International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 7 No. 4 January – February - 2026

Sex Ratio in the Kumbhi River Basin, Kolhapur District (2011): A Geographical Analysis

Patil Prajakta Ravindra[1], Dr. Arun Bhagwan Patil[2] & Dr. Sandip Arjuna Patil[3]

[1] *Research Scholar, Women's College, Karad,*

[2]*Principal, Arts and Commerce College, Ashta, Walwa, Sangli,*

[3]*Department of Geography, Karmaveer Bhaurao Patil College, Urun–Islampur*

Corresponding Author – Patil Prajakta Ravindra

DOI - 10.5281/zenodo.18479933

Abstract:

Sex ratio is one of the most significant socio-demographic indicators in population studies, as it directly influences marriage patterns, fertility, labour force composition, and mortality differentials between males and females. The present study examines spatial variations in sex ratio across different physiographic regions namely the hilly region, foothill region, and plain river basin region of the Kumbhi River Basin in Kolhapur District, Maharashtra. Village-level data from the Census of India 2011 were used to analyse regional and intra-regional variations in sex ratio and to assess the influence of geographical, social, and economic factors. The findings reveal pronounced regional disparities in sex ratio, closely associated with physiography, migration patterns, and levels of socio-economic development. The study highlights that relatively remote and less developed regions exhibit comparatively balanced sex ratios, whereas economically developed and accessible plains show lower sex ratios. The results have important implications for regional population planning and inclusive social development.

Keywords: Sex Ratio, Kumbhi River Basin, Hilly Region, Foothill Region, Plain Region, Population Geography, Kolhapur District

Introduction:

Population constitutes a fundamental resource for the social and economic development of any region. Demography, as a scientific discipline, deals with the size, structure, distribution, and dynamics of human population and provides a basic framework for understanding societal organisation (Singh, 1995). Among various demographic indicators, sex ratio occupies a central position because it reflects the relative status of women in society and influences several demographic processes such as marriage systems, fertility behaviour, population growth, and labour participation.

Ideally, a healthy and balanced society should exhibit a near-equal proportion of males and females. However, sex ratio is shaped by a complex interaction of social, economic, cultural, and geographical factors. According to Sabat and Das (1976), sex ratio plays a crucial role in determining marriage patterns, family structure, birth rates, and overall population growth. Masal (2012) emphasised that sex ratio is an essential indicator for assessing the level of socio-economic development of a region.

The Kumbhi River Basin is characterised by marked physiographic diversity, comprising hilly terrain, foothill zones, and flat alluvial plains. Such diversity provides a suitable geographical framework to examine spatial variations in sex ratio. The basin extends across the administrative boundaries of Radhanagari, Panhala, Gaganbawada, and Karveer tehsils of Kolhapur District. Owing to perennial water

availability, the region is agriculturally prosperous, particularly known for sugarcane cultivation, along with crops such as rice, soybean, maize, wheat, sunflower, groundnut, fruits, and vegetables. The development of agro-based industries such as sugar factories, jaggery units, rice mills, and oil mills has further influenced population dynamics and migration patterns. In this context, a geographical analysis of sex ratio in the Kumbhi River Basin is significant for understanding the relationship between physical environment, economic development, and demographic structure.

Study Area:

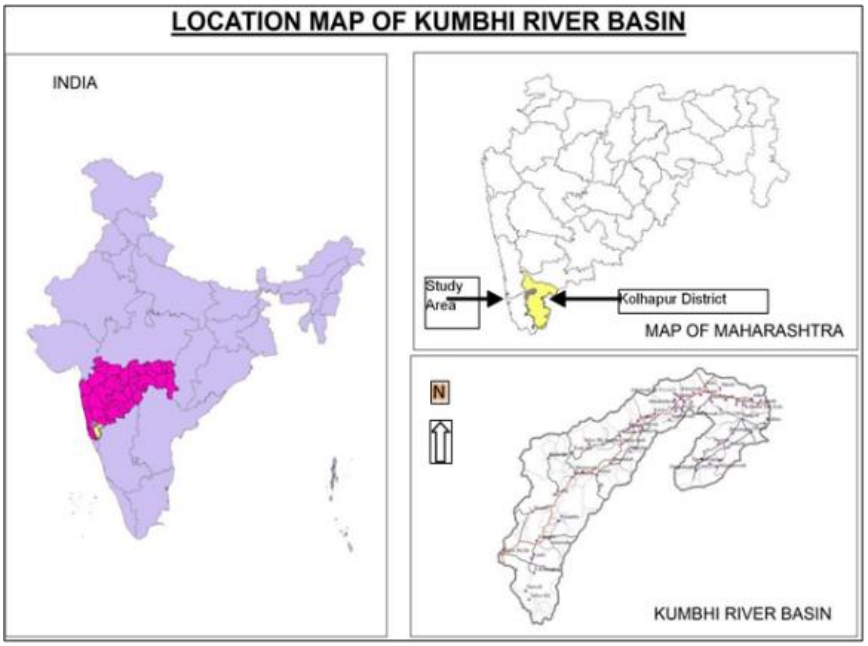
The study area comprises the Kumbhi River Basin located in the south-western part of Kolhapur District, Maharashtra. The Kumbhi River originates near Lakhamapur village in Gaganbawada tehsil, where the Lakhamapur Dam has been constructed. The construction of the dam began in 1980 and was completed during 2006–07. From its source, the river flows for about 45 km towards the north-east and then turns eastward before joining the Panchganga River. Near Gote village, the Dhamani River joins the Kumbhi, and further downstream near Bahireshwar and Koge villages, it merges with the Bhogavati River.

Geographically, the basin extends between 16°28′20.77″ N to 16°44′0.35″ N latitudes and 73°07′13.74″ E to 74°49′31.91″ E longitudes. The basin encompasses villages located in hilly, foothill, and plain regions, with average elevations ranging from 567 m to 650 m above mean sea level. The total area of the Kumbhi River Basin within Kolhapur District is approximately 315 sq. km.

According to the Census of India 2011, Kolhapur District had a population of 3,876,001, with a literacy rate of 81.51% and an overall sex ratio of about 904 females per 1000 males. For the present study, the Kumbhi River Basin was divided into three physiographic regions for a detailed analysis of sex ratio variations:

1. Hilly Region 2. Foothill Region 3. Plain River Basin Region

Selected villages from each region were analysed to understand spatial patterns and regional contrasts in sex ratio.



Map: 1

Objectives:

The specific objectives of the study are:

1. To analyse the sex ratio across different physiographic regions of the Kumbhi River Basin and to examine village-level variations in sex ratio within each region.
2. To identify geographical and socio-economic factors influencing sex ratio.
3. To provide suggestions for future population planning and balanced regional development.

Methodology:

The study is based on descriptive and analytical research methods. Secondary data were collected primarily from the District Census Handbook of Kolhapur District, Census of India 2011. Additional data were obtained from statistical abstracts of Maharashtra State and other published government reports.

Village-level population data were classified and analysed using regional comparison and ratio analysis techniques. In India, sex ratio is defined as the number of females per 1000 males and is calculated using the following formula:

Sex Ratio = (Total Female Population / Total Male Population) × 1000

Tables and graphs were prepared to present and interpret regional and village-wise variations in sex ratio.

Review of Literature:

Several geographers, sociologists, and demographers have examined the spatial dimensions of sex ratio in India and Maharashtra. Studies have highlighted the role of rural–urban differences, migration, female foeticide, education, employment opportunities, and healthcare facilities in shaping sex ratio patterns. However, studies focusing specifically on river basin frameworks are relatively limited.

Husain and Chandna observed that variations in sex ratio are largely the outcome of socio-economic processes rather than natural factors. Dyson and Moore emphasised regional disparities in India and linked sex ratio with social structure and women's autonomy. Amartya Sen's concept of "Missing Women" highlighted deep-rooted gender bias embedded in social and economic institutions. Several studies have also noted that remote and hilly regions often exhibit relatively balanced sex ratios due to male out-migration, whereas developed plains and urbanised areas tend to show lower sex ratios.

