

Letter to the editor:

**SEX RATIO AT BIRTH IN COVID-19 ERA:
A REPORT FROM IRAN**

Mostafa Saadat 

Department of Biology, College of Sciences, Shiraz University, Shiraz 71467-13565, Iran,
Fax: +98-71-32280926; E-mail: saadat@shirazu.ac.ir

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Dear Editor,

The sex ratio at birth (SRB) is defined as the ratio of male to all live births (male proportion). It has been relatively well established that mammalian SRB is an indicator of parental condition at the time of conception (James, 1994, 1997; James and Grech, 2018). When parents experience acute stressful conditions, the SRB shows significant alteration. For example, the SRB decreased significantly after earthquakes in Kube (Japan) and Bam (Iran) (Fukuda et al., 1998; Saadat, 2008). It should be noted that SRB might be increased under some other stressful conditions (Saadat et al., 2002; Saadat, 2006).

In Coronavirus Disease 2019 (COVID-19) pandemic, there are several stressors such as infection fears, financial loss, longer quarantine duration, boredom, inadequate supplies, etc. Negative psychological effects of these factors are expectable. In a recently published systematic review using 103 studies, anxiety prevalence among general population has been estimated equal to 27.3 percent (Pashazadeh Kan et al., 2021). Considering that there is no study on alteration of SRB during the current COVID-19 crisis, the present study was carried out.

The first confirmed COVID-19 patients were declared in February 21, 2020 by Iranian Ministry of Health and Medical Education. Data for number of live births by sex was extracted from the National Organization for Civil Registration database. The SRB was calculated in three distinct interval periods. Thirty six months before diagnosis of the first cases of COVID-19 as control level (first interval), the first 9 months after the beginning of the epidemic (second interval), and 4 months after that (months 10-13 post-epidemic as third interval). The SRB was expressed as the male proportion. The χ^2 test was used to compare SRB in the second and third intervals with control. A $p < 0.05$ was considered a statistically significant difference.

The number of total live births (males / females) in the first, second and third intervals was 4075425 (2099500 / 1975925), 849959 (438396 / 411563), and 349514 (180762 / 168752), and the corresponding SRBs were 0.5152, 0.5158, and 0.5172, respectively. Although, there was no significant difference between the second and first intervals for SRB ($\chi^2 = 1.09$, $df = 1$, $p = 0.295$), the elevation in the SRB in third interval compared with control level was statistically significant ($\chi^2 = 5.25$, $df = 1$, $p = 0.022$).

Alteration in the offspring SRB has been discussed as an important health indicator for monitoring whether parents were exposed to hazardous factors (James, 1994, 1997; James and Grech, 2018; Obel et al., 2007). Numerous studies indicated that SRB decreased in various stressful conditions, such as the Kobe (Fukuda et al., 1998) and Bam earthquakes (Saadat,

2008), the London smog and the Brisbane flood (Lyster, 1974), during war of Iran-Iraq (Ansari-Lari and Saadat, 2002; Saadat and Ansari-Lari, 2004; Saadat, 2011), exposure to gasoline (Ansari-Lari et al., 2004) and insecticides (Adachi et al., 2019). Considering that anxiety prevalence increased among general population during COVID-19 (Pashazadeh Kan et al., 2021), I thought that SRB should be decreased in this period. However, the present finding did not support my hypothesis.

It should be noted that SRB increased in some other stressful conditions, such as, in offspring of residents of contaminated areas of Masjid-i-Sulaiman (Khozestan province, Iran) by natural sour gas containing high level of H₂S (Saadat et al., 2002), in Sardasht (northwest of Iran) after chemical bombardment by Saddam Hussein's regime (Saadat, 2006), and in offspring of persons exposed to organochlorine pesticides (Abdel Hamid et al., 2020).

Mass disasters, such as the pandemic COVID-19 potentially may affect several aspects of human health including sexual behavior and health. Studies on sexual desire and activity during pandemic COVID-19 have controversial results. Although the majority of studies reported the negative impact of the quarantine on sexual life (Fuchs et al., 2020; Bhambhvani et al., 2021; Cito et al., 2021; Szuster et al., 2021), there are some studies which indicated sexual desire and activity elevated in COVID-19 era (Yuksel and Ozgor, 2020; Stavridou et al., 2021). On the other hand, recently it has been confirmed that sexual activity may decrease the risk of quarantine-related problems such as anxiety (Mollaioli et al., 2021). It has been suggested that SRB positively correlated with parental coital rate (James, 2008, 2009). If in Iranian population, sexual activity increased in COVID-19 era, then the present finding, at least in part, might be interpreted by correlation between SRB and parental coital rate. However, there is no study on alteration of sexual activity in Iran.

Finally, it should be added that the Iranian population in the study period has experienced unfavorable economic conditions such as a sharp increase in inflation rate, which has been due to economic sanctions imposed by many countries. Unfavorable economic conditions can be considered as a confounding factor in the present study. Reliability and consistency of the results of the present study should be evaluated by future studies in other populations.

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Conflicts of interest

None.

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