

# Ramadan and birth weight at full term in Asian Moslem pregnant women in Birmingham

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## Abstract

**The birth weights of 13 351 babies born at full term from 1964-84 to Asian Moslem mothers in Birmingham were analysed to see if the effect of the Ramadan fast on maternal biochemical profiles was of any clinical relevance. These were compared with two age matched control groups comprising white and non-Moslem Asian babies. Ramadan had no effect on mean birth weight at whatever stage of pregnancy it occurred. There was an increase in the prevalence of low birth weights (4.5% to 8%) among babies who were born at full term when Ramadan had occurred during the second trimester, but this was not significant.**

**We conclude that the Ramadan fast has no effect on the birth weights of babies born at full term.**

Moslems everywhere are required to fast from sunrise to sunset during the month of Ramadan. This is the ninth month of the Islamic calendar and begins 11 or 12 days earlier each successive Gregorian year.<sup>1</sup> Certain Moslems are given dispensation, including women who are pregnant. Most choose to fast at the set time, however, because all missed days must be repaid later, and it is easier to fast as a group than alone.<sup>2 3</sup>

Various metabolic changes occur in healthy adults taking part in such a fast. Mustafa *et al* found increases in serum uric acid and lipid concentrations as well as changes in overall fluid balance.<sup>4 5</sup> Furthermore, nutritional studies have shown that with a reduction in the frequency of meals food intakes are generally lower, with overall reduction in body weight,<sup>6</sup> more significant in women.<sup>7</sup> Similar metabolic changes have been described in pregnant women who observe the Ramadan fast in Gambia<sup>3</sup> and Birmingham,<sup>8</sup> and these included reduced blood glucose concentrations and raised plasma concentrations of free fatty acids and ketones. The clinical importance of these metabolic changes and in particular their effect on the outcome of pregnancy is, however, unclear.

The aim of this study was to determine whether Ramadan affected one clinical outcome of pregnancy—that is, birth weight.

## Subjects and methods

Data were drawn from the Birmingham births data from 1964 to 1984.<sup>9</sup> The race of the mother is included in the data set, but categorises

Asians as a single group. For this study it was necessary to distinguish between Moslem and non-Moslem (Sikh and Hindu) births. Preliminary work was therefore undertaken in order to separate these groups.

## DISTINCTION BETWEEN MOSLEM AND NON-MOSLEM ASIANS

The births data set includes the first three letters of the mother's maiden surname. Using these letters Asian births were allocated to three groups ('Moslem', 'non-Moslem', and 'uncertain'). In a small subgroup, the antenatal records of 100 mothers were reviewed at Sorrento Maternity Hospital. With the aid of literature on Asian names<sup>10-12</sup> it was possible to determine certain three letter prefixes that could be allocated to Moslem and non-Moslem surnames. This categorisation was then tried on a subset of the Birmingham data 1964-78 (19 111 Asian births). It was realised at this stage that some births would have to be omitted from the study because of the overlap of certain prefixes (for example, Kau may be Kauser (Moslem) or Kaur (Sikh)); 37% of Asian names could be allocated to the Moslem group with certainty, 49% were non-Moslem, and 14% could not be allocated. Having decided which three letter prefixes were in which categories, the same procedure was used for distinguishing between Moslem and non-Moslem Asians in the main data set.

## MAIN STUDY

For each Asian Moslem birth, a white and a non-Moslem Asian birth that had taken place within two days of the Moslem birth were selected. This controlled for secular and seasonal changes in distribution of birth weights. It was not always possible to select a non-Moslem Asian control because there was not always a non-Moslem Asian birth within two days of a Moslem birth. The numbers in this group are therefore smaller. We selected 13 351 Asian Moslem, 13 351 white, and 5 106 non-Moslem Asian births by this method. Only babies born at full term (38 to 41 weeks inclusive, the data set available) were included. The date of Ramadan in relation to the birth was then calculated.

