Brief Research Article

Trends in Selected Birth Defects among Parents from Below Poverty Line Population in Karnataka during 2010–2020

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Summary

The aim of the study is to reveal the common birth defects among parents of newborns belonging to the below poverty line (BPL) category in Karnataka state (South India) by analyzing Suvarna Arogya Suraksha Trust data. In the last 10 years, 3672 kids in BPL families have been born with various birth abnormalities. It is found that 50.3% of newborns have anorectal malformations, 33.1% have hypospadias, 6.0% have diaphragmatic hernia, 5.1% have esophageal atresia, and 2.8% have intestinal atresia and obstruct. As a parent's age rises, the likelihood of having a child with birth abnormalities raise as well, particularly anorectal malformations than diaphragmatic hernia. Male newborns have a higher risk of birth defects. We hypothesized that poverty, material deprivation, and low socioeconomic profile throughout the life course among the BPL community could be some of the key reasons for poor maternal health care and related neonatal outcomes.

Key words: Below poverty line, birth defects, health, newborn, poverty

Health inequalities and maternal socioeconomic disparities have a direct impact on the newborn's outcomes.[1-3] The link between low socioeconomic position and birth abnormalities is not well understood.[4] However, studies have found a significant link between a parent's low socioeconomic level and an elevated risk of different birth abnormalities in newborns.[2,4] Parents with low socioeconomic status (SES) levels are more likely to have newborns with neural tube defects, anorectal malformations, orofacial clefts, and congenital heart defects, according to the American National Birth Defects Prevention Study.[2,3,5]

It was revealed that mothers from low-income families had a nearly three-fold increased risk of numerous birth abnormalities when compared to parents from high-income families.[5,6] According to studies, the mother's level of education, income, and family background all have a direct link to various birth abnormalities linked to material poverty. Late marriage due to poverty (maternal age), lifestyle factors such as smoking, alcohol, and gutka consumption, working in a hazardous environment, lack of knowledge of antenatal checkups, health illiteracy, neglected pregnancy, mental stress due to financial hardship, the issue with folic acid, dietary deficiency, and so on are all risk factors for birth defects.[4,7,8]

This study is based on data from Suvarna Arogya Suraksha Trust, a legally registered government body under the auspices of the Department of Health and Family Welfare, Government of Karnataka. This study is based on information obtained from the Trust for the years 2010 through 2020. This agency's main responsibility is to manage, document, and oversee any new government health-care programs for families below poverty line (BPL) in the state. BPL is an official system for identifying the "poorest of the poor," with an annual income of around Rs. 126,000/-per year (US$1758) according to current criteria. We focused on the information of newborns with birth abnormalities who received treatment under various insurance schemes in the last 10 years (2010–2011–2020–2021).

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Table 1: Multinomial logistic regression result of determinants of birth disorders

