NURSE-MIDWIVES FOR MATERNAL HEALTH

Experience in southern Rajasthan

ACTION RESEARCH & TRAINING FOR HEALTH

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CONTENTS

1. Introduction

India has a high maternal mortality ratio (MMR) between 420-570 deaths per 1,000oo live births[1], translating into an unacceptably high lifetime risk of one in 55 maternal deaths[2] (WHO). The major states of India exhibit a wide variation in MMR with Rajasthan displaying an MMR of 670 per 100,000 live births[3], much higher than the national average. For the past several years, while other indicators of health have shown improvement, maternal mortality levels have not declined as significantly. Dr. Halfdan Mahler, Director General of World health Org anization in 1987 defined maternal mortality as "a neglected tragedy, because those who suffer it are neglected people, with the least power and influence over how national resources shall be spent; they are the poor, the rural peasants, and above all, women".

The Safe Motherhood Initiative was launched at an international conference held in Nairobi, Kenya in 1987. The goal set out by the Initiative, and later adopted at several United Nations conferences, was to reduce maternal mortality by half by the year 2000. The next major landmarks were the 1994 International Conference on Population and Development in Cairo, and the 1995 Fourth World Conference on Women in Beijing. Each of these conferences gave substantial attention to maternal mortality, and called for efforts to "achieve a rapid and substantial reduction in maternal mortality and morbidity…." The Cairo Conference defined safe motherhood as one of the components of reproductive health. In the Safe Motherhood technical Consultation held in 1997 in Sri Lanka, key lessons learned from the Initiative's first ten years were reviewed, and a consensus was developed on the most effective strategies. Experience and research findings from several countries had shown that:

- Majority of maternal deaths – 61 percent - occur in post partum period, and more than half of these take place within a day of delivery.
- Obstetric complications (direct and indirect) develop in 15-20% of all pregnancies with most occurring around the time of birth.
- Once a complication develops the time lag between onset and death is short. For example, after postpartum haemorrhage, an untreated woman might die in an average of 2 hours.
- Delays in treatment occur at various levels after a complication occurs -- in recognising the problem, in deciding to seek care, arranging transport, and in starting definitive care at referral facility.
- The strategy of risk assessment[4] is not effective in developing country settings, it was ineffective in identifying women who will develop a complication, because some complications develop suddenly, without any warning signs or symptoms (e.g. postpartum hemorrhage).
- During pregnancy, any woman can develop life threatening complications that require medical care. Because there is no reliable way to predict which women will develop these complications, it is essential that all pregnant women have access to high quality obstetric care, especially during and immediately after childbirth.
- The single, most critical intervention for safe moterhood is to ensure that a skilled attendant[5] is present at every birth, and transportation is available in case of an emergency (see box).
- Training of TBAs alone, in the absence of back up from a functioning referral system and support from professionally trained health workers is not effective in reducing maternal mortality[6].

The term "***skilled attendant***" in the context of childbirth refers to persons with midwifery skills (for example, doctors, nurses, midwives) who have been trained to proficiency in the skills necessary to manage normal deliveries and diagnose (manage), or refer complications [7]."

Skilled care or attendance refers to the process by which a pregnant woman and her infant are provided with adequate care during labour, childbirth, and the postpartum period and immediate newborn periods, whether the place of delivery is the home, health centre, or hospital.

In order for this process to take place, the an attendant with the necessary skills must be supported by an enabling environment at various levels of health system, including:

- a supportive policy and regulatory framework
- adequate supplies, equipment, and infrastructure
- an efficient and effective system of communication and referral/ transport.

The eight Millennium Development Goals adopted by countries in 2000 strengthened the focus on safe motherhood, when goal 5 called for improving maternal health. Two key indicators – reduction of maternal mortality and proportion of births attended by skilled personnel, are meant to monitor progress towards achieving this goal.

