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Increased pain tolerance in dental patients by Yoga with special reference to Pranayama and Bhakti Yoga

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Abstract:

Yoga practices to assess the pain tolerance especially in dental pain when compared to control group. The bhakti yoga methods such as AUM chanting, Mantra Japa, Prayer and Meditation have increased the pain tolerance level of the patients. Based on Cohen's formula, the selected clinical sample size is 32 with and without bhakti yoga practitioners. The statistical 't' test is applied to analyze the data by using SPSS. Significant changes in pain tolerance values are found at p<0.001.The findings are discussed and compared with the findings of other researchers on pain. The OHQoL –UK is compared with our percentage of oral health changes. The percentages are found to be both positive and negative effects on oral health. Based on these results, it can be said that Yoga is a non drug, non invasive and cost effective method which has therapeutic intervention and protective effects on pain tolerance levels. The beneficial effects of Yoga as seen in this study may be assumed that adoption of Yoga on long term basis. However, considering the small sample size, limited methodology, and the potential heterogeneity, further extensive, large- scale, and long term studies are necessary to support our findings.

Key words: Dental pain, Bhakti yoga, Pranayam, Pain tolerance.

1. Introduction

The practice of yoga in India was documented as early as 3000 BC. The term 'yoga' is obtained from Sanskrit word ‘yuz’ or in other words as signifying 'union'. Yoga is said to be for motivation behind joining the brain, body and soul. Yoga focuses on body, breathing and mind (Kumar et al. 2013) this is accomplished by Asanas (exercise postures), pranayama (breathing techniques) and meditation (Cramer et al. 2013).

Several studies have directly examined yoga as a potential treatment for pain and found evidence for the beneficial and safe use of yoga to alleviate different painful conditions (Wren et al. 2011; Posadzki et al. 2011; Nambi et al. 2014). These studies have often assumed that the benefits of yoga stem from its effect on the musculoskeletal system (e.g. increase in strength and flexibility). However, yoga also involves focused attention and has been shown to improve mood and depression (Woolery et al. 2004; Lavey et al. 2005; Shapiro et al. 2007). Both attentional and emotional factors influence pain perception (Wiech et al. 2008). Furthermore, yoga practitioners are encouraged to adopt an emotionally detached observation of the present moment and, accordingly, yoga has been shown to improve mindfulness scores (Brisbon and Lowery 2011), which are also associated with improved pain tolerance (Kingston et al. 2007).

Oral maladies keep on being a noteworthy medical issue around the world (Petersen et al., 2005). Dental caries and periodontal diseases are among the most important global oral health problems, although other conditions like oral and pharyngeal cancers and oral tissue lesions are also of significant concern. Oral health is integral to general

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well-being and relates to the quality-of-life .Dental caries, gingivitis & periodontal disease are the three most common chronic human diseases, which finally results in painful dental conditions (Petersen et al., 2003)..

Most of the physicians say cause of pain is triggering stimulus, if it is removed then the pain will also reduce (Gulati, & Loh, 2011). In toothache it is difficult to bite, chew, concentrate in the day time and sleep in the night, there for many patients are worried about their dental pain and treatment. A non-clinical study (Vassend, 1993) based on anxiety, pain and discomfort associated with dental treatment, shows result of two samples, by using Corah's Dental Anxiety Scale. A significant correlation of 0.32 - 0.48 range founded between dental anxiety and dental pain. Another study (Kent, 1984) also concluded the same findings that those patients expected more anxiety in dental procedure, experienced less pain during drilling and extraction type procedures while patients with low-anxiety predicted actual level of pain which they experienced during the procedures. Patients of anxiety expected more pain in treatment, than they experience less pain during treatment, while they experienced more anxiety and fear than fearless samples (Arntz et al. 1990). As per studies carried out by Liddell & Locker (2006), indicates that female patients report more levels of dental anxiety than males. Further, the same authors indicate that the younger patients show more dental anxiety than older people. Pain tolerance defer with age, gender and race results show in a research (Woodrow et al. 1972) conducted on 41,119 subjects for a year by determining the mechanical pressure on the Achilles tendon. From this studies there were three findings 1.women pain tolerance level is lesser than men, 2. Pain tolerance level

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decreases with the age and 3. white people can tolerate more pain than Orientals. In all these studies, the impact of yoga was not considered in pain tolerance. A study (Tul et al. 2010), conducted on seven adult patients after 8 week yoga program, based on observation and in-depth interview, they concluded that pain's sensory aspects did not change through yoga but it is helpful to control the pain. ISKON movement on Krishna consciousness, (Dines, 2015) speaks bhakti concept in the form of Nada - Brahma or the sacrilege of sound for Krishna devotees. Bhakti yoga methods are most enjoyable and helpful methods for reducing anxiety (Telles et al. 2009). Krishnamurthy & Telles (2007) defines Bhakti as "surrendering to a Supreme or Higher Power" and it's an important part of Yoga philosophy. However, they have considered it as a philosophical statement indicator for reducing the anxiety levels along with the theory of yoga. In our studies, we have covered the dental pain tolerance levels, while most of the studies mentioned above, doesn't reflect the dental pain tolerance levels, but they do cover the anxiety and depression levels before and after the procedures. So we made an attempt in this paper to incorporate bhakti yoga techniques of increasing the pain tolerance levels.

