

# Impact of Aesthetic Intervention of Discoloured Teeth on Mental Health - A Cross Sectional Study in Guntur

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## ABSTRACT

### BACKGROUND

Tooth discoloration, which is often considered as a deviation from the beauty standards, is one of the significant factors that can affect an individual's mental health and well-being. Therefore, determining the relationship between tooth discoloration, its aesthetic treatment and mental health can provide answers for the improvement of treatment services.

### METHODS

The present study is a cross sectional study. 96 participants meeting the inclusion criteria were assessed via demographic characteristics form and a standardized Goldberg's general health questionnaire (GHQ) - 28 before starting the treatment. Following the assessment, a standard bleaching protocol was followed. Two weeks after the completion of the treatment, the patients were re-assessed using the same questionnaire. The data obtained were analyzed using the statistical package for social sciences (SPSS) software. The analysis was performed using descriptive statistics and chi square test for correlation analysis. Wilcoxon sign rank test was used to compare the scores before and after the intervention.

### RESULTS

Higher GHQ scores were associated with younger age groups, females, unmarried persons, and lower education levels. The participants mainly showed higher mean social dysfunction scores (17.7), followed by anxiety scores (12.2) compared to somatic (7.7) and depression scores (4). The mean total GHQ scores were significantly decreased after aesthetic intervention. The mean GHQ scores were reduced from 42.5 before the bleaching treatment to 21.4 post-treatment.

### CONCLUSIONS

Tooth discoloration showed a significant impact on mental health, mainly affecting the social functioning and the anxiety of the individuals. Tooth discoloration has a significant impact on the mental health in younger age groups, females, unmarried persons, and education status. The aesthetic intervention had significantly improved the overall mental health of the individuals.

### KEYWORDS

GHQ, Mental Health, Tooth Discoloration

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## BACKGROUND

The world health organization (WHO) defines mental health as mental well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community. WHO has conceded the importance of mental health and has included mental health in sustainable developmental goals.<sup>1</sup> Anxiety, social dysfunction, and depression-related symptoms are observed in persons with deranged mental health. In this aspect, dental health can impact mental health, which has been less considered in the past. Dental health is not the mere absence of oral disease, but it also includes its influence on individuals' social lives.

Tooth discoloration, which is often considered as a deviation from the beauty standards, is one of the significant factors that can affect an individual's mental health and well-being. In this day and age, the general public has been influenced by the flawless, pearly white smiles depicted in the media. Self-awareness of discoloured teeth has risen by color quality of television, movies, electronic and print media. A campus-based survey among the young adults by Afroz et al. also revealed that tooth discoloration was the primary reason for dissatisfaction. This study also concluded that higher percentage of the participants who were highly pleased with their smile, flaunted their teeth while smiling and liked to see their teeth in the mirror, videos and photographs.<sup>2</sup> The study also concluded that the self-perceived satisfaction of dental aesthetics has a positive impact on an individuals' social and psychological behaviour and in turn on the dental self-confidence.

In the scenarios of sternly discoloured teeth, bleaching is the treatment of choice. Dental bleaching is referred to as the procedure involving the use of an oxidizing agent to remove the stain or discoloration from a tooth thereby resulting in subsequent teeth whitening. There are three fundamental approaches for dental bleaching i.e., use of over the counter teeth whitening products (tooth whitening strips, tooth pastes, mouth rinses, or gels), power bleaching or in-office and bleaching dentist supervised home bleaching. In case of severe tooth discoloration, professional in-office bleaching is performed using high-concentration oxidizing agents to treat the discoloration. Bleaching agents generally consists of different concentrations of hydrogen peroxide or carbamide peroxide. There are also several methods of application. This procedure cannot make a complete color change, but it may lighten the existing shade of the tooth. Advantages of dental bleaching is that the procedure is minimally invasive, easy to perform and low cost. Also, dental bleaching can lead to results that fulfil the expectations of the patients.

An analytical interview based study was conducted by Newton et al. to determine the impact of dental appearance on the subjective assessments of personal characteristics, precisely social competence, intellectual ability, and psychologic adjustment. The results revealed that the participants had judged the subjects with the less dental disease as socially competent, with greater intellectuality and psychological adjustment.<sup>3</sup> Similar results were observed among Chinese people living in United Kingdom by

Feng et al.<sup>4</sup> This shows the impact of tooth discoloration on the social functioning of an individual.

