

Smoking: What Has Been Addressed in Brazilian Journals

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Abstract

The topic of tobacco smoking, in its several aspects, has been receiving increasing attention among researchers over the past few years, which has been reflected in more data and more solid scientific literature on the subject in national journals. This article aims to review the studies that focused on smoking published between January 2010 and June 2012, in *Arquivos Brasileiros de Cardiologia* (Brazilian Archives of Cardiology), *Brazilian Journal of Medical and Biological Research, Clinics* (Sao Paulo), *Jornal Brasileiro de Pneumologia* (Brazilian Journal of Pulmonology), *Revista da Associação Médica Brasileira* (Journal of the Brazilian Medical Association) and *Revista Brasileira de Cirurgia Cardiovascular* (Brazilian Journal of Cardiovascular Surgery). During the aforementioned period 58 articles were published, 52 of which were original ones, addressing several aspects of smoking, such as effects on health, epidemiology, cessation and experimental studies.

Introduction

The topic of tobacco smoking has been gaining increasing attention among researchers in Brazil, which is reflected in study presentations at regional, national and international conferences. This interest, reflected in the increasing number of publications, has developed together with a successful national effort to reduce the prevalence and consumption of tobacco products, which decreased from 34.8% (National Health Surveillance Survey and Nutrition 1989)¹ to 17.5% (Special Survey on Smoking - PETab 2008)². Although the first one refers to the population aged 18 or older, and the second, to 15 years or older, the decrease amounted to almost 50% in 19 years.

The fact that Brazil, in 2005, ratified the Framework Convention on Tobacco Control – FCTC (“Convenção Quadro para o Controle do Tabaco - CQCT”), consolidated

Keywords

Smoking / epidemiology; Tobacco / adverse effects; Tobacco Use Disorder; Review.

a structured ongoing action since the middle of the previous decade, by prohibiting of the consumption of tobacco-related products in enclosed spaces and the regulation of the advertisement of tobacco products (1996), prohibiting the use of terms “light” and “ultra light” by cigarette brands (2001), establishing the inclusion of images warning about tobacco-related diseases on cigarette packs (2002) and the structuring of the Implementation Plan on Tobacco Use Approach and Treatment in SUS in 2004. Concomitantly, a gradual awareness of the population about the dangers of smoking and the increasing availability of access to treatment for nicotine dependence by SUS consolidated the scenario of changes that contextualized the decrease of almost 50% of the prevalence of smokers in Brazil.

Over the past few years, the growing scientific production addressing nicotine dependence and the consequences of tobacco product consumption has permeated the major national journals. This article intends to address, in an organized format, the content of the main articles on this topic.

Methods

A systematic review was carried out at the PubMed database of publications relevant to the topic of smoking according to the following inclusion criteria: articles in English and Portuguese languages, published between January 2010 and June 2012 in the journals *Brazilian Archives of Cardiology* (*Arquivos Brasileiros de Cardiologia*), *Brazilian Journal of Medical and Biological Research, Clinics* (Sao Paulo), *Brazilian Journal of Pulmonology* (*Jornal Brasileiro de Pneumologia*), *Journal of the Brazilian Medical Association* (*Revista da Associação Médica Brasileira*) and the *Brazilian Journal of Cardiovascular Surgery* (*Revista Brasileira de Cirurgia Cardiovascular*). We used the following key words: *tabagismo*, *fumo*, smoking and tobacco.

Results

A total of 58 articles were found with different approaches, as shown in Table 1, grouped by topic and discussed below. Some items had more than one approach; in these cases we chose to group them according to the primary goal.

Smoking and morbimortality

Twenty one (36%) of the articles addressed smoking as a risk factor associated with mortality. A cross-sectional, observational study³ that investigated the association between abdominal obesity and alcohol and tobacco use in

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Table 1 - Distribution by topic of articles published between January 2010 and June 2012 in Brazilian journals¹

Topic	Published articles N (%)	References
Smoking and morbimortality	21(36.2)	3-23
Prevalence of smoking	14 (24.1)	24-37
Cessation	10 (17.2)	10.38-41.43-47
Experimental	8 (13.8)	48-55
Clinical trial	2 (3.5)	57-58
Smoking and the female sex	1 (1.7)	59
Editorials	2 (3.5)	60-61
Total	58	

