Population Characteristics of Maternal and Child Health Demographic Survey (MCHDS), Gujarat 2019

Kranti S. Vora[1*], Parth A. Tailor[1] and Shahin L. Saiyed[1]

[1]*Indian Institute of Public Health Gandhinagar, NH-147, Palaj Village, Opposite New Air Force Station HQ, Gandhinagar, Gujarat 382042, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors KSV and PAT have designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors PAT and SLS managed the analyses of the study. Authors PAT and SLS managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: This research article aims to discuss the preliminary finding of Maternal and Child Health Demographic survey (MCHDS) and compare health and demographic indicators across urban, rural and tribal regions.
Study Design: MCHDS is longitudinal survey design and its methodological considerations are discussed briefly in another article.
Methods: MCHDS comprised 3 rounds, 1) Household survey 2) Maternal survey and 3) Child survey. Census survey method was used incorporating each and every individual from population. Total of 2,70,576 individuals were surveyed belonging to 58897 households in the baseline census. Under child survey, 12,370 under 5 children and under maternal survey 10,999 women (age 15-49) who were either pregnant at the time of survey, or had at least one pregnancy in 5 years preceding the survey were surveyed. Descriptive statistics is used to explore and understand the demographics and Maternal and child health indicators.
Results: Proportion of pucca houses were highest in urban followed by rural and tribal. Majority of the urban household had proper water and sanitation facility, followed by rural and tribal field site. Proportion of salaried employers was highest in urban followed by tribal and rural. Statistics based

---

Corresponding author: Email: kvora@iiphg.org;

on wealth index, indicates that proportion of comparatively richer class (highest and fourth) was highest in urban followed by rural and tribal and proportion of poorest class (second and lowest) was highest in tribal followed by rural and urban.

Conclusion: All three regions have distinct socio-demographic and economic characteristics which coincides with the similar studies and national surveys. Urban and rural population was better off than tribal populations in terms of socio-demographics, economic status, housing, water and sanitation facility and morbidity scenario.

1. INTRODUCTION

Maternal and child health (MCH) is a major public health concern. Most commonly socio-demographic and economic characteristics of region often reflects health status of a country. These factors have been associated with variations across various states and social groups in India and among social groups [1,2]. India has made several progress in gaining maternal and child health on track. However, much progress is needed in terms of health, social, and development sector [3].

In the current scenario, provision of quality services in MCH remain unclear in India. As per NFHS-4 data, Anemia and Malnutrition were prevalent in pregnant women (15-49 years) and children under five years of age [4]. In addition, evidence suggests that, biological, socio-economic and environmental factors such as-gender discrimination; birth order; mother's age at birth; birth intervals; availability of professional antenatal and delivery care; full immunization of children; mother's exposure to mass media; mother's religion and ethnicity; mother's education; income of the household; use of clean cooking fuel; water, sanitation and hygiene practices; and urban-rural residence are closely interlinked with poor health conditions [5–7]. Hence, it is important to have surveillance data on these populations in order to inform program planning.

A health demographic surveillance system (HDSS) enable improvement in health care planning by expanding the geographical coverage and improving quality and availability of data [8]. A study also reported that, due to exposure of surveillance and research activities under HDSS field sites, awareness about targeted intervention or subject increases compared to non-HDSS regions [9]. HDSS is an excellent scientific infrastructure for establishing population impacts of health interventions, in particular those that affect large proportions of the population, effective data management can substantially enhance the scientific opportunities to establish the impacts of treatment on outcomes and play a significant role in capturing the health needs of a population [10, 11]. This article presents population character-istics of Maternal and Child Health Demographic Survey carried out in urban, rural and tribal locations of Gujarat and provide a comparative insight. This paper would serve as a reference for future publications from the survey data.

2. METHODS

2.1 Study Site

The Maternal and Child Health Demographic (MCHD) survey was carried out in urban, rural and Tribal regions of Ahmedabad district of State of Gujarat, India. Two wards (Behrampura and Vasna) of Ahmedabad city as urban; one sub-district (Bavla) of Ahmedabad district as rural and three sub-districts (Bhiloda, Meghraj and Modasa) of Aravalli districts were selected as tribal field site. (Fig. 1) Behrampura and Vasna wards of Ahmedabad district fall on opposite side of river Sabarmati running from northeast to southwest direction through the centre of City. Behrampura has total population of 1,59,181 with the area of 8.67 km^2 and Vasna has 1,53,558 with the area of 6.03 km^2 [12,13]. Exclusively Urban slum households of these two wards were surveyed so as to represent marginalized and urban poor population. As defined by UN-Habitat "slum is a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services" [14]. These two wards were selected as urban field sites having large proportion of slum population. As per the previous studies conducted by Saath Charitable Trust, Behrampura and Vasna wards have 52% & 34% of the population residing in urban slum.

