# ASSOCIATION OF MATERNAL HEALTH SERVICES UTILIZATION AND WOMEN LITERACY IN THE DISTRICTS OF WEST BENGAL

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**Abstract:** Examining the development of a region, maternal health is considered as one of the vital social indicators. This concept was promoted and emphasized by World Health Organization and has been pipelined through SDG 3 of the United Nation. The present study used secondary data from NFHS-5. The current study aims to observe the district wise variation of maternal health indicators in the districts of West Bengal. It also examines to associate the women literacy levels to the performance of various maternal health service utilization. Finally, the study attempts to carve out formal region classification based on the strength of relationship between these variables. The study found more than the average performance of the maternal health performance in the districts. Education levels was found to significantly influence variables like Antenatal Care, Folic acid intake, Births attended by skilled personnel and Mothers who received postnatal care. The districts like Purulia, Uttar Dinajpur, Murshidabad, Bankura and Birbhum were the most disadvantaged both in case of utilization of maternal health services as well as in literacy levels. Proper monitoring of the women education along with improvement of basic health facility especially at rural levels are the suggestive alternatives.

## 1. Introduction:

Maternal health is one of the indicators of social wellbeing by reducing the country's poverty and improving equality thereby, contributing to the aspect of development. The Sustainable Development goal-3 emphasizes good health and wellbeing at all ages.  According to WHO maternal health and wellbeing should be the main priority to ensure the full potential of the health care services. It also reported that about 95% of maternal deaths in 2020 took place in low- and middle-income countries. It further reported that these deaths were due to huge inequalities in health care access, as well as differences between the wealthy and disadvantaged population. Despite all efforts, access to maternal health care facilities continue to be the norm in many developing countries.

## 1.1 Background Literature:

It was the established there was vital relation between healthcare system and socioeconomic status, which translated into public access to health care facilities (Majumder, Roy, Bose, & Chowdhury, 2022). The study of North East India, hinted the health care was found to be inaccessible due to the low economic levels of the poor population among other contributing variables (LYNGDOH, 2015).

Among the various forms of healthcare, there existed disparity in the maternal health care utilization due to low literacy of women and poverty as vital along with other contributing factors. It was observed that lower education leads to ignorance of the existing heath facility use. (Prusty, Gouda, & Pradhan, 2015), ( Letamo & Rakgoasi, 2003). Ignorance due to illiteracy causes the people to opt for indigenous maternal health services. In fact, both traditional and modern health care co-exist. But education acts as positive catalyst which help women to develop thinking ability, improves decision making which translates into their better health seeking behavior (Babalola & Fatusi, 2009).In association, several studies found that literate women reside in countries with better resources, which were more accessible making them

4300

secure and safe. They were found to be more independent with ownership rights, hence significantly contribute more to the national workforce (McTavish, Moore, Harper, & Lynch, 2010). This case of differences in maternal health facility use was found at the household level also, with more use for better off households and less for disadvantaged households (DIMBUENE, et al., 2017). Therefore, the inequity was observed at all hierarchical levels from households to nation.  In India too, the low level of women literacy was the manifestation of poor status of women population along with factors like place of residence and financial condition of the household. Therefore, analyzing the existing condition of maternal health care utilization is important element for future improvement in this sector (Vora, Trivedi, Yasobant, & Mavalankar, 2016), ( Dey, et al., 2018).

Therefore, women's economic status, financial condition, and empowerment status combined influences the degree of maternal health services use. At the same time, the heath care challenges like absence of basic health facility, low patient friendly service were easily dealt away by the decision-making ability of these women. ( Ahmed, Creanga, Gillespie, & Tsui, 2010). Furthermore, the rate of maternal health facility use was also influenced by maternal health literacy which helps then to understand health instructions and make knowledge-based decisions during pregnancy. (Bello, Esan, Akerele, & Fadare, 2022).

Therefore, the impact of women literacy was found to be the major catalyst in improving individual social, economic and financial condition hence controlling the degree of maternal health facility utilization. This was found true for both at micro (household) level to macro (nation) level. Besides there was limited number of studies observed on maternal health in this part of the region. Hence, the current study is quantitative in nature attempting to observe the role of education in directing the maternal health facility at district level in the state of West Bengal.

