



Clinical Strategies for Managing Dental Caries in Egypt: Opinions of General Practitioner Dentists

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Authors' contributions

This work was carried out in collaboration between all authors. Authors AF, WJMvdS and JEF designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author JM analysed the study results. Author NHJC provided feedback on draft manuscripts. All authors read and approved the final manuscript.

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ABSTRACT

Background: To assess the approach of GPDs in Upper Egypt regarding preventive and restorative treatments for various stages of carious lesion development.

Methods: A 42-item questionnaire was constructed for obtaining the GPD's opinions. Factor analyses (with Varimax rotation) were conducted to identify scales (clusters) of variables. Logistic regression analyses, with continuing professional development as dependent variable, were conducted to test for the effect of single and scaled factors regarding indications to perform preventive or restorative treatments.

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Results: All 70 participants returned the questionnaire. Three scale factors, i.e., treatment strategies, were identified as: 'operative-minded dentists' (who make >10 amalgam and resin composite restorations per week); 'problem solvers' (who have >10 years of experience, see >60 patients and make >10 temporary restorations per week); and 'thinkers' (who spend >50 hours / year on continuing professional development but also make >10 restorations per week). Logistic regression analyses found only one statistically significant relationship ($p=0.03$): 'operative-minded dentists' indicated provision of significantly less caries-preventive measures. Most patient visits were pain-induced.

Conclusion: It was concluded that most GPDs in Upper Egypt have an operative-minded treatment philosophy, and spend less time on preventive measures. Amalgam is the most common restorative material used.

Keywords: Dental caries; caries control; caries management; Egypt; restorative dentistry; preventive dentistry; practice based research; public oral health.

1. INTRODUCTION

Egypt, considered being one of the low- to middle-income countries, suffers from poor oralhealth in its population, especially in rural areas and Upper Egypt. The latest national oral health survey in Egypt which was carried out in 1990 revealed that 54.57% of 3-6 years old children were affected by dental caries, this percentage increased to 90.02% in 35 - 45 years old adults which is considered as an alarming oral health situation [1]. Since then, only one epidemiological survey has been conducted in the province of Upper Egypt [2]. This survey showed a low level of restorative care and a high level of unmet treatment needs in the children population. The study also pointed out that information about oral health was found to be scarce because of the limited access to the community and the low number of dentists employed. The findings of the Upper Egypt-study corroborate well with the results of two surveys related to the effectiveness of the public health service in other regions of Egypt. These two surveys showed that extraction rather than restorative care was the first choice in treating cavitated lesions: only 4.5% of these teeth had been treated restoratively [3,4]. Reasons for the low level of (restorative) care had not been investigated. However, there is ample information that the dental equipment in many of the public health service clinics is not functioning because of mechanical failure and absence of spare parts [5,6,7]. Such a situation restricts the use of the traditional restorative treatment model and calls for improvement of the state of the equipment or the use of alternative treatment models. A preventive and restorative care model unrelated to dental equipment is that of the Atraumatic Restorative Treatment (ART) approach which, if introduced, could improve the delivery of oral health care services [8].

However, the decision about which treatment should be used is not only related to the availability of dental equipment. Traditionally, treatment decisions in dentistry are mainly based on personal experiences and attitudes. This process results in inaccuracy and inter-professional variation. Nowadays, integration of best available evidence-based information and patient values plays a prominent role in deciding which treatment should be offered [9]. Further information about the Egyptian oral health care system is presented in Box 1.

Little information is available about caries management strategies used among general practitioner dentists (GPDs) in Upper Egypt. Different restorative strategies adopted by GPDs in their dental clinic have been previously studied in various countries using questionnaires [10,11]. The present study aimed to assess the approach of Upper Egypt GPDs towards preventive and restorative treatment options, as well as to assess their choices of restorative dental material at various stages of the carious process.

2. MATERIALS AND METHODS

2.1 Participants Selection and Procedure

The study protocol was approved by the research ethics committee, Faculty of Dentistry, Minia University, Egypt (ERC/2010/12), and was registered in the Netherlands Trial Register (NTR2719). Ministry of Health (MOH) and Health Insurance Organization (HIO) in upper Egypt permitted and facilitated our access to the GPDs. MOH and HIO provided us with a convenient sample of 70 volunteer GPDs and written consent was obtained from each participant by approval to participate in the study. The study was carried out among 70 Upper Egyptian GPDs working in Minia and Asyut governorates

respectively, as part of a larger study. Inclusion criteria were: 1) sufficient knowledge of the English language, and; 2) working in both private and governmental dental clinics, and; 3) written consent for participation in this study. GPDs were initially contacted by MOH, and only those who agreed to participate, were presented to the research team. MOH did not provide any information about the total number of invited GPDs. All GPDs on the list were included in this study. Eventually, the number of participating private dental clinics was 35 (of 164) in Minia governorate, and 35 (of 195) in Asyut governorate. For governmental dental clinics, these figures were 29 (of 248), and 24 (of 144), respectively.

