SELECTION OF DIRECT POSTERIOR RESTORATIVES BY DENTISTS IN NAIROBI, KENYA

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RESEARCH PROPOSAL FOR A COMMUNITY DENTISTRY PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE BACHELOR OF DENTAL SURGERY DEGREE PROGRAMME OF THE UNIVERSITY OF NAIROBI
DECLARATION

I, Ndonga Lilian Muthoni, declare that this is my original work and that it has not been submitted by any other person for research purposes or a degree in any other university or institution.

Signature

Date 25/08/11

Name Ndonga Lilian Muthoni
SUPERVISORS APPROVAL

This research proposal has been submitted in partial fulfillment of the degree of Bachelor of Dental Surgery with our approval as supervisors.

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Signature ~ Date 23/8/2011
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**DEFINITION OF TERMS**

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<td>Msc</td>
<td>Masters in Science</td>
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<td>UON</td>
<td>University Of Nairobi</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>ADA</td>
<td>American Dental Association</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<tr>
<td>DA</td>
<td>Dental Amalgam</td>
</tr>
<tr>
<td>GIC</td>
<td>Glass Ionomer Cement</td>
</tr>
<tr>
<td>DRC</td>
<td>Dental Resin Composite</td>
</tr>
<tr>
<td>MOD</td>
<td>Mesial-Occlusal-Distal</td>
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ABSTRACT

Dental amalgam has been known as a dental filling material for about 160 years and it has been popularly used for the past 50 years.¹ Yet, use of composite restorative materials has been increasing since 1980’s². Several studies have been conducted in different countries to assess the prevalence of amalgam restoration and factors associated with dentists' selection of dental restorative materials. Ganatra F.A et al conducted a similar study in Kenya in 2002³ but since then the current situation in Kenya is unknown.

Objective: The aim of this study is to investigate the criteria used currently in dental material selection by dentists in Nairobi for direct restoration of permanent and deciduous posterior teeth.

Design: This will be a cross-sectional descriptive study.

Study Area: The study will be carried out in Nairobi, Kenya’s capital city.

Study Population: Registered dental practitioners both in the public and private sectors.

Materials and Methods: A self-administered semi-structured questionnaire will be distributed to a randomly selected sample drawn from the study population.

Data collected will be analyzed and presented in form of text, tables and graphs.
CHAPTER 1.0: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Dental amalgam has been widely used as a permanent restorative material for close to 160 years. However during the last decade there has been a rapid change in the selection of dental restorative materials as the use of dental amalgam has decreased. Some countries such as Norway, Sweden and Denmark banned the use of dental amalgam. The main reasons cited in various studies for the decline in use of dental amalgam include; the detrimental effects that waste amalgam has on the environments, toxicity or allergy which may be associated with constant mercury exposure, particularly as a potential cause of chronic illnesses, autoimmune disorders, neurodegenerative diseases, birth defects, oral lesions, and mental disorders, unaesthetic appearance of dental amalgam, lack of chemical adhesion to the tooth structure, susceptibility of dental amalgam to corrosion among others.

Conversely, the use of dental resin composite has steadily been rising since the 1980’s and current trends show that tooth colored restoratives are rivaling and replacing dental amalgam. In Finland, Forss H et al (1997) investigated the selection of restorative materials and restoration longevity in order to obtain information on restorative dental care in Finland and to analyze the changes in treatment over a 5-year period. The most common restorative material was composite resin, which was used in 74.9% of the restorations, whereas dental amalgam was used in 4.8% and Glass Ionomer Cements in 9.4% of the restorations.
A similar study conducted in Nairobi, Kenya in 2002 revealed that despite the shift towards dental resin composite and other tooth colored restoratives in developed countries, dental amalgam was the most preferred material for direct posterior restorations in permanent teeth. Almost half the study population (47%) indicated that they always used dental amalgam. The reason for preference for dental amalgam was good performance and ease of manipulation. Glass Ionomer Cement was the most applied for deciduous teeth restorations.

