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DISTRICT-LEVEL FERTILITY DISPARITIES IN NEPAL: EXPLORING THE EXTREMES AROUND REPLACEMENT LEVEL

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ABSTRACT

Indeed, national fertility levels reach nearly replacement level in Nepal, yet sizable disparities are observed at the district level in terms of fertility. While some districts exhibit fertility below replacement levels, others have high fertility levels, which are mainly recognized to age. This study endeavors by examining age-specific fertility rates (ASFRs) and total fertility rates (TFRs) at the district level to search the extremes in fertility and its geographic as well as demographic dimensions of fertility transitions in Nepal.

The study used an analytical method using fertility data from the 2021 National Population and Housing Census (NPHC), direct as well as indirect methods of estimations were used. Age-specific fertility rates were computed using births that occurred in the past 12 months before the census. The indirect estimates were generated using the Arriaga method that relied on average children ever born (CEB) from the 2011 and 2021 censuses. The total number of districts analyzed included 77, concentrating on the highest and the lowest fertility. Descriptive statistics, fertility equations and comparison of ASFRs and TFRs between districts were then utilized for analysis.

The high fertility districts such as Rautahat (TFR 4.33), Dhanusa (3.94), and Achham (3.47) could get born each child aged even from their uneasy older cohorts; in contrast, Lalitpur (TFR 1.24), Kathmandu (1.29), Bhaktapur (1.31) displays late fertility beginning and rather less children after age 35. The differences in fertility in Nepal are, however, caused by long-standing social problems, which are really geographical and service-related inequalities needing targeted interventions at a district level. Policies should therefore promote adolescent reproductive health, delay early marriage, and strengthen localized family planning programs that are personalized for proffering district-specific fertility profiles.

Keywords: Fertility, disparities, ASFR, TFR, Nepal, census

INTRODUCTION

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Fertility patterns are important indicators of demographic and social change with subsequent far-reaching implications on population growth, economic development, and public policy-making. In Nepal, fertility indicators show a marked decline these days, with a national shift from high-fertility to near replacement-level fertility. Total Fertility Rate (TFR) was estimated by the Nepal Demographic and Health Survey (NDHS) in 2016 to be 2.3 children per woman, down from 4.6 in 1996 (Ministry of Health, Nepal; New ERA; and ICF, 2017). The prenatal marries postponed, urbanization, educating girls to control births on one's own; these are but a few factors that bring this new trend.
Fertility differs significantly across the mountain, hill, and Tarai ecological zones as well as between urban and rural (Aryal, 2020; Thapa & Niehof, 2013). It is in these rural and unreached that the incidences of early marriage, son preference, and limited access to reproductive health care build a generally higher fertility experience (Gurung & Shrestha, 2021). In comparison, urban centers such as Kathmandu and Lalitpur are currently experiencing much lower TFR levels well below replacement due to delayed childbearing (Bongaarts, 2017; Singh & Frost, 2015). However, except for a few publications, little attention has been paid to district-level fertility extremes around the level of replacement-fertility that is insistently high e demographic, social, and geographical processes responsible for those situations.

Total Fertility Rate (TFR) is an important demographic indicator because it measures the average number of children a woman would bear throughout her life if she experienced current age-specific fertility rates. TFR is useful for comparative studies across geographic areas and across population subgroups (Siegel & Swanson, 2004). Fertility analysis at the district level would give a more in-depth appreciation of the where and why of the disparate effect. Through a focus on both ends-the high-fertility districts and the low-fertility ones- can separate patterns unknown by national means.

In addition, socio-economic variables such as education, wealth of the household, and urbanization have always been related to fertility decline. Sub-national evidence shows that women's education and employment, and access to health infrastructure are all major forces in fertility decline (Khanal & Aryal, 2019). However, in high-fertility districts, those transitions are either slow, especially when such districts function within the frame of inherent patriarchal norms and under levels of female autonomy (Pradhan, Silwal, & Ghimire, 2022). Understanding the demographic setting and contextual variables that keep fertilizing in certain districts, while the others experience below-replacement fertility, may give vital insights to the policymakers.

