ORIGINAL PAPER

Are our sub-centers prepared enough to tackle high-risk pregnancies? A cross-sectional survey from Southern Rajasthan, India

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ABSTRACT

Introduction and aim. Sub-centers (SC) are the first contact point with the community with auxiliary nurse midwife (ANM) as the instrument, delivering all the primary health care services. The SCs are under constant criticism for their inability to deliver quality services. This study assessed the preparation of facilities available at the SC to manage high-risk pregnancies (HRP) and to compare the same between rural and tribal blocks of the selected district.

Material and methods. This health facility-based cross-sectional observational study was done for 6 months among 276 rural and tribal SC of the Udaipur district by a two-stage random sampling method using an observational checklist to assess the infrastructure and logistics of SCs. Data were analyzed using SPSS 20.

Results. The study covered 264 (95.7%) non-24x7 SCs and 12 (4.3%) 24x7 SCs. Only one-third SCs, 93 (33.6%) were situated at the center of the village. Only 151 (54.7%) SCs had attached ANM quarters. All 24x7 SCs and 78.4% of non-24x7 SCs had adequate equipment and infrastructure.

Conclusion. Most of the subcentres' infrastructure and functional equipment was equipped to tackle HRP. Rural SC adhered more than tribal. Most HRPs were tracked and referred to higher centers. Unless we emphasize strengthening SCs, the dream of a healthy nation will remain obscure.

Keywords. auxiliary nurse-midwifery, high-risk pregnancy, primary health care, subcentres

Introduction

The sub-centers (SC) are the geographically closest first contact point with the community with auxiliary nurse midwife (ANM) as the instrument. The health planners in India have visualized the subcentres (SCs) as the proper structural units to provide health services to the rural population.[1] A well-functioning SC providing quality and timely outdoor health care services is important for successfully implementing all health care programs and maternal and child Health (MCH). As per population norms, there shall be one SC established for every 5000 population in plain areas and for every 3000 population in hilly/tribal/desert areas.[2] The ANM has to finish class 12 and have a training of 2 years in midwifery given by Indian Nursing Council to get the awarded with the title ANM and start serving the community.[3] ANM along with a multipurpose worker male (MPW-M) are present in one sub-centre. The ANM is given training under various compoments of primary health care along with maternal and child health care. Different training programs for Induction, skill building and leadership, new programs and if required, refresher training are given to ANM.[4]
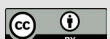
The number of functioning Sub Centres in Rajasthan was 14408 as of 31st March 2016. It accounted for 9.25% of the total number of functioning Sub Centres in India as on 31st March 2016.[5]

Mothers who are in the HRP group include those who have a history of chronic disease (diabetes, hypertension, heart disease, etc) or those with a history of previous pregnancy problems (abortion and stillbirth). Multiple pregnancies, gestational age under 18 years or over 35 years, pregnancy more than 4 times (the fifth and beyond), and the interval between pregnancies less than one year. All of these can be considered high-risk pregnancies.[6] Out of all pregnancies, 20-30% belong to the high-risk category.[7]

According to AHS 2012-2013, the Maternal Mortality Rate (MMR) of India was 174 and Rajasthan is 208.[8] Rajasthan is the state with the second highest number in maternal mortality in India. High MMR is one of the major areas of concern for the state. Timely identification and management of HRP can prevent most maternal deaths. This can only be possible if the complete range of the required services is accessible to the pregnant women at grass root level at the geographically closest health center, that is SC.