The aim of the present study was to evaluate the effect of tooth discoloration and the subsequent aesthetic treatment on the individual's mental health.

## METHODS

The present study is a cross sectional study conducted at various dental clinics in Guntur, Andhra Pradesh. Ethical clearance was obtained before commencing the study. The study aims and methods were explained in advance to the study participants, and the responses were recorded only after obtaining written informed consent. The data was collected from 5<sup>th</sup> January to 5<sup>th</sup> December 2020. The sample size was determined as a minimum number of 60 individuals considering a 95 % confidence level. Considering the probability of 30 % sample attrition, the sample size was calculated about 90 people. One hundred twenty participants meeting the inclusion criteria were selected using a convenience sampling method.

### Inclusion Criteria

Minimum of least 16 years of age; patients with intact permanent anterior teeth with moderate discoloration indicated for bleaching treatment.

### Exclusion Criteria

Patients with malocclusions, pre-existing white spot lesions, extensive composite restorations, poor gingival health, loss of follow-up, an incomplete response rate of the questionnaires. The null hypothesis was that there is no effect of the aesthetic intervention of discoloured teeth on mental health of individuals. The participants were assessed via a demographic characteristics form and a standardized Goldberg's general health questionnaire before starting the treatment.<sup>5</sup>

### Goldberg's General Health Questionnaire (GHQ)

This is a 28-item self-administered questionnaire dealing with different aspects of mental health. Item 1 - 7 assesses the somatic symptoms i.e., individuals' outlook about their health status and their fatigue associated with physical symptoms.

Item 8 - 14 evaluates the anxiety and sleep disorder symptoms which are related to sleeplessness and anxiety. Item 15 - 21 analyses the social dysfunction of the participant i.e., ability of an individual to deal with professional work load and daily life issues as well as enlightening how people feel about coping with common life situations. Item 22 - 28 gauges the depression related symptoms - i.e., chronic depression cases and suicidal orientations.

Furthermore, there was a score for every subscale, and a score was also allocated to the total score of individuals.

Following the assessment, a standard bleaching protocol was followed. Before initiating the bleaching procedure, oral prophylaxis and polishing were carried out. All the teeth were cleaned using pumice slurry and air dried. A gingival barrier was applied and light cured for 20 seconds. In-office vital bleaching was performed for the participants using 35 % hydrogen peroxide and an application time not exceeding 15 minutes. Bleaching agent was removed using air water syringe and suctioned and then final polishing was done. The procedure was repeated in two or three appointments based on the severity of the tooth discoloration. Two weeks after completion of the treatment, the patients were re-assessed using the GHQ - 28 questionnaire. The data obtained were analyzed. Finally, only 96 questionnaires were evaluated due to incomplete responses. Each response was scored, and an overall score was evaluated.

**Statistical Analysis**

Data extraction and statistical analysis were conducted using the statistical package for social sciences (SPSS) software (Version 25). The analysis was performed using descriptive statistics and chi square test for correlation analysis. To compare the scores before and after the intervention, the Wilcoxon sign rank test was used.

**RESULTS**

Demographic data revealed the mean age group as 20.79 ± 3.17 with a minimum of 16 years and a maximum of 27 years old. Out of them, 28 (29 %) were males, and the remaining 68 (71 %) participants were females. Only 20 (20.83 %) were married, and the remaining 76 (79.16 %) were unmarried. Most of the participants, 44 (45.83 %) were undergraduates, 32 (33.33 %) were intermediate, 20 (20.8 %) were SSC (Table 1).

In our study, it was observed that younger age groups were more affected compared to older people. Lower education status is associated with higher GHQ scores. Unmarried participants were more concerned than the married participants. Also, the negative impact of tooth discoloration was more in the case of females. From the table 2, it is observed that the pre-treatment mean GHQ somatic scores was 7.7, which significantly decreased post treatment i.e., 4.8 (P < 0.0001). The pre-treatment mean GHQ anxiety scores was 12.2, which significantly decreased post treatment i.e., 5.45 (P < 0.0001). The pre-treatment mean GHQ social scores was 17.7, which significantly decreased post treatment i.e., 8.58 (P < 0.0001). The pre-treatment mean GHQ depression scores was 4, which significantly decreased post treatment i.e., 2.5 (P < 0.0001). The mean total GHQ scores were reduced from 42.5 before the bleaching treatment to 21.4 post treatment. This suggests a statistically significant difference considering the Wilcoxon sign rank test at 95 % confidence level (P < 0.0001). It was observed that the participants mainly showed higher mean social dysfunction scores, followed by anxiety scores. Low mean depression scores were noted. All the GHQ subscales, i.e., somatic, anxiety, social, depression