Fertility differences using census data at the district level have been studied seldom in the post-2021 era, while a good amount of demographic literature exists on Nepal. Most likely, the work has concentrated at the national or regional level, lacking in granularity necessary for determining localized fertility patterns with their determining factors. This study hence fills a gap in examining fertility disparity at the district level across Nepal while focusing on those districts at either end of the fertility spectrum above and below the replacement level significantly. This focus has been justified by the growing policy demand from geographically disaggregated data to inform reproductive health and population strategies. This study has considerable social and policy implications. This study unlike previous studies that emphasize aggregate national trends, incorporates district-level age-specific fertility rates (ASFRs) and contextual analysis as the main perspective providing a detailed spatially disaggregated view of Nepal's fertility transition. Therefore, this strengthens the evidence base for attaining equitable reproductive health results in the framework of Nepal's federal system and sustainable development goals.

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METHODS

This study analysis the trends on fertility using direct and indirect estimation methods based on the National Population and Housing Census (NPHC) of Nepal, which was conducted in 2021. Total Fertility Rates are used as primary indicators to assess reproductive behavior and the transition level of fertility at national, provincial, and district levels. For their estimates, the standard demographic formula describes direct ASFR and indirect estimates as computes through age-specific fertility rates based on births during the year preceding the census (Siegel & Swanson, 2004). However, in case of underreporting or incomplete data, indirect estimates would be useful.

This is a robust indirect method because it produces ASFRs from average children ever born (CEB) data across two points of census 2011 and 2021 which is able to accommodate changes in fertility behavior over time and operates particularly well in the argument that these data become skewed through socio-economic changes (Arriaga, 1983; Moultrie et al., 2013). Reporting errors and underreporting is also measured in older women that give more stable and more detailed estimates in their fertility (Devkota, 2022).

By converging both estimation methods, the analytical framework makes it a complete experience for a better understanding of the transition population of Nepal. It takes account of urbanization, increasing education of women, and a wide net of family planning as factors of decreasing fertility (CBS, 2021). Thus, the framework is very useful when conducting targeted policies through understanding subnational disparities.

RESULTS

The comparison of fertility pattern at national level and Darchula district with different five-year age groups was made in Table 1. Nationally, highest fertility is recorded at 20-24 years with a rate of 0.149, again followed by 25-29 with a rate of 0.111, proving that these years are the peak childbearing ages. After 30, fertility declines rapidly, and women 40 years and older contribute little to no births. Fertility appears to be more concentrated at young ages, for in Darchula the highest numbers of births by age group are in the 20-24 years (865 births); next comes the 25–29-year age group (667 births) and the smallest number of births occurred in the 30-34 age group (311). Hence, really fewer children are born after the age of 34 years, which might be a sign of changes in preferences regarding fertility.

Table 1: National and replacement level districts fertility

Variables	**Five-year age group**						
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**
Nepal	0.047	0.149	0.111	0.062	0.017	0.000	0
Darchula	259	865	667	311	19	0	0

National Statistics Office. (2025).

Total Fertility Rates remaining above the replacement level of 2.1, this study shows the fertility pattern in 32 districts of Nepal. Age-specific fertility that early and sustained childbearing have a raised fertility impact and identify various regional and demographic factors that affect the trends. In almost every high-fertility district, there is a trend where most births are concentrated among women aged 20-24 and 25-29 high reproductive years in Nepal. So in districts, such as Dhanusa

(TFR-3.94) and Rautahat (TFR-4.33), 2,000 births or more are recorded in the two said age brackets, pointing toward early marriage and childbearing as the primary drivers of fertility. These patterns are forced by low female education and socio-cultural prospects regarding early motherhood.

