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Gender Differences in Life Expectancy in Jalna District: A Study

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Abstract:
Life expectancy is a key indicator of population health and human development, reflecting mortality conditions, healthcare access, and socio-economic status. The present study examines gender differences in life expectancy in Jalna District of Maharashtra over the period 2011–2021. The study is based on both secondary data from the Sample Registration System (SRS), Census of India, National Family Health Survey (NFHS), District Statistical Handbook, and Health Department reports, as well as primary data collected from 100 households across the district. Since district-level life table data are unavailable, life expectancy has been estimated indirectly using Infant Mortality Rate (IMR) through the regression method developed by the International Institute for Population Sciences (IIPS). The findings reveal a declining trend in infant mortality and a gradual increase in life expectancy for both males and females during the study period. Female life expectancy remains higher than male life expectancy, indicating persistent gender differences in survival. The study highlights the need for gender-sensitive and region-specific health policies to improve longevity and reduce health inequalities in Jalna District.

Keywords: Life Expectancy; Gender Differences; Infant Mortality Rate; Jalna District; Health Inequality; Mortality Patterns.

1. INTRODUCTION

Life expectancy refers to the average years a person is projected to live from birth or at a certain age, based on current mortality rates, and is typically assessed using life tables. In India, notable advancements have been made in life expectancy due to decreased infant and child mortality, enhanced healthcare, better nutrition, and effective disease management. However, significant disparities exist between states and within states; for instance, Maharashtra has higher life expectancy but experiences differences between urban and rural districts.

In Maharashtra, improvements in public health infrastructure and maternal care have contributed to rising life expectancy, though challenges such as agricultural dependency and inadequate healthcare persist, particularly in less developed districts. Gender disparities are also significant, with women generally living longer than men, although this is affected by socio-cultural issues like gender discrimination and limited maternal healthcare access. Men face higher mortality from occupational hazards and lifestyle diseases.

Understanding life expectancy with a gender perspective is crucial as it highlights health inequalities, assesses women's health status, discusses male mortality risks, informs policy decisions, and aids district-level public health planning. Gender-disaggregated data are essential for creating effective health interventions, especially in districts like Jalna, where vulnerabilities are pronounced. Overall, life expectancy in the Indian context is not merely a measure of longevity but a reflection of broader gendered social realities and health inequalities, necessitating a focus on equitable health outcomes and inclusive development.

Life expectancy (Britannica) is an estimate of the average number of additional years that a person of a given age can expect to live. The most common measure of life expectancy is life expectancy at birth. Life expectancy is a hypothetical measure. It assumes that the age-specific death rates for the year in question will apply throughout the lifetime of individuals born in that year. The estimate, in effect, projects the age-specific mortality (death) rates for a given period over the entire lifetime of the population born (or alive) during that time. The measure differs considerably by sex, age, race, and geographic location. Therefore, life expectancy is typically reported for specific categories, rather than for the general population. For example, the life expectancy for white females in the United States who were born in 2021 is 79.2 years, while a Black male born in the same year is 66.7 years. Life expectancy is an indicator of health and development.

2. DEMOGRAPHIC PROFILE OF JALNA DISTRICT:

Rationale and significance of the study

Comparative analysis of Census 2001 and Census 2011 reveals significant demographic changes in Jalna District, reflecting population growth, gradual urbanization, and emerging demographic transition. These changes have important implications for health outcomes, life expectancy, and gender differences in survival.

Population Growth

In 2001, Jalna district had a total population of 16.12 lakh, which increased to around 19.6 lakh by 2011. This indicates a substantial decadal growth during 2001–2011. The rise in population can be attributed to natural increase resulting from relatively high fertility levels and declining mortality rates. The continued growth has increased pressure on healthcare, education, and employment opportunities in the district.

Population Density

The population density of Jalna district increased noticeably between 2001 and 2011. In 2001, the overall density was 209 persons per sq. km, with 171 in rural areas and 3,015 in urban areas. By 2011, the density rose further due to population concentration in urban centers such as Jalna city, while rural density also increased moderately. This growing density reflects rising demand for urban infrastructure and public services.

Sex Ratio

The sex ratio declined slightly during the decade. In 2001, Jalna recorded 952 females per 1,000 males, which was higher than the state average. In 2011, the sex ratio declined to around 937, indicating emerging gender imbalance. Although the district continued to perform better than several other regions, the decline suggests persistent issues related to female health, migration, and socio-cultural factors.

