Research Paper

Sex Ratio Imbalance and Deficit of Female Births in Ardabil Province, Iran

Samira Shahbazzadegan[1*]

1. Department of Midwifery, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran.

Use your device to scan and read the article online

Citation Shahbazzadegan S. Sex Ratio Imbalance and Deficit of Female Births in Ardabil Province, Iran. Iranian Journal of Health Sciences. 2025; 13(4):329-332. http://dx.doi.org/10.32598/ijhs.13.4.1196.1

http://dx.doi.org/10.32598/ijhs.13.4.1196.1

ABSTRACT

Background and Purpose: An imbalanced sex ratio at birth (SRB), characterized by an excess of male births, is a serious problem in some parts of the world . This study was conducted to determine the sex ratio imbalance and deficit of female births in Ardabil Province, Iran.

Materials and Methods: In this cross-sectional descriptive study, data related to the births in Ardabil province were extracted from an integrated health system from Mar 2017 to Feb 2024. All live births since the beginning of 2017 were included. The sex ratio for each year was calculated by dividing the number of live male births by the number of live female births and multiplying the result by 100. The expected number of female births was determined by dividing the number of live male births by 105 and then multiplying by 100. The deficit of female births was obtained by subtracting the actual number of female births from the expected number of female births. The obtained data were compared with the normal SRB using a one-sample t-test utilizing SPSS software, version 16.

Results: A total of 117,763 births occurred in Ardabil Province (64,892 male and 52,871 female) from 2017 to 2024. The expected number of female births was 61797. Therefore, the actual number of female births was 8,926 less than the expected value. The average SRB for the study period was 122.5, which is significantly higher than the normal SRB (P<0.001).

Conclusion: During the past seven years, a deficit of about 9,000 female births compared to the expected value was observed in Ardabil Province. This can intensify population reduction. Education to improve public awareness about gender equity and legal restrictions on sex-selective procedures are suggested.

Keywords: Population dynamics, Sex ratio imbalance, Female deficit, Fertility

Article info:
Received: 02 Jan 2025
Accepted: 11 Feb 2025
Available Online: 01 Oct 2025

*** Corresponding Author:**
Samira Shahbazzadegan, Associate Professor.
Address: *Department of Midwifery, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran.*
Tel: *+98 (45) 33728005*
E-mail: *samirashahbazzadegan2000@yahoo.com*

Introduction

Sex ratio at birth (SRB) is the ratio of males born per 100 females, which naturally ranges between 103 and 107 [1]. It is remarkably constant in human populations [2]. Gender preferences for offspring exist worldwide, with varying patterns [3]. In Iran, male preference as a lasting cultural characteristic, leads some parents to prefer males and eliminate females. Although SRB levels in Iran are currently within normal ranges, they are increasing and abnormal in some provinces [3, 4]. In addition to the declining live birth rate, the highest reported sex ratio in the country belongs to Ardabil City, which is 127 male births for every 100 female births [4]. "Masculinisation" is a clear aspect of Asia's recent population dynamics that cause an unexpected increase in the number of males in its population [5].

Social determinants of health (SDH) have a greater impact than medical care, and gender is one such determinant [6]. The fertility rate is declining in many countries, including Iran and Ardabil province [4]. Given the country's priorities in supporting families and the lack of comprehensive SRB studies, this research was conducted to determine the sex ratio imbalance and the deficit of female births in Ardabil Province, Iran.

Materials and Methods

In this cross-sectional descriptive study, the data were collected from an integrated health system from Mar 2017 to Feb 2024 in Ardabil province. The inclusion criteria were live births registered in public healthcare facilities in Ardabil Province between 2017 and 2024. The gender of all newborns at birth that were registered in the integrated health system since the beginning of the study in 2017 was collected.

The sex ratio and expected female births for each year was calculated. Sex ratio was calculated by dividing the number of live male births by the number of live female births and multiplying the result by 100. The expected number of female births was calculated by dividing the number of live male births by 105 and multiplying by 100 [1]. The data were compared to the normal SRB with using SPSS software, version 16.

Results

The results showed that from 2017 to 2024, 117763 births occurred in Ardabil province (64892 males and 52871 females), while 61797 female births were expected to achieve a normal SRB. In other words, achieve (Table 1).

