

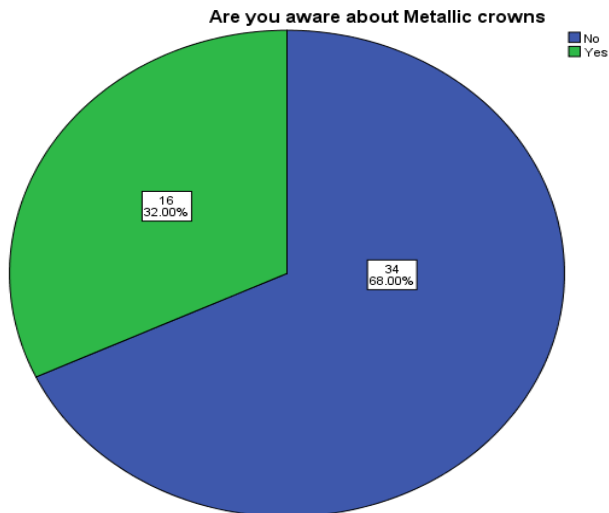
## **MATERIALS AND METHODS**

A 50-person sample was used in a cross-sectional survey of the population. A self-administered structured questionnaire with ten items was created based on knowledge of dental crowns as dental evidence. Participants were made aware of it through an internet portal (google form). A chi-square test was employed to examine the correlation in the statistics, and a P-value of 0.05 was deemed to be statistically significant. The fact that people from all cultures and lifestyles were polled is one of the survey's benefits. The sample technique utilised to reduce sampling bias was simple random sampling. Due to the small sample size, the study's findings cannot be generalised.

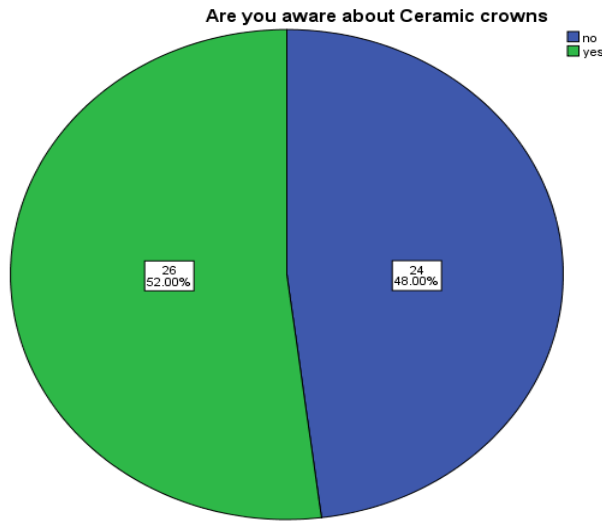
## RESULTS



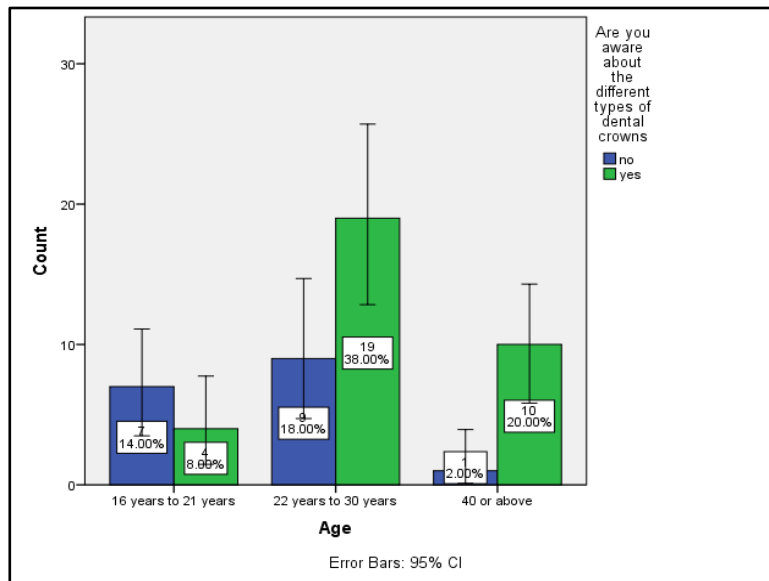
**Figure 1:** Pie graph illustrating the percentage distribution of people. In the research above, whereas 22.86% of the population (blue) was unable to analyse the many categories of dental crowns, 66% (green) of the study population were aware of the numerous types of dental crowns. Blue stands for no. Green indicates a yes.