Bavla sub-district is located on the outskirts of Ahmedabad city in the west. It has total of 799 km^2 area with the population of 1,58,191

individuals. The site is predominately resided by the rural population (more than 73%) [15], hence Bavla was selected as rural field site.

Bhiloda, Meghraj and Modasa sub-districts of Aravalli district were selected as the Tribal field sites. As per the population census 2011, Bhiloda, Meghraj and Modasa had population of 2,39,216; 1,67,115 and 2,22,625 [16]. Primarily, Bhiloda and Meghraj were given more emphasis on inclusion as these blocks are designated as Tribal regions of Gujarat [17]. Another criterion for selection of these blocks were their proximity to Community Health Centre (CHC), Shamlaji.

For preparing household list of Rural and Tribal sites, we approached the Sarpanch/elected head of the village and also consulted actively working ANM (Auxiliary Nursing Midwifery) and ASHA (Accredited Social Health Activist) worker of the specific village. To prepare checklist of Urban households, we approached the Ahmedabad Municipal Corporation (AMC), Saath (a partner NGO based in Ahmedabad) and ASHA workers.
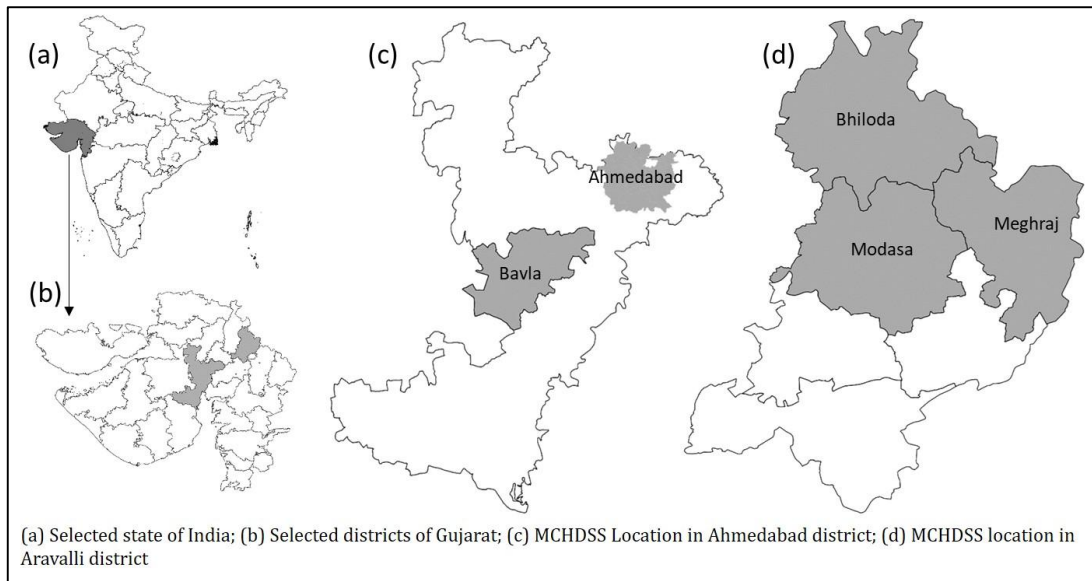
Census survey method was adopted and each and every listed household was surveyed unless for any possible reason house members remain unavailable for 2 repetitive visits. Major reason encountered were; 1) House was locked and 2) Not able to spare time. Such cases were reported highest in tribal region due to the fact that, many tribal residents seasonally migrate to the city centres in search of employment. Urban,

rural and tribal field sites were selected in order to achieve homogeneity within and heterogeneity across these three sites. For carrying out survey, an android-based mobile application was developed to collect and transfer data to the data management unit in real time. A written consent was taken from respondent before the survey.

