

EVALUATION OF DENTAL CARIES STATUS DMFT AND PUFA IN PERMANENT MOLARS ON PRIMARY SCHOOL IN AL-NAJAF/ IRAQ

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Abstract

Background: Oral diseases and traumatic injuries are serious public health problems, especially when talking about children. The most widespread oral disease in developing countries has been found to be dental caries. The maintenance of healthy permanent molars is very important. DMFT and PUFA index can be used to determine the caries status and severity in untreated carious teeth of an individual. **Aims:** to discover the prevalence and severity of dental caries in permanent first molars amongst 8–10 years of children in Al- Najaf city, Iraq. **Materials and methods:** This was a cross-sectional descriptive survey that included 1232 children between the age group 8-10 years from schools of Al-Najaf, Iraq. Dental caries was assessed using DMFT index, and the severity of caries was evaluated by PUFA index for permanent first molars. **Result:** The prevalence of first permanent molar caries in Al-Najaf city was 56.1% (n=691) out of 817 children of 8-10 years of age were affected with caries evaluated using DMFT index. The severity of first permanent molar caries (PUFA index) was found to be 38.7 %. That is the children had more severe first permanent molar caries. **Conclusion:** Caries prevalence and severity increase with age. PUFA index is an effective index in evaluating the clinical sequel of untreated carious teeth and helps better treatment plans for a socially deprived group of society.

Keywords: Dental caries, DMFT, PUFA, first permanent molar.

Introduction

Dental caries is a demineralization of the inorganic part of the tooth with the dissolution of the organic substance depending on interaction of several factors [1-2]. these multiple factors that include tooth morphology, bacteria, etc., and other offending factors including diet and genetic predisposition [3]. It is the most prevalent chronic disease affecting persons of both gender in all races and every age group [4-5]. First permanent molars (FPMs) have a key role in establishing dental occlusion. They are very prone to caries because of their anatomical structure and early eruption. As a result, many children have to visit the dentist and often require (FPMs) restoration or extraction. Hence, the estimation of dental caries in FPMs at individual and community levels could help to understand the pattern and severity of dental caries [6-7]. The development of the FPM begins in intrauterine life. As radiographic investigations have shown, the crypts of the FPMs can be seen at birth in the territory of the second primary molars, in addition to the germs of the deciduous teeth. At first, the crypts of the maxillary FPMs are oriented high in the maxilla, above and behind the germ of the second deciduous molar, and the crypts of the mandibular ones are found below the anterior border of the ramus of the mandible [7-8]. The eruption of the FPM is a



unique morphological and functional event because it simultaneously establishes the distal limit of the canine and premolar segment and the mesial limit of the molar teeth [9]. It not only achieves the only stable posterior occlusal stops, but it contributes to accomplishing the consistency between the anterior determinant (the teeth) and the posterior determinant (the temporomandibular joint) of occlusion [10]. Today, it has become increasingly necessary to identify methods that allow large population studies to collect data on dental caries more efficiently. This would represent a savings in economic resources and health staff work time. Epidemiological studies are considered of the utmost importance for dental public health because they constitute the only source of exact information on the frequency and distribution of oral diseases, providing the basis for the assessment of treatment needs [11]. The Decayed Missing Filled Surfaces/Teeth (DMFT) index has been in use and is well established as the leading measure of caries experience in dental epidemiology and it is the most commonly used tool in caries assessment [12]. But it fails to record information on the clinical consequences of untreated dental caries, such as pulpal involvement, dental abscess and sepsis which may be more serious than the caries lesions themselves. A deep carious lesion with pulpal involvement is still considered as “caries in dentin” and pulpal involvement is not included in the caries scoring system even in the latest edition of WHO-Oral Health Surveys-Basic Methods. In order to improve the accuracy of the caries diagnosis, Monse et al. [13] introduced a new index which could quantify the various advanced stages of a carious lesion, namely “PUFA” index. This index records (P - Pulpal involvement, U - Ulceration, F - Fistula and A - Abscess). pufa/PUFA is an index, which is used to assess the presence of oral conditions arising from untreated dental caries. Despite the fact that a vast number of surveys on schoolchildren in India have been done to study the frequency of dental caries and caries experience [14-15]. The aim of the present study was to determine the prevalence of dental caries and untreated dental caries among schoolchildren in the primary school of Najaf city, Iraq and to collect the basic data on clinical consequences of untreated dental caries among them using DMFT and PUFA index.

