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Investigating physicians' and patients' oral health knowledge: a field needed interdisciplinary policy making approach

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ABSTRACT

Oral health is not only limited to healthy teeth and gums, but it is really interconnected to the general health. Oral cavity frequently reveals the existence of eating disorders, blood diseases, endocrine and metabolic disorders, which may be the result of microbial infections, immune disorders and medications. This study aimed to evaluate the knowledge and habits of patients and physicians concerning oral care and moreover to compare their knowledge about the relationship between oral and general health. A questionnaire was developed by the authors and distributed to all 94 primary care general practitioners who worked at public health units in Cyprus and 550 dental patients. A two sided p-value equal to 0.05 was considered statistically significant. The SPSS program, version 19.0 was used for statistical analysis. The mean score of dental patients' knowledge regarding oral health was found poor, just 3.7/10, while physicians score was higher 6.4/10 ($p < 0.001$). More than half of patients (55.5%) and 29.5% of physicians reported that the reason for their last visit to a dentist was an emergency situation. Dental patients with higher educational level and patients who have been informed about the significance of oral health by their doctors visited 4.4 and 1.9 times more often dentist within 6 or 12 months compared to those with low educational level ($p < 0.001/p = 0.005$ respectively). Patients' and physicians' level of knowledge, behavior and perceptions about oral health are not satisfactory and these results underline the necessity for improving relevant health promotion programs.

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Introduction

Oral health is not only limited to healthy teeth and gums, but it is also interconnected to general health. This relation is diverse and, on the one hand, stems from the common causative factors of oral and other chronic non-communicable diseases and, on the other hand, in certain cases, there seems to be an interconnected and bilateral causal link between

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oral and other diseases. Over the last 20 years, a large number of papers have been published about the relationship between oral diseases and systematic diseases (such as diabetes mellitus (Sandberg et al. 2000; Taylor 2001) and ischemic heart disease) (Mathews 2008; Humphrey et al. 2008; Lockhart et al. 2012). Moreover, the intraoral examination frequently reveals the existence of eating disorders, blood diseases, endocrine, and metabolic disorders, which might be the result of microbial infections, immune disorders, and medications. About 50% of HIV-positive individuals experience the onset of this disease with early oral manifestations, such as gingivitis, periodontitis, Kaposi's sarcoma, pseudomembranous oral candidiasis, and dry mouth, due to oral opportunistic infections related to viruses, bacteria, and fungi (Pindborg 1990).

In addition, a healthy mouth plays a decisive role in the quality of life, affecting important everyday functions, such as mastication and nutrition, and also improves the appearance, thus greatly influencing a person's social inclusion.

However, despite progress in the oral health area, oral diseases are still among the most widespread diseases worldwide, affecting the everyday lives of billions of people (Marcenes et al. 2013).

Therefore, the protection of oral health constitutes an invaluable tool in the effort to enhance the quality of life and the population's health status (Petersen 2003). General practitioners may play catalytic role, as people and especially the elderly are visiting them regularly. On the other hand, there is evidence (Glick and Greenberg 2005) that dentists can play an important role in identifying people in need of medical care or prevention services, as far as intraoral examination frequently reveals signs and symptoms of systemic diseases (e.g., cardiovascular diseases)

It is obvious that the general practitioners must be sufficiently educated in recognizing the early symptoms of oral diseases, such as caries, gingivitis, periodontitis, cancer, and other oral lesions, in order to give sufficient information to patients about oral diseases and also to provide early diagnosis of oral disorders and promote individuals' general health and quality of life (Liaropoulos 2010). It is well documented in literature (Sippli, Rieger, and Huettig 2017) that patients rely on GPs much more than any other health professional as the first contact in case of illness. Due to this special relationship between GPs and patients, dentists believe that the primary responsibility for the diagnosis of diseases (included oral problems) pertain to the GPs.

