



MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

Capstone Project
at
IIHMR UNIVERSITY, Jaipur

By
Dr. Shubham Maheshwari

IIHMR/JHSPH MPH

2013-2015

MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

**Capstone Project
At
IIHMR UNIVERSITY, Jaipur**

**A study on Comparative Assessment of ANC and PNC services
of High and Low MMR Divisions of Rajasthan, 2011-12**

**By
Dr. Shubham Maheshwari**

**Under the guidance of
Maj. (Dr.) Vinod S.V**

Master of Public Health

Year 2013-15

MASTER OF PUBLIC HEALTH

A cooperative Program of

**JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH**

TO WHOMSOEVER MAY CONCERN

This is to certify that Dr. Shubham Maheshwari student of Master of Public Health Program offered by Institute of Health Management Research, Jaipur in cooperation with Johns Hopkins Bloomberg School of Public Health, Baltimore has undergone capstone training at IIHMR UNIVERSITY, JAIPUR on the topic A Study on Comparative Assessment of ANC and PNC services of High and Low MMR Divisions of Rajasthan, 2011-12 from 26 May 2014 to 7 July 2014.

The Candidate has successfully carried out the study designated to him during capstone training and his/her approach to the study has been sincere, scientific and analytical.

The Capstone is in fulfillment of the course requirements.

I wish him/her all success in all his/her future endeavors.



Dean, Academics and Student Affairs

IIHMR, Jaipur
Baltimore



Capstone Advisor/ Advisors

IIHMR, Jaipur / JHSPH,

CERTIFICATE BY SCHOLAR

This is to certify that the Capstone Project titled **A study on Comparative Assessment of ANC and PNC services of High and Low MMR Divisions of Rajasthan, 2011-12** and submitted by **Dr. Shubham Maheshwari** Enrollment No **9** under the supervision of **Maj. (Dr.) Vinod S.V.** for award of **Master of Public Health** carried out during the period from **26 MAY 2014 to 7 JULY 2014.**

Embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature



Abstract

India's rural health system has disadvantaged by a shortage of health staff, including doctors, ANM's and technicians. Year 2010 suggested a short-fall of 10% for doctors at primary health centers (PHCs) and 62% for specialists at (CHCs). There are many reasons of retention of health workers from rural to urban such as Higher incomes, better living condition and educational opportunities for their children and high life style ¹(1). Managing maternal health is a top priority of the health systems in any country. Situation is no different in India. This study reviews the status of maternal health in the state of Rajasthan (India). Maternal Mortality of the state is still quite high (228 per 100,000 live births). Although Government of Rajasthan is providing a variety of interventions under the existing programmes to improve maternal health situation, many challenges in terms of infrastructure, human resources, inequity in terms of access to health services exist to a large extent in the state. This study describes the status of poor maternal health in Rajasthan, which is the largest state of India and attempts to review the factors associated with it. The latest Maternal Mortality Ratio (MMR) for the state of Rajasthan is 228 per 100000 live births and India's MMR is 178 (Registrar General of India) ²(2). The districts of two divisions, viz; Ajmer Division (with highest MMR in the state) and Jaipur Division (with lowest MMR) were compared with regard to the delivery of key ANC, Natal and postpartum services; existing infrastructure and human resources to draw a correlation with observed MMR in these divisions using secondary data available from representative survey reports (AHS 2011-12) and the MIS of the state government. On comparison, the overall literacy rate is higher in the districts belonging to the division with low MMR. Similarly female literacy rate was also higher in most of the districts belonging to Jaipur

Division which has lower MMR when compared to Ajmer Division. The only exception in Ajmer division was Ajmer District itself, which had a female literacy rate of 70 percent.

Population density of districts of Jaipur division was considerably higher in comparison to that of districts from Ajmer Division.

Review of data on Maternal Health Services revealed that most of the service delivery indicators including proportion of women receiving Antenatal Care (ANC) in first trimester, proportion of women who received 3 or more ANC checks ups, proportion of women who underwent institutional delivery and Postnatal Care (PNC) checkups (>24 hrs and within 48 hrs) were better in districts of Jaipur division.

Comparison of fertility and family planning indicators for the two groups of districts indicates that total fertility rate (TFR) and median age at first live birth of women between 15-49 years of age were comparable across districts of both the divisions. With exception of Dausa district, all other districts of Jaipur Division seemed to have lesser proportion of women reporting birth order of 3 or above as compared to the districts of Ajmer division.

The review indicates that the districts belonging to low maternal mortality region had better overall literacy, better female literacy and had better coverage of maternal health services though they did not differ much from the districts in high MMR division in terms of fertility and family planning indicators.