scores in the study participants, showed a significant decrease in post-treatment scores than the pre-treatment scores (P < 0.0001). Therefore, it was observed that cosmetic intervention significantly reduced mental health problems and enhanced the participant’s mental health status. Hence null hypothesis was rejected.

Variable	N (%)	
Age	≤ 21 years	56 (58.3 %)
	> 21 years	40 (41.6 %)
Gender	Male	28 (29 %)
	Female	68 (71 %)
Marital status	Unmarried	76 (79.16)
	Married	20 (20.83 %)
Level of education	SSC	20 (20.8 %)
	Intermediate	32 (33.33 %)
	Undergraduate	44 (45.83 %)

**Table 1. Participants Demographic Details**

Variable	Pre-Treatment		Post Treatment		Z	P
	Mean	S.D	Mean	S.D		
GHQ somatic score	7.7	2.31	4.8	2.03	4.37	< 0.0001*
GHQ anxiety score	12.2	3.4	5.45	2.02	4.28	< 0.0001*
GHQ social score	17.7	3.73	8.58	2.2	4.28	< 0.0001*
GHQ depression score	4	1.73	2.5	0.35	4.19	< 0.0001*
GHQ total score	42.5	10.09	21.4	5.49	4.28	< 0.0001*

**Table 2. GHQ Scores in Participants Pre- and Post-Aesthetic Intervention**

\*statistically significant

**DISCUSSION**

The smile plays a crucial role in creating and maintaining positive attitude about one’s self and having a symbolic value in emotional life. A person’s smile is often looked upon as a window into one’s personality in our society.<sup>6</sup> Tooth discoloration usually affects the social smile, and it influences how a person interacts with others. Hence, we tried to evaluate the effect of tooth discoloration on mental health and whether there is any change in the patient’s attitude following aesthetic treatment procedures.

Use of a simple questionnaire that inspect the somatic, psychological and behavioural processes is potentially useful for discerning psychosocial distress. Validity of Goldberg’s GHQ - 28, by Lobo et al. has been shown to be a good instrument for detecting problems of psychosomatic problems, social dysfunction, anxiety and depression in the Spanish population.<sup>7</sup> We chose this test as an instrument primarily because of three factors. Firstly, this scale is shorter than similar instruments and yet is similar to them in terms of validity and is therefore considered more appropriate for use in primary care settings. Secondly, the GHQ - 28 has a sensitivity of 77 % and specificity of 90 % which are acceptable and similar to those reported in other countries that have tested questionnaires that are extensive to administer and infer. Thirdly, the GHQ scale has four subscales which provide an added information on psychosomatic symptoms, social dysfunction, anxiety and depression.

A correlation was observed between age and the level of dissatisfaction with dental aesthetics. Young adults (< 19) showed higher GHQ scores compared to 20 + age groups. Lesser GHQ scores were observed with ageing. This could be attributed to the fact that the younger individuals are highly influenced by the social media whereas the older

adults would be more accepting and have less desire to changes. Similar observations were reported in the United Kingdom by Alkhatib et al. Their study was to determine the prevalence of satisfaction with dental appearance and own tooth colour and investigate the impact of ageing on these perceptions. Results revealed that older participants of age more than 55 years were more satisfied with their dental appearance.<sup>8</sup> They also suggested that the perceived look is associated with cognitive factors other than social and cultural ones. Bruhn et al. conducted a study to determine whether vital tooth bleaching affects oral health related quality of life (OHRQOL) in adults of age 50 years and older, and whether tooth whitening helps in increasing their participation in social activities. Results showed that vital tooth bleaching does not improve overall oral health related quality of life in older adults. Also, in our study, a significant decrease in the GHQ scores after the aesthetic procedures was observed in the younger age group. This shows that the aesthetic intervention of discoloured teeth had a significant positive impact on the mental health of young individuals.