**1.2 Study Area:**

West Bengal is one of the eastern states of India covering the coordinates between 27º13′15″N to 21º25′24″N latitudes and 85º48′20″E to 89º53′04″E longitudes covering an area of 88,752 km². The literacy rate of the state is 77.08% with 82.67% of male and 71.16% female population. It has a sex ratio of 1,049 female/1000male persons. The total male literacy rate was 81.6% and female as 76.1 aged between 15 to 49 years. Women with 10 years and more schooling was 32.9% and men with 34.7% The women who participated in the decisions regarding health care and major household subjects was about 89%.  But only 20% women were paid in cash in the past 12 months. Moreover, only 23% of women owned the house and land although 76.5 % of women having bank accounts. Further, only 50 % of the women had mobile of their own (District Fact Sheet, West Bengal, 2019-20). Since the past five years preceding the survey, 84% mothers received antenatal care. About 92% of births took place in government facility and 94% births were delivered by skilled assistance but 4% births were by traditional method. Janani Suraksha Yojana benefit was received by only 35% of the mothers. Overall, 92% births were conducted at institutions and 74% of the mothers had postnatal check-up after their delivery. Awareness about signs of pregnancy complication by the health provider was given to only to 75% of the male counterparts of the mothers (ICF, 2019-21). These facts and figures highlighted the current scenario of women health service facility. Although there were signs of improvement of heath delivery but still there were loopholes and areas that needs proper monitoring.
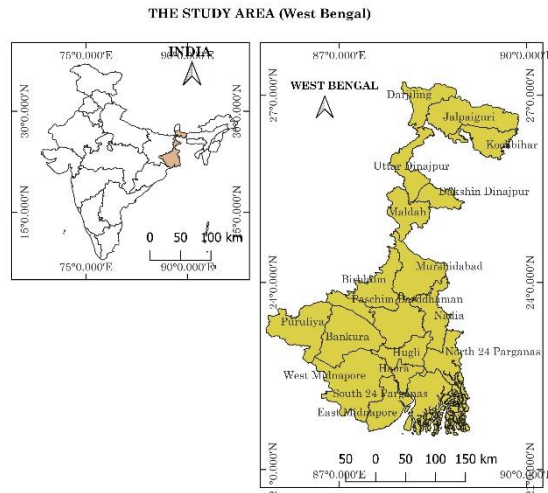
Figure1: The study Area

## 1.3 Objectives:

The study aims to achieve the following objectives:

1. To observe the district wise average utilization of maternal health services
2. To examine the association between maternal services utilization and the level of literacy among the districts.
3. To delineate the districts according to the degree of association between maternal services utilization and the level of literacy

## 2. Database and Methodology:

The current study is based on the secondary data from *National Family Health Survey 2019-20*. The districtwide data fact sheets of West Bengal were used to analyze the maternal health care utilization services. The data of 20 districts (acc.to NFHS-5) with a total sample of 18,187 households including 3021 male and 21,408 female has been extracted. The variables used are the maternal health care utilization services and women literacy in the districts.

2.1. The district wise distribution pattern of maternal health services was analyzed by Z-score. The total performance of the districts was observed by calculating the *P values* of individual maternal health indicators. Standard score is calculated by the formula $z = x{-}\mu/\sigma$ *where z is standard score, x refers to observed value, μ refers to mean and σ refers to standard deviation* of the given variable.

The parameters observed in the study were a) M-folic acid: Mothers with 180 days of folic acid consumption during pregnancy, b) MPC: Mothers who received postnatal care from a doctor/nurse/LHV/ANM/midwife/other he lth personnel within 2 days of delivery, c) CPF: Births in a public health facility that were delivered by caesarean section, d) Births attended by skilled health personnel, e) Institutional birth: Institutional births in public facility, f) Registered pregnancies: Registered pregnancies for which the mother received a Mother and Child Protection (MCP) card, g) Av.OOPE : Average out-of-pocket expenditure per delivery in a public health facility, h) ANC: Mothers who had at least 4 antenatal care visits.