Acknowledgement

This project would not have been possible without the support of Maj Vinod Kumar SV., who is also the advisor for this Capstone project. Dr. Vinod sincere efforts in explaining the subject and the related topics helped me to accomplish each step through the project. Thereby I also extend my sincere thanks to Dr. Suresh Joshi as my faculty advisor, for his active involvement right from the beginning of the project.

I am also extremely thankful to Dr. Prasad Bogam (MPH Candidate), Dr. Pradeep Singh Kachawa and Ashutosh Sharma for being supportive throughout the project and at last Dr. Nutan Jain for granting the IRB approval.

Contents

ABBREVIATION-.....	1
<u>INTRODUCTION-.....</u>	<u>2</u>
<u>SPECIFIC AIMS AND OBJECTIVES:.....</u>	<u>3</u>
<u>2. BACKGROUND.....</u>	<u>3</u>
2.1 RAJASTHAN-.....	3
<u>METHODOLOGY.....</u>	<u>4</u>
3.1 DATA SOURCES.....	4
3.2. METHODOLOGY.....	5
<u>LITERATURE REVIEW-.....</u>	<u>5</u>
<u>ANALYSIS AND RESULTS.....</u>	<u>11</u>
SERVICE DELIVERY INDICATORS IN RAJASTHAN-	11
STATE OF HUMAN RESOURCES FOR HEALTH (HRH) IN RAJASTHAN.....	12
<u>DISCUSSION.....</u>	<u>13</u>
APPENDIX -	16
REFERENCES-	20

Abbreviation-

AHS- Annual Health Survey
ANC- Antenatal Care
ANM- Auxiliary Nurse Midwife
CBR- Crude Birth Rate
CHW- Community Health Worker
DLHS- District Level Households and Facility Survey
EAG- Empowered Action Group
IEC- Information Education and Communication
IFA- Iron Folic Acid
IMR- Infant Mortality Rate
LHV- Lady Health Visitor
MOHFW- Ministry of Health and Family Welfare
NFHS- National Family Health Survey
NRHM- National Rural Health Mission
PNC- Postnatal Care
RCH- Reproductive and Child Health
RGI- Registrar General of India
SBA- Skilled Birth Attendant
SC/ST- Scheduled Caste/ Tribes
TFR- Total Fertility Rate
UNFPA- United Nations Population Fund

Introduction-

Maternal mortality in developing countries is adverse pregnancy outcome. Rajasthan, the largest state of India is fighting the challenges of food insecurity, draught, low literacy levels, and poverty. There is also limited access to skilled health professionals who can provide adequate antenatal care and suitable birthing conditions. Accordingly, this study was planned to review and compare the status of ANC and PNC services in districts of the division having highest and those of the other having the lowest maternal mortality. The study would attempt to relate the underlying relationship between human resources and socio demographic factors with the observed differences in coverage indicators of maternal health in the districts of these two divisions. The primary biological causes of maternal death in the state are toxemia, sepsis, anemia, and hemorrhage. Pregnant women are not seeking or do not have access to adequate antenatal care, and health facilities are overburdened. MOHFW in collaboration with RGI had launched AHS in the EAG states Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Uttarakhand, Uttar Pradesh, Orissa and Rajasthan. AHS provided the district level data on TFR, IMR, and MMR at the regional level. RCH indicators such as ANC, PNC, Institutional delivery, immunization and contraceptives are also available to show the reality. To increase its efforts, the Government of India (GOI) launched the National Rural Health Mission (NRHM) in September 2004. The NRHM strives for improving maternal health care and providing available, affordable and accessible services to mother. The scheme is Janani Shishu Suraksha Yojana (JSSY) or also known as (“Mother and Child Protection Scheme”); a conditional cash transfer program that gives mothers 1400 rupees in rural areas and 1000 rupees in urban areas for

registering with public hospitals and giving birth in either a public or private institution is an example for its effort. In country's initiatives like JSSY have the prospective to address barriers and increase deliveries at hospitals, however the program's impact depends on the current status of public health infrastructure and availability of human resources in each state. In summary, this kind of programs/schemes or initiatives tend to ignore the diverse needs of individual states. In order to achieve the decline in MMR, the Central and state governments should identify and adapt the interventions to meet the unique needs of each state, especially where higher MMR is still a challenge.

Specific Aims and Objectives:

- To review and compare the status of ANC and PNC services in group of districts with highest mortality with the lowest mortality in Rajasthan.
- To review the status of resources and service delivery with regard to ANC services.
- To review the status of resources and service delivery with regard to PNC services.
- To correlate the findings with the existing statistics on maternal mortality in these districts.