2.2 Questionnaire Development

A questionnaire seeking information about treatment decision making in relation to several stages of carious lesions was constructed [10,11,12] [Box 2], based on the questionnaire as used at the Dental School of Radboud University Nijmegen Medical Center. The final questionnaire comprised 42 items, and was initially assessed for its clarity and appropriateness by a panel of 3 experienced dentists, and modified according to their comments. Nine questions were related to personal background, 5 requested clinical data, 1 was related to continuing professional development, 7 sought information about the dentist's intentions to use ART and their experiences with this treatment model, 10 were related to information about type of dental restoration used to treat cavities and its frequency of use during 1 week. The following 8 questions each contained 7 statements seeking GPDs' opinions regarding the indication for a preventive or a restorative treatment in specifically designed stages of a carious lesion. Those stages were: (a) outer, and (b) inner part of enamel; (c) just passed through enamel/dentin junction, obvious spread in the (d) outer third, and (e) outer half (but less than halfway through the pulp) of the dentin (f), caries with obvious spread in the inner half of the dentin, and (g) inner third (pulp threatening) of the dentin [12]. Participants were asked to indicate their level of agreement with each of the opinions expressed, using the following ordinal scale: strongly agree; agree; disagree, strongly disagree. The questionnaire was concluded with a question about which tooth surface was most frequently decayed, for both the child and the adult population.

2.3 Questionnaire Distribution and Collection

The questionnaire were sent to each participant by mail including a confidentially code, also an introduction about the research project, and a reply-paid envelope. The participants were asked to answer the questionnaire and resend it back. Non-respondents GPDs were reminded by telephone to return the questionnaire after 1 and 2 months.

2.4 Statistical Analysis

The second author entered the data in an electronic data base. It was checked by the first author. SAS software version 9.2 (SAS institute, Cary, NC, USA) was used for calculations and statistical analyses. Chi Square tests were used to test the influence of age, and district of residence (Minia or Asyut governorate) on the indication to perform a preventive or restorative treatment. Factor analyses (with Varimax rotation) were conducted to identify scales (clusters) of variables, i.e., treatment strategies. Three scale factors were found: 'operative-minded dentists' (those who make >10 amalgam and >10 resin composite restorations per week), 'problem solvers', (those who have >10 years of experience, see >60 patients and make >10 temporary restorations per week) and 'thinkers' (those who spend many (>50) hours per year on continuing professional development and also make >10 restorations per week). A reliability analysis of the 'item sum of the identified scales with Cronbach's Alpha could not be performed because of the low number of variables (n = max 3). Logistic regression analyses, using the responses to the question about 'continuing professional development' as the dependent variable, were performed to test the effect of single and scaled factors on the indication to perform a preventive or restorative treatment, respectively. For these analyses, responses to the questions concerning the 'indication to perform an operative treatment' were clustered into 2 caries stage, i.e., 'enamel caries', containing superficial and deep enamel caries and; 'dentin caries', containing all 5 earlier mentioned dentin caries stages, respectively.

Box 1

General information about Egypt and the health care system

Egypt belongs to the low- to middle income countries. Egypt's health care status is poor in comparison to the level of its national income. The health care system in Egypt is complex and pluralistic. The major provider of care is the Ministry of Health [MOH], which runs a nationwide system of health services. MOH services are subsidized, and provided largely free to all citizens. However, due to insufficient equipment and materials, most people seek treatment in private clinics. The second major provider is the Health Insurance organization [HIO], which was founded in 1964 with the intention of eventually covering the whole population. However, universal coverage has remained elusive, and restricted to the small urban formal sector.

Oral health care

A total of 28,000 dentists are working in the different health sectors all over Egypt. There is a maldistribution of dental providers in Egypt, as the majority of the dentists work in the big cities in Lower Egypt. The dentist/population ratio in the rural areas, where almost 60% of the population lives, is low. Only a few dentists are available to work in 'upper Egypt, due to the poor living condition in this region. Oral care and dental hygiene is still not a major concern for many Egyptians, especially the uneducated middle- and low income population. As there no nationwide awareness program about the importance of seeking oral health care regularly, and factors involved in maintaining oral health.

It is worth to mention that there is no recent available national epidemiological data.

