Original Article

Trend, Pattern, and Prevalence of Adverse Pregnancy Outcomes among Women of Reproductive Age in India, 1992–2021

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Abstract

Background: Adverse pregnancy outcomes (APOs) are the most important vital statistics used to assess maternal health and child health statistics. They are an indicator of the quality of maternal and child health care services, i.e., antenatal care, intrapartum care, and medical services. **Material and Methods:** The objective of the study is to analyze the trend, pattern, and prevalence of APOs among women of reproductive age group at the national level over successive NFHS rounds. The current study uses data from the National Family Health Survey (NFHS), conducted during 1992–2021. The study uses geo-spatial mapping techniques through QGIS software and report analysis to arrive at definitive conclusions. **Results:** The study finds that the incidence of APOs among women of reproductive age (15–49 years) has increased over the years. Twenty states and union territories have APOs that are below the national average. On the other hand, States like Madhya Pradesh, Meghalaya, Sikkim, Goa, Maharashtra, Andhra Pradesh, Karnataka, and Kerala have witnessed their APOs worsening as per NFHS-5 vis-à-vis NFHS-4. The study also finds that apart from the Himalayan belt and the east coast of India, APOs are more prominent in the contiguous regions adjoining these areas. **Conclusions:** The findings of the study have thrown on very interesting facts. Despite rapid economic development during the intervening period between NFHS-4 and NFHS-5, rising APOs are a testament to the fact that the policymakers in the country need to be more target-oriented and get their acts together.

Keywords: Abortion, adverse pregnancy outcomes, India, miscarriage, NFHS, stillbirth

Introduction

Motherhood, for a woman, is invariably the most precious blessing of nature. Nonetheless, the journey to motherhood is fraught with many challenges. One of these challenges is the probability of adverse pregnancy outcomes (hereafter APOs). Generally speaking, pregnancy outcomes refer to life events that occur to the newborn infant from the age of viability (28 weeks) to the first week of life. The evolution of the fetus wrapped up in the amniotic fluid to life outside the womb is not always smooth and may result in adverse occasions for the mother and the baby. According to the World Health Organization 2019, every day nearly 810 women die of preventable complications during pregnancy, childbirth, or the postpartum period, globally.[1] The vast majority (94%) of all deaths occur in low and lower-middle-income countries located in South Asia (20% of total deaths) and Sub-Saharan Africa (66% of total deaths). The burden of APOs in low and middle-income countries is the highest. These adverse birth outcomes such as prematurity, low birth weight, stillbirth, etc., represent significant problems in both developing and developed countries. Each year, about 15 million babies in the world, more than one in 10 births, are born too prematurely. More than one million of those babies die shortly after birth; countless others suffer from lifelong physical, neurological, or educational disabilities, often at great cost to families and societies.[2] The purpose of this work is to document this important area of public health in India holistically by identifying its spread, depth, factors responsible, and specific inputs for the policymakers to make changes in the policy framework so that India achieves the targets set under the 2030 Agenda of Sustainable Development Goals of the United Nations.[3] In India, the Government has come

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out with numerous policy interventions to ensure improved women's health and pregnancy outcomes. These include programs like Janani Suraksha Yojana-2005, Dakshata implementation package-2015, Pradhan Mantri Surakshit Matritva Abhiyan-2016, Pradhan Mantri Matru Vandana Yojna-2017, LaQshya-2017, etc.

APOs have been widely studied across the World in developed as well as developing countries.[4,5] Pregnancy outcomes vary from pregnancy to pregnancy and include instances of normal live birth, low birth weight, prematurity in the baby, stillbirth, intrauterine fetal death, early neonatal death, and late neonatal death.[6] APOs are those pregnancy outcomes other than normal live birth which majorly includes preterm birth, stillbirth, and low birth weight, which are the major cause of neonatal morbidity, mortality, and long-term physical and psychological problems.[7] APOs lead to serious health consequences for the mother and/or the baby. APOs can occur in any of the four possible ways: When women lose their baby during early pregnancy, i.e. miscarriage or spontaneous abortion; When women lose their baby during late pregnancy, i.e. stillbirths; When women have a baby earlier than expected, i.e. preterm birth; or When women have a baby with low birth weight.[8]

The causal mechanism of APOs has not been established satisfactorily as there are many reasons for the onset of APOs. Studies have reported numerous risk factors for APOs such as obesity,[9] anemia,[10] diabetes,[11] antenatal care,[12] maternal tobacco consumption,[13] history of abortion,[14] hypertension,[15] and many others.