2.2.  In the second part, the relationship of literacy level of women was observed with the extent of maternal health care utilization, using regression statistics. According to NFHS-5, the women literates were those "women who completed standard 9 or higher and women who can read a whole sentence or part of a sentence" Simple linear regression model was used to observe and predict the relationships. Simple linear perform better than other regression models especially for small datasets ( Lichtenberg & Simsek, 2016). The general equation is*: $y_i = \beta_0 + \beta_1 . x_i + \varepsilon_i$ where: $y_i$ is the dependent variable, $x_i$ is the independent variable, $\beta_0$ is the constant or intercept on the y-axis (where x = 0), $\beta_1$ is the $x_i$'s slope of the line or coefficient and $\varepsilon_i$ is the error or deviation of the point from the line.*

4302

Initially, all the components as mentioned above were taken but only the significant relationship was considered and interpreted. The significant parameters were a) ANC- mothers with 4 antenatal checkups, b) M-folic acid - Folic acid intake during pregnancy period, c) Births attended by skilled health professional and d) MPC-mothers who received post-natal care.

2.3The Single Weighted Index method was used for the delineation of formal region. Bou Deville introduced this method of formal region delineation. The chosen variables are given weights and further total weight is calculated and regions with similar weights are carved out into separate region. The mapping has been done using QGIS 3.22 software.

**Table No. 1:**

| Parameters | Weights |
|---|---|
| MPC-mothers who received postnatal care | 0.1 |
| M-folic acid-Folic acid intake during pregnancy | 0.2 |
| ANC-Mothers with 4 antenatal checkups | 0.3 |
| Births attended by skilled health personnel | 0.4 |
| Literacy level of women | 0.5 |

A total of 5 weights were allotted to the parameters. The literate level of women was given maximum weight because it was used as the predictor variable to explain maternal health services utilisation. The weights to other variables were allotted based on the proportion of variance explained of the predicted (independent) variable by the predictor variable. In other words, the weights were allotted as per the strength of relationship between these two variables.

**3.1 Results and discussion:**

The following parameters were used to analyse the important maternal health services utilisation in the districts of West Bengal. The average utilisation of maternal health services was given in the table 2. All the indicators of maternal health show more than the average utilisation. The parameters like Registered pregnancies have the probability of 87% followed by Institutional birth facility (89%). Folic acid intake by mothers and average out of pocket expenditure was found to have maximum utilisation (98%). It was followed by Mothers' Postnatal care (96%), Cesarian birth at public facility (95%), Mothers Antenatal care (94%) and births attended by skilled personnel (91%).

**Table No.2:**

| Indicators | MAX | MEAN | SD | Max-Mean | Z SCORE | P Value | % of Probability |
|---|---|---|---|---|---|---|---|
| M-folic acid-Folic acid intake during pregnancy | 42.00 | 30.37 | 5.49 | 11.63 | 2.12 | 0.98 | **98%** |
| MPC-mothers who received postnatal care | 89.4 | 68.26 | 11.63 | 21.14 | 1.82 | 0.96 | **96%** |
| ANC-Mothers with 4 antenatal checkups | 89.9 | 75.21 | 9.34 | 14.69 | 1.57 | 0.94 | **94%** |

4303

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|---|---|---|---|---|---|---|---|
| Caesarean birth at public facility | 36.8 | 22.57 | 8.16 | 14.23 | 1.74 | 0.95 | **95%** |
| Births attended by skilled health personnel | 99.3 | 94.29 | 3.73 | 5.02 | 1.35 | 0.91 | **91%** |
| Institutional birth at public facility | 83.3 | 72.62 | 8.5 | 10.69 | 1.26 | 0.89 | **89%** |
| Registered pregnancies | 100 | 98.28 | 1.52 | 1.72 | 1.13 | 0.87 | **87%** |
| Average out of pocket expenditure /delivery in public facility | 8.43 | 8.43 | 1.53 | 3.43 | 2.25 | 0.98 | **98%** |
| Women Who are literate | 87.6 | 74.85 | 6.64 | 12.76 | 1.92 | 0.97 | **97%** |

3.2 Maternal health services utilisation and its relation with the literacy of women: Simple linear regression was used to build the relationship of literate levels of the female population in the different districts of West Bengal. Only the significant variables output has been discussed below.

$H_0$ = There is no relation between women literacy and the maternal health care utilisation services in the districts of West Bengal

$H_1$ = There is significant relation between women literacy and the maternal health care utilisation services in the districts of West Bengal

Women literacy explained 37% of the variance, $R^2$ =0.371, $F(1,18)$ =10.63, $p < 0.005$. Women literacy significantly predicted births attended by skilled health personnel. $\beta$= 0.33, t =3.26, $p < 0.005$.