¹*Clinics (São Paulo), Jornal Brasileiro de Pneumologia, Brazilian Journal of Medical and Biological Research, Arquivos Brasileiros de Cardiologia, Revista da Associação Médica Brasileira e Revista Brasileira de Cirurgia Cardiovascular.*

a sample of 1,235 male blood donors held in Cuiabá (MT) between 1999 and 2000 found a prevalence of 22.1% of smokers and 16.3 % of ex-smokers. In this study, smoking and alcohol consumption were directly related to higher rates of abdominal adiposity, a known cardiovascular risk factor. Barros et al.⁴, in a cross-sectional observational study involving 388 infants born to teenage mothers, observed that newborns of mothers who smoked (6.5%) showed, within the first 24-48 hours of life, significant difference in the number of waking periods and excitability, when compared to those born to nonsmoker mothers.

Tobacco consumption by the mother during pregnancy had a positive correlation with the lethargy and a negative one with the levels of attention of neonates. Also regarding the effects of intrauterine exposure to maternal smoking, a prevalence study carried out in the city of Porto Alegre (RS) in 2006⁵ found that smoking during pregnancy is positively correlated (OR: 1.14, 95%CI: 1.02-1.26, $p = 0.017$) with the development of wheezing in the first year of a child's life. These findings suggest the influence of intrauterine exposure to tobacco neurological and pulmonary development of children and reinforce the need to encourage smoking cessation in pregnant women.

A retrospective⁶ study that evaluated mortality and the incidence of cardiac events in smokers, ex-smokers and nonsmokers undergoing noncardiac surgery showed that smokers had a higher mortality rate at 30 days postoperatively, adjusted for age, heart failure, liver disease and cancer surgeries. These findings reinforce the need to strengthen the approach toward smoking cessation during the preoperative period in patients scheduled for elective surgery. Moreover, regarding cardiovascular morbimortality attributable to smoking, Takada et al.⁷ prospectively evaluated 1104 patients consecutively admitted for acute coronary syndromes and found that smoking was an independent risk predictor (OR: 1.72, 95%CI: 1.11-2.67, $p = 0.014$) for hospital stay ≥ 5 days. Osorio Gomes et al.⁸ also showed that active smoking was associated with a significantly increased risk (HR: 3.66, 95%CI 1.20 to 11.10, $p = 0.02$) of death in 504 patients with coronary disease undergoing angioplasty with drug-

eluting stents. This strong correlation between smoking and coronary heart disease was also evidenced by Monteiro et al.⁹ in a screening study of atherosclerosis using coronary computed tomography of coronary arteries in a sample of patients with HIV / AIDS and more two years of antiretroviral therapy (ART) use. The researchers verified that both smoking (OR: 27.2, $p = 0.023$) and age (OR: 20.6, $p = 0.033$) were independent predictors of the presence of atherosclerosis (defined as calcium score $> zero$) and that there was no effect between type and duration of ART on the studied outcome.

A study by Castro et al.¹⁰, comparatively evaluating 167 smokers seeking treatment for smoking cessation and 272 nonsmoker blood donors, through structured questionnaires, found that smokers had more often chronic cardiorespiratory comorbidities, diabetes, mental illness and hospitalizations. This comparison, as it involves individuals seeking treatment for smoking cessation, in contrast to a sample of blood donors may have influenced the difference regarding the prevalence of comorbidities between the groups. Cross-sectional study with 452 patients from two primary care units in the city of São Paulo, which evaluated the prevalence and factors associated with metabolic syndrome (MS), found a percentage of 45% of MS, with smoking being the second most important associated risk factor, second only to the age group of 50-69 years¹¹. Boing et al.¹² in a study that evaluated factors associated with prevalence of medical consultations in 2,022 individuals aged 20-59 years in the city of Lages (SC), found that the frequency of medical visits was higher among smokers and ex-smokers, compared to nonsmokers.

A study¹³ that evaluated several factors associated with survival in 445 patients with head and neck cancer, recruited from hospitals in three Brazilian capital cities between 1998 and 2002, did not find an association between survival and smoking. Survival was positively associated with five or more years of schooling and negatively with alcohol consumption, but the effects were non-significant. In another study involving the frequency of the gene polymorphism *MTHFD1* G1958A, associated with folate metabolism and the risk of head and neck cancer, Silva et al.¹⁴ showed that smoking and the associated presence of the polymorphism increased the risk of head and neck cancer.