A rising trend is evident in the risk of self-reported pregnancy loss (miscarriage, stillbirth, ectopic pregnancy) and early pregnancy loss among US women.[16] A study highlighted that stillbirths are higher than miscarriages or abortions as per the overall rate of adverse birth outcomes among pregnant women in eastern Ethiopia.[17] Another study demonstrates decreasing national trends in miscarriage and the treatment of miscarriage is increasingly nonsurgical among women in Finland.[18] Similarly, the study revealed that the declining trend of stillbirths over time is caused by a significant increase in cesarean delivery over time.[19]

Scanty work has been done on the trend and pattern of APOs in India. Among those studies have examined a contiguous east-west belt of high stillbirth rate in India.[20] The stillbirth rate remains high, especially in low and middle-income countries, including India, tenfold higher than in high-income countries.[21] The studies have also revealed that a high prevalence of APOs was found in India.[22,23]

From the existing literature, we observed that though there are some studies on the relevant topic, studies especially focused on the national level over the decades and the current study is an attempt toward filling the gap in the literature. The objective of the present population-based study is to analyze the trend, pattern, and prevalence of APOs among women of reproductive age at a national level over the decades. This study has also examined the region-wise trend and regional differences comparison within all rounds of National Family Health Survey (NFHS) reports in the prevalence of APOs among women of reproductive age (15–49) in India.

Materials and Methods

Data Source

The current study uses relevant sources from the NFHS, conducted during 1992–2021 by the International Institute for Population Sciences, Mumbai under the aegis of the Ministry of Health and Family Welfare, Government of India (GoI).[24] NFHS is a large-scale, multiround survey conducted in a representative sample of households across the length and breadth of the country. The study uses geo-spatial mapping techniques through QGIS software [https://qgis.org/en/site/], Microsot Excel for diagrams, and survey report analysis to arrive at definitive conclusions.

Data collection procedure

All rounds of the NFHS have been designed along the lines of the Demographic and Health Surveys Program that has been conducted in many developing countries since the 1980s. NFHS-5 fieldwork for India was conducted in two phases and congregated information from 636,699 households, 724,115 women, and 101,839 men. NFHS-5 provides the much-needed estimates on fertility, mortality, maternal, child, adult health, and women and child nutrition for India, each state/union territory (UT), and for 707 districts. However, NFHS-5 includes some new areas, such as preschool education, methods and reasons for abortion, disability, access to toilet facilities, death registration, bathing practices, etc., during mensuration to ascertain their interaction with APOs.

NFHS-4 included a set of questions on nonlive births within the reproduction section of the interview. All women age 15–49 were asked: 'Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?' If the answer was 'yes', the respondent was further asked: 'When did the last such pregnancy end?' and 'How many months pregnant were you when the last such pregnancy ended?' In NFHS-5, information on pregnancy outcomes relating to nonlive birth was obtained from the section on other proximate determinants of fertility and the same questions were asked as per the previous survey.

Results

Trend and pattern of APOs

From 1992 to 2021, there has been a significant increase in the rate of APOs in India. From Figure 1, it is observed that during the survey period of NFHS-5, i.e. 2019–21, at the national level, 12.2% of women aged 15–49 have experienced abortion, miscarriage, or stillbirth in their lifetime, compared to 12% women off the same age group during the survey period for NFHS-4, i.e. 2015–16, 14.4% during the survey period 2005-06(NFHS-3) and 8.1% for NFHS-1 and NFHS-2, i.e. for the survey periods 1992–93 and 1998–99, respectively.

Here, we can observe that in NFHS-3, APOs among women of reproductive age were the highest as compared to other survey periods at the national level.

