Research Article

Effect of Atraumatic Restorative Treatment on Streptococcus mutans Count in Saliva of Pregnant Women: A Randomized Controlled Trial

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Abstract

Background: Oral environment stabilization (OES) procedure in literature includes filling of the carious lesions & extraction of effected teeth. This study was aimed to observe the effects of Atraumatic Restorative Treatment (ART) on Streptococcus mutans count in saliva of pregnant women.

Methods: A total of 64 pregnant women diagnosed with at least 3 untreated carious teeth were enrolled and randomly allocated in to study and control groups. Saliva samples were taken from both study and control groups at baseline and follow-up visits.

Results: ART was given to the study group only and a statistically significant reduction was found in Salivary streptococcus mutans count ($p<0.001$) after this treatment in the study group when compared with the controls.

Conclusion: ART is an effective intervention and oral environment stabilization procedure in reducing salivary streptococcus mutans count in pregnant women that will also minimize the vertical transmission.

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Introduction

Evaluations, both microbial and molecular, propose that women who are pregnant are at a increased risk for development of caries[1]. The reason is that in pregnancy there is release of number of hormones as estrogen, progesterone, relaxin and gonadotropin[2]. Due to these hormones the oral cavity might also affected and risk of caries, gingival, periodontal and dental infections become higher than normal. The reason of increased chances of caries in pregnant women is increased PH in oral cavity due to frequent vomiting, expectant mothers have craving towards sugary snacks and less attention towards oral health due to prevailing physical condition[2]. High count of Streptococcus mutans has been documented as a potential indicator for the transmission of caries from mother to their children. Mothers with presence of Streptococcus mutans are more likely to give birth to babies with similar levels of this bacteria in their saliva[3].

Literature have also revealed that preventive methods including Oral Environment Stabilization (OES) procedures done on pregnant women or mother with younger children results into limiting Streptococcus

mutans count resulting in consequent reduction of microbial colonization and subsequent development of caries[4]. OES procedures have also been seen to be effective in the reduction of high level of S. mutans in pregnant women[4]. The introduction of ART as a part of preventive programs has been postulated as being advantageous in preventing vertical transmission from mothers to infants[5,6]. However, search on PubMed revealed only one interventional study that has investigated the effect of OES procedures on S. mutans count among expecting mothers through ART and extractions. This study shows that there is a statistically significant decrease ($p<0.0001$) in S. mutans colony forming unit counts in saliva samples of pregnant women after OES[4]. The aim of the present study was to observe the effect of single intervention of ART in reduction of salivary S. mutans count in pregnant women. In this study no other procedure such as extraction will be performed in addition to ART; in order to observe the individual effect of this procedure alone on S. mutans count. It was hypothesized that simple ART would significantly reduce salivary Streptococcus mutans count in pregnant women.

