

Health Workforce related challenges for Emergency Obstetric Care at peripheral health facilities: Providers' Perspective

Sarika Dakhode^{1*}, Abhay Gaidhane², Pramita Muntode³, Sonali Choudhari⁴, Quazi Syed Zahiruddin⁵, Ajay Dawale⁶

¹Department of Community Medicine, Assistant Professor, Jawaharlal Nehru Medical Collage, DMIMS (DU), Wardha, Maharashtra, India

²Department of Community Medicine, Director Professor, School of Epidemiology & Public Health, Professor & Head, Jawaharlal Nehru Medical Collage, DMIMS (DU), Sawangi, Wardha, Maharashtra, India

³Department of Community Medicine, Assistant Professor, Jawaharlal Nehru Medical Collage, DMIMS (DU), Sawangi, Wardha, Maharashtra, India

⁴Department of Community Medicine, Associate Professor, Jawaharlal Nehru Medical Collage, DMIMS (DU), Sawangi, Wardha, Maharashtra, India

⁵Department of Community Medicine, Associate Dean (Global Health), Professor, Jawaharlal Nehru Medical Collage, DMIMS (DU), Wardha, Maharashtra, India

⁶MD in Community Medicine, District Health Officer, (District Health Office), Wardha, Maharashtra, India

*Corresponding author: Sarika Uttamrao Dakhode, Jawaharlal Nehru Medical Collage, India

Email: sarikac31@gmail.com

Received: 09/18/2017; Accepted: 12/17/2017

Abstract

Introduction: Ministry of Health and Family Welfare of India is constantly functioning to provide optimum health care to achieve Sustainable Development Goals (SDGs) by updating health infrastructure.

Objective: To study the readiness and challenges of peripheral health facilities regarding skilled health workforce to provide Emergency Obstetric Care (EmOC).

Materials and Methods: A descriptive phenomenological type of qualitative research study was done in all peripheral health facilities (seven) in Deoli block of Wardha District (Maharashtra, India) from February-July 2014. Key informant interviews of Emergency Obstetric Care (EmOC) service providers at different level (facility, block and district level) were conducted by using stratified purposive sampling, to obtain their perspective regarding facility preparedness for health workforce in terms of their availability and skilfulness (training) and barriers if any to provide EmOC. Written informed consent of participants to conduct and audio recording of interview session was obtained. Thematic analysis of data was done where in appropriate, significant and evocative remarks from service providers were used for analysis. Themes that were emerged out after discussion with all providers (participants) were presented. Comments were presented in text form with quotes to highlight the study findings whenever appropriate.

Results: Service providers shared key concern about medical officers who have recently completed graduation and recruited for one-year bonded service but mostly desire for further education and show minimal involvement in service. Trained contractual Medical Officers left over service after completion of bond. Usually single Medical Officer remains available in most of the Primary Health Center (PHCs). Stakeholders discussed the difficulties about retention of specialist in rural hospital. Insufficient trainers and training pattern are significant challenges; suggested to shift from theoretical to practical skill and trainees' selection for improving outcome.

Conclusion: Contractual staff is the current option to address health workforce issue. After building up capacity of such staff, their consistent availability is challenging for district stakeholders too. Training for EmOC was provided at the district level, but to develop practical skill among trainees more hands on practice was essential. This requires significant policy level interventions.

Keywords: Emergency Medical Services, Obstetrics, Health Personnel, Health Facilities

Please cite this article as: Dakhode S, Gaidhane A, Muntode P, Choudhari S, Syed Zahiruddin Q, Ajay Dawale A; Health Workforce related challenges for Emergency Obstetric Care at peripheral health facilities: Providers' Perspective. J Holist Nurs Midwifery. 2018;28(1):44-55

Introduction:

Ministry of Health and Family Welfare of India is constantly functioning to provide optimum health care to achieve Sustainable Development Goals (SDGs) by updating health infrastructure which includes building maintenance, availability of equipments and drugs along with trained staff at health care facility [1,2].

Recruitment of health staff in public health facilities in India is quite variable from state to state like bonded, contractual or permanent. Total health staff (doctors and nurses) generation in India is increased tremendously since last decade as Government and Private medical institutes has been increased [3]. Health staff has prime role in ensuring the implementation of health programs or policies and ultimately to achieve the health related goals and sustainable development. So, new post for health staff in public health facilities has been created and tried to fulfill but the trend in vacancies is not coping up with generation of health workforce [4]. India lags behind to achieve Millenium Development Goals (MDGs), especially MDG5 that is to reduce maternal mortality; though infrastructure has been maintained [5].