In Cyprus, the majority of the dental care needs are met mainly by private dentists and, to a lesser extent, by the public health system. Although 80% of the population is entitled to almost free-of-charge treatment in the public sector, only 10–12% make use of it (Charalambous et al. 2013). In general, based on Eurostat data, Cypriots seem to underuse dental services (both public and private). In particular, only 0.15 in 2008 and 0.13 in 2016 consultations by dentists/inhabitant were reported in Cyprus while the corresponding rates in the vast majority of the European countries varied between 0.5 and 1 consultations by dentists/inhabitant in 2016. On the other hand, rates for medical consultations were remarkably higher (compared to dentists consultations), exceeding 2/inhabitant during all the years of the study under period (Eurostat Database 2019)

Public dental care services are provided by the general hospitals of Nicosia, Limassol, Larnaca, and Paphos and the hospitals of Paralimni, Kyperounta, and Polis, eight urban and twenty-three rural health centers, two institutions in Nicosia, and four mobile dental units (Cyprus Ministry of Health 2014). A wide spectrum of services is provided

by the public sector except for fixed prosthetics and implants. Moreover, PDS (Public Dental Services) are responsible for conducting epidemiological studies, as well as for organizing oral health campaigns and educative seminars about oral diseases to health professionals (nurses) and the public (e.g., school-teachers, parents, students).

Taken into consideration that knowledge level about oral health is deemed decisive for the promotion of oral and general health and that until today there has not been conducted a relative study in Cyprus, there is need of further investigation in regards patients' and physicians' knowledge level about oral health.

This study aimed to investigate and compare the habits and knowledge about oral health and hygiene among primary care physicians and dental patients with general diseases and, moreover, to compare their knowledge about the relationship between oral and general health.

It is anticipated that the results of this study will identify the priority areas for policymakers (e.g., the necessity for modernizing curriculum of health scientists and for developing oral health promotion programs for population or/and restructuring oral and health services) in order to improve the oral health and, consequently, the general health of Cypriots.

Material and methods

Study population and data collection

The study was conducted from March to April 2012 in Cyprus. The study population consisted of all 94 primary care general practitioners, who worked at public health centers (urban and rural) and hospital outpatient clinics and 550 dental patients (who correspond to 0.5% of the total outpatient visits) with general diseases, who visited a governmental dentist at health centers. The patient selection criteria were the individual's age (> 18-years-old), the presence of general disease, and a good perception of the Greek language.

The general practitioners and dental patients completed questionnaires distributed by dentists in the health centers. Moreover, the participants were informed about the study objectives and assured that their personal data were not registered at any stage of the study. Additionally, they were informed about their right to withdraw participation in the study. During the whole procedure, dental assistants were present in order to ease the completion of questionnaires by the patients.

Through the aforementioned study design, high response rates for dental patients (96%- 526 out of 550 questionnaires) and general practitioners (83%, 78 out of 94 questionnaires) were achieved. The study protocol was approved by the scientific research committee of the Cyprus Health Ministry.

Development of the tool

The development of the questionnaire was based on previous relative studies (Koboli-Kontovazainiti, Karidis, and Hatzigeorgiou 2004; Al Habashneh et al. 2010) and was supported by a number of dentists and primary care general practitioners.

The questionnaire of dental patients and primary care general practitioners included common questions about the methods and objectives of oral hygiene, the knowledge

level about oral health, and the correlation between oral and general health. The questionnaire also included sociodemographic and labor characteristics. Furthermore, one part of the questionnaire, which was completed only by the physicians, included questions about whether they advise their patients about oral health, their knowledge about the adverse reactions of prescribed medicines on oral health, and if they refer their patients to the dentist. Where the participants answered 'do not know' to a question, this response was considered incorrect. The knowledge score resulted from the ten-multiplied quotient of the number of correct answers to all the questions, and this score was reported as values between zero and 10, with higher values indicating greater knowledge about oral health. Information about patients' health status included self-report of diabetes (high blood glucose levels), hypertension (high pressure), cardiovascular diseases, renal diseases, respiratory diseases, and cancer-neoplastic diseases.

During February 2012, a pilot study was conducted in a sample of 19 primary care general practitioners, who worked at the health centers of Strovolos and Nicosia, and 25 patients who visited the health center of Strovolos during this period. The pilot study was carried out in order to improve the comprehensibility of the questionnaires.