The objective of this study is therefore to investigate the criteria used in selection of direct posterior restoratives for both primary and secondary teeth by dentists in Nairobi. In the conclusion of this study, a comparison will be made to the previous study conducted in 2002 and any changes observed in the selection of direct posterior restoratives by dentists in Nairobi will be highlighted.

1.2 LIMITATIONS OF THE STUDY

- Time constraints.
- Limited financial resources.
1.3 EXPECTED BENEFITS

• The report will contribute to the fulfillment of the requirements of the Bachelor of Dental Surgery program in the University of Nairobi.

• The study will provide more information regarding the selection and use of materials for restoration of posterior teeth by dentists in Nairobi.

• The study results may be used to organize and carry out seminars and forums to educate dentists on current advances in regards to dental materials and the need to incorporate certain materials in their day to day practice.

• The study will also enable formulation of recommendations and guidelines for the use of direct posterior dental restorative materials.
CHAPTER 2.0 LITERATURE REVIEW

Several studies have been conducted worldwide regarding the selection of direct posterior restorative materials by dentists and the factors that influence their selection\(^2\). Majority of these studies were carried out in developed countries and there is little information on this topic with regard to Africa and other developing countries. Despite this, the studies conducted were conclusive and a clear pattern in the selection of posterior restorative materials is evident.

As reported by Gordon J. Christensen et al (2010)\(^2\) that the major health organizations in the world continue to accept dental amalgam use but the “amalgam war” of the 1800s is still going on. The end is not in sight. There is little disagreement that dental amalgam serves well and, although controversial it appears to have minimal to no health hazards. There is a wide variation in the relative amount of dental amalgam placed in developed countries, and many dentists in North America do not use it. However, dental amalgam is still being used at least some of the time by the majority of practitioners in North America, and most of those practitioners also place resin-based composite in Class II locations. The evolution from dental amalgam to tooth-coloured restorations has been a slow and tumultuous journey. The acceptability of resin-based composite in proximal locations continues to be a question for some dentists, while others have concluded that dental amalgam is “dead”.

\(\)
Some studies have shown that dental amalgam to be the most selected restorative material by dentists for posterior restorations; In Kenya, a similar study conducted by Ganatra F.A et al (2002)³ revealed that dental amalgam was the most preferred material for direct posterior restorations in permanent teeth (47% indicated that they “always” used dental amalgam for MOD cavity on a premolar and “most of the time” 42%). The reason for preference for Dental Amalgam was good performance (41.1%) and ease of manipulation (26%). Suh-Woan Hu et al (2002)⁷ investigated the prevalence of and factors associated with dental amalgam restorations of posterior teeth in Taiwan. Results revealed that Dental Amalgam was used in 53.3% of the direct restorations of posterior teeth. Doctors' age, patients' age, type of dental treatment settings, population served per dentist, type of tooth, and number of surfaces restored was significantly associated with dental amalgam restorations in Taiwan.

In contrast, other studies have shown tooth colored restorative materials such as Resin Composite and Glass Ionomer Cements to be preferred over dental amalgam for restoration of posterior teeth; A survey carried out in the USA by Haj-Ali R et al (2005)⁸ where a total of 714 dentists (26.3%) responded showed that Direct composite was the material used most commonly for posterior intra-coronal restorations. Dentists in amalgam-free practices (31.6%) were significantly more likely to use direct composite than dentists whose practices used dental amalgam. Dentists in amalgam-free practices were less likely to consider caries rate, patient demand, and moisture control as important clinical decision factors and were more likely to report never experiencing complications.
Mjör IA et al investigated the selection of restorative materials in permanent teeth in general dental practice in several countries; In Sweden (1993-95)⁹, a survey conducted after a ban on amalgam had been proposed by politicians, compared with those obtained in a similar survey in 1978-79. A total of 177 clinicians participated. Marked changes in the selection of direct restorative materials were noted in the present study compared with the survey in 1978-79. Resin-based composite materials are taking over as the routine posterior restorative material, also in stress-bearing areas. Glass Ionomer restorative materials are used preferentially in the treatment of primary caries. The use of amalgam restorations has decreased in relative and absolute numbers. Inlays are infrequently used but, when used, usually include three or more surfaces, and ceramic materials predominate.