2. BACKGROUND

2.1 RAJASTHAN-

Rajasthan is the largest state of India with a total geographical area of 3, 42,239 square kilometers. The State is characterized by a non-nucleated, dispersed pattern of settlement, with diverse physiographic ranging from desert and semi-arid regions of Western Rajasthan to the greener belt east of the Aravalli Mountain Ranges.

Rajasthan is a state of diversity and it is located in the north-western part of India. It is covered in the northwest by Pakistan, in the northeast by states of Punjab, Haryana, and Uttar Pradesh, the states of Uttar Pradesh and Madhya Pradesh in the southeast, and the state of Gujarat is in southwest. The capital of Rajasthan is Jaipur. According to the 2001 census, Rajasthan had a population of 56.5 million, which increased to 68 million in 2011. The population density of the state is less than 200 people per sq kilometer. The population growth rate of Rajasthan is 21 percent, which is higher than the national average. The state has a literacy rate of 67 percent ³.

Maternal Mortality data of the states of India is available at the divisional level. Rajasthan has seven administrative divisions, with each division having four to six districts. For the purpose of this study, the districts belonging to divisions with the highest and lowest maternal mortality as per AHS updating bulletin 2011-12 were selected.

Methodology

3.1 DATA SOURCES- In 2010- 2011 NRHM, MOHFW launched the as the Annual Health Survey (AHS). AHS is one of the largest demographic surveys in the world which is basically a hybrid model of NFHS and DLHS. The government confined the survey in 284 districts with 9 EAG states⁴. Due to data availability issues, the data related to human resources was taken from DMHS (Directorate of Medical and Health Services, Jaipur, Rajasthan) 2011-12 and maternal health services (ANC and PNC) data was collected from PCTS (Pregnancy and Child Tracking System), HMIS (Health management information system) online portal system for service delivery indicators and utilization factors of

Government of Rajasthan. The HMIS /PCTS data only included observation of women who experienced pregnancy in year 2011-2012.

3.2. METHODOLOGY

Secondary Data Analysis: Data related to Maternal Morbidity and Mortality, Service Delivery Statistics, and Socio demographic indicators was collected from published AHS survey reports, government records (PCTS, DHS) and online data portals of government websites. Maternal Mortality data of the states of India is available at the divisional level. Rajasthan has seven administrative divisions, with each division having four to six districts. For the purpose of this study, the districts belonging to divisions with the highest and lowest maternal mortality as per AHS updating bulletin 2011-12 were selected.

The reports included the Annual Health Survey in Rajasthan (AHS 2011-12), and Census Report (2011). PCTS (Pregnancy and child Tracking System), which is part of HMIS (Health Management Information System) is an online portal with information on human resources, as well as service delivery indicators and utilization indicators. PCTS portal of Rajasthan was accessed to collect relevant data.

This study analyzes the secondary data to figure out the possible interpretation for high maternal mortality in association with Service delivery and socio demographic factors.

LITERATURE REVIEW- MMR in Rajasthan has always been higher than the national average. Lifetime risk of maternal deaths ranged from 1.9 percent to 2.2 percent, with maternal deaths contributing 29 percent of all deaths among women of reproductive ages. As per WHO report the primary causes of maternal death in south Asia are hemorrhages

(30.8 percent), sepsis (11.6 percent), anemia (12.8 percent) and other indirect causes 12.5 percent⁵.

Antenatal care is an opportunity which provides variety of preventive involvement during pregnancy, including TT injections, and educating women about nutrition, safe delivery, and postpartum care ⁶.According to DLHS 3, 56.6 percent of women received ANC services in Rajasthan where rural women are less likely to receive ANC service than the urban women. Percentage of received ANC services was higher (73 percent) in urban areas compared to rural (53 percent). 39 percent of women received ANC services by doctors and 19 percent from ANM's. ASHA's or health worker also played a major role in door step ANC services for which they contributed 11 percent of ANC services. But the proportion of services provided by ANM/LHV's was high in rural and low in urban. ⁷ Variables associated with the exposure including awareness of programs; IEC materials and husband's education were also considered for studying antenatal service utilization ⁸. Women in general are more likely to utilize antenatal services than delivery-care services because some antenatal services are provided by health workers at home and accessibility is not a problem, especially for rural women. (6).The finding in DLHS 3 showed 19 percent illiterate women received ANC services. Women with high level of educational status were more likely to receive ANC services from doctors. 27.7 percent of mothers received 3 or more ANC's and 55 percent of mothers had at least one TT injections while 53.5 percent of mothers consumed 100 IFA tablets (7). As per NFHS 3, Less than half women who received ANC had their weight taken, their blood pressure taken, their urine tested, and their blood tested. One-third did not even have their abdomen examined. An ultrasound test was performed during 17 percent of pregnancies which is lower than the national average

of 24 percent. Women with at least 10 years of education were seven times as likely to have an ultrasound test as women with no education. Almost all women with education of 10 or more years and women with highest wealth quintiles received antenatal care⁹.