To reduce maternal mortality, 'high risk approach' in Reproductive and Child Health (RCH) program even though help somehow but most complications during pregnancy, delivery or postpartum are difficult to predict and therefore may not be prevented even by good antenatal care services [6]. However, emergency obstetric care (EmOC) has been accepted by WHO, UNICEF, The United Nations Population Fund (UNFPA) as a lifesaving and cost-effective strategy to avert maternal deaths [7, 8, 9, 10].

National Family Health Survey-4, reflects the utilization of government health services in Maharashtra State of India, that 45% beneficiaries received treatment for

pregnancy complication and 48% for delivery complication. By 2015, about 77.29% of deliveries were expected to be performed by skilled personnel, far short of the targeted universal coverage [5, 11]. As per District Level Health Survey -4, in Wardha district (Maharashtra), only 10.5% were those Primary Health Centers (PHCs) which conducted at least 10 deliveries during last one month on 24×7 hours basis as compared to 36.8% as per District Level Health Survey -3. Only 42% PHCs were having referral services for pregnancies/delivery on 24×7 hours basis and single out of eight Community Health Centers (CHCs) having Obstetrician/Gynaecologist whereas not a single CHC in the district was having anaesthetist [12].

Under National Health Mission (NHM) of India, equipments and drugs are made available or can be accessible from Rogi Kalyan Samittee fund in minimum required quantity which is funded by government in public health facilities. However, on studying 'Global Patterns in availability of Emergency Obstetric Care', infrastructure development was found to be insufficient to provide quality EmOC [13]. The first step in process of improving EmOC is to have a clear understanding of service delivery environment regarding health care providers. Hence this study has been conducted to study the readiness and challenges of peripheral public health facilities regarding skilled health workforce to provide EmOC services in a District of Maharashtra. Thus the study intended to identify gaps in existing emergency obstetric services and suggest tangible recommendation for augmenting the services and to ensure its optimum utilization.

Methods and Materials: This descriptive phenomenological type of qualitative research study was done from February to July 2014 in Deoli block (one out of eight block) of Wardha District of Maharashtra

state, India. Selected block has five Primary Health Centers (PHCs) and two Rural Hospitals (RHs). All these seven peripheral health facilities were included in the present study. Service providers have some key observations about service delivery environment and their view's plays a crucial role to know facility readiness and challenges in-terms of trained workforce for EmOC services at PHC and RH. Hence EmOC service providers were selected as study participants using stratified purposive sampling. Total twenty selected study participants were categorized into groups depending on health care delivery level. Data was collected by qualitative techniques i.e. Key Informant Interviews (KII). Details of service providers who were interviewed are shown in table 1. The purpose of interview was to obtain providers' perspective on health workforce related challenges and possible measures to address these gaps to provide the EmOC through peripheral health facilities.

Separate interview guide was prepared for different level providers which covers various key issues related to EmOC such as:

- Availability and competency of skilled health staff
- Content and quality of EmOC training of service providers
- Issues for facility preparedness for competent/efficient health staff
- Suggestions to improve readiness of facility for skilled staff.

The interviews were taken at respected facility office of health providers. Written informed consent of participants to conduct and audio recording of interview session was obtained. Interviews were transcribed into verbatim and then translated into English. Thematic analysis of data was done wherein appropriate, significant and evocative remarks from service providers were used for analysis. Themes that were emerged out after discussion with all providers (participants)

are presented in result section. Comments are presented in text form with quotes to highlight the study findings whenever appropriate. The study was approved by the Institutional Ethics Committee of DMIMS, Wardha [IEC Ref. No. DMIMS (DU)/IEC/2011-12/289] and permitted by District Health Officer (DHO) [No.DHO/PGST/Training/495/2012] and Civil Surgeon (CS) of District Hospital [Office of the Civil Surgeon/PGST/2136-40/13].

Conceptual framework of study methodology is presented in figure 1 as follows.

Results:

Health workforce for EmOC at Peripheral Health Facilities

The key informant interview of health providers at all level; district, block (Taluka) and facility level revealed that facilities were equipped with minimum required physical infrastructure to provide EmOC through PHCs and RHs. However, to operationalize these services the most important issue was understood about trained and efficient health workforce availability.

Facility level service providers shared key concern related to posting of medical officers who had recently completed graduation and recruited for one year bonded service. Such bonded MOs usually desire for further education (Post graduation) and show minimal involvement in PHC service. One of the MO narrated

“Mostly single MO is posted in any PHC and second MO if available is of 11 month bonded or contractual posting...interested in PG and prepare for entrance...leaves any time...then again whole workload comes towards single man (MO)...I think....second MO must be available consistently.”

