EDITORIAL

Contribution of Occupational Medicine to Cardiovascular Medicine

Fernando Rodríguez Artalejo and José R. Banegas

Departamento de Medicina Preventiva y Salud Pública, Facultad de Medicina, Universidad Autónoma de Madrid, Madrid, Spain.

The article by Sánchez-Chaparro et al[1] in this issue of REVISTA ESPAÑOLA DE CARDIOLOGÍA provokes reflection on research which combines occupational and cardiovascular epidemiology, particularly studies of the frequency and determinants of cardiovascular disease (CVD) in working populations. Such studies have contributed decisively to our knowledge of, and ability to manage CVD.

Principal types of study on cardiovascular health in the workplace

In line with epidemiological tradition, studies of cardiovascular health in working populations can be divided into 3 types: analytic, experimental, or interventionist, and descriptive studies. The first type of study aims to determine whether certain factors are associated with a greater risk of CVD. These factors may be specific to working populations, or not. Interventionist studies aim to demonstrate that it is possible to control risk factors and to reduce the risk of becoming ill, while descriptive studies in the workplace try to determine the magnitude of the risk factors and to provide a follow-up of their control.

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Correspondence: Dr. F. Rodríguez Artalejo.
Departamento de Medicina Preventiva y Salud Pública. Facultad de Medicina. Universidad Autónoma de Madrid.
Avda. Arzobispo Morcillo, s/n. 28029 Madrid. España.
E-mail: fernando.artalejo@uam.es

Analytic Studies

Research into the effect of working conditions. Workplace studies have been used to identify cardiovascular risk factors which are workplace specific as well as risk factors which are present in the general population. Among studies which have looked at occupational risk factors, those by Morris are classics of their kind. In 1 study, he demonstrated that coronary heart disease was more common among the drivers of London's double-decker buses than among the conductors, as the latter spent the day going up and down stairs.[2] In another study, he showed that coronary heart disease was less common among mailmen who delivered letters than among postal workers in administrative positions who had more sedentary jobs.[3] These were some of the first and best demonstrations of the protective effect of physical activity at work.

Work-related risk factors include both physical and psychosocial elements. Karasek et al[4] showed that individuals who suffer more "job strain," i.e. those who are under pressure to work hard or quickly but who have less control over that pressure, had a greater risk of cardiovascular disease.[4] Such studies have not only examined CVD, but have also looked at the association between psychosocial factors and the natural history of the disease. In a case-control study, Schnall et al[5] showed that "job strain" is a risk factor both for high blood pressure and for structural changes in the heart (left ventricular hypertrophy) in male workers.[5] These authors were amongst the first to show that organization at work can affect a worker's level of cardiovascular risk.

Other authors have used occupation as an indicator of social class. Marmot et al,[6] in 2 classic cohort studies in Whitehall, showed that executive level civil servants developed coronary heart disease less

frequently than unqualified manual workers. These 2 studies are classics of their kind for at least two reasons:

1. Because they observed an inverse relationship between social class and CVD, such that the lower the occupational level the greater the risk of cardiovascular disease. As all of the study subjects were government employees, those in the lower occupational levels cannot be said to be have been living in poverty. The study therefore provided evidence that social inequality is an important factor in terms of the risk of developing cardiovascular disease, and may be more relevant than poverty.[6]

2. Because they observed that, although the classic cardiovascular risk factors (grouped into the so-called "metabolic syndrome") and tobacco consumption were more frequent in workers in lower occupational levels, this did not entirely explain the higher rates of CVD in these workers, which were also due in part to psychosocial factors such as chronic stress. Further evidence of this was provided by the high blood cortisol levels.[7] A recent study in Spain confirmed the inverse relationship between social class and the prevalence of metabolic syndrome in the Spanish working population.[8]

Occasionally, population-based research in both working and non-working populations is required to study the association between occupational factors (e.g. unemployment) and CVD. We know, for example, that people without paid employment have poorer psychological well-being, with higher rates of anxiety and depression and suicide. Unemployed people also have higher rates of all cause mortality, including coronary heart disease. The large numbers of people in paid employment and the frequency of certain work conditions mean that their effects on health can also be investigated in general population studies. For example, INTERHEART was a case-control study carried out in 52 countries on five continents which showed that work-related stress was associated with a higher risk of acute myocardial infarction.[9]