Beyond early childbearing, many districts also show an extension of fertility into older ages. Table 2 shows Rautahat, there are 770 births among women aged 30-34 and 392 births in the 35-39. Mustang shows a different trend altogether, with huge number of births even among women aged 40-44 (311) and 45-49 (547) which could indicate a delayed fertility cessation or an influence of poor contraceptive access. Conversely, in some districts like Kalikot, fertility is very focused in the 20-29 age range with virtually no births among older women. In the absence of later motherhood, however, Kalikot's TFR is still quite high (3.13); this demonstrates the impact of early reproductive years being dominated by intense fertility.

Terai regions form a geographically defined area of high fertility in the districts of Saptari, Siraha, Dhanusa, Mahottari, and Rautahat (TFRs from 2.94 to 4.33). These areas are subject by rigid social customs, namely son preference, early marriage, and low literacy levels in women. Therefore, initiating activities to reduce fertility will not be limited to access to family planning; social change as well as gender empowerment must engage development efforts.

In other districts, such as Rukum (West) and Salyan, TFRs just above 2.1, some signs of the fertility transition have been detected: a sharp decline in births after age 30 and nearly non-existent fertility in women older than 45. Such fertility-transition markers clearly indicate the success of family planning uptake and reproductive health awareness.

Inaccessibility has contributed to high fertility in remote districts like Mugu, Jumla, Humla, and Achham, indicating poorly developed infrastructure and health service delivery. Nonetheless, Achham is particularly noted for high fertility, even in the advanced reproductive age stages of women, features of fertility ending possibly being associated with late contraceptive usage.

To summarize, Nepal's high-fertility districts represent entrenched socio-cultural and service-level differentials. There is an urgent need for concentrated local approaches that work towards marriage delays, women's empowerment, and youth sexual and reproductive health to maintain the national fertility decline.

Table 2: Total fertility rate above replacement level

District	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Taplejung	292	668	588	391	182	71	202	2.36
Sankhuwasabha	281	739	606	400	191	57	1	2.25
Khotang	280	758	593	361	169	32	0	2.16
Bhojpur	287	718	559	349	202	50	100	2.23
Saptari	303	1085	856	538	265	114	25	3.17
Siraha	339	1188	838	485	221	50	23	3.12
Dhanusa	409	1253	948	659	402	206	106	3.94
Mahottari	340	1204	963	555	201	44	0	3.29
Sarlahi	332	1172	933	539	202	15	0	3.17
Rautahat	422	1389	1151	770	392	172	63	4.33
Bara	349	1099	856	479	167	10	0	2.94
Parsa	291	1079	871	512	207	34	0	2.98

Rasuwa	129	764	605	438	275	68	0	2.25
Nuwakot	223	782	669	405	207	185	66	2.52
Kavrepalanchok	154	593	640	431	270	167	18	2.26
Mustang	166	509	642	634	527	311	547	3.18
Baglung	234	819	661	375	182	31	0	2.28
Rukum (East)	366	778	635	471	408	123	93	2.78
Kapilbastu	90	942	845	581	274	32	0	2.76
Mugu	432	1108	853	426	49	0	0	2.84
Humla	414	1064	838	546	18	0	0	2.83
Jumla	305	861	634	237	88	423	176	2.7
Kalikot	269	1211	937	568	167	0	0	3.13
Dailekh	364	1015	738	441	202	9	0	2.74
Jajarkot	434	1052	800	519	207	20	0	3
Rukum (West)	392	956	529	238	35	2	5	2.12
Salyan	390	912	473	249	69	51	2	2.11
Bajura	285	1076	678	289	15	0	0	2.32
Bajhang	263	1155	825	385	38	0	0	2.65
Baitadi	196	1092	789	434	182	0	0	2.68
Dadeldhura	228	970	724	407	174	17	0	2.51
Doti	204	1172	886	485	256	21	0	3.01
Achham	231	1197	957	594	226	172	105	3.47

National Statistics Office. (2025).

