Twinning and Birth Weight in the Israeli Jewish Versus Muslim Maternities

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Ethnicity differences account for genetic, environmental, lifestyle, and reproductive variables, influencing the rate of twinning (Nylander, 1981). Frequently, ethnic differences correlate with variable perinatal care leading to differences in outcome. Free access to antenatal care, and to facilities for delivery and neonatal care is available for the entire population in Israel, and therefor differences attributed to levels of medical care are practically negligible. We previously evaluated the overall relationship between ethnicity and outcome in a population-based cohort of mothers of twins (Goldman et al., 2001). However, the overall comparison may have masked some differences that could be present. The purpose of this study was to evaluate whether ethnicity is associated with differences in perinatal outcome in randomly selected, matched-controlled Israeli Jewish and Muslim mothers of twins.

Patients and Method

We used data of the Israeli Birth Registry obtained through the Central Bureau of Statistics, which includes, as required by law, all deliveries in Israel. The database of 12,785 twin pairs delivered during the period 1993–1998 has been used to select 12,567 pairs with known maternal parity (98.3%), complete birth weight data, and neonatal gender. We randomly selected 2388 Jewish and 2388 Muslim mothers matched for maternal age and parity. We selected 2388 mothers because this was the maximal number of mothers to accommodate all maternal ages and all parities in a 1:1 (Muslim:Jewish) quantitative relationship. We selected the 2388 Jewish mothers out of the Jewish maternal group based on a case-control method, and randomised selection inside the controlled group.

The data were analysed by the Microsoft Excel® program (Microsoft Corporation, Redmont, Washington). In addition, we studied in the entire population the following variables: change in twinning rate during the period 1993–1998, seasonality, urban or village origin of the family, maternal age and parity, twin gender combination, birth weight, total twin birth weight (TTBW: birth weight of twin A + twin B) and the percent inter-twin birth weight discordance (inter-twin birth weight difference divided by the birth weight of the larger twin), low birth weight (LBW) and very LBW (VLBW) were defined as birth weights less than 2500g and 1500g respectively.

We used the True EPISTAT Software (Math Archives, Round Rock, Texas) and SPSS 7.5.1 software (SPSS Inc.) for statistical analysis. The χ^2 test was used to compare frequencies and Student's t test was used to compare continuous variables. Probability values less than .05 were considered significant.

Results

During the study period, we found a consistent rise in the number of twin deliveries among Jewish mothers while the number of Muslim mothers remained relatively constant (Figure 1). Twinning rates for the Jewish and Muslim populations in Israel over the study period are shown in Figure 2. Since 1994 a constant rise in twinning rate among the Jewish population is clear, whereas in Muslim families a rise was registered during the latter years only.

Both ethnic groups display similar seasonality with relatively higher rates at the second half of the year (Figure 3). Although both sub-populations are predominantly urban, Muslim families originated significantly more often from rural areas (14.1% vs. 10.3% $p < 0.0005$). Muslim mothers were significantly younger than Jewish mothers (28.2±5.7

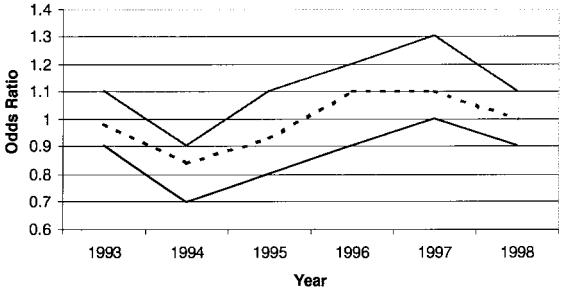

Figure 1
Odds Ratio (— — —) and 95% confidence interval (_____) of twin deliveries among Israeli Jewish and Muslim mothers.

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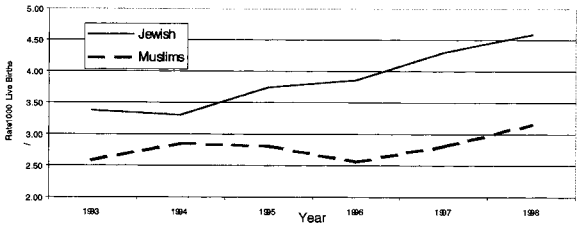

Figure 2

Twinning rates for the Jewish and Muslim populations in Israel.