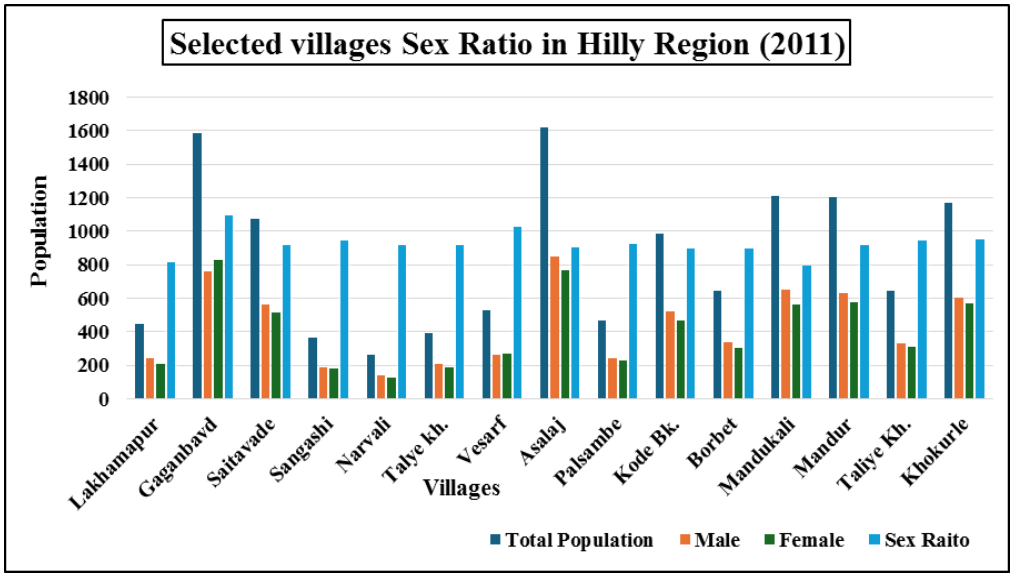
Data Analysis and Discussion:

1.Sex Ratio in the Hilly Region:

A study of the demographic data of 15 selected villages in the hilly region of the Kumbhi river basin reveals significant regional and village-wise differences in the sex ratio. The total area of this region is 164.24 sq. km., with a total population of 12,597. This includes 6,508 males and 6,089 females, resulting in an average sex ratio of 935.61 for the region. This ratio is slightly lower than the average for Maharashtra and reflects the influence of the hilly geographical conditions and socio-economic factors.

Table: 01

Selected villages Sex Ratio in Hilly Region					
Village	**Total Areas**	**Total Population**	**Male**	**Female**	**Sex Raito**
Lakhamapur	7.57	445	239	206	816.92
Gaganbavd	8.95	1588	758	830	1094.98
Saitavade	16.27	1072	560	512	914.28
Sangashi	6.76	364	187	177	946.52
Narvali	7.27	263	137	126	919.70
Talye kh.	10.76	393	205	188	917
Vesarf	10.08	525	259	266	1027
Asalaj	13.66	1619	851	768	902.46
Palsambe	9.08	469	244	225	922.13
Kode Bk.	21.77	983	519	464	894
Borbet	16.29	645	340	305	897
Mandukali	12.4	1210	649	561	795
Mandur	4.9	1205	628	577	918.78
Taliye Kh.	10.76	644	331	313	945
Khokurle	7.72	1172	601	571	950
Total	**164.24**	**12597**	**6508**	**6089**	**935.61**



Graph: 01

Source: - Researcher Creation

Village-wise analysis shows that the sex ratio is higher than 1000 in Gaganbawda (1094.98) and Vesaraf (1027), indicating a higher proportion of the female population. The main reasons for this in these villages could be the hilly and remote geographical conditions, limited industrialization, and migration of men to other places for work. In such regions, since men migrate for employment, the proportion of the female population in the village appears to be relatively higher. Conversely, the sex ratio is extremely low in Mandukli (795) and Lakhmapur (816.92). The low sex ratio in these villages may be a result of socio-economic backwardness, lack of health facilities and education, and a patriarchal social structure. Specifically, in Mandukli village, despite a large population, the proportion of the female population is

comparatively low, which gives serious indications regarding women's health and social status.