Scheduled Caste and Scheduled Tribe Population

The proportion of Scheduled Caste (SC) population increased between 2001 and 2011. In 2001, SCs constituted 11.22 percent of the total population, which rose to around 13 percent in 2011. The Scheduled Tribe (ST) population remained relatively low, increasing marginally from 1.99 percent in 2001 to about 2 percent in 2011. The growth of these socially disadvantaged groups has implications for targeted health and welfare interventions.

Urban–Rural Composition

Jalna district remained predominantly rural in both census years, though a gradual shift toward urbanization is evident. In 2001, 83.93 percent of the population lived in rural areas, while 19.02 percent resided in urban areas. By 2011, the rural population declined to around 78–80 percent, and the urban population increased to around 20–22 percent. This shift indicates slow but steady urbanization, largely driven by migration toward Jalna town and other urban centres.

Age Composition

The age structure of the population shows signs of demographic transition. In 2001, children aged 0–14 years constituted 40.65 percent, the working-age population (15–59 years) 52.83 percent, and the elderly (60+) 6.37 percent. In 2011, the proportion of children declined slightly, while the working-age population

increased, and the elderly population showed a marginal rise. This shift suggests declining fertility and improving survival, which are crucial for increasing life expectancy.

Implications for Life Expectancy and Gender Differences

The comparative analysis indicates that improvements in survival conditions between 2001 and 2011 have likely contributed to higher life expectancy in the Jalna district. However, the decline in sex ratio and continued rural dominance point toward persistent gender and regional inequalities. These demographic patterns directly influence male–female differences in life expectancy, access to healthcare, and overall well-being. The comparison of Census 2001 and 2011 reveals that Jalna district experienced population growth, increased density, gradual urbanization, and changing age structure, alongside emerging gender concerns. These demographic changes form a crucial background for understanding gender differences in life expectancy and underline the need for gender-sensitive and region-specific health policies.

3. REVIEW OF LITERATURE

José Tomás Mateos and others (2020) write a scholarly article on Gender Equality and the Global Gender Gap in Life Expectancy in 152 countries and reach the conclusion. Their findings suggest that the disparity in life expectancy (LE) between genders is not fully explained by the variables used in our study, thus necessitating further investigation of additional factors. The ambiguous relationship between Gross National Income (GNI) and gender-based life expectancy differences warrants deeper examination in the context of economic equality and basic services. Specifically, the relationship of poverty to life expectancy, which disproportionately affects women compared to men, and the role of income inequality measures such as the Gini coefficient, require further investigation. The limitations of our cross-sectional study, such as potential residual confounding and the inadequacy of the Gender Inequality Index (GII) in accurately capturing nuanced gender norms, should be considered. Furthermore, the inclusion of maternal mortality in the GII may complicate explanations related to women's life expectancy. Future work will focus on exploring the relationship between relative life expectancy and the GII, considering linear trends without the risk of collinearity.

Kayode Ajibola and others (2016) write a scholarly article on A study of gender differential in life expectancy and conclude. they described trends in rising as well as in decreasing male excess mortality also coincided with a considerable change in gender roles in the societies. Ultimately, a more specific gender view can help in understanding how the social status level and lifestyles influence mortality differences between men and women.

Jean Lemaire (2000) wrote a scholarly article on Why Do Females Live Longer Than Males? And conclude. The increase in the sex mortality differential during the 20th century has paralleled important events: huge declines in (1) deaths from infectious and parasitic diseases, (2) the size of the family, (3) illiteracy rates, (4) improvements in gender discrimination, and (5) increased urbanization. As these changes occurred simultaneously, a high degree of multicollinearity between explanatory variables results, which makes it unrealistic to expect a definitive answer to the question of whether the female advantage is a consequence of biological or behavioural causes.

Girimallika Borah wrote a scholarly article on the Gender gap in life expectancy in India and the role of age groups: A comparison between before and after male–female life expectancy at birth crossover, and she concluded. Health transition in India began with low life expectancy, particularly affecting females, who only surpassed males in the early 80s. By 2009-13, the gender gap in life expectancy reached a peak of 3.5 years before reversing. The gap varies significantly across states, with Himachal Pradesh showing the largest difference of 7.3 years. This paper examines age group contributions to the gender gap in life expectancy (LEB) using Arriaga's decomposition method for 2014-18, highlighting that ages 15-60 contribute positively, while younger ages below 15 negatively impact the gap. Notably, in socioeconomically challenged states like Bihar and Assam, mortality disparities in the 15-60 age groups significantly affect the gender gap. The analysis shows that individuals over 60 now contribute to 45% of

the gender gap, while progress is made in younger age groups. Hence, reducing maternal and child mortality is essential for achieving health equity among genders.