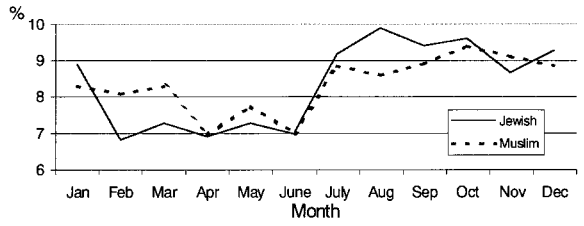

Figure 3

Seasonality in twin deliveries among Israeli Jewish and Muslim mothers.

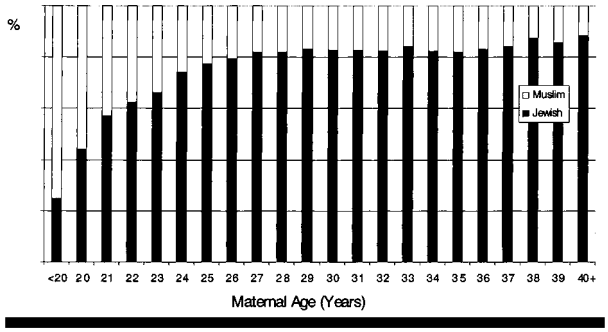

Figure 4

Maternal age in twin deliveries among Israeli Jewish and Muslim mothers.

vs. 30.5±5.2. $p < 0.0005$), the most significant difference was in the group of mothers less than 20 years of age where 75% of the mothers were Muslim (Figure 4). Muslim women delivered twins in a higher mean parity than Jewish women (2.3±2.2 vs. 1.3±1.6 $p < 0.005$ CI–1.1, –0.9). When twin gender combination was examined, we found similar frequencies of 60.7% (5873) vs. 63.4% (1620) for unlike-sexed twins in the Jewish and Muslim groups respectively.

A total of 4776 records (38% of the total population) including 2388 Muslim mothers matched for parity and age with 2388 Jewish mothers. The matching characteristics are shown in Table 1. The variables studied are shown in Table 2. Resemblance between the Israeli Jewish and Muslim populations was found in all parameters tested.

Table 1

Maternal Age and Parity for Selected Records

		Number	(Percent)
Parity			
	Nullipara	627	(26)
	1–2	797	(34)
	3+	964	(40)
	Total	2388	(100)
Maternal Age			
	≤20	99	(4)
	21–30	1422	(59)
	31–40	829	(34)
	>40	38	(2)
	Total	2388	(100)

Table 2

Factors Studied for Jewish and Muslim Population ($p > 0.05$)

	Jewish Population (%)	Muslim Population (%)
Mean Birth Weight (gr)	2384±614	2398±605
Smaller Twin BW (gr)	2240±580	2250±570
Larger Twin BW (gr)	2530±620	2550±600
Total Twin Birth weight (gr)		
< 1500	29 (1)	14 (1)
1500 – 2999	140 (6)	142 (6)
3000 – 4999	1115 (47)	1110 (46)
5000 – 6999	1080 (45)	1096 (46)
≥7000	24 (1)	26 (1)
Birth Weight Discordance		
< 15%	1738 (73)	1691 (71)
15%–25%	446 (19)	482 (20)
>25%	204 (9)	215 (9)
Low Birth Weight Combinations		
VLBW – LBW	109 (4.6)	105 (4.4)
VLBW – VLBW	140 (5.9)	128 (5.4)
LBW – LBW	775 (32.5)	751 (31.5)
Same Gender	1510 (63)	1495 (63)
Live in a City	2151 (90)	2058 (86)

Mean twin birth weight was almost identical in both populations with similar standard deviation. Both Jewish and Muslim mothers had no significant differences in the percentage of VLBW and LBW twins, as well as the TTBW and the inter-twin discordance.

Discussion

Twinning is subject to changes by a number of factors, including maternal age, parity, social class (Murphy & Botting, 1989) and ethnicity (Nylander, 1981). Immigration and interethnic mixing modify twinning rates as well (Pollard, 1995). It seems that ethnic origin is the most consistent factor which actually comprises all other factors as part of marital and maternity customs.

