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Assessing Knowledge, Attitudes, and Practices of Preventive Dental Measures Among General Dental Practitioners in Benghazi, Libya

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A B S T R A C T

This study investigates the knowledge and attitudes of general dental practitioners in the city of Benghazi, Libya, regarding preventive dental measures, specifically focusing on the use of topical fluorides and pit and fissure sealants. The study is based on a survey of dental practitioners, aiming to assess their familiarity with these preventive methods and their implementation in daily practice. Our findings reveal that while a high percentage of dentists are aware of the benefits of topical fluorides and sealants, there is a significant gap in the actual application of these measures in clinical practice. This discrepancy may be attributed to various factors, including patient cooperation issues and a lack of comprehensive knowledge about caries risk assessment. Additionally, our study highlights the preferences of dental practitioners for specific types of fluoride applications, contrasting with the guidelines provided by the American Academy of Pediatric Dentistry (AAPD).

Keywords: Preventive dental measures, topical fluorides, pit and fissure sealants, dental caries, caries risk assessment, dental practitioners.

INTRODUCTION:

Dental caries, otherwise known as tooth decay, is one of the most prevalent chronic diseases of people worldwide; individuals are susceptible to this disease throughout their lifetime. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors including teeth and saliva. The disease develops in both the crowns and roots of teeth, and it can arise in early childhood as an aggressive tooth decay that affects the primary teeth of infants and toddlers. Risk for caries includes physical, biological, environmental, behavioral, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, inappropriate methods of feeding infants, and poverty. The approach to primary prevention should be based on common risk factors. Secondary prevention and treatment should focus on management of the caries process over time for individual patients, with a minimally invasive, tissue-preserving approach (Selwitz et al., 2007).

Dental caries is one of the most common preventable childhood diseases; people are susceptible to the disease throughout their lifetime (Pitts, 2004; Fejersskov& Kidd, 2003). It is the primary cause of oral pain and tooth loss (Kidd &Fejerskov, 2004). It can be arrested and potentially reversed in its early stages, but it is often not self-limiting and without proper care, caries can progress until the tooth is destroyed (Fejerskov& Kidd, 2003).

Therefore, physicians and other health-care providers should be familiar with dental caries and its causes. Dental caries is the localized destruction of susceptible dental hard tissues by acidic by-products from bacterial fermentation of dietary carbohydrates (Fejerskov& Kidd, 2003; Marsh & Martin, 1999). The signs of the carious demineralization are seen on the hard dental tissues, but the disease process is initiated within the bacterial biofilm (dental plaque) that covers a tooth surface. Moreover, the very early changes in the enamel are not detected with traditional clinical and radiographic methods. Dental caries is a multifactorial disease that starts with microbiological shifts within the complex biofilm and is affected by salivary flow and composition, exposure to fluoride, consumption of dietary sugars, and by preventive behaviors (cleaning teeth). The disease is initially reversible and can be halted at any stage, even when some dentine or enamel is destroyed (cavitation), provided that enough biofilm can be removed. Dental caries is a chronic disease that progresses slowly in most people. The disease can be seen in both the crown (coronal caries) and root (root caries) portions of primary and permanent teeth, and on smooth as well as pitted and fissured surfaces. It can affect enamel, the outer covering of the crown; cementum, the outermost layer of the root; and dentine, the tissue beneath both enamel and cementum. Caries in primary teeth of preschool children is commonly referred to as early childhood caries.

The terms dental caries or caries can be used to identify both the caries process and the carious lesion (cavitated or non-cavitated) that is formed as a result of that process (Fejerskov, 1997; Selwitz et al., 2007). In daily practice, dental practitioners, other health-care providers, and patients often refer to an established caries lesion as a cavity in the tooth. The cavity, or decayed surface, is the sequela of the disease process and is a sign of fairly

advanced disease (Thylstrup&Fejerskov, 1994). Dental caries is a continuum of disease states of increasing severity and tooth destruction that ranges from sub-clinical sub-surface changes at the molecular level to lesions with dentinal involvement, either with an intact surface or obvious cavitation (Kidd &Fejerskov, 2004; Pitts, 2004; Axelsson, 2000; Featherstone, 2004). Assessment of the presence or absence of dental caries is dependent on the diagnostic cutoff points selected; this decision greatly affects practitioners' treatment decisions. Carious lesions are the outcome of events that progress over time (Fejerskov, 1997).

Risk Factor

A person's risk of caries can vary with time since many risk factors are changeable. Physical and biological risk factors for enamel or root caries include inadequate salivary flow and composition, high numbers of cariogenic bacteria, insufficient fluoride exposure, gingival recession, immunological components, need for special health care, and genetic factors (Fejerskov& Kidd, 2003; Featherstone et al., 2003; Thomson, 2004).

Caries is related to one's lifestyle, and behavioral factors under a person's control are clearly implicated. These factors include poor oral hygiene; poor dietary habits—i.e., frequent consumption of refined carbohydrates; frequent use of oral medications that contain sugar; and inappropriate methods of feeding infants (Fejerskov& Kidd, 2003; Featherstone et al., 2003; Krol, 2003; Winn, 2001; Touger-Decker & van Loveren, 2003). Other factors related to caries risk include poverty, deprivation, or social status; number of years in education; dental insurance coverage; use of dental sealants; use of orthodontic appliances; and poorly designed or ill-fitting partial dentures (Kidd et al., 2000; Curzon & Preston, 2004; Krol, 2003; Ramos et al., 2002). Also, children with a history or evidence of caries or whose primary caregiver or siblings have severe caries should be regarded as at increased risk for the disease (Fejerskov& Kidd, 2003; Krol, 2003). Although evidence of a link between low birthweight and dental caries is inconclusive, clinicians are advised to regard such children as at risk for dental caries (Burt & Pai, 2001). Colonization by mutants' streptococci, and other cariogenic bacteria at a young age could be a key risk factor for caries development (Seow, 1998; Berkowitz, 2003).

However, the role of mutants' streptococci as the main cause of caries has not been proven. Because of the complexity of the oral microflora, which contains several hundred species of bacteria and millions of cells growing on a single tooth surface, no single bacterial species can predict caries development in a particular person (Marsh & Martin, 1999; MacFarlane & Samaranayake, 2014). Moreover, the present knowledge of this complex disease does not allow for accurate prediction of caries activity in any one person or tooth (Hausen, 1997). However, evidence that consideration of risk factors such as the presence of mutants' streptococci or lactobacilli; low socioeconomic status; previous caries experience; amount of fluoride exposure and salivary flow; and the dentist's judgment can lead to beneficial outcomes. The major reservoir from which infants acquire mutants' streptococci, a widely studied cariogenic bacterial species, is the primary care giver, usually the mother (Seow, 1998; Berkowitz, 2003; Weintraub et al., 2010). Evidence suggests that mutants' streptococci can colonies the mouth of pre-dentate infants and are acquired by both vertical and horizontal transmission from human reservoirs (Berkowitz, 2003). The report of the 2001 US National Institutes of Health Consensus Development Conference on Diagnosis and Management of Dental Caries Throughout Life contains additional information on caries risk.