A moderate sex ratio is found in the villages of Saitwade (914.28), Naravali (919.70), Talye Khurd (917), Mandur (918.78), and Palasambe (922.13). Despite being hilly, these villages do not show a significant imbalance in the male-female ratio due to a relatively stable agricultural economy and limited migration. This indicates that, despite geographical remoteness, a degree of social balance has been maintained. The villages of Sangshi (946.52), Taliye Khurd (945), and Khokhurle (950) have a relatively good sex ratio, which is higher than the average for the hilly region. The positive influence of small population size, local employment opportunities, and community-based social structures is evident in these villages. Furthermore, the active participation of women in agriculture and allied occupations appears to have contributed to the maintenance of the female population here. In the villages of Kode Budruk (894), Borbet (897), and Asalaj (902.46), the sex ratio is lower than the average for the hilly region. The lower sex ratio in these villages, despite their larger area, underscores the need to study migration patterns, the nature of employment, and social factors.

Overall, the differences in village-wise sex ratios in the hilly region are closely linked to geographical conditions, migration patterns, economic opportunities, social structures, and health and education facilities.

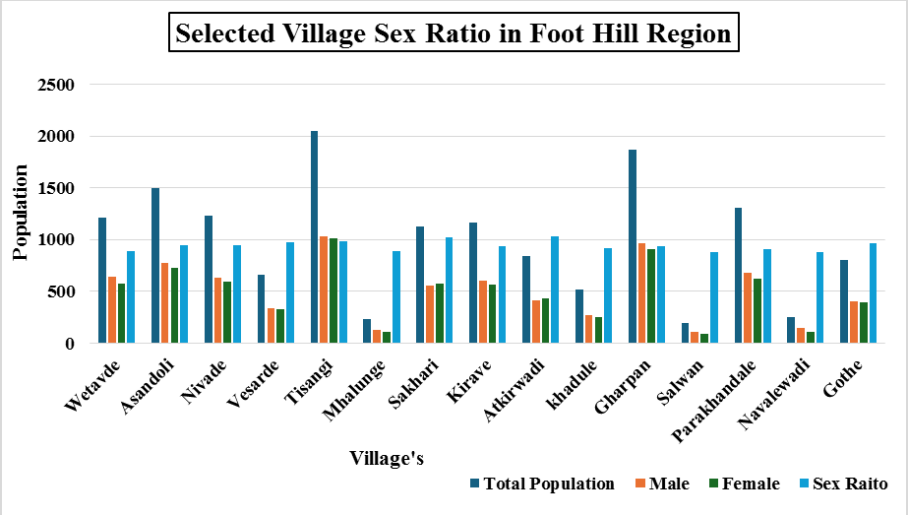
2. Sex Ratio in the Foothill Region:

A study of the demographic data of 15 selected villages in the foothills of the Kumbhi river valley reveals a relatively balanced sex ratio, but with noticeable village-wise differences. The total area of this region is 48.48 sq. km., with a total population of 14,963. Of this, the male population is 7,683 and the female population is 7,277, resulting in an average sex ratio of 947.15 for the region. This ratio is slightly higher than that of the hilly regions and indicates a relatively stable socio-economic condition.

Table: 02: Selected Village **Sex Ratio** in Foot Hill Region

Villages	Total Areas	Total Population	Male	Female	Sex Raito
Wetavde	3.64	1216	645	571	885.27
Asandoli	8.77	1496	770	726	942.85
Nivade	4.86	1228	632	596	943
Vesarde	4.73	659	334	325	973
Tisangi	5.85	2048	1031	1017	986.42
Mhalunge	1.75	232	123	109	886.17
Sakhari	3.45	1130	559	571	1021.46
Kirave	2.85	1167	602	565	938.53
Atkirwadi	3.71	842	414	428	1033.81
khadule	2.85	516	269	247	918.21
Gharpan	2.55	1874	969	905	933.95
Salwan	0.31	197	105	92	876.19
Parakhandale	1.58	1305	683	622	910.68
Navalewadi	0.32	251	142	109	879
Gothe	1.26	802	408	394	965.68
Total	**48.48**	**14963**	**7683**	**7277**	**947.15**