Table 3 shows that more or less, in its entirety, the total fertility rate of the Nepali districts is analysed which lies at replacement level of 2.1 or slightly above it. The study includes age specific fertility data across mountain, hill and Terai regions. The study shows how fertility transitions are further influenced by the local socio-economics and demographic dynamics.

The births consistently cluster in the 20-24- and 25-29-years' age brackets, thus strengthening the statement that these are the highest periods of childbearing. A few examples include Darchula, Banke and Myagdi where Darchula reported 865 births for the 20- 24 years old, while that of 25-29 years is 667. Early marriage and childbearing are still very common in rural and semi-urban areas so they do sustain fertility level, despite the national level declines. Contributions from the merging cohorts of 15-19 and 30-39 are also noteworthy in these areas, further supporting the multifaceted nature of fertility maintenance.

In Dhankuta (TFR 2.04), Ramechhap (2.0), and Banke (2.01), fertility is more evenly distributed along the early. Dhankuta has a higher number of births in the age group of 30-34 and 35-39. This indicates a continuous fertility transition, which may be induced by improved reproductive health services and increased awareness that allows women to better space.

Urban districts such as Lalitpur (TFR 1.24) and Kathmandu (1.29), however, unexpected decline in fertility after 29 with almost nil births among women above 40. This results mainly from raised levels of female education, higher accessibility to contraception, and urbanized norms that encourage delayed and limited childbearing. Hence, this is also considered a model of successful fertility reduction in Nepal.

Nevertheless, the middle hill and mountain districts continue to exhibit slightly higher TFRs in Rolpa, Dolpa, Palpa as they are trend toward the national averages. This means in Rolpa, fertility behavior extends to the age group of 40-44, indicating cultural continuance of bigger families and possibly service gaps in health delivery. In the Terai, a few districts such as Sunsari, Morang, and Jhapa (TFRs 1.6-1.9) continue to report quite high adolescent fertility rates. In the case of Sunsari, the statistic is some women between the ages of 15 and 19 who recorded 250 births, all blaring of the need to focus on adolescent appropriate reproductive health education and services, even as fertility declines overall. Mostly, near-replacement districts have concentrations of fertility that become minimal beyond age 40, signaling increasing acceptance of fertility limitation. To bridge the gap, Nepal needs to make concerted efforts to put in place localized fertility strategies-deferment of early marriage, better access to contraceptives, and increased women education so that all geographic areas transition demographically evenly.

Table 3: Total fertility rate below replacement level

District	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Solukhumbu	199	697	483	281	168	42	0	1.85
Okhaldhunga	169	678	480	212	8	1	0	1.53
Dhankuta	232	618	583	382	184	68	0	2.04
Terhathum	251	667	544	330	95	0	0	1.86
Panchthar	294	657	495	324	141	0	0	1.87
Ilam	177	509	445	226	159	9	0	1.5
Jhapa	129	605	515	304	78	0	0	1.62
Morang	191	707	541	296	72	0	0	1.79
Sunsari	250	720	539	290	84	0	0	1.87
Udayapur	242	637	490	191	8	0	0	1.54
Dolakha	141	721	547	336	153	7	0	1.89
Sindhupalchok	174	672	530	317	98	0	0	1.78
Dhading	221	672	557	247	38	2	0	1.71
Kathmandu	48	295	450	347	139	14	0	1.29
Bhaktapur	69	319	479	329	118	7	0	1.31
Lalitpur	59	285	410	342	148	6	0	1.24
Ramechhap	166	718	626	320	165	22	0	2
Sindhuli	235	735	475	183	5	0	0	1.61
Makwanpur	213	590	420	163	24	0	0	1.39
Chitawan	155	503	517	195	13	0	0	1.37
Gorkha	214	614	576	253	46	25	1	1.71
Manang	137	410	410	403	259	43	0	1.65
Myagdi	258	675	540	328	149	18	0	1.93
Kaski	97	401	546	266	39	0	0	1.34
Lamjung	188	532	475	185	45	0	16	1.42
Tanahu	218	533	483	203	14	0	0	1.42
Nawalparasi (East)	194	557	457	139	1	0	2	1.33
Syangja	139	643	542	219	37	0	0	1.57