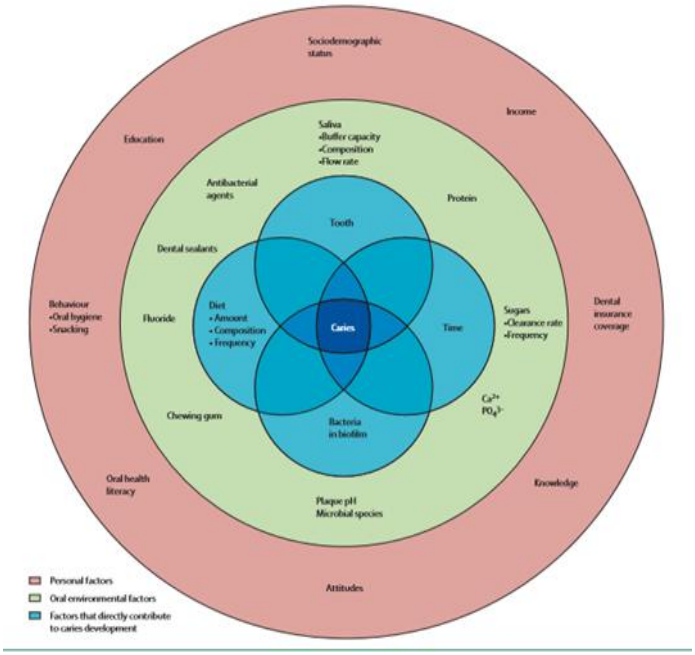

Fig. 1. Summary of the factors implicated in the caries process.

Prevention

Discussions about improved methods for caries detection, assessment, and diagnosis for effective caries prevention should not be seen as an alternative to public health and health promotion strategies to reduce the burden of disease before a patient arrives at a dental practice with obvious disease. New

clinical developments should work in conjunction with such public health approaches. In dentistry, the promotion of evidence-based care and the production of clinical guidelines to support appropriate care for individual patients is now possible (Akram&D'Cruz, 2010). In dental caries management, the focus has been around preventive caries management for children (Pitts, 2002), but caries is a disease process that needs to be managed over a person's lifetime (Ismail, 2004). The evidence is leading to an international trend in clinical practice to move away from operative intervention towards prevention of caries. The theory is that the caries process should be managed over time for individual patients and that the least invasive preservative dentistry should be provided (Tyas et al., 2000). This approach relies on accurate diagnosis of disease and lesions, disease prevention just-in-time restoration, minimally invasive operative procedures, and prevention of recurrence. It should be noted that there has been some controversy about the increased use of a high-risk individual approach for identification of people in need of caries prevention (Batchelor&Sheiham, 2002). However, the distribution of caries is very skewed, and although risk groups are increasingly targeted for prevention, appropriate and prudent surveillance and care should be provided for all patients since caries can occur and can progress in all risk groups. Risk classifications are dynamic and vary from person to person, so they should be periodically reviewed and updated. For self-administered care, fluoride toothpaste is the most powerful intervention for caries prevention because it has high clinical effectiveness and social acceptability. A Cochrane review of randomized or quasi-randomized controlled trials with blind outcome assessment, comparing fluoride toothpaste with placebo in children aged 16 years or more for at least 1 year, concluded that fluoride toothpastes are clearly effective in prevention of caries. This conclusion is supported by more than 50 years of research. Studies of other oral hygiene interventions alone are not as clear cut because many are confounded by the concurrent use of fluoride toothpaste. However, consensus supports the use of tooth brushing in combination with fluoride toothpaste, especially for occlusal surfaces at the time of tooth eruption (Folayan et al., 2013). Another Cochrane review (Marinho, et al., 2003) looked at the effectiveness of fluoride gels administered by professionals. Randomized or quasi-randomized controlled trials with blind outcome assessment compared fluoride gel with placebo or no treatment in children aged 16 years or younger for at least 1 year, and the reviewers concluded that fluoride gel showed clear evidence of a caries-inhibiting effect. Pit-and-fissure sealants were the subject of another Cochrane review (Ahovuo, et al., 2004) of randomized or quasi-randomized controlled trials of sealants used for caries prevention in children and adolescents aged less than 20 years. The reviewers recommended sealing of the occlusal surfaces with resin-based sealants to prevent.

Fluoride

Fluoride is a mineral in the bones and teeth. It is also found naturally in water, soil, plants, rocks, and air. Fluoride is commonly used in dentistry to strengthen enamel and help to prevent decay. It is also added in small amount to public water supplies in many countries. The high fluoride modalities, such as fluoride varnish, combine with calcium in dental plaque acids (lactic and pyruvic acids produced by bacterial breakdown of fermentable carbohydrate). This occurs because of the presence of a phosphate or protein-rich coating of the globular deposits of calcium fluoride, which releases bioavailable fluoride ions over a longer period of time. In addition, progression of caries in dentin toward the pulp may be inhibited or slowed by increased fluoride concentration within dentin. Fluoride can be incorporated into the developing tooth if a child swallows fluoride toothpaste or water in communities with fluoridated water. There are multiple fluoride modalities from programs in the community and schools to home-based approaches and professionally applied fluoride in dental offices and other settings.

Community-level Fluoride:

The world's population exceeds 7 billion (Kc, 2018), yet fewer than 1 billion have access to proven community-based water or salt fluoridation programs (and not all those with access take advantage of it). Such programs reduce the prevalence and severity of tooth decay, the most common chronic disease of children, which may be untreated in as much as 95% of the population of some countries.

Water Fluoridation:

Water fluoridation is practiced in many countries throughout the world. As of 2012, more than 420 million people worldwide have access to either naturally fluoridated water (about 50 million) or water with adjusted fluoride concentrations at or near optimal (about 370 million) according to British Fluoridation Society (Johnson et al, 2021). In the United States, more than 211 million people—or about 75% of the population served by public water supplies—have access to fluoridated water. A global systematic Cochrane review has shown that the introduction of community water fluoridation results in a 35% reduction in the mean number of decayed, missing, and filled primary teeth and a 26% reduction in the mean number of decayed, missing, and filled permanent teeth in children. Water fluoridation has also increased the percentage of children with no decay by 15%, according to the global Cochrane review. Pediatric providers should encourage families to drink tap water where it is fluoridated. In Libya, about 400,000 get artificially fluoridated water (data pre-2003).

Salt Fluoridation:

It has been estimated that between 40 million and 280 million people worldwide use salt fluoridation, mainly in European, South American, and Central American countries. Salt fluoridation is sometimes suggested as an option for communities that have a low water fluoride concentration and have no possibility of implementing community water fluoridation. There are no salt fluoridation programs in the United States. The benefits and safety of salt fluoridation are similar to water fluoridation. Although this is effective when no water fluoridation can be achieved, one has to be cautious if both options are available. It is recommended that a national fluoride program use only one of these community-based approaches (water or salt) to minimize the risk for dental fluorosis in young children with developing teeth.

Fluoridated Milk:

Although not practiced widely, fluoridated milk may be beneficial to schoolchildren, contributing to a substantial reduction in dental caries in primary teeth. Successful milk fluoridation programs have been evaluated in Japan, Scotland, Hungary, and several other countries, including a study in Louisiana, USA in the 1950s.