Graph: 02



Source: - Researcher Creation

Village-wise analysis shows that the villages of Atkirwadi (1033.81) and Sakhari (1021.46) have a sex ratio of more than 1000. In these villages, the female population appears to be relatively stable due to an agrarian economy, limited industrial migration, and greater participation of women in local economic activities. The villages of Vesarde (973) and Gote (965.68) also show a relatively good sex ratio, reflecting social balance. Conversely, the villages of Vetavade (885.27), Mhalunge (886.17), Salvan (876.19), and Navlewadi (879) show a lower sex ratio. Despite having smaller populations, these villages show a decline in the proportion of the female population, which may be related to migration, limited health facilities, and educational opportunities. The imbalance in the sex ratio is particularly pronounced in smaller villages like Salvan and Navlewadi. In the villages of Asandoli (942.85), Nivade (943), Kirve (938.53), Gharpan (933.95), and Parakhandale (910.68), the sex ratio is moderate and close to the regional average. These villages show limited but stable development in agriculture, allied occupations, and infrastructure. Overall, the sex ratio in this foothill region reflects the characteristics of a geographical transition zone, where the socio-economic influences of both hilly and plain regions are at play.

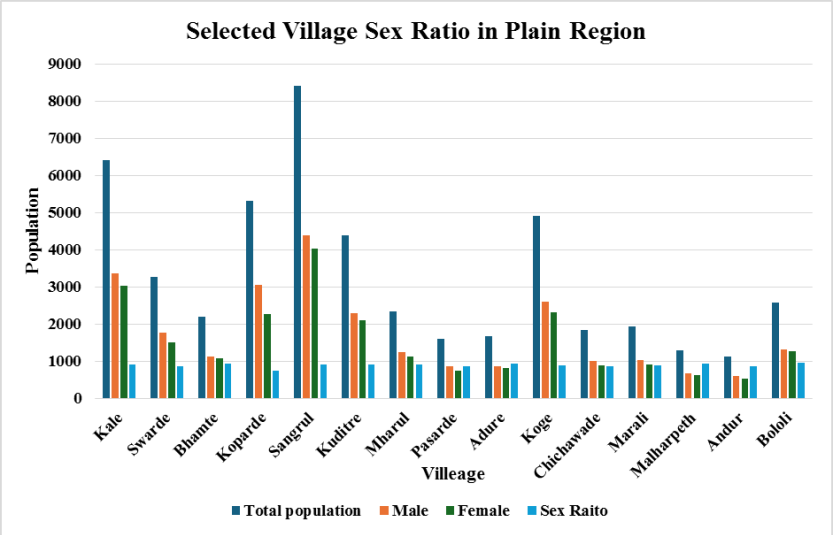
3.Sex Ratio in the Plain River Basin Region:

Table: 03: Selected Village Sex Ratio in Plain Region

Village	Total Areas in Hectors	Total population	Male	Female	Sex Raito
Kale	598	6403	3369	3034	900.56
Swarde	678	3271	1764	1507	854.30
Bhamte	276.47	2190	1129	1061	939.76
Koparde	504.15	5311	3051	2260	740.74
Sangrul	892.68	8414	4395	4019	914.44
Kuditre	637.88	4382	2296	2086	908.53
Mharul	309.25	2343	1230	1113	904.87
Pasarde	288	1602	858	744	867.13

Adure	302.82	1668	865	803	928.32
Koge	1228	4920	2602	2318	890.85
Chichawade	302.55	1827	1002	875	855.28
Marali	213	1935	1023	912	891.49
Malharpeth	31	1288	667	621	931
Andur	1272.55	1119	601	518	861.89
Bololi	749.39	2563	1309	1254	957.98
Total	**8283.74**	**49236**	**26161**	**23125**	**883.94**

Source: - Researcher Creation



Graph: 03

Source: - Researcher Creation

Information from 15 villages in the flat river valley plains of the Kumbhi river basin reveals that the sex ratio in this region is significantly lower compared to the other two geographical divisions. The total area of this region is 8,283.74 hectares, with a total population of 49,236. This includes 26,161 males and 23,125 females, resulting in an average sex ratio of only 883.94. This ratio is a clear indicator of socio-economic imbalance.

