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International Journal of Emerging Trends in Science and TechnologyIC Value: 76.89 (Index Copernicus) Impact Factor: 4.219 DOI: <https://dx.doi.org/10.18535/ijetst/v5i1.03>**Original Article**

Dental Malpractice in Prosthodontics, Endodontics, and Restorative Dentistry: The Prevalence in Saudi Arabia

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Abstract

Aim: *The aim of this study was to detect the prevalence of dental malpractice in the fields of prosthodontics, endodontics, and restorative dentistry in the Kingdom of Saudi Arabia.*

Materials and Methods: *251 patients ≥ 18 years of age were randomly selected and clinically examined for substandard dental treatments done in dental premises in KSA in the following fields: Prosthodontics (substandard crown and bridge placement in relation to tooth preparation and crown adaptation, PFM crown and bridge placement on feather edge finishing line, substandard post and core), endodontics (substandard root canal (RCT) treatment), and restorative dentistry (overhanging restorations: class II, III, IV, V). The data obtained were documented in a patient examination form then statistically analyzed using Chi-Square Test.*

Results: *There was a significant difference in the percentages (number) of dental malpractice observations in all of the three types (prosthodontics, endodontics, restorative dentistry) p -value = 0.001 < 0.05, and the dental malpractice observations were not equally distributed. Therefore, endodontics malpractice was of the first rank up to 40% followed by restorative dentistry malpractice of the second rank up to 33% then prosthodontics malpractice of the third rank up to 27%.*

Conclusion: *Dentists must consider ethical principles and acceptable standards and protocols of diagnosis and treatment. There is high need for improving the technical skills of practitioners in root canal treatments. Also, stressing on the importance of using wedges to avoid overhanging dental restorations is recommended. Social and economic factors in the Saudi society might play a role in the lower percentages of prosthodontics malpractice in KSA.*

Keywords: *Malpractice, Prosthodontics, Endodontics, Restorative Dentistry.*

Introduction**Dental Malpractice**

Dental malpractice is the failure of a dental professional to follow the accepted standards of practice of his or her profession, resulting in harm

to the patient. Usually, proof of failure to comply with accepted standards of dental practice requires the testimony of someone with expertise in dentistry.^[1]

Iatrogenic Damage to Periodontium by Restorative Treatment Procedures

Periodontal tissues play an important role in proper esthetics, function, and comfort of the dentition. The interplay between periodontics and restorative dentistry is present at many aspects. For instance, location of restorative margins, crown contours, and response of the gingival tissues to restorative preparations.^[2] The close relationship of iatrogenic factors with periodontal breakdown was originally recognized by Black 1912.^[2,3] Many studies have focused their attention on different aspects of the periodontal–restorative interaction such as position of the restoration with respect to the gingival margin, presence of overhangs, presence of marginal leakage, roughness of the surfaces, and the type of restorative material.^[2,4]

Substandard Root Canal Treatment

It's known in the field of dentistry and proved in literature that substandard root canal treatments cause various kinds of periapical pathological conditions including granulomas, abscesses, or even cysts.^[5]

Preparations for Full Coverage Crowns

Literature makes it clear that a shoulder preparation is the correct finishing line for full coverage metal ceramic crowns also called porcelain-fused-to-metal restoration (PFM) in addition to full ceramic crowns for the purpose of achieving correct adaptation, avoiding marginal gap and plaque accumulation.^[6]

Post and Core

The length of the dowel (DL) should equal the crown length or two-thirds the length of the root. The length of the remaining apical fill (AF) should be at least 4.0 mm.^[7]

Wedging for Proper Proximal Contact

Literature clarifies the importance of using a wedge during preparation of interproximal areas. The benefits of using the wedge are summarized in serving as a guide to help prevent

overextension of the gingival floor, helping in separating the teeth which is critical to establishing proper proximal contact subsequently, and compensating for the thickness of the matrix band (the matrix band must be in absolute contact with (touching) the adjacent contact area).^[8]

It is clear that not abiding with the rules and instructions of using a wedge when preparing restorations in interproximal or interdental areas ends up with the creation of overhanging restorations that cause plaque accumulation as there isn't accessibility for the patient to clean properly thus periodontal irritation and inflammation.

Materials and Methods

Ethical approval

The study was registered with the research center of Riyadh Colleges of Dentistry and Pharmacy and received ethical approval from the institutional review board of the same institution (RC/IRB/2016/423).