Region/State/UT wise trend in APOs

From Table 1, we observe that in the Northern part of the country, while Delhi, Haryana, and Uttarakhand have witnessed an increased percentage of APOs, states like Punjab, Rajasthan, Himachal Pradesh, and UTs of Jammu and Kashmir, and Chandigarh have witnessed fall in APOs. In Central India, while Chhattisgarh and Uttar Pradesh have witnessed a fall in APOs, Madhya Pradesh has seen an increase in APOs. In the eastern part of the country, traditionally laggard states like Bihar, Jharkhand, and Odisha have witnessed the prevalence of rising APOs, while West Bengal is the lone standout to showcase a fall in APOs albeit at a tepid pace. Among the North Eastern states, Arunachal Pradesh, Assam, Mizoram, Nagaland, and Tripura have been able to contain the occurrence of APOs while other states like Manipur, Meghalaya, and Sikkim have witnessed rising APOs. Similarly, among the western Indian states, Gujarat and UT of Dadra and Nagar Haveli and Daman and Diu have registered declining APOs, while the states like Maharashtra and Goa have registered rising APOs. In South India, except the state of Telangana and the UT of Lakshadweep, all other states and UTs have registered worsening APOs.

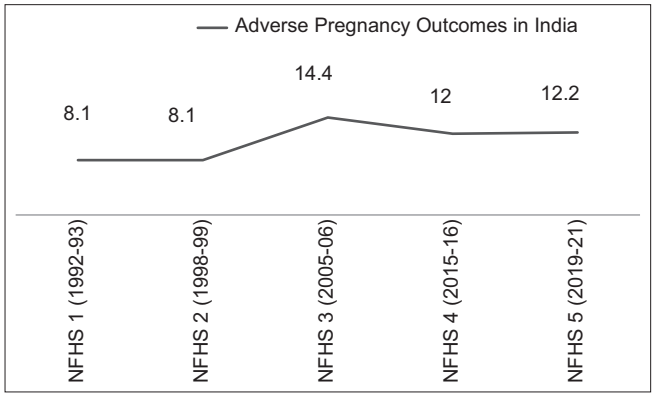

Figure 1: Trend of APOs, India, 1992–2021. Data Source: NFHS India, (All rounds of the survey). Note: Data represents the percentage of women aged 15–-49, who have ever had an APO

Geospatial Distribution of APOs across India from NFHS-5 vis-a-vis NFHS-4

There are two graphs given in Figure 2 that give a clearer picture regarding the status of different states as per the NFHS-4 and NFHS-5 surveys. We observe clear regional differences in APOs among women of reproductive age in India. The prevalence of APOs has been higher than the national average for the northeastern states as compared to other states/regions of India. For most of the states, we observed a declining trend in APOs as per NFHS-4 and NFHS-5 those states are Chandigarh, Himachal Pradesh, Jammu and Kashmir, Punjab, and Rajasthan from north India, Chhattisgarh and Uttar Pradesh from central India, West Bengal from east India, Arunachal Pradesh, Assam, Mizoram, Nagaland, and Tripura from Northeast India, Dadra and Nagar Haveli, Daman and Diu, and Gujarat from west India, and Lakshadweep and Telangana from south India. Similarly, the prevalence of APOs is increasing in Delhi, Haryana, and Uttaranchal/Uttarakhand from north India, Bihar, Jharkhand, and Odisha from east India, Manipur, Meghalaya, and Sikkim from northeast India, Goa and Maharashtra from west India, and Andaman and Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Puducherry, and Tamil Nadu from South India. The two graphs show in Figure 2 the clustering of the high incidence of APOs in the Himalayan belt as well as along the eastern coast of India. Comparing NFHS-4 with NFHS-5, we observe that the clustering of a high incidence of APOs has further expanded to south India, which is a cause of concern.

State/UT wise APOs vis-a-vis National Average (NFHS-5, 2019–21)

Figure 3 depicts the Indian scenario vis-a-vis the cross-state comparison of the APOs. Among the states, Manipur has the highest APO at 25.4% which is a cause of concern, distantly followed by other states like Delhi, Odisha, Puducherry, Tamil Nadu, etc., The presence of so many developed states like Delhi, Puducherry, Tamil Nadu, Haryana, etc., in the top 10 list is surely an indication that economic development has not percolated down enough to mitigate APOs among the weaker section of the society. The best-performing state in APOs is Arunachal Pradesh followed by Jammu and Kashmir, Sikkim, Mizoram, etc., which are quite heartening to note. The national average of 12.2% is a worry which may lead us to miss the Sustainable development goals (SDG) targets. Necessary policy intervention is squarely needed on this issue.