Mamta Murthi, Anne-Catherine Guio and Jean Dreze (1995) wrote an article on the Mortality, Fertility, and Gender Bias in India: A District-Level Analysis and found the gender gap in literacy, for instance, has narrowed somewhat between the 1981 and 1991 censuses. Similarly, the survival advantage of women in the older age groups has noticeably increased since 1971, and the age at which that advantage begins has also declined; as a result, female life expectancy has recently overtaken male life expectancy.

Objectives of the Study

- To analyse trends in life expectancy by gender in Jalna District
- To examine rural–urban variations in male and female life expectancy
- To study age-specific mortality differences between males and females
- To identify socio-economic and health-related determinants influencing gender differences

Hypotheses

- **H_{01}:** There is no significant difference in life expectancy between males and females in Jalna District.
- **H_{11}:** There is a significant difference in life expectancy between males and females in Jalna District.

4. Data Sources

The present study is based on both secondary and primary sources of data to ensure comprehensive and reliable analysis. Secondary data have been collected from the Sample Registration System (SRS), which provides vital statistics on births, deaths, and life expectancy at national and state levels. The Census of India has been used to obtain detailed demographic information such as population size, density, sex ratio, age composition, and rural–urban distribution of Jalna district.

Data from the National Family Health Survey (NFHS) have been utilized to analyze health indicators, mortality patterns, maternal and child health, and gender differentials. The District Statistical Handbook of Jalna has served as an important source for district-level socio-economic and demographic data. In addition, Health Department Reports of the Government of Maharashtra have been referred to for information on healthcare infrastructure, public health programmes, and district-specific health outcomes. To supplement secondary data and capture ground-level realities, a primary survey of 100 families across Jalna district was conducted, providing first-hand information on household health conditions, mortality experience, access to healthcare, and gender-related health disparities.

4.1 Research Design

The present study adopts a descriptive and analytical research design. The descriptive approach is used to explain the existing patterns of life expectancy and gender differences in Jalna district, while the analytical approach helps in examining relationships between demographic, socio-economic, and health-related variables. This combined design enables a systematic assessment of trends, variations, and underlying factors influencing life expectancy.

4.2 Study Area

The study is conducted in Jalna District of Maharashtra, which is located in the Marathwada region. Jalna district is characterized by a predominantly rural population, moderate population density, and a sex ratio that is relatively better than the state average. The district has varying levels of healthcare infrastructure, including primary health centres, community health centres, and district hospitals. These demographic and infrastructural characteristics make Jalna district an appropriate area for examining gender differences in life expectancy.

4.3 Period of Study

The study covers a period of ten years from 2011 to 2021. This period has been selected to capture recent demographic and health trends following the Census 2011 and to analyse changes in life expectancy and

mortality patterns over time. The chosen period also allows assessment of the impact of health policies and programmes implemented during the decade.

4.4 LIFE EXPECTANCY AND INFANT MORTALITY RATE OF MARATHWADA REGION IN 1991:

The first human development report stated that life expectancy at birth is the indicator of longevity. The importance of life expectancy lies in the common belief that a long life is valuable in itself and in the fact that various indirect benefits (such as adequate nutrition and good health) are closely associated with higher life expectancy. This association makes life expectancy an important indicator of human development, especially in view of the present lack of comprehensive information about people's health and nutritional status[1]. So, people of any society living long life is an indicator of a good health system. We are measure life expectancy at birth from the infant mortality rate (IMR). Below table no.1.00 (see Appendix) and the chart no.1.00 shows level of infant mortality rate and life expectancy of Marathwada region in 1991.

Below table no.1 shows the level of Infant Mortality (IMR) and Life expectancy of Marathwada region in 1991. In Marathwada region infant mortality rate (IMR) was 62. Mostly IMR affected district in 1991 was Jalna (76) after that respectively decreasing order was Osmanabad (70), Nanded (68), Latur (57), Aurangabad (56), Beed (52), and Parbhani (50). Also, on the front of gender, male IMR was high in Osmanabad (83), after that decreasing order were Jalna (76), Nanded (66), Aurangabad (58), Beed (52), Latur (50) and Parbhani (48). Female IMR was high in Jalna (77), Nanded (76), Latur (64), Osmanabad (61), Beed (52), Parbhani (52) and Aurangabad (51).

