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Original Research

Knowledge and awareness of dental practitioners about the anti cariogenic effect of xylitol in Hyderabad city

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ABSTRACT

Dental caries is a multifactorial disease among which one of them is the substrate or sugars that are associated with the decay process. Sugar substitutes which are not fermented by the oral microorganisms will be of great importance in avoiding the series of reactions associated with dental caries. Xylitol is a sugar alcohol which cannot be fermented by mutans streptococci which is the caries inducing microorganism. Thus, knowledge about its availability commercially, dosages, frequency will be of great use in utilizing it as a preventive measure in controlling the disease process. This study aims to assess the knowledge of dental practitioners in Hyderabad city about sugar substitutes; xylitol in particular in a questionnaire based study. The questions regarding xylitol are based on its anti-cariogenic potential, correct age appropriate dosages, frequency of consumption, its commercial availability, its side effects and major hindrances in not being able to prescribe it as a preventive measure.

INTRODUCTION

Fermentable carbohydrates are the cause of series of reaction's associated with dental caries. Sucrose is the most commonly available fermentable carbohydrate that is consumed. It is commonly available in fruits, vegetables, grains and dairy products.[1] This is especially a cause of concern with child patients who consume more of these foods and thus increasing susceptibility to caries as sucrose is not metabolized by the micro organisms present in the oral cavity causing demineralization of the tooth structure.[1] Therefore, sugar substitutes can be used as an alternative. The sugar substitutes are nutritive and nonnutritive types. The nutritive substitutes offer calories: they are sugar and sugar alcohols whereas the nonnutritive sweeteners offer no energy and provide sweetness with very little amount. Although they are popular in medical fraternity for their use in controlling weight and managing diabetes, there use as an anti-cariogenic substitute is less common. The relationship of mutans streptococci and dental caries is sucrose dependent, thus methods that reduce the bioavailability of sucrose in plaque ecosystem will provide effective preventive measures.[2] Among the various sugar substitutes the sugar alcohols, especially xylitol has been studied extensively. The Turku xylitol chewing gum study showed that xylitol was non cariogenic and possibly anti cariogenic when substituted for sucrose either in foods or chewing gums. The xylitol food study was a 2 year clinical trial in which young adult volunteers consumed food sweetened with sucrose, or fructose or xylitol. The xylitol group exhibited at the end of the study about 85-90% reduction in caries score compared to sucrose group.[3] Sugar alcohols especially xylitol and sorbitol have been studied extensively, they provide bulk and calories and are less cariogenic as their five carbon chemical structure is not metabolized by s.

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mutans, thus rendering them non fermentable.[4] There are different mechanism of actions proposed to explain the anti-cariogenic potential of xylitol.

There has been a lot of debate on its usage and frequency regarding its use as an anti - cariogenic agent. The present study is questionnaire based awareness study among the dental surgeons in Hyderabad city to know their knowledge regarding the use of sugar substitutes, xylitol in particular as an anti -cariogenic agent.

MATERIALS AND METHODS

A randomized cross sectional questionnaire study was conducted among the dental surgeons in Hyderabad city. Our study comprised of 205 dentists both general practitioners and specialty practitioners. The dental surgeons were randomly selected. The questionnaires (table1) were related to the awareness about the sugar substitutes, the anti-cariogenic effects of xylitol, the commercially available vehicles for xylitol delivery, the correct dose and frequency to get the caries preventive effect, and the problems in using xylitol in preventive protocol for child patients. The questionnaire was approved by the ethical committee of Sri Sai College of Dental Surgery, Vikarabad. The informed consent was taken before the questionnaire was given.

RESULTS

The study comprised of 205 dental surgeons across Hyderabad city, who were randomly selected and all participated in study questionnaires (Table 1)

Question 1: Are you aware of the sugar substitutes with anti-cariogenic effect?

41.1% of the doctors were aware of sugar substitutes with anti - cariogenic effect. 25% of the doctors were unaware. 11.9% were aware of their use in diabetics for weight control

Question 2: Are you aware of xylitol as sugar substitute with anti-cariogenic potential

63.6% percent of the doctors think xylitol as a sugar substitute, 59.9% know it as an anti-cariogenic agent.

Question 3: Do you prescribe xylitol to child patients?

