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Rise in Institutional Deliveries, states position by early newborn care -Gap analysis approach

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Abstract:

Background*:** India has the largest number of child deaths, and has wide variation within the country, Infant mortality rate in India ranges from 15 in kerala and goa to 73 in Uttar Pradesh. Inter-state disparity in availability and utilization of health services and health manpower are challenges in achieving health for all for the nation as a whole. Keeping in view the significance of studying inter-state variations in healthcare, this study focuses on the performance of states based on Institutional Early new born care. ***Methodology*:** Gap analysis, an assessment tool that helps to compare actual performance with its potential performance and identifies areas that have room for improvement. Multivariate Techniques like Cluster Analysis and Factor Analysis have been used to identify factors- structures and states differences. ***Results: 39% of the deliveries take place in Institutions; Nearly 67% of the women from rural deliver in institution, and is higher among literates. Among institutional delivered babies 29.6% of the child in urban receives 0 Polio, and for rural it is only 21.8%. The overall child receiving BCG is 97.2, but the status among institutional deliveries is low 38.2 % and 41.2% in rural and urban respectively. Birth weight is recorded for only 34% of babies. The initiation of breast feeding within one hour is nearly one-quarter. ***Conclusion:*** Cluster with Kerala and Goa are found to be best performing, Jammu& Kashmir, Uttar Pradesh, and Bihar on other extremity. Sikkim, Tripura and west Bengal in better performing cluster, while Arunachal, Manipur, Meghalaya, Assam, Orissa, Tamilnadu, Maharashtra, Mizoram were in good performing cluster. Rest all states are in average performing cluster.

Key Words: Institutional delivery, Newborn care, Neonatal mortality rate , factor analysis and, cluster analysis,

Introduction:

Infant mortality rate (IMR) especially neonatal mortality rate (NNMR) is used as demographic assessment of the population and is the important measure of country's socio economic development, health status and quality of life, it is also an important indicator used for evaluation of many health programs. IMR in India has declined 24 points from 68 deaths per 1,000 live births in 2000 to 44 deaths per 1,000 live births in 2011[1]. 70% of total infant deaths and more than half of under-five deaths fall in the neonatal period[2]. Deaths in the first week alone account for about 45% of total under-five deaths[2]. Infant and child mortality rates are considerably higher in rural areas than in urban areas. Infant and child mortality rates have declined slightly faster in rural areas than in urban areas[3]. This increased proportional contribution of NNMR to IMR suggests the possible contribution of strategies towards reducing the NNMR. The NNMR is reduced from 48.6 in NFHS 1 to 39 in NFHS 3, the decline rate is very low i.e. not even 1 death per thousand, per year.

Coverage of skilled attendance at birth increased from 58% to 73% between 1990 and 2013[4]. Skilled attendance at delivery is an important indicator in monitoring progress towards Millennium Development Goal 5 to reduce the maternal mortality ratio by three quarters between 1990 and 2015. In addition to professional attention, it is important that mothers deliver their babies in an appropriate setting, where life saving equipment and hygienic conditions can also help reduce the risk of complications that may cause death or illness to mother and child[5]

Many interventional programs were made by the Government of India (GOI) to reduce the NNMR like Child survival and safe motherhood (CSSM) through National rural health mission (NRHM) and reproductive and child health (RCH). Place of delivery is considered as an important factor, that has direct effect on morbidity and mortality of women and child[6]. Thus the main innovation of NRHM is to increase the institutional delivery especially in rural areas.

The institutional deliveries are also showing increasing trend after intervention of NRHM[7]. Nearly 40% (38.7% exactly) of the delivery in India occurs in any one of the institutions[8] (NFHS-3) , GOI also taking many measures to increase the safe(institutional) delivery under the supervision of Health care providers so as to reduce the IMR. But still the public sector is perceived to be of low quality in India. Prevalence of institutional births in rural India has increased and the Progress has been slightly greater in the private-for-profit than public sector[9]. Significant increases in institutional deliveries, particularly in hospitals, were accompanied by reductions in stillbirths and PMR, but not by NNMR[10]

The study by Vijay Silan,et.al identified the commonly stated reasons for underutilization of government health facilities for delivery services were lack of quality care, abominable behavior of hospital staff, poor transportation facilities, and frequent referrals to higher centers. So there is a need to set a minimum set of standards for providing quality care[11]. Hence it is necessary to assess the quality of care given in the institutions to the new born.