MCHDS is longitudinal survey which was designed with three rounds of survey, namely 1) Household survey, which collected information related to Household's socio-demographics (Baseline), 2) Maternal survey (Women aged 15-49), which collected information related to maternal health, obstetric history, service utilization, complications etc and 3) Child survey (under 5 age), which collected information related to child health, vaccination, nutrition etc.

2.2 Population Characteristics

As per the design of the survey, every household member including eligible women and children below 5 years of age were surveyed from the selected sites. Total of 2,70,576 individuals were surveyed belonging to 58,897 households in the baseline census. The sex ratio of state of Gujarat for year 2015-16, was 950 which correlates with the surveyed data. Field site level disparities may be due to the extent of population coverage. Comparing the under 6 age sex ratio with NFHS 4 data (884) [4], the MCHDS reported ratio was much higher (941), could be due to inclusion of tribal population.

(a) Selected state of India; (b) Selected districts of Gujarat; (c) MCHDSS Location in Ahmedabad district; (d) MCHDSS location in Aravalli district

Fig. 1. Study area location MCHDS-2019

Table 1. Description of MCHD survey 2019

	Urban	Rural	Tribal	Total
Household level survey				
Total Household	21283	20024	17590	58897
Total Population	123422	68967	78187	270576
All age Sex ratio	946	931	1008	960
Child: Women ratio (per 1000 female, 15-49yr)	159	176	161	164
Under 5 Children survey				
Male	2703	2925	901	6529
Female	2577	2736	888	6201
0-6 age sex ratio	945	890	990	941
Eligible women (Age 15-49) survey				
Non-pregnant women	4031	3662	1753	9446
Pregnant women	638	648	267	1553

Table 2. Data collected under MCHD survey 2019

Data forms	Information collected
Household	Caste, poverty class, family type, endowments of HH, structural property of household, water & sanitation facility, income, occupation type, illness
Eligible-women	Obstetric history, ANC history, maternal health complications, delivery planning, anthropometry
Children	Age, gender, feeding practice, immunization, morbidity, anthropometry

All the eligible women and children under 5 years of age surveyed during the baseline census, were included in the second round of survey, to record in-depth information related to their health and health care practices. In second round, total of 10,999 eligible women were surveyed out of which around 14% were reported to be pregnant at the time of survey. Under the child health survey, 12,730 under 5 children were surveyed. Sex ratio for under 5 children were found to be 950 girls per 1000 boys.

Table 2 describes the major Demographic, Maternal and Child health indicators recorded under the survey. This paper presents the preliminary analysis of the survey and survey design and methodological considerations have been discussed briefly in previous publication [10]. SPSS version 25 and MS excel software were used for data management and analysis.

3. RESULTS AND DISCUSSION

The Maternal and Child Health Demographic Survey (MCHDS) was conducted between July 2018 to September 2019. Operations and Management of MCHDS was done by the main office situated in Indian Institute of Public Health Gandhinagar (IIPHG), Gujarat.

The MCHDS is the first of its kind survey, which was carried out at such a large scale. Unlike the other HDSS listed in Table 3, under MCHDS we surveyed all three populations; urban, rural and tribal.

Fig. 2 shows the age-sex pyramids by field sites. Urban and tribal field sites have similar population dynamics, comparatively less proportion of young population (<14) than tribal rural region. Narrow head (age>= 70) of all field sites' population pyramid indicates scanty number of elderly population. Median age of urban, rural and tribal population was 25, 26 and 26 respectively. Paired comparison by field sites for different age groups shows that, for the age group of 15-24, there was no significant difference between urban and tribal region. Rest all paired comparison for different age groups indicate statistically significant difference at 5%. Thus, it can be said that, all three fields sites have demographically distinct characteristics.

Comparing MCHDS data with the SRS (Sample Registration System) data [19] shows similarities across all age groups (Table 4). Thus, true representativeness of the population for all age group is considered to be achieved under this survey.

3.1 Socio-demographic Findings

More than 1/3rd of the households were headed by a male family member, in which tribal

households were having highest proportion of households (89%) headed by a male member. In urban, Scheduled Cast (SC) and Other Backward Class (OBC) were predominant, collectively accounting for more than 85% of the surveyed households. While in rural site, 85 % of the surveyed households were of OBC caste. In tribal site, 63% of the population belonged to Scheduled Tribe (ST) caste, followed by OBC (27%). In all three field site majority of family were of nuclear type with median family size of 4,3 and 4 family members in urban, rural and tribal respectively. There were very few kuchcha houses in urban and rural, while in tribal 1/3rd of the population were reported to be living in kuchcha or no house at all. Proportion of pucca houses were highest in urban field site (67%) followed by rural (51%) and tribal (30%). Level of structural properties of households also coincide with the sanitation and water facility. Majority of the urban household had proper water and sanitation facility (96%, 93%), followed by rural (87%, 63%) and tribal (63%, 1%) field site.

