

DENTAL COMPOSITE RELATED ALLERGIC REACTIONS IN DENTISTS WORKING IN KARACHI

¹AFTAB AHMED KHAN, BDS, MSc (Dental Materials)

²ADEL ZIA SIDDIQUI, BDS, MSc (Dental Materials)

³HASAN ASKARI, BDS

⁴FOUZIA IMTIAZ, MBBS, PhD

⁵SADAF SHAKOOR, BDS

ABSTRACT

Dental professional and their supporting staff daily handle many materials and chemicals with their uncovered hands. One of the most widely used chemical is methyl methacrylate monomer based dental material. Materials based on methacrylate and its polymer appear to be a significant reason for contact dermatitis in dental personnel. There may be other unfavourable effects on health.

Objectives of the study was to see the effect of uncured polymeric resin composite material on the health of dental personnel.

This survey based cross-sectional study was done on 330 dentists working in different areas of Karachi. Data were collected by interviews, telephonic conversations or by mailing questionnaire to the participants. The sampling area was the Karachi city and sampling method was non-random convenience sampling. The data were analyzed using SPSS version 17.

Results showed that methyl methacrylate based resin composite material is a source of various allergic reactions among the dental personnel. It was concluded that the material can have adverse effects on dental practitioners and patients.

Key Words: Monomer, resin composite, methyl methacrylate, allergic reactions.

INTRODUCTION

Dental professionals and their supporting staff daily handle many materials and chemicals with their uncovered hands. One of the most widely used chemical is methyl methacrylate monomer based dental material.^{1,2} These methyl methacrylate based dental materials are either set chemically by mixing two components or by application of visible light on a single

paste system. In both cases curing remains incomplete and unreacted monomers are discharged from the set material. Dental materials based on methacrylate and its polymer appear to be a significant reason for contact dermatitis, aggravation of skin conditions, eyes or mucous membranes, allergic dermatitis, asthma and paresthesia in the fingers.³

Studies have shown that unreacted monomers have eluted immediately after placement in the tooth cavity.⁴ Polymerization process involves absorption of visible light energy by methyl methacrylate based materials. During the conversion process of monomer molecules into macromolecules, some of the monomers don't take part due to diffusion limitations. 15 to 50% methacrylate groups don't take part in the conversion process.⁴

However, recent advancement in material formulations has resulted into higher degree of conversion of

¹ Department of Dental Materials Science, Mohammad Bin Qasim Dental College, Near Razzakabad Police Training Centre; Port Qasim Karachi, Email: aakjk@hotmail.com
Phone # 0300-9270366, Res: B-102, Block-5, KAECHS, Karachi-75350

² Department of Dental Material Sciences, Baqai Dental College, Baqai Medical University, Karachi

³ Department of Biochemistry, Mohammad Bin Qasim Dental College, Karachi

⁴ Professor Biochemistry, Dow University Health Sciences, Karachi

⁵ Department of Physiology, Mohammad Bin Qasim Dental College, Karachi

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the set material. Currently only 1.5 to 5% methacrylate groups remain unreacted. But even the small amount of this group is enough to cause cytotoxicity.⁵ A number of local and systemic allergic reactions have been reported in which incidence of patients and dentists allergic reactions have been shown in the range of 0.7% to 2%.⁶

The monomer based methacrylate materials are volatile in nature. Henriks-Eckermann et al. studied exposure of dental personnel to airborne methacrylate in clinics in Finland. HEMA, 2-HEMA and TEGDMA were found in the air in different concentrations in the clinics. The results showed exposure of dental personnel to different Methacrylate at lower levels.⁷ Aside from the information from this paper, there appears to be exceptionally limited data about the actual level of exposure to volatile monomers in a clinical circumstance.

It is a common assumption that surgical gloves ensure hands from the adverse effects of the chemicals. A study was conducted in this regard by Anderson et al. Permeability of six different types of gloves; namely 1 vinyl, 2 nitrile, 2 latex and a 4H glove were checked. Latex and vinyl gloves that are most commonly used in clinical practice were found to give poor protection against methacrylate groups.⁸

Asthma due to methacrylate material has also been reported. Occupational asthma, conjunctival symptoms and allergic contact dermatitis among dental technicians were reported.⁹ Another study proposed that the use of a local exhaust ventilation system essentially lessened the peak concentration of methyl methacrylate vapor in the breathing zone of dental technicians.³

Like other occupational problems, eye injuries are the most common of the all among the dentists. Previous studies conducted in this regard infer that eye injuries among dentists could be as high as 10%. A cross sectional study conducted in Saudi Arabia found that one month prevalence of 42% in dentists¹⁰ whereas the low prevalence of eye injuries equally among dentists, students and assistants were found in an Australian study. Our hypothesis is that the methyl methacrylate based materials are the source of occupational hazards related to skin, respiratory and ocular injuries. The present study was done to find out the prevalence of occupational dental composite related allergic reactions in dentists in Karachi.