In Florida (1998)¹⁰, dentists in general dental practice in Florida were invited to record details from their own work pertaining to restorations. The 27 clinicians involved placed 2,035 restorations of which 53% were replacements of failed restorations. The increased use of resin based restorative material was clearly evident including posterior composites. In Norway (1999)¹¹, they recorded the type of restoration and the materials used in 24,429 restorations in permanent teeth by 243 Norwegian clinicians in general practice. The overall recorded use of restorative materials in permanent teeth shows that 32% are amalgams, just over 40% composites, and about 25% Glass Ionomer type materials. Three percent are "other" materials. A marked shift away from amalgam restorations is noted both in the clinician's estimated use during the last 2 decades and by comparing the present use of materials with that in failed restorations. Amalgam was the predominant material in 2- and 3-surface Class II restorations.
Saiki et al (2008) also carried out a similar study in Mexico. A questionnaire was presented to 632 dentists. The results of the study revealed that the dental material most used was the composite resin (55.4%) in class I restorations, and dental amalgam was the selection for class II (50.6%). The physical properties of dental amalgam were the main reason for its selection, and in the case of composite resin the easy manipulation of this material was the answer of the surveyed dentists. The selected material by patients was tooth colored restorations 76.9% and dental amalgam 22.5%. The most common reason for replacement of posterior restorations was: secondary caries 47%, bulk fracture 31%, pain/sensitivity 7.3%, tooth fracture 3.6%, poor anatomy 3.6% and other reasons 5.2%. In Australia, a study by FJT Burke et al (2002) was conducted in order to determine the reasons for dentists' choice of materials, in particular amalgam and resin composite. Out of the 560 replies received it was concluded that 73 per cent of dentists in Australia place large composite restorations in molar teeth and their choice of material is influenced greatly by clinical indications, and patients' aesthetic demands.

Studies have also been conducted to compare Dental Amalgam and Dental Resin Composite as well as other tooth colored restorative materials based on their failure rates and longevity. Simecek J.W et al (2009) evaluated the replacement rates for posterior resin-based composite and amalgam restorations in U.S. Navy and Marine Corps recruits. The authors determined the prevalence of placement of posterior amalgam and resin-based composite restorations and the incidence of replacement among U.S. Navy and Marine Corps personnel. Dental records from 2,780 personnel were analyzed to determine the relative risk of replacement for initially sound restorations during subjects' first years of military service.
The authors found significant increases in replacement rates for resin-based composite restorations compared with amalgam restorations for replacement due to all causes, as well as for replacement due to restoration. The study concluded that about 30 percent of posterior restorations required replacement, either at the initial examination or during the subjects' first years of military service. In a young military population, significantly more resin-based composite restorations in place at the initial examination will require replacement than will amalgam restorations. The number of surfaces restored and subjects' caries risk status may influence the longevity of resin-based composite and amalgam.

A retrospective clinical study on longevity of posterior composite and amalgam restorations was carried out by Opdam N.J et al (2009) to evaluate retrospectively the longevity of class I and II amalgam and composite resin restorations placed in a general practice. Longevity and reasons for failure of 2867 class I and II amalgam and composite resin restorations placed in 621 patients by two operators between 1990 and 1997 were recorded in 2002. 912 amalgam restorations and 1955 posterior composite resin restorations were placed. 182 amalgam and 259 posterior composite resin restorations failed during the observation period. The main reasons for failure of the restorations were caries (34%), endodontic treatment (12%) and fracture of the tooth (13%). Life tables calculated from the data reveal a survival for composite resin of 91.7% at 5 years and 82.2% at 10 years. For amalgam the survival is 89.6% at 5 years and 79.2% at 10 years.
Levin L et al (2007)\textsuperscript{16} conducted a cross-sectional radiographic survey of amalgam and resin-based composite posterior restorations that was so as to compare the failure rate of posterior inter-proximal amalgam restorations to resin-based composite restorations in a random young adult population. Bilateral bitewing radiographs of 459 young adults were screened. A total of 14,140 inter-proximal surfaces were examined, recorded, and statistically analyzed. Higher failure rates were observed in resin-based composite restorations than in amalgam restorations. Secondary caries was the main reason for failure. Overhanging margins were not a primary factor in restoration failure.