As per DLHS3, 45 percent of women delivered at institutions while 53.7 percent delivered at home out of which 7.2 percent deliveries at home were conducted by skilled health personnel (7).

Another study showed that only one in five deliveries in the northern India is attended by a health workers or skilled birth attendants (6). Among the socioeconomic and demographic variables, mother's education, mother's media exposure and awareness programs or campaign related to maternal and child health services affects the utilization of the services. The study on community accessible the health care services showed that Mother's education (10) has the strongest effect of all the predictor variables included in the analysis, with mothers who have at least completed middle school being two to three times as likely to receive delivery assistance as illiterate mothers. The adjusted effects of the other socioeconomic variables are generally small and not statistically significant. Household living standards, woman's education, woman's exposure to mass media, have considerable influence on the use of these services. Woman's education emerges as the predictor variable with the strongest influence on knowledge and use of antenatal care, delivery care, and preventive child-health care (immunization status and vitamin A supplementation)¹⁰.

Early postnatal care helps mothers their health and can reduce maternal mortality. Only 38.2 percent mothers in Rajasthan received post natal care within two weeks of delivery (9). According to Iyengar et al, several women were discharged very early from the facilities after delivery often within two to three hours without any advice on initiation of

breastfeeding or about post natal care. The finding was supported by survey in two districts of Rajasthan showing 14 percent of 632 women where discharged within 6 hours of institutional vaginal delivery and 70 percent of women were discharged before 70 hours had elapsed. The JSY scheme which provides financial assistance for delivery covered 31.9 percent of mothers in Rajasthan (5).

Accessibility to the health facility is one of the critical factor for ANC and PNC services As per DLHS3 72.4 percent of villages with sub centers in Rajasthan are located within 3 kilometers while 66.2 percent of villages with PHCs are located within 10 kilometers (7).

According to a study on maternal health service utilization in tribal areas of Gujarat conducted by Patel et al, maternal deaths were dependent on service utilization such as ANC & PNC services. 75.6 percent of ANC services were delivered by government setup including Sub Centers, PHCs and CHCs while 24.4 percent was provided by private setup. In the same case study PNC services such as breastfeeding initiation was 78.3 percent and breastfeeding after 24 hour was 46.2 percent.¹¹

A multivariate analyses done in the state of Madhya Pradesh showed that at least one ANC was received 61.7 percent of the respondents whereas PNC within 2 weeks. The household socio-economic status and mother's education were the most important factors associated with the use of ANC. The District Level Household Survey 3 showed that in Kerala 99.8 percent. The Andhra Pradesh and Tamil Nadu also registered high ANC coverage comparable to that of Kerala. Caste was also strong correlate of Institutional Delivery as demonstrated by a study conducted in Andhra Pradesh which showed in the other states schedule caste and tribes using maternal health services¹².

According to WHO Mother-baby package is suggested for care included the utilization of both iron and folic acid tablets and TT injections is related to quality in maternal services. As per study on utilization of ANC services in Rajasthan for improved utilization of ANC service. The availability and accessibility of a health facility is critical. The distance from the health facilities such as sub center, primary health centre or block hospital to the village where the woman resides is crucial (8). In India, the regional diversity is also an important factor. There is a great social and cultural variation across the country and this also applies to the northern versus southern states of the country. Southern states mainly follow Dravidian culture and women enjoy freedom, and higher levels of literacy, education, and employment. Northern women are more subjected to the traditional moderation of the Mogul bequest and are less educated, and less likely to work outside the home. In south women are two and a half times are likely to receive iron/folic-acid tablets, four times as likely to be delivered in a medical facility, and three times as likely to receive delivery care from a health professional (6).