Selection of the content for analysis and statistical analysis

251 patients ≥ 18 years of age were randomly selected and clinically examined for substandard dental treatments done in dental premises (hospitals, polyclinics, private clinics, etc...) in the Kingdom of Saudi Arabia. The study was conducted in the period July through December 2017. After taking the patient consent on an informed consent statement form for clinical studies, each patient was clinically examined in the following fields: Prosthodontics (substandard crown and bridge placement in relation to tooth preparation and crown adaptation, porcelain fused to metal (PFM) crown and bridge placement on feather edge finishing line, substandard post and core), endodontics (substandard root canal (RCT) treatment), and restorative dentistry (overhanging restorations: class II, III, IV, V). The data obtained were documented in a patient examination form then statistically analyzed using Chi-Square Test (nonparametric statistics) to test

the contingency of the variables. All statistical analyses were performed using the IBM SPSS Statistics 20 data processing software. The significance level was set at $p\text{-value} < 0.05$.

Results

For the purpose of the study, we tested the null hypothesis H_0 which stated that the percentages of dental malpractice (prosthodontics, endodontics, restorative dentistry) were equal at a confidence level 95%. The results of the 251 patients were as the following:

Table 1: Descriptive Statistics

	N	Mean	Std. Deviation	Mode
Endodontics	251	.85	.359	1
Restorative Dentistry	251	.69	.462	1
Prosthodontics	251	.57	.497	1
Valid N (listwise)	251			

Table 2 shows that endodontics was of the first rank with 213 observations (40%), restorative dentistry was of the second rank with 174 observations (33%), and prosthodontics was of the third rank with 142 observations (27%).

The question of this study was: Were dental malpractice observations distributed in equal proportions? In another word: Was the difference in the percentages of dental malpractice significant or insignificant? at a confidence level 95%.

Table 2: Observed Malpractice Frequency and Percentages
Malpractice

	Frequency	Percent	Valid Percent	Cumulative Percent
Endodontics	213	40.3	40.3	40.3
Restorative Dentistry	174	32.9	32.9	73.2
Prosthodontics	142	26.8	26.8	100.0
Total	529	100.0	100.0	

Table 3 shows the observed and the expected number of dental malpractice (prosthodontics,

Table 1 shows that the Mean of observed endodontics malpractice was 0.85, restorative dentistry malpractice was 0.69, and prosthodontics malpractice was 0.57. In addition, the standard deviation was 0.359, 0.462, 0.497 for the aforementioned three types of dental malpractice, respectively. Furthermore, Mode =1 which indicated that the existence of dental malpractice was more than the nonexistence of dental malpractice for all of the three types (prosthodontics, endodontics, restorative dentistry).

To answer this question, we tested the null hypothesis H_0 versus the alternative hypothesis H_1 which stated that there was a significant difference in the percentages (number of observations) of dental malpractice (prosthodontics, endodontics, restorative dentistry).

Hypotheses:

$$H_0: p_{\text{Restorative Dentistry}} = p_{\text{Endodontics}} = p_{\text{Prosthodontics}} = \frac{1}{3}$$

$$H_1: p_{\text{Restorative Dentistry}} \neq p_{\text{Endodontics}} \neq p_{\text{Prosthodontics}} \neq 0$$

endodontics, restorative dentistry). We used χ^2 Chi-Square Test to test the contingency (test of

goodness of fit) of the observed and expected number of dental malpractice. The expected number was equal for each of the three types of

Table 3:Chi-Square Test Malpractice Frequencies

Malpractice	Observed N	Expected N	Residual
Endodontics	213	176.3	36.7
Restorative Dentistry	174	176.3	-2.3
Prosthodontics	142	176.3	-34.3
Total	529		

The answer came in Table 4 which contains the results of the study test. For taking the decision we recognized the following:

For degree of freedom (df)=2 and significance level of this study set at $\alpha=5\%$ (one side test, right) with referring to Chi-Square statistical tables, the value of $\chi^2_{tab}=5.991$. When comparing χ^2_{tab} with the actual value in Table 4 $\chi^2_{cal}=14.340$, we found that $\chi^2_{tab} < \chi^2_{cal}$ with p-value (sig)=0.001<0.05. This result was the acceptance of H_1 and the rejection of H_0 .

Chi-Square Test showed that there was a significant difference in the percentages (number of observations) of dental malpractice (prosthodontics, endodontics, restorative dentistry) p-value =0.001 < 0.05.

dental malpractice (176.3), and this was what the null hypothesis stated. So, was the hypothesis accepted or not?

