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Effects Of Charcoal In Tooth Discolouration And Morphology - An In Vitro Study

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ABSTRACT :
INTRODUCTION : Charcoal toothpastes are used in oral hygiene products, for toothbrushing, extrinsic stain removal, it is claimed as 'tooth whitening'. You can find an array of dental products containing activated charcoal from toothpastes to many food products. Products coffee stains, wine stains,and plaque.Since there is no data behind the claims that activated charcoal is safe or effective, products containing these ingredients aren't eligible for the American Dental Association (ADA).
AIM: Finding the effects of charcoal in tooth discolouration and morphology.
MATERIALS AND METHOD: 6 non-carious teeth were taken in One solution of diluted water and another solution of charcoal toothpaste and were taken in a beaker. The six non-carious teeth were put on the solution of distilled water and charcoal paste diluted solution.Later the measurements were taken.Then the tooth was observed for 3 days in the solution.Then the tooth was taken out for observation and the readings were taken and changes noted.
RESULT: From the observation it is concluded that charcoal gives some discoloration to the teeth by whitening the tooth and no changes in morphology.And it is not completely safe to use charcoal in dental products and dentistry.
CONCLUSION: Activated charcoal may whitens the teeth but it is not effectively proved and charcoal is not safe as it has sorbitol.In recent times activated charcoal is used in toothpaste, ice creams,soaps,but more research may be required to know the beneficial and deleterious effects on human health.

KEYWORDS: Discolouration, Charcoal, Oral health, teeth whitening .

INTRODUCTION:

Charcoal is known as lightweight carbon, produced by very strong heating of animal and plant material and carbon in minimal oxygen to remove all water and volatile constituents.Traditional version of pyrolysis process

is known as charcoal burning. The heat was supplied by the burning part of the starting material itself, with a limited supply of Oxygen. The material can also be heated in a closed retort(1,2). This process happens inadvertently while burning wood, as in a fireplace or wood stove. The visible flame in these is due to combustion of the volatile gases excluded as the wood turns into charcoal (3). The soot and smoke commonly given by wood fires result from incomplete combustion of those volatiles. Charcoal needs high amount temperature than wood to burn , with hardly a visible flame, and that releases almost nothing except high heat.Woods charcoal is obtained as the residue of wood such that the products are:

- Liquid products – Pyroligneous acid and wood tar
- Gaseous products – Wood gas
- Residual product – Wood charcoal (4) Maxillary Premolars:

1. Maxillary premolars bicuspids -We have 4 maxillary premolars, 2 in right and 2 in left side. Messial to them is the canine and distal the molars present which has two cusps, one buccal and one lingual bicuspid.
2. Premolars are posterior teeth because. They have an occlusal surface instead of incisal ridge. The buccolingual measurements were greater than anterior teeth. The crown is shorter than the anterior teeth. The cervical curvature is less than the anterior. The contact areas were broad and are at nearly the same level.
3. Maxillary first premolar.

The present research aims to study the effects of charcoal in tooth discolouration and morphology.

MATERIALS AND METHOD

6 non-carious canine teeth were taken. One solution of diluted water and another solution of charcoal were taken in the beaker.The six non-carious teeth were put on the solution and measurements were taken.Then the tooth was observed for 3 days in the solution.Then the tooth was taken out and the readings were taken and changes noted.

RESULTS:

After observing the teeth which were soaked in diluted water and charcoal paste for three days. It was noted that the teeth became a bit whiten and there is no morphological change in any of these three days.

Figure 1: premolar teeth after immersion in distal water and charcoal on day 1.

Figure 2: premolar teeth after immersion in distilled water and charcoal on day 2.

Figure 3: premolar teeth after immersion in distilled water and charcoal on day 3.