In a review article on factors associated with coronary artery disease, Da Luz et al.¹⁵ conclude that among the main risk factors, tobacco stands out. A retrospective study¹⁶ that evaluated the risk of mediastinitis in 500 patients undergoing myocardial revascularization surgery, the incidence of mediastinitis was 28 (5.6%) with a mortality rate of eight (1.8%), with smoking conferring a two-fold higher risk for this outcome.

Case-control study involving 140 patients with rheumatoid arthritis and 143 healthy volunteers showed that although smoking was not associated with rheumatoid arthritis, it was associated with the presence of anti-cyclic citrullinated peptide antibody (OR: 3.82), which in turn was independently associated with rheumatoid arthritis (OR: 247.9)¹⁷. Moraes et al.¹⁸ in a cross-sectional study of 991 high-school students (14-18 years) in Maringá (PR), found that the prevalence of drug use was elevated and higher among smokers. A study carried out in Nigeria, with 498 subjects (20-44 years of age), with the objective of assessing the presence of factors associated with nocturnal cough, revealed that smoking was the third risk factor (with three times the risk compared with to nonsmokers), behind only asthma and rhinitis among seven factors investigated¹⁹.

About the impact of smoking on the risk for acute respiratory diseases, a retrospective study published by Lenzi et al.²⁰ evaluated the database of the National Information System for Notifiable Diseases (Sinan - Ministry of Health) of confirmed infections by influenza H1N1 between March and December 2010 in the state of Paraná. In this study, it was observed that smoking (in addition to obesity, diabetes, heart and respiratory diseases) was a factor positively correlated with higher frequency of hospitalization. A study evaluating the prevalence of respiratory symptoms in a group of 67 workers involved in coal production in three cities of the state of Rio Grande do Sul, showed that smokers (31.34%) had significantly stronger symptoms of coughing, wheezing, nasal obstruction and coryza when compared to nonsmokers²¹. Martinelli et al.²² performed a retrospective study involving autopsies of 199 patients aged one year or older, admitted to the University Hospital of Botucatu (SP) and who died of nosocomial pneumonia, and found that tobacco-related structural lesions were associated with 3.2-fold greater risk of fatal nosocomial pneumonia.

Chatkin et al.²³ performed a study in which they compared the amounts of carbon monoxide in exhaled air (CO_{ex}) in smokers with and without COPD and found no difference between the concentrations, while there were differences in the levels of urinary cotinine. The time of the test and the time elapsed between the last cigarette smoked and the measured CO_{ex} may have influenced the results.

Studies on the prevalence of smoking

Fourteen published articles have addressed the prevalence of smokers in several populations, determinants factors for smoking and for experimentation, and risk knowledge assessment by the smokers. The most comprehensive of them²⁴, a cross-sectional population-based sample of individuals from the capitals of the 26 Brazilian states and

the Federal District (DF), aged 18 or older, carried out in 2008, showed a wide variation in the prevalence of smoking, with the lowest percentage (9.7%) in Maceió (AL) and highest (20.9%) in São Paulo (SP), which surpassed Porto Alegre (RS) (19.7%), the capital which had had the highest prevalence in previous surveys. In this survey, the highest ratio "smoking males: females" (M: F) was observed in Macapa (AP) (M: F = 3.2) and lowest in Rio Branco (AC) (M:F = 1.0), both in Northern Brazil. There was a trend toward a higher prevalence of smoking among individuals with less than 8 years of schooling, compared to those with 12 or more years, 20.1% versus 11.5%, respectively. Similar findings were demonstrated in another population-based cross-sectional study carried out on a sample of 1,168 individuals aged > 18 years in the town of Firminópolis (GO)²⁵, which showed a prevalence of smoking of 23.2%.

