Brit. J. prev. soc. Med. (1957), 11, 214–216

ABO BLOOD GROUPS AND BRONCHOPNEUMONIA IN CHILDREN

BY

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The association between ABO blood groups and certain diseases of the upper intestinal tract, peptic ulcer, gastric carinoma, and pernicious anaemia, is now well established, but this is not true for any of the other associations noted, except perhaps diabetes. The evidence has recently been summarized by Roberts (1957). Of the other associations that have been reported, the one which, if true, would be of most interest as a selective force acting on the relative frequency of the ABO groups is the association between bronchopneumonia in children and the ABO groups other than O. The observation that children of blood group O are relatively resistant to bronchopneumonia was made in 1949 (Struthers 1951). It was based on 400 consecutive *post-mortem* examinations at the Royal Hospital for Sick Children, Glasgow.

Struthers's findings were that 55 children had no apparent abnormality at death apart from bronchopneumonia, and that in this group only fourteen (25·5 per cent) were group O, compared with 51 per cent. group O children in a large control sample from the same area (χ^2 for one degree of freedom: 13·18). Of 93 children with bronchopneumonia associated with other abnormality, only 33 (35·5 per cent.) were group O, giving χ^2 for one degree of freedom: 8·16 in comparison with the contact sample. We note that there is no significant difference in the percentage of group O between the group with bronchopneumonia alone and that with bronchopneumonia in association with other abnormality, and in the combined series of 148 there are 47 group O children (31·8 per cent.), giving χ^2 for one degree of freedom: 20·5 in comparison with the control group. Struthers found that the deficit of group O children in his total series of 400 was largely confined to the 320 children under 2 years old, but he did not give the blood groups separately for children under 2 years old with or without bronchopneumonia. The ABO blood group distribution of the 252 children dying without bronchopneumonia did not differ significantly from that of the control sample.

We attempted to repeat Struthers's observations on children who came to *post-mortem* examination at the Hospital for Sick Children, London. A special examination was made by one of us (B.H.) of the sections of the lung of those children whose blood groups had been determined and who died between 1949 and 1955. The blood groups were not known to B.H. at the time of histological examination. There were 358 examinations but they were not consecutive. Usually only a proportion of the children available for necropsy were blood grouped, and in a few instances permission was given for only a limited examination which did not include the lungs. The total number of children examined *post-mortem* during these years was 964. The incompleteness of the series should not have introduced any bias, because inclusion was independent of the blood group and of the presence or absence of bronchopneumonia. The blood groups were determined by the tube and not the slide method.

It was soon apparent that the repetition of Struthers's observations could not be complete since no child in the London series had bronchopneumonia without other associated abnormalities. Few requests are received at the hospital for the admission of children with uncomplicated bronchopneumonia and the effective treatments now available have reduced mortality. But there were 171 children with bronchopneumonia in association with other abnormalities on which to base a comparison with Struthers's whole group of 148, or perhaps, more justly, with his group of 93 with bronchopneumonia associated with other abnormality.

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The lung sections were graded for bronchopneumonia into four groups:

(1) No bronchopneumonia: no evidence of inflammation

(2) Bronchopneumonia Grade 1: bronchiolitis with commencing infiltration of the lung tissue—the very earliest lesion diagnosable as pneumonia (as opposed to bronchiolitis).

(3) Bronchopneumonia Grade 2: definite consolidation involving part of the pulmonary lobule.

(4) Bronchopneumonia Grade 3: consolidation affecting the whole pulmonary lobule, including cases showing abscess formation.

In view of the differing quantities of lung tissue available for histological examination, it was not possible to compare the total extent of the lesions present in different specimens. The pneumonic process was therefore graded according to the maximum lesion present. The possibility that any given sections did not show the maximum lesion present in the lung is unlikely except in the case of very early pneumonia, as the customary practice in selecting histological material is to examine the areas which appear most abnormal to the naked eye.

The distribution by blood group is shown in Table I for the whole group dying at ages ranging from birth to 13 years, graded according to the absence or presence of bronchopneumonia and the degree of bronchopneumonia. The distribution is compared with a control series for the London area (Discombe and Meyer, 1952), which has proved typical of London and South East England.

The grouping of the children without bronchopneumonia is, as in Glasgow, similar to that of the controls. For the children with bronchopneumonia there is a small deficit of group O compared with "not O", a difference in the same direction as that found by Struthers (1951), but much smaller and not significant, (χ^2 for one degree of freedom: 1·78) These comparisons are shown in Table II.