It has been widely acknowledged that among those categorized as "skilled attendants", nurse-midwives are an important cadre for the reduction of maternal mortality. They have (or should have) the skills necessary to prevent maternal death, but require fewer resources for training and salaries than physicians. They are more flexible in terms of being posted in rural health facilities, making them more accessible to the women.

Rajasthan is the largest state of India in terms of land area with a population of 56 million, of which 77% is rural. The development indicators of the state are poor, as reflected in the low female literacy rate 44.3%[8] and low age of marriage (median age at first marriage for women is 15.3 years). Women produce an average of 4 children as reflected in the total fertility rate of 3.78[9]. National Family Health Survey 1998-99 data that shows that 14.8% of deliveries in rural areas take place at a health facility, and the remaining at home. Of all deliveries, 44% have been attended by a *dai* (traditional birth attendant) and 27% by relatives or other non professional persons.

In the current situation, auxiliary nurse-midwives and lady health visitors (ANMs/LHVs) are an important group providing rural health care, but they play a relatively small role conducting deliveries and treating maternal emergencies in Rajasthan. This is apparent in a survey conducted by ARTH in 1997 in the southern part of Kumbhalgarh block that revealed nurses or ANMs to have attended only 4 % of deliveries, while the NFHS-II, Rajasthan revealed that only 14.3% rural deliveries in the state had been attended by a doctor or other health professional.

The main reason for nurse midwives conducting so few deliveries is that only 38% of ANMs of government health & family welfare department reside within their field areas[10]. Moreover, the cadres of ANMs suffer from very weak pre-service training - an assessment[11] of the pre-service training of ANMs and diploma nurses, has revealed that most had not conducted a complete antenatal examination or an independent delivery during their training. They do not acquire knowledge or skills to manage complications of maternal period. The pre-service training does not allow most ANMs /GNMs an opportunity to insert a Copper-T or to conduct pelvic examination. However, nurses are generally found to have skills in sterilization of instruments giving injections and starting IV fluids, taking temperature, pulse etc.

In addition to this, ANMs/LHVs are only able to provide limited services because of the restrictions by nursing council regulations and the limited, dependent roles assigned to them. A study carried out by ARTH[12] in Udaipur district also revealed that nurses tend to avoid conducting home deliveries because they do not feel secure about traveling at night.

2. Nurse-midwives for Safe Motherhood

"Action Research & Training for Health" (ARTH), is a not-for-profit society that was established in Udaipur in 1997 with the aim of helping rural communities access health care as per their needs and capacity. The organization has a mandate to pursue a research and training agenda in order to add value to health policies and programmes, so as to make them more effective, efficient and sensitive to community needs.

The field rogramme began in a cluster of 10 villages with a population of 11,500 in Kumbhalgarh block of Rajsamand district, and subsequently has now expanded to cover a total of twenty-seven villages with a population of nearly 30,000 in Kuncholi cluster and 22 villages with a population of over 19000 in Kadiya area. Thus, the total population covered by ARTH's field programme is 49000, of which forty six percent belongs to scheduled castes/ tribes. A baseline survey conducted by ARTH in 2000 showed that less than one in four households had electricity and sanitation facilities were virtually non-existent. Antenatal checkups were rare (16%) and most deliveries (95%) took place at home in the presence of relatives or a TBA. Only 9% of deliveries had taken place in the presence of a skilled birth attendant. Less than 15% of women had a postnatal visit by a health worker. The infant mortality rate was 93 per 1000 live births with almost half of all women having had at least one child death in the past.

Recognising the need for sensitive and affordable services among large numbers of women in small towns and villages of rural Rajasthan, ARTH believed that there was a scope for professional nurse-midwives to act as free standing practitioners of maternal and related reproductive health care. This report describes ARTH's intervention in its field program area that centered on delivery of a wide range of maternal and related reproductive health care by professional nurse-midwives after they were suitably trained, empowered, and supported.