Previous report from Israel, compared Occidental Jews (immigrated from Europe and America) and Oriental Jews (immigrated from Africa and Asia). Mothers of Oriental origin, emigrating mainly from Muslim countries, had a higher rate of twinning — 10.4 per 1000 live birth, com-

pared to 8.9 in Occidental Jewish families (Modan et al., 1968). A comparison between Jewish and Bedouin populations in southern Israel showed an increase in dizygotic twinning in the whole population with time (1970 and 1986), largely due to an increased rate in the Bedouin population. The authors suggested that while dizygotic twinning rates are influenced by environmental factors, the monozygotic twinning rates are not (Picard et al., 1989).

Twinning rates among Muslim population is usually higher than among other population in the same country. In West Bengal, rates were 20.48 and 10.57 per 1000 deliveries for Bengalee Muslim population and the Bengalee Hindu caste population. The same correlation was found in different populations in India. This increased twinning rate may be due to the greater amount of inbreeding in the Muslim population (Das Chaudhuri et al., 1993).

Twinning rates were shown to be different among different ethnic groups, and higher among minorities in the same geographical area. Differences between afro-Americans, whites, and Asians were found in California with significant differences even within the Asian group (Pollard, 1995). Significant differences in twinning rate were found among Indian populations living in different continents (Pollard, 1985). In Malawi, families of minor ethnic origins have an unusually high twinning rate compared to the main ethnic group. A district with a mixed ethnic population, had by far the lowest rate (Pollard, 1996). Numerous studies have documented changes in twinning rates in spontaneous conceptions over time. One example shows the change from 0.7% to 1.5% the mid 18th century to 1987 among the Hutterites (Nonaka et al., 1993).

In this study the rate of male and female newborns was almost the same among Jewish and Muslim populations. No significance was found when maternal age, season, TTBW, discordance and birth year were compared. Differences between like-sexed and unlike-sexed twin pairs were not significant. In one study (Picard et al., 1991) the proportion of males in the Jewish subpopulation was significantly lower in twins than in singleton births; parity increased the odds for male twin birth while maternal age had the inverse effect. In the Bedouin subpopulation, the sex ratio did not differ significantly from that of singletons, and no consistent patterns were found by maternal age and parity. In South India, like-sexed pairs were lower than that of unlike-sexed (Rao et al., 1983).

We found a seasonal variation of twinning in our population as was also shown by Fellman and Eriksson (1999) during the spring-summer season in the Danish population, indicating a stronger seasonal variation for the twin maternities than for the general maternities. The authors assumed that some factors affected fecundity during summer-autumn and around Christmas time, making them prone to polyovulation and/or more able to complete a multiembryonic gestation. Canadian dizygotic twinning rates were shown to have a seasonal variation with an October maximum (Elwood, 1978). In Japan the highest rates were during April, with the lowest rate in September (Imaizumi, 1992). In the Hutterite population a significant seasonal variation was also found, significantly lower in May-July during the years until 1965 ($P < 0.01$) (Nonakaet al., 1993). Nylander (1981) noted no significant association between twinning and seasonality between African and Caucasian populations in Nigeria. In Israel, the peak month for the birth of monozygotic twins was September in Jewish and Beduin populations, while the maximum number of deliveries occurred in January for Bedouins and August for Jews. An autumnal peak was found, which was independent of ethnic origin (Picard et al., 1990). It seems that one as yet undefined seasonal factor affects the rates of multiple birth. It is clear that environmental factors, as well as those related to family planning programs influence the decision of conception and thereby the time of delivery.

The different maternal age and parity between Jewish and Muslim mothers could be explained by the two different cultures. Muslim motherhood starts usually earlier and contraception is much less practiced due to religious grounds and lower socioeconomic status in Israel. In contrast, the majority of the Jewish women postpone motherhood to older age. The reason for the higher rate of twinning among Jewish primiparas may be the more frequent use of assisted conceptions. Furthermore, although no effect of parity on the Jewish monozygotic twinning rate was found, this rate was directly affected by parity in Bedouin women. Both maternal age and parity affected the twinning rates in both populations; however, the effects were not additive without interaction between maternal age and parity (Picard et al., 1989). In Canada (Elwood, 1978) and Taiwan (Chen et al., 1987) increased twinning was noted with both maternal age and with the number of previous livebirths. In one study the higher the maternal age, the lower the twinning rates were, while the higher the parity, the higher the rates (Chen et al., 1992). In Ethiopia it was shown that the peak prevalence was seen after the sixth parity and in mothers 40–44 years old. Although we have no data on the number of twin deliveries at home in this study group, the monozygous and dizygous twinning rates per thousand deliveries tended to increase with both parity and maternal age (Zein, 1989).

