

## SHORT REPORT

## Changing sex ratio in Iran, 1976–2000

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*J Epidemiol Community Health* 2002;**56**:622–623

Sex ratio—that is, the ratio of male to total live births—is a subject of scientific interest but little is known about the factors that affect the sex ratio of humans. Many demographic and environmental factors have been suggested to affect the sex ratio. Some of these include birth order, race, coital rate, certain hormonal treatment,<sup>1,2</sup> parental age,<sup>1,3</sup> and exposure to environmental toxins.<sup>2</sup> Studies on secular trends in the human sex ratio at birth have shown that there are rapid increase during and just after war.<sup>4</sup> The sex ratio can vary between populations and changes within populations over time, for example it has been reported that it decreased in recent decades in some countries such as Denmark<sup>5</sup> and the United States<sup>6</sup> and increased in Italy<sup>3</sup> and Japan.<sup>7</sup> There is no investigation about the sex ratio in Iran. To determine if the sex ratio has changed in Iran we examined the live births data from 1976 to 2000.

## METHODS

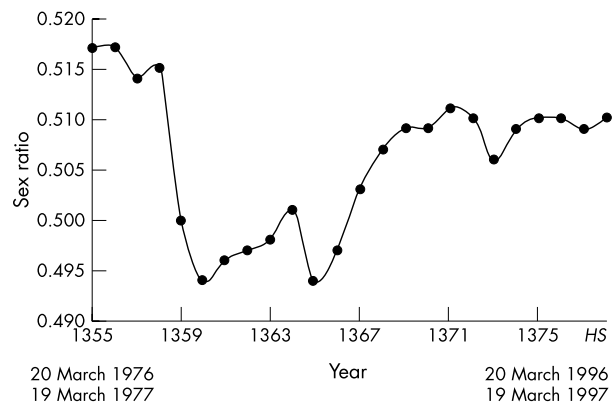
Data about live births are routinely compiled by the statistic centre of Iran (SCI). The annual number of live births by sex for the period 1355 to 1378 Hejrae Shamsi (HS) (Iranian calendar) was obtained from the annual publications of SCI. It should be mentioned that this period was from 20 March 1976 to 19 March 2000. The war between Iran and Iraq began at mid-1359 HS (September 1980) and ended in early 1367 HS (July 1988). To determine the possible effect of the war on the sex ratio, the total studied period was divided to three distinct parts as before, during, and after war. The odds ratio (OR) (the odds of being male) was calculated, considering the exposure to the war as a risk factor. An OR > 1.0 indicates an increase in the sex ratio and an OR < 1.0 indicates a decrease in the sex ratio.

## RESULTS AND DISCUSSION

The sex ratio for all live births in Iran was 0.517 in 1355 HS (1976–77) and declined gradually to 0.514 in 1358 HS (1979–80). It had decreased to 0.500 in 1359 HS (1980–81), which was the beginning of the war, and with some degree of fluctuation reached 0.503 in 1367 HS (1988–89), which was the end of the war. It increased thereafter and reached to 0.510 in 1378 HS (1999–2000) (fig 1). The sex ratio decreased significantly in Iran during war when compared with prewar (OR=0.9287; 95% CI 0.9271 to 0.9303) and when the comparison was done between wartime and postwar years it showed significant increase (OR=1.0440; 95% CI: 1.0431 to 1.0460). Another point is that the sex ratio decreased in postwar period when compared with prewar period (OR= 0.9701; 95% CI: 0.9683 to 0.9718).

This is not in complete agreement with previous studies on the first world war and second world war. It has been shown that the sex ratio increased in practically all the belligerent European countries during the first world war and in the succeeding two or three years; also an increase in England and Wales during second world war was detected.<sup>4</sup>

There are other factors such as parental age and birth order, which is suggested to affect the sex ratio. Although we were limited by availability of precise data about birth order and parental age of live births, but as suggested by Erickson the association between birth order and sex ratio accounts for only a very minor (<10%) proportion of the total variation in the



**Figure 1** Sex ratio for live births in Iran, 1976–2000. HS means the Iranian calendar.

ratio.<sup>1</sup> Certainly this is true for parental age, the effect of which on sex ratio was not established by some studies.<sup>1</sup> According to population census data, the average Iranian family size was 4.9 in 1355 HS (1976–77) without change in 1365 HS (1986–87) and decreased significantly ( $t=-35.8$ ,  $p<0.0001$ ) to 4.6 in 1375 HS (1996–97). Taken together, it is clear, that demographic changes did not provide an obvious explanation for the remarkable decline during wartime.

Of interest are the animal studies that have suggested that under favourable environmental and maternal conditions male infants would be favoured and the probability of delivering a female infant would increase under unfavourable conditions,<sup>8</sup> which surprisingly seems reasonable to explain the findings of our study. There is little doubt that the environmental conditions were disturbed during wartime and became unfavourable because of psychological tensions and stressful life. However, it is possible that unidentified factors would be responsible for this variation and it therefore needs further studies to explore those factors.

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Funding: the study was supported by Shiraz University.

Conflicts of interests: none.

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Accepted for publication 11 March 2002

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