Table 1. Birth statistics in Ardabil province from 2017 to 2024

Birth Statistics Time Intervals	No. (%)			
	Birth		Expected Female Birth	Deficit Female Birth
	Male	Female		
Mar 2023 to Feb 2024	7530(55.11)	6134(44.89)	7171(52.48)	1037(7.59)
Mar 2022 to Feb 2023	7890(54.66)	6544(45.38)	7514(52.06)	970(6.72)
Mar 2021 to Feb 2022	8341(55.67)	6643(44.33)	7943(53.01)	1300(8.68)
Mar 2020 to Feb 2021	8696(55.30)	7029(44.70)	8281(52.66)	1252(7.96)
Mar 2019 to Feb 2020	9432(53.77)	8110(46.23)	8982(51.20)	872(4.97)
Mar 2018 to Feb 2019	11155(55.74)	8858(44.26)	10623(53.08)	1765(8.82)
Mar 2017 to Feb 2018	11848(55.36)	9553(44.64)	11283(52.72)	1730(8.08)
Total	64892(55.10)	52871(44.90)	61797(52.48)	8926(7.58)

Shahbazzadegan S. Sex Ratio Imbalance and Female Birth Deficit in Ardabil. Iran J Health Sci. 2025; 13(4):329-332.

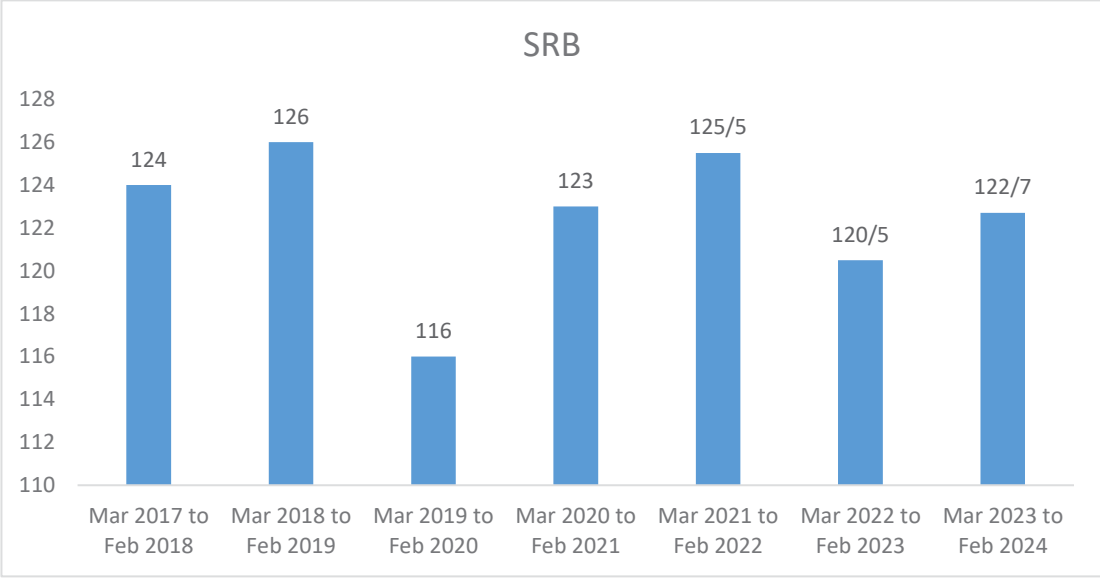

Figure 1. SRB in Ardabil province from 2017 to 2024

Comparison using a one-sample t-test showed that the mean SRB over the seven years (122.5±3.42) was significantly higher than the criterion value (normal SRB: 105) ([P<0.001], [95% CI, 14.37%, 20.69%]).

The sex ratio was higher than normal in all study years (Figure 1). The total birth rate decreased continuously during the study period (Figure 2). From 2017 to 2024, the birth rates of males and females decreased by 63.6% and 64.2%, respectively.

Discussion

In addition to the decreasing trend in the number of births in Ardabil province, 8926 females were born fewer than the expected value in seven recent years. In other words, during the past seven years, about 9,000 "missing women" were identified in Ardabil Province. This finding aligns with that of Sen who showed that there are about 100 million missing women in West Asia and North Africa [4]. A systematic assessment showed that there were 12 countries with strong statistical evidence of SRB imbalance from 1970 to 2017, resulting in 23.1 million missing female births globally [6]. In this regard, large groups of "surplus" men appear in society,