METHODOLOGY

Four hundred Specially designed questionnaires were distributed among registered dental practitioners working in different parts of Karachi city. The questionnaire was designed as such to assess the prevalence of dental composite material's related allergies to dental professionals. Data were collected by face-to-face interviews, telephonic interviews or by mailing questionnaire to the participants. The sampling frame was the Karachi city and sampling method was non-random convenience sampling. The dental professionals having atleast one year clinical experience working and at least practicing three hours daily were included in this study. Dental profession above 50 years were excluded. Questionnaire was divided into two sections; The questions of the first part were related to demographic information such as name, age, gender, clinic's location; and clinical experience. The second part, consisted of 10 questions

TABLE 1: OCCURRENCE OF VARIOUS ALLERGIC REACTIONS AMONG THE PARTICIPANTS ACCORDING TO THEIR WORKING EXPERIENCE

	Working experience (1-5 years)		Working experience (6-10 years)		Working experience (11-15 years)		Working experience (16-20 years)	
Symptoms	N	%	N	%	N	%	N	%
Skin rashes	5	1.5	4	1.2	4	1.2	2	0.6
Skin irritation	6	1.8	4	1.2	4	1.2	3	0.9
Skin redness	4	1.2	3	0.9	1	0.3	1	0.3
Skin itching	6	1.8	5	1.5	0	0.0	4	1.2
Irritation in eye	1	0.3	2	0.6	0	0.0	0	0.0
Redness in eye	11	3.3	2	0.6	2	0.6	0	0.0
Itching in finger	15	4.5	6	1.8	2	0.6	1	0.3
Redness in finger	2	0.6	1	0.3	0	0.0	0	0.0
Dyspnea	0	0.0	0	0.0	0	0.0	0	0.0
Asthma	0	0.0	0	0.0	3	0.9	0	0.0

and was related to dentist's protection measures in handling resin based composite materials. Questions were posed in the way to assess the opinion such as if resins based materials caused any kind of rashes, redness, itching skin or fingers or eyes, and whether they took any protective measures. Study objectives were explained to the dentists and a fully informed consent was taken from them. The collected data were analyzed using SPSS version 17.

RESULTS

Among 330 collected questionnaires, 120 were of male dentists and 210 of females. 70 dental surgeons didn't participate. The geographic distribution of the respondents is dominated by Nazimabad and F.B. Areas. This is not strange as these areas are densely populated and majority of the dentists practice in these areas. So it was more convenient to approach the dentists from these areas to be the part of this study. Distribution by gender was not uniform in this study, with predominance of female practitioners due to non-random convenience sampling method. The results of the survey are presented in tables and figures which are self-explanatory. With the summarization of the results we fail to reject the hypothesis of this study.

