

Study of Some Morphological, Physiological and Serological Parameters in Twins

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ABSTRACT The present study was conducted on 18 pairs of twins. The similarity method was used for zygosity determination. Eight pairs were found to be monozygotic and the rest dizygotic. Intra-pair differences regarding various morphological and physiological parameters were observed in these twins. MZ twin pairs showed very small differences for morphological parameters than DZ, confirming that MZ twins have similar genetic makeup. Physiological parameters however showed comparatively larger intra pair differences as they depend more on emotional state of the individual. The mean maternal age was found to be 28 years in our sample. The twinning tendency was found to be inherited in 50 percent of the cases with paternal transmission being more common (38.8 per cent) than maternal. None of the mothers admitted the intake of fertility drugs. No heritable diseases were detected though in a few cases one of the pair was reported to be more prone to some allergic or infectious conditions.

INTRODUCTION

Twin studies have been established as a most dependable tool in understanding the inheritance of simple as well as genetically complex traits and the nature-nurture problem. Environmental factors affect the development of genes into a trait to a great extent. The classical method for distinguishing between the part played by genes and the part played by the environment in the development of traits, is the comparison of the incidence of a trait in monozygotic and dizygotic twins.

The incidence of twin births ranges from 1 to 2 per cent in different populations of the world (Leviton and Montagu, 1977) and the causal factors for twinning are the secretion of increased amount of the hormones and higher maternal age of 35 to 39; (Gamzell, 1965; James, 1979) whereas some genetic factors are also found to be involved in the frequency of twinning in various families (Schmidt, 1983). Intake of fertility drugs also result in twin-births.

Newman, Freeman and Holzinger (1937) conducted a large scale study and concluded that the physical traits are least affected by the environment. The second important anthropometric study was done by Osborne and De George (1959). Sussane (1975) reported that genetic variability is highest for linear measurements and least for circumferential measurements.

The proposed study was an attempt to determine the zygosity of the twins on the basis of serological parameters and to check intra-pair differences in the monozygotic and dizygotic twins regarding morphological and physiological parameters.

MATERIAL

The study comprises of 18 pairs of twins. The data were collected from two districts of Punjab- Ludhiana and Patiala. Since age was not specified, the present data have a very broad range of subjects ranging from 6 years to 66 years.

Anti-A, Anti-B and Anti-D antisera were obtained from J. Mitra & Sons. Antisera containing antibodies to CcE and MNSs were procured from DiaMed.

METHODS

The serological parameters included were three blood group systems i.e. A₁A₂BO, Rh (CcDEe) and MNSs. The blood typing was done following the standard techniques of haem-agglutination reaction.

Zygosity determination was done by the similarity method using the formula given by McKusick (1969).

$$P(\text{twins are Mz}) = \frac{P(\text{Combination of traits if MZ})}{P(\text{Combination of traits if MZ}) + P(\text{Combination of traits if DZ})}$$

$$\text{Relative probability of zygosity} = \frac{P_{MZ}}{P_{DZ}}$$

GROWTH PARAMETERS

Some anthropometric measurements were taken on left side of the body using standard techniques recommended by Tanner et al. (1969) under the aegis of International Biological Programme/ Human Adaptability section. Height was taken with the help of anthropometer rod and weight by weighing machine. Bigonial diameter was taken using spreading calipers. Steel tape was used for measuring upper arm circumference and skinfold caliper for triceps skinfold.

Physiological parameters taken were pulse rate, respiratory rate and blood pressure. Blood

pressure was measured with sphygmomanometer.

RESULTS AND DISCUSSION

The results of the serological parameters and zygosity determination of the 18 pairs of twins investigated are presented in the table 1.

The similarity method classified the twins as MZ and DZ on the basis of inherited traits such as blood groups, since they are stable characteristics and independent of age. It is found that MZ twins are alike in such traits and a difference in a single allele establishes dizygosity.

The maternal age ranged from 23 to 34 years in our sample. Mean maternal age has been found to be 28 in the present study. James (1979)