Therefore this study aims at quantifying and comparing the performance variations of states of India based on performance of institutions (Quality of Health care services) to identify critical area for improvement so as to reduce NNMR and IMR still more.

Materials and methods:

This study used the secondary data from the National family health survey (NFHS-3) conducted in 2005-2006. NFHS-3 provides in new insights with additional indicators and information than previous rounds (NFHS-1, NFHS-2) like perinatal mortality, adolescent reproductive health, high risk sexual behaviour, family life education, safe injections, and knowledge about tuberculosis. Three types of questionnaires were administered in all NFHS-1, NFHS-2 and NFHS-3, Household Questionnaire, Woman's Questionnaire, and a Village Questionnaire.

This study uses data from Woman's Questionnaire which provides, for ever-married women of reproductive age, information on socioeconomic and demographic characteristics, reproductive history, contraceptive behaviour, fertility preferences, and maternal and child health. 1, 24, 385 women's age 15-49 and 74,369 men age 15-54 were interviewed from all 29 states. Standard sampling procedures were adopted to have a national level representative sample from each state which is provided in the NFHS-3 national report.

Variables:

To evaluate the institution's performance, four important variables were chosen, like Initiation of breast feeding within one hour, Birth Weight of the baby checked, and Provided vaccines like "0" polio and BCG all of these services should be provided to the baby in the institution itself. It is the prime responsibility of the institutions to encourage and to furnish information about all this to a mother who deliver in their institutions. The mother who delivered in any of the institution (Government/private clinic/ NGO, trust hospital) is considered as institutional delivery for this study. To avoid recall bias, only

the vaccine dated on card and vaccine marked in card is taken as "vaccine provided" and Birth weight taken in the hospital recorded in card is considered. The mother who breast feed the baby within half an hour and half to one hour is considered for analysis.

Variables Preparation: The variables were first prepared using frequency table to find the percentage for all the factors state wise. The gaps for each state were found by comparing its current level of performance with the expectation (100%) for all the factors and then classification of states were made based on the performance in four factors to identify best-performed, moderately-performed and poorly-performed groups of states. Grouping of factors were made to determine factor structure. Multivariate analysis techniques like Hierarchical clustering techniques (HCT) were used for identifying factor and state structures. Statistical software SPSS version 17 is used for the analysis.

Results

Background characters

Table 1: Shows few demographic and socio economic indicators of women delivered the baby in institution across pan India. Nearly 67% of the women reside in rural deliver in institution, among illiterate only 20% of them delivered in institution, among those completed higher secondary education 92% delivered in institutions, 46% of the Hindus delivered in institution, next comes Muslims are nearly 42% and Christians 37%. By wealth of the population, nearly 84 % of deliveries were happening in institution among high wealth index group and it is only 13% for poorest wealth index group.

The table 2 shows that only 29.6% of the child in urban receives 0 Polio, and for rural it is only 21.8%. Nearly the same percentage of child receives 0 Polio among Hindu, Muslim, and Christian community (37.6%). Except initiation of breast feeding within 1 hour all other variables shows increasing trend towards literacy levels. The child receiving BCG in rural and urban is nearly 38.2 % and 41.2% respectively. Birth weight of 96.8% of the children's from Christian community was measured immediately after birth. The initiation of breast feeding within one hour is nearly same for both rural and urban, but it increases gradually as the literacy level increases.