As reported by Shenoy A. (2008)\textsuperscript{17} that the longevity of dental restorations is dependent on many factors, including those related to materials, the dentist, and the patient. Dental amalgams have successfully served the profession for over a century. The main reasons for restoration failure are secondary caries, fracture of the bulk of the restoration or of the tooth, and marginal deficiencies and wear. The importance of direct-placement, aesthetic, tooth-colored restorative materials is still increasing. Amalgam restorations are being replaced because of alleged adverse health effects and inferior aesthetic appearance. All alternative restorative materials and procedures, however, have certain limitations. In terms of longevity, dental amalgams are probably superior to composite resins, especially when used for large restorations and cusp capping. The newer high copper single composition alloys offer superior properties but may not offer as good a seal as older amalgams. Composite resins are a viable alternative to amalgam for posterior restorations. They are more technique sensitive but offer a better seal and meet the patient's demands for esthetics. Fears about their longevity are unfounded and they perform well in clinical conditions. Their use in large restorations and in cusp capping situations is still a matter of debate.
In conclusion, based on this literature review, resin composites and other tooth colored restorative materials have gained popularity over dental amalgam and the use of dental amalgam has greatly declined in the developed world. However dental amalgam is still superior to resin composites and other restoratives in terms of longevity and the use of the alternative materials should be reconsidered.
CHAPTER 3.0 STATEMENT OF THE PROBLEM, JUSTIFICATION, OBJECTIVE

3.1 STATEMENT OF THE PROBLEM

Dental amalgam has been the predominant direct posterior restorative material for many years. However studies show a decline in its use especially in the developed world and an increased preference for resin composites, compomers, GIC’s, giomers, ormocers and other tooth colored restorative materials. However despite these changes in other countries, amalgam was the most selected material for permanent posterior teeth and GIC for deciduous teeth in Nairobi according to the study conducted in 2002. The current status of selection of direct posterior restoratives by dentists in Nairobi is unknown. This study will investigate current criteria used in selection of materials by dentists in Nairobi and determine the material most preferred for restoration of posterior permanent teeth and minimal cavities in posterior deciduous teeth.

3.2 JUSTIFICATION

This study will generate information regarding the practices of Kenyan dentists, both in the private and public sectors, and the day to day challenges in selection of direct posterior restoratives. The information will be used to determine whether Kenyan dentists are aware of and follow the currents trends in selection of dental restoratives the modern and developed world. The information obtained from this study will also enable formulation of recommendations and guidelines for the use of direct posterior dental restoratives.
3.3 OBJECTIVES

3.3.1 GENERAL OBJECTIVES

- To investigate the criteria in selection of direct posterior restoratives for both primary and secondary teeth by registered dentists in Nairobi.

3.3.2 SPECIFIC OBJECTIVES

- To determine the material most preferred for restoration of posterior permanent teeth.

- To determine the material most preferred for restoration of minimal Class I and II cavities in deciduous teeth.

- To establish reason of preference of the selected materials.
CHAPTER 4.0 RESEARCH METHODOLOGY

4.1 STUDY AREA
The study will be carried out in Nairobi, the capital city of Kenya that captures most of the dentists in both private and public practice. It is also an urban area in which a lot of restorative dentistry takes place.

4.2 STUDY POPULATION
All registered dentists in both public and private practice in Nairobi city.

4.3 STUDY DESIGN
This study will be a cross sectional descriptive study.

4.4 SAMPLING

4.4.1 SAMPLING METHOD
All the registered dentists in Nairobi will be used as the sampling frame and non-probability convenience sampling will be used to obtain the study subjects.