Statistical analysis

The categorical variables were presented as absolute (n) and relative (%) frequencies, whereas quantitative variables were presented as the mean (\pm standard deviation). The normality assumption of the quantitative variables was evaluated using the Kolmogorov-Smirnov criterion ($p > 0.05$ for all variables) and regularity charts. The quantitative variables appeared reasonably normally distributed. To determine associations between quantitative variable and dichotomous variables, we used the student's t-test, whereas the determination of associations between quantitative and categorical variables (over than two categories) was achieved by analysis of variance (ANOVA). Correlation between two quantitative variables with normal distribution was assessed using Pearson's correlation coefficient, whereas the correlation between ordinal and quantitative variables was assessed with Spearman's correlation coefficient. The Chi-square test (χ^2 test) was applied to determine the correlation between two categorical variables. Multivariate linear regression with the dependent variable knowledge score and backward stepwise linear regression were applied in case of the presence of more than two statistically significant independent variables ($p < 0.2$) in the bivariate analysis. A two-sided p-value equal to 0.05 was considered statistically significant. The Statistical Package for Social Sciences (IBM SPSS) program, version 19.0, was used for statistical analysis.

Results

Dental patients

Based on the results of the descriptive analysis, 46.7% of the participants were males and 53.3% females, with a mean age of 60.7 (SD = 13.3) years. The vast majority of those (96%) were Cypriot citizens. More than half of the participants (53.1%) were living in urban areas, while the rest were living in rural areas. Almost 33% were employees (in the public or private sector), 25% were housewives, and 10% were not working (unemployed or

unable to work). Only 11.7% had a higher education level while the rest were almost equally distributed to low (45.8%) and medium (42.5%) educational levels.

A large proportion of dental patients (55.7%) were affected by hypertension, while 30.6% and 28.3% of patients were affected by diabetes mellitus and cardiovascular diseases, respectively.

It is remarkable that the majority of dental patients agreed that the care of teeth and gum care are important (97.3% and 96%, respectively). Moreover, 95.3% of dental patients considered that oral health is of equal importance as general health. However, the mean score of dental patients' knowledge regarding oral health was poor, just 3.7 (SD = 1.9).¹ Table 1 shows patients' vs. physicians' responses for selected oral objectives. Referring to patients' awareness of the significance of oral health, 44.3% (n = 231) of patients reported that they had been informed by their doctor (about the significance of oral health).

In accordance to multivariate linear regression analysis, female patients had a greater average knowledge score about oral health (by 0.6) compared to men (p = 0.003). Moreover, employees had a greater average knowledge score (by 1.1) about oral health compared to farmers and workers (p < 0.001). The patients with higher educational level had a greater average knowledge score about oral health (p < 0.001). Patients who have been informed about the significance of oral health by their doctors had greater average knowledge score about oral health compared to those who have not been informed (p < 0.001). Finally, based on the results of bivariate analysis (Pearson coefficient correlation) increased age was associated with lower knowledge score about oral health (r = -0.26, p < 0.001).

More than half of patients, 55.5% (n = 294) reported that the reason for their last visit to the dentist was an emergency. One-fifth (20.8%, n = 110) of patients visited dentist every 6 months, 15.3% (n = 81) visited dentist every 12 months, and 8.5% (n = 45) visited dentist in a period longer than 12 months. Moreover, 27.6% (n = 144) of patients reported that their doctor advised them to visit the dentist, 59.5% (n = 310) of patients did not receive such an advice by their doctor, and 12.9% (n = 67) of patients did not remember to have been advised by their doctor.

Particularly (based on multivariate regression analysis), female patients were twice as likely to visit a dentist within 6 or 12 months compared to male patients (p = 0.001). Dental patients with higher educational level visited a dentist within 6 or 12 months 4.4-times more often compared to those with low educational level (p < 0.001). Additionally, patients with a medium educational level visited a dentist within 6 or 12 months 2.4-times more often compared to those with low educational level (p < 0.001). Patients who have been informed about the significance of oral health by their doctors visited a dentist 1.9-times more often within 6 or 12 months compared to those who have not been informed (p = 0.005).

Concerning the dental patients with diabetes mellitus, 37.3% of those visited dentist within 6 or 12 months. The corresponding percentage for non-diabetic patients was 39.3%, but the relationship between diabetes mellitus and the frequency of dental visits was not statistically significant (X^2 test for trend, p = 0.7).