In one of the PHCs, second MO was appointed but was carrying additional charge of District Tuberculosis Officer, so

Table 1: Study participants and sample size for Key Informant Interviews

Facility level	Study Participants	No. of sample
	Civil Surgeon (CS)	1
District level	District health officer (DHO)	1
	Additional District health officer (ADHO)	1
Sub-district level	Taluka health officer (THO)	1
	Medical Superintendent (MS)	2
Facility level	Specialist	1-Obstetrician & 1-Anesthesiologist
	Medical officer (MO) In-charge of PHC	5(1- each from selected facility)
	Staff nurse/ANM	7(1- each from selected facility)
Total number of Participants		20

he could not remain available at the headquarter PHC. Such kind of posting was not going to help in PHC activities or EmOC.

On discussion with Taluka Health Officer (THO) and Additional District Health Officer (ADHO), it appeared that usually single MO remained available in most of the PHCs in the district and to provide 24 hours EmOC services there was need of two MOs in each PHC, so that workload could be distributed. They further added about requirement of more staff especially sanitary workers and ANMs at PHC to maintain cleanliness of facility and to deal with obstetric emergency 24 hours respectively.

Obstetrician & Gynaecologist was visiting once a month at studied PHC under Public Private Partnership Program of NHM, that too for OPD services and not for EmOC. Hence MOs demanded Obstetrician & Gynaecologist at least on-call basis which might be helpful if complications arose.

Civil surgeon discussed the problem regarding availability of Obstetrician at RH that -

“Obstetricians are hardly willing to do government service and that in rural hospital!...very rare!... in fact our civil hospital usually has shortage of hands in obstetrics.....We require at least four gynaecologist, but at present we have only two, they are really overburdened.... you

know, specialists are uncommonly reside in rural area and it is really very difficult to make them available at rural hospital....

After interviewing with ADHO, THO and MOs, it seemed to know that medical officer had to perform multiple tasks. In case, if second MO would not be available for any reasons; the single person (MO) had to manage the entire work load. THO said:

“Medical officer has a lot of work....a long list...most of the time single MO is available at PHC.....if second MO posted and sent for training or bond completed or resigned....then it becomes very hectic to manage all this for single MO...All the work comes on my shoulder”

Almost all of the MOs and THO explained the difficulties about the residential facility including quarters and social lifestyle. One MO expressed that:

“...good residential and other primary facilities such as standard education, electricity, water supply, marketplace, entertainment should be available...but at PHC....residential quarters were also improperly constructed and not well maintained.... which is the very primary need!”

The DHO during KII shared the model of one Medical College regarding posting of the Obstetric-Gynaecology resident in the remote area of Melghat adjoining the Amravati District of Maharashtra state. As a result of this initiative, emergency care,