Materials and Methods

Study design

The study was conducted in 11 December 2022 to 21 May 2023, in Najaf City in Iraq. Data was collected from children at the age of (8-10) years in several primary schools which were selected randomly from different areas of the city (six schools for boys) and (six schools for girls). The study received ethical clearance from the Local Committee of Collage of Dentistry of Kufa University. Written informed consent was obtained from parents/guardians prior to the conduct of the study after the explanation of the study objectives. Furthermore, school authorities were approached to obtain permission to conduct the study.

Sampling and Sample Size

In AL-Najaf city, 6 primary public schools (schools for boys) and (schools for girls). They were randomly selected among schools which were easily assessable and in secure areas. A cross-sectional study was carried out in a total sample of 1232 children, about 682 girls and 550 boys. All children were examined on the ordinary upright chair individually with the help of a sterilized

mouth mirror and no. 23 explorers in natural daylight. Dental caries was assessed using the DMFT index, and the severity of caries was evaluated by PUFA index for permanent first molars. Initial caries lesions were not scored Teeth presenting with early stages of cavitation, but where the ball end probe could not enter were not scored as caries, the criteria for the PUFA/pufa index were applied without the use of instruments.

Dental caries

Dental caries Clinical examination were performed using plane mouth dental mirrors and CPI probe. Systematic approach of examination for dental caries were performed starting from the upper right side to the upper left side in orderly manner, then to the lower teeth in the same manner. Examinations included all surfaces of teeth. A tooth was considered to be present when any part of the tooth was visible. An alphabetical coding system was applied for primary, and numbers for the permanent teeth [16].

Dental caries indices: tooth (DMFT) and PUFA Index

The diagnostic criteria for caries are based on the oral Health Organization (WHO). The child's caries was measured by dmft and DMFT indices. Descriptive findings are reported in terms of frequencies and percentages, as well as means and standard deviations. Data were analyzed using SPSS version 16. A Chi-square test was used, whereas a p-value less than 0.05 were considered significant [17]. PUFA is an index used to assess the presence of oral conditions resulting from untreated caries. The index is recorded separately from the DMFT/dmft and scores the presence of either a visible pulp, ulceration of the oral mucosa due to root fragments, a fistula or an abscess [18].

P/p: Pulpal involvement is recorded when the opening of the pulp chamber is visible or when the coronal tooth structures have been destroyed by the carious process and only roots or root fragments are left. No probing is performed to diagnose pulpal involvement.

U/u: Ulceration due to trauma from sharp pieces of tooth is recorded when sharp edges of a dislocated tooth with pulpal involvement or root fragments have caused traumatic ulceration of the surrounding soft tissues, e.g., tongue or buccal mucosa.

F/f: Fistula is scored when a pus releasing sinus tract related to a tooth with pulpal involvement is present.

A/a: Abscess is scored when a pus containing swelling related to a tooth with pulpal involvement is present [13, 15, 19].

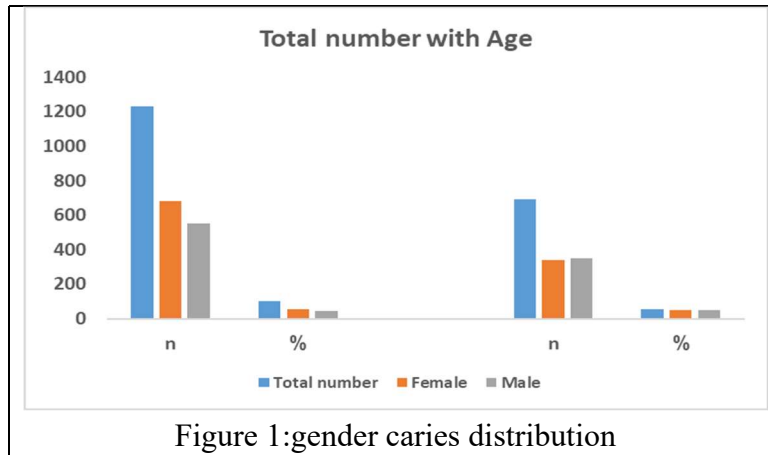
Results

This cross-sectional descriptive survey was conducted amongst 1232 children of 8-10 years in Al-Najaf city, Iraq. The data obtained (table 1) were systematically compiled. The prevalence of first permanent molar caries in Al-Najaf city was 56.1% (n=691) out of 1232 children of 8-10 years of age were affected with caries evaluated using DMFT index figure (1).