Investigating factors associated with smoking initiation among children and adolescents, Machado Neto et al.²⁶ in cross-sectional study carried out in the city of Salvador (BA) in 2008 involving 5347 students aged 11-19 years from 47 public and private schools, found a prevalence of experimentation of 16.1%. The main significant variables related to the risk of smoking experimentation were, in ascending order: exposure to the content of advertising and promotion of smoking (OR: 1.99, 83%CI: 1.39 to 2.86), maternal smoking (OR: 2, 12; 83%CI: 1.53 to 2.93), paternal smoking (OR: 2.18; 83%CI: 1.66 to 2.87), friends who smoke (OR: 3.18; 83%CI: 2.05 to 3, 99), boyfriends/girlfriends who smoke (OR: 3.42; 83%CI: 1.78 to 6.56) and alcohol consumption (OR: 6.04; 83%CI: 4.62 to 7.88), confirming findings in other studies carried out in Brazil and other countries, which have shown the influence of social interaction in the initiation of smoking. Petroianu et al.²⁷, in a study that evaluated the consumption of different drugs in 332 students from the first to the sixth year of Medical School at the Federal University of Minas Gerais interviewed between 2007 and 2008, found a high prevalence of smoking, 16.3% (23.1% among men and 9.9% among women), lower than the consumption of alcohol and similar to that of marijuana. Another survey²⁸ carried out among college students from the healthcare area from Cuiabá and Várzea Grande (MT), found an overall prevalence of smoking of 17.4%, with the highest frequency of smokers found in the pharmacy and dentistry courses, 29.6% and 25.5%, respectively. The pharmacy students were the ones who recognized, at the largest percentage, the use of nicotine as the substance responsible for nicotine dependence (88.8%) versus 72.2% of medical students and 68.2% of psychology students.

A study carried out in 2006²⁹, involving 345 students of pharmacy and science at the Italian University of Camerino, found a prevalence of smoking of 28.1% and a rate of cannabis experimentation of 46.7%, higher than those found in most studies carried out in Brazil, as previously described.

Five studies assessed the prevalence of smoking among hospitalized patients and elderly. Barreto et al.³⁰, in a study performed at a university hospital in Florianópolis (SC), observed a prevalence of smokers and ex-smokers of 18.7% and 32.8%, respectively, and a mean tobacco load of 32 pack-years and

a median daily consumption of 20 cigarettes/day. In another study, Ferreira et al.³¹ found a prevalence of 13.7% of smokers and 36.9% of ex-smokers among hospitalized patients in the cardiology ward of a teaching hospital in Niterói (RJ), from May 2008 to April, 2009. In this study, the mean tobacco load was 46.7 pack-years and the mean daily consumption was 24.7 cigarettes/day. Similar results were indicated by Frare e Silva et al.³² in a survey among inpatients at a university hospital in Curitiba (PR), which showed a prevalence of 12.1% of smokers and 28.5% of ex-smokers. In a study involving 573 individuals living in 13 long-term stay institutions of the Federal District, Carvalho et al.³³ found a prevalence smoking of 23%. Tanni et al.³⁴, evaluating patients from a public hospital, found a smoking prevalence of 22.6% and, although the diagnosis of tobacco-related disease was established in 39% of smokers and ex-smokers, 56% of smokers and 65% of ex-smokers ignored the association between smoking with the cause of hospitalization. It is also noteworthy in the study the fact that only 19% of smokers and 32% of ex-smokers thought tobacco use unhealthy. These findings suggest the need for further action by health professionals working in institutions caring for the elderly. Also among the elderly, but in contrast to the previous study, Conceição Ferreira et al.³⁵, performing a cross-sectional evaluation of a sample of 418 individuals older than 60 years of age followed by the Unified Health System (SUS) in Goiânia (GO), found a lower prevalence (10%) of smoking in this population.

Pinto et al.³⁶, in a study involving 110 patients undergoing treatment for head and neck carcinoma, found that 35% of patients continued smoking after the treatment, with cessation being higher in the group undergoing treatment with chemotherapy and/or radiation therapy (58.3%) versus 25% in those who underwent surgical treatment. Despite the lack of adjustment for factors that could contribute for result limitation, it is evident the need for better interventions directed at smoking cessation in this group of patients.

Viegas et al.³⁷, in a study that evaluated the behavior of 2,800 pulmonologists in Brazil with respect to nicotine dependence, showed that 3.2% did not believe that nicotine caused addiction, only 14.7% treated smokers and 32.4% referred patients to other professionals for treatment. This leads to the conclusion that, in spite of the reasonable knowledge on nicotine addiction as a disease, there is still a significant gap in medical education and training regarding the treatment of this endemic disease in Brazil and worldwide epidemic.