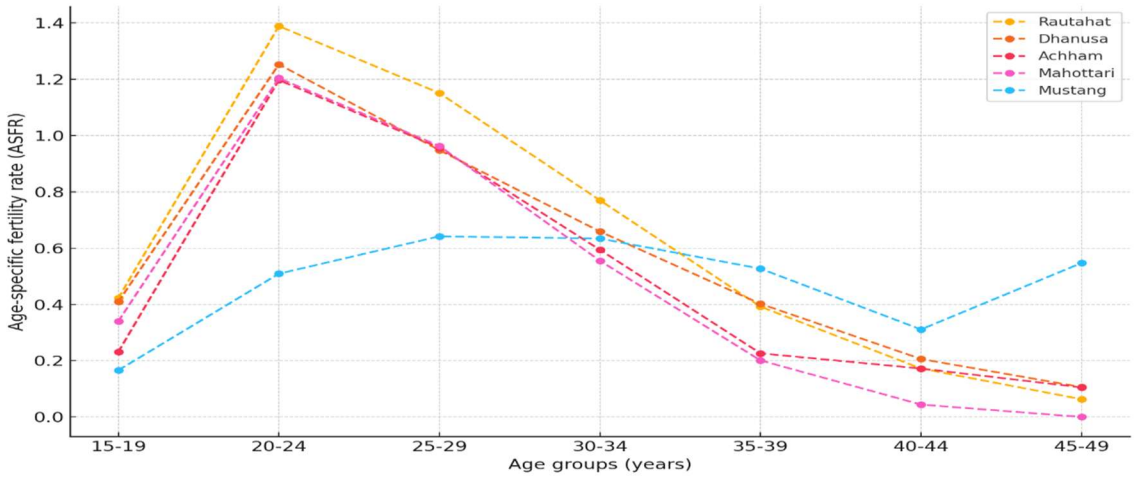
Parbat	208	688	521	184	40	0	0	1.62
Rolpa	300	789	531	264	53	45	0	1.95
Pyuthan	258	819	550	184	12	0	0	1.8
Gulmi	233	771	516	157	69	5	0	1.73
Arghakhanchi	258	802	553	144	14	6	0	1.76
Palpa	224	637	531	243	134	19	0	1.76
Nawalparasi (West)	113	727	538	271	48	0	0	1.69
Rupandehi	84	732	571	334	84	0	0	1.8
Dang	211	625	407	144	8	0	0	1.38
Banke	189	739	597	368	127	0	0	2.01
Bardiya	218	559	355	170	14	0	0	1.3
Dolpa	191	743	582	339	80	0	0	1.91
Surkhet	308	689	463	201	39	0	0	1.67
Darchula	259	865	667	311	19	0	0	2.1
Kailali	159	563	415	208	33	0	0	1.37
Kanchanpur	142	639	522	229	33	0	0	1.56

National Statistics Office. (2025).

Figure 1 shows that ASFRs and TFRs are provided for five districts in Nepal with the highest fertility levels which are all above the national replacement level of 2.1. Rautahat stands apart in TFR because of 4.33, supported by very high fertility in the 20-24 (1.389) and 25-29 (1.151) age groups with a high contribution from women aged 30 and above. TFR for Dhanusa (3.94) and Achham (3.47) stands below but nevertheless reflect sustained fertility among women aged 40-49 with early age at first birth. Mustang is unique in its multiphasic fertility pattern with a lower ASFR in the first half of the reproductive phase but increased fertility enjoyed in advanced ages with an exceptionally high 45-49 ASFR of 0.547, continued childbearing behavior.