Table1: Gender caries distribution of the study subjects

Samples	n	%	Samples	n	%
Total number	1232	100	Total Caries teeth	691	56.1
Female	682	55.35	Female Caries teeth	341	49.34

Male	550	44.64	Male Caries teeth	350	50.65
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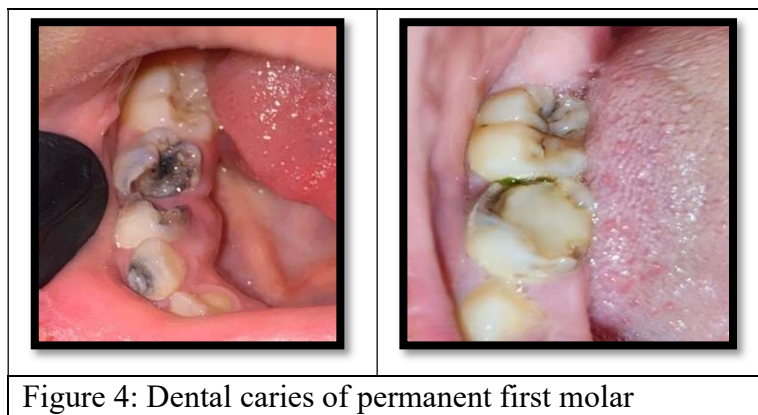
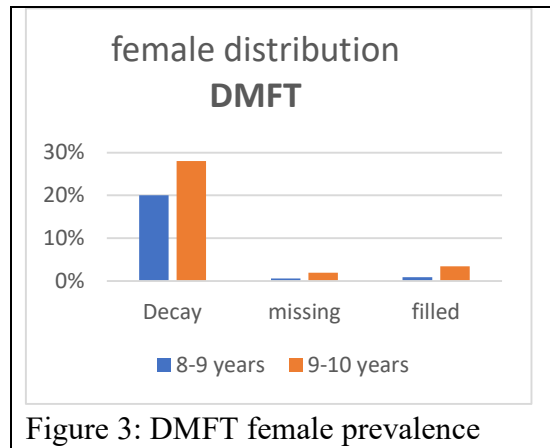
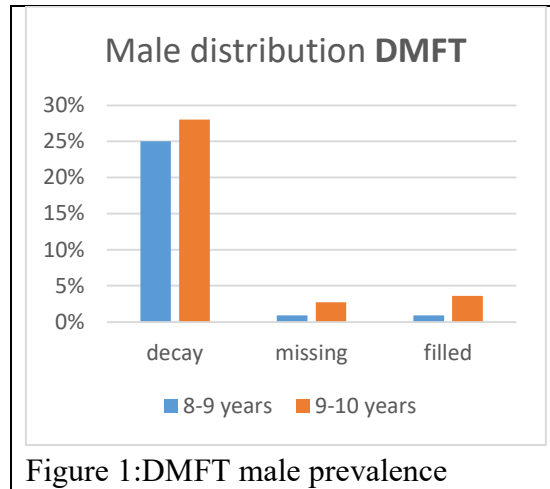


Analysis using DMFT index

After the age group - wise allotment of male children who experienced first permanent molar caries, prevalence amongst 8-9 years 22.8% and 9-10 years 33.3% was found from total number of 1232, which shows that the occurrence of caries is reasonably less in the 1st year after the eruption of the tooth, this drastically increases at 8-10 years of age. Table (2) shows the decayed element was greatest amongst all the groups; the missing component was almost 6.14%, showing amongst 8-10 years of age group. Table (2) also shows significant difference between age range in males and females. At the same time, the filled component was nominal compared to the untreated carious lesion. After gender-wise distribution of children in age of 8-10 years for total caries exposure, present study showed that males (figure 2) were affected more than females (figure 3) 52% and 48%, respectively (figure 4).