Two items were used as measures of final outcome, the mean birth weight and the proportion of low birthweight babies. In order to look at sequential four week periods (Ramadan lasts for four weeks) the four week moving mean birth weight was calculated. A similar procedure was followed for proportions of low birthweight

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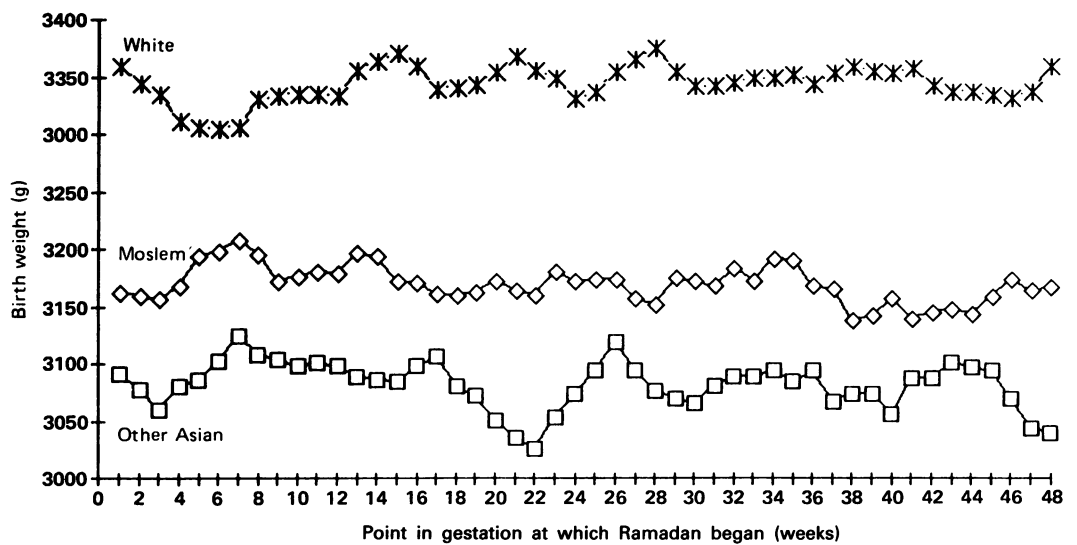


Figure 1 The effect of Ramadan on moving mean birth weight, 1964–84.

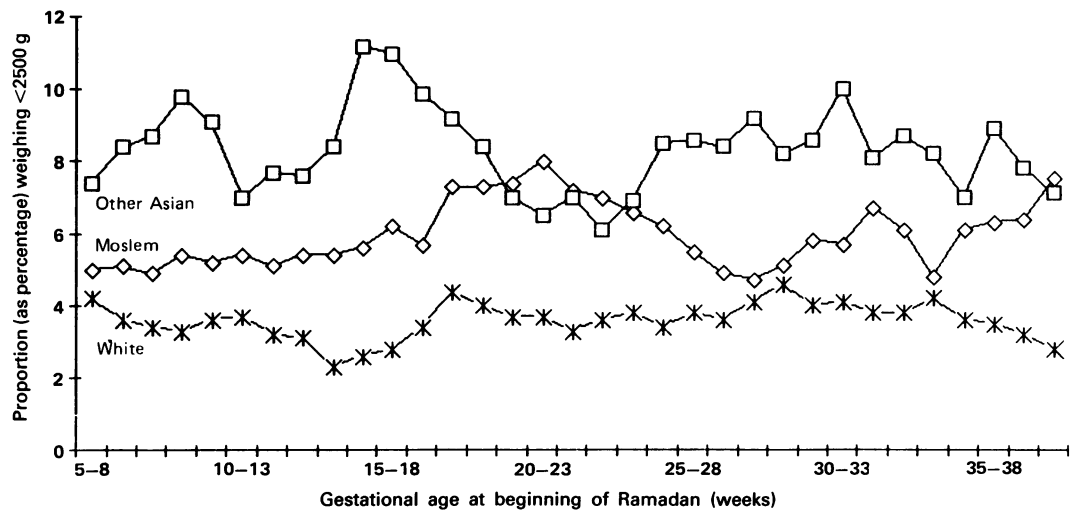


Figure 2 The moving four week proportion of low birthweight babies and Ramadan (plot of mean proportion for each consecutive four week period).

infants. In order to study further the effect of Ramadan, the data were reviewed in five year periods. This would show—for example—if there had been a secular trend in the observance of Ramadan, and therefore its effect on birth weight.

