International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Inter-District Disparity of Maternal Mortality and its Major Determinants in Tamilnadu, India

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Abstract: ***Socio-economic, biological and demographic factors may impact on the maternal mortality rate. In this paper we want to explore the inter-district disparity of maternal mortality and its determinants in Tamilnadu, India(for 2015).we are very interested to study about maternal mortality and it is one of the important indicator to analyze women's health status under maternity condition. We choose Tamilnadu because of heal infrastructure. Not only that Tamilnadu has performed reasonably well in terms of literacy growth (according to 2011 census).the study reveals about the inter-district disparity of maternal mortality of advanced and backward districts in Tamilnadu. The effects of socio-economic, health, demographic factors are analyzed for fulfilment of the purpose. The results also present such as number of district hospitals, women married below 18 years, prevalence of anaemia for pregnant women of age group between 15-49, prevalance of severe anaemia for pregnant women age group between 15-49, institutional deliveries are the considered to be independent variables and these are the determinants consider here for maternal mortality or deaths rate.***

Keywords: Maternal mortality rate, inter-district disparity, socio-economic, health and demographic variables, pair wise correlation, multiple regression, Tamilnadu and its districts, India

1. Introduction

In this paper we want to explore the inter-district disparity of maternal death rate (2015) and its determinants in Tamilnadu, India. It is necessary to reduce maternal deaths in the technically developing country (India).women's are the assets of our nation therefore reduction in maternal deaths is the major objective of this paper. We would explore 32 districts of Tamilnadu in India.

Next it is important to clarify why we choose the state of Tamilnadu in India. First and for most Tamilnadu is a most important in terms of health infrastructure. The Christian medical college (cmc) is a leading institution which is located in Vellore in Tamilnadu (India). Secondly best private hospital in Tamilnadu is Apollo hospital.

Moreover all India medical institute was going to be found in the district of Madurai in Tamilnadu. "Hence Tamilnadu becomes a house of health center in India". According to 2011 census populations of Tamilnadu is 72,147,030".

Population of male	36,137,975
Population of female	36,009,055

In Tamilnadu maternity leave was extended from 6months to 9months during the year 2016 by our late honourable chief minister J. Jayalalitha.

2. Review of Literature in Brief

There exists a vast pool of literature in the field of health statistics particularly in respect of mortality indicators like infant mortality, child mortality, maternal mortality etc. But literature is silent in the field of inter-district disparity of maternal mortality in India and its few states in India. So my study claims in the novelty in the field of research. Moreover my objective is to show the maternal mortality in districts of Tamilnadu and to examine the interstate disparity of maternal deaths (2015) and its major determinants .the study was based on maternal deaths that occurs in 32 districts of Tamilnadu. The choice of state and socio-economic and demographic variables are partly guided by the availability of data (obtained from secondary sources such as civil registration system and national institution for transforming information. (Niti Aayog)).

Maternal deaths have been considered as a most important indicator of health for the construction of human development index and it is considered as a proxy variable of the life expectancy ratio.

In this paper, we represented inter-district disparity of the state Tamilnadu in India maternal deaths by vertical bar diagram approach and next to explain the major determinants of maternal deaths. We have run a poisson regression. Since number of death is a count variety.

Then we had done a pair wise inter correlation among the explanatory variables (independent variables) had been calculated. It is seen that from a bar diagram there is clear evidence of inter-district of disparities of maternal mortality in Tamilnadu in the year 2015.

The findings of pairwise correlation coefficients between maternal deaths and its explanatory variable helps to indicate the nature and degrees of association between paired variables to be satisfy theoretical expectation prior in every situations. Multiple regression models helps in finding the relationship between response and explanatory variables.

Objective of this article

In keeping with the view of access to health can facilty broad study is to health can facility broad study is to high light the situation of maternal deaths in inter-district disparity of Tamilnadu in India. The objective of the study may be stated as below.

1) To examine the inter-district disparities of prevalence of maternal mortality in Tamilnadu, India.
2) To examine the factors which are responsible of the variation of maternal mortality in Tamilnadu, India.

