ELSEVIER

Birth Weight Does Not Predict Blood Pressure in a Young Working Population: A Sharp (Scottish Heart and Arterial Disease Risk Prevention) Study

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PURPOSE: We sought to assess the association between birth weight and adult systolic blood pressure in a relatively young, healthy, working population with prospectively collected birth data and blood pressure consistently recorded.
METHODS: Detailed information on pregnancy and birth came from the Walker cohort, a database of babies born in Dundee, Scotland 1952–1966. Follow-up was conducted through record linkage to demographic and health information from the SHARP (Scottish Heart and Arterial Disease Risk Prevention) cohort, a working population screened for cardiovascular risk factors between 1991 and 1993.
RESULTS: There were 1158 (56% male) subjects with a mean age of 32.1 years. Multivariable regression analysis showed no association between birth weight and systolic blood pressure when adjusted for age, gender, body mass index (BMI), cigarettes and alcohol, and social class B = 0.04 (95% confidence interval −1.37, 1.45). A decrease of 0.1 mm Hg for each 1-kg increase in birth weight was observed after additional adjustment for parental high blood pressure but was not statistically significant. BMI and male gender were predictors of increasing blood pressure. A parental history of high blood pressure showed an increase in systolic blood pressure of 4.1 mmHg (maternal) and 3.0 mm Hg (paternal).
CONCLUSION: We were unable to demonstrate an inverse association between birth weight and systolic blood pressure. In this cohort, BMI and male sex remain consistent influences on blood pressure.
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KEY WORDS: Blood Pressure, Birth Weight, Body Mass Index, SHARP, Walker.

INTRODUCTION

Numerous studies have examined the relationship between birth weight and subsequent blood pressure. Some studies have reported no association (1, 2), whereas in others, a 1- kg increase in birth weight is associated with a 2- to 4-mm Hg decrease in systolic blood pressure (3). Authors of a recent review (4) have challenged the strength of this association and have demonstrated weaker associations in larger studies. However, a recent large study (5) has shown a robust association between birth weight and adult blood pressure, and these authors have suggested that weaker associations may be caused by "methodological limitations" that are more common in larger studies, particularly the use of recalled birth weight and blood pressure recorded for routine rather than research purposes.

We conducted a cohort study of relatively young, working adults with birth weight recorded prospectively and blood pressure data recorded for the specific purpose of a comprehensive cardiovascular risk assessment. The aim of the study was to examine whether an inverse association between birth weight and adult blood pressure would be apparent in this cohort.

MATERIALS AND METHODS

Study Population

Detailed birth data came from the Walker cohort (6), a database of 48,404 infants of 64,196 born in Dundee, Scotland, between 1952 and 1966 of whom 34,183 have been traced. This database contains extensive information covering perinatal and maternal characteristics, including birth weight recorded at the time of birth. Extensive data relating to adult environmental, demographic, and health factors were obtained from the SHARP (Scottish Heart and Arterial disease Risk Prevention) cohort (7). In brief, after extensive publicity about the SHARP screening program, a specially

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Selected Abbreviations and Acronyms

SHARP = Scottish Heart and Arterial Disease Risk Prevention
BMI = body mass index
SD = standard deviation

adapted bus staffed by a regular team of experienced nurses visited more than 700 workplaces between 1991 and 1993 at the employer's request, and employees were invited to volunteer to have a cardiovascular risk assessment. Variables, including height, weight, and blood pressure, were measured, and a blood sample was taken. Subjects were questioned regarding lifestyle and prescribed medication and a detailed family history of cardiovascular disease was taken. Overall, 75% of employees took up the offer of screening. A unique patient identifier, the Community Health Index Number, was used to record link subjects from the Walker cohort with information in the SHARP database.

Blood Pressure Measurement

Blood pressure was measured in the SHARP study with standard mercury sphygmomanometers with an appropriate cuff size. The subject sat for at least 5 min before measurements were made using the right arm. The diastolic pressure was determined at the fifth phase and all readings made to the nearest 2 mm Hg. Two readings were taken at an interval of approximately 5 min and the mean used for analysis. The local research and ethics committee approved the study.

Data Analysis

Systolic blood pressure was tested for normality with the Shapiro Wilk statistic, which suggested some deviation from normality ($W = 0.96$, $p < 0.0001$). However, an examination of a normal plot showed that this was not a significant problem. We therefore used a series of multivariable regression models as outlined by Lucas et al. (8) to assess the association of birth weight with adult systolic blood pressure.

The effect of body mass index (BMI) and current weight were examined in the regression models because both have been used in previous studies as indicators of the effect of adult body size on systolic blood pressure. However, as current weight is usually correlated with birth weight our study concentrated on BMI as the main confounding variable in the regression models.

Early model: Birth weight adjusted for age and gender as a predictor of systolic blood pressure
Later model: BMI as a predictor of systolic blood pressure
Combined model1: Early and later models combined
Combined model2: Combined model1 further adjusted for number of cigarettes per week, total units of alcohol per week and social class.
Combined model3: Combined model2 further adjusted for maternal and paternal history of high blood pressure.

A social class was defined from information on occupation reported in the SHARP database with standard occupation classifications (9), that is, 1 – Professional, 2 – Managerial and Technical, 3N – Skilled (nonmanual), 3M Skilled (manual), 4 – Partly skilled, and 5 – Unskilled. All analyses were conducted with SAS v8.1 (SAS Institute, Cary, NC).

RESULTS

The 34,183 subjects from the Walker cohort who have been traced could be used to link to the SHARP cohort of 8254 subjects who were born between 1952 and 1966. There were 1158 (56% male) subjects in the Walker database who also had information recorded in the SHARP database. These 1158 subjects comprised the study population.

When we compared the study population to the whole of the Walker cohort who had been traced, we found few differences. The mean birth weight of the study population was slightly greater, 3.36 kg (standard deviation [SD] 0.49) vs. 3.33 kg (SD 0.75), which was just statistically significant ($p = 0.05$) but is unlikely to be of clinical significance. Mothers of the study population were very slightly older at the time of birth, mean age 26.9 (SD 5.67) years vs. 26.4 (SD 5.73) and were less likely to have had hypertension during the pregnancy, 10.5% vs. 13.6%. The subjects in the study population were less likely to have been breast-fed (64.9% vs. 70.2%). There was no difference between the study population and the cohort for length of gestation, percentage of males, mother's parity, or mothers experiencing pre-eclampsia.

Subjects were aged 24 to 42 years (mean, 32.1, SD 4.51) at the time of the cardiovascular risk assessment. Their birth weights ranged from 1.52 kg to 5.36 kg. Fifty four subjects (4.7%) had a low birth weight of $\leq$2.5 kg compared with 5.2% in the traced Walker cohort. There were 86 (7.4%) subjects with a BMI > 30.

There was a linear trend by social class in several demographic variables with weight, BMI, cigarette consumption, and systolic blood pressure all lowest in social classes 1 and 2 and highest in social classes 4 and 5. Adult height and birth weight were higher in social classes 1 and 2 than in social classes 4 and 5.

Subjects were asked what prescribed medication they were taking. Two were definitely receiving treatment for high blood pressure, two others were possibly being treated for high blood pressure, and one was being treated for peripheral arterial disease. In addition, there were 19