## Results

### CUMULATIVE ANALYSIS

Figure 1 shows the four week moving mean birth weight in relation to the timing of Ramadan for the three groups. There were no discernible changes in mean birth weight in relation to Ramadan in any of the groups. What is clearly shown, however, is that the mean birth weight of white infants was greater than that of Moslems (mainly Pakistani), which was in turn greater than that of non-Moslem Asians (mainly Hindus), confirming previous reports.<sup>13 14</sup>

Figure 2 shows the moving four week proportion of low birth weight in relation to the timing of Ramadan during gestation. There is a peak in the number of low birthweight babies delivered to Moslem mothers when Ramadan began at 17

to 25 weeks' gestation, and a similar peak in non-Moslem Asian births when Ramadan started during the period 13 to 18 weeks' gestation. Neither of these peaks was significant using a test of heterogeneity.<sup>15</sup>

### QUINQUENNIAL ANALYSIS

Figure 3 shows the moving mean birth weight for each five year period from 1964 to 1984 and where Ramadan occurred during gestation, among Moslems. If Ramadan had an effect on birth weight, a depression would have been seen in each line at the same point in the plot for each five year period. The depression would, however, move as Ramadan moved if the effect was seasonal. No such depressions are seen, but there was a general overall increase in birth weight over the 20 year period.

Figure 4 shows a similar quinquennial analysis of the moving proportion of low birthweight infants and where Ramadan occurred during gestation. In this instance if Ramadan had an effect there would be peaks in each graph, each occurring at a similar point. Similarly if there

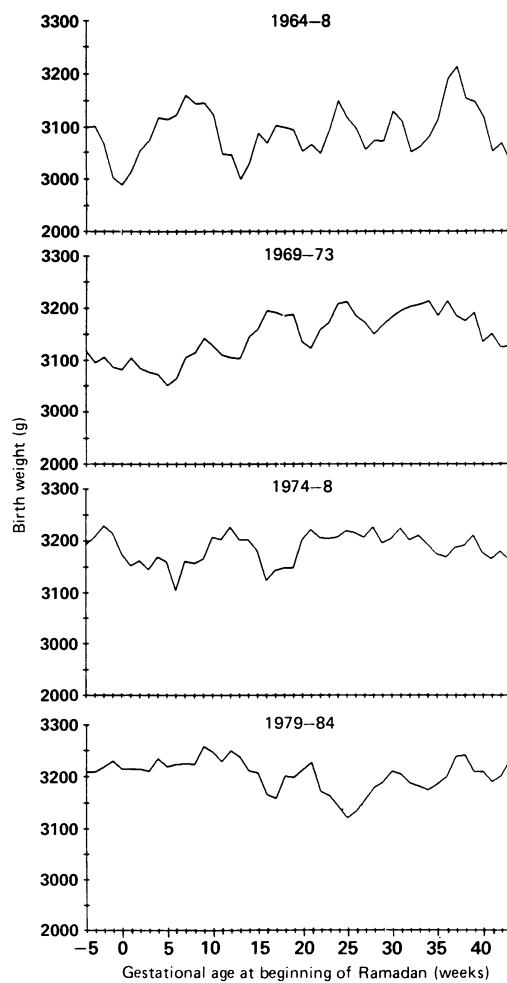


Figure 3 Moving mean birth weight and Ramadan (Moslem).