3. Data, Methodology and Statistical Model

In section we shall provide a detailed description of research methodology follows to carry out. The present paper includes exposition of study are sources of data, description of various tables, comutational based on secondary data .we used the data from several maternal health related indicators as well as socio-economic data from "district level household survey (2012-13)"of Indian institutes of population science (IIPS) and" ministry of health and family welfare" and in order to obtained maternal rate i had took 2011 census data for obtaining number of women's at reproductive age between 15-49.the data source of for maternal mortality is obtained from civil registration system.

We are now examined the district wise disparities of maternal mortality among 32 districts in Tamilnadu ,India through bar diagram approach in 2015.then we examine pairwise correlation profile among maternal mortality and chosen explanatory variables .

We specify the following functional relationship (multiple regression model) in our study

Maternal mortality rate= factors (factor1, factor2, factor3, factor4 , factor5, u_i).

MMR denotes maternal mortality rate.
The denoted factors are:
Factor 1: number of district hospitals.
Factor 2: women married below 18.
Factor 3: prevalence of anaemia in pregnant women between age 15-49.
Factor 4: prevalence of severe anaemia in pregnant women between age 15-49.
Factor 5: institutional deliveries.
U: random error component.
Y=maternal mortality rate.

More specifically we transform the above functional relationship into regression equation as follows.
$\mathbf{Y=\beta_1+\beta_2 f1+\beta_3 f2+\beta_4 f3+\beta_5 f4+\beta_6 f5+u_i}$
Here i = 1,2,.....,32.

Hypothesis:

Null hypothesis:
$\mathbf{H_0:}\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=0$

Against the alternative hypothesis
$\mathbf{H_1:}\beta_i\neq 0$.
To estimate our model we use ordinary least square technique .for the purpose of statistical significance we can use t test.

4. Results and Discussions

Inter-district disparity of maternal death rate
Table1 represents the appendix (i.e.) District wise maternal mortality rate.

A bar diagrammatic approach:
Table 2 helps to show maternal mortality rate in diagrammatic representation .it represented in the vertical bar diagram shows maternal rate of 32 districts in Tamilnadu, India

Table3 represents summary and the descriptive statistics of maternal death rate.

Table4 represents above average and below average of the 32 districts in Tamilnadu, India.

Now the mean of maternal mortality rate of Tamilnadu is 2.3309375.

Its standard deviation is 2.750356410188.

Maximum number of maternal death rate is 14.38(Madurai).

Minimum number of maternal death rate is 0.09(Thiruvallur).

Tamilnadu performance above average which can be termed as at very low level is 10 districts. Tamilnadu performance below average which is developed districts of maternal death rate is of 22 districts.

Pairwise correlation among maternal death rate and its independent variables:
From the profile of inter correlation coefficient which shown in table 4.

The summary of the pairwise correlation are given below

Pairwise correlation between maternal deaths and number of districts hospital available its correlated value is -0.025 at 95 % level of significance.(negatively correlated)

Pairwise correlation between maternal death rate and women marred below 18 its correlated value is -0.025 at 95% level of significance (negatively correlated)

Pairwise correlation between maternal death rate and institutional deliveries its correlated value is -0.03 at 95% level of significance (negatively correlated).

Pairwise correlation between maternal death rate and prevalence of anaemia of pregnant women between 15-49 .its correlated value is 0.130 (positively correlated) at 95% level of significance.

Pairwise correlation maternal death rate and prevalence of severe anaemia of pregnant women at age group between 15-49. Its correlated value is 0.428(positively correlated) at 95% level of significance

Pairwise correlation between maternal death rate and institutional deliveries of its correlated value is -0.03 (negatively correlated) at 95% level of significance.

Since there is some correlation among the explanatory variables in our model so we can predict the effects of multicollinearity.

Estimated multiple regression model for maternal death rate:

Now we turned to the regression analysis model for maternal deaths rate of inter-district disparities we choose best fitted model. The multiple coefficient of determination (r^2) found that 0.185 which shows the overall goodness of fit. It is note that the model suffers from very low multicollinearity level has its mean is 1.1656.