4.4.2 SAMPLE SIZE DETERMINATION

\[ N = \frac{Z^2 P (1 - P)}{C^2} \]

Taking a confidence level of 95%, a Z value of 1.96 and a prevalence of 50%,

Whereby: \( N = \) SAMPLE SIZE

\( P = \) PREVALENCE

\( Z = \) VALUE

\( C = 1 \) - CONFIDENCE LEVEL
\[
N = \frac{(1.96)^2 \times 50 - (100 - 50)}{(100 - 95)^2}
\]
\[
= 3.8416 \times \frac{50 \times 50}{25}
\]
\[
= 384.16
\]
\[
= 384 \text{ persons (for a population more than 10000)}
\]

But for a population less than 10000:

\[
f^f = \frac{n}{1 + n/N}
\]

Where

\(f^f\) = the derived sample size for a population less than 10000

\(n\) = the derived sample size for a population greater than 10000

\(N\) = the estimated population size of 100 dentists who practice dentistry in Nairobi

\[
f^f = \frac{384}{1 + 384/100}
\]
\[
= \frac{384}{4.84}
\]
\[
= 79.3
\]
\[
= 79 \text{ persons}
\]

**4.5 DATA COLLECTION METHOD**

The collection of data will be done using a semi-structured questionnaire.
4.6 ETHICAL CONSIDERATIONS

- Permission to carry out the study will be sought from the Kenyatta National Hospital ethics, research and standard board.
- The subjects will be informed about the study and consent will be obtained prior to their participation in the study.
- The data will be collected in a discrete and anonymous manner and information obtained will be treated with utmost confidentiality.
- The subjects will be allowed to withdraw from participation at any point during the study without penalty.
- The results obtained from the study will be used to benefit the participants and the community.

4.7 INCLUSION AND EXCLUSION CRITERIA

4.7.1 INCLUSION CRITERIA

- Registered dentists that practice restorative dentistry within Nairobi city.
- Registered dentists that consent to the study.

4.7.2 EXCLUSION CRITERIA

- Dentists who do not consent to participate in the study.
4.8 DATA ANALYSIS

The data collected by means of a questionnaire will be input and analyzed using SPSS version 12.00 and the information obtained presented using graphs and tables.

4.9 BUDGET

PROPOSAL

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GRAND TOTAL       KSHS 5500
REFERENCES


12. Saiki RET, Gómez CJF: Selection of direct restorative material for posterior tooth in Mexico City and suburban areas. Rev ADM 2008; 65 (3).


Dear Participant,

I, Ndonga Lilian Muthoni, am a level III Bachelor of Dental Surgery student at the University of Nairobi. I am currently conducting research on selection of direct posterior restoratives by dentists in Nairobi. I wish to request you to participate in the study that will form part of my degree course.

You will participate by filling the attached questionnaire. Participation is voluntary and utmost confidentiality is assured. Your honest participation in this study will be highly appreciated.

I would therefore appreciate your consent by signing here below.

I, the participant confirm that I have understood the relevant parts of the study and do hereby give consent to participate.

Sign __________________________ Date __________________________
APPENDIX 2 – QUESTIONNAIRE

SELECTION OF DIRECT POSTERIOR RESTORATIVES BY DENTISTS IN NAIROBI, KENYA

The information you herein remit shall be used for the sole purpose of research and shall be fully confidential. It is within your right to object to answering any of the questions you feel uncomfortable with. Your honest responses to the questions in the following questionnaire will be invaluable to my research. Thank you

DEMOGRAPHY

GENDER: a. Male
   b. Female

AREA OF PRACTICE
   a. Public sector
   b. Private sector
   c. Both

NUMBER OF YEARS OF IN CLINICAL PRACTICE
   a. 0 – 5 years
   b. 6 - 10 years
   c. 10 – 15 years
   d. More than 15 years

NATURE OF PRACTICE:
   a. General Dental Practitioner
   b. Specialist
1. On average, how many fillings do you do in a week?
   a. 0 – 10
   b. 11 – 20
   c. 21 – 30
   d. More than 30