Village-wise, Bololi (957.98), Malharpeth (931), and Andur (928.32) have a relatively better sex ratio. These villages have an agrarian economy, and women are actively involved in agriculture and related occupations. This seems to have helped maintain the proportion of the female population to some extent.

In contrast, Koparde (740.74) is a striking example of a village with an extremely low sex ratio. Similarly, Savarde (854.30), Chichwade (855.28), Andur (861.89), and Pasarde (867.13) also show a low sex ratio. In these villages, better transportation facilities, proximity to markets, and employment opportunities in the industrial and service sectors appear to have led to higher male migration and settlement, which has directly impacted the sex ratio.

The villages of Kale (900.56), Sangrul (914.44), Kuditre (908.53), Mharul (904.87), and Koge (890.85), which have larger populations, show a moderate sex ratio. However, despite the large population, an imbalance in the male-female ratio is observed, which is related to urbanization, economic development, and migration processes.

Overall, urbanization, industrialization, male migration for employment, and socio-economic structure are the major factors behind the low sex ratio in the plains of the flat river

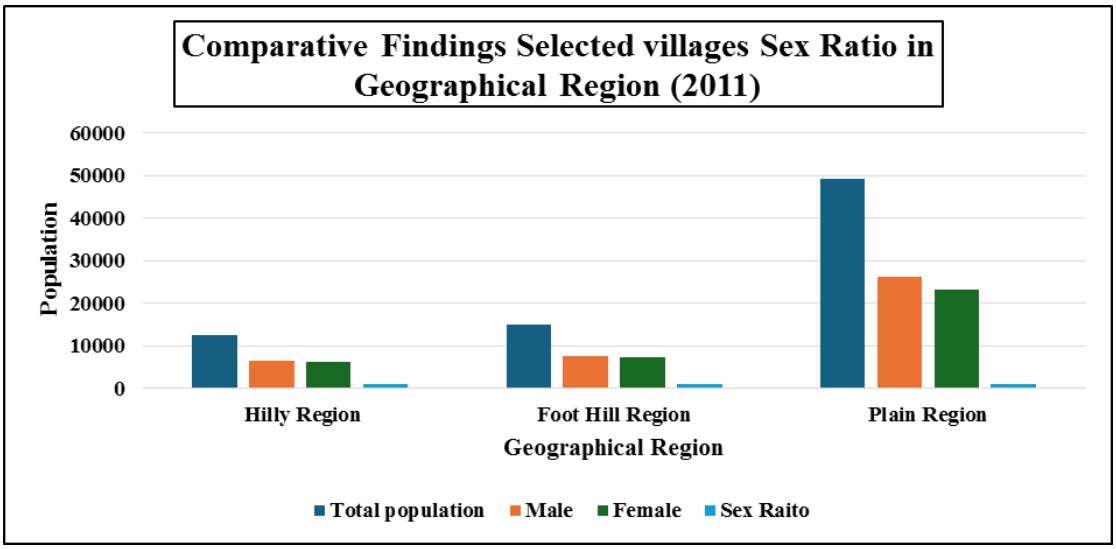
basin. Although this region is economically developed, it shows a significant disparity in the sex ratio in terms of social balance, which is important from the perspective of population geography.

Comparative Findings of the Three Geographical Regions:

Table: 04 Comparative Findings Selected Villages Sex Ratio in Geographical Region

Sr. No	Region	Total population	Male	Female	Sex Raito
1	Hilly Region	12597	6508	6089	935.61
2	Foot Hill Region	14963	7683	7277	947.15
3	Plain Region	49236	26161	23125	883.94

Graph: 04



Source: - Researcher Creation

A clear and significant regional disparity in the sex ratio is observed across the three geographical divisions of the Kumbhi River basin: the hilly region, the foothill region, and the flat river valley plain. This disparity underscores the influence of geographical structure, the level of socio-economic development, and the nature of migration on the sex ratio.