The f-value is 1.183 at 5% level of significance.

Factors and its significance level

Prevelance of severe anaemia in pregnant women between 15-49 is statistically significant with maternal deaths with f value of 2.283 at 0.05 level of significance.

The another 4 factors are statistically significance:

They are:

Next factor is that number of districts hospital in each districts of Tamilnadu in India is insignificant with its dependent variable maternal death rate. Its t value is -0.261 at 0.05 level of significance.

Next factor is that women married below 18 in each district of Tamilnadu in India is insignificant with its dependent variable maternal death rate .its t value is -0.093 at 0.05 level of significance

Next factor is that prevalence of anaemia for pregnant women between 15-49 at each district of Tamilnadu is insignificant with its dependent variable maternal death rate. Its t value is 2.283 at 0.05 level of significance

Next factor is that institutional deliveries at each district in Tamilnadu is insignificant with its dependent variables maternal death rate .its t value is 0.273 at 0.05 level of significance.

5. Conclusion and Policy Suggestions

In this study of maternal death rate, we conclude that maternal death rate (2015),had been predicted ,vertical bar diagram has helped to show the rates in diagrammatic representation. We could able to know that,

Minimum number of maternal death rate is 0.09(Thiruvallur). 10 districts out of 32 districts will under above average condition where government has to concentrate more on those districts like free checking of women's nutrition level for pregnant women before and after pregnancy. This helps in reduction of maternal deaths.

And another 22 districts out of 32 districts was below average where there is very low with maternal deaths.

Overall Tamilnadu performance in maternal was reduced while comparing with the previous year 2014.

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Appendix

Table 1: Represents tabulation of maternal deaths in districts of Tamilnadu

Serial number	District	Maternal deaths
1	Chennai	4.51
2	Kancheepuram	1.88
3	Thiruvallur	.09
4	Cuddalore	.67
5	Villupuram	1.46
6	Vellore	3.90
7	Thiruvannamalai	1.16
6	Salem	6.50
7	Namakkal	.42
8	Dharmapuri	1.94
9	Krishnagiri	1.73
10	Erode	.96
11	Coimbatore	3.00
12	Tiruppur	.97
13	The nilgiris	.47
14	Tiruchirappalli	3.70
15	Karur	1.01

16	Perambalur	.63
17	Ariyalur	.48
18	Pudukkottai	.66
19	Thanjavur	4.63
20	Nagapattinam	.90
21	Thiruvarur	3.28
22	Madurai	14.38
23	Theni	3.78
24	Dindigul	.98

25	Ramanathapuram	.53
26	Virudhunagar	.36
27	Sivagangai	1.03
28	Tirunelveli	5.17
29	Thoothukkudi	2.06
30	Kanniyakumari	1.35
31	Chennai	4.51
32	Kancheepuram	1.88

Table 2: Representation of bar-diagram for maternal mortality for inter-district of Tamilnadu (32 districts)