With the broad goal of contributing to the improvement of maternal-neonatal health and survival in southern Rajasthan, ARTH's intervention aimed to establish the effectiveness of trained nurse-midwives in providing safe motherhood and neonatal health services in a rural community and to increase utilization of such services in a rural block of Rajasthan. In addition, it aimed to enhance the contributions made to safe motherhood by panchayats (village level government) and men in the family. The implementation strategy rested on the *5 pillars of safe motherhood* (figure 1), which focus on the provision of essential services relating to pregnancy and childbirth:

Figure 1. Diagram of the safe motherhood approach illustrating the 5 pillars of action.

This report mainly follows the experiences of nurse-midwives trained by ARTH, who were part of the pilot project, *Nurse-Midwives for Safe Motherhood,* that was launched in April 1999. The activities of this project were dovetailed with the existing Reproductive and Child Health (RCH) clinic that had been operational in Village Kuncholi, Kumbhalgarh block since October 1997, along with community level educational activities.

3. Getting started

3.1 Key components of the intervention

The key components of the intervention were:

- (i) Practical hands-on clinical and counseling training in a range of reproductive health issues including first aid for obstetric emergencies, reversible contraception and neonatal and child care
- (ii) Use of standard guidelines and protocols adapted to Rajasthan setting
- (iii) Pairing of nurse-midwives at a health centre, guaranteeing that if one is out of station, 24-hour delivery services can be ensured, and it also helps to reduces the feeling of isolation.
- (iv) Providing mobility to nurse-midwives by placing a field worker cum driver with motorcycle in the health centre
- (v) A clinic attendant to assist nurse-midwives in cleaning the premises and linen and for conducting deliveries
- (vi) Subsidies to poor women and children who needed referral to city hospital for obstetric complications or childhood illnesses

(vii) Arrangements for assisted referral: when a nurse identified a problem that was beyond her competence, she stabilized the patient, arranged transport and accompanied the patient to the referral hospital, facilitated admission and left after the treatment started at the referral facility

(viii) Mobilization of men and panchayats to take greater responsibility for maternal health care through targeted education of husbands of pregnant and recently delivered women

(ix) Support from doctors (gynecologist, pediatrician, and public heath professionals) who visited the clinics 1-2 times per week

(x) Providing regular supply of drugs and consumables

(xi) An escort to accompany nurse-midwives for home visits, and for referrals in the night

3.2 Clinic upgrade

The rural outpatient clinic, at Kuncholi village (52 kms from Udaipur city) was upgraded by adding essential equipment and supplies, a two-wheeler for transporting nurse-midwives and by ensuring 24 hour presence of staff. A team of at least one nurse-midwife, a field worker/field supervisor (who doubled up as a motorcycle driver) and a clinic attendant were always available to attend to a woman at clinic or to visit a woman's home, when called for an emergency. A revolving "clinic fund" was established, to procure drugs and supplies, which were charged at no profit basis. Arrangements were made with three local jeep taxis for quick transport of women needing referral to the hospital in Udaipur, at fixed cost. Referral links were developed with the medical college and with a few private diagnostic facilities in the city. Prior to being upgraded to serve as a 'safe motherhood centre (SMC), the RCH clinic that was in its second year showed signs of increasing popularity, especially for reproductive health services.

Another health center was established in Kadiya village (25 kms from Udaipur city) in September 2002, which initially commenced as an outpatient clinic where doctors provided services twice a week. Delivery services were initiated in April 2003 when 2 nurse-midwives started residing at the center. Arrangements similar to that of Kuncholi centre were made for mobility, supplies, referral, and support of nurse midwives.

3.3 The nurses

Initially two nurses were recruited for the first health centre, at Kuncholi. The first of the two nurses, was from the southern Indian state of Kerala, and was recruited in September 1998. She had one and a half years of ANM training and had worked for five years as a nurse in a private hospital in Jaipur. Another nurse, also from Kerala, was recruited a year later. She had a three year general nursing and midwifery (GNM) degree and had also worked in a private hospital in Jaipur. Both of them resided in a rented house in Kuncholi village, about 400 meters from the RCH clinic. Subsequently, after one more RCH center started in Kadiya, 2 more nurses joined and started providing 24-hour delivery services from April 2003. One of them has a 3-year diploma in nursing and midwifery (GNM) and another one is an auxiliary nurse midwife. In order to sustain 24-hour delivery services and field clinics, and to allow for leave vacancy, we have been having a total of 5 nurse-midwives between the 2 health centres.