Table 6 illustrates the morbidity scenario by the field sites. It is apparent that women from almost every household had suffered from some maternal illness. However, as these are self-reported responses, authenticity of the information provided especially for maternal illness remains ambiguous. Child illness and General illness were reported high in rural 16.1% and 16.9% respectively.

3.2 Economic Findings

Urban and rural residents were similar in terms of economic levels. In both the site, around 60% of the residents were above poverty line, while around 30% were living below it. As per the planning commission of India a person is said to be below poverty line if monthly per capita consumption expenditure is less than $13.6 for rural and $19.8 for urban [20]. The report reveals all India poverty ratio of 29.5% for 2011-12, which is similar to the result of this study except for tribal site, where almost 65% of the sampled households were reported to be below poverty line. Antyoday Ann Card (AAN) is result of Antyoday Ann Yojana (AAY), under which poorest of poor families were identified through survey and provided with the highly subsidised ration [21]. And apparently only marginal tribal population were registered under this scheme. Majority of the population were employed in daily wage type occupation, indicating their engagement in some sort of informal labour work. Though, proportion of daily wagers are comparable across all three sites, proportion of salaried employers were highest in urban (26%) followed by tribal (12%) and rural (9%).

Average monthly family income was also highest in urban setting (12,004 INR), followed by rural (9,611 INR) and tribal (7,181 INR). Multiple comparison between region indicates that there is significant difference in the average monthly income of all three field sites ($p < 0.05$).

3.2.1 Wealth index

With reference to the methodology described in a report [22], wealth index was constructed using principal component analysis method (PCA). Sample was found to be of adequate size (KMO = 0.697) and sufficient correlation between variables prevailed to create factor solution (Bartlett, $p < 0.05$). Wealth index was created by generating quintile groups of the first factor score, which explained 10.898 % of the variability in the data. Fig. 3 graphically represents distribution of wealth groups across field sites. As it may be presumed, proportion of comparatively richer class (highest and fourth) was highest in urban (59%) followed by rural (36%) and tribal (21%). On the other hand, proportion of poorest class (second and lowest) was highest in tribal (64%) followed by rural (39%) and urban (22%). Kruskal-wallis test indicates that distribution of wealth quintile groups are significantly different across all three field sites ($p < 0.05$).

Table 3. Major surveillance sites in world and comparison with MCHDS-2019

Survey	Established in	Population covered	Type of population/field site
Matlab	1966	225,000	Rural
Nairobi	2002	65,000	Urban slums
Ballabgarh	1961	90,000	Rural
Vadu	2002	91,000	Rural
Ifkara	1996	168,000	Rural
MCHDS	2018	2,70,000+	Tribal, Rural, Urban slums

Source: In-depth Network [18]

Table 4. Comparison of MCHDS data with SRS data

Age groups	Urban		Rural		Tribal	
	SRS	MCHDS	SRS	MCHDS	SRS	MCHDS
0-4	7%	9%	9%	10%	9%	9%
5-9	8%	9%	10%	10%	9%	9%
10-14	9%	9%	10%	8%	10%	9%
15-59	68%	66%	63%	66%	64%	65%
60 +	8%	6%	8%	6%	8%	7%

Table 5. Socio-demographic and economic characteristics of population, MCHD survey 2019

	Urban	Rural	Tribal
Gender of head of HH			
Male	75%	73%	89%
Female	25%	27%	11%
Caste category			
SC	46%	14%	5%
OBC	41%	85%	27%
ST	1%	0%	63%
General	11%	1%	4%
Other	0%	0%	0%
Family type			
Joint	31%	26%	41%
Nuclear	69%	74%	58%
Median Family size (range)	4 (1-23)	3 (1-15)	4 (1-16)
House type			
Kuchcha/No house	1%	0%	33%
Kuchcha-Pucca house	32%	48%	36%
Pucca house	67%	51%	30%
Sanitation facility			
Own Flush toilet	93%	63%	1%
Shared/public flush toilet or Own pit toilet	5%	2%	44%
Shared/public pit toilet	1%	1%	8%
No Access to toilet/Open defecation	1%	35%	47%
Drinking water source			
Pipe, tap, hand-pump, well in residence/yard/plot	96%	87%	63%
Public tap, hand pump or well	3%	10%	37%
Other water source (tanker, open source)	0%	3%	0%