With regards to knowledge of ANC and PNC services contraceptive methods, the knowledge of spacing methods is lower than the knowledge of terminal methods of contraception. According to NFHS-3, 2005-06 the contraceptive prevalence rate for any method at the national level is 56 percent. According to the same survey, the contraceptive prevalence rate for any method was 47 percent. According to the third District Level Household Survey (2007-08), the percentage of women currently using any contraceptive method has shown an increase to 58.0 percent. According to the goal of Rajasthan Population Policy 1999, it has been projected that Rajasthan will achieve a Contraceptive Prevalence Rate of 68.0 percent by 2016. This is one of the most important aspects which

need to be looked into considering the high TFR of Rajasthan (3.3, SRS, 2009) and rapid population growth, which is pulling down the impact of developmental activities. Human resources and infrastructure is the mainstay of any health system which consists doctors, nurses, technicians and midwives. This includes CHW, SBA, nurses, midwives, doctors, obstetricians, other health workers with capacity building of midwives (PMNCH Report 2013)¹³. Ensuring quality of maternal and child health services through improved human resources like doctors, nurses and Lab Technicians and service delivery is one of the key interventions for reducing maternal and child mortality and morbidity. Due to the large regional disparities in shortages of health work force, it is important to assess the distribution of newly trained and recruited health workers by region (15). Robinson and Wharrad et al suggested that presence of adequate doctors were significantly related to maternal outcomes. However contradictory findings were observed by researchers while exploring linkages between human resources especially doctors and maternal mortality. Review by Karl Krupp cited Cochrane et al, Kim and hertz et al to not have found a significant association between doctor density and maternal mortality¹⁴. There is strong global evidence to show that increasing the human resource at every level to population's ratio has led to improvement in maternal mortality ratio. Due to the large regional disparities in shortages of health work force, it is important to assess the distribution of newly trained and recruited health workers by region¹⁵.

In Rajasthan only 29 percent had the recommended postnatal check-up within 48 hours of birth. More than 2/3rd of women received no postnatal care at all. Postnatal care is most common following births in a medical facility; however, more than 1/5th of births in

medical facilities were not followed by a postnatal check-up of the mother. Only 11 percent of home births were followed by a postnatal check-up (9).

ANALYSIS AND RESULTS

Service Delivery Indicators in Rajasthan-

Comparative assessment of Socio-demographic Indicators of High and Low MMR districts-

Table 1. Shows Socio-demographic indicators of High and Low MMR districts. CBR is comparable across the High MMR Districts (Ajmer Division) and the Low MMR districts (Jaipur Division). Overall Literacy rate is lower in districts of High MMR (varying from 61 – 69 percent) when compared with Low MMR districts (70-75 percent) It is notable that the literacy rate of Low MMR districts was higher than the State average (66.1 percent). Overall Population density (person per sq. km) was higher in Low MMR districts compared with High MMR districts. Densely populated districts seem to offer an advantage in terms of having a more effective placement of health facilities which are accessible when compared to the sparsely populated districts. Overall decadal growth rate was high in Low MMR districts compared with high MMR districts. The Scheduled caste and Scheduled Tribe population was, however; comparable in both groups of districts.

Comparison of Maternal Care Services Indicators of High and Low MMR districts-

Table 2. Shows the data of ANC and PNC indicators which revealed that, Women receiving first trimester ANC checks were higher in low MMR districts being highest in Jhunjhunu (74.3%) as compared with lowest in Nagaur (54%) district. Though it appeared that the proportion of women who had received 3 or more ANC was comparable in High and Low MMR districts this proportion was 73.1 percent in Jaipur, which was distinctly higher than Nagaur which registered the lowest value (38.9 percent). Institutional Deliveries were

lower in high MMR districts. Jaipur had the highest recorded institutional deliveries (91.8 percent) while it was lowest in Bhilwara (67.6 percent). The data of PNC checkups in High and Low MMR districts revealed that the proportion of children breastfed within 1 hr of birth was comparable both high and low MMR districts. Being highest in Nagaur (73.6 percent) and Dausa districts while Sikar district registered the lowest proportion (41.3 percent).

Fertility indicators of High and Low MMR districts -

The table 3 shows that fertility indicators of High and Low MMR districts of Rajasthan showed that TFR of districts from High MMR and Low MMR divisions did not differ much. Interestingly, all the districts of the two divisions' had a TFR lower than the state TFR (3.1). Median age at first live birth of women aged 15-49 years was also similar across these districts, being slightly higher in cities of Jaipur and Ajmer when compared with state average. Proportion of Live births taking place after an interval of 36 months was higher in most of the districts with High MMR. Proportion of women reporting birth of order 3 or above was 35.9% in state. High MMR districts registered a higher proportion than the state value. It was highest in Bhilwara (35.8 percent) and lowest in Jaipur (23.5percent) district.