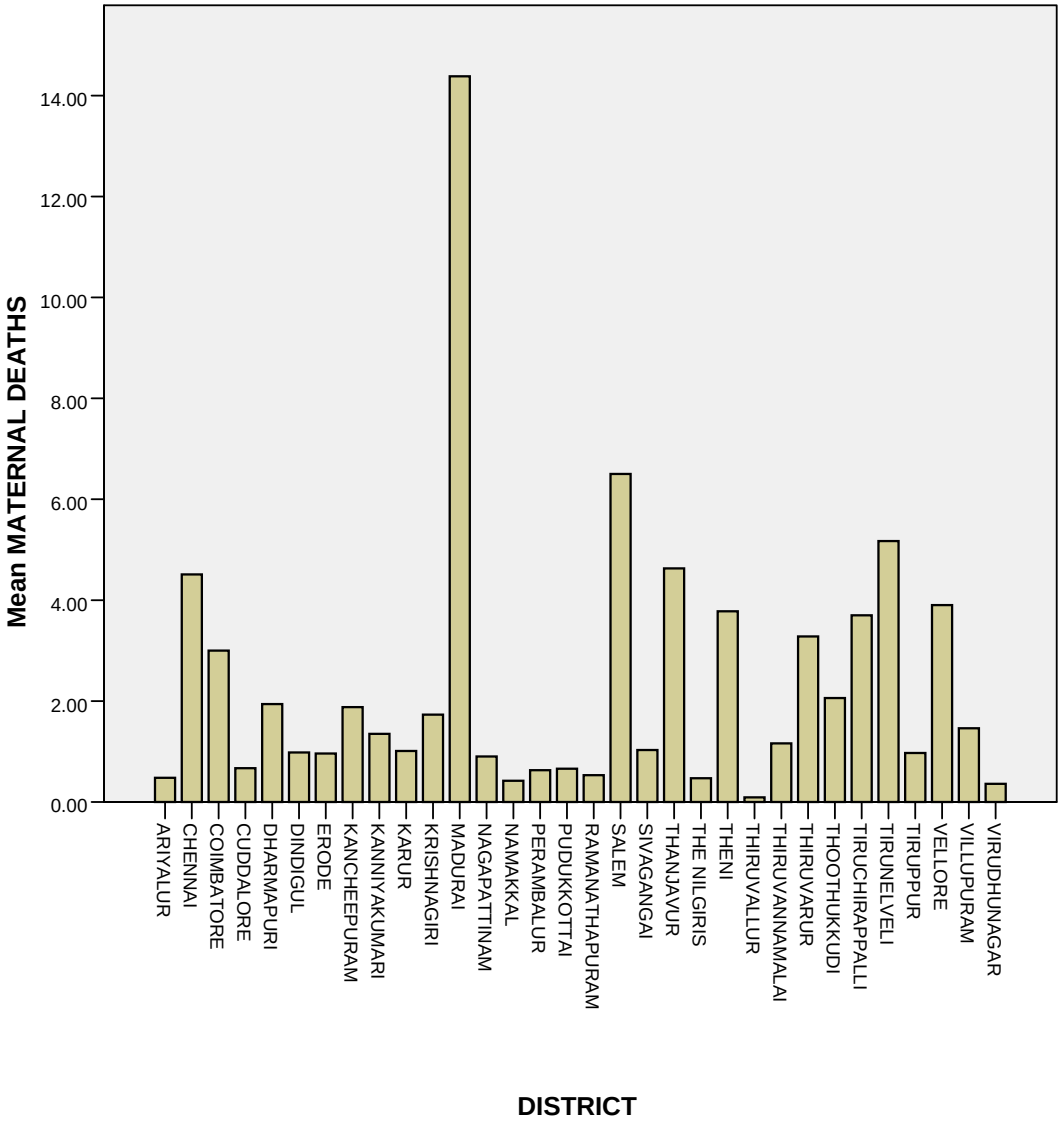

Table 2: Descriptve statistics for maternal death rate

		District	Maternal deaths
N	Valid	32	32
	Missing	0	0
Mean			2.3309
Std. Error of mean			.48620
Median			1.2550
Mode			.09(a)
Std. Deviation			2.75036
Variance			7.564
Skewness			2.978
Std. Error of skewness			.414
Kurtosis			11.497
Std. Error of kurtosis			.809
Range			14.29
Minimum			.09

Maximum			14.38
Sum			74.59
Percentiles	1		.0900
	5		.2655
	10		.4350
	20		.5900
	25		.6625
	30		.8770
	40		.9860
	50		1.2550
	60		1.8500
	70		3.0280
	75		3.5950
	80		3.8280
	90		5.0080
	95		9.2580
	99		14.3800

A multiple modes exist. The smallest value is shown

Table 4: Represents above value ,below value,average value for inter-districts maternal mortality in Tamilnadu,India.