Therefore, Endodontics malpractice was of the first rank up to 40% followed by restorative dentistry malpractice of the second rank up to 33% then prosthodontics malpractice of the third rank up to 27%, and this was out of the total number of dental malpractice observations in the aforementioned three types (Table 2, Chart 1, Chart 2).

Table 4: Chi-Square Test Statistics Test Statistics

	Malpractice
Chi-Square	14.340 ^a
df	2
Asymp. Sig.	.001

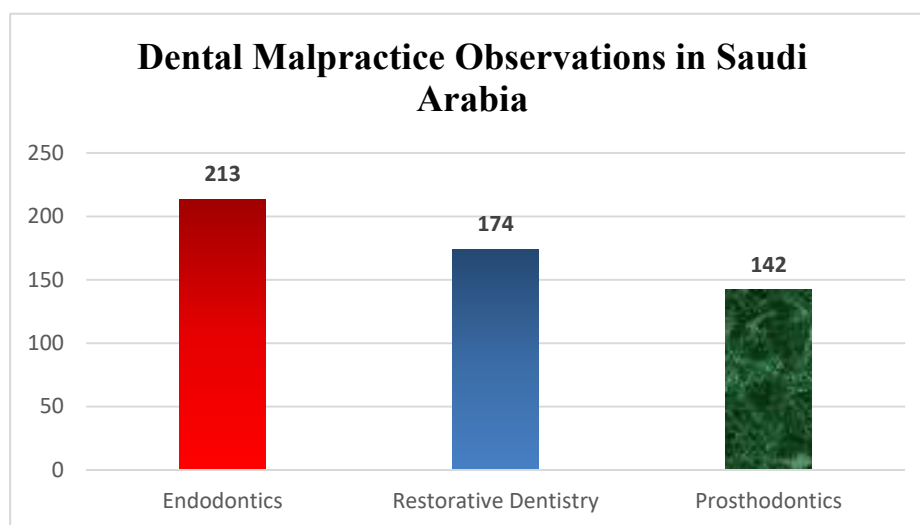


Chart 1: Dental Malpractice Observations in Saudi Arabia

Discussion

Comparison with literature

For the purpose of comparison with literature, we present Table 5 which contains the results of literature targeting the top three most frequent areas of malpractice cases in different countries.

According to the data available in literature, endodontics and prosthodontics have been present in all reports and have been among the three most frequently listed complaint areas during the past decade (Table 5).^[9] Also, as detailed in Hapcook study done in the United States of America and published through The Journal of The American Dental Association (Table 5), prosthodontics,

endodontics, and restorative dentistry malpractice were considerably more common in the dental field than others.^[9,13,18]

1. Comparison with literature (Table 5) except (Hapcook to be compared later in details).

When comparing prosthodontics only with endodontics, we found that in literature the percentages of prosthodontics malpractice were higher than the percentages of endodontics malpractice. However, in this study (KSA), the percentages of prosthodontics malpractice were lower than the percentages of endodontics malpractice.

Table 5: The top three most frequent areas of malpractice cases/complaint cases as described in actual references.^[9]

René and Öwall ^[10]	Prosthodontics (36.8%)	Formalities (13.6%)	Endodontics (12.4%)
Milgrom et al. ^[11]	Oral surgery (21.9%)	Prosthodontics (19.5%)	Endodontics (18.1%)
Ozdemir et al. ^[12]	Oral surgery (45.6%)	Prosthodontics (36.4%)	Endodontics (18.2%)
Hapcook ^[13]	Prosthodontics (28%)	Endodontics (17%)	Restorative (16%)
Bjørndal and Reit ^[14]	Prosthodontics (30.78%)	Endodontics (13.8%)	Diagnostics(12.3%)
Kiani and Sheikhezadi ^[15]	Prosthodontics (27.8%)	Oral surgery (23.5%)	Endodontics (16.6%)
Givol et al. ^[16]	Prosthodontics (28.0%)	Oral surgery (16.0%)	Endodontics (13.8%)
Pinchi et al. ^[17]	Implant (25%)	Prosthodontics (24%)	Endodontics (19.3%)

Notably, prosthodontics and endodontics have been present in all reports.^[9]

2. Comparison with Hapcook - JADA, USA

For the purpose of comparison with literature in details, we chose Hapcook-JADA (The Journal of The American Dental Association) in the USA for the year 2006 because it was the study that tackled the most prevalent types of malpractice which were similar to the three chosen types of dental malpractice in this study (endodontics, restorative dentistry, prosthodontics). Hapcook study results were (Table 5):

Prosthodontics 28%, Endodontics 17%, Restorative Dentistry 16%.^[9,13,18]

For comparison, we considered the aforementioned types of dental malpractice

as one comparative group. Through the following calculation the percentages were:

Prosthodontics+Endodontics+ Restorative Dentistry =100% (equation 1).