2. What material do you select for direct restoration of wedge class II cavities (MO/DO) in permanent teeth?
   a. Dental amalgam
   b. Dental resin composite
   c. Conventional Glass Ionomer Cement
   d. Resin modified Glass Ionomer cement
   e. Other (Indicate) ____________________________

3. How often do you select the material chosen in question 2?
   a. Always
   b. Most of the time
   c. Seldom
   d. Never

4. What is your reason for selecting the material chosen in question 2?
   a. Good performance history
   b. User friendly
   c. Cheap
   d. Patient demand
   e. Other (Indicate) ____________________________
5. What material do you select for direct restoration of Mesial-Occlusal-Distal (MOD) cavities in permanent teeth?
   a. Dental amalgam
   b. Dental resin composite
   c. Conventional Glass Ionomer Cement
   d. Resin modified Glass Ionomer Cement
   e. Other (Indicate) ____________________________

6. How often do you select the material chosen in question 5?
   a. Always
   b. Most of the time
   c. Seldom
   d. Never

7. What is your reason for selecting the material in question 5?
   a. Good performance history
   b. User friendly
   c. Cheap
   d. Patient demand
   e. Other (Indicate) ____________________________

8. What material do you use for direct restoration of minimal class I and II cavities in deciduous teeth?
   a. Dental amalgam
   b. Dental resin composite
   c. Conventional Glass Ionomer Cement
   d. Resin modified Glass Ionomer Cement
   e. Compomer
   f. Other (Indicate) ____________________________
9. How often do you select the material chosen in question 8? 
   a. Always
   b. Most of the time
   c. Seldom
   d. Never

10. What is your reason for selecting the material chosen in question 8? 
   a. Good performance history
   b. User friendly
   c. Cheap
   d. Patient demand
   e. Other *(Indicate)*

I wish to thank you for taking the time to fill this questionnaire.
APPENDIX 3 – LETTER OF APPROVAL

The Chairman,
KNH/UON Ethics, Research and Standards Committee,
Kenyatta National Hospital.

Through,
Internal Supervisor,
Dr. Mua B. N
Signature ...................................... Date ................................

External Supervisor,
Dr. Kisumbi B.K
Signature ...................................... Date 23/8/2015

Dear Sir/Madam,

RE: COMMUNITY DENTISTRY PROJECT BY BDS LEVEL III


As part of BDS degree, the BDS students attending the University of Nairobi are required to carry out research to compile a project report. The project is on the selection of direct posterior restoratives by dentists in Nairobi. The proposal and the project account for 30% of the total marks in community and preventive dentistry unit.

The research project is approved at the departmental level by assigned supervisor and retesting of tools is done before the student is allowed to proceed with data collection.

The student is closely supervised at all stages during the study.

This is a request to your office to grant permission for the collection of data.

Yours faithfully,

Ndonga Lilian Muthoni
Ndonga Lilian Muthoni
BDS Level III
School of Dental Sciences
University of Nairobi

Dear Lilian

RESEARCH PROPOSAL: “SELECTION OF DIRECT POSTERIOR RESTORATIVES BY DENTISTS IN NAIROBI, KENYA” (UP354/08/2011)

Your above proposal refers.

This is to inform you that permission has been granted by the KNH/UON-Ethics & Research Committee to carry out research on study titled “Selection of Direct posterior Restoratives by Dentists in Nairobi, Kenya”.

By a copy of this letter, I am requesting the relevant persons to accord you the professional support and other materials that may be useful to your research.

Yours faithfully

PROF A N GUANTAI
SECRETARY, KNH/UON-ERC

cc. The Deputy Director CS, KNH
The Dean, School of Dental Sciences, UON
The HOD, Records, KNH
Supervisors: Dr. B.N. Mua. Dept.of Period. Community and Preventive Dentistry, UON
Dr. Kisumbi B.K, Dept.of Conservative and Prosthetic Dentistry, UON