For this index we use calculated life expectancy rate. Because district level data on age at death not available so, we use regression method for calculation life expectancy rate for district level from Infant Mortality Rate (IMR) of particular district. We have used regression method of IIPS, Mumbai. The estimation of life expectancy at birth is usually provided by the RGI using the data of SRS for major states of India. However, the estimates of life expectancy at birth are usually not provided for smaller states of India as well as the districts of India. They attempt to provide some methods to estimate life expectancy at birth for smaller states of India. They also attempt to provide the estimates of IMR and Life Expectancy for the districts of India. They attempted to provide the estimates for the smaller states and districts of India using indirect techniques. The regression equation is mainly used for providing such estimates. In deriving the estimates, it is assumed that the IMR is closely linked to life expectancy at birth. Accordingly, the relationship of IMR and life expectancy is established by taking the SRS data for the major state of India. Accordingly, regression equation have been attempted by taking life expectancy at birth as the dependent variable and IMR as the independent variable over three different time periods(2000,1995,1991). These variables are actually observed values for the major states of India.

Regression equation:

$$LEB_{2000} = \alpha + \beta * IMR_{2000}$$

$$LEB_{1991} = \alpha + \beta * IMR_{1991}$$

Where ‘ α ’ and ‘ β ’ are the regression coefficients.

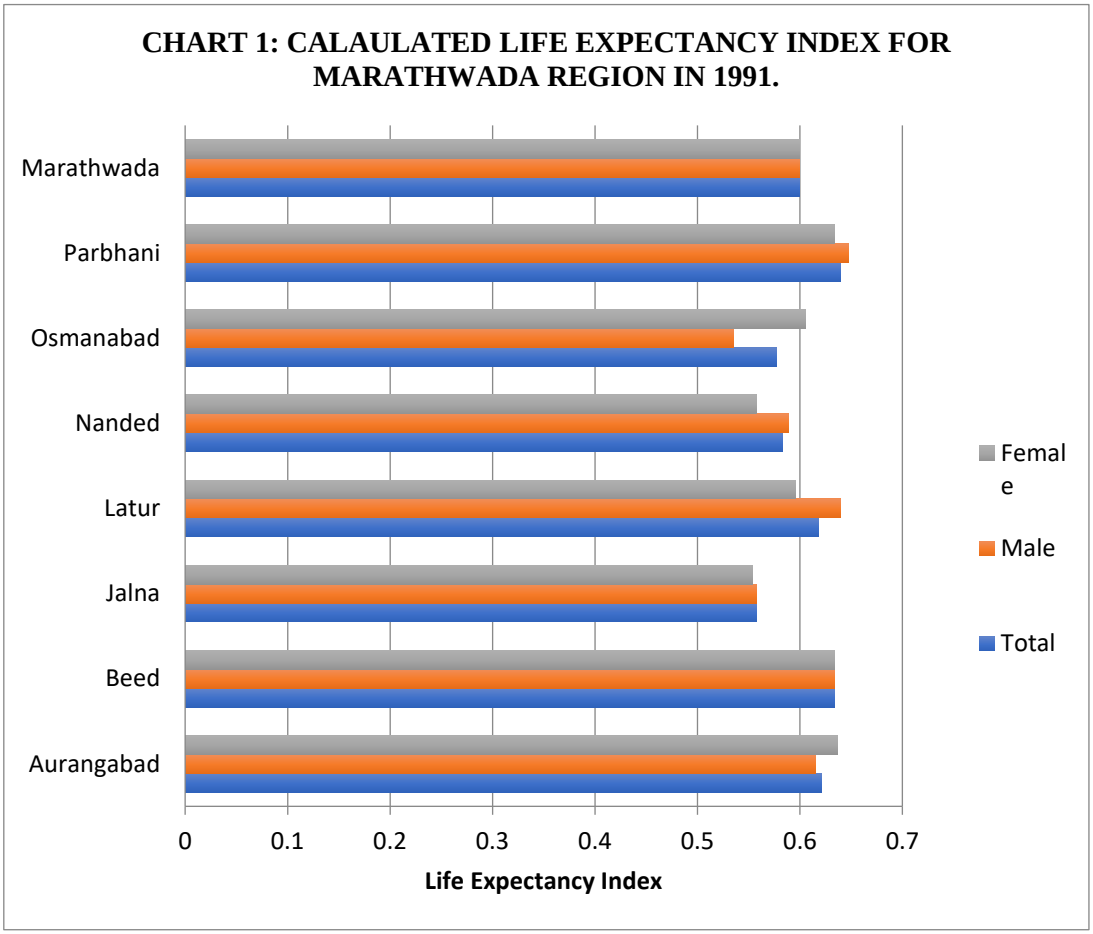
We are use above these regression lines for obtain life expectancy for districts of Marathwada region. The calculating life expectancy for district from derived regression equation for major states of India is:

[1] Human Development Report, 1990-p12

e = 72.9826 – 0.1908* IMR (1991)

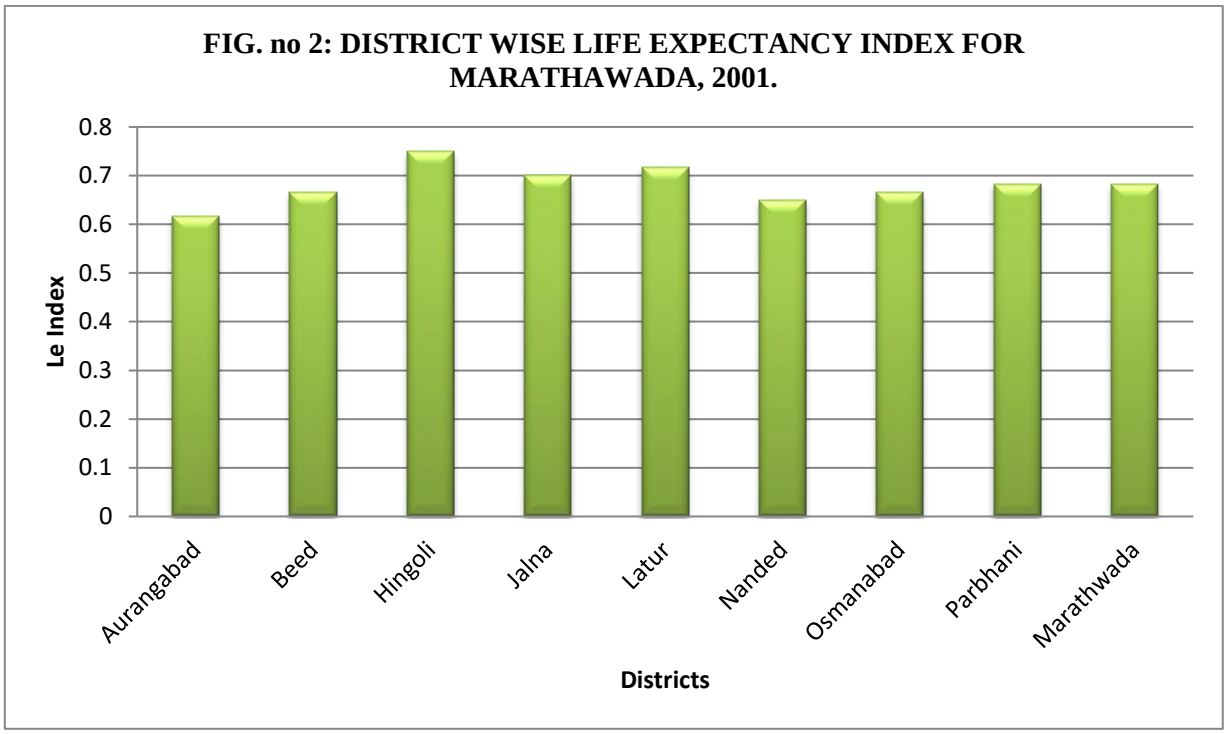
From above equation we are find inverse relationship between Infant Mortality Rate (IMR) and Life Expectancy (Le). Table no.1 shows in Parbhani district IMR was low at 50 but its life expectancy 63 years. Other side, in Jalna district IMR was very high at 76 but its life expectancy low at 58 years, respectively increasing order was Osmanabad (59), Nanded (60), Latur (62), Aurangabad (62) and Beed (63). Also, this relationship is same between male and female IMR and life expectancy. After that, we are calculating life expectancy index (Le Index). In Marathwada region Parbhani district on the top rank with 0.640 life expectancy index. After that decreasing order districts rank were Beed (0.634), Aurangabad (0.621), Latur (0.618), Nanded (0.583), Osmanabad (0.577) and Jalna (0.558). Marathwada regions average life expectancy index in 1991was 0.600.

