

Original Article

Maternal factors and the male to female birth ratio in Malta

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Abstract

Introduction: The sex ratio at birth is commonly calculated as the total male live births divided by all live births, and is represented as M/F. A multitude of factors influence M/F, especially stress, which increases male foetal losses during pregnancy.

This study was carried out in order to ascertain whether any maternal or perinatal relevant factors influenced M/F in Malta.

Methods: National Obstetric Information System data was used for the period 2012-2015. Non-Maltese mothers were excluded. Factors analysed were maternal age, marital status, education, body mass index, regularity of menses, utilisation of assisted reproductive technology, previous diabetes mellitus, previous miscarriages, abortions, ectopic pregnancies, vaginal deliveries, caesarean sections, livebirths, early and late neonatal deaths, stillbirths and premature deliveries. Intra-partum conditions included infection, cardiovascular disorders and all forms of diabetes mellitus.

Results: This study analysed 14498 births. None of the above mentioned variables was significantly linked to the M/F ratio.

Discussion: Our dataset failed to find any variables that influenced M/F, including stressing variables. However our study may have been underpowered due to the small numbers of births and the relative rarity of the various conditions. Alternatively, in Malta, such variables may produce little or no stress due to hitherto unknown mitigating factor/s.

Key words

Sex Ratio, Infant, Newborn, Malta

Introduction

The sex ratio at birth is commonly defined as male divided by total births and is conventionally referred to as M/F. A multitude of factors have been shown to influence this ratio,¹⁻² most notably stress, which appears to be linked to an increase in male foetal losses during pregnancy.³ It is very difficult to access any given country's periconceptual and pregnancy data at sufficiently detailed level in order to perform an analysis of factors that might conceivably influence M/F.

In Malta, data on all births is collected by the National Obstetric Information System (NOIS) at the Directorate for Health Information and Research and access to anonymised data was possible.

This study was carried out in order to ascertain whether any relevant variables influenced M/F in Malta and if so, to perform a multivariate analysis (logistic regression with binary outcome male or female) so as to determine which model best fits any putative discernible influence on M/F.

Methods

NOIS data was deemed suitably complete for the period January 2012- December 2015 (Dr. Miriam Gatt – personal communication) and therefore analysis was restricted to births in this period. Furthermore, a shorter time period was deemed more appropriate so as to avoid time-series issues. All non-Maltese mothers were excluded.

Variables deemed relevant to this analysis

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were maternal age, marital status, education, body mass index, regularity of menses, utilisation of assisted reproductive technology, previous history of diabetes mellitus, miscarriages, abortions, ectopic pregnancies, vaginal deliveries, caesarian sections, livebirths, early and late neonatal deaths, stillbirths and premature deliveries. The following conditions in the pregnancy itself were also factored in: infection, cardiovascular disorders and all forms of diabetes mellitus

The data was analysed in the Statistical Package for the Social Science (SPSS) version 20. The null hypothesis was that none of the above variables significantly influenced M/F. Each variable was first tested in order to ascertain whether it was linked to M/F. The chi-squared test of association and the unpaired t-test was used depending on the nature of the individual variables. A p value of ≤ 0.05 was taken to represent a statistically significant result.

Results

This study analysed all 14498 births to mothers of Maltese Nationality during this period. None of the above mentioned variables was significantly linked to M/F ratio on univariate analysis. For this reason, multivariate analysis was not indicated.

Discussion

It is well known that stress at population level is strongly linked to changes in M/F. The ultimate cause is postulated to be one of evolutionary biology and is known as the Trivers–Willard hypothesis.⁴ This suggests that in polygynous species (wherein males have multiple mating opportunities with several females), female mammals (including humans) are able to adjust M/F in response to their periconceptual and intrapregnancy conditions. This is because under poor environmental conditions, a male pregnancy (which yields a larger baby) is more difficult to carry to term. If the baby survives to birth, a frail male may not survive infancy and childhood. Should he manage, he would compete poorly for mating privileges with more robust males. A female baby who survives to reproductive age is likely to become pregnant. On the other hand, in good conditions, a male baby is likelier to propagate his mother's genes as he has more mating opportunities than a female who is limited by pregnancy and

lactation. Hence, under poor conditions, males are likelier to be spontaneously aborted than females,³ a process which appears to cull the frailer males.⁵

Our dataset failed to find any variables that influenced M/F, including variables that prima facie appear to be reasonable proxies for poor condition as defined above. These include, for example, single mothers and lack of support during pregnancy. However, such influences may be small and our study may have been underpowered due to the relatively small available number of births. Alternatively, in Malta, such variables may produce little or no stress due to mitigating factor/s that were untestable as unavailable.

References

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