State of Human Resources for Health (HRH) in Rajasthan- As per data (Table 4 & 5) obtained from DMHS 2011-12, it was observed that the High MMR districts had higher percentage of vacant posts of doctors as compared to districts with low MMR. Districts of Ajmer and Tonk with high MMR were seen to have highest percentage of posts vacant for doctors reported to be 33 percent and 4percent respectively among the compared districts. While

low MMR districts had comparatively lower percentage of vacant posts varying from 5 percent in Jaipur to maximum 15 percent in Jhunjhunu. The average percentage of vacant posts for doctors in high MMR districts was 28 percent whereas it was as low as 10 percent for low MMR districts. Difference in percentage of vacant posts for nurses was also observed between high MMR districts and low MMR districts; however the difference for nurses was not as high as for doctors.

DISCUSSION- Despite the focus on effective programmes and high impact interventions to reduce maternal mortality, Rajasthan is still facing the challenge to effectively deliver the services. This is highlighted by the evident differences in the coverage of maternal health services in the comparative assessment of districts of the state with high and low MMR.

There is an observable difference in the sociodemographic profiles of the districts. The comparative analysis reveals that low female literacy and difficult access to facilities in sparsely populated areas further compounds the challenge of delivering maternal health services effectively in the districts where MMR is high. According to a study in Uttar Pradesh, India on impact of female literacy on maternal mortality, the findings suggested that literacy is one of the common factors directly related to maternal mortality. Author suggested that literacy not only improved women self confidence but also made women more conscious, aware and enhanced their decision making capabilities. Literacy has a positive impact on health seeking behavior of women. Also female literacy has indirect effects such as socioeconomic, sociocultural and health conditions related to the status of women consequently affecting the maternal mortalities¹⁶. In another study of rural north India (EAG states) pregnant women with uneducated background were the most unlikely to

receive ANC. Women's education consistently showed well in all 3 states Uttar Pradesh, Bihar, Madhya Pradesh except Rajasthan where women's autonomy significantly varies with ANC's services.¹⁷ In India Southern states showed higher level of literacy with increase uptake of antenatal care (5). A study in Rajasthan by Monica Soni et al also supported the fact that low level of literacy prevents women from taking ANC services even if it is available.¹⁸

Antenatal period is a crucial time for reaching women with intervention and information that promote their health, well being and survival. The comparative assessment found difference between utilization of ANC services with a higher proportion of women receiving ANC in first trimester in districts with low MMR than districts with high MMR. Also the women in districts with low MMR received higher percentage of 3 or more ANC's as compared to high MMR district. The basic goal of antenatal care is early recognition and management of high risk patient and thus has potential to improve perinatal outcomes. A study in Nepal by Tuladhar and Dhakal cited number of studies in developing countries that have shown positive effects of ANC on perinatal outcomes including lower rates of pre term labor, low birth weight and also perinatal death¹⁹

Comparative assessment found a difference in percentages of institutional deliveries between high MMR districts and low MMR districts in Rajasthan. It was seen that most of the low MMR districts registered a higher rate of institutional deliveries. The recent initiatives such as JSY under umbrella of NRHM has been focusing on increasing institutional deliveries to address the maternal deaths due to complications and emergencies in intra partum and post partum period.

As per the table 3, median age at first live birth of women aged 15-49 years in Rajasthan is 21.8. However study Hanif et al showed that early maternal ages have been classified as high risk for child bearing. However there is no major difference seen in low and high MMR districts for median age at first live birth.²⁰ Pregnancy in early age have a high risk to mother and increase in institutional deliveries among women of this age group can play important role in reducing MMR and achieving MDG5.²¹

As per the results from comparative assessment between low MMR and high MMR districts, it was observed that low MMR districts had high density of doctors as compared to high MMR districts where the doctors are scarce. Recently Anand and Barninghausen cited as Karl krup et al after analysis of most largest and comprehensive WHO data from 198 countries found a strong negative correlation between concentration of physician and maternal mortality. Their findings also suggested doctors are best capable of addressing the largest proportion of conditions putting mothers at risk. No association was found between the density of nurses and improvement in maternal outcomes in any study reviewed.²²

The current assessment indicates that there is inequity in terms of the coverage of maternal health services. Further there is evidence that there is geographic and socio-demographic variation amongst the districts across the state. Appropriate and context specific solutions which and aim to reduce inequity among the High and Low MMR districts need to be explored²³. A community based study on rural Rajasthan on PNC services showed that in most women did not receive any postpartum care at the home level, increases the risk of late maternal death it is essential for every woman to take part in PNC services starting from first day to relevant time and these conditions would be managed on time²⁴.