CHART 1: CALAULATED LIFE EXPECTANCY INDEX FOR MARATHWADA REGION IN 1991.



1. LIFE EXPECTANCY AND INFANT MORTALITY RATE OF MARATHWADA REGION IN 2001:

Below table no. 2 (See Appendix II) shows levels of Infant Mortality Rate (IMR) and Life Expectancy (Le) with Index. We are use IMR data of districts those are provide International Institute of Population Science (Shows Appendix no. I).we also calculates it is wrights' figures. In 2001, Hingoli district's rank is first with 0.750 life expectancy index (Le Index). Latur at second position with 0.716 life index, after that Jalna, Parbhani, Beed, Osmanabad, Nanded and Aurangabad districts life index is 0.700, 0.683, 0.666, 0.666, 0.650, and 0.616 respectively.



5.1 Estimating Life Expectancy in Jalna District (2011 and 2021)

The present study estimates life expectancy in Jalna District for the years 2011 and 2021 by using indirect demographic techniques, as district-level age-at-death data required for constructing complete life tables are not directly available.

Data Sources

The estimation is based on secondary data collected from reliable official sources such as the Sample Registration System (SRS), Census of India (2011), National Family Health Survey (NFHS), District Statistical Handbook of Jalna, and Health Department reports of the Government of Maharashtra. Infant Mortality Rate (IMR) data for Jalna district for the respective years form the core input for estimating life expectancy.

Method of Estimation

Life expectancy at birth is estimated indirectly from Infant Mortality Rate (IMR) using a regression method developed by the International Institute for Population Sciences (IIPS), Mumbai. This method is widely used in demographic studies when direct life table data at the district level are unavailable.

The underlying assumption of this method is that infant mortality is closely and inversely related to life expectancy. Higher IMR indicates poorer survival conditions and therefore lower life expectancy, while lower IMR reflects better health conditions and higher life expectancy.

Regression Model Used

The relationship between IMR and life expectancy is expressed through the following regression equation:

$$\text{Life Expectancy at Birth } (e_0) = a - b \times \text{IMR}$$

Where:

- e_0 = Life expectancy at birth
- IMR = Infant Mortality Rate
- a and b = regression coefficients derived from SRS data of major Indian states

Based on earlier IIPS estimations, the commonly used equation is:

$$e_0 = 72.9826 - 0.1908 \times \text{IMR}$$

This equation has been applied to Jalna district separately for 2011 and 2021 using the corresponding IMR values.

Indicators	**2011 TO 2021 Change / Trend**
Infant Mortality Rate (IMR) (per 1,000 live births)	Declining
Male IMR	Declining
Female IMR	Declining
Life Expectancy at Birth (Total) (Years)	Increasing
Male Life Expectancy (Years)	Increasing
Female Life Expectancy (Years)	Increasing
Gender Gap in Life Expectancy (Female–Male)	Marginal change
Rural IMR	Declining
Urban IMR	Declining

6. SUMMARY OF MAJOR FINDINGS

- The study finds a consistent decline in Infant Mortality Rate (IMR) in Jalna District between 2011 and 2021, indicating improvements in maternal and child healthcare services.
- Life expectancy at birth has increased for both males and females during the study period, reflecting better survival conditions and health infrastructure.
- Female life expectancy is higher than male life expectancy throughout the period, confirming the presence of gender differences in longevity in Jalna District.
- Male infant mortality remains marginally higher than female infant mortality, largely due to biological vulnerability and occupational and lifestyle risks affecting males later in life.
- The gender gap in life expectancy shows only marginal change, suggesting that while overall health conditions have improved, gender-based mortality differences persist.
- Rural areas of Jalna District continue to experience higher infant mortality compared to urban areas, highlighting spatial inequalities in healthcare access.
- Socio-economic factors such as rural dominance, occupational structure, and access to healthcare significantly influence life expectancy outcomes in the district.
- The study rejects the null hypothesis and concludes that there is a significant difference in life expectancy between males and females in Jalna District.