ABOVE AVERAGE	
Chennai	4.51
Vellore	3.9
Salem	6.5
Coimbatore	3
Tiruchirappalli	3.7
Thanjavur	4.63
Thiruvarur	3.28
Madurai	14.38
Theni	3.78
Tirunelveli	5.17

Highest value	14.38
Lowest value	0.09

Below average	
Kancheepuram	1.88
Thiruvallur	0.09
Cuddalore	0.67
Villupuram	1.46
Thiruvannamalai	1.16
Namakkal	0.42
Dharmapuri	1.94
Krishnagiri	1.73
Erode	0.96
Tiruppur	0.97
The nilgiris	0.47
Karur	1.01
Perambalur	0.63
Ariyalur	0.48
Pudukkottai	0.66
Nagapattinam	0.9
Dindigul	0.98
Ramanathapuram	0.53
Virudhunagar	0.36
Sivagangai	1.03
Thoothukkudi	2.06
Kanniyakumari	1.35

Table 5: Pairwise correlation

Correlations

	Maternal deaths		No. of district	Wmb18	Prevalence of anaemia pregnant women	Prevalence of severe anaemia severe pregnant women	Institutional deliveries
Maternal deaths	Pearson correlation	1	-.025	-.059	.130	.428(*)	-.003
	Sig. (2-tailed)		.890	.749	.479	.015	.988
	N	32	32	32	32	32	32
No. of district	Pearson correlation	-.025	1	.374(*)	.185	-.041	.145
	Sig. (2-tailed)	.890		.035	.311	.822	.429
	N	32	32	32	32	32	32
Wmb18	Pearson correlation	-.059	.374(*)	1	.057	-.117	-.120
	Sig. (2-tailed)	.749	.035		.756	.525	.514
	N	32	32	32	32	32	32
Prevalence of anaemia pregnant women	Pearson correlation	.130	.185	.057	1	.281	.008
	Sig. (2-tailed)	.479	.311	.756		.119	.964
	N	32	32	32	32	32	32
Prevalence of severe anaemia severe pregnant women	Pearson correlation	.428(*)	-.041	-.117	.281	1	-.116
	Sig. (2-tailed)	.015	.822	.525	.119		.527
	N	32	32	32	32	32	32
Institutional deliveries	Pearson correlation	-.003	.145	-.120	.008	-.116	1
	Sig. (2-tailed)	.988	.429	.514	.964	.527	
	N	32	32	32	32	32	32

* correlation is significant at the 0.05 level (2-tailed).

Table 6: Multiple Regression

Model summary

Model	R	R square	Adjusted r square	Std. Error of the estimate
1	.431(a)	.185	.029	2.71058

A predictors (constant), institutional deliveries, prevalence of anaemia pregnant women, wmb18, prevalence of severe anaemia severe pregnant women, no. of district

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.	95% confidence interval for b	
		B	Std. Error	Beta			Lower bound	Upper bound
1	(constant)	-16.715	64.154		-0.261	0.796	-148.586	115.156
	No. of district	-0.144	1.542	-0.019	-0.093	0.926	-3.314	3.026
	Wmb18	0.003	0.196	0.003	0.018	0.986	-0.399	0.406
	Prevalence of anaemia pregnant women	0.003	0.049	0.012	0.063	0.95	-0.098	0.104
	Prevalence of severe anaemia severe pregnant women	0.51	0.223	0.43	2.283	0.031	0.051	0.969
	Institutional deliveries	0.177	0.648	0.05	0.273	0.787	-1.156	1.51

Coefficients(a)

Model		Collinearity statistics	
		Tolerance	Vif
1	No. of district	.797	1.254
2	Wmb18	.814	1.229
3	Prevalance of anaemia pregnant women	.882	1.134
4	Prevalance of Severe anaemia Pregnant women	.884	1.131
5	Institutional Deliveries	.926	1.080

A dependent variable: maternal deaths

Residuals statistics (a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted value	.6035	5.0107	2.3309	1.18418	32
Residual	-3.63138	9.36933	.00000	2.48237	32
Std. Predicted value	-1.459	2.263	.000	1.000	32
Std. Residual	-1.340	3.457	.000	.916	32

A dependent variable: maternal deaths