2. Materials & Methods

The required sample size was obtained using Cohen's formula (Kenny,1986) for an effect size of 0.46 and with an alpha value of 0.05, powered at 0.90 using G power program (Telles, et al. 2008). A sample size of 32 is decided which is considerably more than 21 required. A comparative study has been made on 32 patients (M-23, F-9) aged 32.696 ± 9.732, selected out of 40 patients from Dental Clinic and Research Center, Haridwar, through random sampling. The participants were divided into two groups,

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each group having 16 patients. Group 1 participants were practicing yoga and bhakti yoga on daily basis for about 10 minutes on meditation, mantra japa, Aum chanting and prayer for a month's time. Subjects who are practicing yoga for more than one year are only selected for the study. The feedback was also received even after a month's time of bhakti practices. Group 2 participants were those who were not involved practicing Yoga. In both groups, there are 3 types of pain levels – gum, teeth and root canal treatment measured in the visual analog scale of none (0), mild (1,2.3), moderate (4,5,6), severe (7,8,9) and 10 (unconscious). They were requested to fill a questionnaire developed by dentist and Yoga expert, for the assessment of dental pain tolerance by yoga and bhakti yoga. Six questions were framed for Yoga and pain assessment separately, 3 of them were based on visual analog scale, which was described to patients for rate their pain as 0 for none pain, 1,2,3 combined for mild pain,4,5,6 for moderate, 7,8,9 for severe and 10 number intolerable pain.

Assessment of Bhakti practices

Assessment of dental pain patients is done by using four practices;

- **Aum Chanting**

In ancient India, it was believed that universe has been derived from the sound vibrations of the word AUM and it is a symbol of super power. A study on Aum (Telles et al, 2009) conducted on 300 participants, shows significant reduction of 14.7% in anxiety levels after Yoga practice including AUM chanting, *Asana* and *Pranayama*. Another study (Dhanya, 2015) conducted on 60 older adults selected from old age home in Tamilnadu India shows significance of $p \leq 0.05$ and found that AUM meditation was effective on improving

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subjective well being among older adults. Based on these findings, we have assessed the dental pain tolerance levels using the visual analog scale (from 0 to 10) and facial pains (0- No hurt, 1-2, Hurts little bit, 3-4 hurts little more, 6-7, hurts even more, 8-9 hurts whole lot, 10- hurts worst).

- **Mantra Japa**

Mantra Japa is a repetition of positive words silently which produces harmonious and resonant waves, which first affects our emotions and then behavior. A significance level (Pradhan, B., & Derle, S.G., 2012) of $p \leq 0.001$ found between Gaytri Mantra Japa and poem learning among 60 school students (boys 30 and girls 30) for the age group of 12-15 years. We have used this Bhakti technique in assessing the pain tolerance levels. As mentioned above, we have used the analog and facial pains for assessing the dental pain

- **Meditation**

Meditation is the concentration on any object or thought (Kirkwood et al. 2005). The practice of breathing techniques such as meditation on breath will reduced breathing rates, the tolerance level is found to be on raise. A statistical analysis (Kabat-Jinn et al. 1985) find significant reduction of chronic pain observed as negative body image, present moment pain, inhibition of activity by pain, symptoms, mood disturbance and psychological symptomatology including anxiety and depression after practicing mindfulness meditation for ten week. The result was also compared with a control group in this study. The control group patients did not get significant improvement. The assessment is done based on daily meditation for 10 minutes for the tolerance.

- **Prayer**

Prayer is worship to the almighty. The participants were given universal prayer, such as – *"Om, Sarve bhavantu sukhinah, Sarve santu niramayah, Sarve bhadrani pasyantu, Ma kashchit dukha bhagbhavet, Om Shantih, Shantih, Shantih"*,it is translated as- May all be prosperous and happy, May all be free from illness, May all see what is spiritually uplifting, May no one suffer. Om Peace, Peace, Peace. This prayer is repeated both in the morning and evening in a group for about 10 minutes. The feedback received very increasing. A correlation study (Dezutter, & Corveleyn, 2011) done on 202 patients with chronic pain fund that prayer is significantly related with pain tolerance but not with pain severity.