Table 1: Sample size/Number of respondents across NFHSs on APOs among women aged 15–49 in India

C1	C2a	C2b	C3	C4	C5
NFHS Round/ Survey periods	Women age 15–49		Number of women respondents in the survey	Number of pregnancies	Pregnancies in the last 5 years
	Percentage of women who have ever had an APO during their lifetime	Percentage who has had an APO in the past 5 years preceding the survey period			Percentage that ended in an APOs
NFHS-1/1992–93	8.1	NA	89,777	NA	NA
NFHS-2/1998–99	8.1	NA	91,000	NA	NA
NFHS-3/2005–06	14.4	6.2	124,385	68,750	10.4
NFHS-4/2015–16	12.0	4.1	699,686	300,209	8.5
NFHS-5/2019–21	12.2	3.9	724,115	274,440	8.8

NA: Information not available in reports. Note: In NFHS-1, the ages of ever-married women aged 13–49 were taken from the women's questionnaire

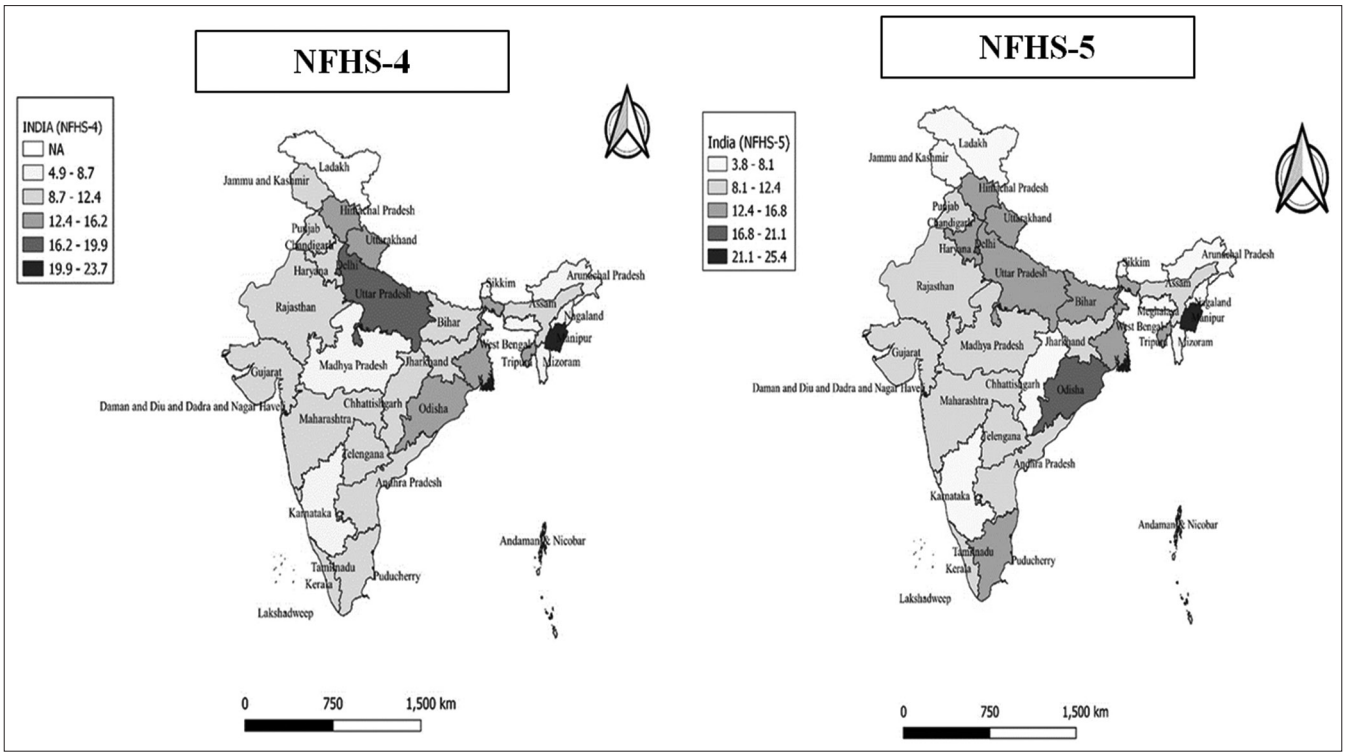

Figure 2: Geospatial distribution of APOs across India from NFHS 5 vis-a-vis NFHS-4. Data Source: NFHS India, (Round-4 and Round-5). Author's Calculation