72.7% sometimes prescribe xylitol to child patients.

Question 4: Can xylitol be prescribed to child less than 4 years?

77.8% of the doctors say xylitol should not be prescribed to child less than 4yrs.

Question 5: Does maternal consumption of xylitol prevents decay in children? if yes then do you prescribe ?

43.9% of them do not know, 15.2% doctors do not prescribe

Question 6: Most common commercial choice of xylitol substitute prescribed?

54.5% know chewing gum as the most common commercial xylitol containing product which they prescribe.

Question 7: Quantity of xylitol prescribed for caries control?

59.1% do not know the correct dosage of xylitol with only 17.6% knowing the correct frequency for prescription

Question 8: Are there any toxic effects of xylitol ?

64.7% think there are no toxic effects with xylitol

Question 9: Commercial chewing gums containing xylitol ?

54.5% think orbit as the chewing gum containing xylitol.

Question 10: Commercial Tooth paste available containing xylitol ?

94.1% think kidodent as tooth paste & mouth wash containing xylitol.

Question 11: Commercial Mouth rinses available containing xylitol ?

94.1% think kidodent as tooth paste & mouth wash containing xylitol.

Question 12: Problems faced in prescribing xylitol to patients ?

27.3% think that the major difficulty in not prescribing xylitol containing products as not knowing the commercial vehicles containing xylitol. 31.8% do not know the correct dosage & frequency for prescribing as an anti-cariogenic agent.18.2 % think availability of products is difficult.

Question 13: Any other sugar substitute most commonly prescribed ?

61.2% of them do not prescribe sugar substitutes only 15.2% of the doctors prescribe sometimes

Question 14: If yes, then the most common commercial choice of these substitutes?

50% of the dentist are aware of Aspartame as the sugar substitute which is most commonly available.

DISCUSSION

Xylitol is a nonnutritive polyol with sweetness equal to table sugar and 40% fewer calories. It is produced commercially from birch trees, other hardwoods containing xylan. It is now manufactured using bio technology from fibers.[5]

Xylitol is not fermentable by S. mutans. This may be attributed to five carbon chemical structure which is stoichiometrically unfavorable to be fermented by S.mutans.[6] Xylitol can be ingested by mutans streptococci and thus it inhibits the glycolysis process by fructose phosphotransferase system, effecting the growth and the metabolism of these organisms. The metabolite produced in this process is xylitol-5- phosphate that cannot be metabolized.[7]

Short-term consumption of xylitol decreases S mutans levels in both saliva and plaque. Long-term consumption of xylitol has a selective effect on S mutans strains causing selection of less virulent strains that are less capable of adhering to tooth surface therefore shed easily from plaque to saliva.[5]

Maguire suggested that xylitol may reduce the levels of *mutans Streptococci* in plaque through non-specific and specific effects (Maguire 2003).[8]

American Academy of Pediatric Dentistry (AAPD), recommends the use of xylitol use in moderate or high caries risk patients. It also recommends that those who prescribe xylitol must be aware of product labeling and recommended age appropriate products, which should be routinely reassessed for changes in caries risk.[9]

Total daily dose of xylitol should be 3-8 gms per day for a clinical effect with currently available delivery methods of chewing gums, syrups, lozenges. The dosing frequency should be minimum 2 times a day and not exceeding 8 gms per day.[9]

American Academy of Pediatrics (AAP) does not recommend the use of chewing gum, mints or hard candies by children less than 4 years of age due to risk of choking. Therefore syrups are better delivery vehicle for infants. A pacifier with pouch containing slow release of xylitol in tablet form, which is not yet available everywhere. Dosages for child less than 4 years ins 3-8gms / day in syrup form.[9]

Studies using tooth paste formulations using 10 percent xylitol (0.1gm/ brushing) have shown reduction in MS level and caries in children.[10]

TABLE 1: Questionnaire regarding knowledge and awareness of dental practitioners about xylitol

Name of the Doctor:

Speciality:

Practice – a. General practice b. Specialty practice

1. Are you aware of the sugar substitutes with anti cariogenic effect
a. Yes b. no
2. Are you aware of xylitol as a sugar substitute with anti- cariogenic potential
a. Yes b. no
3. How often do you prescribe xylitol to patients?
a. Regularly to every patient as preventive care.
b. Sometimes
c. Rarely
4 Can xylitol be prescribed to child less than 4yrs ?
a. Yes b. no
5 Can xylitol be prescribed to pregnant females to ?
a. Yes b. no c don't know
6. Most common commercial choice of xylitol substitute prescribed ?
a. Tooth paste
b. Mouth rinse
c. Chewing gum
d. Any one
e. Any other ————
7. Quantity of xylitol prescribed for caries control ?
a. <3 gms
b. 4-6 gms
c. >10 gms
d. 6-10 gms
e. Not sure
8. Are there any toxic effects of xylitol ?
a. Yes
b. No
9. Commercial Chewing gums containing xylitol ?
a. Center fresh
b. Orbit
c. Proteax
d. Happy dent white
10. Commercial Tooth paste available containing xylitol ?
a. Pepsodent kid
b. Colgate kid
c. Kidodent
d. Cheerios
11. Commercial Mouth rinses available containing xylitol ?

a. Kidodent mouth wash
b. Listerine
c. Chlohex
d. Plax
12. Problems faced in prescribing xylitol to patients ?
a. Difficulty in knowing the commercial xylitol delivery vehicles.
b. Problem in prescribing the amount of dosage that has to be prescribed.
c. Cost.
Choice of answers
1. A
2. B
3. C
4. A,b
5. B,c
6. A,c
7. All
13. Any other sugar substitute most commonly prescribed ?
a. Saccharin
b. Malitol
c. Aspartame
d. Any other
e. None
14. If yes, then the most common commercial choice of these substitutes?
a. Chocolate bars
b. Biscuits
c. Sweets
d. Any others
15. Any other commercial products of choice containing xylitol, that are most commonly prescribed

2015 revised policy by AAPD on xylitol's use states that AAPD supports the use of xylitol and other sugar alcohols as non-cariogenic sugar substitutes. Recognizes that large dose and high frequency of xylitol used in clinical trials may be unrealistic in clinical practice.[11]

Xylitol is safe for children when consumed in therapeutic doses for dental caries prevention. The most common side effect associated with excess consumption of xylitol is gas and osmotic diahorhea. The symptoms subside once xylitol consumption is stopped.[9]

Maternal consumption xylitol gums had shown to be associated with decreased MS counts in children, still there is no consensus regarding this. Emphasizes has to be made on duration of the xylitol intervention as well as the xylitol dose (Milgrom et al, 2009).[12]

Maternal MS reservoirs can be suppressed by dietary counseling, reducing the frequency of simple carbohydrate intake, applying topical chlorhexidine and/or fluoride, removing and restoring active caries, and chewing xylitol-containing chewing gum. Evidence suggests that the use of xylitol chewing gum (at least two or three times per day by the mother) has a significant impact on mother-child transmission of MS and decreasing the child's caries rate.[13]

Most of the clinicians are aware of orbit being the chewing gum containing xylitol; kidodent tooth paste and mouth wash containing xylitol which are commercially available.

Most of the doctors are aware about the sugar substitute aspartame which is commonly available with trade names sugar free natura and relish in the Hyderabad market.

The major issues in prescribing xylitol in caries preventive programs according to this study are definitely the not knowing correctly the dosage and frequency it can be used as an anti - cariogenic agent.

Although AAPD supports it for its anti- cariogenic property, no consensus regarding its dosage is established. The other major hurdle is non availability of the commercially available vehicles. AAPD does not support the use of gums and hard candies containing xylitol as in children less than 4 years, therefore syrups only can be prescribed to very young patients who are susceptible to early childhood caries, the drawback being unavailability in the market. The unawareness about the products containing xylitol and all the various forms in which it is available is also a drawback for it not being used in practice.

CONCLUSION

This study shows the awareness among the dentist in Hyderabad about sugar substitutes, xylitol in particular. AAPD supports the use of xylitol and other sugar alcohols as non-cariogenic sugar substitutes. Still there is lack of consistent evidence for xylitol being effectively being used to decrease mutans level in oral cavity, but it can be a preventive measure. The lack of awareness about the commercially available products with correct labeling on them and clarity about its dosage to prevent dental caries will surely go a long way in decreasing dental caries.

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