3. Result

The data presented in Table 1, shows significant difference (2 - tailed) at $p<0.001$. While comparing groups- Yoga group and non Yoga groups and their pain tolerance, the degrees of freedom is 15 and the standard deviation to the variance mean is ±6.28 and the non Yoga group it is ±5.57. The data obtained from the SPSS analysis is shown in the bar diagram (Figure 1) where it is explicitly clear that with practice of Yoga the pain tolerance is higher than the non practice group. Difference of 1.73% in pain tolerance level found between Bhakti Yoga Group and Control Group.

4. Discussion

Regular and long-term practice of yoga may improve pain tolerance, according to a recent study. Findings from the study also show that yoga practitioners have more gray matter in multiple brain regions compared with individually matched people who did not practice yoga**.** There are many types of pains in the physical body level. Dental pain is very much a different pain like Achilles pain in the literature (Woodrow et al.1972).

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Achilles pain was measured by Automated Multiphase Screening Examination unlike in the dental pain where it is measured using a psychological questionnaire scale. Dental pain is measured in the term of psychological scale Visual Analog Scale (VAS), none-0, mild-1, 2,3, modrate-4,5,6, severe-7,8,9 and 10 for unconscious. This scale is little modified at the level 10 as unconscious or maximum limit of pain leading to unconscious state. The dental pain relief through yoga and bhakti yoga method, we have used the Oral health related quality of life – UK items which includes the physical, social and psychological domains. Each of these oral health questions was scored first on effect with response ranging from good to bad effect on the quality of life. The respondents were asked to rate the impact of each effect on the scale ranging from none to extreme impact by the way of incorporating an individual weighing factor from none to extreme in the scale Each item thus could be scored on a scale from 1 to 9. Summing up the individual item responses would generate an overall OHQoL – UK score with possible scores ranging from 16 to 144 (McGrath, and Bedi, a 2001, b 2002). The post yogic study respondents perceived their oral health has changed their quality of life. This supports earlier findings of the studies done in Britain using the same items of OHQoL measure. Though the clinical sample size is small, the validation requires repeated trials to prove the reliability of the data. However, the findings by Pradeep, and Pushpanjali, (2014) support our study. As reported by Pradeep and Pushpanjali (2014) some other studies claimed that with oral health did not bring the desired effect (Murariu et al. 2014; Caglayan et al., 2009). In their individual or with social interactions, perhaps, the OHQoL has the dimensions of both positive and negative

effects on oral health. Further, our findings may be related to the model proposed by Melzack (1999), Rome and Rome, (2000) disused about neuro matrix model. As per the model, the brain is a dynamic entity involved in the processing of pain. The processing includes inhibition, modulation, and excitation through sensory, thalamic, limbic, hypothalamic pituitary axis (HPA) and cortical pathways. This model also discusses about Oral Health Quality of Life in term of bio psychosocial paradigm which includes psychological, somatic and social aspect of life. These three aspects are also discussed in the form of 16 questions of OHQoL-UK. In our findings also the same oral health questionnaire Table 2 was used and compared with the findings of Pradeep and Pushpanjali (2014).

The strategies used by yoga practitioners to tolerate pain, it appears that it is the yoga training itself that equips individuals with tools to tolerate more pain, and this increased pain tolerance could be mediated through autonomic activation of the insular cortex. The strategies used by yogis, including breathing techniques, focusing on sensations without reacting, relaxing the mind or body, and accepting pain, are all part of yoga training and are similar to mindfulness practice that has been shown to improve pain tolerance (Kingston et al. 2007). Yoga practitioners are encouraged to adopt an emotionally detached observation of the present moment and, accordingly, yoga has been shown to improve scores on the Freiburg Mindfulness Inventory (Brisbon and Lowery 2011).

Yoga practitioners tolerate more pain and have more brain GM in multiple cortical regions related to affective pain processing, pain regulation and attention than do individually matched controls. Nevertheless, only the increased GM in the insular cortex

correlated with the higher pain tolerance across groups. Further, the results of our exploratory whole-brain regression analysis indicate that the duration of yoga practice positively correlated with GM volume in the left insular cortex, suggesting that yoga practice contributed to the anatomical differences, rather than the yoga practitioners having fundamentally different brains before beginning to practice yoga. In addition to GM differences, the WM tract running along the posterior/anterior length of the left insular GM showed signs of higher integrity, indicating an increased intrainsular connectivity. We also observed that yoga practitioners, but not control subjects, used cognitive strategies involving parasympathetic activation and interoceptive awareness to tolerate pain. These types of strategies constitute an integral part of yoga practice. Since other studies show a sequential processing of pain in the human insula, from nociceptive input in the posterior insula to autonomic integration in the midinsula to subjective feelings in the anterior insula (Craig 2011)., The results of post operated patient's shows the pain decrease from 60 to 30 percentages while the pain tolerance level increased when compared to control groups. The study carried out by Villemure et al. (2014) shows that insulator gray matter untimely correlated with pain tolerance and it is positively correlated with Yoga experiences. The experimented study improves the pain tolerance level in Yoga practitioner.