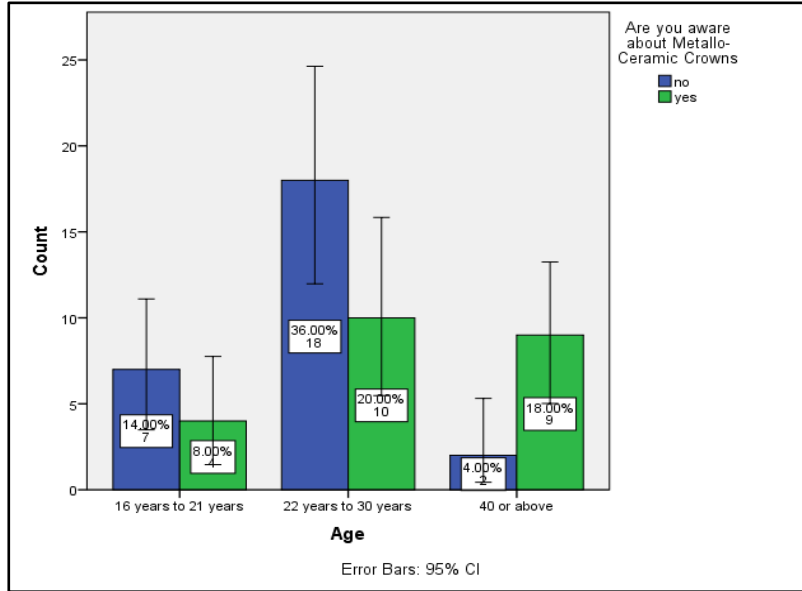
**Figure 2:** The percentage distribution of those who knew about metallic crowns is shown in a pie chart. 68% (blue) of the population was uninformed of the use of metallic crowns for conservative dentistry, compared to 32% (green) of the study population who were aware of them. Blue stands for no. Green indicates a yes.



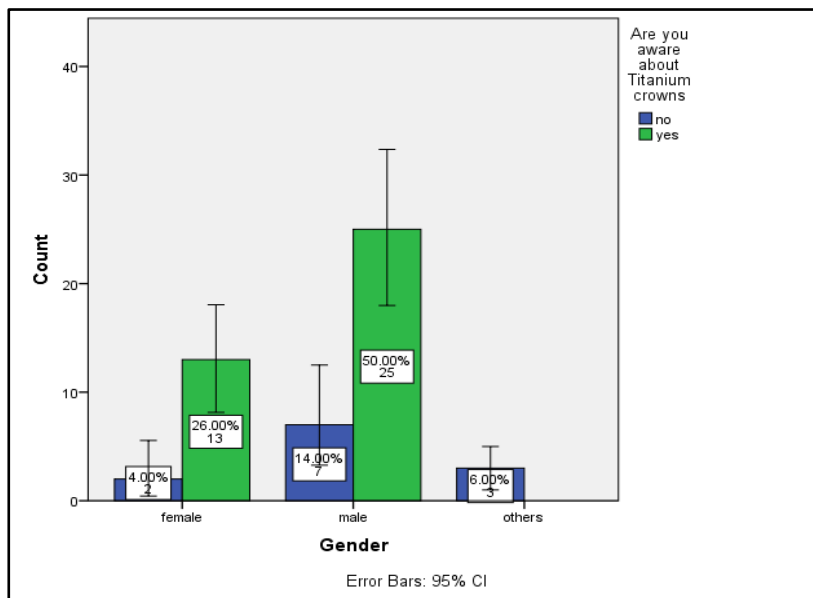
**Figure 3:** A pie chart illustrating the distribution of people's knowledge about ceramic dental crowns by percentage. While 48% of the public (blue) was uninformed of ceramic crowns, 52% (green) of the study population was aware of their usage in dentistry post-treatment. No is denoted by blue. Green is a positive symbol.