Incidence of APOs across different rounds of NFHS

In Table 2, we first examine interstate differentials in APOs among women using all rounds of NFHS data. A substantial state-wise variation in APOs among women of reproductive age in India can be seen. In NFHS-4, Manipur showed the highest incidences of APOs among women (23.7%), followed by Uttar Pradesh (16.9%), Delhi (16.5%), Chandigarh (15.9%), and Tripura and Dadra and Nagar Haveli, and Daman and Diu (14.6%). In contrast, APOs were low in Sikkim (4.9%), Meghalaya (5.8%), Karnataka (6.1%), and Arunachal Pradesh and Andaman and Nicobar Islands (7.4%). In NFHS-5, we can see the pattern of APOs with the same groups of states falling in the high and low categories of experiencing APOs among women of reproductive age. Manipur shows the highest incidences of APOs (25.4%), followed by Delhi (17.8%), Odisha (16.9%), Puducherry (15.4%), Tamil Nadu (14.7%), and Haryana (14.5%). States such as Bihar (14.4%), Uttaranchal/Uttarakhand (14.0%), Uttar Pradesh (13.8%), Tripura (13.7%), Chandigarh (13.6%), West Bengal (13.6%), Himachal Pradesh (13.0%), Dadra and Nagar Haveli and Daman and Diu (12.6%), Jharkhand (12.4%), and Andaman and Nicobar Islands (12.4%) also have shown an increase comparing national level (12.2%) in APOs among women. In contrast, APOs were low in Lakshadweep (3.8%) followed by Arunachal Pradesh (5.4%), Ladakh (6.0%), and Jammu and Kashmir (6.0%).

Discussion

APOs is a broad term comprising health problems that occur to the mother, the newborn, or both during pregnancy, labor and delivery, and the postpartum period. APOs are the most important vital statistics used to assess maternal health and child health programs. They are an indicator of the quality of maternal and child health care services, i.e. antenatal care, intrapartum care, and medical services. The burden of APOs in low and middle-income countries is still high. In India, the NFHS is a large-scale, multiround survey conducted in a representative sample of households across the length and breadth of the country, which hopes to capture the ground reality of the situation at hand. Over the decades, the nationwide registered-based study shows that the incidence of APOs among women of reproductive age has increased. As per the latest round of surveys, i.e., NFHS-5, APOs among women of reproductive age (15–49) in India stood at 12.2% compared to 8.1% during the survey period of NFHS-1, i.e. 1992–93. This shows that despite chest-thumping claims by our policymakers over these many years, APOs' health indicators have worsened. When we observe the APOs' prevalence across different survey periods from NFHS-1 to NFHS-5, we see an inconsistent pattern. These changes are uncorrelated with past changes. Part of this behavior of APOs can be attributed to a change in the scope of NFHS over successive survey periods in the form of coverage of more areas, improved techniques of data collection, better responses by the respondents, etc.

Region-wise too, we see a mixed picture as far as trends in APOs are concerned. We observed that while states like Delhi, Haryana, Uttarakhand, Madhya Pradesh, Bihar, Jharkhand, Odisha, Manipur, Meghalaya, Sikkim, Maharashtra, Goa,