Table 6. Morbidity by field sites in MCHDS-2019

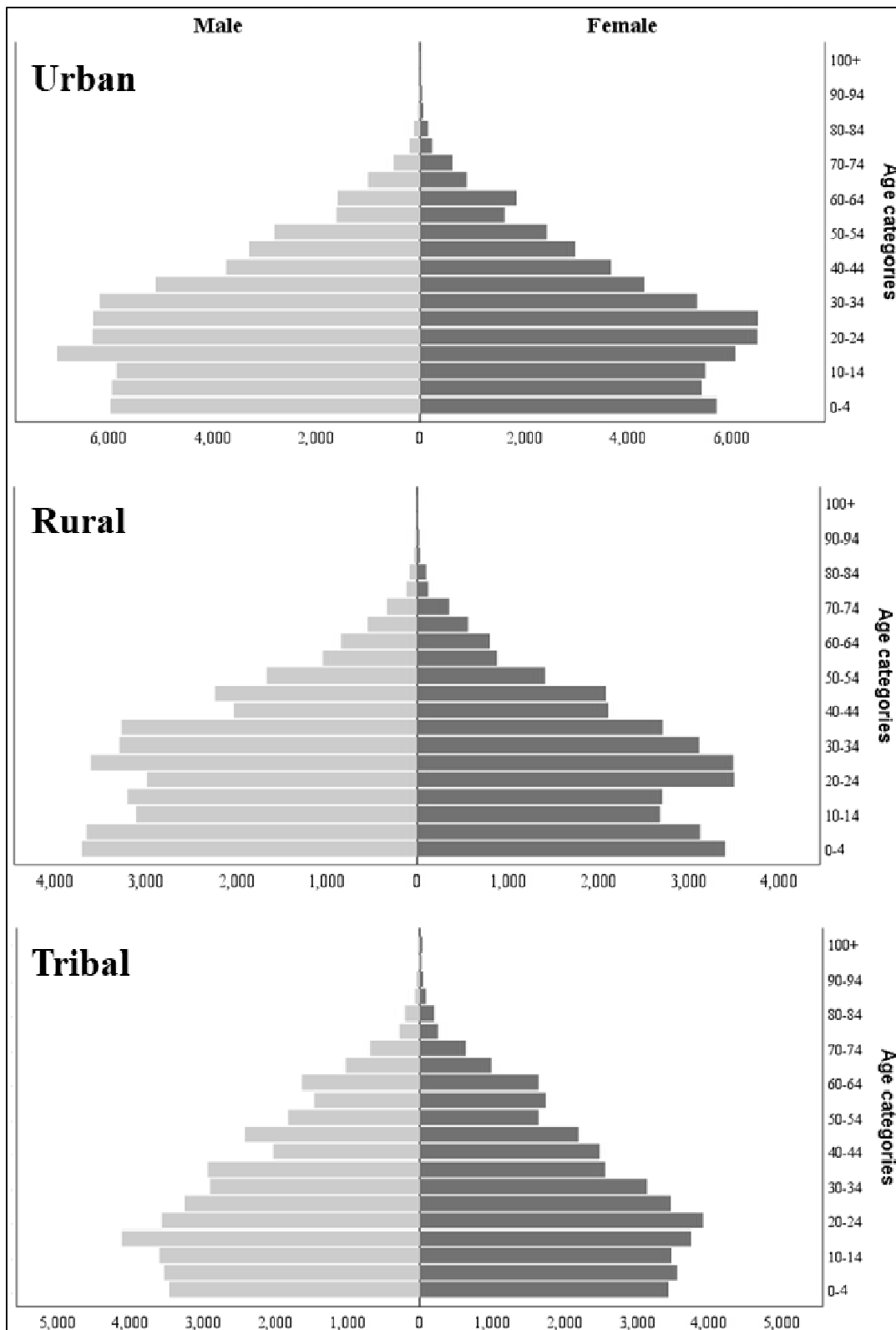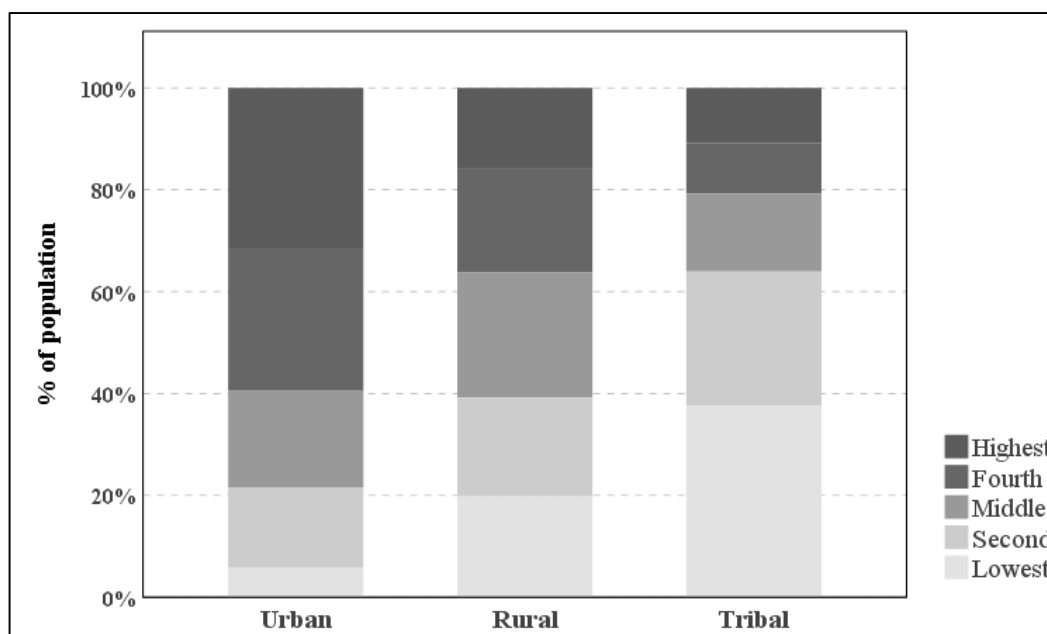|		Urban	Rural	Tribal	Total
General Illness	n	1050	1010	345	2405
	% within	5.1%	16.9%	2.1%	5.6%
Maternal illness	n	19074	3962	14030	37066
	% within	92.5%	66.3%	87.0%	86.7%
Child illness	n	423	962	557	1942
	% within	2.1%	16.1%	3.5%	4.5%
Communicable disease	n	1445	251	1067	2763
	% within	7.0%	4.2%	6.6%	6.5%
Non communicable disease	n	324	87	598	1009
	% within	1.6%	1.5%	3.7%	2.4%
Total	n	20622	5980	16133	42735

