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Multiple Birth Rates in Japan: Further Analysis

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Abstract: The rates of MZ and DZ twin births and of triplet births slightly decreased in Japan in 1955-1967 and 1974, whereas that of trizygotic triplets tripled. The rates of triplet and quadruplet births were comparable to those of Caucasians. Although the sample size is small, Japan seems to be characterized by higher rates of triplets and quadruplets of polyembryonal origin and lower rates of those of polyovulational origin as compared to Caucasian populations. Stillbirth rates in both MZ and DZ twins gradually decreased in 1960-1967 and 1974. The rate was higher in MZ than DZ twins, and higher in males than females. The secular trends of stillbirth rates in like-sexed triplets was similar to that in twins, whereas the rate in unlike-sexed triplets remained almost constant for the entire period. The rate was higher in like-sexed than unlike-sexed triplets.

Key words: *Twinning rates, Stillbirth rates, Maternal age, Birth order*

MULTIPLE BIRTH DATA

Multiple birth rates in entire Japan were analyzed using vital statistics for the years 1951-1968 and 1974 [13] and the "Survey on Socio-Economic Aspects of Vital Events - Plural Births in 1975" [14]. The latter consists of two surveys, A and B. In survey A, data on 25,184 children or fetuses born in plural deliveries to mothers of Japanese nationality were obtained from certificate records of live birth and fetal death (after the beginning of the fourth month of fetal life) for all of Japan in 1974. Survey B was conducted in July 1975 on a part of the above 25,184 cases, namely, multiple births registered from January 1 to June 30, 1974. The total number of households in survey B was 6,189. Questionnaires were directly distributed to all of them by health center officials, and 1,828 (29.5%) were not returned. Survey A includes information on maternal age, occu-

pation of the heads of the household, place of residence, number and sex of children in the plural birth according to birth order and live birth or fetal death, period of gestation, month of the year of live birth or fetal death. Information on the numbers of previous pregnancies and live births was also included. Survey B includes, in addition, information on plural births in relatives (not defined), previous plural births, treatment with ovulation inducing hormone (time is unknown), and other items. The following is the summary of results reported elsewhere [3-12].

SECULAR CHANGES IN MULTIPLE BIRTH RATES

Table 1 and Fig. 1 show the rates of twin, triplet, and quadruplet deliveries according to zygosity and year of birth. The rates per million from 1955 to 1967 were 4,112 and 2,258 for MZ and DZ twins, 32.81, 18.56, and 3.76 for MZ, DZ, and TZ (trizygotic) triplets, 0.803, 0.169, 0.042, and 0.085 for MZ, DZ, TZ, and TTZ (tetrazygotic) quadruplets, respectively. In 1974, corresponding rates were 3,903 and 1,856 for twins, 29.15, 14.57, and 12.22 for triplets, but unavailable for quadruplets. It is thus indicated that rates for MZ and DZ twins and triplets were slightly decreased, while the rate of TZ triplets tripled.

With respect to racial difference of triplet rates according to zygosity, MZ triplet rates in England and Wales (1938-62), USA (1922-54), Italy (1933-54) [2], and Australia (1920-69) [1] were 13, 21, 21, and 24 per million deliveries, respectively. The rate in Japan was 32 per million deliveries. DZ triplet rates per million deliveries in the former four countries were 62, 58, 75, 52, respectively, whereas the rate in Japan was 18, and TZ triplet rates per million deliveries were 34, 31, 52, 24 in the former four countries, and 4 in Japan.

According to Bulmer [2], MZ, DZ, TZ, and TTZ quadruplet rates per million deliveries were 0.29, 0.43, 0.42, and 0.56, respectively, for the combined data from England and Wales, USA, France, and Italy, whereas the corresponding rates in the present study were 0.803, 0.169, 0.042, and 0.085, respectively (Table 1). It is seen that, although the sample size both in Bulmer's report and in the present study is small, a characteristic feature in Japan is the higher rates of triplets and quadruplets of polyembryonal origin and the lower rates of those of polyovulational origin.

