

Socio-economic determinants of anemia among the pregnant women in Karnataka

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Abstract

Objective: To estimate various determinants of anemia among the pregnant women in the Karnataka state. The study examines differences in anemia incidence related to socio-economic, demographic and nutritional status. It is hypothesized that significant differences exist between Hyderabad Karnataka and the rest of the state in the incidence of anemia.

Methods: The National Family Health Survey 2015-16 (NFHS-4) provides district level cross sectional survey data on women's socioeconomic status, maternity care, nutritional status, haemoglobin status, household and individual status. The study uses regression analysis to identify determinants of anemia among pregnant women. Hyderabad Karnataka Region and rest of the Karnataka state, a south Indian state.

Results: Our model indicates that the factors such as literacy of women, antenatal care, receiving postnatal care are significantly negative associations with incidence of anemia, while higher level of poverty, obesity (BMI \geq 25.0kg) and lower educational levels are positively associated with incidence of anemia. Other socio-economic factors such as consumption of alcohol, social background (SC/ST), other comorbid factors such as hypertension were not found to be significantly correlated in this study.

Keywords: Anaemia, Hyderabad Karnataka Region, Regional imbalance, Pregnancy and socioeconomic analysis.

1. Introduction

Anemia is a major health disorder and an indicator of poor nutrition, health among women during their pregnancy. Globally, 40.1 % of pregnant women suffered from anemia in 2016. India contributes to about 80% of pregnant women death due to anemia in south Asia. Prevalence of anemia among pregnant women is 50.4% in India (NFHS-4). The global target is 50% reduction of anemia among women of reproductive age by 2025 (WHO). Anemia affects during pregnancy with severe complications like increased risk of premature delivery, maternal mortality. Maternal anemia was associated with higher risk of the new born [1-3]. India has the highest prevalence of anemia during pregnancy compared to the non-pregnant women 53.2% (NFHS-4).

According to [4-5] the 2011 census, women comprise 49.19% of the total population of Karnataka state. The prevalence of anemia among pregnant women in Karnataka is 64.6 %, followed by non-pregnant women is 62.5% (DLHS-4). A higher prevalence of anemia was found among pregnant women. Anemia is also an important contributor to maternal mortality. 52.7% of women are anemic during their pregnancy in the Hyderabad Karnataka region as compared to the rest of the state average is 47.3%. A severe imbalance exists between the two regions in terms of socio-economic and health conditions. The Hyderabad Karnataka (HK) region comprises of Bidar, Ballari, Koppal, Kalaburagi, Raichur and Yadgir districts covering 23% of the geographical area with an 18.46% sharing in the total population of Karnataka. This region has 26.69% of the scheduled caste and scheduled tribe population. The level of women having anemia indicating that poor health and nutrition status of women in this region. Given the impoverished nature and the nature of causal factors of the problem, it is hypothesized in this study, that incidence of anemia is significantly different among the two regions.

2. Literature survey

Anemia is a condition in which reduced the number of red blood cells or haemoglobin concentration, and their carrying capacity of oxygen around the body. Globally, the most significant contributing factor to anemia is iron deficiency, so anemia and iron deficiency anemia are used synonymously [6].

Severe anemia in pregnancy is defined as haemoglobin <70 g/l and Very severe anemia are defined as haemoglobin <40 g/l. severe anemia increases the risk of congestive heart failure and maternal death rates [NHD]. Anemia decline is correlated with improving sanitation and female education [NFHS-4]. Anemia significantly associated with women's age, socioeconomic status, and education level of women, birth interval, and body mass index [7-8]. It is found that the level of education and nutritional factors such as consumption of leafy vegetables, meats, and health condition of asthma are significantly associated with anemia [9-10]. Education and occupation are statistically significantly associated with anemia [11]. It has been shown that inverse relationship between the prevalence of anemia and literacy [12-13]. Poor women have the highest rates being anemic. Delayed for antenatal check-up play a role for prevalence of anemia among pregnant women. Anaemia affecting large proportions of the population, including specific physiological groups such as children, menstruating women and pregnant women. In [14-15] found that alcohol consumption was a greater impact on prevalence of obesity and associated with iron deficiency anemia.

3. Data and Method

Data is cross sectional across districts of Karnataka. Provided by National Family Health Survey-4 and Economic survey of Karnataka. Following work of Ponnaluru and Mekonnen, Dependent variable of the study is taken as pregnant women age 15-49 year who are anemic. Independent variables socio-economic factors such as primary education, higher education, number of SC and ST female, alcohol consumption revenue, poverty index and infrastructural factors antenatal check-up and postnatal care and existing health conditions hypertension, body mass index were included in the study as shown in Table 1.