Box 2

Information about Minya and Asyut Governorates

	El Minya governorate	Asyut governorate
Total area:	32,280 km ²	25,930 km ²
Population:	4.2 million	3.5 million
MOH dental clinics (n):	248	144
Private dental clinics (n):	164	195
Frequency GDPs (n):	243	175

3. RESULTS

The questionnaire was returned by all 70 dentists (response rate 100%). A Chi-square test found no statistical relationship between age, or district, and the indication to perform a preventive or restorative treatment, respectively.

3.1 Participants Demographic Data

Twenty five females and 45 males GDPs participated in the study from Minia and Asyut governorate. Sixty-two percent of the participants were younger than 30 years, whereas the remaining 38% were between 31-60 years old. Mean years of clinical dental experience was 10 yr (range 2-34 yrs). All participants worked in both governmental and private clinics. Participants indicated that they spent on average 96 hours (range 5-600; median = 50) per year in continuing professional development. On average, they spent 13 hours on clinical restorative treatment activities per week (range 4 to 50 hours; median = 10). Their workload was, on average, 74 patients per week (range 9 to

300; median = 60), of which 50 (range 3-200; median = 40) visited the clinic for relief from dental pain. Two-thirds of the patients (mean = 51, median = 40) were adults.

3.2 Response of the GDPs to the Questionnaire

A total number of 45 (64%) participants had heard of the ART approach and 13 (19%) of participants practiced ART. Logistic regression found only one statistically significant relationship between the 3 identified scale factors and all statements: 'operative-minded dentists' indicated significantly less caries-preventive measures (p=0.03).

(Table 1 and Fig. 1) provide an overview of the indicated treatments related to the various caries stages. Superficial and deep enamel carious lesions were indications for monitoring, preventive and direct (plastic) restorative treatment, whereas most other lesions were indications for direct or indirect (crown) restorative treatment. In case of caries lesions

confined to the enamel (Fig. 1, caries stages 1a, 1b), a direct restoration was indicated by 60.3%. Another 20.3% would make a restoration in case the lesions had just broken the enamel-dentin junction, but without obvious spread in the dentin (Fig. 1, Stage 2). The remaining 19.4% would restore in case the lesions had obvious spread into the dentin (Figs. 1, 3a, 3b).

Of the participants, 4.4% would immediately indicate an indirect restoration (crown) in case the carious lesion was observed without obvious spread into the dentin (Fig. 1, Stage 1a, 1b, 2). Another 31.4% indicated a crown for treatment of

dentin lesions with obvious spread up to the outer half of the dentin (Fig. 1, stadia 3a, 3b). From the remaining, 42.1% would indicate a crown in case of deep dentin lesions (Fig. 1, Table1, stadia 4a, 4b), whereas the other 22.1% never indicated a crown in case a carious lesion was present.

(Fig. 2) gives insight into the plastic material used for direct restorations. Deep dentin cavities were mainly treated with a temporary restoration material. Resin composite material was merely used in cases of enamel lesions, and less in (deep) dentin lesions.

