

## **Needs Of Bhopal Gas Tragedy Victims- A Cross Sectional Study To Evaluate Prosthodontic Status**

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**Abstract**

*Background-*The medical profession at Bhopal faced a war like situation in the early hours of third December 1984. The toxic effects of the gas also resulted in considerable morbidity with more than five lakh registered survivors of the tragedy. The Bhopal gas victims are therefore prone to biological, social and psychological problems.

*Aim-*This study aims to study the prevalence of missing teeth, attrition of teeth and dentofacial deformities, requiring prosthetic intervention, in Bhopal gas victims. Also aims to uncover the oral health status of Bhopal gas victims thereby provoking efforts to help government to design newer and effective policies for helping the survivors.

*Settings and Design-* The study population comprised of 840 subjects for a cross-sectional, case-control survey on the Bhopal gas tragedy survivors coming as patients at the OPD of BMHRC.

*Methods and Material-* The data collection was done by interview using a questionnaire and oral examination.

*Statistical analysis-* For each of the categories, descriptive statistics such as mean, standard deviation, and percentages were generated. Depending on the distribution of the data, the chi-square test, student t -test, ANOVA, Turkey's post hoc analysis, pearson's correlation test, and regression analysis were used. All statistical tests have significance set at a probability value lower than 0.05.

*Results-*It revealed that there is significant increase in tooth loss in the victims, the reason for which is attributed to the compromised medical and socioeconomic situations and to poor oral hygiene conditions as well.

*Conclusion-*Thus, dental-care providers should be familiar with oral-systemic link and should be able to diagnose and provide specialized dental care to improve the quality of life of their patients.

**Keywords-** Bhopal gas tragedy; dental health; oral health; Prosthodontic needs

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**I. Introduction-**

The world's worst chemical industrial disaster occurred at Bhopal (India) on the night between 2nd-3rd December 1984. The leakage of toxic gases that included methyl isocyanate (MIC) took place at the Union Carbide Factory from a buried stainless steel tank in which forty two tones of liquid methyl isocyanate was there, accounting for around 2500 deaths within a week, over 10,000 in the subsequent period.<sup>1,2,3</sup>

The toxic effects of the gas also resulted in considerable morbidity with more than five lakh registered survivors of the tragedy.<sup>4</sup>The medical profession at Bhopal faced a war like situation in the early hours of third December 1984 which had no parallel in the annals of medical history and they provided the best possible treatment to thousands of people thronging the hospitals struggling for breath, frothing in the mouth, retching, fear and panic writ on their faces.<sup>5</sup> A number of range of health effects were recorded from the survivors and these have ranged from ocular, respiratory, reproductive system, psychological and genetic damage.<sup>6</sup>

The vital systems were affected earnestly, the dental and craniofacial anomalies were probably ignored or not documented in these studies. The Bhopal gas victims are prone to biological, social and psychological problems, which can lead to an enhanced prosthodontic need. There is no documentation till date for the dental status of these victims. In a study to explore the reasons to visit a quack for prosthodontic solutions it was conspicuous that there is a necessity of a study which does a careful and comprehensive evaluation of Bhopal gas victims.<sup>7</sup>

The present study aimed to evaluate the prevalence of missing teeth, attrition of teeth and dentofacial deformities, requiring prosthetic intervention in Bhopal gas victims. The study aimed to uncover the oral health status of Bhopal gas victims thereby provoking efforts to help government to design newer and effective policies for helping the survivors. The study included the non victims as control population which enhanced the external validity as well.

**II. Materials And Methods-**

The study was a cross-sectional, case-control survey on the Bhopal gas tragedy survivors coming as patients at the OPD of BMHRC (Bhopal Memorial Hospital and Research Centre). The study population comprised of 840 subjects, which were selected by systematic random sampling over a period of eight months. A same number, i.e. 840 age and gender matched subjects who were not exposed to the gas made the control group (IEC/02/X-BMHRC/16)

The data collection was done by interview using a questionnaire and oral examination. Based on open-ended questions asked to the patients, a close-ended questionnaire was made. After the design, the questionnaire

was submitted to ten patients to determine whether the questions were understandable, clear and in a logical order for face validity. Moreover, the same patients and three prosthodontists were asked to criticize the content of the questionnaire for content validity. The Cronbach's alpha coefficient value was calculated to be 0.8. The questionnaire was made in Hindi language by an expert to ensure comprehension and the content of the questionnaire was validated again. A single interviewer collected the demographic data for all the patients to avoid observer bias. An informed consent was obtained from the subjects or their parents in case of minor.

The data was retrieved from pre-coded survey proforma to a computer. A master file was created and the data was analyzed using SPSS. Descriptive statistics including mean, standard deviation and percentages was calculated for each of the categories. Chi-square test, student t test, ANOVA, Turkey's post hoc analysis, Pearson's correlation test and regression analysis was applied as applicable depending on the data distribution. Significance for all statistical tests were predetermined at a probability value of less than 0.05.

### **III. Results -**

In the study the case and controls were matched for age and sex. Table 1 shows the comparison of missing teeth between cases and controls. Graph 1 shows the distribution of significant medical history in cases and controls. Graph 2 shows the distribution of Prosthodontic need fulfillment in cases and controls. Graph 3 showing the distribution of cases and controls according to prosthetic status. Graph 4 shows the distribution of cases and controls according to reason for Dentist visit.