Fluoride Mouth Rinse:

Because of the natural swallowing reflex, most children younger than 6 years may not be able to resist swallowing a mouth rinse. For children older than 6 years, regular use of alcohol-free fluoride mouth rinse under supervision has been shown to result in a large reduction in tooth decay in children's permanent teeth. The margin of safety for acute toxicity with school-based 900-ppm fluoride mouth rinse is wide (10 mL contains 9 mg fluoride), which is more than 10 times lower than the probably toxic dose for a 6-years old child of average weight (20 kg). In communities with low exposure to fluoride in water, school-based fluoride rinsing programs are recommended, but their adoption should be based on the cost of implementation and the caries status of the community.

Dietary Fluoride Supplements:

Prescription fluoride supplements (fluoride tablets or drops) have been shown to be effective in reducing caries incidence in permanent teeth when used as prescribed. However, fluoride tablets and drops have limited application as a public health measure due to poor adherence to the recommended daily schedule, and evidence for ECC prevention with fluoride tablets and drops is insufficient. Dietary fluoride supplements may be prescribed (with or without vitamins) for children at high risk for caries; the daily dose depends on age and fluoride concentration of the water supply. However, fluoride supplements are not recommended for infants younger than 6 months (or without teeth) or for any children from areas where the fluoride in the water contains greater than 0.6 mg/L of fluoride. Where water supplies contain less than 0.3 mg/L fluoride, no fluoride tablets should be prescribed before the age of 6 months. Between 6 months and 3 years, prescribe 0.25 mg fluoride per day. Between 3 and 6 years, 0.50 mg fluoride per day. Between 6 and 16 years, 1 mg fluoride per day. For water supplies with 0.3 to 0.6 mg/L fluoride.

Fluoride Toothpaste:

There is strong evidence that twice-daily use of fluoride toothpaste has a significant caries-reducing effect in young permanent teeth compared with a placebo. Strong evidence suggested a dose–response relationship with enhanced caries protection from toothpastes with 1500 ppm of fluoride compared with formulations with 1000 ppm of fluoride in young permanent teeth following daily use. Nevertheless, daily tooth brushing with fluoride toothpaste, even at less-than-optimal fluoride dosage, from the time of eruption of the first tooth must be regarded as the best clinical practice today, based on moderate quality of evidence. Toothpaste should be applied by the parent, with only a smear for children younger than 3 years and a pea-size amount for those older than 3 years. Toothpaste should be spit out after brushing, without water for rinsing.

Prescription Strength Fluoride Toothpaste:

There is a strong evidence base for the use of high-fluoride toothpastes (5000 ppm fluoride) in groups at a greater risk of caries. It is recommended to restrict its use in those younger than 6 years to cases where the risk of severe morbidity caused by caries is greater than that of aesthetically objectionable fluorosis. For children younger than 9 years who are at risk for developing dental fluorosis, it is recommended that the toothpaste be rinsed out with water after using high-fluoride toothpaste, whereas when using regular fluoride toothpaste, it is recommended that the toothpaste be spit out after use, rather than rinsed with water.

Professionally Applied Topical Fluoride:

Fluoride gels, i.e., professionally applied high-concentration fluoride gels, have been widely used by dental professionals in dental offices to prevent tooth decay in children and adults at high risk for tooth decay (Ford & Rich, 2021), whether in a fluoridated or no fluoridated area. The application of fluoride gel (12,300 ppm of fluoride as acidulated phosphate fluoride) results in a large reduction in tooth decay in both permanent and primary teeth. Gels are applied to the teeth using gel trays in the dentist's office, which must stay on the patient's teeth for approximately 4 minutes, with adequate suction to reduce swallowing of the gel. Fluoride varnishes and gels are equally effective at preventing caries. Increasingly, varnishes are used instead of gels due to the ease of application and low risk from ingestion of large doses, especially for younger children (Marinho et al, 2002). Professionally applied 5% sodium fluoride varnish (22,600 ppm of fluoride), in single doses of up to 9 mg fluoride, can demineralize early enamel caries and prevent the need for dental restorations. Varnishes are brushed into clean, dry teeth, in the dentist's office, the medical office, and increasingly in other sites with children at high caries risk. The application takes about 1 minute, and the varnish sets quickly. To keep the varnish on the teeth for several hours, patients are told to eat soft foods and avoid brushing and flossing for the remainder of the day. Fluoride varnish has been shown to be effective in the prevention of caries in both primary and permanent teeth. The interval for frequency of application of fluoride varnish varies depending on the risk of the patient— more frequently for children with higher risk. Although the use of fluoride varnish for caries prevention is technically considered an "off-label" use (it is US Food and Drug Administration [FDA] approved for tooth sensitivity), there is a robust evidence base for the efficacy of varnish at preventing caries. Varnish can be reapplied every 3 to 6 months, depending on risk, and no cases of fluorosis have been linked to excessive varnish use.

Pits and Fissure Sealant

Dental sealant is a term that describes a material applied to occlusal surfaces, which acts as a physical barrier between enamel surface and the biofilm to restrict bacterial overgrowth. This was first introduced to dental practice by Buonocore in 1955. Fissure sealants should be used as part of caries prevention programs as their effectiveness in preventing pit and fissure caries has been well documented (Ahovuo et al, 2017). Interestingly, studies have correlated caries free status among children aged 6–17 years to sealant application, although their effectiveness is dependent on the caries risk of

individuals and national caries prevalence. Another important point regarding sealant effectiveness is that it has also been shown to manage incipient occlusal carious lesions.

Pit and fissure sealant have been used to prevent occlusal caries in children and adolescents. However, this effective intervention has been underused, with socioeconomic factors being the main barrier. Two main types of sealants, resin based and glass ionomer, provide clinicians with several variations and options for application. Public health and school-based sealant programs have been effective in reaching underserved populations. Research continues to support the use of pit and fissure sealants compared to no ongoing sealants as an effective means of preventing dental caries in children and adolescents. Regarding effectiveness, safety and retention rates, pit and fissure sealants have been used to prevent occlusal caries in children and adolescents.

In 2010, only one-third of 8-year-old children in the United States and 14.1% of 14-year-old had a dental sealant (US Department of Health and Human Services, 2000). The reasons for underutilization of dental sealants seem to be multifactorial; however, one of the reported main reasons beyond that was insufficient professionals' knowledge.

Knowledge

Despite the proven effectiveness of pit and fissure sealants in preventing dental caries, there is a significant lack of knowledge and utilization among dental professionals globally. In a national survey in Greece, for example, 61.9% of general dental practitioners reported inadequate knowledge on when and how to use dental sealant, and only 35% practiced it routinely. In addition, studies in India, Spain, and the US reported a lack of current knowledge on dental sealants that consequently affected its practice. In Yemen, data regarding the knowledge and utilization of fissure sealants by dental professionals is lacking, although the prevalence of dental caries in this country has been reported among the highest in the world. Therefore, this study was conducted to evaluate fissure sealants knowledge and practices among practicing dental practitioners.