Figure 4: Buccal length

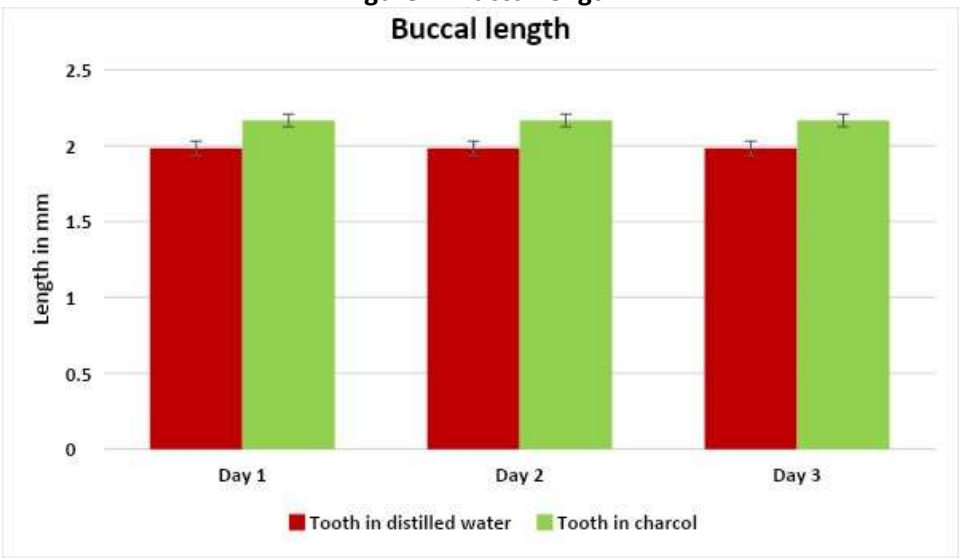

Figure 4: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in buccal length morphology in day 1,day 2 and day 3.

Figure 5: Palatal length

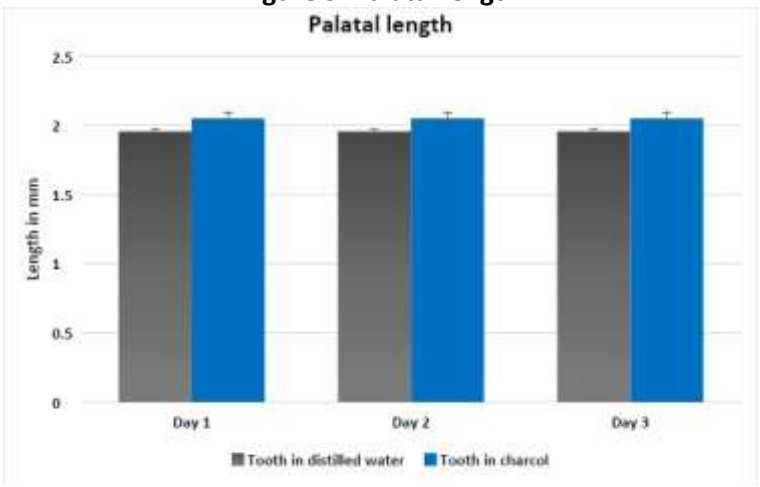

Figure 5: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in palatal length morphology in day 1 , day 2 and day 3.

Figure 6: Buccal width

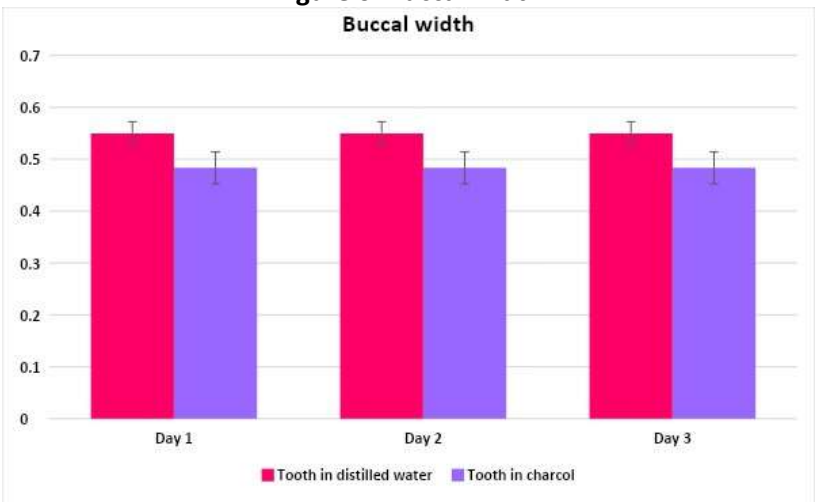

Figure 6: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in buccal width morphology in day 1 , day 2 and day 3.