TABLE I

BLOOD GROUPS OF CHILDREN DYING AT AGES RANGING FROM LESS THAN 1 TO 13 YEARS IN THE HOSPITAL FOR SICK CHILDREN, LONDON

Blood Group	No. of Controls	No. of Children with:				
		No Broncho-pneumonia	Bronchopneumonia*			
			Grade 1	Grade 2	Grade 3	All Grades
O	4,578	91	18	20	31	69
A	4,219	73	20	33	24	77
B	890	16	4	6	8	18
AB	313	7	3	3	1	7
Total	10,000	187	45	62	64	171

* Criteria for grading are given in the text

The distribution for children under 2 years of age is shown separately in Table III (overleaf). The deficit of group O among those with bronchopneumonia is slightly, but not significantly, increased (χ^2 for one degree of freedom: 2·57).

Further, the sub-grouping of those with bronchopneumonia into three grades reveals no definite trend for the proportion who are group O to decrease with an increasing degree of inflammation.

It is possible to confirm whether Struthers's findings are definitely incompatible with our own by Woolf's method, which makes allowance for the different blood group distributions in the control population (Woolf, 1955). If the comparison is made with Struthers's whole group with bronchopneumonia (which includes those with bronchopneumonia and no other apparent abnormality), the two series are very probably not compatible (χ^2 for one degree of freedom: 5·98), but if the comparison is made with

TABLE II

COMPARISON OF PROPORTION GROUP O AMONG CHILDREN WITH BRONCHOPNEUMONIA DYING AT THE ROYAL HOSPITAL FOR SICK CHILDREN, GLASGOW, AND THE HOSPITAL FOR SICK CHILDREN, LONDON

Blood Group	Glasgow						London			
	Controls		Children with Bronchopneumonia				Controls*		Children with Bronchopneumonia With Associated Abnormality	
			With Associated Abnormality		With and Without Associated Abnormality					
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
O	3,063	50·96	33	35·48	47	31·76	4,578	45·78	69	40·35
A+B+AB	2,948	49·04	60	64·51	148	68·24	5,422	54·22	102	59·65

For Glasgow (all bronchopneumonia) $\chi^2 = 20·54$; D. of F. $= 1$; $P < ·001$
For Glasgow (bronchopneumonia with associated abnormality) $\chi^2 = 8·16$; D. of F. $= 1$; $P < 0·005$
For London (all bronchopneumonia, including none without associated abnormality) $\chi^2 = 1·78$; D. of F. $= 1$; $0·1 < P < 0·2$

* Discombe and Meyer, (1952)

TABLE III

BLOOD GROUPS OF CHILDREN DYING AT THE HOSPITAL FOR SICK CHILDREN, LONDON

Blood Group	No. of Children dying at less than 2 years with:					No. of Children dying at 2 to 13 years with:				
	No Broncho-pneumonia	Bronchopneumonia				No Broncho-pneumonia	Bronchopneumonia			
		Grade 1	Grade 2	Grade 3	All Grades		Grade 1	Grade 2	Grade 2	All Grades
O	67	11	16	22	49	24	7	4	9	20
A	54	13	25	21	59	19	7	8	3	18
B	11	4	4	6	14	5	0	2	2	4
AB	3	2	3	1	6	4	1	0	0	1
Total	135	30	48	50	128	52	15	14	14	43

his group dying of bronchopneumonia associated with other abnormality, the London and Glasgow series are compatible (χ^2 for one degree of freedom: 2·37).

While, therefore, Struthers's findings are not confirmed in this London series, it does not follow that there is no phenomenon to investigate. It is not inconceivable that the degree of association differs in different areas of the country, and further studies would be valuable.

SUMMARY

The lungs of the children (358) on whom autopsy was performed at the Hospital for Sick Children, London, from 1949–55 inclusive, and whose ABO blood group was known, were graded according to the degree of bronchopneumonia if present. Struthers (1951) had reported a similar series from Glasgow showing a marked deficit of children of blood group O among those with bronchopneumonia alone and those with bronchopneumonia associated with other abnormality. In the London series there were no children with bronchopneumonia alone, and in the 171 with bronchopneumonia in association with other abnormalities the ABO blood group distribution did not differ significantly from that of the general London population. Comparison with Struthers's series shows no significant evidence of heterogeneity between the London and Glasgow groups with bronchopneumonia associated with other abnormality, but there is heterogeneity if the Glasgow cases with bronchopneumonia alone are included.

We are indebted to Dr. Martin Bodian for access to the *post-mortem* specimens and the *post-mortem* records, to Dr. Ian Cathie for the blood group determinations, and to Dr. J. A. Fraser Roberts for much helpful advice on methods of analysis.

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