The average sex ratio of the hilly region is 935.61, which is relatively balanced. In some villages of this region, the sex ratio is found to be more than 1000, indicating a higher proportion of the female population. The difficult geographical conditions, limited industrialization, and outward migration of men for employment appear to be the main reasons behind the relatively better sex ratio in the hilly region. However, the extremely low sex ratio found in some villages points to social and health-related vulnerabilities.

The foothill region is a transitional geographical division with an average sex ratio of 947.15, the highest among the three regions. In this region, the agrarian economy, limited migration, and rural social structure seem to have maintained a relatively balanced male-female ratio. Located at the boundary influenced by both the hilly and plain regions, this area emerges as an excellent example of social and demographic stability. Conversely, the flat river valley plain, despite being the most developed and densely

populated, has an average sex ratio of only 883.94, the lowest among the three regions. Due to urbanization, industrialization, transportation facilities, and more employment opportunities in this region, there is a large-scale migration and settlement of men. Consequently, the imbalance in the male-female population is clearly more pronounced. A comparison of the three regions reveals that as geographical inaccessibility increases, the scope of economic activities narrows, but the sex ratio improves relatively; conversely, as geographical accessibility and economic development increase, the gender imbalance in the sex ratio intensifies. Therefore, the sex ratio pattern in the Kumbhi river basin is consistent with the concept of "Development–Gender Imbalance." In hilly and remote areas, the rate of migration is low, resulting in a relatively balanced male-female ratio. The current study shows that the sex ratio in the hilly region of the Kumbhi river basin supports this theory. In the foothill region, due to the agrarian economy and limited industrial development, the sex ratio is found to be relatively stable, which is consistent with previous studies on rural populations.

The findings of the current study, which show a lower sex ratio in the flat river basin region, are consistent with the studies by Guilmoto and Sen. In this region, due to urbanization, transportation facilities, proximity to markets, and employment opportunities, the rate of male migration is higher, which directly impacts the sex ratio. Thus, the interrelationship between geographical development and gender balance in the population is clearly demonstrated through the study of the Kumbhi river basin.

Overall, this comparative study concludes that the sex ratio is not merely a biological factor but a combined result of geographical, social, and economic processes. The differences in sex ratios across the three geographical divisions of the Kumbhi river basin are significant from the perspective of population geography and can serve as a guide for regional planning, social development, and population policies.

Comparative Analysis:

A comparative analysis of the three physiographic regions clearly reveals that sex ratio declines with increasing levels of economic development and accessibility. The foothill region exhibits the most balanced sex ratio (947.15), followed by the hilly region (935.61), while the plain region records the lowest sex ratio (883.94).

This pattern supports the concept of a development–gender imbalance relationship, wherein rapid economic growth and urbanisation tend to intensify gender disparities unless accompanied by strong social and institutional safeguards.

Findings:

1. Sex ratio varies significantly across physiographic regions of the Kumbhi River Basin.
2. Hilly and foothill regions show relatively balanced sex ratios due to male out-migration and agrarian livelihoods.
3. The plain region exhibits a markedly low sex ratio, influenced by urbanisation, industrialisation, and male-dominated migration.
4. Sex ratio is strongly shaped by geographical setting, economic opportunities, and social structure rather than biological factors alone.

Suggestions:

1. Strengthen female education and healthcare facilities across all regions.
2. Ensure strict implementation of laws against female foeticide.

3. Promote local employment opportunities in rural and hilly areas to reduce distress migration.
4. Conduct sustained social awareness programmes to improve gender equity.

References:

1. Census of India (2011). District Census Handbook: Kolhapur District. Government of India.
2. Chandna, R. C. (1986). *A Geography of Population: Concepts, Determinants and Patterns*. Kalyani Publishers, New Delhi.
3. Husain, M. (1999). *Population Geography*. Anmol Publications, New Delhi.
4. Sen, A. (1990). More than 100 million Women Are Missing. *The New York Review of Books*.
5. Dyson, T., & Moore, M. (1983). On Kinship Structure, Female Autonomy, and Demographic Behaviour in India. *Population and Development Review*.
6. Government of Maharashtra (2011). Maharashtra State Gazetteer: Kolhapur District.