Methods

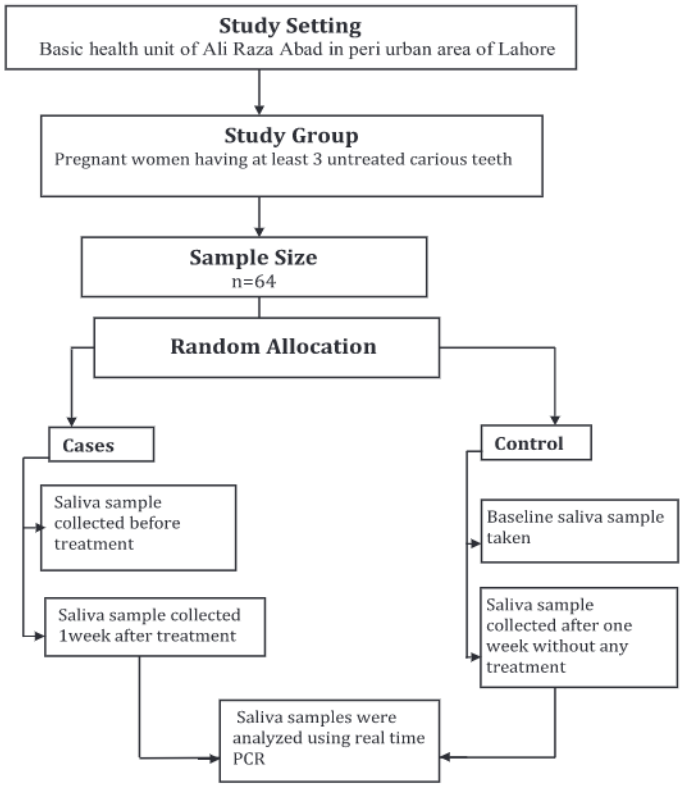

Figure 1: *Overview of Methodology*

A total of 64 women who are pregnant, with minimum 3 or more carious teeth that aren't treated, were enrolled in the study and randomly allocated in to two groups (study and control groups). Pregnant women having at least 3 untreated carious teeth were included in the study. All the pregnant women recruited were between 2 to 8 months of gestation. Study subjects having deep carious lesions involving the pulp and any systemic diseases like Diabetes Mellitus, hypertension and cardiac diseases were excluded from study. Randomization was done through the lottery method. Chewable Paraffin tablets were given to the participants to stimulate saliva. First stimulated saliva was rinsed out to get rid of the debris. Second paraffin tablet was given, and this time stimulated saliva sample were taken from both study and control groups in 1.5ml sterile tube. Samples were stored in cold chain (mobile refrigerator at -4C°) and transported to Division of Molecular Virology and Molecular Diagnostics at National Centre of Excellence in Molecular biology (CEMB), University of the Punjab Lahore, Pakistan. The samples were then analyzed for Streptococcus mutans count using Real Time Poly-merase chain reaction method. The real time PCR was performed with two primers, GTFBRIN (5′-AATGTAAATTTTGCCATCAGC-3′) and GTFB-FIN (5′- GATGATAGCAATGCAGCCAAT-3′). Immediately after the salivary sample was collected, ART was implemented to fill all carious lesions in the study group only using the standard guidelines which involves excavation of enamel and dentine that is soft and carious by using manual instruments and filling the cavity with adhesive restorative material (Glass ionomer cement). After one week of treatment, second collection of sample was taken from both study and controls groups following the same protocol of the first collection. At completion, the samples of second collection were transported to the same Centre for Real time PCR analysis and ART was administered on the control group as well. The Data was compared by using paired t-test.

Results

Study population was divided in to study group (cases) and control group. ART was given to study group only. The results of the analysis are shown in Table 1. It can be noted that in cases, the mean value of salivary S. mutans count before treatment was $1.60\times10^4 \pm 0.28\times10^4$. After treatment the mean value

of salivary Streptococcus mutans count was $0.68\times10^4 \pm 0.13\times10^4$. Paired t test showed statistically significant reduction in salivary S. mutans count with $p<0.001$. It shows that ART reduces salivary Streptococcus mutans count in pregnant women.

In control group, the mean value of salivary S. mutans count at baseline was $1.3\times10^4 \pm 0.23\times10^4$. It changed to $1.39\times10^4 \pm 0.24\times10^4$ after one week on follow up. Paired t test showed no statistically significant reduction in salivary Streptococcus mutans count with $p=0.29$. As shown in table 2, it can be stated that both cases and controls had statistically insignificant results in reduction of Streptococcus mutans count before commencement of ART.