The SCs are under constant criticism for their inability to deliver quality services, The main reasons are the non-availability of health workers, inadequate infrastructure and facilities, and insufficient supply of drugs, and equipment.[9] In many a place, SCs do not have buildings for providing services to the beneficiaries.[10] Basic amenities like water and electricity were also found deficient at SCs, as suggested by previous studies.[5,10,11]

Identification of HRP is a prerequisite for ensuring maternal health. This will ensure safe delivery, and timely and adequate referral and will also play a major role in reducing premature deliveries and infant mortality. Besides, the perinatal outcome can be changed significantly by early detection followed by special intensive care for HRP. Worldwide it has been observed that delays at three levels are the reasons for the deaths of pregnant mothers. Most of the deaths of pregnant mothers can be averted by addressing these delays. The third delay occurs at the facility level, when a pregnant lady reaches at facility either trained manpower, equipment, or drugs are not available. Hence initiation of treatment is delayed to address all these delays and problems faced by a pregnant lady.[12]

Aim

This study was undertaken to assess the preparation of facilities, availability of functional equipment and logistics for the identification and tracking of HRP at the sub-centers and to compare the same among the rural and tribal subcentres. Also, to describe the different high-risk pregnancies registered in the selected blocks of the district.

Material and methods

Ethics approval

The study was approved by the institutional ethical committee, RNT Medical college, Udaipur, Rajasthan (RNT/Stat/IEC/2017/167). Permission to collect data was obtained from the district chief medical and health officer, Udaipur. We adhered to the principles of ethics thereafter throughout the study.

Study design and duration

This was a health facility-based observational cross-sectional study done for 6 months (July 2018-Dec 2018)

Study setting

This study was done among rural and tribal SC of the Udaipur district.

Udaipur district is the southernmost district of the state of Rajasthan, India, and a predominantly rural district with a population of 3,068,420 (Census 2011, India) and having 12 subdivisions and 629 subcentres catering to the population of these areas.

Sample size estimation and sampling technique

According to Manas PR et al., 56.2% of SC were operational and met the Indian Public Health Standards (IPHS) norms in their study.[13] So, the minimum sample size required for this study was 266 rounding off to 276 at 95% confidence intervals,80% power, and 6% absolute precision. The sample size was calculated using Statulator (an online sample size calculator).

We used a two-stage random sampling technique. There were a total of 12 Blocks in the Udaipur district out of which six were tribal, five were rural, and one urban.[14]

In stage one, 50% of the tribal (three blocks) and 50% of the rural (rounded to three blocks) blocks were selected randomly by the lottery method. The blocks thus selected were Gogunda, Jhadol (Phalasia), Sarada, Salumber, Bhinder, and Badgaon. In stage two, all the 305 SC among these selected Blocks[15] were line listed and 276 SC were randomly selected to arrive at the sample size.

Study tools and techniques

An observational checklist, each for infrastructure and logistics and skills of ANM like antenatal examination, measuring blood pressure, and laboratory testing for hemoglobin, urine albumin, and sugar were made and records at the subcentre were checked for common high-risk pregnancies (HRP) noted in each SC. SC has scored accordingly. SC with >60% scores was considered as 'SC with adequate functional equipment' for tackling HRP and further SC were categorized as 'good (8-10 functional equipment)', 'average (5-7 functional equipment)', and 'below average (<5 functional equipment)' based on the availability of functional equipment. For antenatal care (ANC), the equipments like sphygmo-

manometer, measuring tapes, weighing scale, haemo-globinometer, urine dip sticks for glucose & protein, thermometer, stethoscope, essential medicines including iron and folic acid, Inj. Tetanus toxoid, record register and for labor room, equipments like partograph, sphygmomanometer, stethoscope, fetoscope were assessed. The skills of ANM towards essential ANC was assessed based on checklist having skills like history taking, examination, lab investigation, treatment (Iron and Folate distribution, Inj. Tetatnus toxoid), counselling and referral of antenatal mothers. The skills were considered adequate if ANM scored ≥60% for all essential parts of skill assessed on checklist. Prior permission was taken from the district Chief Medical and Health officer for the visits and block meeting days were excluded after discussing with the respective block chief medical officer, SCs were visited and the ANMs were not given any prior information about the visit.

Data analysis
Data was coded and entered in a Microsoft excel sheet and analyzed on SPSS version 20 (SPSS Inc., Chicago, IL, USA). Results were expressed as tables and figures wherever necessary. Categorical variables like type of SC, basic facilities at SC, adequacy of availability of functional equipment at SC, and common HRP registered as frequency and proportions. The chi-square test of association was applied to compare characteristics across 24x7 and non-24x7 SC and rural-tribal SC and the difference was ascertained as significant when the p value was <0.05.