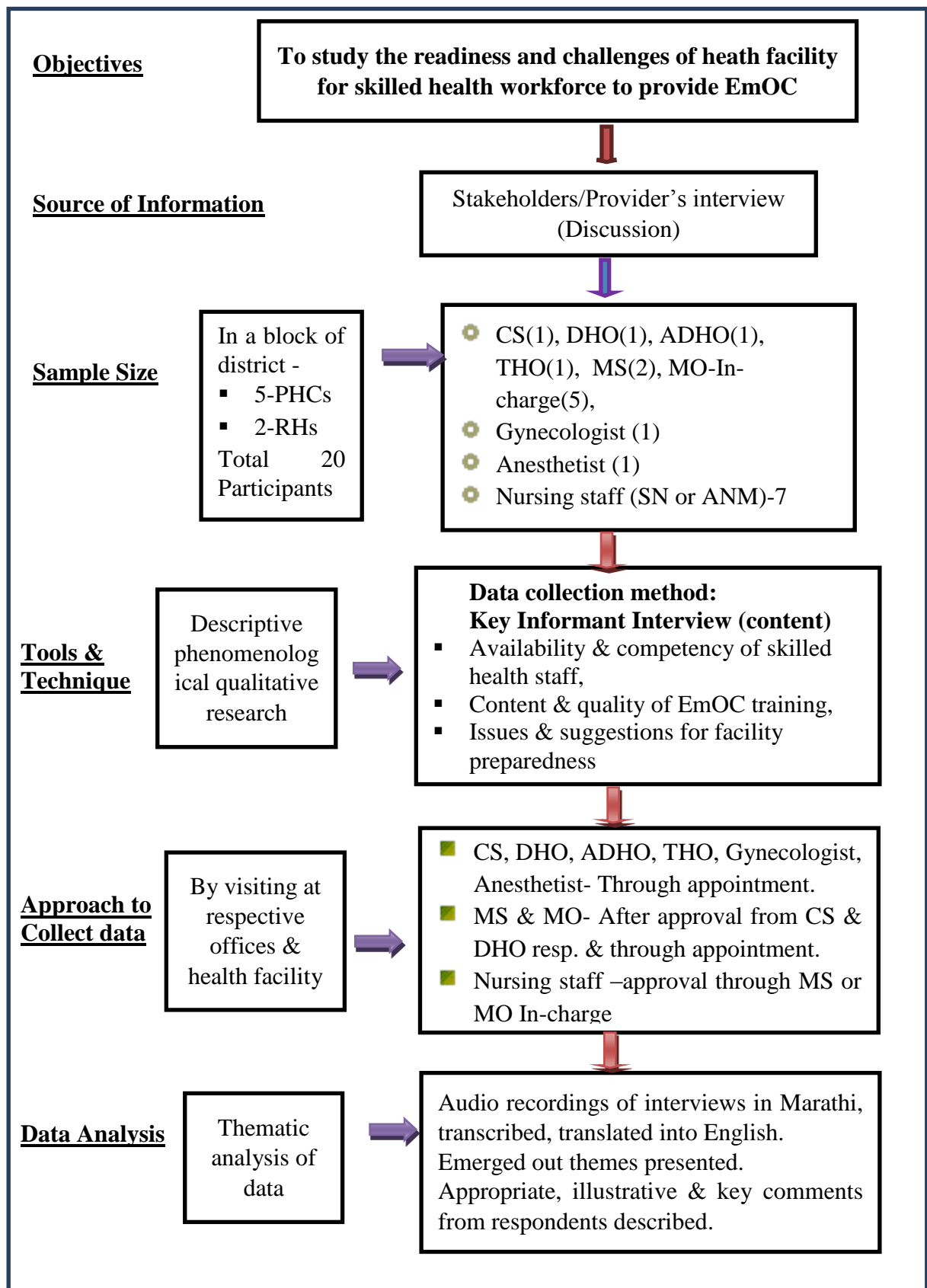


Figure1: Conceptual framework of the study methodology

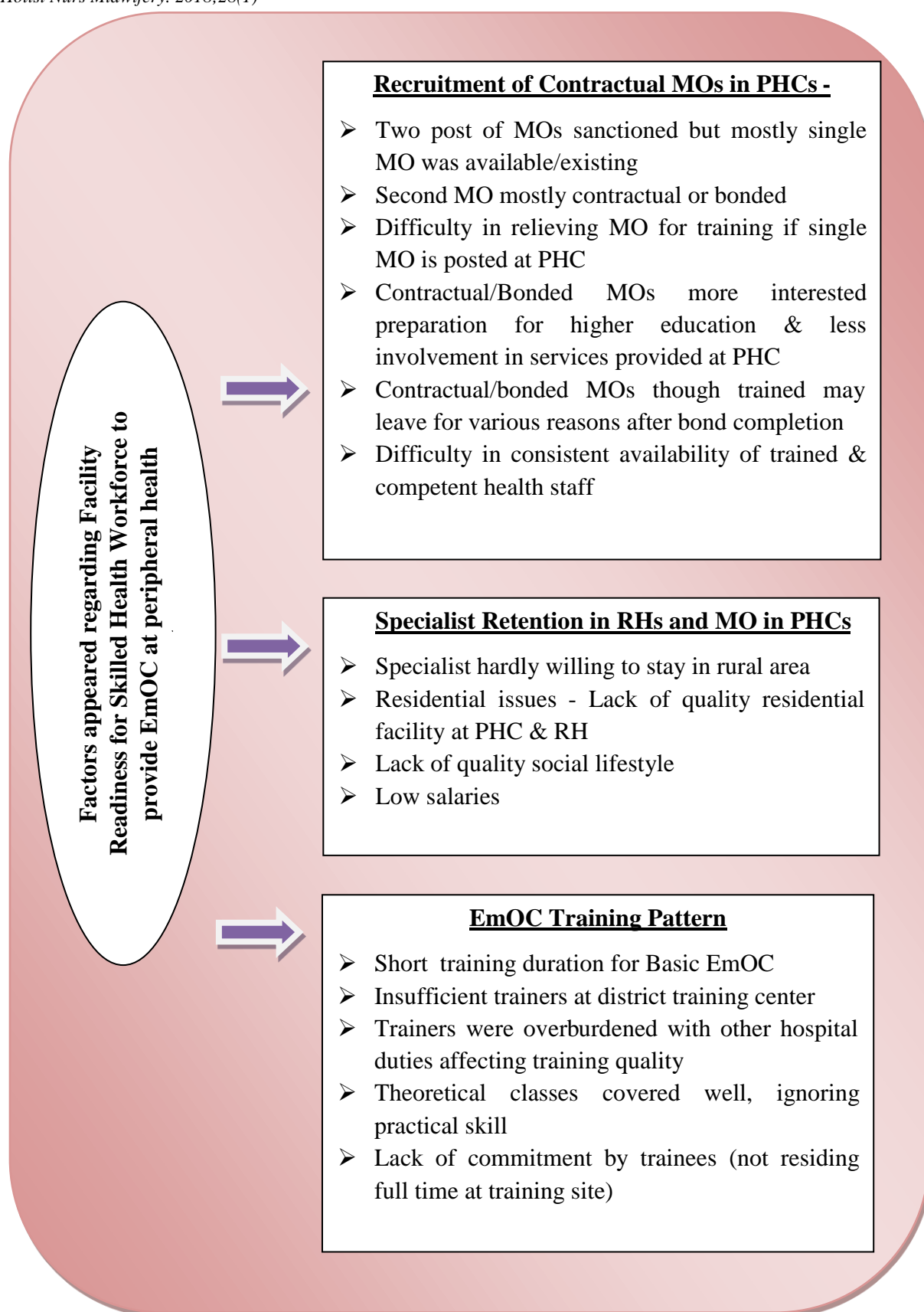


Figure 2: Factors appeared regarding Facility Readiness for Skilled Health Workforce to provide EmOC at peripheral health centers

caesarean section and hysterectomy services were made available for the remote and tribal community.

Training of health care staff in EmOC

Stakeholders were asked about content and quality of training to explore benefits, lacking if any and improvement needed in training.

Basic EmOC training (residential) of 15 days was provided by trained gynaecologist at District Hospital to medical officers. Trained MOs experienced satisfactory coverage of theory part in day time sessions. However, clinical skill required to handle obstetric emergency can be developed at clinical sites only. MOs usually neglect hands on training as most of them don't stay at training institute during evening and night hours after completing the classroom teaching. Furthermore, MOs also pointed out the trainers (Obstetrician & Gynaecologist) busy schedule of clinical work at district hospital which indirectly affecting training quality and hence requirement of more staff (trainers or specialist). He narrated that:

"....Two gynaecologists were posted in district hospital and they were taking our training classes but along with this, their hospital workload was too much....they tried to take out time for us....but I think training was not according to standard.....definitely there is need of more gynaecologists if it (hospital) is attached with training institute."

Most of the MOs expressed the demand of clinically competent training for some of the Basic EmOC signal functions like manual removal of placenta, removal of retained products of conception, management of post-partum haemorrhage and pregnancy induced hypertension. MOs perceived that training duration was insufficient to learn clinical skill and stated that:

"....15 days duration was insufficient, at least one month should be there..... instead of theoretical, clinical activities should be taken more....as practical is easier to understand. In small period of training all types of patients (complicated cases) does not cover...which may be covered in one month."

District stakeholders (CS, DHO and ADHO) also opined a need of re-sensitisation of MOs periodically, as one time training may be insufficient to manage obstetric complication at peripheral health set-up. DHO also agreed about the short duration of training and perceived need of separate training of medical termination of pregnancy or manual vacuum aspiration to perform some EmOC signal functions/procedures at peripheral health centers.

All the untrained nursing staff expressed their desire for EmOC training. Some ANMs told that often during night hours they had to handle obstetric cases alone and training may increase their knowledge, self-confidence to handle such complications. ANM, who underwent training, also suggested for more practical exposure, especially on episiotomy.

To make available EmOC trained MO at public health facility in rural area was again found challenging ascends during discussion with higher stakeholders. While explaining the exact situation about this ADHO voiced:

"There are eight permanent MBBS (Bachelor of Medicine and Bachelor of Surgery is graduate degree awarded after the study of five and a half years duration, including 1-year internship in India). Medical Officers in total PHCs of the district, and.....in this block four are MBBS, but they are contractual or bonded.....We train them (MBBS, MO) in EmOC and if they left the job...it (training) goes waste....again another fresh doctors are appointed,...again we need to train

them!... but still! we provide training them...others are BAMS (Bachelor of Ayurveda Medicine and Surgery is graduate degree awarded after the study of five and a half years duration, including 1-year internship in India)...yes we have just started to train these BAMS doctors to improve and stabilize EmOC services; because mostly they remain regular in service.”