Physicians

Referring to the sociodemographic characteristics of physicians, 40.8% of the participants were male and 59.2% female, with a mean age of 47.3 (SD = 8.7) years. The

Table 1. Dental patients' (N = 540) vs physicians (N = 78) responses regarding knowledge questions about oral health.

	Correct response (N/%)		False response (N/%)		I do not know (N/%)	
	Pt	Ph	Pt	Ph	Pt	Ph
	Flossing (correct)	98 (18.1)	28 (35.9)	442 (81.9)	50 (64.1)	0 (0.0)
Brushing method (bass)	20 (3.7)	0 (0.0)	520 (96.3)	78 (100.0)	0 (0.0)	0 (0.0)
Time period of brushing (2 minutes)	185 (34.3)	39 (50.0)	327 (60.6)	37 (47.4)	28 (5.2)	2 (2.6)
Removal of food and bacteria is the main objective of the brushing (correct)	373 (69.1)	63 (80.8)	133 (24.6)	14 (17.9)	34 (6.3)	1 (1.3)
Oral hygiene cleans the teeth and gums (correct)	387 (71.7)	67 (85.9)	109 (20.2)	7 (9.0)	44 (8.1)	4 (5.1)
Gum bleeding is pathological (correct)	175 (32.4)	58 (74.4)	210 (38.9)	4 (5.1)	155 (28.7)	5 (6.4)
Periodontitis is not hereditary disease (correct)	113 (20.9)	49 (62.8)	76 (14.1)	14 (17.9)	351 (65.0)	15 (19.2)
Loss of teeth is abnormal with age (correct)	157 (29.1)	52 (66.7)	237 (43.9)	21 (26.9)	146 (27.0)	5 (6.4)
Gingivitis can be started from childhood (correct)	221 (40.9)	65 (83.3)	73 (13.5)	5 (6.4)	246 (45.6)	8 (10.3)
The health of teeth and gums affects blood glucose levels (correct)	186 (34.4)	69 (88.5)	43 (8.0)	7 (9.0)	311 (57.6)	2 (2.6)
Patients with diabetes mellitus are more likely to develop gingivitis (correct)	232 (43.0)	72 (92.3)	21 (3.9)	2 (2.6)	287 (53.1)	4 (5.1)
Smoking can cause dental caries (wrong)	48 (8.9)	9 (11.5)	272 (50.4)	50 (64.1)	220 (40.7)	19 (24.4)
Smoking can cause gingivitis (correct)	242 (44.8)	58 (74.4)	37 (6.9)	6 (7.7)	261 (48.3)	14 (17.9)
Smoking can cause oral cancer (correct)	325 (60.2)	71 (91.0)	23 (4.3)	1 (1.3)	192 (35.6)	6 (7.7)

Pt = Patients, Ph = Physicians

majority of the participating participants were general practitioners (81.6%), and only 18.4% were specialist pathologists. More than half of the physicians were working in urban areas (55.8%) and the rest in rural. About one-third of the participants (34.2%) had over 15 years of working experience in the public sector, while 29% of physicians had only 1–5 years of working experience.

It is remarkable that all of the participants agreed that the care of teeth and gums is important and oral health is of equal importance to general health.

Concerning physicians' knowledge level about oral health, a large percentage of doctors (80.8%) knew about the aims of oral hygiene. About 74.4% ($n = 58$) of doctors knew that the gum bleeding is pathological and that periodontal disease is not hereditary, but affects the blood glucose levels. However, only 36% of participants used dental floss, 11.5% of doctors knew that smoking does not lead to caries, and no one knew about the correct bass brushing method (Table 1). The mean knowledge score of doctors for oral health was 6.4 ($SD = 1.3$).

Older age of doctors was associated with decreased grade knowledge about oral health. Specifically (based on multivariate linear regression analysis), increasing age by one year resulted in a decreased knowledge score by 0.05 points ($p = 0.003$). Moreover, specialist pathologists had a greater average knowledge score about oral health (by 0.9) than general practitioners ($p = 0.02$).

Almost one-third of physicians (29.5%, $n = 23$) reported that the reason for their last visit to the dentist was an emergency, 29.5% ($n = 23$) of doctors reported that they visited a dentist within 6 months, 33.3% ($n = 26$) of doctors reported that they visited a dentist within 12 months, and 7.7% ($n = 6$) of doctors reported that they visited a dentist in a period longer than 12 months. We detected (based on bivariate analysis) no statistically significant relationship between sociodemographic or other characteristics of physicians and the frequency of visits to dentists.