Results
General characteristics of SC
Most of the SCs, 264 (95.7%) in the study were of non-24x7 type. Only 12 (4.3%) SCs functioned 24x7. Tribal areas had more, 8 (5.7%) 24x7 SCs as compared to rural areas [4 (3%)].
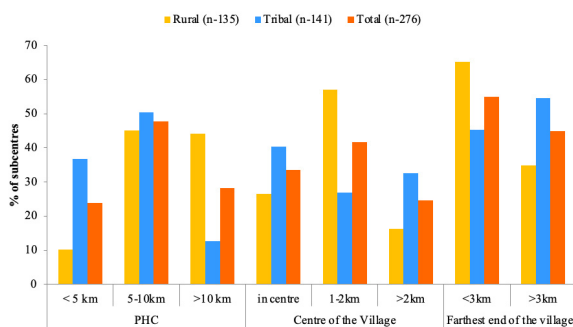

Fig 1. Location of the sub centres from different setups (n=276)

Only one-fourth, 66 (23.9%) SCs were situated within five km from the nearest PHC. 52(36.8%) being tribal and 14 (10.3%) being rural. Only one third, 93(33.6%)

were situated in the centre of the village, 57 (40.4%) in tribal and 36 (26.6%) rural SCs. The majority, 152 (55%) of SCs were within three km from the farthest end of the village, 88 (65.1%) were rural, and 64 (45.3%) were tribal SCs (Fig. 1).

Basic facilities at SC
All SCs had names and facilities displayed prominently and had color-coded waste bins. Most, (≥80%) SCs fulfilled other requirements of infrastructure. Only 151 (54.7%) had attached ANM quarters. Separate space for the laboratory was available at only 126 (45.7%) SCs. All 24x7 SCs in both rural and tribal areas fulfilled most of the infrastructure norms. None of the SCs had a registered telephone line. 24-hour electricity backup was available only at the 24x7 SCs (Table 1).

Table 1. Distribution of subcentres according to availability of basic facilities required (n=276)*

Basic facilities	Non 24x7 sub-centers (n=264)		24x7 sub-centers (n=12)		Total (%)
	Rural (n=131,%)	Tribal (n=133,%)	Rural (n=4,%)	Tribal (n=8,%)	
Name and facilities displayed prominently	131 (100)	133 (100)	4 (100)	8 (100)	276 (100)
Display of HRP related IEC Material	106 (80.9)	102 (76.7)	4 (100)	8 (100)	220 (79.7)
Dedicated Room for ANC	115 (87.8)	109 (82)	4 (100)	8 (100)	236 (85.5)
Privacy is ensured in examination room	124 (94.7)	117 (88)	4 (100)	8 (100)	253 (91.7)
Separate space for laboratory	52 (39.7)	64 (48.1)	4 (100)	6 (75)	126 (45.7)
Color coded Waste bins	131 (100)	133 (100)	4 (100)	8 (100)	276 (100)
Attached ANM Quarters	75 (57.3)	64 (48.1)	4 (100)	8 (100)	151 (54.7)
Registered telephone line	0 (0)	0 (0)	0 (0)	0 (0)	0(0)
Separate Labor Room with Attached Toilet	0 (0)	0 (0)	4 (100)	8 (100)	12 (4.3)
24 hours electricity back up	0 (0)	0 (0)	4 (100)	8 (100)	12 (4.3)

* ANC – Antenatal care; HRP – high risk pregnancy; IEC – information education communication

Logistics and functional equipment at SC for tackling HRP
All (100%) 24x7 SCs in both rural and tribal areas had adequate functional equipment related to ANC and labor Room. Most (≥85%) non-24x7 SCs had adequate functional equipment (Table 2).