Pit and fissure sealants can be utilized as a primary prevention tool when the tooth or the patient is at an increased risk of experiencing caries, or as a secondary prevention method interrupting the progression of incipient caries. The indications for placing a pit and fissure sealant are as follow:

1. Pits and fissures of deciduous teeth in children when the tooth, or the patient, is at an increased risk of experiencing caries (Hotuman et al. 1998).

2. Pits and fissures of permanent teeth in children and adolescents when the tooth, or the patient, is at risk of experiencing caries (Taifour et al. 2003, Dennison et al. 2000).

3. Pits and fissures of permanent teeth in adults when the tooth, or the patient, is at risk of experiencing caries (Taifour et al. 2003, Dennison et al. 2000).

4. Incipient carious lesions (non-cavitated) of pits and fissures in children, adolescents, and adults (Griffin et al. 2008).

5. Pit and fissures of primary and permanent teeth should be considered in children and young people with medical, physical, or intellectual disabilities, mostly when systemic health could be jeopardized by dental disease or the need for dental treatment (Welbury et al. 2004).

6. Dental professionals should decide to place a pit and fissure sealant based on the patient's risk, not the age or time elapsed since tooth eruption (Cvikl et al, 2018). If the patient does not exhibit any risk factors or is at low risk of developing carious lesions, there is no need to perform this preventive measure at that time. However, it is essential to highlight that all children should be regularly monitored for any changes in cariogenic risk factors or clinical or radiographic changes (Welbury et al. 2004).

LITERATURE REVIEW:

The literature on the knowledge, attitudes, and practices related to preventive dentistry and fluoride usage among dental professionals reveals a variety of findings across different regions and populations. This review synthesizes studies conducted in various countries, including the United States, India, Iran, Saudi Arabia, Yemen, the United Kingdom, Greece, and Nigeria, to highlight common themes and identify gaps in understanding and practice.

Heller et al. (1997), in a study on data from 1990 to 1997, reported that Michigan dentists did not apply topical fluoride based on assessed risk. Similarly, findings from a study of dental professionals concluded that many of the respondents lacked knowledge about the mode of action or the relative concentrations of products, indicating inadequate preparation for counseling patients on the appropriate use of fluorides (Eklund et al, 2000).

In Iran, Ghasemi et al. (2007) found that amongst 980 dentists (64% male), only 31% showed a very high positive attitude towards preventive dentistry, while 47% showed medium level and 22% a low level of positive attitudes. There was also notable gender difference: 39% of women versus 27% of men viewed preventive dentistry as important. This contrasts with a study in Vadodara, India, where Ramya et al. (2015) found higher knowledge among less experienced practitioners and 48.8% had a highly favourable attitude towards preventive dentistry, but no correlation between knowledge and attitudes was found. The researchers also reported that 86.6% of dentists administered oral hygiene instructions to their patients. The majority of the 82 dentists responded to the questionnaire felt that patient-related barriers hindered preventive dentistry the most (Ramya, et al., 2015).

Tseveenjav (2004) noted that students and dentists (n=245) were generally aware that fluoride toothpaste (FTP) can prevent tooth decay but were unaware of the importance of FTP over brushing technique. The students and dentists were also unaware of the benefit of fluoridated water and topical

fluoride This lack of detailed knowledge on fluoride was echoed in a survey by Ahuja et al. (2014) among lecturers in Bangalore, who demonstrated accurate knowledge about sugar consumption and water fluoridation but poor understanding of FTP's superiority in preventing caries. Amongst 218 lecturers in four dental colleges in Bangalore, participants had the most accurate knowledge regarding the importance of fissure sealants and water fluoridation in preventing caries. The least accurate knowledge was regarding the importance of FTP over brushing technique in the prevention of dental caries and the fact that using a sharp explorer when examining an early carious lesion could damage enamel rods. The poorest knowledge was seen for the prevention of caries. No differences were found with respect to gender, academic department, or years of experience (Ahuja, et al., 2014).

In Texas, Bansal et al. (2012) found that 94% of surveyed dentists (n=599) routinely used fluorides in their clinics. However, only 20% agreed that low caries risk patients do not benefit from topical fluoride applications. This reflects a broader uncertainty in the dental community about fluoride application guidelines. The researchers compared the people who were in the sample and the sampling frame and conducted an independent sample t-test with years since graduation (YOP) as the test variable. There was no significant difference between the two groups ($p = 0.305$) for the first wave of respondents vs respondents in the second wave, nor between respondents and nonrespondents ($p = 0.153$). As in all survey research, there is a possibility of response bias, which cannot be measured. 20% of the respondents were in agreement with the recommendation that patients having a low caries risk do not benefit from topical fluoride applications. Getting the correct response was not significantly associated with YOP ($t = –1.47$; $p = 0.141$) or to continuing education ($t = –1.79$; $p = 0.073$). Due to the small numbers of self-identified public health dentists, logistic regression results are presented for only the general dentists and pediatric dentists. 84% of the respondents were in agreement with the recommendation that patients with that moderate caries risk below 6 years of age should receive topical fluoride applications every 6 months and 93% of the respondents replied correctly that for the high-risk category below 6 years of age, topical fluoride treatments should be at 3 or 6 months. Responding correctly was not significantly associated with YOP ($t = 1.1$; $p = 0.258$, $t = 0.512$; $p = 0.6$) respectively, but was significant with respect to CE ($t = 2.0$; $p = 0.007$, $t = 2.0$; $p = 0.03$) respectively.

Blumer et al. (2018) explored parents' (n=100) attitudes towards fluoride use and found high satisfaction levels for fissure sealants and fluoride gels but split opinions on fluoridated water. Most of the parents (88% of the mothers and 84% of the fathers) had an academic education. Most of the parents (54%) had a favourable attitude towards the use of fluoridated gels, while only 37% of them had a positive opinion regarding fluoridated water. The satisfaction levels were very high regarding fissure sealants, fluoridated mouth rinses and fluoridated gels (78.1%, 73.6% and 72.5% respectively). The satisfaction from fluoridated water was split almost equally (50.8% were 'pleased' and 49.2% 'not pleased'). The main source for parental oral health knowledge was the dentist (83%). Parents' attitude towards caries preventive measures was significantly correlated to their gender, dental experience, level of education, and the number of children in the family. On the other hand, in Saudi Arabia, Zakirulla et al. (2019) reported that while many mothers recognized the benefits of fissure sealants and professional fluoride therapy, there was confusion about its cost-effectiveness and application. On FS therapy benefits in the prevention of caries in children, 22 % responded that it was beneficial. When participants were asked regarding FS wearing out easily after application on the tooth, 8% agreed while 13.4% disagreed. A majority of mothers (40.9%) agreed that TF therapy prevents caries, while 47.7% stated that they brush twice daily with fluoride toothpaste. The mothers that disagreed that fluoride gel is recommended only for children, not for adults were 32.9%. When the mothers were asked about the benefit of fluoride if its cost is taken into consideration, 46.6% disagreed that fluoride gel was worth its cost, while 22.3% took the opposite view.