APPENDIX - Table1. Comparison of Socio-demographic characteristics of High and Low MMR districts of Rajasthan (AHS 2011-2012)

Indicators	Rajasthan	Low MMR districts					High MMR districts			
		Jaipur	Alwar	Jhunjhunu	Sikar	Dausa	Ajmer	Bhilwar a	Nagaur	Tonk
Crude Birth Rate	24.4	22.9	22.6	23.2	23.5	22.1	23.6	22.2	23.4	23
Literacy Rate %	66.1	75.1	70.7	74.3	71.9	68.1	69.3	61.3	62.8	61.5
Currently Married illiterate women(aged 15-49yrs)%	51.4	33.2	43.5	29.4	32.9	48.5	29.3	62.1	51.6	56.6
Female Literacy Rate %	60.4	71.8	64.6	68.1	68.4	61.7	70.5	50	58	56.1
Population Density Person per square km	200	471	438	361	346	476	257	230	187	198
Decadal Growth Rate %(2001-11)	21.3	26.1	22.7	11.6	17	24	18.4	19.6	19.2	17.3
% of Schedule Caste and Tribes	31.3	23	25.5	18.7	18.4	48.1	20.97	26.52	21.43	32.7

Table2. Comparison of Maternal Health services indicators of High and Low MMR districts of Rajasthan

Indicators	Rajasthan	Low MMR districts				High MMR districts				
		Jaipur	Alwar	Jhunjhunu	Sikar	Dausa	Ajmer	Bhilwara	Nagaur	Tonk
Women who received First Trimester ANC	58	67.7	65.8	74.3	71.3	61.1	61.7	64.3	54	65.3
Women received 3 or more ANC	51.5	73.1	51	53.1	50.4	48.7	51.5	54.5	38.9	54.6
Institutional delivery (%)	74.4	91.8	80.3	82.7	84.1	83.9	74.4	67.6	80.8	79.3
Less than 24 hrs stay in inst. After delivery (%)	30	22.4	37.8	35.3	36.8	22.9	20.9	25	37.7	23.6
Within 48 hrs of delivery	76.6	88.6	82.4	85.6	84.7	83.7	73.3	74.7	76.4	73.9
Children Breastfed within 1 hr of birth (%)	50.1	60	45.8	60.6	41.3	73.9	53.4	42.4	73.6	52.4

Table3. Fertility Indicators of High and Low MMR districts of Rajasthan (AHS 2011-2012)-

Indicators	Rajasthan	Low MMR districts					High MMR districts			
		Jaipur	Alwar	Jhunjhunu	Sikar	Dausa	Ajmer	Bhilwara	Nagaur	Tonk
Total Fertility Rate	3.1	2.7	2.9	2.7	2.7	2.8	2.9	2.8	2.8	2.9
Median age at first live birth of women aged 15-49 years	21.8	22.3	21.8	21.7	21.7	21.1	22.6	21.5	22	21.2
Live birth taking place after an interval of 36 months	37.6	36.9	33.8	43.9	45.6	38	40.4	40.2	49.4	34
Women aged 15-19 years who were already mothers at the time of survey	38.6	49	50.8	36.4	33.8	41.8	32.6	29	25.2	41.8
Women reporting birth of order 3 or above	35.9	23.5	29.9	26.5	26.5	35.3	31.8	35.8	29.3	32.7
Total Unmet needs of family planning	12.6	16.7	8.3	3.1	5.4	12.4	16.3	17.2	12	24.6

TABLE 4- HRH of High MMR districts-

	Doctor		ANM		LT		% Vacant posts for Doctors	% Vacant posts for ANM	% Vacant posts for LT
DISTRICTS	Sanction Post	Vacant Post	Sanction Post	Vacant Post	Sanction Post	Vacant Post			
AJMER	209	69	1900	785	231	112	33	41	48
BHILWARA	246	59	1822	642	225	126	24	35	56
NAGAU	121	14	762	245	107	33	12	32	31
TONK	207	89	1353	336	171	83	43	25	49
Average % of vacant post							28	33	46

Table 5: HRH of Low MMR districts

	Doctor		ANM		LT		% Vacant posts for Doctors	% Vacant posts for ANM	% Vacant posts for LT
DISTRICTS	Sanction Post	Vacant Post	Sanction Post	Vacant Post	Sanction Post	Vacant Post			
JAIPUR	483	22	3923	895	491	172	5	23	35
ALWAR	285	30	1779	514	175	51	11	29	29
JHUNJHUNU	197	30	1465	198	192	110	15	14	57
SIKAR	226	16	1621	374	199	91	7	23	46
DAUSA	111	15	756	293	97	32	14	39	33
Average % of Vacant post							10	25	40