Table 2: Incidence of APOs across different rounds of NFHS

State/Union Territory	NFHS-2	NFHS-3	NFHS-4	NFHS-5	% Change of NFHS-5 over NFHS-4	% Change of NFHS-4 over NFHS-3	% Change of NFHS-3 over NFHS-2
North							
Chandigarh	NA	NA	15.9	13.6	-14.47	NA	NA
Delhi	11.8	12.4	16.5	17.8	7.88	33.06	5.08
Haryana	10.1	11	12.2	14.5	18.85	10.91	8.91
Himachal Pradesh	8.7	5.9	13.5	13	-3.70	128.81	-32.18
Jammu & Kashmir	9.5	11.4	12.2	6	-50.82	7.02	20.00
Ladakh	NA	NA	NA	6	NA	NA	NA
Punjab	10	10.6	11.1	10.9	-1.80	4.72	6.00
Rajasthan	8	13.8	12	10.5	-12.50	-13.04	72.50
Uttaranchal/Uttarakhand	NA	13.4	13.9	14	0.72	3.73	NA
Central							
Chhattisgarh	NA	12.2	11.5	6.5	-43.48	-5.74	NA
Madhya Pradesh	6.6	11.4	8.5	9.5	11.76	-25.44	72.73
Uttar Pradesh	7.7	19.9	16.9	13.8	-18.34	-15.08	158.44
East							
Bihar	5.6	20.8	10.5	14.4	37.14	-49.52	271.43
Jharkhand	NA	16.7	11.2	12.4	10.71	-32.93	NA
Odisha	9.1	16.9	14.1	16.9	19.86	-16.57	85.71
West Bengal	8	13.7	13.8	13.6	-1.45	0.73	71.25
Northeast							
Arunachal Pradesh	6.4	9.2	7.4	5.4	-27.03	-19.57	43.75
Assam	12.6	20.3	11.9	10.7	-10.08	-41.38	61.11
Manipur	14.1	17.9	23.7	25.4	7.17	32.40	26.95
Meghalaya	9.2	2.4	5.8	7.6	31.03	141.67	-73.91
Mizoram	8.2	8.4	8.2	6.4	-21.95	-2.38	2.44
Nagaland	10.4	7.4	8	7.1	-11.25	8.11	-28.85
Sikkim	5.9	5	4.9	6.2	26.53	-2.00	-15.25
Tripura	NA	18.9	14.6	13.7	-6.16	-22.75	NA
West							
Dadra & Nagar Haveli and Daman & Diu	NA	NA	14.6	12.6	-13.70	NA	NA
Goa	12.1	11.8	9.2	10.4	13.04	-22.03	-2.48
Gujarat	8.4	15.6	10.5	9.8	-6.67	-32.69	85.71
Maharashtra	7.2	9.6	9.9	11.2	13.13	3.13	33.33
South							
Andaman & Nicobar Islands	NA	NA	7.4	12.4	67.57	NA	NA
Andhra Pradesh	7.1	9.3	10	11.2	12.00	7.53	30.99
Karnataka	7.2	7.9	6.1	7.9	29.51	-22.78	9.72
Kerala	8.8	15	11.5	11.7	1.74	-23.33	70.45
Lakshadweep	NA	NA	9.8	3.8	-61.22	NA	NA
Puducherry	NA	NA	9.7	15.4	58.76	NA	NA
Tamil Nadu	13.9	16.6	12.1	14.7	21.49	-27.11	19.42
Telangana	NA	NA	11.7	10.6	-9.40	NA	NA

NA: Information is not reported; not available. Data Source: NFHS India, (Round-2, 3, 4, and 5). Author's Calculation. Note: Uttaranchal was the earlier name of the present state of Uttarakhand. The Dadra and Nagar Haveli and Daman and Diu merged these two UTs into one. In NFHS-1, information on pregnancy outcomes of all pregnancies of ever-married women was reported according to the age of the women, but state-wise information was not reported. Reports on APOs of states like Uttaranchal/Uttarakhand, Chhattisgarh, Jharkhand, and Tripura were reported from rounds of NFHS-3 to NFHS-5. Similarly, reports on APOs of states such as Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Andaman and Nicobar Islands, Lakshadweep, Puducherry, and Telangana were reported from rounds of NFHS-4 and NFHS-5

Andhra Pradesh, Kerala, Karnataka, Tamil Nadu, UTs of Puducherry, and Andaman and Nicobar Islands have witnessed increased percentage of APOs, states like Punjab, Rajasthan, Himachal Pradesh, Chhattisgarh, Uttar Pradesh, West Bengal, Arunachal Pradesh, Assam, Mizoram, Nagaland, Tripura, Gujarat, Telengana, and UTs of Jammu and Kashmir, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, and Chandigarh have witnessed fall in APOs. We also observed the existence of APO clusters in both NFHS-4 and NFHS-5 survey periods. During NFHS-4, while the APOs' cluster is