Figure 7: Palatal width

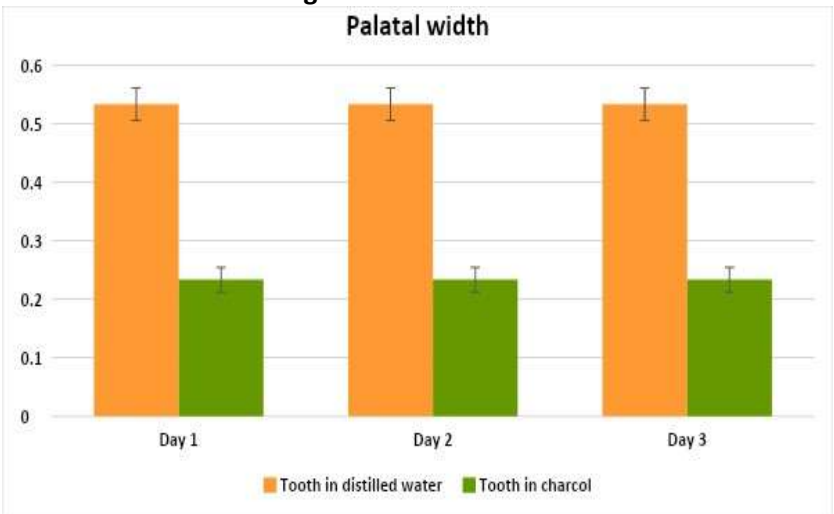

Figure 8: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in palatal width morphology on day 1, day 2 and day 3.

Figure 9: Mesial width

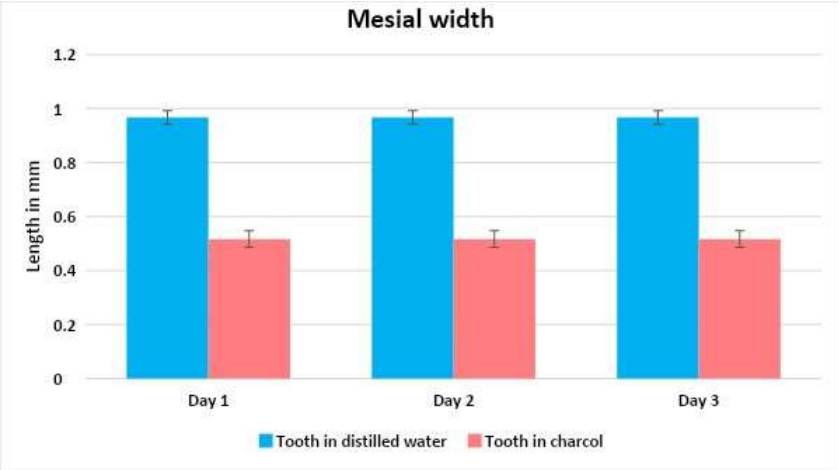

Figure 9: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in mesial width morphology in day 1 , day 2 and day 3.

Figure 10: Distal width

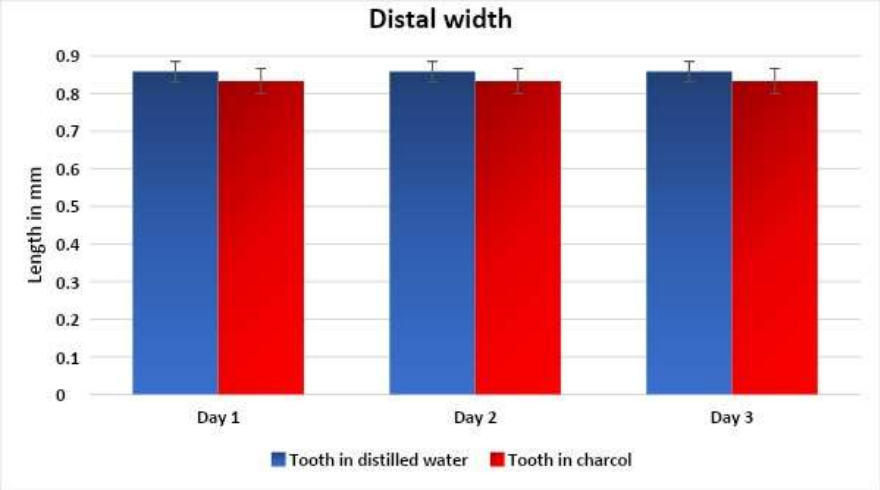

Figure 10: The bar graph shows that the teeth immersed in distilled water and charcoal diluted water do not show any changes in distal width morphology on day 1 , day 2 and day 3.