Patil et al. (2016) and Folayan et al. (2014) conducted systematic reviews in Udaipur and Nigeria, respectively, and found a general positive attitude towards caries prevention among dentists but noted that preventive strategies were not consistently applied based on caries risk. To explain further, Patil et al ., (2016) found that many of dentists implement the procedures for prevention of dental diseases like diet counselling, fluoride tooth pastes prescription, and fluoride application, whereas Folayan et al., (2014) found that preventive strategies for children with high caries risk were also used for those with low caries risk. Age, gender, knowledge of caries prevention measures, and self-perceived competency in providing caries-preventive care were not associated with student's capacity to provide caries-preventive practice for children.

Michalak et al. (2010) discovered that although most Greek dentists (87.6%) believed in and practiced prevention, only a minority (35.8%) routinely used fissure sealants, citing patient reluctance to pay and lack of knowledge on their use. In other words, factors highly correlated with FS usage for all dentists were using fluoride regimens (p0.01). Concerning the type of surfaces sealed, 45.6% of GDP used FS on intact surfaces and 41.1% on questionable, while only 15% of them sealed incipient caries. Overall, fewer GDPs compared with PD sealed premolars, primary teeth, questionable surfaces, incipient enamel caries and molars in high-risk patients ($p<0.001$) while fewer PD sealed intact surfaces ($p\leq0.001$). The reasons mentioned for not using FS were that 76.3% parents were unwilling to pay, 61.9% did not know how to use them, while 43.0% believed that oral hygiene was sufficient in order to reduce caries. Similarly, Al-Maweri et al. (2016) reported that Yemeni dental practitioners showed reasonable knowledge about sealants with the majority (88%) believing that there is strong scientific evidence about fissure sealants effectiveness and around 90% showed a good understanding of sealant placement instructions. On the other hand, respondents showed insufficient practical knowledge about their clinical application.

Pakdaman et al. (2015) highlighted that a majority of dentists (n=347) agreed with fluoride application in water and the prescription of fluoride tablets/drops in fluoride-deficient areas yet reported a lack of clear guidelines on its application. This means that fluoridated toothpaste was considered useful by 85.3%; this rate was 78.7% for fluoride rinse and 87.6% for fluoride varnish, foam, or gel. The majority of dentists (67.4%) reported no access to clear guidelines on fluoride application; 83% considered fluoride to be effective for caries prevention in children less than 12 years and 39.2% believed it was useful for adults and adolescents; 50% of the respondents correctly managed the high-risk child and adult with respect to appropriate selection of fluoride product. Younger dentists (OR=0.94; 95% CI 0.8- 0.9; P=0.043) and new graduates (OR=0.94; 95% CI 0.89-0.99; P=0.034) were more likely to correctly manage the high-risk child. similarly, Sabbagh et al. (2011) found varying levels of knowledge among 605 pediatricians in

Saudi Arabia, with significant gaps in understanding the appropriate age for first dental visits and the benefits of fluoride supplementation. In other words, the highest levels of knowledge were related to the eruption of the first primary tooth (89.8%), followed by the importance of frequent sugar intake in relation to caries etiology (82.6%), and the need to visit a dentist regardless of the presence of caries (76%). Some questions revealed that the level of pediatricians' knowledge was minimal or low. Less than 35% of pediatricians responded correctly to these questions. These included responses to questions concerning the appropriate age for first dental visit (25.6%), knowledge on pit and fissure sealants (17.4%), the time when a child should stop thumb sucking (9.1%), differences between breast and bottle feeding regarding their effect on the dentition (8%), and different questions concerning fluoride supplementation (ranged from 9.1- 1.9%).

Al-Wesabi (2015) observed that Yemeni senior dental students had good knowledge of fissure sealants but less understanding of the importance of fluoride toothpaste. This study also identified significant gender differences in attitudes, with female students showing higher positive attitudes towards preventive measures. To elaborate further, the researchers found that among 346 students who filled the questionnaire, a total of 91.6% had good knowledge about fissure sealant effectiveness; only 34.7% knew about the importance of fluoride toothpaste compared to brushing technique in preventing caries, with significant gender difference (p=0.005). Odds of good knowledge among non-Qat chewers was 1.9 (95%CI: 1.26-4.42). Multivariable regression analysis indicated that female gender was associated with higher positive attitudes (OR: 2.03, 95%CI:1.21-3.36, p=0.007). Attitudes were significantly associated with Qat chewing (OR = 1.95, 95%CI: 1.04-3.66, p=0.03), type of university (OR = 0.59, 95%CI: 0.36-0.94, p=0.02), and mothers' level of education (OR = 1.91, 95%CI: 1.05-3.47, p=0.03). There was a high percentage of competency in practicing preventive measures among students (80.9%).

In the UK, Oge et al. (2018) found that a third of health visitors (n=1088) had not received oral health training, yet almost all agreed that oral health advice/promotion should be included in their practice, which led to an increase in oral health knowledge, confidence in entering a discussion with parents/caregivers, and willingness to be involved in dental referral process.

The studies by Ghasem et al. (2007) and Patil et al. (2016) provide insights into dentists' perspectives on preventive dental care, highlighting both knowledge and practice aspects. Ghasem et al. (2007) focused on Iranian dentists, revealing strong awareness among them regarding the roles of sugar consumption (Mean±SD: 3.73±0.60), sealants (3.58±0.68), and water fluoridation (3.35±0.81) in preventing caries. However, there was a notable lack of understanding regarding the superiority of fluoride toothpaste over brushing technique (1.11±1.09). Despite this knowledge gap, dentists expressed positive attitudes towards preventive dental care, particularly emphasizing its usefulness (Useful — Useless; 6.67±0.94), value to the community (Valuable — Worthless; 6.59±0.98), and scientific credibility (Scientific — Unscientific; 6.47±1.06). Female dentists exhibited more favorable attitudes compared to male colleagues, suggesting potential gender differences in perceptions of preventive care. The study recommended enhanced dental education to update dentists' knowledge and attitudes towards preventive dentistry. In contrast, Patil et al. (2016) surveyed dental practitioners' (n=147) knowledge, attitudes, and practices related to preventive measures in pediatric patients. They found a significant association between younger age and higher levels of knowledge among dentists, indicating that younger practitioners may be more informed about preventive dental practices (i.e., the mean±SD were found for knowledge as 8.46±1.82, attitude as 2.65±0.780, and practice as 1.66±1.57). The study highlighted a positive correlation between attitudes towards preventive care and actual implementation in practice ($r=0.58$, $p<0.001$), underscoring the importance of aligning knowledge and attitudes to enhance preventive care delivery. Together, these two studies emphasize the need for continuous education and training among dental professionals to improve their understanding and implementation of preventive dental practices, ultimately aiming to enhance oral health outcomes among patients.

Across diverse geographic regions, studies reveal that while knowledge and attitudes towards preventive dentistry and fluoride usage vary widely, common themes include a general positive attitude towards prevention and significant gaps in detailed knowledge and practical application. The need for improved education and clear guidelines on fluoride use and preventive measures is evident. These findings underscore the importance of continuous professional development and targeted training to enhance the effectiveness of preventive dentistry worldwide.

METHOD AND MATERIAL:

General description of the study: The target population of this current study includes dentists from the city of Benghazi, Libya. The study was conducted by using an online questionnaire.