The district of Hyderabad Karnataka region specific effects are captured by the Dummy variables. Dummy variables *bay*, *bdr*, *glb*, *kop*, *rai* and *ydg* were similarly constructed to take the value of 1 if the districts were Bellary, Bidar, Gulbarga, Koppal, Raichur, and Yadgir respectively or zero otherwise [17]. Bellary is the second most populated district in the HK region with 50.5% of females is anemic during their pregnancy. The percentage of women that are less than ten years schooling is 53.1% followed by more than ten years schooling is 26.9% in the district. The poverty ratio in the district is 23.6%. Health care utilized in the district is mediocre. For example, antenatal care visits 80.3% and visits for postnatal care are 44.7% and 18.4 % of females have obesity. District has 1090.02 crore excise tax revenue from alcohol consumption. Bidar district in HK region has a 49.3% of females are anemic during their pregnancy. The percentage of women that are less than ten years schooling is 72.2% followed by more than ten years schooling is 46.4% in the district. The poverty ratio in the district is 30.8%. Health care utilized in the district such as antenatal care visits is 69.1% and visits for postnatal care are 69.1% and 15.9 % of females have obesity. District has 13.33 crore revenue from alcohol consumption.

Gulbarga (recently renamed as Kalaburagi) is the most populated district in the HK region with 53.9% of female are anemic during their pregnancy. The percentage of women that are less than ten years schooling is 54.3% followed by more than ten years schooling is 33.4% in the district. The poverty ratio in the district is 30.5%. Health care utilized in the district such as antenatal care visits is 84.6% and visits for postnatal care are 40.1% and 14.8 % of females have obesity. District has 23.5 crore revenue from alcohol consumption. Koppal district has a 43.3% women are anemic during their pregnancy. The percentage of women that are less than ten years schooling is 56.2% followed by more than ten years schooling is 28.1% in the district. The poverty ratio in the district is 28.3%. Health care utilized in the district such as antenatal care visits is 60.5% and visits for postnatal care are 54.3% and 12% of females have obesity. District has 236.93 crore revenue from alcohol consumption. Raichur district has a 73.1% women are anemic during their pregnancy. The percentage of women that are less than ten years schooling is 45.8% followed by more than ten years schooling is 28.6% in the district. The poverty ratio in the district is 30.5%. Health care utilized in the district such as antenatal care visits is 65.4% and visits for postnatal care are 48.3% and 19.8% of females have obesity. District has 11.08 crore revenue from alcohol consumption. Yadgir district has a 46.5% women are anemic during their pregnancy.

The percentage of women that are less than ten years schooling is 41.8% followed by more than ten years schooling is 23.3% in the district. The poverty ratio in the district is 38%. Health care utilized in the district such as antenatal care visits is 63.6% and visits for postnatal care are 51.8% and 12.9% of females have obesity. District has 4.74 crore revenue from alcohol consumption.

Table 1. Descriptive statistics of data used this study

Description	Minimum	Maximum	Mean	Std Dev
Pregnant women age 15-49 year who are anemic	21.2	73.1	47.56	10.72
Women who are literate <10 schooling	41.8	86	68.32	10.57
Women literate with 10 or more schooling	23.3	51.5	40.76	8.28
Women who had antenatal care	60.5	92.7	74.99	8.60
Who received postnatal care	40.1	90.3	64.89	11.56
Hypertension very high	0.2	1.9	0.83	0.42
Who are overweight (BMI≥25.0kg)/obese	11.7	29.4	20.96	5.18
Number of SC/ST Female	65110	484782	229067.07	118095.6
Poverty Rate Index (In percentage)	7.8	38	22.46	7.54
Revenue (Alcohol excise tax)	4.74	4884.1	342.84	920.80

Model estimation:

$$y = X\beta + \varepsilon$$

Equation is estimated with data cross sectional during study period. Dependent Variable y is pregnant women age 15-49 year who are anemic and X is the vector of independent variables. β is the parameter vector and ε is the error term. Estimation is done by least squares estimator with heteroscedasticity consistent Whites estimates for co-variances. Model diagnostics such as Normality tests, Autocorrelation tests were calculated. Multi-collinearity was diagnosed using Variance Inflation Factors (VIFs). VIF value greater than 10 is an indicator of multi-collinearity. Estimation was done in SAS using Base SAS and SAS SQL routines as shown in Table 2.