Table 2: male and female DMFT distribution of study

gender	Age range	Decayed	missing	Filled	X ²	P value
Male	8-9 years	24%	0.91%	0.91%	33.014	0.001*
	9-10 years	28%	2.7%	3.6%	33.864	
female	8-9 years	20%	0.6%	0.88%	33.014	0.002*
	9-10 years	28%	1.9%	3.4%	33.864	



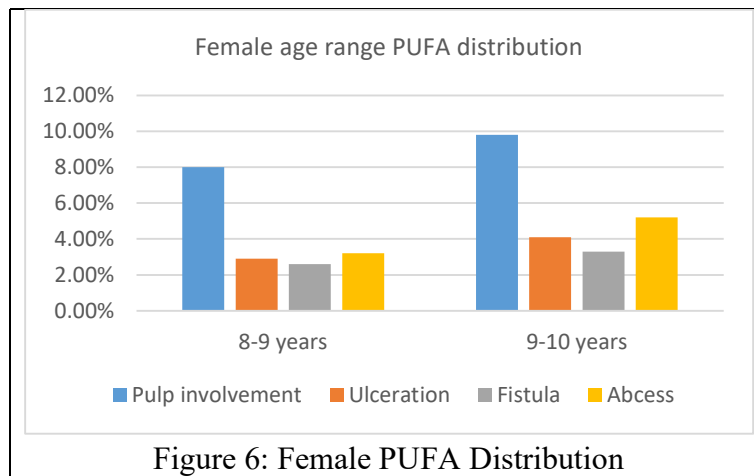
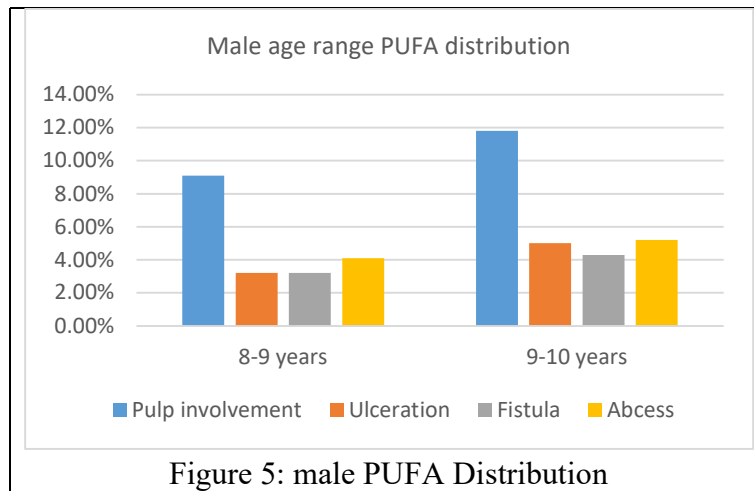
Analysis using PUFA index

On gender-wise distribution 8-9 years old male school children, table (3) and figure (5) shows the total PUFA score which pulp involvement (figure 7) was 9.1% and in 9-10 years old 11.85%. On gender-wise distribution, the PUFA score in females (figure 6) was 16.86% in age range 8-9 years, but in 9-10 years was 21.7%. while ulceration (figure 8), fistula and abscess (figure 8) in male (8.2%, 7.56%, 9.3%) respectively and female children school (7%, 5.9%, 8.4%) respectively were in small proportions as shown also in table (3). there is a significant difference between the age range

in males and females.

Table 3: Male and Female PUFA Distribution

Gender	Age range	Pulp involvement (P)	Ulceration(U)	Fistula(F)	Abscess(A)	X ²	P value
Male	8-9 years	9.1%	3.2%	3.2%	4.1%	27.561	0.0002*
	9-10 years	11.8%	5%	4.36%	5.2%	26.205	
Female	8-9 years	8%	2.9%	2.6%	3.2%	28.251	0.0012*
	9-10 years	9.8%	4.1%	3.3%	5.2%	29.854	