was a seasonal effect the peaks would move as Ramadan moved. A consistent peak is suggested on three of the four graphs (1969 to 1973, 1974 to 1978, and 1979 to 1984); this occurred when Ramadan started during weeks 17 to 24. There was no significance, however, when a test of heterogeneity was used.<sup>15</sup>

**Discussion**

Using available data on births in Birmingham between the years 1964 and 1984 neither visual trends nor statistical analysis suggested any effect of Ramadan on mean birth weight. Selection of data was dependent on tracing religion by prediction of names using three letter prefixes. There may have been some inaccuracies in this and some prefixes could not be allocated with certainty. This bias is unlikely to have had a systematic effect, however, and any random effect would have decreased the differences between the groups rather than exaggerated them. We have no indication of how many of the women included in the study adhered to Ramadan during pregnancy, although from the results of other studies at this hospital it seems that most Moslem mothers do observe the fast.<sup>2 8</sup>

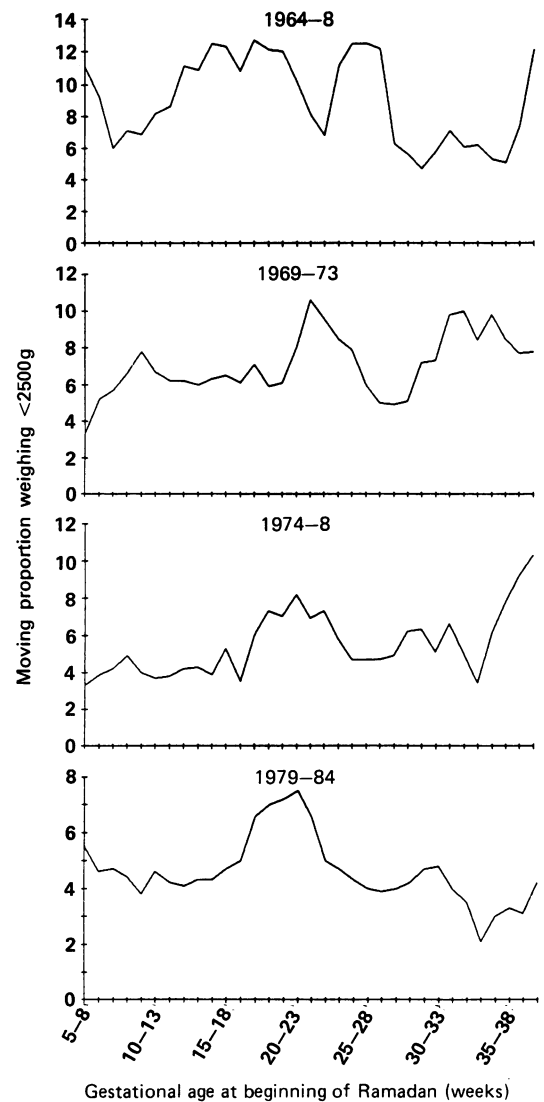


Figure 4 Quinquennial moving proportion low birth weight and Ramadan (Moslem) (plot of mean proportion for each consecutive four week period).

The effect of Ramadan on the prevalence of low birth weight was less clear cut. Both the cumulative and three of the four periods of the quinquennial analysis suggested that when Ramadan began in the middle trimester there was an increase in the proportion of low birth-weight babies subsequently born at full term. During the second trimester mothers lay down stores of fat in anticipation of later fetal demands,<sup>16</sup> and failure to do so is associated with lower birth weight among Asian mothers.<sup>17 18</sup> It was tempting to speculate that the metabolic disturbances of Ramadan fasting at this time had interfered with fetal growth. In clinical terms these variations in prevalence of low birth weight were quite pronounced, being from 4.5% to 8%, whereas in a similarly large number of white births, variation during the year was less (2.5% to 4%). These visual impressions were, however, not significant. In view of the large number of births it seems unlikely that this can be explained by a type II error. We therefore conclude that Ramadan has no effect on the prevalence of low birth weight in babies born at full term.

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