EFFECT OF MATERNAL AGE ON MULTIPLE BIRTH RATES

Table 2 and Fig. 2 show MZ and DZ twinning rates according to maternal age in 1960-1967 and 1974. The DZ twinning rate increased up to age 35-39 and decreased thereafter in both periods. The same tendency is seen in the MZ rate, but the maternal age effect is less marked. Table 3 shows MZ, DZ, TZ triplet rates according to maternal age in 1960-1967 and 1974. The MZ triplet rate is slightly increased up to age 35-39 and decreased thereafter, while the DZ triplet rate, as estimated from twinning rates, is markedly increased up to age 35-39 and decreased thereafter. The TZ triplet rate seems to be not dependent on maternal age.

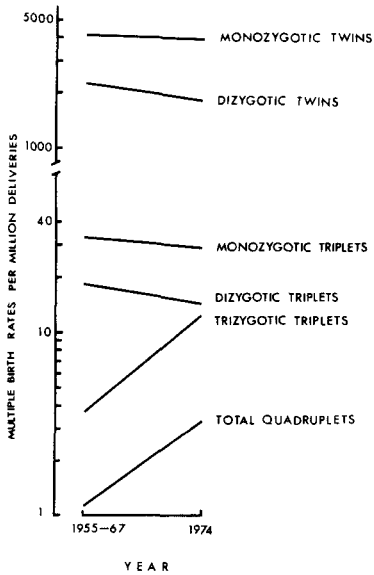


Fig. 1

Fig. 1 - Multiple birth rates during 1955-1967 and in 1974.

Fig. 2 - Birth rates of twins and triplets by zygosity and maternal age during 1960-1967 and in 1974.

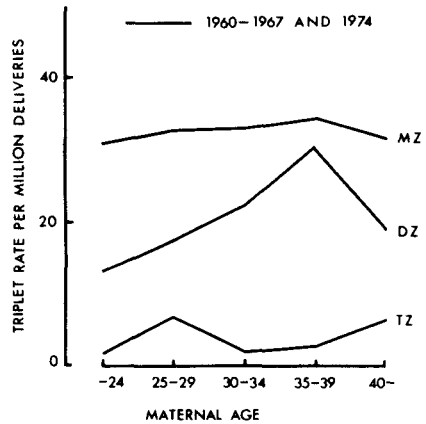
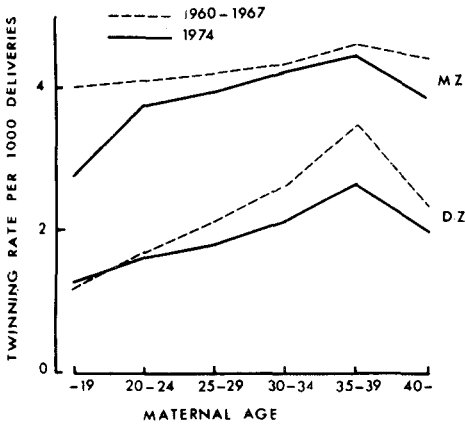


Fig. 2

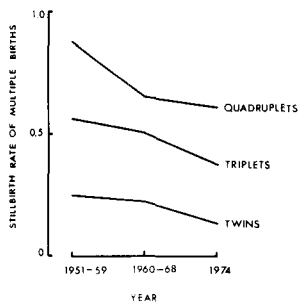


Fig. 3

Fig. 3 - Secular change of stillbirth rates in twin, triplet, and quadruplet births during 1951-1968 and 1974.

Fig. 4 - Secular change of stillbirth rates in twins and triplets, for males and females, during 1960-1967 and in 1974.



Fig. 4

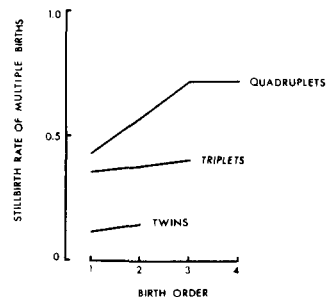


Fig. 5

Fig. 5 - Stillbirth rates in multiple births according to birth order in 1974.