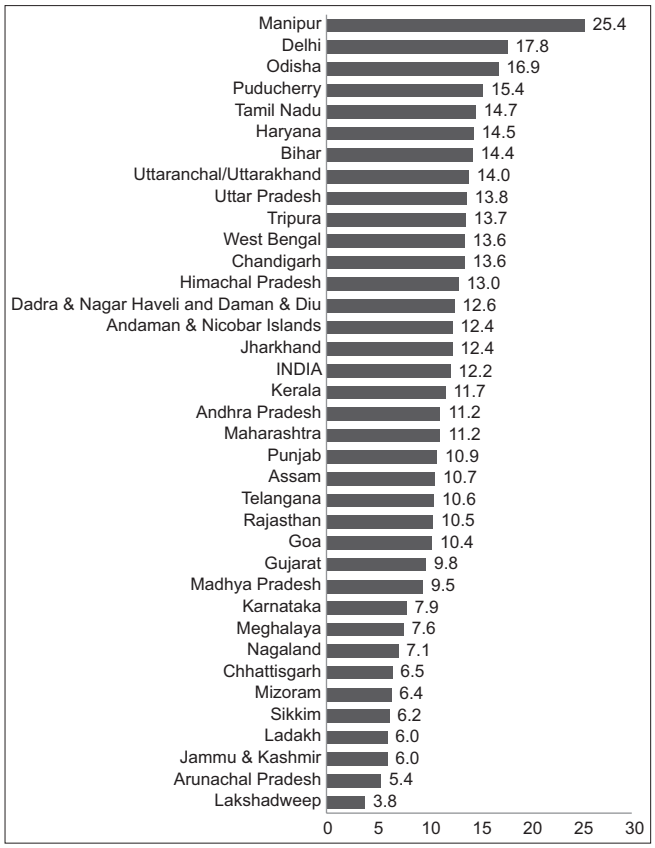

Figure 3: State/UT wise APOs vis-a-vis national average (NFHS-5, 2019–2021). Data Source: NFHS India, (Round-5)

visible in the Himalayan belt, along the east coast of India, and some pockets of North-East India, during the survey period of NFHS-5, the APOs' cluster is visible in the south coast and along the clusters identified in NFHS-4. As mentioned earlier, NFHS-5 reports worsening APOs' prevalence compared to NFHS-4. We observe that out of 36 administrative units (28 States and 8 union territories) across the length and breadth of the country, 16 states/UTs report APOs' prevalence over and above the national average which is a major cause of concern. This means other 20 states/UTs report a prevalence of APOs below the national average. However, among these 20 states/UTs, some states/UTs, namely, Madhya Pradesh, Meghalaya, Sikkim, Goa, Maharashtra, Andhra Pradesh, Karnataka, and Kerala have observed their NFHS APOs worsening compared to their NFHS-4 APOs. Among different states/UTs, we observed that the Union Territory of Lakshadweep, Jammu and Kashmir, Chandigarh, and states of Chhattisgarh, Arunachal Pradesh, Mizoram, Uttar Pradesh, and Rajasthan are the best-performing states/UTs as far as reduction in APOs is concerned.

Conclusions

The above results confirm that APOs are a common experience shared by many Indian women who become pregnant. The health programs impact on APOs in India and other countries. The government has executed different health programs to improve the health of women and children in India. However, there is a high variability of APOs in the states of India. All rounds of NFHS report data used in this study have actually given us some important insights into the state of APOs in India. The finding of the study can be reinforced by the use of primary data in future studies in this field; therefore, we can reach the grassroot issues among women. The association between sociodemographic variables and pregnancy outcomes is attributed to the fact that there is a lack of availability of fundamental healthcare services for young women. There is a need for efficient and effective healthcare facilities in Primary Health Centers and Community Health Centers (CHCs) to reduce the burden of APOs nationwide. These findings appeal for action to guarantee contraceptives, clinical monitoring, and guidance to diffuse various factors responsible for APOs through a concerted effort on the part of the government machinery and other stakeholders. This will also push India toward achieving the targets mentioned under relevant Sustainable Development Goals.

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Conflicts of interest

There are no conflicts of interest.

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