Smoking cessation

Ten articles have addressed the topic of smoking cessation. Souza et al.³⁸ developed and tested a modified scale of reasons for smoking in 311 smokers selected among blood donors, and suggested that the scale applicability, as it is simple and has good factor structure, can complement the Fagerström test for broader understanding of smokers seeking treatment.

Prado et al.³⁹, in a pragmatic clinical trial (non-randomized and non-controlled) carried out in 868 smokers (31.2% men and 68.8% women) with a mean score at the Fagerstrom

Test of Nicotine Dependence (FTND) of $6 (\pm 2)$, mean monoximetry of 22 ppm, mean daily consumption of $25 (\pm 20)$ cigarettes and mean tobacco load of 39.7 pack-years, observed a point rate of smoking abstinence of 33.6% in 52 weeks. Among the pharmacological treatments available, the use of nortriptyline-nicotine association was related to higher abstinence rate at one year (46.4%) with OR: 1.37 (95%CI: 1.01 - 2.83, $p < 0.05$), compared to the other groups. In this study, there was a significant association between the prevalence of smoking abstinence in a year and the time since the last cigarette was smoked before the first interview, suggesting that this variable may be a marker of severity of nicotine dependence. This trend of prevalence of patients with high levels of tobacco consumption and dependence in reference services that treat tobacco-addicted individuals had already been reported by two other previous studies. A survey conducted with 53 smokers who, between 2008 and 2009, sought a treatment center due to addiction to tobacco and other drugs in the city of Campinas (SP)⁴⁰, showed a similar population profile, with a prevalence of severe nicotine dependence (FTND > 6) in 76.5% of women and 52.6% of men who sought help to stop smoking, and this was decision strongly influenced by the stimulus provided by the family. In another reference center for treatment of smoking in Londrina (PR), Castro et al.¹⁰ also demonstrated mean FTND scores > six and tobacco load > 20 pack-years, in approximately 60% of the assessed smokers. These studies suggest that the smokers who seek help in reference services are probably more dependent and have greater tobacco load than the average volunteer of clinical efficacy studies on drugs for smoking cessation. Pietrobon and Barbisan⁴¹ in a cohort of patients with heart disease submitted to coronary artery bypass grafting, showed a prevalence of 71.9% of smokers at hospitalization and smoking abstinence rates of 93.15% and 93.84% at 60 and 90 days after surgery, respectively, suggesting that performing CABG surgery is an important motivating factor that determines cessation in the short term. The limited follow-up period of patients in this study, up to 90 days, implies the need for caution when interpreting and implementing these results, as other studies suggest a much higher recurrence rate of smoking. More solid results are observed when inpatients are followed in smoking cessation programs after hospital discharge⁴², which did not occur in this study⁴¹. Also in order to investigate the effect of non-pharmacological treatment for smoking cessation, Scherr et al.⁴³ prospectively evaluated the impact of a structured program of multiprofessional counseling in 2337 cardiac patients attending a secondary prevention service. The cessation rate observed in this study was 60%, but the short follow-up period (120 days total, 90 days after the last intervention) and the absence of abstinence confirmation through biomarkers limits the extrapolation of these results to other scenarios.

In 2010, the Guidelines on Smoking, by the Brazilian Medical Association (AMA), were published in three parts, divided into three different issues of the journal, authored by the Medical Specialty Societies affiliated to it and the Supplemental National Health Agency (ANS), which, based on an extensive review of international and national studies, established the Brazilian recommendations for smoking

cessation⁴⁴⁻⁴⁶. Also as a guideline, the Brazilian Society of Cardiology published in 2011, the recommendation that smoking cessation in the preoperative period should be encouraged by the physician, regardless of the time gap between the consultation and the proposed surgery, reinforcing the evidence that there are no deleterious effect of smoking cessation in the preoperative period and that the benefits of reducing the risk of postoperative complications were more evident after the third or fourth week, although no minimum temporal cutoff has been established⁴⁷.