DHO told about various challenges for organizing training for MOs, as many PHC has only one MO, it is difficult to relieve them for training. District Health Officer again added:

“Firstly, MBBS doctors are less interested to work in rural area and...if joined somehow they leave within a short period for different reasons such as....getting job in urban, started self-clinic or higher education....results in shortage of doctors... but what can do?...still we provide training to them...”

One of the senior MO who belonged to Indian system of medicine, (BAMS-Bachelor of Ayurveda Medicine and Surgery) was due for retirement was still untrained in Basic EmOC. He expressed that:

“...I am interested in training, but I am disappointed that yet my name was not suggested from DHO office for the training...may be because...I am BAMS.”

BAMS medical officers told that some of the PHCs have second medical officer of BAMS qualification; however they should be trained in EmOC. Overall total eight medical officers were posted in five PHCs of selected block, out of them only three were trained to provide Basic EmOC. Two trained MOs were BAMS and working regularly since many years; third one was contractual or bonded to government for 11 months (Figure 2).

Suggestions from Service Providers for EmOC

While discussing, participants suggested some possible solutions to improve EmOC service in rural setup such as:

- Creating conducive work atmosphere in rural area such as providing good family residential quarters with electricity backup facility, quality education facility, communication facility etc.
- Linking with medical colleges for rural residential posting of resident doctors from obstetric and pediatrics department.
- Additional incentives and increments for those staff staying round the clock at headquarter.
- Compulsory PG seats for those who work in rural area for three years

Discussion

Availability of EmOC services depends on many factors, such as availability of emergency drugs and maintained equipment, referral facility and geographic accessibility. However, all these amenities can be utilized merely in presence of motivated and trained service providers at the facility level; support from district and sub-district level managers as well. The present study focussed on health workforce circumstances to provide EmOC services at peripheral health facilities.

Recruitment of Contractual MOs in PHCs

To achieve the key results on skilled attendance at birth, government of India has taken certain policy decisions which empower Medical Officers and nursing staff to carry out certain emergency interventions after proper training. This study identified availability of trained and competent health workforce as a biggest challenge for providing EmOC through PHC and RH. Studied facilities have second Medical Officer, but they were contractual or bonded and interested in post graduation and showed less motivation or interest in services to be provided through PHCs. When one of Medical Officers was sent for training or any one of the MOs left the job for various

reasons (higher education, approaching for urban residency, completion of bond or contract) single MO, due to excess workload and multitasking; could not provide 24 hours services consistently. Another issue, if only one MO is working at PHC, his/her chance to post for training is remote because to relieve one MO for training, alternative arrangement has to be done, which is again challenging for higher authority.

Specialist in Rural health center

India started to improve access to comprehensive EmOC in rural areas in 1992 under the Child Survival and Safe Motherhood program [14, 15]. However the results were not very encouraging, primarily due to shortage of public sector obstetricians and anaesthesiologists in rural areas. There are several barriers to recruit obstetricians to rural public health facilities including low salaries, prohibited private practice, lack of facilities and threat of transfer [16].

In present study, higher stakeholders unfolded the residential issue of specialist in rural area and unwillingness of specialist for working in government sector leading to scarcity of gynaecologist in district hospital. Such type of health workforce shortage at the district hospital leads to overburdening of existing doctors with the hospital work. This may results in finding them difficult to focus on training program as a trainer at the district training centers. Hence requisite quality training which consists of practical and hands on teachings might be suffered.

Unequal distribution of all qualified health workers has been observed and 77.4% were located in urban areas. This urban–rural diversity was higher for allopathic doctors (density 11.4 times higher in urban) compared to nurses and midwives (5.5 times higher) [4]. The Ministry of Health and Family Welfare, India reported continuous shortfall of OBGY specialist by 65.9% in 2011, 65.1% in 2012 and

65.4% in 2015[17, 18] Even in a progressive state like Maharashtra, currently out of required 360 posts of obstetricians and gynaecologists at CHCs, 40% are still vacant and anaesthesiologists were even more scant, situation is nearly same as in 2011 when 50% were vacant [18,19]. In studied facilities, Obstetrician visited once a month under Public Private Partnership Program of NHM to diagnose high risk pregnancy. Though such type visits are helpful to prevent some amount of predictable complications, but very rarely or equal to none is beneficial to manage unpredictable 15% emergency complicated cases in rural areas. These current interventions fall short of addressing health workforce issues and Medical Officers were also unsatisfied as it is helpless for EmOC and they desired for the on call gynaecologist.

