National trends in birth weight: implications for future adult disease

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Birth weight is a powerful predictor of infant survival and is associated with morbidity, childhood growth, and adult height. Recently it has been argued that intrauterine conditions, represented by birth weight, have long term effects on adult conditions such as ischaemic heart disease and non-insulin dependent diabetes.[1] Thus national trends in this health indicator are of great interest.

Sources of information and results

In Scotland birth weight is reported on *Scottish Maternity Records (SMR2)* and collated by the Scottish Health Service Common Services Agency. The agency provided information on birth weights of liveborn infants since 1975. For England and Wales, routinely collected data on live births were obtained from the Office of Population Censuses and Surveys since 1983, when records were considered to be complete.[2]

The table shows an increasing percentage of heavier birth weights; regression of birth weights >3500 g against year indicates that heavier births increased by 0·40% a year (95% confidence interval 0·37% to 0·44%) in Scotland and by 0·35% (0·11% to 0·60%) in England and Wales. Over this period the proportion of births 2500-2999 g and 3000-3499 g steadily decreased and very low weight births (<1500 g) increased, with the proportion of other low weight births (<2500 g) remaining unchanged.

Comment

In recent years the birth weight distribution has shifted noticeably towards heavier birth weights.[3] Although generally related to infant and childhood outcomes, such changes may have wider implications if hypotheses linking intrauterine development with adult health[1] are confirmed. Good quality national data on birth weight are desirable for future monitoring; hence, the rise in incomplete data for England and Wales since 1989 is regrettable.

Annual increases in birth weight in England, Wales, and Scotland have been small and gradual, as in other countries such as Norway, Sweden, and the United States.[3] Even so, the impact of such changes may not be insignificant in relation to adult health. Risks associated with birth weight, as for other cardiovascular risk factors, seem to be continuous and graded: standardised mortality ratios for cardiovascular disease decrease from 119 for weights of <5·5 lbs (2500 g) at birth to 74 for those >8·5 lbs (3900 g).[4] Risk of disease is not confined to a high risk group. When risk is diffused throughout the population a large proportion of the population affected by a small risk may have a greater impact on population levels of disease than a smaller proportion at high risk. The distributional shift shown here for birth weight could therefore have substantial and favourable effects on future population levels of disease.

Although the general trend is towards heavier births, very low birth weights (<1500 g) are also increasing. The trend for Scotland is similar to that for England and Wales.[5] Possible explanations include an increasing proportion of triplets and higher order births, and changes in classification of non-registrable miscarriages to registered births.[5] Very low weight births are important in relation to infant deaths, but as they constitute a small proportion of survivors (under 1%) this increase is unlikely to have a major impact on population levels of adult disease.

Recent birth weight trends should not engender complacency, especially as we can only speculate as to why changes have occurred. Research on intergenerational influences on birth weight suggests that current trends may be as much a product of grandmaternal as of current circumstances. Increases in height and reductions in smoking in women (from 49% in 1972 to 34% in 1990 among 25-34 year olds) may contribute to the recent birthweight trend, while increases in the proportion of first births would tend to depress it. Within Britain at least the association between birth weight and socioeconomic circumstances is well

Trends in birth weight. Figures are percentages of live births unless stated otherwise

		Birth weight (grams)								
Year	No of live births	Not stated	≤1500	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000†	≥4500
				*Scotland**						
1975	65 064	0·47	0·69	1·21	4·97	18·74	39·60	26·60	6·79	0·91
1976	64 052	0·40	0·65	1·18	4·70	18·22	39·17	27·27	7·40	1·01
1977	61 786	0·56	0·74	1·18	4·54	18·24	39·32	27·26	7·15	1·01
1978	63 898	0·43	0·69	1·13	4·53	18·04	39·22	27·50	7·41	1·05
1979	66 970	0·47	0·76	1·21	4·47	17·93	38·72	27·52	7·72	1·19
1980	67 272	0·29	0·82	1·20	4·34	18·01	38·49	28·06	7·70	1·09
1981	68 087	0·19	0·79	1·22	4·31	17·48	38·75	28·27	7·88	1·11
1982	65 219	0·17	0·79	1·25	4·29	17·69	38·41	28·31	7·89	1·21
1983	64 261	0·13	0·85	1·36	4·35	17·58	38·02	28·15	8·34	1·22
1984	64 546	0·12	0·98	1·31	4·21	17·58	37·68	28·62	8·29	1·20
1985	65 318	0·09	0·86	1·34	4·45	17·00	38·00	28·43	8·51	1·31
1986	65 071	0·10	0·91	1·27	4·50	16·94	37·92	28·59	8·45	1·33
1987	65 334	0·07	0·90	1·35	4·40	16·89	37·25	29·06	8·67	1·40
1988	65 826	0·07	0·93	1·35	4·29	16·35	36·63	29·59	9·16	1·63
1989	63 376	0·13	0·92	1·24	4·31	16·29	36·46	29·58	9·49	1·58
1990	64 995	0·06	0·92	1·32	4·43	16·59	36·34	29·24	9·57	1·53
1991	65 827	0·06	0·77	1·38	4·21	16·08	36·30	30·01	9·54	1·62
1992‡	64 283	0·07	0·76	1·35	4·29	15·80	35·45	30·54	9·93	1·76
				England and Wales						
1983	629 134	0·14	0·84	1·26	4·59	18·59	38·62	27·33	8·63	
1984	636 818	0·13	0·87	1·28	4·54	18·40	38·47	27·62	8·67	
1985	656 417	0·13	0·90	1·30	4·60	18·35	38·34	27·52	8·85	
1986	661 018	0·09	0·93	1·35	4·65	18·13	38·13	27·70	9·03	
1987	681 511	0·07	0·95	1·33	4·54	17·71	37·95	37·44§		
1988	693 577	0·11	0·94	1·30	4·36	17·13	37·62	38·54§		
1989	687 725	3·07	0·95	1·28	4·31	16·73	36·26	37·40§		