In case of folic acid consumption, 21% of the variance was explained by women literacy, $R^2$ =0.205, $F(1,18)$ =4.65, $p < 0.005$. Hence the dependent and independent variables show significant relationship. $\beta$= 0.36, t =2.15, $p < 0.005$.

Analysing the women literacy and mothers with 4 antenatal care visits the output was as follows, $R^2$ =0.241, $F(1,18)$ =5.72, $p < 0.005$. Hence the dependent and independent variables show significant relationship. $\beta$= 0.67, t = 2.39, $p < 0.005$.

Observing the Maternal post-natal care and women literacy the following findings were noticed. $R^2$ =0.193, $F(1,18)$ =4.32, $p < 0.005$. Hence the dependent and independent variables showed significant relationship. $\beta$= 0.751, t = 2.07, $p < 0.005$.

Hence in all the cases of four parameters, the null hypothesis is rejected and the alternative hypothesis was accepted. Therefore, it can be stated that there is significant relation between the public maternal health care service utilisation and education of women.

3.3 Delineation of formal region by single weighted index method: Formal regions are those homogenous regions with respect to physical or any other demographic attributes. In this study the formal region was carved out using the relation of maternal health services utilisation and level of women literacy in the districts of West Bengal. The mean and standard deviation was used to calculate the class range (Table 3).

**Table 3. Delineation Pattern of Women Literacy Levels and subsequent Maternal Health Care services Utilisation in West Bengal Districts:**

| Sl. No. | Single weightage Value | Class | Legend | Frequency | Districts |
|---|---|---|---|---|---|
| 1 | >than 0.32 | > Mean + SD | Very High | 2 | North 24 Parganas, South 24 Parganas |

| 2 | 0.30 to 0.32 | Mean to (Mean+SD) | High | 7 | Darjeeling, Jalpaiguri, Dakshin Dinajpur, Haora, Hooghly, Kolkata, Purva Bardhhaman |
| 3 | 0.28 to 0.30 | (Mean-SD) to Mean | Moderate | 6 | Koch Behar, Malda, Nadia, Paschim Bardhhaman, Paschim Medinipur, Purva Medinipur |
| 4 | < than 0.28 | < (Mean-SD) | Low | 5 | Uttar Dinajpur, Purulia, Bankura, Birbhum, Murshidabad |

3.a) Low Utilisation of Maternal Health services: The total of 20 districts were divided in 4 classes (Table 3). The districts which fall under this group were Uttar Dinajpur, Purulia, Bankura, Birbhum, Murshidabad. It was been noticed that these districts also had lower levels of educated women. For example, the average literacy rate of women was 75%. Purulia district had 61% of women literates which was found to be less than 14 % from the average literates of the total districts. Overall, in all the districts in this group the women literacy outcome was found only up to 70% (Appendix 1).

b) Moderate Utilisation of Maternal Health services: The districts which fall under this group were Koch Behar, Malda, Nadia, Paschim Bardhhaman, Paschim Medinipur, Purva Medinipur (Table 3). All the six districts had the literacy values very close to mean (75%). The values in this group range between 74% (Murshidabad) to 79% (Koch Behar) (Appendix 1).

c) High Utilisation of Maternal Health services: In this group, 7 districts were categorised as Darjeeling, Jalpaiguri, Dakshin Dinajpur, Haora, Hooghly, Kolkata, and Purva Bardhhaman (Table 3). The literacy levels of this group range between 73% (Purva Bardhhaman) to 87% (Kolkata) (Appendix 1).

d) Very- High Utilisation of Maternal Health services: Two southern districts (North and South 24 Parganas) excel in maternal health services utilisation (Table 3). The women literates consisted of 85%, which was observed to be almost 10% more than the average (75%) in the total districts of West Bengal (Appendix 1).

4. Discussion and Conclusion: In the given study, the important parameters for maternal health service utilisation have been observed. All the parameters indicate more than the average performance in the districts.