Most, 207 (78.4%) of non-24x7 Sub Centres had good availability of functional equipment. Only 87 (65.4%) tribal as compared to 120 (91.6%) rural non-24x7 Sub Centres had good availability of functional equipment. The difference was statistically significant.

(p<0.001). All 12 (100%) 24x7 SC had good availability of functional equipment (Table 3).

Table 2. Number of subcentres having adequate functional equipment (n=276)*

S.N.	*Adequate functional equipment	Non 24x7 sub centres (n=264)		24x7 sub centres (n=12)		Total SCs (n=276)
		Rural (n=131)	Tribal (n=133)	Rural (n=4)	Tribal (n=8)	
1	ANC related functional equipment available	125 (95.4)	113 (85)	4 (100)	8 (100)	250 (90.6)
2	Labor room related functional equipment available	NA	NA	4 (100)	8 (100)	117 (42.4)

*Score >60% of total equipment; ANC – antenatal care

Table 3. Level of availability of functional equipment in Sub Centres (n=276)

Rating	Non 24x7 sub-centres			24x7 sub-centres		
	Rural (n=131)	Tribal (n=133)	Total (n=264)	Rural (n=4)	Tribal (n=8)	Total (n=12)
Good *	120 (91.6)	87 (65.4)	207 (78.4)	4 (100)	8 (100)	12 (100)
Average**	5 (3.8)	26 (19.5)	31 (11.7)	0 (0)	0 (0)	0 (0)
Below Average***	6 (4.6)	20 (15)	26 (9.8)	0 (0)	0 (0)	0 (0)
Total	131 (100)	133 (100)	264 (100)	4 (100)	8 (100)	12 (100)

*8-10, **5-7, ***< 5 Functional equipment

Chi-square (χ^2) =27.012, df= 2, p<0.001#

#p<0.05 is significant

Skills of ANM on different components of essential antenatal checkup
Almost all, 266 (96.3%) out of 276 ANM displayed adequate skills of prescribing treatment for ANC but only half had adequate skills of history taking (50.7%) and counselling (50%). Almost less than half were skilled adequately for examination (47.8%), referral (46%) and lab investigation (44.6%).

Table 4. Types of HRP cases identified and registered at the sub centre (in last 3 months)*

Type of HRP	Rural	Tribal	Total
Anaemia	393 (73.04)	500 (83.89)	893 (100)
APH	36 (6.6)	12 (2.01)	48 (100)
Malpresentation	42 (7.8)	34 (5.7)	76 (100)
Pre-eclampsia	67 (12.4)	50 (8.3)	117 (100)
Other	0 (0)	0 (0)	0 (0)
Total	538 (47.4)	596 (52.5)	1134 (100)

* HRP – high risk pregnancy

Common HRP registered at SC
In the last three months of the study, 1134 high risk antenatal pregnancies (HRAP) were identified and registered at the selected SCs. 596 (52.6%) of these at tribal and 538 (47.4%) at rural SCs. 990 (87.3%) of these were tracked and referred to higher health centers. None of the HRAP were delivered at the SC.

Anaemia [893, 78.7%] was the most commonly associated risk factor among the HRAP identified followed by pre-eclampsia [117 (10.3%)]. More HRAP were identified at tribal 596 (52.5%) as compared to rural SCs 538 (47.4%). Anaemia was associated as a risk factor in more tribal ANC cases 500 (83.89%) as compared to rural ANC cases 393 (73.04%) (Table 4).

Discussion
Out of the 276 SCs covered in the study only 12 (4.3%) were 24x7 SCs, all of which had the infrastructure and functional equipment required to tackle HRP. Only 87 (65.4%) tribal as compared to 120 (91.6%) rural non-24x7 Sub Centres had good availability of functional equipment (p<0.001). A study from Bihar has also reported a huge gap of more than 50% in the required v/s functional SCs.[16] The SCs were in poor condition that lacked even basic furniture. There was the unavailability of equipment for ANC, like BP instrument, haemoglobinometer, stethoscope, weighing scale with the ANMs, and irregular supply of iron and folic acid tablets and tetanus toxoid injections.