The gaps of the institutional delivery for all the states were found from the expected values, study expectation is to achieve 100% for all the variables. Then the gaps found were used to find the

factor structure, initiation of breast feeding within one hour alone as a factor and all other three factors grouped together. Then Hierarchical clustering techniques were adopted for clustering the states, squared Euclidean distance measure is used and all the seven clustering method were adopted to find the natural clustering pattern. The HCT group the variables or objects stage by stage without making any assumptions. To identify natural cluster pattern, a dataset has to be applied to different clustering techniques. If all the techniques produce same cluster pattern, it indicates the presence of natural cluster pattern

To identify factor structure and state structure the following 7 hierarchical clustering methods were applied. The clustering techniques used are Between-groups linkage, Within-groups linkage, Centroid clustering, Ward method, nearest neighbor, Farthest neighbor, Median clustering

Figure 1 shows the clustering pattern by ward method, same clustering pattern is found to be in 5 methods which show that there is natural clustering pattern. Five clusters were found to be more meaningful which has Goa and Kerala to be one cluster, Sikkim, Tripura, West Bengal in second cluster, Arunachal Pradesh, Nagaland, Manipur, Meghalaya, Assam, Orissa, Tamilnadu, Maharashtra, Mizoram in third cluster, Punjab, Haryana, Delhi, Rajasthan, Jharkhand, Chhattisgarh, Madhya Pradesh, Gujarat, Andhra Pradesh, Himachal, Uttaranchal, Karnataka as fourth cluster, J&K, Uttar Pradesh, Bihar as the final cluster. Based on the average found, scores were given to the clusters for individual factors. Based on the total score (rank) the clusters are categorized as best, better, good, average, and poor. Smaller the rank better is the cluster performance.

Discussion:

This study shows some important results to be noted and taken forward to strategies further to speed up the reduction in mortality indicators. The analysis shows that the cluster with Kerala and Goa are found to be the best performing cluster considering the 4 variables mentioned earlier, Jammu& Kashmir, utter Pradesh, and Bihar found to be the cluster performing poor when considering all the four factors. This is shown in table 4.sikkim Tripura and west Bengal are found to be in better performing cluster, while Arunachal Pradesh, Manipur, Meghalaya, Assam, Orissa, Tamilnadu, Maharashtra, Mizoram are found to be in good performing cluster. Rest all states are in average performing cluster.

Kerala remains in the best performing cluster which is supported by a study done by Muttikal B. Thomas and James in 2014. The paper concludes that although the health issues of infants, children, and mothers in the reproductive age group, are effectively addressed through various policies in Kerala[12].

Kulkarni MS et al assessed the impact of the net domestic product, the population per doctor, and literacy on infant mortality and found 82.96% of infant mortality in Goa was explained by these three factors. Around same proportion of infant mortality in Kerala was explained by these same factors[13]. This supports our result that Kerala and Goa has been in same cluster of performing best considering the four factors.

A study done by Reddy et al, concluded that, though India as a nation is not predicted to attain all the MDG 4 and 5 targets, only four of its 15 most populous states are predicted to do so. In the past two decades MMR reduction efforts were more effective than IMR reduction efforts[14]. This shows still the Infant mortality reduction in India needs more effective strategy.

Similar clusters were observed in another study by Mariam cleason et al by using NFHS 1 (1992-1993) and the cluster doesn't change much[15] even in our present study using NFHS 3 for different indicator, which indicates poor states were performing poor and good states are improving on the same way. This needs to be analyzed once NFHS 4 data is released, to understand is there a change in this cluster after 25 years with the implementation of different health programs and policies, especially after the implementation of NRHM in 2005.

The results also shows that those factors with higher scores are to be improved hence the particular cluster should make strategies to improve the performance in that factor to be in better performance cluster of the state as well as the country towards the reduction of IMR, through reduction of NNMR.

For example: Though Sikkim, Tripura and West Bengal were in better performing cluster they have to revise or revisit their strategy mainly on "Initiation of breastfeeding within an hour" to join hands with Kerala and Goa as best performing states.

Indian Government places special focus on the nine poorer states of Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and uttarakhand in the same way our study also shows some of these states are not performing good even in newborn care among institutional delivery. Though J&K is not mentioned under poorest states by GOI, Institutional early new born care is poor in the state which seeks our attention.