**Table 4: Statistics for women literates:**

| Women who are literate | |
| --- | --- |
| Mean | 74.85 |
| Standard Error | 1.52 |
| Median | 73.95 |
| Mode | 77.00 |
| Standard Deviation | 6.81 |
| Sample Variance | 46.39 |
| Kurtosis | -0.05 |
| Skewness | 0.10 |
| Range | 26.60 |
| Minimum | 61.00 |
| Maximum | 87.60 |

Association between these outcome variables and literacy level of women was made where, only the significant outcomes were discussed. Literacy was found to be vital indicator to explain

4305

maternal health services (Dey, et al., 2018). Although literacy explained only 19 % to 37% of the variation of the maternal health services, but they do highlight the impact of education on the degree of maternal utilization.

The region delineation depicts the state into four major classes where low maternal service use was found to have lower education levels of women a gap from 5% to 14% Various studies confirm to this link between literacy and low or non -use of public health services ( Letamo & Rakgoasi, 2003), The districts with moderate utilization have literacy levels very close to the average ranging between -1 % to 4% . In the high and very- high category the district performed 10% to 12% above the average performance.

Although the performance of the districts regarding the maternal health was found to be moderate but the role of literacy clearly explained the districts that are lagging in the low or non- use of health facility. According to the report by NFHS-5, 4% of the mothers in the state were delivered through traditional method. Lack of awareness, more dependence on traditional methods, are the drawbacks which prevent the possible mothers to participate in heath facility access (Babalola & Fatusi, 2009).
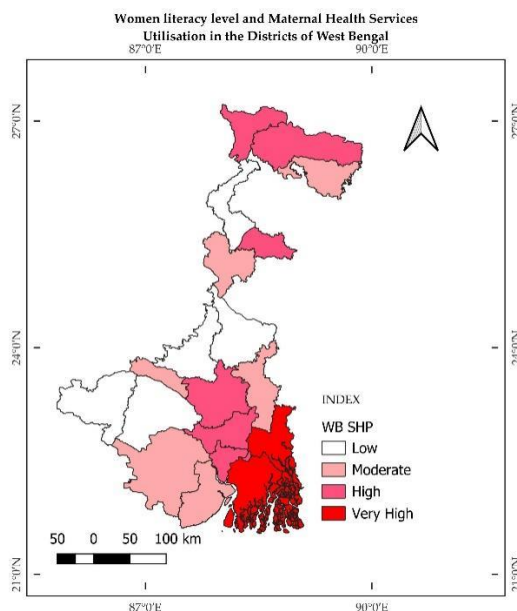


**Figure 2: Formal region delineation**

In addition, the areas where there is easy access to resources, more utilisation is found to be the norm e.g. districts like North and South 24 Parganas performed better which is very close to the state capital Kolkata. Moreover, low access to infrastructure leads to low utility and hence low performance as discussed in the previous literature (Majumder, Roy, Bose, & Chowdhury, 2022). Furthermore, literacy leverages the imbalance of income, by more participation in community workforce, makes the women more resilient to probable risks, self- confident and self- reliant to take major decisions.

Besides, the critical areas of intervention are education for women especially in the remote parts of the region as well as availability of the health facilities. The WHO emphasizes on the aspect of health equity promotes equal rights to health for all which underlies the core of human rights and justice. It also echoes the close association of SDG 3 of good health and wellbeing to SDG 5 of gender equality and empower all girls (WHO, 2022). Hence, a close monitoring of the various maternal health indicators along these lines of sustainable goals is the need of the hour.

**Appendix 1:**

| West Bengal Districts | Women who are literates |
|---|---|
| Bankura | 68.3 |
| Birbhum | 70.8 |
| Dakhin Dinajpur | 74.3 |
| Darjeeling | 77 |
| Haora | 80.5 |
| Hugli | 77.4 |
| Jalpaiguri | 73.6 |
| Koch Behar | 79.2 |
| Kolkata | 87.6 |
| Maldah | 72.3 |
| Murshidabad | 67.6 |
| Nadia | 76.2 |
| North 24 Parganas | 85.5 |
| Pachim Bardhhaman | 73.5 |
| Pachim Medinipur | 70.9 |
| Purba Bardhaman | 73.2 |
| Purba Medinipur | 77 |
| Purulia | 61 |
| South 24 Parganas | 85.6 |
| Uttar Dinajpur | 65.4 |

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4307

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