Table 1: *Streptococcus Mutans Count in Cases and Controls*

Study population		Mean	Standard error	*P* value
Cases	Before treatment	1.60×10^4	0.28×10^4	<0.001
	After treatment	0.68×10^4	0.13×10^4	
Controls	Baseline	1.3×10^4	0.23×10^4	0.29
	After 1 week without any treatment	1.39×10^4	0.24×10^4	

Table 2: *Streptococcus Mutans Count*

	Cases		Controls		*P* value
	Mean	Standard error	Mean	Standard error	
Before treatment	1.6×10^4	0.28×10^4	1.3×10^4	0.23×10^4	0.444
After treatment	0.68×10^4	0.13×10^4	1.39×10^4	0.24×10^4	0.029

Discussion

In Pakistan, the decayed component in the 15-45-year-old ranges from 1.44 to 4.64 teeth per individual; 97% of all carious lesions are untreated[7]. It may be assumed that these untreated carious lesions will yield high bacterial counts and cause an increased risk of vertical transmission to their children.[8] Pregnant women are at higher risk of tooth decay that may be due to changes in diet and oral hygiene.[9] According to the studies, high levels of salivary streptococcus mutans can also be related to the poor pregnancy outcomes (preterm low birth weight babies).[10] One fourth of women of reproductive age have dental caries. Oral health care in pregnancy is often avoided and misunderstood by physicians, dentists, and patients[11]. Studies have shown that mothers having raised levels of Streptococcus mutans in their saliva pose a source of transmission of Streptococcus mutans to their children.[6] The reduction of microbial levels in highly infected mother's oral secretions can reduce their establishment their children's mouth[12].

Methods of Oral environment stabilization have been in use to reduce pathogenic micro-organisms number and count in oral cavity, thus preventing the progression of diseases. This procedure creates favorable conditions for the improvement of the environment of oral health. OES consists of a number of procedures that are performed according to patient's necessities. These procedures become helpful in the behavioral management of the patient as well as the augmentation of dentine remineralization under the placed restorative material[13]. It has been reported in a recent research work on preventive methods of vertical transmission that if pregnant women are given preventive program, it will reduce the plaque accumulation as well as S. mutans colonization and hence providing a positive effect in OES[14]. Previously conducted interventional study in Brazil also showed results with statistically significant reduction in the S. mutans count after treatment by performing OES procedures (extraction + fillings) in saliva of pregnant women[4]. However, in this study extractions were also performed in addition to ART and therefore the individual effect of each procedure could not be calculated and accessed. In the present trial, a reduction in the salivary streptococcus mutans count was observed ($p<0.001$). Thus, a single intervention by ART alone brought a significant decrease in the salivary streptococcus mutans count. The excavation of carious dentine using of glass ionomer cement as filling material in Atraumatic Restorative Treatment (ART), has been widely done in the previous years. This procedure has been postulated to reduce the Streptococcus mutans[15] counts. ART is most suitable, noninvasive approach for pregnant women with minimal intervention, minimal invasion and minimal cavity preparation for carious lesions[16]. Previous studies have also confirmed that considering Streptococcus mutans, glass ionomer cement is the best material of choice.[17] Many studies have shown that fluoride release from the glass ionomer inhibits the growth of Streptococcus mutans in plaque and have a cario-static effect and it helps in remineralization of damaged enamel.[18] Giving ART to pregnant women not only improve oral health status of mother by reduction in the S. mutans count but also reduce vertical transmission to their children.[19] For the detection of Streptococcus mutans in saliva of pregnant women, Polymerase chain reaction method was used in the present trial. In previous study conducted in Brazil, culture method was used for the detection of Streptococcus mutans count present in saliva of expecting women. Many Studies have

shown that PCR method is more rapid, more sensitive and simpler than Culture that is more time consuming and gives false positive results due to the presence of S. sobrinus in the oral cavity because both organisms have similar characteristics[20]. In the current study, all pregnant women were between 2 to 8 months of gestation. It is noticed that clinically, the second trimester is the most suitable for dental treatment, in which pregnant women do not have so much nausea and other physiological alterations, being the most stable trimester for further trials. Larger longitudinal studies are recommended to substantiate the observations made in the present study. Further studies can be done not only to determine the level of infection in pregnant women but also to detect vertical transmission of S. mutans from mother to their children.

Conclusion

The current results indicate that giving single intervention that is ART is an effective oral environment stabilization procedure in reducing salivary Streptococcus mutans count in pregnant women that will also inhibit vertical transmission.

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