Gender related observations revealed that women showed higher GHQ scores than men, and a significant decrease in the values was noted post-treatment. Akarslan also reported that Turkish female patients tend to be more dissatisfied with their teeth color and the most sought after treatment was found to be whitening of teeth.<sup>9</sup> Similarly, McGrath & Bedi et al. reported that women perceived oral health has a more significant impact on their quality of life in general, having both a greater negative or positive impact than men.<sup>10</sup> Their study also revealed that the patients experiencing high levels of dental anxiety are those associated with the poorest oral health related quality of life in Britain. The greater dissatisfaction level in females could be related to the notion that the self-confidence of females could be affected further from physical injuries when compared to males.<sup>11</sup> Also, married participants were more satisfied with their tooth color compared to unmarried participants. Similar observations were observed in a study by Enabulele et al.<sup>12</sup>

In the present study, the participant's lower education status was associated with higher GHQ scores, and with the increase in education level, lesser GHQ scores were noted. We assumed that, with an individual's higher education status, self-esteem may be enhanced and may indirectly improve self-satisfaction with tooth color. Education will have a significant influence for feeling confident about the aesthetics. These observations are in association with a previous study in the Chinese population by Xiao et al. who reported that dental aesthetic satisfaction was significantly correlated with education level compared to age and gender. Self-satisfaction with tooth colour decreased with increasing severity of discoloration.<sup>13</sup> Similarly, Gomez et al. revealed that the nonstudent group gave greater importance to tooth color, whereas the university student groups considered tooth alignment a more important feature. It is also predicted that fundamental behavioural (pattern of visits to dentist and brushing habits), psychologic (pessimism and agreeableness), and educational (training in dentistry) factors affected the participant's perceptions of orofacial attractiveness, oral satisfaction, and self-rated oral health.<sup>14</sup>

On the whole, it is observed that social scores and anxiety scores were most affected compared to somatic and depression scores. The mean GHQ scores were significantly decreased after aesthetic intervention. Pavicic et al. reported that patient satisfaction was associated with lower chroma, higher lightness, and uniform color of all maxillary anteriors.<sup>15</sup> Similar to our study results, Carlsson et al. observed less satisfaction with a dental and facial appearance in patients with dental anxiety and also concluded that the self-rating of orofacial aesthetics is related to both oral and psychological health.<sup>16</sup>

The in-office bleaching procedure had a significant impact on the GHQ scores. The social and anxiety scores were significantly decreased following the aesthetic intervention. An earlier study by Bersezio et al. regarding the effect of at home whitening procedure with carbamide peroxide showed that after one month, only 10 % of the participants had a positive impact on patient's oral health related quality of life, psychology and perception.<sup>17</sup> Better results in our study could be because of more effective stain removal through in-office bleaching compared to at home bleaching since high concentration of bleaching agents are used. Meireles et al. conducted a randomized clinical trial to assess changes in oral health related quality of life (OHRQOL) in the participants to evaluate the efficacy and safety of two different concentrations of carbamide peroxide used in at home vital bleaching in a southern Brazilian city. They reported that dental bleaching had a positive impact and patients could show more of their teeth without embarrassment.<sup>18</sup>

This study also supports the findings of our research. Bersezio et al. also investigated the effect of teeth bleaching with hydrogen peroxide (35 %) and carbamide peroxide (37 %) using the walking bleach technique on the aesthetic perceptions and the psychosocial impact of patients up to three months. They revealed that bleaching had a positive influence on the aesthetic perception and psychosocial impact of patients, and also remained stable over time. Similar results were observed in another study with six months follow up also.<sup>19,20</sup>

Small sample size and few incomplete responses by the participants were the most important limitations of this study. However, the questionnaires were completed by the participants, and the co-researcher provided samples with information if needed. Thus, the answers in this study were assumed accurate. Also, long term follow-up evaluation studies are needed to assess the relationship between aesthetic intervention and mental health. The present study is performed in a hospital setting in a semi urban area. Hence the results cannot be generalized to entire population. Although we found encouraging results, large scale studies in Indian settings are required to validate the results of the study.

## CONCLUSIONS

Tooth discoloration showed a significant impact on mental health, mainly affecting the individual's social functioning and anxiety. Tooth discoloration has a significant impact on

the mental health in younger age groups, females, unmarried persons, and education status. The aesthetic intervention had significantly improved the overall mental health of the individuals.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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