Fig. 2. Poulation pyramid by field site, MCHDS-2019

Fig. 3. Proportion of wealth groups by region, MCHDS-2019

Table 7. Poverty level, occupation type and average monthly income-MCHDS-2019

		Urban	Rural	Tribal
Poverty Card	APL Card	60%	61%	34%
	BPL Card	25%	35%	64%
	AAY Card	0%	0%	1%
Type of Occupation	Daily wages	74%	84%	79%
	Salaried	26%	9%	12%
	Food for labour	0%	3%	0%
	Livestock dependent	0%	4%	8%
Average monthly income (INR)		12004	9611	7181

4. LIMITATIONS OF STUDY

The baseline/household survey was conducted while engaging any adult family member who was available at the time of survey, the data may be both under and over reported. The recall bias may also affect the quality of data, which was minimized by inquiring about key events in detail.

5. CONCLUSION

Population characteristics in terms of socio-demographic and economic status are different across the urban, rural and tribal regions. While urban and rural population have comparable profile, tribal population differ vastly from the other two. In tribal region, population is deprived of basic facilities like water and sanitation and morbidity proportion is significantly higher than that of urban and rural populations. Average monthly income also vary greatly. Average monthly income of urban, rural and tribal populations were found to be significantly different (p<0.05). Similarly, principal component analysis shows proportion of Highest and fourth wealth group was highest in urban (59%) followed by rural (36%) and tribal (21%). These results emphasize the need for accurate surveillance data from sites such as MCHDS and use of such data for program planning and evaluation.