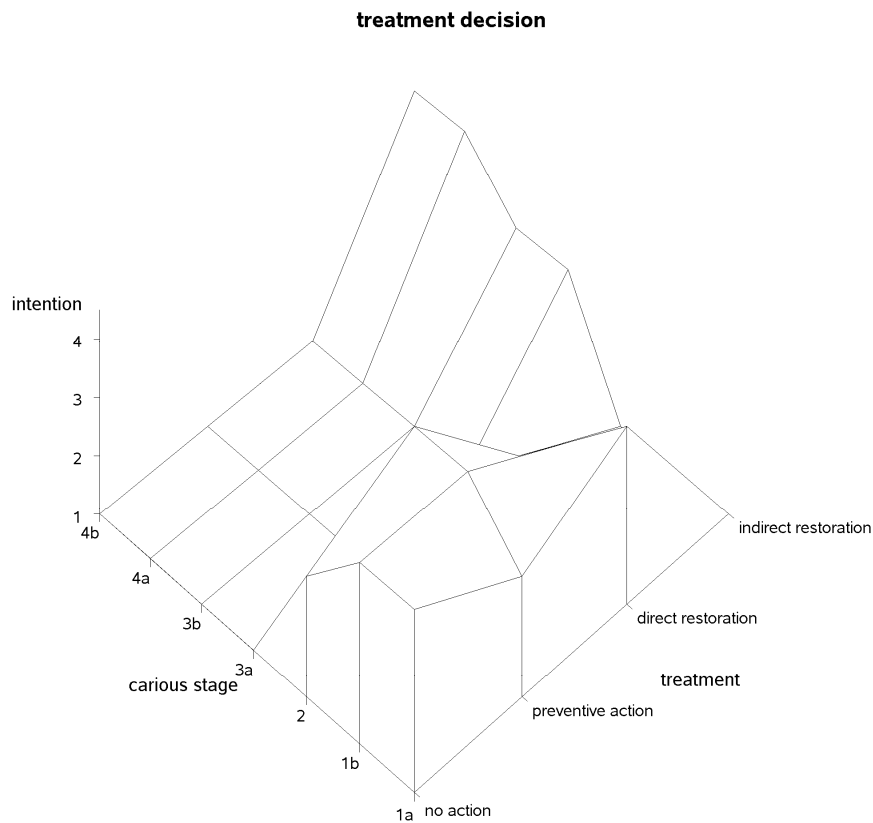


Fig. 1. Mean answers (Intention scale 1 = strongly disagree, 2 =disagree, 3 =agree, 4 = strongly agree) plotted on treatment decisions (no action, preventive action, direct restoration, indirect restoration) and stages of caries lesion development

Caries stage; caries lesion: 1a = up to the inner half of the enamel; 1b = up to , but not beyond the enamel-dentin junction; 2 = caries broken enamel-dentin junction, but without obvious spread in the dentin; 3a =, with obvious spread in the outer third of the dentin; 3b = caries with obvious spread in the outer half of the dentin; 4a = caries with obvious spread in the inner half of the dentin; 4b = with obvious spread in the inner two-third of the dentin

Table 1. Mean answers of participants (n=70; intention scale: 1 = strongly disagree, 2 =disagree, 3 =agree, 4 = strongly agree) on 8 statements related to treatment decisions (no action, preventive action, direct restoration, indirect restoration) and stages of caries lesion development

Statement/caries stage	1a	1b	2	3a	3b	4a	4b
I usually perform no (clinical) action	2.64	2.22	1.80	1.40	1.38	1.41	1.47
I usually perform a preventive action	3.53	3.31	2.64	1.98	1.73	1.71	1.67
I usually make a direct restoration	2.57	3.02	3.41	3.37	3.29	2.95	2.82
I usually make an amalgam restoration	2.16	1.82	2.44	3.30	3.43	3.24	3.25
I usually make a resin composite restoration.	3.14	3.3	3.18	2.36	2.04	1.58	1.51
I usually make a glass ionomer restoration	2.89	3.05	2.91	2.39	2.23	2.09	2.09
I usually make a temporarily restoration	1.44	1.58	1.74	2.48	2.96	3.41	3.53
I usually make an indirect restoration	1.22	1.17	1.26	1.71	2.04	2.74	2.98

Caries stage; caries lesion: 1a = up to the inner half of the enamel; 1b = up to, but not beyond the enamel-dentin junction; 2 = caries broken enamel-dentin junction, but without obvious spread in the dentin; 3a =; with obvious spread in the outer third of the dentin; 3b = caries with obvious spread in the outer half of the dentin.; 4a = caries with obvious spread in the inner half of the dentin; 4b = with obvious spread in the inner two-third of the dentin

material selection

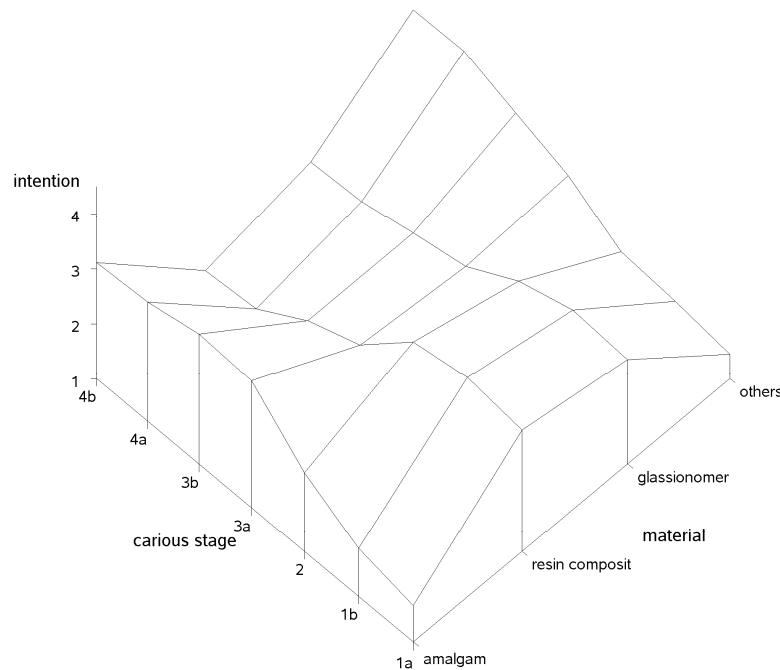


Fig. 2. Mean answers (Intention scale 1 = strongly disagree -4 = strongly agree) plotted on selected direct (plastic) restorative material in divers caries stages