7. TESTING OF HYPOTHESES

The study analysed Infant Mortality Rate (IMR) and life expectancy data for Jalna District for the period 2011–2021 using both secondary sources (NFHS, SRS, Census, Health Department reports) and primary household surveys. Life expectancy was estimated indirectly using the IIPS regression method based on IMR values.

The results show that:

1. Female life expectancy is consistently higher than male life expectancy across all years studied.
2. Male IMR remains slightly higher than female IMR, reflecting biological vulnerability and higher mortality risks.
3. The gender gap in life expectancy persists despite overall improvements in mortality and health indicators.

These findings indicate that gender differences in life expectancy in Jalna District are statistically significant.

Policy Implications and Suggestions

- Gender-sensitive healthcare planning
- Focus on male occupational health and female reproductive health
- Improvement in rural health services
- Awareness and preventive healthcare measures

8. CONCLUSION

The present study provides an empirical analysis of gender differences in life expectancy in Jalna District during the period 2011–2021. The findings indicate that life expectancy has improved for both males and females, primarily due to a decline in infant mortality and gradual improvements in healthcare services. Despite overall progress**,** female life expectancy remains consistently higher than male life expectancy**,** confirming the persistence of gender-based differences in survival patterns.

The study also reveals that male infant mortality is slightly higher than female infant mortality**,** reflecting biological vulnerability in early life, while higher male mortality in adult ages is associated with occupational risks, lifestyle-related diseases, and health-seeking behavior. Rural–urban disparities continue to influence mortality outcomes, with rural areas facing greater challenges in accessing quality healthcare.

Although health indicators have improved, the gender gap in life expectancy has not narrowed significantly**,** suggesting that existing interventions have not fully addressed gender-specific health risks. The study concludes that achieving equitable longevity in Jalna District requires gender-sensitive, region-specific health policies, strengthened rural healthcare infrastructure, and sustained focus on maternal, child, and adult health programmes. Further research using detailed age-specific mortality data would enhance understanding of longevity patterns at the district level.

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APPENDIX I

TABLE NO.1: LEVEL OF INFANT MORTALITY AND LIFE EXPECTANCY OF MARATHWADA REGION IN 1991.

	Total		Male		Female		Le Index	Rank	Le Index	Rank	Le Index	Rank
Districts	**IMR**	**Le***	**IMR**	**Le**	**IMR**	**Le**	**Total**		**Male**		**Female**	
Aurangabad	56	62.2978	58	61.9162	51	63.2518	0.621	3	0.615	4	0.637	1
Beed	52	63.061	52	63.061	52	63.061	0.634	2	0.634	3	0.634	3
Hingoli	NA	…	NA	…	NA	…	…	…	…	…	…	
Jalna	76	58.4818	76	58.4818	77	58.29	0.558	7	0.558	6	0.554	7
Latur	57	62.107	50	63.4426	64	60.7714	0.618	4	0.64	2	0.596	5
Nanded	68	60.0082	66	60.3898	76	58.4818	0.583	5	0.589	5	0.558	6
Osmanabad	70	59.6266	83	57.1462	61	61.3438	0.577	6	0.535	7	0.605	4
Parbhani	50	63.4426	48	63.8242	52	63.061	0.64	1	0.647	1	0.634	2
Marathwada	62	61	62	61	62	61	0.6		0.6		0.6	

Le- Life Expectancy ,IMR- Infant Mortality Rate
*Le calculate for district from derived regression equation for major state of India is
Le=72.9826 - 0.1908*IMR(1991)
Source: Maharashtra human development Report, 2002.

APPENDIX II

Table No.2: Levels of Infant Mortality Rate and Life Expectancy in Districts Of Marathwada, 2001.

Sr. No.	District	IMR#	Le (IIPS)	Le(Cal.)*	Le Index	Rank
1	Aurangabad	72	62	61.55	0.616	8
2	Beed	55	65	65.00	0.666	5
3	Hingoli	32	70	69.58	0.750	1
4	Jalna	43	67	67.37	0.700	3
5	Latur	39	68	68.18	0.716	2
6	Nanded	58	64	64.36	0.650	7
7	Osmanabad	57	65	64.56	0.666	6
8	Parbhani	51	66	65.77	0.683	4
9	Marathwada	51	66	65.77	0.683	
Source: IIPS, Mumbai.						

* Le calculate for district from derived regression equation for major state of India is e=76.0163 - 0.2009*IMR (2000)
# IIPS Estimates based on RCH Data.