Experimental studies

Eight experimental studies in animals have been published. In one, Moreira et al.⁴⁸ evaluated the effect of tobacco smoke on the myoarticular system of mice with arthritis and verified that exposure to cigarette smoke induced musculoskeletal atrophy and prevented weight gain in exposed mice. Dogan et al.⁴⁹, in a study that compared histopathological changes in lung tissue triggered by exposure to tobacco smoke, smoke resulting from biomass burning and combined exposure, demonstrated that both types of exposure caused extensive histological damage, particularly the combined exposure. With these findings, the researchers recommend the need to limit biomass burning and that smoking cessation encouragement be emphasized in the population exposed to the combination of these two risk factors. In an experimental model of mice exposed to tobacco smoke and residual oil fly ash (ROFA - diesel burn waste), Biselli et al.⁵⁰ evaluated the presence of lung lesions in the animals exposed to fossil fuel burning and cigarette smoke inhaling, separately and combined, for two months. The combined exposure group showed an joined effect of the two environmental risk factors on the most frequently studied lung abnormalities (airway wall thickening, end-terminal airspace dilation and inflammatory infiltrate), followed by the group exposed to inhaled cigarette smoke and nasal instillation of a suspension of particulate matter from fossil fuels, thereby enhancing the combined effect of both types of exposure. In an experimental model used to study cardiac alterations triggered by smoking, Azevedo et al.⁵¹ developed a controlled model of mice exposure to cigarette smoke for two months. At the end of the period, the exposed group showed higher incidences of concentric and eccentric myocardial hypertrophy shown at the echocardiography. Another study designed to evaluate the cardiovascular impact of a less prolonged exposure (3 weeks) of mice to pollution showed no differences in the studied variables (blood pressure, heart rate, heart rate variability and baroreflex response to nitroprusside stimulus) between the exposed and non-exposed group⁵². Justo et al.⁵³ evaluated in young rats, whether the use of stimulant drugs such as methylphenidate (MPH), could facilitate the nicotine addiction, as suggested by some studies in humans. However, the study did not show cross-sensitization, suggesting that the MPH treatment did not induce neuroadaptation in rats that could increase sensitivity to nicotine. In a similar study, also in rats, but evaluating the use of stress as a possible sensitizer factor to nicotine, Zago et al.⁵⁴ verified that in adolescent rats, nicotine caused behavioral sensitization only in those that were exposed simultaneously to stress, whereas in adult rats, nicotine promoted sensitization regardless of exposure to stress. Manzano et al.⁵⁵, in an experimental study in humans that assessed 25 young smokers, verified a decrease in the indicators

of heart rate variability after having smoked two cigarettes after an interval of 8 hours of abstinence, with recovery values after 30 minutes, showing acute effect of exposure and confirming the findings of other studies, as demonstrated in a newly published review⁵⁶.

Clinical trial

Double-blind, randomized clinical trial⁵⁷, involving 50 smokers undergoing orthopedic, gynecological and plastic surgeries under general anesthesia, tested the use of lidocaine (or 0.9% saline solution) in the cuff of the endotracheal tube and showed that the group submitted to this procedure, when compared to the control group (placebo), showed lower incidence of coughing and sore throat in the postoperative period, but not of hoarseness. In addition to these findings, it was observed that the group who received lidocaine showed significantly lower elevation of the cuff inflation pressure. Therefore, the authors recommend the use of this procedure in smokers undergoing surgery under general anesthesia. Faria et al.⁵⁸, comparing the use of forced oscillation technique (FOT) with spirometry to detect respiratory alterations induced by smoking in 170 smokers, showed that the FOT was more accurate than spirometry to assess the presence of potentially reversible early alterations, suggesting the use of this test as a complement to detect early airway changes, enabling better prevention efforts for the smoker.

Smoking and the female sex

In a review article, Lombardi et al.⁵⁹ showed an extensive approach on smoking in the female sex, from aspects associated with motivations for initiation, addiction - usually higher in females - epidemiological data on smoking, tobacco-related diseases, calling attention to its influence on breast cancer, which, from a controversial theme until a few years ago, came to be included among the tobacco-associated cancers, as well as aspects related to treatment.

Conclusions

The approach of studies on smoking in Brazil was quite varied in journals during the analyzed period^{60,61}. Epidemiological studies on health effects predominated, mostly in specific populations, but with reduced samples, followed by experimental studies on smoking cessation. The number and variety of studies show the diversity of groups and lines of research in the country.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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