Research into the effect of factors which are not specific to the workplace. This type of research measures the impact of smoking, high blood pressure, obesity and other potential occupational or general risk factors on cardiovascular health. In Spain, the pioneering study in this field (and in cardiovascular epidemiology in general in Spain) was the Manresa study, which was carried out in male workers in the Michelin company. The study showed that cardiovascular risk factors identified in studies carried out in non-Mediterranean countries can be associated with coronary heart disease even in Mediterranean countries which have a low coronary mortality rate.[10] Studies in working populations have also highlighted the influence of genetic factors on cardiovascular risk. The Olivetti study in workers in Naples, for example, showed that there was an association between renin-angiotensin system polymorphisms and hypertension[11] and obesity.[12]

Lastly, worker cohorts provide an opportunity for very long term follow-up, which may be over 30 years in some cases. The Chicago Heart Association Detection Project in Industry, for example, included over 40 000 workers and showed that exposure to risk factors in middle age was associated with CVD later in life. It also provided the information necessary to calculate the benefits of a simultaneous absence of the main CVD risk factors and the lifetime advantages of prevention both at individual and population level. These calculations showed that the absence of the five main CVD risk factors reduced the risk of CVD by over 90% (the "low risk" benefit). Unfortunately, only a small proportion of individuals in Western countries meet this condition.[13]

Predicting cardiovascular risk. The development of formulas which can be used to predict cardiovascular risk is a good example of how results from large population-based cohort studies can be applied to clinical practice by allowing interventions to be tailored to the degree of individual risk. The Framingham formulas are perhaps the best known example; however, it is less well-known that the SCORE equation, which is used to predict the risk of cardiovascular mortality in countries in southern Europe and which has been adopted by most of the Spanish medical societies, stems in part from cohort studies in workers.[14]

Intervention Studies

Workplace-run programs to manage cardiovascular risk may be more efficient than programs run by conventional clinical centers,[15] in part at least because of the relevance of "context-based" or non-specific aspects of the intervention. In a program to control high blood pressure, specific components may include diet, physical activity, and drugs, whereas non-specific components would include the center's physical characteristics, visiting hours, the relationship between patients, and health care staff, etc. The proximity of the medical center to the workplace, the ability to adapt the medical consultation to working hours, the frequency

of clinic visits for work-related check-ups, and the health care staff's knowledge of working conditions can all help to ensure that the most appropriate treatment is chosen for the patient, as well as facilitating follow-up and compliance with treatment.

In Spain, occupational health teams are very useful in following up patients with chronic conditions, in helping to implement lifestyle modifications, and in encouraging compliance with treatment. Some studies in Spain have evaluated the effectiveness of lifestyle interventions. For example, a randomized trial to assess a smoking cessation intervention which was adapted to the degree of nicotine dependence was carried out in workers in the Iberdrola factories in the Basque Country and in bus drivers in Bilbao. With the intervention, which included minimal structured smoking cessation advice and nicotine substitution treatment, the rate of smoking cessation doubled after one year compared to usual clinical practice in the centers involved (sporadic sessions of unstructured medical antismoking advice).[16]

Interventions can also be performed in groups of subjects. In cardiovascular epidemiology, a pioneering example of this approach was the European Collaborative Trial of Multifactorial Prevention of Coronary Heart Disease, which was performed in the workforces of several companies. Innovative features of this study included the fact that it was performed in several different countries (Belgium, Italy, Poland, United Kingdom, and Spain), that it was one of the first trials of simultaneous intervention on several factors, which included advice to stop smoking and diet modification to control blood pressure and dyslipidemia, that it randomized groups of subjects (rather than individuals) to the intervention in 80 factories, that the study population (61 000 men aged 40-59 years) was very large, and that it included individuals with very varied cardiovascular risk profiles, and not only high-risk subjects. Unfortunately, the intervention only achieved modest and non-statistically significant reductions in the incidence of coronary heart disease and overall mortality.[17]