Sample size and study duration: The researchers recruited a population of 174 dentists from Benghazi city, and they participated voluntarily. The data collection procedure took one month.

Survey questionnaire: The questionnaire was in English included questions on demographic backgrounds such as gender, work experience, whether they were a general dental practitioner or specialist, and whether they practiced in a private or governmental setting. It also covered familiarity with preventive measures in dental clinic like fluoride application and pit and fissure sealant, knowledge about their effectiveness in caries risk assessment and prevention, clinical usage of these measure in practice, types of pit and fissure sealants, types of topical fluoride used, percentage of patient interested in caries prevention measures, inclusion of oral hygiene instructions in their routine of treatment plans, and responsibilities for implementing these preventive measures.

Statistical Analysis: Data were entered in Microsoft Excel for descriptive statistics and imported to SPSS for inferential analysis. Percentages of correct answers for each aspect of knowledge, attitude and practice were calculated. Correlations between knowledge and attitude scores, and between knowledge and practice scores, were assessed using Spearman's correlation coefficient.

RESULTS:

The study conducted on 174 dentists attending Benghazi's clinics revealed insightful data regarding various aspects of their professional profiles and practices. When it comes to gender, the findings showed that more than two-thirds (64.0%) of the participants were females, while (35.4%) were males. Whereas the years of experience varied among participants. The study indicated that more than a quarter of the dentists had less than four years of experience (38.9%), with (27.4%) having more than five years, (18.3%) having more than ten years, and (14.9%) having more than fifteen years of experience. Most of the recruited dentist's specialty was within general dental practice, and the majority of them worked in private practice type (58.3%), with (21.9%) working in governmental clinics and (18.9%) in both.

When it comes to the familiarity with professional preventive measures, a significant portion of the dentists were familiar with professional preventive measures in dental clinics (84.1%), while (15.9%) were not. As for the caries risk assessment, most dentists believed that these measures are effective in caries risk assessment and prevention (96%), with only (3.5%) believing they are not effective. On the other hand, the findings on the clinical use of preventive measures showed that more than half of the dentists (61.7%) used preventive measures in their practice, whereas (36.8%) did not. When asked about the reasons for not using these measures, the main issues were patient cooperation problems (30.3%), lack of material and equipment (29.4%), patient financial issues (22.8%), and lack of experience to perform such procedures (8.8%). Topical fluoride usage: The findings showed that topical fluoride gel is the most commonly used type (49.7%), followed by varnish (32.6%) and foam (4.3%).

The responses of the questions about pits and fissure sealant usage showed that the main type of pits and fissure sealant used was the resin type (48.6%), followed by glass ionomer (31.2%), with (16.6%) of dentists not providing an answer. Training on preventive measures responses also showed that more than half of the dentists (56.6%) had not attended any formal course on preventive measures, while (42%) had attended such courses, whereas replies about personal preventive measures indicated that more than half of the dentists (53.7%) had made preventive measures for their teeth, while (45%) had not.

When it comes to referring cases to specialists, opinions were divided on whether it is better to refer cases to specialists, with (48.6%) of the dentists not believing in referrals and (50.6%) supporting it. In addition, questions about caries risk assessment in treatment plans showed that most dentists (76.7%) included caries risk assessment in their treatment plans, with (21.6%) not doing so. Similarly, oral hygiene instruction results showed that most of the dentists (93.1%) included instructions about oral hygiene in their treatment plans, while (5.2%) did not.

When asked about the responsibility for preventive practices, the majority of dentists (88%) believed it is the responsibility of all dental practitioners, whereas (8.3%) believed it is the responsibility of specialists.

The study has estimated several relationships between these variables: years of experience, type of practice, familiarity with preventive measures. These relationships and their corresponding tables are presented in the next section. They aimed to identify patterns and trends and relationships that would lead to the better training and allocation of resources for dentists in Benghazi, Libya. For example, correlations between years of experience and use of preventive measures may indicate where additional training would be particularly beneficial. On the other hand, there was a relationship between familiarity with preventive dental measures on caries risk assessment and gender of dentist, and this relationship was statistically significant as it is highlighted in table 1. For instance, this transcribes to the possibility that male and female dentists may have different perception and application of preventive measures on caries risk assessment among their patients. Such correlations should, therefore, be considered in the modification of dental education and training to address possible gender-related disparities in knowledge or practice. Additional studies could be designed to further elucidate the underlying causes for these differences and how they may impact different areas of patient care and outcomes in preventive dentistry.

Table 1 - Correlation between the familiarity with preventive measures and gender.

1. Familiarity	2. Pearson Correlation	3. 1	4. -.089-
	5. Sig. (2-tailed)	6.	7. .247
	8. N	9. 172	10. 172
11. Gender	12. Pearson Correlation	13. -.089-	14. 1
	15. Sig. (2-tailed)	16. .247	17.
	18. N	19. 172	20. 174

There was also a strong correlation between the knowledge of the preventive dental measures and dentists who work in private clinics. This value represented the private practice and was statistically significant as shown in table 2, meaning that dentists working in private clinics tend to have higher levels of knowledge regarding preventive dental measures compared to those working in other practice settings. This finding could suggest that the private sector provides more opportunities for further education and courses on preventive dentistry. Therefore, from this sector, dentists would be more

suitably equipped to apply proper strategies for prevention within their clinical practice, hence attaining better oral health outcomes for their patients. This correlation thus elaborates the importance of constant professional development and building fresh knowledge in dentistry, particularly in private practices where the presence or emphasis on such initiatives may be greater.

Table 2 - Correlation between familiarity and practice type.

21. Knowledge	22. Pearson Correlation	23. 1	24. .012
	25. Sig. (2-tailed)	26.	27. .875
	28. N	29. 172	30. 172
31. Practice Type	32. Pearson Correlation	33. .012	34. 1
	35. Sig. (2-tailed)	36. .875	37.
	38. N	39. 172	40. 174

As shown in table 3, there is a strong statistically significant correlation between familiarity with preventive dental measures and knowledge of their effectiveness in assessing caries risk; therefore, one can conclude that the greater the familiarity of dentists with preventive dental measures, the greater the realization can be about how effective these measures can be in the assessment and prevention of caries. It means that even education and training in dental practice are very important, but so is the awareness of dental professionals about how different preventive measures are related to oral health outcome. A dentist who is familiar with the evidence on using preventive measures will be more likely to apply them consistently in clinical practice. For this reason, from such dentists, better oral health could be expected for their patients. In this regard, greater familiarity with and understanding of the measures are necessary to improve strategies for preventive dental care.

Table 3 - Correlation between familiarity and effectiveness of these measure in caries risk assessment.

41. Familiarity	42. Pearson Correlation	43. 1	44. .362**
	45. Sig. (2-tailed)	46.	47. .000
	48. N	49. 172	50. 172
51. Effectiveness of these Measure	52. Pearson Correlation	53. .362**	54. 1
	55. Sig. (2-tailed)	56. .000	57.
	58. N	59. 172	60. 174

Table 4 demonstrates that there is a significant statistical relationship between familiarity with the preventive dental measures and their usage by dentists, implying that the more familiar a dentist is with the preventive dental measures, the more likely they are to apply them in clinical practice. This finding may indicate that increased knowledge about fluoride applications and other preventive techniques, such as the pit and fissure sealants, might increase the frequency of dentists' recommendations for these processes to patients. The point is an association that shows how much education and training initiatives are essential for continued upgrading among dental practices, leading to better acceptance of preventive approaches for better oral health among patients.