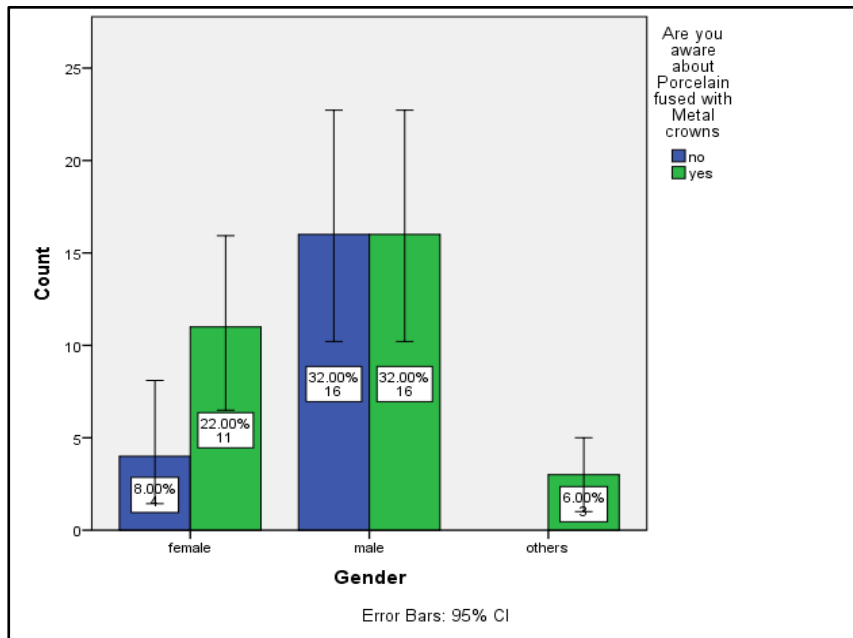
**Figure 4:** Bar graphs displaying the relationships between responses and age. Age is shown on the X-axis, and count is represented on the Y-axis. Green denotes an affirmative answer (8% for ages 16 to 21, 38% for ages 22 to 30, and 20% for ages 40 or older). Blue stands for no (14% for ages 16 to 21, 18% for ages 22 to 30, and 2% for ages 40 or older). The p-value, which is 0.034 (p 0.05), indicates that the result is statistically significant.



**Figure 5:** Bar graphs displaying the relationships between answers and age. Age is shown on the X-axis while count is represented on the Y-axis. Green denotes a yes answer (8% for ages 16 to 21; 20% for ages 22 to 30; and 18% for ages 40 or older), while blue denotes a no answer (14% for ages 16 to 21; 36% for ages 22 to 30; and 4% for ages 40 or older). The p-value, which is 0.013 (p 0.05), indicates that the result is statistically significant.



**Figure 6:** Bar graphs displaying the relationships between gender and response rate. The count is shown by the Y-axis, while the gender is represented by the X-axis. Green indicates that it is (26% females and 50% males). No (4% females, 14% males, 6% others) are represented by the colour blue. The calculated p-value, which is statistically significant at 0.04 (p 0.05), was used.



**Figure 7:** Bar graphs displaying the relationships between gender and response rate. The count is shown by the Y-axis, while the gender is represented by the X-axis. Yes is represented by green (22% women, 32% men, and 6% others). Blue (8% female, 32% male) stands for "no." The p-value was found and is statistically significant at 0.028 (p 0.05).