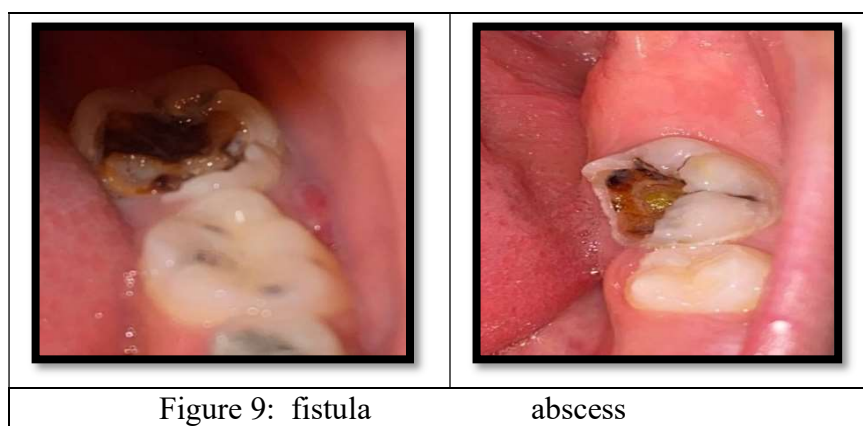
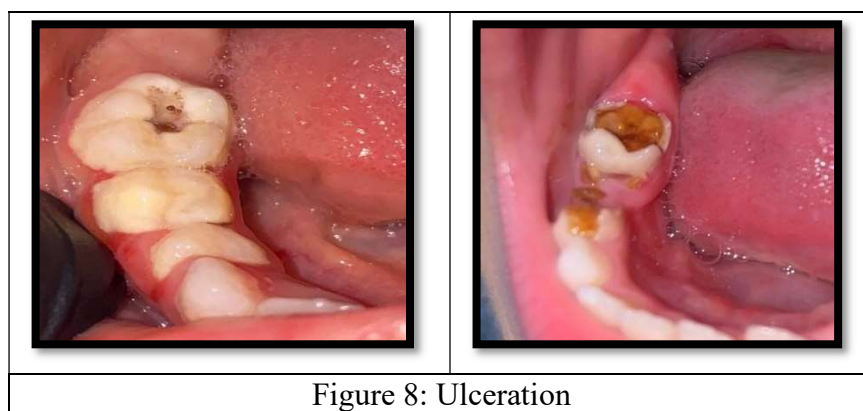
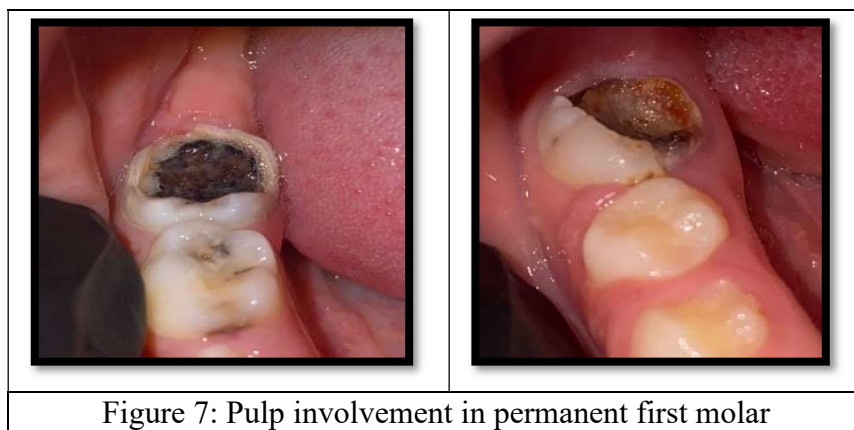


Table (4) shows the mean and standard deviation of DMFT and PUFA Index in the difference sex and comparing between it. There are significant differences between males and female's children primary school in totally in two indices.