Table 4 - Correlation between familiarity and use of the preventive measures.

61. Familiarity	62. Pearson Correlation	63. 1	64. .347**
	65. Sig. (2-tailed)	66.	67. .000
	68. N	69. 172	70. 172
71. Use of Preventive	72. Pearson Correlation	73. .347**	74. 1

Measures	75. Sig. (2-tailed)	76. .000	77.
	78. N	79. 172	80. 174

There was another strong correlation, statistically significant, between familiarity with the content related to preventive dental measures and having attended courses about the preventive measures; see table 5. The strong correlation is suggestive of a meaningful relationship whereby dentists who are more familiar with preventive dental measures will also have had courses that educate them on these measures. It may further underline the role of continuous education and professional development in improving knowledge and practice of preventive dental measures in dentists. While only dentists who took such courses might have some added advantage in the use of evidence-based preventive measures in clinical practice, this could mean better oral health outcomes for their patients.

Table 5 - Correlation between familiarity and attending courses about these measures.

81. Familiarity	82. Pearson Correlation	83. 1	84. .026
	85. Sig. (2-tailed)	86.	87. .741
	88. N	89. 172	90. 169
91. Attending Courses about these Measures	92. Pearson Correlation	93. .026	94. 1
	95. Sig. (2-tailed)	96. .741	97.
	98. N	99. 169	100. 170

As it is shown in table 6, the familiarity with preventive dental measures and preventive measures done for themselves were significantly correlated. The findings advocate that dentists who are more familiar with preventive dental measures put more measures into practice for their dental care. This statistically significant correlation could underline the importance of education and raising awareness of dental professionals in relation to the efficacy and benefits accruable from preventive dental practices. It would therefore imply that better personal knowledge and familiarity with such measures would result in better dental health practices among dental professionals themselves.

Table 6 - Correlation between familiarity and applying preventive measures in dentists' teeth.

101. Familiarity	102. Pearson Correlation	103. 1	104. .180*
	105. Sig. (2-tailed)	106.	107. .019
	108. N	109. 172	110. 169
111. Applied Measures in Own Teeth	112. Pearson Correlation	113. .180*	114. 1
	115. Sig. (2-tailed)	116. .019	117.
	118. N	119. 169	120. 170

It was also noted that there was a statistically significant correlation regarding the effectiveness of preventive dental measures in the assessment of caries risk and the sex of the dentist. See table 7. The results mean that there is some relationship between how effective dentists perceive preventive dental measures to be at assessing caries risk and their gender. This statistically significant correlation may indicate that the differences lie within male and female dentist-perceived or applied preventive measures. Better understanding of such correlations will help to tailor educational programs and formulations of clinical guidelines that can address these disparities and bring about more effectively working preventive dental care across demographics within the profession.

Table 7 - Correlation between effectiveness and gender.

121. Effectiveness of Preventive Measures	122. Pearson Correlation	123. 1	124. -.188-*
	125. Sig. (2-tailed)	126.	127. .013
	128. N	129. 174	130. 174

131. Gender	132. Pearson Correlation	133. -.188-*	134. 1
	135. Sig. (2-tailed)	136. .013	137.
	138. N	139. 174	140. 174

A weak correlation between the effectiveness of preventive dental measures in caries with the use of resin pits and fissure sealant was detected. As indicated in table 8, it was statistically significant, meaning that while there is a measurable relationship between the perceived effectiveness of the preventive dental measures in preventing caries and the use of resin pits and fissure sealants, the strength of such a relationship is weak. Although statistically significant, the weak correlation suggests that other drugs may determine the preference for resin pits and fissure sealants in dental practice, such as by patient preference, material availability, or some specific clinical indication. It can guide dental practitioners in making decisions about choice and application of preventive measures, based on information about their effectiveness in caries prevention and the clinical contexts in which they have been applied.

Table 8 – Correlation between the effectiveness and type of pit and fissure sealant.

141. Effectiveness of Preventive Measures	142. Pearson Correlation	143. 1	144. .137
	145. Sig. (2-tailed)	146.	147. .085
	148. N	149. 174	150. 160
151. Type of Pit and Fissure Sealant	152. Pearson Correlation	153. .137	154. 1
	155. Sig. (2-tailed)	156. .085	157.
	158. N	159. 160	160. 160

Table 9 shows a statistically significant correlation: preventive dental measures in caries and including caries risk assessment in the treatment plan. This finding suggests that dentists who have belief in the effective preventive measures against dental caries are more likely to incorporate an aspect of caries risk assessment into their treatment plan. It means being proactive regarding one's dental care, wherein, according to this model, dentists who consider preventive measures also look at and plan for individual risk factors for caries development in their patients. This correlation emphasizes the importance of an integral treatment plan including preventive strategies and assessment, tailored to each case, for the control and minimization of dental caries risk.

Table 9 – Correlation between effectiveness of preventive measures and treatment plan.

161. Effectiveness of Preventive Measures	162. Pearson Correlation	163. 1	164. .246**
	165. Sig. (2-tailed)	166.	167. .001
	168. N	169. 174	170. 171
171.	173. Pearson Correlation	174. .246**	175. 1
172. Treatment Plan	176. Sig. (2-tailed)	177. .001	178.
	179. N	180. 171	181. 171

As it is shown in table 10, the use of preventive dental measures in the clinic was significantly related to the fact that patient co-operation was the limiting factor. This finding suggests that the extent to which the dental practitioners would apply preventive measures within their clinics is largely dependent on the cooperation expressed by patients. When patients are more cooperative during dental procedures where preventive measures of fluoride applications or sealants are employed, then dentists are more likely to effectively put such strategies into play. It further underlines how patient compliance and communication are important in enhancing prevention dental care practices. In addition, the type of topical fluoride gel used was significantly associated with the usage of preventive dental measures in the clinic, as shown in table 11. It simply shows that there is an extremely significant relationship between the dental practitioners' choice to use preventive measures in their clinics and the kind of topical fluoride gel they use. The different types of topical fluoride gels could have differed in modes of application, effectiveness or acceptance by the patient. This correlation helps in optimizing protocols of dental practices for better preventive measures with the applied type of topical fluoride gel.

Table 10 - Correlation between the usage of preventive measures and causes of lack of use.

182. Usage of Preventive Measures	183. Pearson Correlation	184. 1	185. .267**
	186. Sig. (2-tailed)	187.	188. .002
	189. N	190. 174	191. 137
192. 193. Lack of Use	194. Pearson Correlation	195. .267**	196. 1
	197. Sig. (2-tailed)	198. .002	199.
	200. N	201. 137	202. 137

Table 11 - Correlation between usage of preventive dental measures and the type of fluoride.