On assessment of global pattern in availability of EmOC services observed that comprehensive EmOC are usually available and basic EmOC are consistently unavailable to meet recommended minimum number for population size, in many countries including India [13]. Some studies conducted in Maharashtra and Gujarat also observed shortage of skilled human resources, lack of the managerial capacity for providing EmOC services [20, 21].

EmOC Training Pattern

According to higher stakeholders, most of the Medical Officers feel incompetent to perform some signal functions of basic EmOC at PHC even after training, therefore the curriculum, content and delivery of training needs modification. There is need of dedicated cadre of obstetrician or trainers at the training center, so that full time training/curriculum can be focussed and MOs too feel responsible for receiving training. There was also the shortage of obstetricians at the civil hospital. Training is provided to all categories of Medical Officers; regular, bonded or contractual by the government

of Maharashtra. Bonded or contractual MO after training; may leave the job anytime for various reasons such as higher education, job opportunities in city places or self-practice. Though, district or regional health officers try to make available trained MOs at the peripheral health centers, but it was very challenging to retain them consistently in rural area. There is ample of opportunity to train Medical Officers by appropriate selection that is promoting chance of training to BAMS officers as they used to continue the service in rural area for longer. Since few years BAMS Medical Officer also started to train in BEmOC but no other training such as CEmOC or medical termination of pregnancy or manual vacuum aspiration is provided.

Nursing staff is the first level contact and main provider of antenatal, delivery and postnatal care for the community at village level. They simultaneously have to manage unpredictable emergency. Therefore, it is important to train them in managing obstetric complications to achieve desired competencies to deal with EmOC.

Possible solutions for Shortage of Health Workforce

A severe and expanding shortage of health staff worldwide has created crises in many developing countries, including India [22, 23, 24].

There is chronic shortage of specialist at CHCs/RH, to address this, the NHM has adopted various strategies like Chiranjeevi Yojana in Gujarat [16], selective First Referral Unit development in Tamilnadu and contracting private doctors through public private partnership for services at CHCs/RH [25]. Health workforce issue was very challenging for district level stakeholders and this may require significant resolutions such as improving the work atmosphere in rural area, linking with medical colleges for clinical support, additional incentives and increments, opportunity for higher qualification, etc.

The current arrangement of contractual staff to address health workforce issue has many limitations. District level stakeholders were facing problems of availability of specialist and medical officer recruitment at peripheral health center for providing EmOC in rural area. To deal with these issues there was urging of capacity building of peripheral health staff and hence MOs were trained to provide EmOC. But most of them are contractual or 11 month bonded and interested in further study they hardly continue the rural service. Only to train is insufficient, it is also important to have a regular and experienced staff at the facility and so there is need of structural and policy level intervention in rural area. Competency-based clinical training, re-sensitization and continuing education are crucial to enable the health system to provide good quality care.

The limitations of this study were:

- Since the present study aimed at exploring the challenges to provide EmOC services in the catchment area of Deoli block; finding may not be representative of the entire country. However, the overall situation in the entire Wardha District was almost similar. Therefore these findings may apply to some extent to other facilities of the district as well.
- Beneficiaries might seek care from private providers; however private sector was not considered in the present study.

Acknowledgements

We would like to thank the Civil Surgeon, District Health Officer and Additional District Health Officer of Wardha District for permission to conduct the study in Deoli block and share the valuable information and suggestions with us to explore the result.

Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE

(<http://www.icmje.org/recommendations/>):

-Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;

-Drafting the article or revising it critically for important intellectual content