According to IPHS guidelines for Sub-Centers, the SC is to be located within the village for providing easy access to the people and safety of the ANM, as far as possible no person has to travel more than 3 km to reach the SC.[17] But in this study, it was observed that most of the ANC sessions are being conducted at Anganwadi centers (AWC) and not at SC despite the availability of infrastructures and ANC check-up facilities at the SCs. This was because AWCs are located at the center of the village and are easily approachable for the beneficiaries as compared to SCs. In our study, only one-third SCs 93 (33.6%) were situated at the center of the village while more than half, 152 (55%) were within three km from the farthest end of the village. 72.8% were situated within 10 km of the nearest PHC.

The majority 151 (54.7%) of SCs had attached ANM quarters but it was observed that only one-fourth, 66 (23.9%) subjects were living in the quarters attached to the sub-center. The SCs being located far from the village and lack of effective supervision and monitoring might be the reasons behind it. The unavailability of ANM at the SC adversely affects the quality of identification and management of HRP ANC. In contrast, Rural Health Statistics 2014-15 states that in Rajasthan only 47.2% of SCs had attached ANM quarters and 89.7% SCs were with ANM living in sub-center quarters.[18]

Out of the 1134 HRP ANCs identified in the last three months, 990 (87.3%) were tracked and referred to higher health centers. None of the HRP ANCs were delivered at the SC. In Indian families, the husband and mother–in–laws play an important and dominant role in making the decision that is crucial to women's health. Certain symptoms in pregnancy though are indications for referral and or hospitalization, are mostly not report-

ed to even ANM or Accredited Social Health Activisit as the decision-makers do not realize their gravity. The follow-up visits of the HRP antenatal care are also decided by them. In Rajasthan, about one-third of total deliveries (28.4%) are still conducted at home and in the Udaipur district this is 41.7%.[8] This marks the need of a robust system to tackle such HRPs in the district.

Recommendation
The inadequacy of equipment, drugs, and infrastructure should be assessed through facility surveys and the deficits to be filled up urgently and they should be able to meet the standard norms. Also, there should be a registered telephone line and a locally available and readily accessible vehicle at all sub-centers. Lastly, the identification of potential SCs for conducting deliveries and upgrading them according to the standards is necessary.

Study limitations
Only one district is covered and hence results cannot be generalized to the whole of the state. The sampling would have been better if not for simple random sampling. Also, the study has more of local value and the health care system of one country (India).

Conclusion
The infrastructure, logistics, and availability of functional equipment at most of the subcentres were sufficient enough to identify, track and tackle high-risk pregnancies. Rural SC scored better than tribal. All 24x7 SCs in both rural and tribal areas fulfilled most of the infrastructure norms. All 24x7 SCs and most Non 24x7 SCs in both rural and tribal areas had adequate functional equipment and good availability of functional equipment related to ANC and labor room. Anaemia was the most common HRP identified in the selected SCs. Although National Rural Health Mission (now known as National Health Mission) was launched with a holistic approach, many basic issues including the availability of suitable infrastructure support at peripheral health centers are still required to be addressed. Unless we emphasize strengthening SCs, the dream of a healthy nation will remain obscure as no population can improve the basic parameters of health, based only on tertiary health care. Hence, primary health care should be the priority of health reform.

Acknowledgments

Declarations

Author contributions
Conceptualization, B.P. and R.S.; Methodology, R.S.; Software, B.P. and R.R.; Validation, B.P. and R.R.; Formal Analysis, B.P. and R.R.; Writing – Original Draft Preparation, R.R.; Writing – Review & Editing, B.P, R.S and R.R.; Visualization, R.R.; Supervision, R.S.; Project Administration, R.S.

Conflicts of interest
None to declare

Data availability
Data is available on request to corresponding author

Ethics approval
Institutional Ethical Committee, RNT Medical College and MB General Hospital has been taken for the study (RNT/Stat/IEC/2017/167).

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