Based on the data shown in our case-control comparison between Israeli Jewish and Muslim mothers of twins, we conclude that no significant differences in perinatal outcome were found between the two populations. We assume that free access to medical care, rather than different socioeconomic or behavioral variables, contributed to this similarity.

References

Nylander, P. P. (1981). The factors that influence twinning rates. *Acta Geneticae Medicae Gemellologiae (Roma), 30*(3), 189–202.

Goldman, R. D., Blickstein, I., & Mazkereth, R. (2001). Brief communication: The interplay between ethnicity and free access to perinatal care. *International Journal of Gynecology and Obstetrics, 73,* 163–164.

Murphy, M., & Botting, B. (1989). Twinning rates and social class in Great Britain. *Archives of Disease in Childhood, 64*(2), 272–274.

Pollard, R. (1995). Ethnic comparison of twinning rates in California. *Human Biology, 67*(6), 921–931.

Modan, B., Kallner, H., Modan, M., et al. (1968). Differential twinning in Israeli major ethnic groups. *American Journal of Epidemiology, 88*(2), 189–194.

Picard, R., Fraser, D., Hagay, Z. J., et al. (1989). Twinning in southern Israel; Secular trends, ethnic variation and effects of maternal age and parity. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 33*(2), 131–139.

Das Chaudhuri, A. B., Basu, S., & Chakraborty, S. (1993). Twinning rate in the Muslim population of West Bengal. *Acta Geneticae Medicae et Gemellologiae (Roma), 42*(1), 35–39.

Pollard, R. (1985). Twinning rates in Fiji. *Annals of Human Genetics, 49*(Pt 1), 65–73.

Pollard, R. (1996). Ethnic variation of twinning rates in Malawi. *Acta Geneticae Medicae et Gemellologiae (Roma), 45*(3), 361–365.

Nonaka, K., Miura, T., & Low P. K. (1993). Low twinning rate and seasonal effects on twinning in a fertile population, the Hutterites. *International Journal of Biometeorology, 37*(3), 145–150.

Picard, R., Fraser, D., & Picard, E. (1991). Ethnicity and sex ratio in twin births. *Acta Geneticae Medicae et Gemellologiae (Roma), 40*(3–4), 311–317.

Rao, P. S., Inbaraj, S. G., & Muthurathnam, S. (1983). Twinning rates in Tamilnadu. *Journal of Epidemiology and Community Health, 37*(2), 117–120.

Fellman, J., & Eriksson, A. W. (1999). Statistical analysis of the seasonal variation in the twinning rate. *Twin Research, 2*(1), 22–29.

Elwood, J. M. (1978). Maternal and environmental factors affecting twin births in Canadian cities. *British Journal of Obstetrics and Gynaecology, 85*(5), 351–358.

Imaizumi, Y. (1992). Twinning rates in Japan, 1951–1990. *Acta Geneticae Medicae et Gemellologiae (Roma), 41*(2–3), 165–175.

Picard, R., Fraser, D., Hagay, Z. J., et al. (1990). Twinning in southern Israel. Seasonal variation and effects of ethnicity, maternal age and parity. *Journal of Reproductive Medicine, 35*(2), 163–167.

Chen, C. J., Lin, T. M., Chang, C., et al. (1987). Epidemiological characteristics of twinning rates in Taiwan. *Acta Geneticae Medicae et Gemellologiae (Roma), 36*(3), 335–342.

Chen, C. J., Lee, T. K., Wang, C. J., et al. (1992). Secular trend and associated factors of twinning in Taiwan. *Acta Geneticae Medicae et Gemellologiae (Roma), 41*(2–3), 205–213.

Zein, A. Z. (1989). The frequency of multiple births in Gondar Hospital Northwestern Ethiopia. *Ethiopian Medical Journal, 27*(1), 21–26.