### **IV. Discussion-**

With the matched cases and controls it was found that the more number of cases were suffering from medical disease [graph 1]. The reason is obvious that they are victims of methyl isocyanate (MIC) leakage that took place at the Union Carbide Factory in Bhopal on the night of 2nd-3rd December 1984, which affected their health and is supported by the previous studies also.<sup>2,8</sup>

Dental health is an essential component of general health, so when the general health is affected the oral health is obviously affected. Table 1 showed that the tooth loss in Bhopal gas tragedy survivors is much more than that of the control sample, this difference can be attributed to the various medical diseases which have a detrimental effect on the oral health. Moreover, the medication which these survivors are taking and the medical conditions that needs prioritization results in the set back of dental treatment.

Higher number of missing teeth can be because poor oral health is associated with health problems such as coronary heart disease, stroke,<sup>9</sup> poorly controlled diabetes<sup>10</sup>, and respiratory disease.<sup>11</sup> It is especially pronounced among patients with serious mental illness who have received long term psychiatric

treatment,<sup>12</sup> especially extended inpatient care<sup>13</sup>, a setting that often portends poor access to dentists. The links between SMI and poor oral health has been attributed to afflicted performance and overlook of one's own care, resulting in patients who may not have the means to perform adequate plaque control. Studies suggest that chlorpromazine may be associated with inhibited bone mineral deposits<sup>14</sup> and anticonvulsants can be associated with bone loss, which results in poor dental health.

In his review Nazir M. A.<sup>15</sup> emphasized on the direct correlation of periodontitis and several conditions like smoking, diabetes mellitus, several medications, stress, hormonal disturbances in females, etc. Diabetes mellitus is more in the study population than in control and is also related to periodontal ligament downfall which thereafter can lead to tooth loss.<sup>10</sup> There are increased levels of inflammatory mediators like various cytokines in gingival crevicular fluids and saliva, among diabetic patients with periodontitis in comparison to individuals without diabetes and with periodontitis. Due to medical conditions more number of study population was on medications [graph 1] and the common medications which can decrease the flow of saliva and produce dryness of mouth are beta blockers, atropine, antihistamine, and tricyclic antidepressants.<sup>16</sup> Some drugs like nifedipine, cyclosporine & phenytoin may induce the abnormal growth of gingival tissues which further can complicate the removal of dental plaque subjacent to the enlarged gingival mass, which can aggravate the existing periodontal disease.<sup>17</sup> The flow of salivary secretions is reduced by stress which enhances the formation of dental plaque. There was an observation by Rai *et al.* that stress scores are directly proportional to salivary stress markers like cortisol, salivary CgA, b-endorphin, and a-amylase and tooth loss.<sup>18</sup> A meta-analysis of about three hundred articles have indicated that stress has a correlation to immune system and the different immunological changes that occur in response to various types of stressful situations.<sup>16</sup>

Socioeconomic status has an impact on poor oral hygiene and on tooth loss which is also supported by Nazir M A. Khurana C also stated that the relationship is direct between socio-economic and prosthetic status whereas there is an indirect relationship between socio-economic status and prosthetic need. She also stated that the overall general health of a body and oral health are completely associated with each other and the maintenance of that health depends upon socioeconomic status of an individual.<sup>19</sup> In the present study also there is a significant difference in socioeconomic status which probably is the reason of increased prosthetic need.

According to the study there are no hereditary effects of methyl isocyanate (MIC) as there were no significant differences during examining cleft lip or palate, neither was there any difference when extraoral abnormality of nose, chin, ear and eyes was considered. But there is significant increase in tooth loss in the victims, the reason for which is attributed to the compromised medical and socioeconomic situations and to poor oral hygiene conditions as well.

The unfulfilled prosthetic need [graph 2] is more in the Bhopal gas tragedy survivors (39.6%) than the non-victims (11.5%). It may be due to their socioeconomic status, poor medical conditions and oral hygiene practices. I would like to bring notice the overall unfulfilled Prosthodontic need which is 25.5% which should be decreased for quality living conditions. On the contrary if we observe the prosthetic status, the non-victims already had prosthesis in better numbers [graph 3]. It may be because the control population could visit the dentist more frequently for fabrication of prosthesis as well, as shown in graph 4.

Only the registered Bhopal gas tragedy survivors were a part of the study can be a limitation which was unavoidable. Moreover, the survivors who had left Bhopal after the gas tragedy couldn't be included in the samples.

## V. Conclusion-

Awareness programs should be utilized to change the dental attitudes and dental utilization behaviors for the Bhopal gas tragedy victims and non-victims as well, so that the unmet Prosthodontic need is decreased for the population of Bhopal. Cost-effective strategies can also be used to enhance dental utilization among the survivors. Dental-care providers should be familiar with oral-systemic link and should be able to diagnose and refer the patients to specialized dental care to improve the quality of life of their patients. Opening of dental units in government sectors should be encouraged, so that the Bhopal gas victims can be benefited. If similar kinds incidence occur in future oral health should also be given priority along with medical health as systemic health is linked with oral health.

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**Table 1 : shows the comparison of missing teeth between cases and controls and relates that due medical complications oral health is more deteriorated than the control group**

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Arch	Groups	Numberofmissingteeth		Mann-WhitneyUtest
		Mean±SD	Min-Max	
Maxilla	Case	2.02± 3.50	00.00-14.00	MW=272358.000, P=<0.001 Veryhighsignificant
	Control	1.52± 1.37	00.00-07.00	
Mandible	Case	2.12± 3.34	00.00-15.00	MW=223810.000, P=<0.001 Veryhighsignificant
	Control	1.57± 1.57	00.00-08.00	