DISCUSSION:

This study observed that there are no changes in the shape of the tooth but discoloration takes place.Charcoal-based dentifrices for dental whitening are a novelty in the market. Manufacturers claim that products based on charcoal have antifungal, antimicrobial,remineralization,and whitening properties of charcoal in those products . However, there is no substantial scientific evidence for these claims (5). This laboratory randomized study was designed to evaluate the whitening properties of a charcoal-based toothpowder.a charcoal-containing toothpaste was effective for whitening treatment compared to a regular toothpaste which was the control group of the study, but less effective than other toothpastes which contained microbeads, H_2O_2, or blue covarine as whitening agents. In previous research, it was stated that the usage of activated charcoal powder did not improve colour change when combined with the tested regular and whitening toothpastes (6). Moreover, in a recent literature review, the authors concluded that there is no sufficient evidence for whitening effect of charcoal-containing toothpastes.Activated charcoal is a nanocrystalline form of carbon (C) with a high specific surface area and high porosity in the nanometer range. Activated charcoal is commonly used as an adsorbent in various applications.charcoal absorbs stains in teeth through its pores and then brushed away providing tooth colour change (6,7). This is the reason that some authors recommend this kind of toothpastes only for colour maintenance by delaying the recurrence of surface staining on tooth surfaces after tooth bleaching treatment.In addition, it has been postulated that the high absorptive capacity of activated charcoal may reduce the availability of fluoride ions in the formula of

the toothpaste, leading to limited capacity to remineralize the tooth tissues and as a consequence to decreased resistance to caries and tooth wear.The colour of the teeth is mainly depended on the colour of dentin and modified by the thickness and translucence of enamel. The mineral phase of enamel consists of calcium phosphate in the form of hydroxyapatite which is colourless (8). As a result, natural enamel usually has white colour with some translucency. The continuous wear of enamel causes erosion and abrasion, and may reduce the thickness of enamel, leading to a darker and more yellowish colour because the dentin becomes more visible. In addition, the deposition of various chromophores into and onto the tooth tissues from the diet (coffee, black tea, red wine, etc.) or other daily habits, such as smoking, may change the colour creating intrinsic or extrinsic stains. This deposition may be accelerated by the increased porosity and surface roughness of ename.(9). This fact may explain the differences in the degree of discolouration among the teeth after the staining method.It has been claimed that the type of toothbrush used, the toothbrushing method, and the duration of brushing may be more important to the cleaning and whitening effect than the composition of the toothpaste (10).The effect of a whitening mouthwash on toothbrush abrasion should also be considered. In a recent study,the authors concluded that the continuous use of whitening mouthwashes is able to increase the enamel abrasion potential promoted by daily toothbrushing. Tooth whitening of charcoal-containing mouthwashes is presumably attributed to the inclusion of charcoal particles which act as abrasive agents to mechanically remove extrinsic stains from the tooth surfaces (11). However, it has been claimed that such products may raise the risk of enamel damage and caries formation due to the absence of fluoride or charcoal-induced fluoride degradation. In the current study, the use of the tested charcoal-containing mouthwash did not deteriorate the surface damage of the enamel after brushing with the charcoal-containing toothpaste (11).

LIMITATIONS:

The survey was conducted among 100 participants and a simple random sampling method was used to select the participants hence the same study has to be conducted with more participants.

FUTURE SCOPE:

Making more interactive sessions and exercises regarding pulp and pulpal defects will make them remember more about the subject.

CONCLUSION

Activated charcoal may whitens the teeth but it is not effectively proved and charcoal is not safe as it has sorbitol.In recent times activated charcoal is used in toothpaste, ice creams,soaps,but more research may be required to know the beneficial and deleterious effects on human health.Within the limitations of this in vitro study, it could be concluded that the charcoal-containing toothpaste presented higher whitening effect on the teeth than the regular toothpaste, but the use of the charcoal-containing mouthwash in combination with the whitening toothpaste did not improve the colour change. In addition, the use of the toothpastes during brushing influenced differently the surface morphology of the enamel, while the whitening mouthwash did not influence these morphological alterations. The patients that desire whiter teeth should be well informed by the dental professionals for the indications of the over-the-counter whitening products in order to be aware of the hazards of their daily use. Although the charcoal-containing whitening toothpaste may offer desirable tooth colour change, it should be used carefully following the instructions of a dental professional.

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AUTHOR CONTRIBUTION:

Mufeetha.M : Literature search, sample collection, analysis, manuscript writing.
Dr. Vishnu priya, Dr Abirami, Dr Gayathri, Dr Kavitha, Dr Reshma :Study design, Data verification, manuscript drafting.

CONFLICT OF INTEREST:

The authors declare that there are no conflicts of interest in the present study.

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