Conclusion:

The study shows that the cluster with Kerala and Goa are found to be the best performing cluster considering the 4 variables, Jammu& Kashmir, utter Pradesh, and Bihar found to be the cluster performing poor Even after some two decadal continuous efforts from government/private/ NGOs and several policy changes there is no much significant change in states performance which is obvious from slow decline in Child Mortality indicators. Over some decades our focus is on maternal indicators and it's time to shift our focus towards reducing Neonatal and child mortality rates to achieve MDG-4 before 2020 and it needs more effective strategy. States can concentrate or strategize specific policy for improving the specific indicators where they are poor. Trends in institutional delivery shows good improvement overall but the care provided seeks our attention still and it's the time to take necessary steps to strengthen the health institutes on early new born care.

Limitations:

Since NFHS 4 raw data is not available for all the states this study is done using NFHS 3, Once NFHS 4 data is available for public, same analysis can be done to compare and find is there any change in the cluster. And also possible to see the shift in the states between the cluster and possible factor contributed for the shift.

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Appendix

Table 1: Demographic character of mothers delivered in last five years preceding the survey.

		PLACE OF DELIVERY	
		HOME DELIVERY	INSTITUTIONAL DELIVERY
Place of residence	Urban	32.30	67.60
	Rural	68.80	31.00
Religion	Hindu	53.60	46.30
	Muslim	57.80	42.10
	Christian	62.60	37.30
	Others	50.40	49.40
Wealth index	Poorest	87.60	12.20
	Poorer	77.20	22.50
	Middle	61.30	38.50
	Richer	41.20	58.70
	Richest	15.80	84.10
Educational level	No education	79.30	20.50
	Primary	61.90	38.00
	Secondary	35.40	64.50
	Higher	7.20	92.70
Birth order	1	37.00	62.90
	2-3	54.70	45.10
	4-5	76.30	23.60
	6+	86.70	13.10

Table 2:Distribution of four variables of the study among institutional delivery by socio economic and demographic character.

		BCG (%)	0 Polio (%)	REAST FEED /ITHIN 1 HR (%)	WEIGHTED AT BIRTH (%)
Place of residence	Urban	41.20	29.60	35.60	93.40
	Rural	38.20	21.80	32.70	78.70
Religion	Hindu	39.30	24.60	33.60	85.00
	Muslim	39.10	24.80	34.40	83.20
	Christian	48.40	37.60	51.70	96.80
	Others	40.70	32.50	27.80	89.70
Wealth index	Poorest	27.60	10.90	27.60	65.00
	Poorer	32.80	17.70	32.00	73.70
	Middle	36.40	21.60	36.30	80.80
	Richer	40.90	26.60	35.30	88.10
	Richest	46.20	33.40	33.90	95.60
Educational level	No education	24.40	12.10	25.40	64.80
	Primary	38.60	24.50	35.50	83.50
	Secondary	44.10	28.50	36.80	91.50
	Higher	50.10	37.70	36.10	97.80
Birth Order	1.00	44.70	28.60	31.80	87.70
	2-3	38.20	25.20	36.90	87.40
	4-5	26.40	14.40	31.30	71.70
	6+	14.60	5.30	23.00	50.00

Table 3: Performance of clusters based on four factors

CLUSTERS	0 POLIO (n=15810)	BCG (n=20254)	WEIGHT CHECKED (n=18628)	BREAST FEEDING < 1Hr (n=6529)	TOTAL SCORE	CATEGORY
Kerala, Goa	31.1 (1)	42.65(1)	0.55(1)	41.75(1)	4	Best
Sikkim, Tripura, West Bengal, Arunachal, Nagaland Manipur, Meghalaya, Assam, Orissa, Tamilnadu, Maharashtra, Mizoram	58.85 (3)	82.44(4)	5.93(3)	43.47(2)	12	Good
Punjab, Haryana, Delhi, Rajasthan, Jharkhand, Chhattisgarh, Madhya Pradesh,	62.05(4)	71.45(3)	14.07(4)	72.97(4)	15	Average

Gujarat, Andra Pradesh, Himachal, Uttaranchal, Karnataka, J&K, Uttar Pradesh, Bihar	66.1(5)	90.43(5)	53.87(5)	85.5(5)	25	Poor