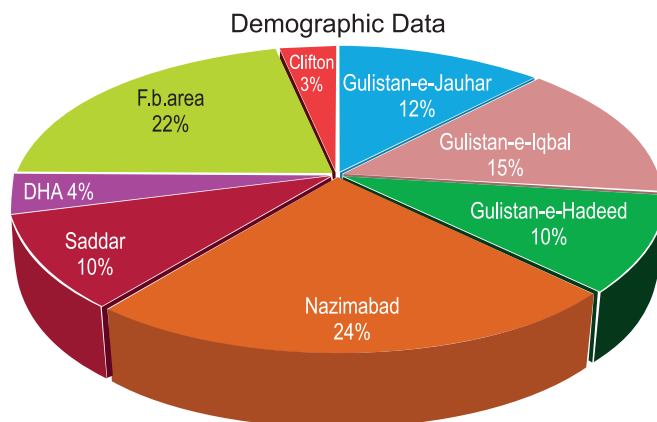


Fig 1: Demographic information of the participants

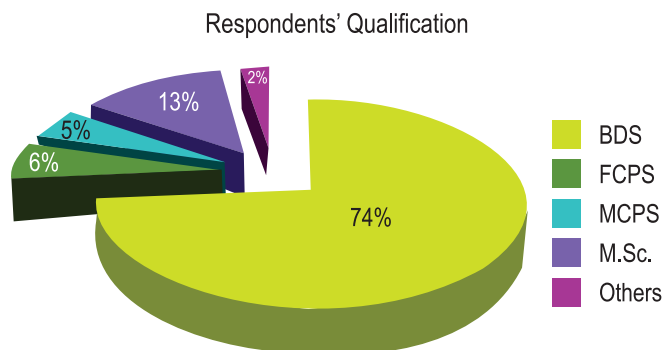


Fig 2: Percentage of respondent's educational qualification

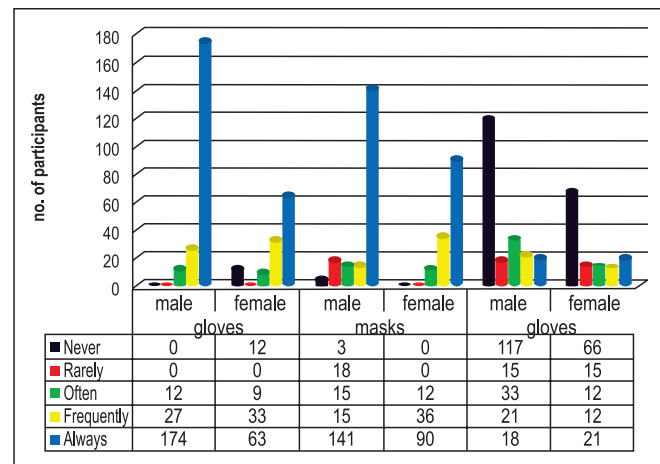


Fig 3: Use of gloves, masks and goggles among male and female respondents

DISCUSSION

A wide range of risks are involved in dentistry related occupational hazards. Dermatitis is one of them. Methyl methacrylate based materials is one of the major cause of contact dermatitis in clinical practice.¹ Studies have shown that polyurethanes, (meth) acrylics, polyesters, amino resins, poly vinyls, polystyrenes, polyolefins, polycarbonates and polyamides have found to be the cause of contact dermatitis.^{11,12} In this study skin rashes, skin irritation, skin redness and skin itching found to be more prevailing among the dentists having a clinical experience of less than 5 years. The reason could be their careless attitude towards handling the uncured composite with their bare hands. The dermatitis related to methyl methacrylate seems to be of less concern to the practitioners as nobody reported to have sought medical advice or its treatment. In this study lesser number skin related complaints were experienced among the practitioners. It is recommended that a dentist should always wear gloves to protect himself from direct skin contact with potential hazards of monomers released from resin based materials. Manual contact between organic components and unprotected skin during application of resin-based materials should always be avoided.¹³

Eye related problems and issues were also observed in this study. It was observed that eye related problems were present equally in respondents irrespective of the clinical experience. It could be because apron and goggles are less frequently utilized as personal protective measures as compared to gloves and masks.¹⁴ When inquired from those participants having eye related problems about the use of goggles as a protective measure against eye splash. None of the participants used

goggles during removing old composite filling. Studies have proven that regular use of eye shields and goggles reduce the eye related injuries in dentistry.⁹ This study showed less use of eye shields or goggles as compared to other studies. The reason could be unawareness of the dentists regarding the volatile nature of the methacrylate groups.

Unreacted monomers not only have a deleterious effect on the skin and eyes, but also on the respiratory tract of the dental personnels.¹⁵ Van Landuyt et al. a study in 2012 suggested wearing of high filtration efficient dental masks to deal with monomer containing materials. They recommended using of water-cooling upon polishing and removing composite fillings; and proper ventilation of the dental office to avoid inhalation of hazardous monomers.¹⁶ In the present study respondents were also inquired of possible respiratory problems due to unreacted composite material handling and clinical usage. Methyl methacrylate is a respiratory irritant and cases of occupational asthma have been reported due to its use.¹⁷ Although 3 out of 330 respondents reported asthma problem due to monomeric material yet it is difficult to conclude whether the asthma problem among them was a sheer consequence of monomeric material. A small number of case reports can't possibly infer the conclusion.

CONCLUSION

Dental materials such as composites used in operative dentistry represent a very significant advancement in dentistry. No matter how beneficial a material is, it may have a negative impact on some members of the profession. Dental personnel should be made aware of the risks involved in dealing with monomer containing materials. 4H gloves should be used by the dental practitioner, if acrylate or latex sensitivity is suspected.

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