Birth Disorders	Coefficients	*B*	SE	Wald	df	*P*	Unadjusted OR (95% CI)
Biliary atresia and choledochal	Intercept	−2.798	0.262	114.376	1	0.000	
	Age of the mother	0.000	0.002	0.014	1	0.907	1.000
	Female	−0.284	0.211	1.802	1	0.179	0.753
	Northern region	−0.136	0.314	0.187	1	0.665	0.873
	Southern region	0.334	0.280	1.424	1	0.233	1.396
	Central region	0.087	0.328	0.070	1	0.791	1.091
	Minority	−1.130	0.520	4.718	1	0.030	0.323
	OBC	−0.138	0.477	0.083	1	0.773	0.871
	SC	0.145	0.415	0.122	1	0.727	1.156
	ST	−0.106	0.335	0.101	1	0.751	0.899
Diaphragmatic hernia	Intercept	−1.921	0.176	118.511	1	0.000	
	Age of the mother	−0.001	0.001	1.695	1	0.193	0.999
	Female	−0.152	0.145	1.102	1	0.294	0.859
	Northern region	0.072	0.197	0.136	1	0.713	1.075
	Southern region	−0.215	0.204	1.117	1	0.291	0.806
	Southern region	0.121	0.215	0.315	1	0.575	1.128
	Minority	−0.191	0.246	0.605	1	0.437	0.826
	OBC	0.207	0.292	0.503	1	0.478	1.230
	SC	−0.834	0.431	3.736	1	0.053	0.434
	ST	−0.051	0.234	0.048	1	0.827	0.950
Hypospadias	Intercept	−0.244	0.092	7.030	1	0.008	
	Age of the mother	0.000	0.001	0.266	1	0.606	1.000
	Female	−0.359	0.075	22.686	1	0.000	0.698
	Northern region	−0.076	0.106	0.525	1	0.469	0.926
	Southern region	−0.001	0.101	0.000	1	0.994	0.999
	Central region	0.021	0.114	0.033	1	0.857	1.021
	Minority	−0.236	0.128	3.409	1	0.065	0.790
	OBC	0.038	0.164	0.054	1	0.817	1.039
	SC	−0.040	0.166	0.059	1	0.809	0.961
	ST	0.068	0.119	0.327	1	0.568	1.070
Intestinal atresia and obstruct	Intercept	−2.480	0.229	117.692	1	0.000	
	Age of the mother	0.001	0.001	0.241	1	0.623	1.001
	Female	−0.297	0.206	2.084	1	0.149	0.743
	Northern region	−0.691	0.301	5.281	1	0.022	0.501
	Southern region	−0.416	0.267	2.424	1	0.120	0.660
	Central region	−0.042	0.279	0.022	1	0.881	0.959
	Minority	−0.009	0.323	0.001	1	0.977	0.991
	OBC	−0.175	0.477	0.134	1	0.714	0.840
	SC	−0.749	0.603	1.542	1	0.214	0.473
	ST	0.166	0.305	0.297	1	0.586	1.181
Esophageal atresia	Intercept	−2.383	0.204	136.198	1	0.000	
	Age of the mother	0.000	0.001	0.015	1	0.904	1.000
	Female	−0.287	0.157	3.334	1	0.068	0.751
	Northern region	0.202	0.230	0.774	1	0.379	1.224
	Southern region	0.347	0.218	2.520	1	0.112	1.415
	Central region	0.276	0.247	1.256	1	0.262	1.318
	Minority	−0.058	0.254	0.051	1	0.821	0.944
	OBC	0.124	0.333	0.139	1	0.710	1.132
	SC	−0.069	0.348	0.039	1	0.844	0.934
	ST	−0.047	0.254	0.035	1	0.852	0.954

Pseudo Cox and Snell, Nagelkerke, and McFadden R^2 values are 0.017, 0.018, and 0.007, respectively. CI: Confidence interval, OR: Odds ratio, SE: Standard error

We used multinomial logistic regression to assess the proportion of various birth defects. The dependent variable (Y) is a categorical variable found with the common six neonatal birth defects (J = 6), which are

Table 2: Trend analysis of birth defects

Year	Anorectal malformations stag (%)	Biliary atresia and choledochal (%)	Diaphragmatic hernia (%)	Hypospadias (%)	Intestinal atresia and obstruction (%)	Esophageal atresia (%)	Total (%)
2010-2011	54 (52.9)	5 (4.9)	6 (5.9)	28 (27.5)	4 (3.9)	5 (4.9)	102 (100.0)
2011-2012	52 (49.1)	2 (1.9)	7 (6.6)	36 (34.0)	3 (2.8)	6 (5.7)	106 (100.0)
2012-2013	52 (49.1)	2 (1.9)	7 (6.6)	36 (34.0)	3 (2.8)	6 (5.7)	106 (100.0)
2013-2014	54 (49.1)	2 (1.8)	7 (6.4)	38 (34.5)	3 (2.7)	6 (5.5)	110 (100.0)
2014-2015	418 (49.5)	16 (1.9)	52 (6.2)	289 (34.2)	25 (3.0)	44 (5.2)	844 (100.0)
2015-2016	224 (50.5)	10 (2.3)	26 (5.9)	151 (34.0)	13 (2.9)	20 (4.5)	444 (100.0)
2016-2017	110 (52.1)	6 (2.8)	13 (6.2)	70 (33.2)	5 (2.4)	7 (3.3)	211 (100.0)
2017-2018	60 (49.6)	3 (2.5)	8 (6.6)	41 (33.9)	3 (2.5)	6 (5.0)	121 (100.0)
2018-2019	93 (50.5)	5 (2.7)	11 (6.0)	63 (34.2)	5 (2.7)	7 (3.8)	184 (100.0)
2019-2020	323 (48.8)	23 (2.9)	47 (5.9)	267 (33.6)	18 (2.3)	36 (4.5)	714 (100.0)
2020-2021	316 (50.2)	24 (3.8)	35 (5.6)	189 (30.0)	22 (3.5)	43 (6.8)	629 (100.0)
Total	1837 (48.9)	98 (2.6)	219 (5.8)	1208 (32.2)	104 (2.8)	186 (5.0)	3672 (100.0)