*Numbers for Scotland are about 2% less than registered live births each year.
†England and Wales. ‡Provisional. §≥3500 g.

documented. Further improvements in birth weight depend, in particular, on the weights of babies from lower social class backgrounds increasing to resemble those in higher classes.

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Axillary sweating in clinical assessment of dehydration in ill elderly patients

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Dehydration is common in elderly patients[1] and may precipitate confusion, renal failure, infection, pressure sores, and constipation. It can be difficult to assess clinically in older patients since collagen changes reduce skin turgor,[2] the tongue may be dry from mouth breathing, and eyes may be sunken due to reduced periorbital fat.[3] We have examined the value of axillary moisture in assessing hydration in ill elderly patients.

Subjects, methods, and results

We studied people aged 70 or above consecutively admitted with acute medical conditions. Exclusion criteria were terminal illness; previous intravenous fluids; skin disorders; hypothermia ($\leq$34°C); bathing in past four hours; use of antiperspirants in past 24 hours. Within 24 hours of admission, one of us applied preweighted tissue paper to the patients' right axilla for 15 minutes (left axilla if the patient had right hemiparesis). Patients held the arm at their right side. The paper was then placed in a preweighed plastic bag and reweighed. Two blinded observers graded axillary moisture by feeling the axillae (0=dry, 1=moist). The observer order was random (interval 1-6 hours).

Subjects were classified as dehydrated or not dehydrated. Dehydrated subjects had a serum urea: creatinine ratio (mmol/l:μmol/l) above 1:10 and plasma osmolality above 295 mmol/kg.[4] Weight gains and serum urea concentrations were logarithmically transformed to achieve normal distribution.

We recruited 38 men and 62 women (age 70-98 (mean 80·2) years). The geometric mean (95% confidence interval) urea concentration was 15·5 (12·4 to 19·8) mmol/l for the 26 dehydrated subjects and 6·8 (6·3-7·5) mmol/l for the 74 without dehydration. Mean plasma osmolality was 308 (SD 19·3; range 295-369) mmol/l for dehydrated subjects and 290 (9·3; 269-312) mmol/l for non-dehydrated subjects.

Thirty three subjects were examined by only one observer, and three only had weight of paper assessed.

Correlation between axillary moisture and hydration

	Biochemical status		
	Dehydrated	Not dehydrated	Total
Observer grading:			
Dry	10	12	22
Moist	10	54	64
Total	20	66	86

Twenty one (24%) axillae were graded as dry by one observer and 24 (32%) by the other. There was agreement of grading in 80% of cases (κ=0·5[5]).

Observer grading and weight gain of tissue paper were related (first observer: geometric mean weight gains 1·78 mg for dry axillae (n=22) and 6·87 mg for moist axillae (n=64); t=6·43; P<0·001). Similar data were obtained for the second observer.

The mean weight gain for dehydrated subjects (3·25 (range 0·0-51·7) mg) was lower than for non-dehydrated subjects (5·54 (0·4-145·2) mg; t=1·85, P=0·06). Weight gain was associated with plasma urea concentration (r=−0·20, P=0·022; n=99), plasma:urine osmolality ratio (r=−0·23, P=0·016; n=53), and difference between urine and plasma osmolalities (r=0·16, P=0·050; n=53).

The table shows the results for the first observer (similar results were obtained for the second observer). Sensitivity of absent axillary moisture in detecting dehydration (percentage of dehydrated subjects without sweating) was 50% (10/20), and the positive predictive value (percentage without sweating who were dehydrated) was 45% (10/22). Specificity (percentage of non-dehydrated subjects with sweating) was 82% (54/66), and the negative predictive value (percentage with sweating who were not dehydrated) was 84% (54/64).

Comment

Axillary sweating is a reproducible and reliable sign of hydration in ill elderly patients with a high negative predictive value and moderate positive predictive value. Overall, 26% of patients were dehydrated but among patients without sweating prevalence of dehydration was 45%.

Interobserver variation may have been increased because some subjects were assessed over a short time and the tissue paper could have dried the axilla before grading. Biochemical classification of hydration is crucial. We used established strict criteria,[4] which may have classed some mildly dehydrated patients as not dehydrated, reducing the predictive value of the sign.

Despite the possible confounding effects of autonomic impairment we included patients with diabetes as this is common among old people in hospital. Predictive values in patients without diabetes were almost identical to the overall results.

The study was conducted as part of the Manchester Medical School fifth year options course.

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