The trends in national and replacement-level fertility shown in Figure 1 underline the fact that national ASFR distributions are now more concentrated at younger reproductive ages (20-29) and there is little contribution from the age group of 35 and above-women. Alternatively, in the case of the five districts with high fertility level, childbearing is characterized by both early initiation and longer continuation. These trends show a separation in fertility behavior from one region to the other, and socio-cultural norms, and women's education are likely to be involved. Such contrasting fertility rules call for focused high-fertility districts to encourage lowered fertility.

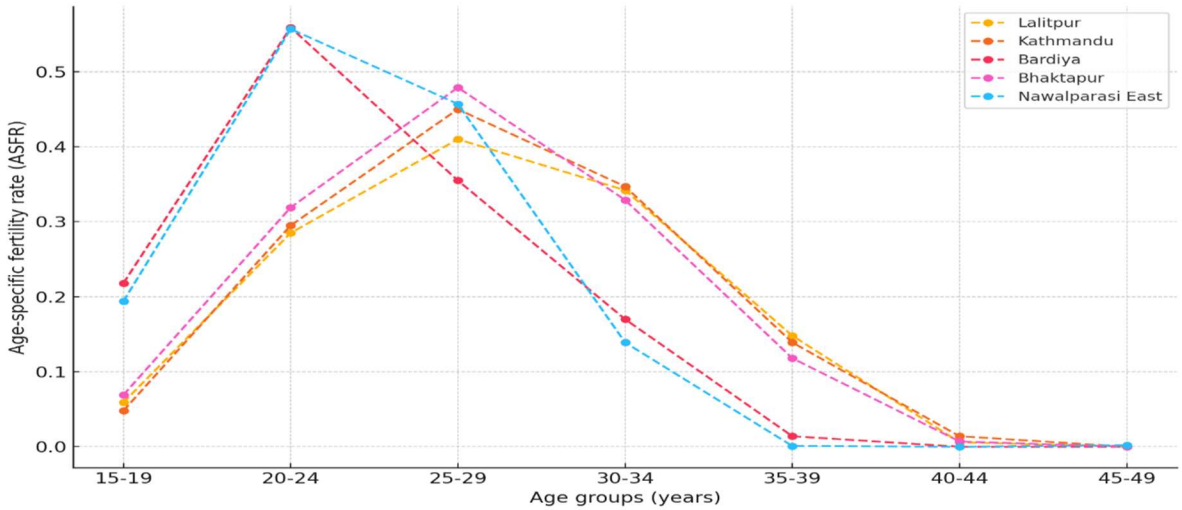
Figure 1: Highest TFR in five districts



National Statistics Office. (2025).

The districts with the five lowest fertility rates - Lalitpur, Kathmandu, Bardiya, Bhaktapur, and Nawalparasi East. Figure 2show Total Fertility Rates (TFR) between 1.24 and 1.33, all far below the replacement level of 2.1. Fertility levels in urban districts like Lalitpur and Kathmandu are highly concentrated in the 25-29 and 30-34 age groups and these are very low in the younger (15-19) and older (35+) age cohorts, indicating postponement of childbearing and an early end of fertility. A similar pattern indicates the prevalence of empowerment through education in Bhaktapur. Bardiya and Nawalparasi East are rural but show slightly higher adolescent fertility rates; however, their TFRs are still low due to very little fertility among older women. All in all, these districts present the case of fertility transition in Nepal produced through urbanization, enhanced health services, and changing reproductive behavior.

Figure 2: Lowest TFR in 5 districts



National Statistics Office. (2025).