assumed to be not ordered. We found the six common birth defects among the neonatal outcomes: one stands for anorectal malformations (50.3), two for biliary atresia and choledochal (2.7), three for diaphragmatic hernia (6.0), four for hypospadias (33.1), five for intestinal atresia and obstruct (2.8), and six for esophageal atresia (5.1) among parents who belong to BPL. The first defect (anorectal malformations) is used as the base category in the estimation. A total of four explanatory variables are considered, with age (mothers') being continuous and the rest of them being categorical. The first categorical variable is sex, with the male being the base category. The second categorical variable is a geographic region with three categories: North (significantly underdeveloped), South (developed), and the Central (moderately developed) regions of the Karnataka state (India). The final categorical variable is caste, with minorities, OBC, ST, SC, and others. In both the multiple categorical variables, the final category (others) is the base category.

We have limited sociodemographic data on the parents. It is revealed that 31% of the parents have been schooled up to college level and 47% are having secondary-level education. Twenty-two percent are illiterate. More than 91% of them are working in the unorganized sector. Most of them are from rural and semi-urban areas. We have found the six most common defects among newborns as per the data, including biliary atresia and choledochal, diaphragmatic hernia, hypospadias, intestinal atresia and obstruct, and esophageal atresia. The coefficient of age is zero or the exponent of the coefficient is equal to one in the case of biliary atresia and choledochal, hypospadias, intestinal atresia and obstruct, and esophageal atresia. It indicates that as the age of the parent increases, there is a one-to-one increase in the chance of having birth defects, especially anorectal malformation problems. However, diaphragmatic hernia is an exception to this, with a negative coefficient which indicates a lesser chance of occurrence when compared to anorectal malformations with respect to the parent's age.[6,8]

The coefficient of age is significant at only a 20% significance level whereas insignificant in all other cases. Sex dummy estimates the coefficient for a female with a male as the base category. In this case, coefficients in all birth defects are negative but significant in the case of hypospadias, intestinal atresia and obstruct, and esophageal atresia at 5% level and at 20% level in the case of biliary atresia and choledochal. It shows that female babies will have a lesser chance of having the above-mentioned disorders than males in comparison. Geographic divisions show insignificant coefficients. Hence, it is not a significant variable in predicting the impact of geographical regions (developed/underdeveloped). However, the lack of health infrastructure, the backwardness of the region, and resource-poor settings of the state have some impact on the onset of certain birth defects among the newborn in the country.[5,7,9] In terms of caste, minorities, OBCs, STs, and SCs have largely negative coefficients, indicating that these communities have a less chance of having these birth defects in comparison with the other categories such as general [Table 1].

The main limitation of the study is the lack of detailed socioeconomic profiles of the parents. These data are from a single source and might not be a complete representation of the state as a whole. The only newborns included were those who had undergone surgery or received advanced treatment; those who had already passed away were not. We suggest that future studies must focus on large-scale samples. The government must take concrete measures to improve the SES and health literacy of the BPL sections and promote more awareness about the importance of antenatal checkups.

This study is based on the data retrieved from Suvarna Arogya Suraksha Trust (2010–2020) to understand if there was a trend in the occurrence of birth abnormalities among newborn children whose parents were from BPL [Table 2]. Anorectal malformations, hypospadias, and diaphragmatic hernia are the most common birth disorders among newborns, according to the data. In comparison to male babies, female babies have a lower risk of birth abnormalities, particularly

anorectal malformations. However, the age of the parents is a low-risk factor in the case of diaphragmatic hernia. Women from disadvantaged families marry later than other women due to financial and other concerns. As a result, having a baby with a birth defect also increases. We can tentatively draw the conclusion that hazard occupation, nutritional factors, lifestyle, food pattern, environment, health care, parity, maternal age, and ethnic origin are all immediate risk factors that could be the triggering factors for the issue.

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Conflicts of interest

There are no conflicts of interest.

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