Further to that, the data collected under the MCHDS coincides with the previous studies and government surveys, thus we may conclude that data appropriately represent the surveyed population and data is of reasonable quality.

CONSENT AND ETHICAL APPROVAL

Prior to commencing survey, all respondents were asked for the written consent to participate in the survey. To carry out the survey, ethical approval was obtained from the IIPHG IEC committee.

ACKNOWLEDGEMENT

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sahu D, Nair S, Singh L, Gulati BK, Pandey A. Levels, trends & predictors of infant & child mortality among Scheduled Tribes in rural India. Indian J. Med. Res. 2015;141(5):709–719.
2. NIMS, ICMR, UNICEF. Infant & child mortality in India: Trends and determinants. National Institute of Medicat Statistics (NIMS), Indian Council of Medical Research (ICMR) and UNICEF India, Country Office, New Delhi, India; 2012.
3. Zodpey SP, Negandhi PH. Tracking India's progress in Health sector after 70 years of Independence. Indian J. Public Health. 2018;62:1–3.
4. Indian Institute for Population Sciences (IIPS) and MoHFW, National Family Health Survey -4; 2017.
5. Saha UR, Van Soest A, Bijwaard GE. Cause-specific neonatal deaths in rural Bangladesh, 1987–2005: Levels, trends, and determinants. Popul. Stud. (NY). 2014; 68(3):247–263.
6. Pandey A, Roy NSD, Acharya R. Maternal health care services: Observations from Chhattisgarh, Jharkhand and Uttaranchal. Econ. Polit. Wkly. 2004;39 (7):713–720.
7. Rutstein Shea O. Further evidence of the effects of preceding birth intervals on neonatal, infant, under-five-years mortality and Nutritional Status in Developing Countries: Evidence from demographic and health survey; 2008.
8. Aryal UR, Vaidya A, Shakya-Vaidya S, Petzold M, Krettek A. Establishing a health demographic surveillance site in Bhaktapur district, Nepal: Initial experiences and findings. BMC Res. Notes. 2012;5(1): 489.
9. Afework MF, Gebregiorgis SH, Roro MA, Lemma AM, Ahmed S. Do health and demographic surveillance systems benefit local populations? Maternal care utilisation in Butajira HDSS, Ethiopia. Glob. Health Action. 2014;7(1):24228.
10. Vora K, Tailor PA, Cottagiri SA, Saiyed S. Methodology of a large Maternal and Child Health Demographic Surveillance System (MCHDSS) in marginalized communities. Int. J. Adv. Res. Ideas Innov. Technol. 2019;5(4):17–22.
11. Herbst K, Law M, Geldsetzer P, Tanser F, Harling G, Bärnighausen T. Innovations in health and demographic surveillance systems to establish the causal impacts of HIV policies. Curr. Opin. HIV AIDS. 2015; 10(6):483–494.
12. Ahmadabad Population, Religion, Caste, Working Data Ahmadabad, Gujarat – Census; 2011.
Available:https://www.censusindia.co.in/.
[Accessed: 10-Oct-2019]
13. Ahmedabad Municipal Corporation: Zones & Ward Details, Government of Gujarat; 2019.
14. Expert group meeting on Urban Indicators Secure Tenure, Slums and Global Sample of Cities, Nairobi, Kenya; 2002.
15. India village directory, Indian village directory: List of Villages in Bavla; 2019.
Available: https://villageinfo.in/
16. Directorate of Census Operations, District Census Handbook: Sabar Kantha, Census of India; 2011.
17. Tribal District and Taluka, Tribal Development Department, Government of Gujarat; 2019.
Available:https://tribal.gujarat.gov.in/tribal-district-and-taluka
[Accessed: 28-Sep-2019]
18. MEMBER HDSSs, INDEPTH Network. Mamta Ray Media; 2016.

Available:http://www.indepth-network.org/ member-centres? option=com_content& task=view&id=1306
[Accessed: 10-Sep-2019]

19. Registrar Journal of India, sample registration system: Statistical report. Office of RGI & Census Commission of India MOHA, New Delhi; 2015.

20. Report of the expert group to review the methodology for measurement of poverty. Government of India Planning Commission; 2014.

21. Prasad M. Press information Bureau, Government of India: Antyodaya Anna Yojana; 2013.

22. Rutstein SO, Johnson K, Measure OM. The DHS Wealth Index; 2004.