References-

- ¹ Saini NK, Sharma R, Roy R, Verma R. What impedes working in rural areas? A study of aspiring doctors in the National Capital Region, India. *Rural and Remote Health* 12: 1967. (Online) 2012. Available: <http://www.rrh.org.au>.
- ² Presentation given by registrar general of india 2012-2013. Available at: www.censusindia.gov.in/.../MMR_2010-12_Report_Press_19.12.2013ppt.
- ³ Office Web portal of Government of Rajasthan. Available at: <http://www.rajasthan.gov.in/StateProfile/Pages/State-Profile.aspx>.
- ⁴ AHS 2011-2012 Fact sheet-2011 census of India.
- ⁵ Iyengar SD, Iyengar K, Gupta V. Maternal health: a case study of Rajasthan. *J Health Popul Nutr* 2009 Apr; 27(2):271-292.
- ⁶ Govindasamy P, Ramesh B. Maternal education and the utilization of maternal and child health services in India. 1997.
- ⁷ District Level Households and Facility Survey 3, Ministry Of Health and Family Welfare. 20007-08.
- ⁸ Mondal S. Utilization of antenatal care services in Rajasthan: observations from the NFHS. *Journal of Family Welfare* 1997;43(3):28-33.
- ⁹ International Institute for Population Sciences (IIPS) and Macro International. 2008. National Family Health Survey (NFHS-3), India, 2005-06: Rajasthan. Mumbai: IIPS.
- ¹⁰ Das N, Mishra VK, Saha P. Does community access affect the use of health and family welfare services in rural India? 2001.
- ¹¹ Patel A, Kumar P, Godara N, Desai VK. Infant Deaths–Data Disparity and Use of Ante, Intra and Post-natal Services Utilization: An Experience from Tribal Areas of Gujarat. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine* 2013;38(3):152.
- ¹² Jat TR, Ng N, San Sebastian M. Factors affecting the use of maternal health services in Madhya Pradesh state of India: a multilevel analysis. *Int J Equity Health* 2011;10(1):59.
- ¹³ PMNCH Report 2013, Analysing Progress on Commitments to the Global Strategy for Women's and Children's Health. 2013:36-37.

-
- ¹⁴ Robinson JJ, Wharrad H. The relationship between attendance at birth and maternal mortality rates: an exploration of United Nations' data sets including the ratios of physicians and nurses to population, GNP per capita and female literacy. *J Adv Nurs* 2001;34(4):445-455.
- ¹⁵ Bangdiwala SI, Fonn S, Okoye O, Tollman S. Workforce resources for health in developing countries. *Public Health Reviews* 2010; 32:296-318.
- ¹⁶ RATES IM. INTERNATIONAL JOURNAL OF MANAGEMENT (IJM). *Journal Impact Factor* 2012;3(2):65-79.
- ¹⁷ Pallikadavath S, Foss M, Stones RW. Antenatal care: provision and inequality in rural north India. *Soc Sci Med* 2004; 59(6):1147-1158.
- ¹⁸ Monica Soni, Sudesh Agarwal, Prasoon soni, Haritasha mehta. Causes of Maternal Mortality:Our Scenario. ;10.5005/jp-journals-10006-1236.
- ¹⁹ Tuladhar H, Dhakal N. Impact of Antenatal Care on Maternal and Perinatal outcome: A Study at Nepal Medical College Teaching Hospital. *Nepal Journal of Obstetrics and Gynaecology* 2012;6(2):37-43.
- ²⁰ Hanif HM. Association between maternal age and pregnancy outcome: implications for the Pakistani society. *Journal of the Pakistan Medical Association* 2011;61(3):313.
- ²¹ Gupta SK, Pal DK, Tiwari R, Garg R, Shrivastava AK, Sarawagi R, et al. Impact of Janani Suraksha Yojana on institutional delivery rate and maternal morbidity and mortality: an observational study in India. *J Health Popul Nutr* 2012 Dec;30(4):464-471.
- ²² Krupp K, Madhivanan P. Leveraging human capital to reduce maternal mortality in India: enhanced public health system or public-private partnership? *Hum Resour Health* 2009 Feb 27;7:18-4491-7-18.
- ²³ Gupta SD, Khanna A, Gupta R, Sharma NK, Sharma ND. Maternal mortality ratio and predictors of maternal deaths in selected desert districts in Rajasthan: a community-based survey and case control study. *Womens Health Issues* 2010; 20(1):80-85.
- ²⁴ Iyengar K. Early postpartum maternal morbidity among rural women of Rajasthan, India: a community-based study. *J Health Popul Nutr* 2012;30(2):213.