TABLE 1 - Multiple Births, 1955-1967 and 1974

Multiple births	Zygoty	1955-1967		1974	
		Total deliveries (N)	Rate per million	Total deliveries (N)	Rate per million
Twins	Total *	151,709	6,414	12,392	5,826
	Monozygoty	97,262	4,112	8,302	3,903
	Dizygoty	53,404	2,258	3,948	1,856
Triplets	Total *	1,330	56.23	124	58.30
	Monozygoty	776	32.81	62	29.15
	Dizygoty	439	18.56	31	14.57
	Trizygoty	89	3.76	26	12.22
Quadruplets	Total *	27	1.141	7	3.29
	Monozygoty	19	0.803		
	Dizygoty	4	0.169		
	Trizygoty	1	0.042		
	Tetrazygoty	2	0.085		

* Including unknown sexes.

TABLE 2 - Twinning Rates per 1,000 Deliveries According to Maternal Age and Zygoty, 1960-1967 and 1974

Maternal age	1960-1967		1974	
	Monozygoty	Dizygoty	Monozygoty	Dizygoty
Under 20	3.99	1.18	3.14	0.90
20-24	4.06	1.69	3.71	1.63
25-29	4.17	2.14	3.91	1.83
30-34	4.31	2.67	4.18	2.16
35-39	4.52	3.50	4.12	2.69
Over 40	4.35	2.37	3.78	2.00

TABLE 3 - Triplet Rates per Million Deliveries According to Maternal Age and Zygoty, 1960-1967 and 1974

Maternal age	Monozygoty	Dizygoty	Trizygoty
Under 25	30.86	13.26	1.66
25-29	32.63	17.41	6.84
30-34	32.99	22.31	1.89
35-39	34.30	30.34	2.64
Over 40	31.36	18.81	6.27
Total	32.31	17.68	4.20

STILLBIRTH RATE IN MULTIPLE BIRTHS

Table 4 shows the decrease of stillbirth rates in twins in 1960-1967 and 1974. The rates of MZ and DZ twins were 0.270 and 0.224 in 1960, vs. 0.135 and 0.099 in 1974. The rate was higher in MZ than DZ twins.

TABLE 4 - Secular Change of Stillbirth Rates (SR) in Twins and Triplets, 1951-1967 and 1974

Year	Total *			Twin deliveries			Dizygotic			Total *			Triplet deliveries		
	N	SR	Total *	Monozygotic		Total *	Dizygotic		Total *	Like-sexed		Total *	Unlike-sexed		
				N	SR		N	SR		N	SR		N	SR	N
1951	15,143	0.2377							136	0.5319					
1952	14,007	0.2387							125	0.5600					
1953	13,053	0.2521							91	0.4908					
1954	12,655	0.2545							103	0.6084					
1955	12,042	0.2572							130	0.5051	101	0.4983	25	0.4533	
1956	11,725	0.2576							102	0.5915	73	0.5708	28	0.6310	
1957	11,407	0.2612							96	0.5451	72	0.5787	22	0.3939	
1958	11,817	0.2644							109	0.6055	76	0.6228	30	0.5333	
1959	11,579	0.2619							95	0.6070	76	0.6096	16	0.5208	
1960	11,159	0.2584	7,164	0.2704	3,922	0.2239			88	0.5530	69	0.5894	18	0.4259	
1961	11,394	0.2589	7,240	0.2775	4,060	0.2099			103	0.6408	87	0.6475	14	0.5714	
1962	11,454	0.2464	7,504	0.2681	3,868	0.1900			101	0.5512	76	0.5921	24	0.4028	
1963	11,638	0.2444	7,643	0.2649	3,908	0.1883			105	0.5143	84	0.5437	18	0.3148	
1964	12,168	0.2184	7,862	0.2398	4,220	0.1635			93	0.4695	71	0.4601	22	0.5000	
1965	12,266	0.2020	7,955	0.2235	4,212	0.1439			107	0.4611	84	0.4921	21	0.2857	
1966	9,848	0.2203	6,638	0.2400	3,118	0.1572			91	0.4799	67	0.5075	22	0.3485	
1967	13,212	0.1746	8,861	0.1905	4,256	0.1250			110	0.4485	82	0.4146	26	0.5128	
1974	12,392	0.1325	8,302	0.1347	3,948	0.0990			124	0.3790	84	0.3333	35	0.4000	

* Including unknown sexes.