The results of the current study showed that (Figure 1), while 34% of the study population was still in the dark regarding the various forms of dental crowns, 66% of the study population was aware of them. In Figure 2 68% of the population was uninformed of the use of metallic crowns for conservative dentistry, compared to 32% of the study population who were aware of them. (Figure 3) While 48% of the community was uninformed of ceramic crowns, 52% of the study population knew they were used in dentistry after treatment. In Figure 4, while 14% of the survey population from the same age group category was unaware of the same, 8% of those aged 16 to 21 years were familiar with the numerous forms of dental crowns. 18% of the study population, who were in the age range of 22 to 30, did not know the different types of dental crowns that were utilised after dental restorations, compared to 38% of them. 20% of the study's participants in the 40+ age group were knowledgeable with the various forms of dental crowns, compared to 2% of the same age group who were not. (Figure 5) 8% of the 16 to 21 year old study population knew that metallo-ceramic crowns were used in dentistry after dental restoration, but 14% of the same research population had no idea what metallo-ceramic crowns were. 36% of the same age group did not know about metallo-ceramic crowns in dentistry, compared to 20% of the study population who were in the 22 to 30 year age range. In the study population, 4% of those aged 40 and older were uninformed of the usage of metallo-ceramic crowns, compared to 18% who were aware of it. In Figure 6, In contrast to the 4% of females who were not aware of titanium crowns used in dentistry, 26% of females were. In contrast to 14% of the same research population's male members who were uninformed of the use of titanium as dental crowns, 50% of the study's male participants were aware of the usage of titanium crowns in dentistry. Only 6% of people were not aware of titanium crowns. Figure 7 shows In contrast to 8% of the male population, 22% of females were aware of the

usage of porcelain with metal crowns in dentistry. In contrast to 32% of the same category of females who were clueless, 32% of males were aware of porcelain crowns in dentistry. 6% of the other participants in the same research group knew that porcelain fused with metal crowns were utilised.

## **DISCUSSION**

In the current survey, 66% of the public knew what kinds of dental crowns were available. According to a survey, 58.3% of the public was aware of the various dental crown forms utilised after restorative procedures [12]. 32% of the population in the current research was aware of metallic crowns. According to another survey, 48% of Sudanese people were aware of metallic crowns [13]. PFM crowns were known to 44% of the study participants in the current investigation. Only 12.5% of the people in one study knew about PFM crowns [14]. 76% of the participants in the current research were aware of dental crowns made of titanium. 39% of the study population knew about titanium-based crowns, according to another research [15].

The dental records provide a lot of information on the person's teeth and are based on the universal dental numbering system [16]. Comparing individualising aspects of the teeth, such as dental fillings, extractions, surface structure and root shape, neighbouring teeth, crowding of certain teeth, diastema, and dental spacing, is a crucial step in forensic dentistry. The colour of the enamel and cementum, as well as the size and form of the teeth, can alter when teeth are carbonised [17]. It is hard to identify since it may both calcify and fragment. The high temperatures in carbonised remains can cause metals to melt (such as bullets, prosthetics, and amalgam restorations) and bones to calcify, erasing evidence and making it hard to determine the cause of death.

The temperature within the trunk may have fluctuated between 1832°F and 3002°F because just a few bone and tooth pieces (including the crown, which was lost) were left, but it did not go over 3002°F because the titanium did not melt. The chemical composition of the analysed materials, such as restorations, prostheses, and implants, can be revealed by the SEM examination, which is very helpful because it enables the comparison of information obtained AM and PM, especially when there is so little evidence and traces left at the crime scene according to Quaresma et al. It is an additional technique that helps with identification even if it does not prove identity.

## **CONCLUSION**

The results of the survey show that the majority of the study group was well informed about the many kinds of dental crowns that are available and may be used as dental evidence.

**Conflict of Interests:** Nil

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