Regarding doctors' attitudes about the importance of oral health, 25% ($n = 19$) of participants reported that they always inform their patients about the importance of oral health, 47.4% ($n = 36$) reported that they inform their patients only if they were asked about oral health by their patients, 22.4% ($n = 17$) reported that they seldom inform their patients, and 5.3% ($n = 4$) reported that they never inform their patients. We found that 42.1% ($n = 32$) of doctors report always referring their patients to visit the dentist, 33.5% ($n = 27$) reported that they refer their patients to visit dentist only if they were asked by their patients, 19.7% ($n = 15$) reported that they seldom refer their patients to visit the dentist, and 2.6% ($n = 2$) reported that never refer their patients to visit the dentist. A large proportion of doctors ($n = 47$, 61.8%) reported that, in case of a patient dental abscess, they refer the patient to a dentist and prescribe antibiotics, whereas 34.2% ($n = 26$) of doctors refer the patient to a dentist and 3.9% of physicians prescribe only antibiotics without referral to a dentist. A satisfactory proportion of physicians knew about the kind of drugs that can lead to osteonecrosis, but a small number of doctors knew that use of antiepileptic, antibiotics, immunosuppressant, and antidiabetic drugs could lead to dry mouth. Moreover, 30% of doctors knew about gingival hyperplasia related to antihypertensive drugs and only 23% knew that immunosuppressant drugs could lead to allergic stomatitis (Table 2).

Table 2. Number of physicians who provided a correct response in regards to potential pre-defined adverse events of selected drugs in the oral cavity (in parenthesis %).

	Correct response			
	Gingival hyperplasia	Allergic stomatitis	Dry mouth	Osteonecrosis
Antiepileptic	44 (61.1)	64 (88.9)	21 (29.2)	64 (88.9)
Bisphosphonates	61 (84.7)	66 (91.7)	67 (93.1)	46 (63.9)
Immunosuppressant	24 (33.3)	18 (23.1)	17 (23.6)	61 (84.7)
Antibiotics	67 (93.1)	38 (52.8)	14 (19.4)	67 (93.1)
Antihypertensive	22 (30.6)	62 (86.1)	33 (45.8)	67 (93.1)
Antidiabetic	65 (90.3)	66 (91.7)	26 (33.3)	72 (100.0)

Patients' vs. physicians

In accordance to the t-test results, doctors had a greater average knowledge grade about oral health (by 2.7) than patients (6.4 vs. 3.7, $p < 0.001$, 95%CI: 2.3–3.2). Furthermore (based on X^2 test), physicians more frequently visited their dentist within 6 or 12 months compared to the patients ($p < 0.001$). We found that 68.1% ($n = 49$) of doctors visited the dentist within 6 or 12 months, whereas the corresponding proportion was only 39.4% ($n = 191$) for the patients.

Discussion

The findings of our study provide important information about the knowledge, attitudes, and perceptions regarding oral health and hygiene among physicians and dental patients in the primary health care units of Cyprus.

As concerns physicians' attitudes about oral health, it is remarkable that all of them recognized the significance of teeth and gum care and the equal importance of oral and general health. However, only 25% of doctors reported that they inform their patients about oral health significance. Consequently, less than 30% of patients reported that they were referred to a dentist by their doctor, whereas about 60% of patients reported that they did not receive such advice. Thus, the majority of patients (55%) reported that they only visited a dentist in case of an emergency. This figure is similar to that of the Eurobarometer, where more people in Cyprus (45%) went to a dentist for emergency treatment compared with the other EU-countries (EU-27 average, 17%) (Special Eurobarometer 2010). These data reveal the need to identify the reasons/obstacles that prevent Cypriots from making regular visits to the dentist. According to the results of the Eurobarometer, 62% of the Cypriots mentioned as the main reason for not visiting a dentist that 'my dental problem is not serious enough', which was higher than the EU-27 average of 27%. It seems that there is a lack of adequate knowledge among Cypriots regarding the advantages of prevention and early diagnosis of oral diseases.