Descriptive Studies

These provide information about the frequency and distribution of cardiovascular risk factors[1] and CVD[18] in the working population. They are the most frequent type of studies in Spain and illustrate the preventive challenges faced by those working in occupational medicine. Descriptive studies are frequently retrospective and use information from routine medical check-ups. In the future, there should be more emphasis on prospective studies and on obtaining standardized data. Information on lifestyle interventions and drug treatments should be collected, as well as information on the control of risk factors. Including this information in computerized clinical records will make it easier to assess progress in controlling risk factors and to identify groups in which risk factors are poorly controlled. This in turn will make it easier to prioritize interventions.

Methodological Advantages of Workplace Studies of Cardiovascular Health

Epidemiological studies in the workplace have numerous advantages, including access to middle-aged populations who spend much of their time at work. This population is difficult to access in population-based studies, or even in clinical studies which focus on less severe diseases or risk factors.

Another advantage of workplace studies is that it is easier to follow-up subjects in cohort studies, allowing for repeated measures of exposure (to determine typical values or changes in exposure) and a more complete assessment of outcomes, particularly if these occur during working life or shortly thereafter.

Workplace studies also allow groups which are relatively homogenous in terms of socio-economic level, lifestyles and professional exposure to cardiovascular risk factors to be selected, which in turn allows for the control of confounding variables which are frequently found in epidemiological studies.

Furthermore, the close relationship between workers and staff in occupational safety and risk prevention teams can help to increase participation in studies and improve adherence to the interventions being analyzed. Increasing study participation rates enhances the external validity of results, whilst improving adherence maximizes the efficacy of the interventions being studied and helps to avoid exposure classification errors.

Finally, by providing health care surveillance and promotion coverage to workers in many companies, organizations such as Ibermutuamur can include a large number of subjects in a single study and provide more precise estimates of both the frequency of risk factors as well as of their effect on CVD.

The availability of routinely collected data on exposure to risk factors and workers' health facilitates retrospective studies, which are attractive because they are quick and low cost. However, these studies have substantial limitations related to cohort completeness, the availability of information, and measurement quality. Standardizing data collection and using

computerized data collection would help to overcome some of these limitations.

The Ibermutuamur Study's Contribution to Cardiovascular Epidemiology in Spain

Sánchez-Chaparro et al's study[1] is the largest study into the prevalence of cardiovascular risk factors carried out to date in Spain, and is based on the use of structured questionnaires, physical examinations, and serum biochemical analysis. Its size makes it larger than any of the national health surveys, the largest of which was carried out in 1987 and included fewer than 50 000 respondents. The information in the health surveys was obtained by interview, and did not include a physical exam.

Although the fact that males, younger workers and workers in the construction sector are overrepresented in the Ibermutuamur study means that it is not entirely representative of the Spanish working population, this limitation is compensated for by the study's ability to provide precise estimations of prevalence rates in both sexes, by age group, and according to type of employment.

The Ibermutuamur study has included over 200 000 workers, so it can provide much more accurate estimates of the prevalence of cardiovascular risk factors than those available to date. It also allows for a reasonably precise estimate of weak associations between risk factors and CVD, and provides data on interactions between risk factors when follow-up data is complete and it is possible to measure outcomes. The fact that a standardized data collection protocol was used and that there were adequate quality controls means that this study overcomes some of the limitations of retrospective studies.

One particularly original feature of the Ibermutuamur study is that it included people in all types of employment, so that it is now possible to study the association between employment type and CVD. This is an area which has received little attention in Spain to date.

Finally, this study is part of Ibermutuamur's Prevention of Cardiovascular Risk Plan, an ambitious project aimed at the early detection and control of risk factors in workers. The Plan includes the systematic measurement of risk factors, estimation of cardiovascular risk using the SCORE equation,[13] lifestyle interventions, and follow-up telephone calls to workers to reinforce compliance. The intervention will be carried out in collaboration with the primary care system and includes an assessment of the effectiveness of the interventions. The Ibermutuamur plan therefore includes all of the different types of occupational epidemiology (descriptive, analytic and observational), which makes it a singular initiative in Spain.

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