Caries stage; caries lesion: 1a = up to the inner half of the enamel; 1b = up to, but not beyond the enamel-dentin junction; 2 = with broken enamel-dentin junction, but without obvious spread in the dentin; 3a =; caries with obvious spread in the outer third of the dentin; 3b = caries with obvious spread in the outer half of the dentin.; 4a = caries with obvious spread in the inner half of the dentin; 4b = caries with obvious spread in the inner third of the dentin (pulp threatening).

4. DISCUSSION

The limitations of this study were; it was the first practice-based research study in Upper Egypt. The results might not be representative for all Egyptian GPDs, and provide insight in what 'early innovators' [13] think and actually perform in their daily clinical practice, and, as such, represent a positive overestimation of current preventive and restorative care. Moreover, possible participants in this study were contacted by MOH, and only those who agreed to participate, were presented to us. As recent general background data about the dentist population in Upper Egypt were not available, a comparison with the characteristics of the study group was not possible. This might cause biased outcomes. Notwithstanding these limitations, we think that the data generated provide a useful insight into the current approach and attitudes of Upper Egyptian GPDs in preventive and restorative dentistry.

The collected data indicate that most patient visits were induced by dental pain. This indicates that people only sought dental aid when they were in severe pain. In this area, where 20% of the Egyptians live below the poverty line [14], the person's financial situation is considered a major barrier to visiting a dentist during early stages of dental problems. This so called 'Upper Egypt poverty phenomenon' is still increasing [15]. Peoples' behavior with regard to seeking preventive and restorative care might further be attributed to cultural or educational background. For example, some people still believe that extraction is better than restoration. Another important issue may be fear of dental treatment, resulting from bad experiences related to previous painful dental treatments [16,17]. Causes of Egyptian patients' attitude regarding dental care are similar to those in other developing countries [18]. An alternative and affordable oral healthcare model, such as the ART approach, might be suitable for use in Upper Egypt.

All participated GPDs showed an 'operative-intervention-minded' approach with a low level of preventive-mindedness. This may in part be attributed to the manner in which their undergraduate education was organized. Until 2000, the dental curricula followed the traditional way of 'drill and fill'. After that, the higher education enhancement project started ensuring that the training of physicians and dentists would take into account the needs of the health system,

including preventive and curative aspects [15,19]. Furthermore, the patient's health concepts and values affect the treatment decision [20]. Most of the Egyptians are unfamiliar with regular dental checkups. Those who visit a dental clinic are, mostly, in urgent need of help. Preventive approaches are thus less required than operative interventions and this might have affected GPDs' answers. Furthermore, Egyptian people may also be unaware of caries prevention measures, as there is no nationwide oral healthcare preventive program [2,6,21]. This might indicate that the Egyptian authorities assign a lower priority to oral healthcare than to general healthcare [15].

The questionnaire used in the present study, was based on the one [12] used at the Dental School of Radboud University Nijmegen Medical Center, whereas other, European studies, looking for opinions and attitudes of GPDs concerning the management of dental caries, used a slightly different carious lesion scale and used different questions [10,11]. As most GPDs in Upper Egypt do not make and use bitewing radiographs for caries lesion detection, the present questionnaire was, based on the panels' comments, adopted for the Egyptian situation. The findings of the present study are in agreement with these European studies, which also found a wide disparity in diagnosis and in clinical decision-making. Remarkable aspects, however, were the participants' indications for restorative treatment of deep enamel lesions, as well as their indications for a dental crown as a method to manage severe dentine caries lesions. The approach chosen differs from modern, minimal invasive oral health care approaches [12,22].

Introduction of the Minimal Intervention Dentistry approach [22], of new dental restorative materials, in addition to the new dental education program [2,15], may slowly improve the present oral health situation in Upper Egypt. The ART approach can partly improve the poor levels of preventive and restorative care [23].

5. CONCLUSION

This study has shown that most GPDs in Upper Egypt have an operative-minded treatment philosophy and spend little time on preventive measures. The main treatment provided is removal of teeth. In cases where a plastic restoration is made, amalgam is first choice restoration material.

CONSENT

All authors declare that 'written informed consent' was obtained from the participants for publication of the study results.

ETHICAL APPROVAL

All authors hereby declare that the study protocol has been examined and approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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