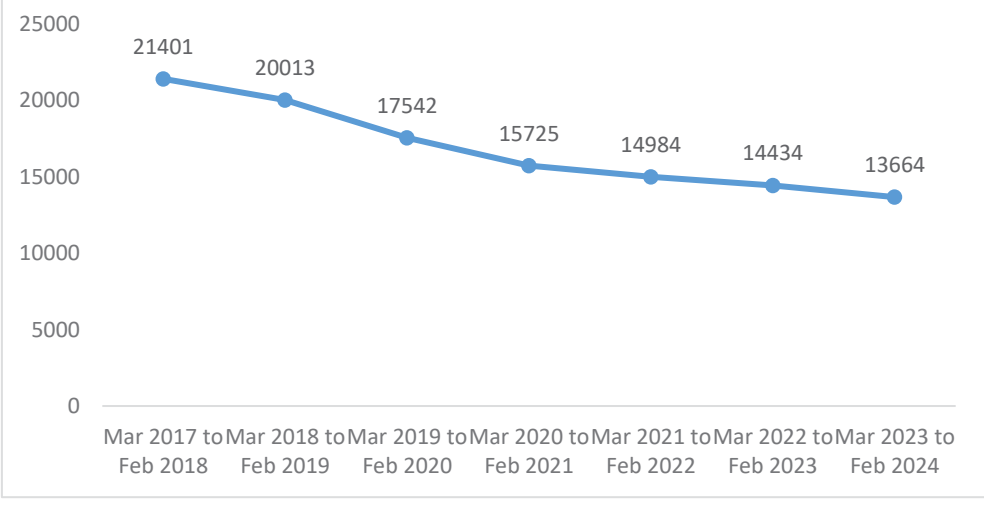

Figure 2. Total birth rate in Ardabil province from 2017 to 2024

which raises concerns about their non-marriage and marginalization. This situation may lead to anti-social behavior and violence, threatening social stability and security [1].

The increased SRB in Ardabil may be due to society's preference for boys, the decrease in the birth rate, and access to technology. The missing population of girls is referred to as the "missing women of Asia" due to the strong preference for boys in some countries [5]. Clément et al. reported that son preference and the perpetuation of patriarchal norms hinder gender equality [7, 8].

A strength of the study is the use of an integrated health system, which significantly reduces the probability of reporting biases in the sex ratio. A weakness of the study is the calculation of the SRB without considering other demographic characteristics.

Conclusion

During the past seven years, about 9000 "missing females" were identified in Ardabil province, reflecting significant gender bias with potential repercussions for social stability, marriage patterns, and gender equity. Public awareness campaigns and legal restrictions on sex-selective procedures are suggested.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Ardabil University of Medical Sciences, Ardabil, Iran (Code: IR.ARUMS. REC.1400.317).

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Acknowledgements

The author thanks the Health Statistics Center of Ardabil Province for the cooperation.

References

[1] Chao F, Gerland P, Cook AR, Guilmoto CZ, Alkema L. Projecting sex imbalances at birth at global, regional and national levels from 2021 to 2100: Scenario-based Bayesian probabilistic projections of the sex ratio at birth and missing female births based on 3.26 billion birth records. BMJ Global Health. 2021; 6(8):e005516. [DOI:10.1136/bmjgh-2021-005516] [PMID]

[2] Vaughan RP. Does women's education improve the sex ratio at birth? Gender, agency and sex-selective abortion in South and East Asia: A critical literature review. Women's Studies International Forum. 2025; Vol. 109:103050. [DOI:10.1016/j.wsif.2024.103050]

[3] Kazemi S. [Trend of change in the sex ratio at birth in Iran: Factors and contexts (Persian)]. Journal of Population Association of Iran. 2020; 15(30):289-320. [DOI:10.22034/jpai.2021.521242.1171]

[4] Shahbazzadegan S. [A study on the sex ratio in ardabil, iran during the last decade (Persian)]. Journal of Midwifery and Reproductive Health. 2023; 11(1):3638-43. [DOI:10.22038/jmrh.2022.65965.192]

[5] Sen A. More than 100 million women are missing. In: Naffine N, editor. Gender and justice. London: Routledge; 2017. [DOI:10.4324/9781315093727-13] [PMID]

[6] Salehnia N, Assari Arani A, Olyaeemanesh A, Sadeghi Saghdel H. Identifying and prioritizing social determinants of population health in Iran: A mixed method research. Iranian Journal of Health Sciences. 2023; 11(2):75-86. [DOI:10.32598/ijhs.11.2.925.1]

[7] Chao F, Gerland P, Cook AR, Alkema L. Systematic assessment of the sex ratio at birth for all countries and estimation of national imbalances and regional reference levels. Proceedings of the National Academy of Sciences. 2019; 116(19):9303-11. [DOI:10.1073/pnas.1812593116] [PMID]

[8] Clément M, Levasseur P, Seetahul S. Sex ratio and fertility preferences in India: A longitudinal analysis. World Development. 2025; 192:107046. [DOI:10.1016/j.worlddev.2025.107046]