5. Conclusions

This study confirms the useful role of Yoga in managing the dental pain. Significant changes in pain tolerance values are found at $p<0.001$. Based on these results, it can be conclude that Yoga is a nondrug, non invasive and cost effective method which has therapeutic intervention and protective

effects on pain tolerance levels. The beneficial effects of Yoga as seen in this study may be assumed that adoption of Yoga on long term basis. However, considering the small sample size, limited methodology, and the potential heterogeneity, further extensive, large-scale, and long term studies are necessary to support our findings.

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Conflict of interest

There are declaring that there are no relevant conflicts of interest.

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Table 1: Pair Sample Statistics

Group	Mean	N	Std. Deviation	T	Df	Sig. (2-tailed)
Yoga Group	29.4375	16	6.28192	4.155	15	0.001
Control Group	19.5000	16	5.57375			

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Table 2: Comparative studies of OHQoL of the present study with Pradeep Y. & Pushpanjali (2014) study.

Aspect of Oral Health		Impact on Quality of Life (%)									
		None		Little		Moderate		Great		Extreme	
S.No.	Items	*Pradeep's study data*	*Present Study*	*Pradeep's study data*	*Present Study*	*Pradeep's study data*	*Present Study*	*Pradeep's study data*	*Present Study*	*Pradeep's study data*	*Present Study*
1.	Eating	21.8	**10**	24.6	**23**	32.9	**32**	19.3	**24**	1.4	**11**
2.	Appearance	14.7	**18**	22.2	**20**	37.2	**35**	22.0	**20**	3.9	**7**
3.	Speech	24.5	**8**	22.0	**35**	31.3	**30**	20.3	**24**	1.9	**6**
4.	General Health	61.6	**40**	10.1	**20**	18.5	**25**	9.0	**13**	0.8	**2**
5.	Comfort	36.1	**20**	20.4	**22**	30.1	**38**	10.2	**17**	3.1	**3**
6.	Breath Odor	32.2	**42**	22.2	**19**	30.2	**28**	15.1	**9**	0.4	**2**
7.	Social Life	55.6	**25**	14.2	**10**	18.6	**40**	11.1	**20**	0.5	**5**
8.	Romantic Life	57.4	**20**	11.8	**22**	20.9	**29**	9.3	**21**	0.7	**8**
9.	Smile	20.2	**18**	26.8	**21**	29.3	**37**	21.0	**16**	2.7	**7**
10.	Usual Work	67.7	**32**	10.5	**37**	12.0	**25**	9.1	**5**	0.7	**1**
11.	Finance	58.6	**30**	15.6	**18**	20.6	**37**	4.1	**12**	1.1	**3**
12.	Confidence	32.2	**25**	23.5	**31**	28.2	**30**	15.1	**9**	1.0	**5**
13.	Lack of Worry	58.8	**23**	13.9	**18**	17.8	**36**	8.9	**14**	0.6	**9**
14.	Sleep	29.8	**21**	18.9	**23**	27.7	**33**	22.5	**13**	1.1	**10**
15.	Mood	68.8	**16**	9.0	**19**	15.9	**34**	6.2	**30**	0.1	**1**
16.	Personality	66.2	**13**	10.4	**32**	15.0	**29**	8.2	**24**	0.2	**2**

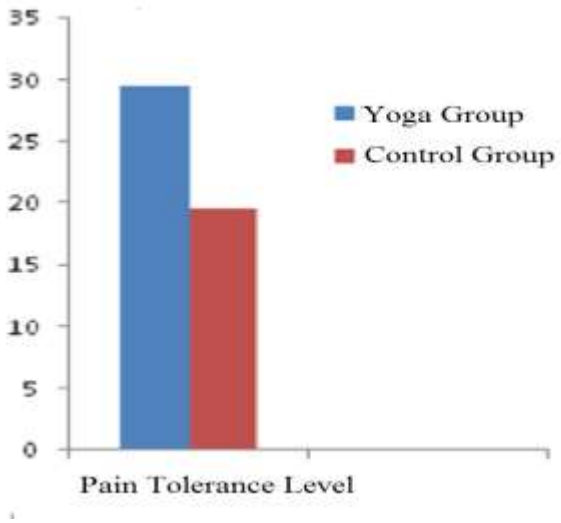

Fig 1: Pain tolerance level of Yoga and Control group