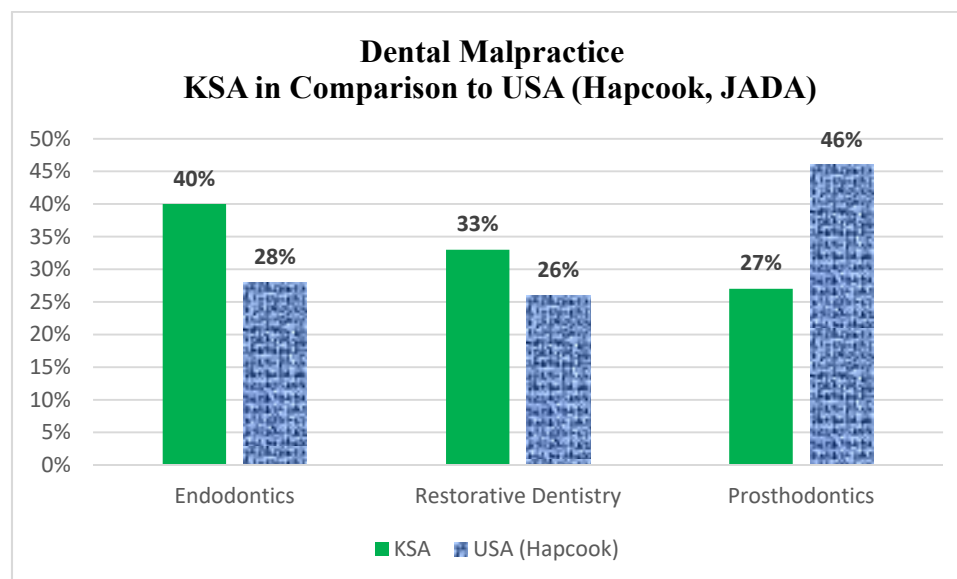
With couple of operations: Prosthodontics=1,647 endodontics, prosthodontics=1,75 restorative dentistry, endodontics=1,0625 restorative dentistry and compensating them in equation 1, the results became:

Prosthodontics=46%, Endodontics=28%, Restorative Dentistry 26%

From the previous results, it was clear that prosthodontics malpractice was of the first rank 46% followed by endodontics malpractice of the second rank 28% followed by restorative dentistry malpractice of the third rank 26%.

Table 6: Comparison of dental malpractice between KSA and USA according to percentages prevalence

Type of Dental Malpractice	KSA		USA	
	Percentage	Rank	Percentage	Rank
Endodontics	40%	1	28%	2
Restorative Dentistry	33%	2	26%	3
Prosthodontics	27%	3	46%	1

**Chart 2:** Dental Malpractice Comparison Between The Kingdom of Saudi Arabia and The United States of America (Hapcook, The Journal of The American Dental Association).^[9,13,18]

The comparison results were (Table 6, Chart 2): Endodontics malpractice was of the first rank 40% in this study (KSA). However, it was of the second rank 28% in Hapcook study (USA). Restorative dentistry malpractice was of the second rank 33% in this study (KSA). However, it was of the third rank 26% in Hapcook study (USA). Prosthodontics malpractice was of the third rank 27% in this study (KSA). However, it was of the first rank 46% in Hapcook study (USA).

Conclusion

Dentists must consider ethical principles and acceptable standards and protocols of diagnosis and treatment. These results can alert the official authorities that there is high need for improving the technical skills of dental practitioners in performing root canal treatments through improving teaching curriculums and training methods at universities, continuing dental education, and benefiting from other countries experiments that have lower percentages in dental

malpractice in endodontics. In addition, it's advised to stress on the importance of wedging - using wedges- to avoid overhanging dental restorations in restorative dentistry.

Concerning prosthodontics malpractice, social and economic factors in the Saudi society might play a role in the lower percentages of prosthodontics malpractice in KSA. For instance, the higher demand on prosthodontics (crowns and bridges/ posts and cores) in the American society might play a role in the higher percentages of prosthodontics malpractice in the USA in comparison to the KSA.

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Conflicts of interest: None declared

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