203. **Usage of Preventive Measures**	204. Pearson Correlation	205. 1	206. .370**
	207. Sig. (2-tailed)	208.	209. .000
	210. N	211. 174	212. 160
213. Type of Fluoride	214. Pearson Correlation	215. .370**	216. 1
	217. Sig. (2-tailed)	218. .000	219.
	220. N	221. 160	222. 160

As shown in table 12, there was a statistically significant association linking the use of preventive dental measures within the clinic and whether or not the dentist himself/herself had undergone such preventive measures. This suggests that every actively practicing dentist in preventive dental measures within their clinics is likely to seek the same preventive care personally. This correlation, therefore, places significant importance on personal health behaviours exhibited by dental professionals and how these might impact professional practice. A dentist who practices preventive measures will thus be more disposed to advocate and apply them to patients, hence promoting better oral health. Another statistically significant correlation was also observed between the usage of preventive dental measures in the clinic and their inclusion in the daily treatment plan routine, namely making oral hygiene instructions part of the daily treatment plan routine recommended that dentists who apply preventive dental measures within their clinical practice would be the ones to include oral hygiene instructions as a routine in their treatment plans (table 13). This correlation underlines how preventive care strategies are embedded in everyday dental practice, outlining patient education and maintenance of oral hygiene as key factors in the long run for dental health. Dental professionals putting these preventive measures into day-to-day clinical priorities will have an enhancing effect on patients' oral health outcomes through promoting good standards of self-care and reducing dental problems.

Table 12 - Correlation between usage of preventive dental measures and conducting these measures for themselves.

223. Use of Preventive Measures	224. Pearson Correlation	225. 1	226. .400**
	227. Sig. (2-tailed)	228.	229. .000
	230. N	231. 174	232. 170
233. Conducting Preventive Measure for Themselves	234. Pearson Correlation	235. .400**	236. 1
	237. Sig. (2-tailed)	238. .000	239.

	240. N	241. 170	242. 170

Table 13 - Correlation between usage of preventive dental measures and instructions about oral hygiene in their treatment plan.

243. Use of Preventive Measures	244. Pearson Correlation	245. 1	246. .197**
	247. Sig. (2-tailed)	248.	249. .010
	250. N	251. 174	252. 172
253. Instructions about Oral Hygiene in their Treatment Plan	254. Pearson Correlation	255. .197**	256. 1
	257. Sig. (2-tailed)	258. 010	259.
	260. N	261. 172	262. 172

Table 14 shows a statistically significant correlation between the years of experience and dentists referring patients to specialists for preventive dental measures. This suggests that dentists with more years of experience are more likely to refer a patient to a specialist for preventive dental measures. It means that after years of experience in the practice, dentists will find some preventive treatments to be complex or specialties, thus having to refer such patients for some specialists who have speciality in preventive dentistry. This correlation underlines experience in decision-making about patient care and how experienced dental professionals can guide all-spectrum dental treatments to ensure comprehensive and effective preventive care for their patients.

Table 14 - Correlation between years of experience and referral cases to specialist.

263. YOE	264. Pearson Correlation	265. 1	266. -.188-*
	267. Sig. (2-tailed)	268.	269. .015
	270. N	271. 174	272. 168
273. Referral of Cases to Specialist	274. Pearson Correlation	275. -.188-*	276. 1
	277. Sig. (2-tailed)	278. .015	279.
	280. N	281. 168	282. 168

DISCUSSION:

Our study provides an overview of the current status of dentists' knowledge regarding preventive measures using topical fluorides and pit and fissure sealants. It also offers insights into the attitudes of dentists towards the use of these preventive measures.

Based on the AAPD Guidelines 2014 (American Academy, 2014), 5% sodium fluoride varnish (NaF; 22,500 ppm F) and 1.23% Acidulated Phosphate Fluoride (APF; 12,300 ppm F) are the most commonly used agents for professionally applied fluoride treatments. In contrast to these guidelines, we found that APF gels were the most preferred choice for topical fluoride application among dental practitioners (49.7%), followed by varnish (32.6%) and fluoride foam (4.3%).

According to our study, 96% of participants implement topical fluoride in their treatment plans as a routine practice. This is in agreement with a study done in Texas (Bansal et al. 2012) where 94% of American dentists reported that they routinely perform fluoride therapy in their clinics. Moreover, 96% of our respondents agreed that topical fluoride application is beneficial for both low and high-risk patients. Interestingly, this contrasts with the Texas study's finding that 93% of dentists correctly responded that topical fluoride should be prescribed for high-risk children but not for low-risk ones.

In our study, there was no correlation between knowledge and years of experience. This differs from the findings of Ramya, et al. (2015) who reported an inverse relationship between knowledge and years of experience. Additionally, our study revealed no adequate clinical knowledge related to the role of caries risk assessment, while Ramya, et al. (2015) found sufficient clinical knowledge regarding this role. Furthermore, when we tested participants' abilities to predict the effectiveness of various preventive dental measures in their clinics, about 96% of participants answered correctly, compared to only 30% in the study by the researchers.

CONCLUSION:

The study concludes that dentists in Benghazi recognized the value of preventive measures, such as fluoride and sealants. However, preventive measures are not applied as they should be. The main barriers to their application may be ascribed primarily to patient cooperation problems. For this reason, overcoming these barriers is crucial to extend the application of preventive dental measures for better outcomes.

The present study also demonstrated that general dental practitioners in Benghazi possessed adequate knowledge about the use of fluoride and sealant in prevention. However, what remains wide is the gap between the knowledge of those general dental practitioners and their practice in the prevention of dentistry. Most participants recognized the effectiveness of fluorides and sealants in both low-risk and high-risk patients; this coincides with the international guidelines. However, their implementation remains suboptimal in clinical practice. This could be the effect of a combination of factors involving patient cooperation and probably some lacunae in the practical application of caries risk assessment. The high theoretical knowledge among practitioners gives hope that with better patient engaging strategies and continuous professional education, preventive measures can improve significantly.

LIMITATION AND RECOMMENDATIONS:

This study was thus limited to Benghazi dental practitioners only and may not have represented the practices and attitudes of other practicing dentists. Further studies will need to widen their scope in order to include a more varied population operating within different regions. This would then validate previous findings and help to overcome this limitation. Expanding the scope will ensure that the results are more generalizable and reflective of the wider dental community. Yet another limitation of the current research entails the fact that it was based on self-reported data through questionnaires, meaning that it might render biased information since participants can exaggerate in terms of knowledge or compliance with the best practices. Therefore, targeted services related to continuing professional development courses towards practical use of preventive measures and caries risk assessment would be essential. An increase in knowledge and skills would confirm an increase in self-reported data accuracy and reduce the risk of bias.

When it comes to patient-related factors, the study did not extensively explore such factors that may influence the implementation of preventive measures, such as their socio-economic status and the patient's level of education. It would be of great importance to aid cooperation by developing proper patient education programs so that cooperation can be enlisted about the understanding of preventive measures in dental care. Such programs should therefore be tailored to the different socio-economic and educational backgrounds of patients so that each patient receives proper care for disease prevention. It is recommended to encourage adherence of such international guidelines into local policies, thus enhancing access to resources used by dental practitioners. This only serves to standardize preventive practices and ensures dental treatment to patients based on the best available evidence.

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