TABLE 5 - Stillbirth Rates (SR) Among Multiple Deliveries, 1951-1968 and 1974

Year	Twin deliveries		Triplet deliveries		Quadruplet deliveries	
	N	SR	N	SR	N	SR
1951-1959	113,428	0.2531	987	0.5589	17	0.8824
1960-1968	105,486	0.2199	915	0.5038	15	0.6500
1974	12,392	0.1325	124	0.3790	7	0.6071

TABLE 6 - Stillbirth Rates in Twin and Triplet Deliveries According to Sex, 1960-1967 and 1974

Year	Twin deliveries		Triplet deliveries	
	Males	Females	Males	Females
1960	0.2777	0.2291	0.5923	0.5191
1961	0.2755	0.2297	0.6497	0.6233
1962	0.2643	0.2173	0.5461	0.5472
1963	0.2609	0.2155	0.4868	0.5195
1964	0.2299	0.1951	0.5000	0.4414
1965	0.2137	0.1777	0.4468	0.4540
1966	0.2383	0.1874	0.4701	0.4667
1967	0.1859	0.1518	0.5056	0.4641
1974	0.1349	0.1133	0.3988	0.3144

TABLE 7 - Stillbirth Rates (SR) in Multiple Births According to Birth Order in 1974

Multiple births	Number of deliveries	Total SR	1st-born	2nd-born	3rd-born	4th-born
Twins	12,392	0.1325	0.1177	0.1474		
Triples	124	0.3790	0.3548	0.3790	0.4032	
Quadruplets	7	0.6071	0.4286	0.5714	0.7143	0.7143

Table 4 shows secular changes of stillbirth rates in triplets. The overall rate was slightly increased from 1951 to 1961 and markedly decreased thereafter up to 1967 and 1974. Yet, the stillbirth rate of triplets remained 2-3 times as high as that of twins and 5-7 times as high as that of the general population during the period examined. Secular change of the stillbirth rate of like-sexed triplets indicated a similar tendency to overall rate, whereas the rate of unlike-sexed triplets remained almost constant for the entire period. For the years 1955-1967 and 1974, pooled stillbirth rate of like-sexed triplets is higher than that of unlike-sexed triplets and the difference is statistically significant at the 0.001 level.

Table 5 and Fig. 3 show overall stillbirth rates in multiple births in the years 1951-1968 and 1974. Stillbirth rates in twins, triplets, and quadruplets in 1951-1959 were 0.2531, 0.5589, and 0.8824, respectively. Corresponding rates in 1974 were 0.1325,

0.3790, and 0.6071, respectively. Therefore, stillbirth rates in multiple births decreased to one half in twins and to two thirds in triplets and quadruplets in about 20 years.

Table 6 and Fig. 4 show secular trends of the stillbirth rates in twins and triplets according to sex in the years 1960-1967 and 1974. In every year, sex difference of the stillbirth rate in twins is statistically significant, whereas in triplets it is not significant in every year and in pooled data.

EFFECT OF MATERNAL AGE AND BIRTH ORDER ON THE STILL-BIRTH RATE IN MULTIPLE BIRTHS

A higher stillbirth rate was seen in young and old maternal age groups both in MZ and DZ twins, the lowest rate being found in the group of 25-29 years for both zygositys. A similar pattern was seen in the stillbirth rate in the general population.

In like-sexed triplets, the stillbirth rate decreased from the youngest maternal age group to 30-34 years, then markedly increased thereafter. The pattern was similar but more marked in unlike-sexed triplets.

Table 7 and Fig. 5 show the increase in stillbirth rates in twins, triplets, and quadruplets with birth order in 1974.

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