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DISCUSSION

This title plots strongly through the pronounced differentials of the fertility trends across the country's regions. Total Fertility Rates (TFR) are high in the districts of Rautahat, Dhanusa, and Achham, where the early and low-fertility areas like Lalitpur, Kathmandu, and Bhaktapur are characterized by a late beginning of fertility with a sharp drop in birth after 34 years of age following decreased fertility intention and widespread access to family planning services (Ministry of Health, Nepal; New ERA; and ICF, 2017). Fecundity transition becomes widespread through different patterns across the country, governed by educational access, health services, cultural norms, and economic development (Aryal, 2020). These findings conform with earlier pieces of evidence indicating that regions of high fertility mainly in the Terai and distant mountain areas include early marriages, poor contraceptive use, and traditional beliefs for large families (Thapa and Niehof, 2013; Gurung and Shrestha, 2021). The continued fertility of women aged 40+ in Achham and Mustang reveals the historic pattern of rural Nepal in which halting reproduction is delayed due to either a lack of access to health services toward son preference (UNFPA, 2020). Dissimilarities between public districts and urban territories around the world manifest a very significant drop in fertility, correlated with major advances in the education and economic participation of women (Bongaarts, 2017; Khanal and Aryal, 2019). More than age group excesses, Lalitpur and Bhaktapur thus, represent a very low-fertility view indicating impressive reproductive autonomy.

The persistent determination of adolescent fertility in many high- and mid-fertility districts remains troubling; in Dhanusa, Kalikot, Saptari, a sizeable number of births within the age range of 15-19 are being reported, posing a national commitment to reducing adolescent pregnancy (Pradhan, Silwal, & Ghimire, 2022). Early childbearing leads to increased lifetime fertility, but it is generally a risky prospect for maternal and neonatal health. The laws that exist to put off marriage and childbirth are not well enforced, and youth-friendly SRH services are not easily available in rural areas (World Health Organization [WHO], 2021). Conversely, districts such as Kathmandu and Lalitpur have reported nearly no cases of adolescent fertility, thus speaking of the protective function of educational and urban exposure (Singh & Frost, 2015).

From the position of policy, these results highlight a need for local context-based interventions at the district level. These interventions must target contraceptive access, gender norms, education, and adolescent SRH within the high-TFR districts for any fertility reductions to become effective. Terai districts where son preference is embedded, behavioral change campaigns and incentives for smaller families may work better than supply-side health interventions alone (UNFPA, 2020). In the meantime, keeping low fertility in urban areas partly hinges on empowerment and reproductive rights (Khanal & Aryal, 2019). In sum, understanding fertility as a socially and geographically patterned phenomenon is vital in securing an equitable response to in Nepal.

This study's main strength is that it uses disaggregated age-specific fertility data from across the districts of Nepal for a detailed analysis of spatial and behavioral variations. The district-level approach indicates valuable implications for subnational policy formulation. However, the study depends on almost entirely on quantitative birth data, lacking control for such key variables as education, household wealth, migration. Moreover, the qualitative aspects, such as cultural norms and personal fertility intentions, have been kept aloof from the analysis, which reduces

interpretational depth. A mixed-method approach is recommended in future studies to encapsulate an all-encompassing fertility behavior and its structural restrictions (Gurung & Shrestha, 2021).

CONCLUSION

The study assesses the fertility patterns in Nepal at large scales in terms of the diversity of the districts and reveals considerable patterning in the age-specific fertility rates and total fertility rates in each of these districts. To high-fertility districts thus signify early and sustained childbearing, whereas low-fertility districts would appear to imply a different trend altogether: late attainment of childbearing followed by early ending. The differences and differences between changing districts shall explain varying socio-cultural norms, access to health services, education for women, and geographical isolation. In many districts, adolescent fertility has remained a central factor leading to high fertility; hence, there is a need to promote strong reproductive health programs targeted toward the youth. This imposes that reproductive health strategies at the local levels be evidence-based and that they take into respect the regional demographic and culturally specific realities of the various districts. To achieve the national fertility target, gender equity, raising the marriageable age, and allowing for the equitable availability of family planning programs will be vital. And hence a joined multi-sectoral approach based on quantitative evidence presented and qualitative insights from the communities will be critical in addressing the fertility transition in Nepal.

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