Table 1: Zygosity determination on the basis of serological parameters

S. No.	Twin Pair	Sex	Blood Group Status			Probability value	Relative Likelihood favouring Monozygosity	Zygosity
			ABO	CcDEe	MNSS			
1	Vikas	Like	O	CDe	MNSS	0.96	25.28	Monozygotic
	Vivek	Sexed	O	CDe	MNSS	(for MZ)		
2	Varun	Like	B	CDe	MMss	0.96	25.28	Monozygotic
	Aditya	Sexed	B	CDe	MMss	(for MZ)		
3	Ajay	Like	B	cDe	MMSS	0.96	25.28	Monozygotic
	Vijay	Sexed	B	cDe	MMSS	(for MZ)		
4	Ramandeep	Like	B	CcDE	MNSS	0.96	25.28	Monozygotic
	Bikramjeet	Sexed	B	CcDE	MNSS	(for MZ)		
5	Harpreet	Like	B	CDe	MMSS	0.96	25.28	Monozygotic
	Gurpreet	Sexed	B	CDe	MMSS	(for MZ)		
6	Sanjeev	Like	O	CDE	MNss	0.96	25.28	Monozygotic
	Rajeev	Sexed	O	CDE	MNss	(for MZ)		
7	Parminder	Like	O	CcDe	NNSS	0.96	25.28	Monozygotic
	Rajinder	Sexed	O	CcDe	NNSS	(for MZ)		
8	Riturisham	Like	A	CDe	MMss	0.96	25.28	Monozygotic
	Neelkiran	Sexed	A	CDe	MMss	(for MZ)		
9	Lakhwinder	Like	O	CcDe	NNss	0.61(if MZ)	1.6	Dizygotic
	Harinderpreet	Sexed	O	CcDe	MNss	0.38(if DZ)		
10	Manmohan S	Like	O	CDe	MMSS	0.61(if MZ)	1.6	Dizygotic
	Tarloak S	Sexed	B	CcDe	MNSS	0.38(if DZ)		
11	Sonal	Like	O	CDe	NNSS	0.61(if MZ)	1.6	Dizygotic
	Monal	Sexed	O	CDe	MMSS	0.38(if DZ)		
12	Gaurav	Like	B	cDe	NNSS	0.61(if MZ)	1.6	Dizygotic
	Saurabh	Sexed	B	cDe	MNSS	0.38(if DZ)		
13	Shamsheer	Unlike	B	Cde	MNSS	-	-	Dizygotic
	Vishavpreet	Sexed	B	Cde	NNSS			
14	Jaspreet K	Unlike	O	CDe	MMSS	-	-	Dizygotic
	Taranpreet S	Sexed	B	CcDe	MNSS			
15	Brahamjot	Unlike	B	CDe	MMss	-	-	Dizygotic
	Brahamraj	Sexed	B	CcDe	MNss			
16	Rohit	Unlike	B	CDe	NNss	-	-	Dizygotic
	Rohini	Sexed	B	CDe	NNss			
17	Amarpal	Unlike	B	cDe	MMss	-	-	Dizygotic
	Amardeep	Sexed	B	CcDe	MNss			
18	Taranbir S	Unlike	Blood Grouping could not be done			-	-	Dizygotic
	Manmeet K	Sexed						

has suggested a higher maternal age of 38 years for twins. Twinning tendency was found to be inherited in 50% of the cases in the present study showing both paternal (38.8%) and maternal (11.1%) transmission.

None of the women responded positively to the intake of fertility drugs known to cause ripening of more than one ova at a time and hence resulting in twins or multiple births. None of the twins have shown any heritable disease, however, 44% cases have shown some allergic problems.

Various intra-pair differences between monozygotic and dizygotic twins for morphological and physiological parameters are briefed in table 2.

In the present study the twin pairs have been reared under very similar environmental conditions. It has been seen that the MZ twins show relatively smaller differences than those shown by DZ twins. The intra-pair differences in the MZ twins for morphological parameters might have originated during the intrauterine

period, as a result of mother's paragenetic factors. The large differences in the DZ twin pairs of the same sexes mainly originate because of the differences in the genetic makeup of the members of the twin pairs. A landmark study on a large sample of MZ and DZ twins by Wilson (1976) had shown negligible differences between the members of MZ twin pair in body length as compared to that of the DZ twin pairs.

In the case of physiological measurements even the MZ twins show larger intrapair differences as compared to those of the morphological characteristics. The development of these variables is perhaps very complex and have a greater linking to the emotional state of a person. The individual differ in their behavioral and emotional predisposition. Some people get disturbed even by slightest stress whereas others may be quite immune to these stimuli. This may be the reason that besides being similar in the genetic makeup, the members of MZ twin pair differ considerably in physiological functions as

Table 2: Intra-pair differences for morphological and physiological parameters

Variables	MZ Males N=5 Mean Age= 17.6 yr.	MZ Female N=3 Mean Age= 15 yr.	DZ Male Like sexed N=2 Mean Age= 36.5 yr.	DZ Female Like sexed N=2 Mean Age= 18.5 yr.	DZ unlike sexed N=6 Mean Age= 14 yr.
1. Height (cm)					
Mean Difference	1.62	0.766	6.45	1.3	10.38
S.D.	0.849	0.503	2.616	1.838	6.7
2. Weight (kg)					
Mean Difference	1.8	0.66	2.25	2.5	5.33
S.D.	1.788	0.577	2.474	0.707	4.32
3. Bigonial Diameter (cm)					
Mean Difference	0.18	0.133	0.5	0.15	0.633
S.D.	0.192	0.057	0.141	0.07	0.618
4. Upper arm circumference (cm)					
Mean Difference	1.00	0.63	3.6	1.8	2.08
S.D.	0.43	0.709	0.848	0.989	1.912
5. Triceps (mm)					
Mean Difference	0.6	1.06	4.4	3.1	1.86
S.D.	0.616	0.986	4.242	2.687	1.107
6. Pulse Rate					
Mean Difference	7.2	11	21	2	8.66
S.D.	4.549	3.605	7.071	2.828	3.502
7. Respiratory Rate					
Mean Difference	2.2	2	2	3	2.33
S.D.	1.095	1.732	0	1.414	1.211
8. Systolic Blood Pressure					
Mean Difference	4	4	9	1	6.66
S.D.	3.741	5.291	12.72	1.414	5.163
9. Diastolic Blood Pressure					
Mean Difference	4.4	5.33	10	0	4.66
S.D.	3.577	5.033	0	0	4.84

displayed by the blood pressure, respiratory rate and pulse rate.

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