Table 2. Parameter estimates from least squares estimation

Variable	Parameter Estimate	Pr > t	Flexibility
Intercept	71.37	0.0552	
Women who are literate <10 schooling	0.0001	0.0062	0.0001
Women literate with 10 or more schooling	-1.307	0.0005	-1.120
Women who had antenatal care	-0.503	0.0466	-0.794
Who received postnatal care	-0.783	0.0015	-1.069
Hypertension very high	-6.078	0.0989	
Who are overweight (BMI≥25.0kg)/obese	1.776	0.0023	0.783
Number of SC/ST Female	-0.00000861	0.6147	
Poverty Rate Index (In percentage)	1.753	0.0307	0.827
Revenue (Alcohol consumption tax)	0.002	0.0717	
Bay	-5.803	0.4613	
Bdr	-3.842	0.4982	
Glb	-1.810	0.785	
Kop	-11.26	0.0637	
Ydg	-21.60	0.0009	
Rai	9.642	0.0741	
R-Square	0.694		
Dependent	Pregnant women age 15-49 year who are anemic		

4. Result

Parameter estimates from the estimated model are presented in Table 2. Parameter estimates on dummy variable representing the districts in Hyderabad Karnataka region are predominantly negative and as hypothesized. Parameter estimate on dummy variable representing Bellary, Bidar, Gulbarga (Kalaburagi) and Parameter estimate on dummy variable representing Yadgir district is negative and significant ($P < 0.0009$). Indicating Koppal and Yadgir have lower significant anemia levels than the rest of the state. Parameter estimate women who are literate <10 year schooling is positive and statistically significant ($P < .0062$). Parameter estimate on women literacy with higher education is -1.307 negative and statistically significant ($P < 0.0005$). Estimated elasticity is -1.30 indicating a 1.12 reduction in incidence of anemia with a 1% increase in higher education.

The parameter estimate on women who are visiting for antenatal care is -0.503 negative and statistically significant ($P < 0.0466$) indicating that pregnant women visiting for antenatal care has a significant impact on incidence of anemia. Estimated elasticity is -0.503 indicating that with 1% increasing visits to antenatal care, anemia decreases by a 0.79%. The parameter estimate on women who received postnatal care from doctor/nurse/other health personnel is -0.783 negative and statistically significant ($P < 0.0015$). Estimated elasticity is -0.783 indicating 1.06% decline in incidence of anemia with 1% increasing in receiving postnatal care. Parameter estimate on hypertension very high among women at age 15-49 is not significant ($P < 0.0389$). Parameter estimate on women who are over weighted or obese ($BMI \geq 25.0\text{kg}$) is 1.776 positive and statistically significant ($P < 0.0023$) indicating the increasing in incidence of anemia with over weighted. Estimated elasticity is 0.78% indicating that with a 1% increasing over weighted or obese, anemia increases. Parameter estimate on social variables such as caste, number of SC/ST females is -0.0000861 negative and turned out to be not significant ($P < 0.614$). Parameter estimate on poverty index is 1.753 positive and statistically significant ($P < 0.030$). Estimated elasticity is 0.82% indicating that with 1% increase in poverty rate, anemia increases. Parameter estimate alcohol consumption tax (Revenue) is positive and turned out to be not significant ($P < 0.0717$).

5. Discussion

The study quantified the impact of socio-economic factors on the prevalence of anemia among pregnant women in the study region. National Family Health Survey-4 and Economic survey of Karnataka, across district-level secondary survey data was analyzed using regression techniques and result from our model indicating that female who have more than ten year schooling, antenatal check-up at least three visits, and who received postnatal care through well-trained doctor/nurse/midwife/other health personnel have significantly lower levels of incidence anemia among pregnant women [18].

Increasing higher levels of education results in the decreased prevalence of anemia among pregnant women. Our result indicates that there is a 1.12% drop in prevalence of anemia with a 1% increase in higher education. And a 1% decrease in lower education, anemia decreases by 0.001%. Antenatal care visits also a statistically significant factor affecting anemia among women. Our result indicates that with a 1% increase in antenatal care visits anemia decreases by a 0.79%, and 1.06% drop in the prevalence of anemia with a 1% increase in postnatal care visit. Obesity also a statistically significant impact on the prevalence of anemia, our result indicates that a 0.78% drop in the level of anemia among women with a 1% decreases in obesity. The result from our model increasing poverty ratio results in an increased prevalence of anemia. Our result indicates that with a 1% alleviation of poverty anemia decreases by 0.82%. Other socio-economic factor such as alcohol consumption revenue and social status (Number of SC/ST females) are not found to be statistically significant factors, and also comorbid factors such as hypertension among women were not found to be statistically significant.

6. Conclusion

The study analyzed the regional differences in the incidence of anemia and determinants of anemia among pregnant women. Impacts of socio-economic variables such as female literacy rate, antenatal care, postnatal care, hypertension, obesity, poverty, social status (SC/ST) and alcohol consumption on anemia is evaluated. Among these variables female literacy, poverty rate, and body mass index (women who are overweight or obese) are positively associated and lower levels of female education, antenatal care, and postnatal care are negatively associated with anemia among pregnant women. The study recommended new program strategies are needed with a proper channel. The availability of a well-trained doctor/nurse/midwife is a must important for the prevention of anemia among pregnant women through giving awareness about health during pregnancy and as well as nutrient caring of women's reproductive age.

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