Table 4: Shows sex comparison in DMFT and PUFA indeces

Variables	Gender	Mean \pm SD	SE	P*-value
DMFT	Male	3.25 \pm 1.75	0.55	0.01

	Female	2.89±1.15	0.45	
PUFA	Male	1.24± 1	0.38	0.05
	Female	1.17±0.78	0.45	

Discussion

Due to the timing of permanent first molar eruption, it is first in a queue of permanent dentition. It exhibits superior control over the teeth that erupt later [20]. First permanent molar plays a crucial role in maintaining the dental and overall health of a person. They take maximum occlusal forces and are situated in the oral cavity such that they control the vertical distance, the vertical dimension, aesthetic proportions as well as the best source of anchorage [21]. This cross-sectional study assessed the effects of caries and its clinical effects using both DMFT and PUFA indices on primary school children 8-10 years old sample related to permanent first molars. There was statistically highly significant between the age range 8-9 years worse in DMFT in both female and male children school, also there is statistically significant of DMFT and PUFA mean score between male and female. The mean DMFT score in first permanent molars of male and female were 3.25 and 2.8 9 respectively, while PUFA mean score in male and female were 1.24 and 1.17 respectively. In this study, the first time have reported the DMFT with PUFA indices for first permanent molars in Iraq. Others studies in Iraq have reported DMFT index on mixed dentition primary and permanent teeth [22-25]. When comparing Our results to reported prevalence in other countries, it was noted to be relatively higher. A Abuaffan et al. in Sudan reported a prevalence of 61%, while Rafi et al. in Abha City, Kingdom of Saudi Arabia (KSA) reported a prevalence of 66.4% [26-27], whereas in Central Africa, Que et al. reported prevalence was 68.79% [28]. Joshi et al., showing that dental caries prevalence was 69.12% with high frequency in boys 70.01% than in girls (68.22%) [29]. All of the reported differences in prevalence could be attributed to sociodemographic factors, different sample sizes, different ages, diagnostic criteria, or statistical methods. Chukwu et al. showed that the permanent first molars are responsible for 42% of all extractions because of caries which is the highest percentage of all other teeth [30]. Salih. showed dental caries was significantly more prevalent (DMFT) in first permanent molars [31]. Elfseyie et al showed the different permanent dental caries result between upper and lower but its 50% totally in Benghazi, Libya which is so close to our DMFT prevalence [32]. Al Mansour revealed a high overall prevalence of dental caries of FPMs among 5-12-year-old children 42% [7]. All of the reported differences in prevalence could be attributed to sociodemographic factors, different sample sizes, different ages, diagnostic criteria, or statistical methods. The need for advanced diagnostic criteria for dental caries assessment was fulfilled by the PUFA index. International caries detection systems have focused more to develop more sensitive diagnostic standards since the last decade, which aids in identifying carious lesions at an early stage [33-34]. This study had employed the PUFA index to assess the complications of teeth which are untreated. The only study has reported pufa index in preschool children in diwanya city /Iraq by Kadhemi [35].

On age-wise distribution of PUFA score, we found that children of age 9-10 years had the highest scores 21.6% compared to 8-9 years 17.1%. It signifies minimal awareness, negligence for oral health and lack of dental health education. Bagińska et al found similar results when prevalence

and experience of the pufa index in primary dentition were evaluated [36]. Monse et al., showed the prevalence of PUFA amongst 6-12 years was 85% [13]. Ramazani & Rezaei showed the Males and females showed no significant differences in terms of prevalence or severity of untreated dental caries ($P > 0.05$) which disagree with our research [37]. Clinical consequences of untreated dental caries (mean PUFA) were considerably more common when all upper and lower first permanent molars of MIH-positive patients were evaluated highly significant agree with our study [38]. Thaker et al., demonstrated the prevalence of first permanent molar caries in Vadodara city was 55.38%; of children of 8–10 years of age were affected with caries evaluated using DMFT index. The severity of first permanent molar caries (PUFA index) was found to be 56.22% which it had more severe first permanent molar caries than us [39]. The reason for our result in DMFT and PUFA indices score (in public schools) may be due to lack of understanding amongst parents and teachers, no accessibility of free routine dental checkups and more staple food than the junk food packets available. Awareness lectures should be given to the teaching staff in schools about importance of teeth and their protection at an early age.

Conclusion

The current research focused on the prevalence and severity of dental caries in permanent first molars, and results suggest that there is a lack of awareness amongst children, parents and teachers regarding the importance of maintaining good oral hygiene. During the mixed dentition period, permanent first molars are the most common teeth found to be neglected because of misjudgment between deciduous and permanent dentition. Hence, school-based educational and awareness programs are needed not only for children but also for parents and teachers. PUFA index is found to be effective in evaluating clinical consequences of untreated caries and help to plan treatment programs.

Ethical approval and consent of the participants

The current work is approved by university Kufa , number:253, year: 2023, 19 December

Availability of data and material

Further data are available on request from the corresponding author on reasonable request

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Nil.

Conflicts of interest

There are no conflicts of interest.

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