Therefore, the development of oral health prevention and promotion programs—starting from the age of birth until the third age—is deemed essential. Regarding oral health education, multiple stakeholders could be involved, except for health professionals such as teachers and caregivers. Additionally, improved oral health could be facilitated through the reinforcement of good oral hygiene practices by parents and supported by the fluoridation of cities' water supplies (Barnett et al. 2017).

However, the low referral rates of patients to dentists by doctors of our study might indicate the necessity for further doctors' education about oral diseases, more effective cooperation among doctors and dentists, and the development of protocols for referral to the dentists of patients with chronic diseases (Allen et al. 2008; Bowyer et al. 2011).

The physicians' average knowledge score was 6.4/10, while the corresponding score in the group of patients was lower (by 2.8, $p < 0.001$). Older physicians and general practitioners had a lower knowledge score compared to younger physicians and specialists. Moreover, this study brought on light specific training gaps among doctors. Only 11.5% of physicians knew that smoking is unable to cause carries and the majority of them were not adequately informed about drugs' adverse reactions on the oral cavity. According to studies (McCann et al. 2005; Owens et al. 2011), doctors are not adequately educated about oral health, as a small number of those have participated in courses about oral health during their basic educational program.

These findings indicate need to develop mandatory continuing education programs for all doctors, and especially for general practitioners and older doctors. Also, taking into consideration the distance between knowledge and attitudes of dentists and GPs, development of pre-graduated joint education programs, updated curricula in medical and dental schools, and implementation of inter-professional practice guidelines, also seem to be of deemed necessity (Sippli, Rieger, and Huettig 2017). Additionally, in order to improve collaboration between GPs and dentists, researchers recognize the impact of common socialization during academic education on later cooperation between professions during their working career (Bhatti, Rana, and Grootendorst 2007).

In 2012, as part of the process for implementing a new NHS, the Ministry of Health begun to implement training programs for all general practitioners. This study high lights the necessity to include lectures and information material about oral health in the curriculum of these educational programs, including information on the relationship between general and oral health and the early diagnosis of oral diseases.

Regarding the frequency of dental visits, it was found that doctors more frequently visited the dentist within 6 or 12 months compared to the patients ($p = 0.001$). Physicians' higher educational level compared to the lower proportion of patients with higher educational level might be the major causal factor of the above findings, which have been confirmed by other studies (Jaramillo et al. 2009; Timothé et al. 2005).

Additionally, underuse of dental services was reported for people with a low educational level and diabetics patients. These findings again underline the need for protocol development and monitoring of diabetic patients and generally patients with chronic diseases in order to be holistically treated and referred to the dentist after the initial examination by their doctor (Karikoski, Murtomaa, and Ilanne-Parikka 2002; Watt and Sheiham 1999; Sheiham 2005; Petersen and Yamamoto 2005). Also, the underuse of dental services by people with low educational level underlines the social inequalities in oral health where people from lower socioeconomic classes have more treatment needs and make less use of the dental services. Therefore, policy-makers should keep in mind that in order to promote oral health, more extensive measures should be taken (Watt and Sheiham 1999).

To conclude, patients' and physicians' level of knowledge, behavior, and perceptions about oral health are not satisfactory. Moreover, there was a statistically significant difference between the two groups of study participants regarding the level of knowledge score for oral health.

Conclusion

The results of the current study should be taken into consideration in order to enhance oral and general health through effective policymaking focusing on the development of prevention and health promotion programs. Moreover, these results underline the necessity of developing continuing education programs for general practitioners in Cyprus in cooperation with the Ministry of Health, the General Medical Society, and the Cyprus Dental Association. The integration of oral health in the context of the basic education program of general practitioners might succeed to reinforce physicians' knowledge and skills to effectively assess the oral cavity during standard clinical examination. The appropriate management of oral health problems improves not only oral, but also general health and subsequently ameliorates quality of life (Petersen and Yamamoto 2005).

Limitations

The study population refers only to people of middle age and older. It is well documented that older people have increased needs of dental care, while also having limited knowledge of oral health issues and low motivation to visit the dentists (Petersen et al., 2005). Also, patients attending the public sector have special socio-economic characteristics, such as a low level of education and income.

Note

1. The grade knowledge ranges from 0 to 10 with higher values indicating greater knowledge about oral health.

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No potential conflict of interest was reported by the authors.

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