Reference

1. Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India. Indian Public Health Standards (IPHS) Guidelines for Primary Health Centres. New Delhi: Ministry of Health & Family Welfare Of India; 2012. Available From: <http://www.nhm.gov.in/images/pdf/guidelines/iphs/iphs-revised-guidlines-2012/primay-health-centres.pdf>
2. National Institution for Transforming of India. Voluntary National Review Report on Implementation of Sustainable Development Goals, India: Sustainable Development Goals (SDGs), Targets, CSS, Interventions, Nodal and other Ministries. New Delhi: NITI; 2107. Available from: http://niti.gov.in/writereaddata/files/Mapping-SDGs%20V19-Ministries%20Feedback%20060416_0.pdf
3. Hazarika Indrajit. Health workforce in India: assessment of availability, production and distribution. WHO South-East Asia Journal of Public Health. 2013 April–June; 2(2): 106-112.
4. Rao Krishna D, Shahrawat Renu, Bhatnagar Aarushi. Composition and distribution of the health workforce in India: estimates based on data from the National Sample Survey. WHO South-East Asia J Public Health. 2016 Sep; 5(2): 133–40.
5. Ministry of Statistics and Programme Implementation, Social Statistics Division, Government of India. Millennium Development Goals: India Country report 2014. New Delhi: Government of India; 2014. Available from: http://mospi.nic.in/Mospi_New/upload/mdg_2014_28jan14.pdf
6. Costello A, Azad K, Barnett S. An alternative strategy to reduce maternal mortality. Lancet. 2006 Oct 28;368(9546):1477-9.
7. Maine D, Rosenfield A. The safe motherhood initiative: why has it stalled? American Journal of Public Health. 1999; 89: 480-82.
8. World Health Organization. Mother-baby package: a roadmap for implementation in countries. Geneva: WHO, Division of Family Health; 1994.
9. Maine D. Safe motherhood programs: options and issues. New York: Center for Population and Family Health, Columbia University; 1993. Available from: <https://www.mailman.columbia.edu/sites/default/files/pdf/designevalmm-en.pdf>
10. WHO, UNFPA, UNICEF. Guidelines for monitoring the availability and use of obstetric services. New York: UNICEF; 1997.
11. United Nations Development Programme. India - Millennium development Goals - Overview - Improve Maternal Health. Available from: <http://www.in.undp.org/content/india/en/home/mdgoverview/overview/mdg5/>.
12. International Institute for Population Sciences (IIPS), District Level Household and Facility Survey (DLHS-4), RCH, District Fact Sheet 2012–13: India: Mumbai: IIPS; 2012.
13. Paxton A, Bailey P, Lobis S, Fry D. Global Patterns In Availability Of Emergency Obstetric Care. Int J Gynaecol Obstet. 2006 Jun;93(3):300-7. Epub 2006 Mar 6.
14. Mavalankar DV. Can PHC system in India deliver Emergency Obstetric Care?: Social Change. 1996; 6(Nos.3-4): 14-29.
15. Directorate of Health Services, Public Health Department, Government of Maharashtra. Training activities under RCH II (Revised) 2011, Reproductive and Child Health Phase – II. India: C-DAC;2011.
16. Mavalankar D, Singh A, Patel SR, Desai A, Singh PV. Saving mothers and newborns through an innovative partnership with private sector obstetricians: Chiranjeevi scheme of Gujarat, India. Int J Gynaecol Obstet. 2009 Dec;107(3):271-6. doi: 10.1016/j.ijgo.2009.09.008. Epub 2009 Oct 20.
17. Ministry of Health and Family Welfare, Government of India. Rural Health Statistics Bulletin. New Delhi: Ministry of Health and Family Welfare, Government of India; 2012.
18. Ministry of Health and Family Welfare, Government of India, Statistic Division. Rural Health Statistics Bulletin. New Delhi: Ministry of Health and Family Welfare, Government of India; 2015.
19. Ministry of Health & Family Welfare, Government of India, Annual Report to the People on Health. New Delhi: Ministry of

- Health & Family Welfare, Government of India; 2011.
20. Kranti S Vora, Dileep V Mavalankar, KV. Ramani, Mudita Upadhyaya, Bharati Sharma, Sharad Iyengar, et al. Maternal Health in Gujarat, India: A Case Study. *J Health Popul Nutr*. 2009 Apr; 27(2): 184–201.
 21. Raman PS, Sharma B, Mavalankar D, Upadhaya ML., Assessing the Regional and District Capacity for Operationalizing Emergency Obstetric Care through First Referral Units in Gujarat. Ahmedabad, India: Indian Institute of Management; 2009.
 22. World Health Organization. The World Health Report: Working together for health. Geneva: WHO; 2006.P.6.
 23. Population Reference Bureau. World population data sheet. Washington DC: Population Reference Bureau; 2007.P. 1–16.
 24. Ministry of Home Affairs of India. Census of India: Rural Urban Distribution of Population. New Delhi: Ministry of Home Affairs; 2011. Available from: http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf
 25. Ashtekar Shyam V, Kulkarni Madhav B, Ashtekar Ratna S, Vaishali S Sadavarte . Emergency Obstetric Care in a Rural Hospital: On-call Specialist Can Manage C-sections. *Indian J Community Med*. 2012 Jul-Sep; 37(3): 180–184. doi: 10.4103/0970-0218.99924.