Before coming to ARTH, the nursing experience of most of the nurse-midwives was limited to a support role that involved bed making, ward duties, and administration of medicines, IM injections and IV fluids on instruction from a doctor. None of them had performed any clinic related roles independently[13]. With regards to reproductive and child health related experience, although they had assisted in maternity ward and had worked in a child nursery, they had not conducted a single delivery, nor had they conducted speculum or pelvic examination or antenatal care independently. Most of the nurses were initially anxious about providing services at ARTH's centres, since they did not have any experience of working in rural areas of Rajasthan. Their apprehension was compounded by the fact that most of them (especially those who were natives of Kerala) did not speak a word of Mewari and even their Hindi was accented, which few villagers could understand. Soon after joining ARTH, the nurses started assisting the gynecologist and pediatrician[14] who had been providing outpatient services on fixed days, and were provided classroom training (see section 3.4).

On 3 days a week, when there was no outpatient service by doctors, the one nurse would travel with the male health worker to conduct outreach field clinics, as per a fixed plan. The male worker's role was to mobilise men and panchayats on reproductive & child health (RCH) related issues and promote the delivery service. However, in addition to provide the services, the field clinics provided an opportunity to the nurses spent getting acquainted with the community, slowly gaining in confidence and picking up the language as they went along.

Between 1998 and March 2005, we have had a total of 9 nurse midwives - 5 were trained as GNM, while 4 as ANMs. The criteria for selection of nurse midwives included their willingness to stay in field area and provide 24 hours services as per a roster. One nurse had to leave after 4 years because she got married outside of the district, one nurse left because she wanted to live in the city to educate her children in better schools, while two nurses had to leave because they were not willing to provide services at night. As of April 2005, we have 5 nurse-midwives with varying levels of experience with ARTH.

3.4 Training

From the start of their employment with ARTH, the nurse-midwives received intense practical induction training on safe motherhood, neonatal and child health, and other reproductive health needs (table 1 & 2).

Curriculum: The training of nurse-midwives was centered on a comprehensive strategy to tackle safe motherhood (including activities at 5 levels) rather than only childbirth. The training curriculum addressed the public health aspects related to maternal mortality; clinical skills related to maternal health, contraception, newborn & child health, laboratory skills, management skills needed to run a health center, and counseling and communication skills. The detailed curriculum has been given in annexure 1. The training guidelines were translated in hindi and adapted from standard international and national evidence based guidelines and modules, which were given as handouts. Those on maternal & neonatal health were later printed as a manual[15].

Specifically, the skills related to obstetric first aid included the following:

Table 1. Obstetric skills in which nurse- midwives were trained

Obstetric complication	*Skills required for detecting it*	*Skills required for providing first aid or treating complications*
Anaemia	Haemoglobin estimation Detecting anaemia by physical examination	Deciding whether to treat or refer Giving oral or injectable iron
Pre-eclampsia and eclampsia	Measuring blood pressure Testing for albumin in urine Interpreting the findings Recognising signs and symptoms of impending eclampsia	Referring / managing pre-eclampsia Maintaining airway Giving first dose of magnesium sulfate Recording observations (BP, respirations, albumin-urea)

Bleeding in early pregnancy	Detecting cause of bleeding Pelvic examination Detecting anaemia Monitoring vital signs	Digital removal of products of conception Oxytocic injections Starting IV fluids
Bleeding in late pregnancy	Monitoring vital signs	Avoiding pelvic examination Starting IV fluids and advising early referral
Prolonged and obstructed labour	Use of partograph Detecting abnormal presentation & multiple pregnancy Early recognition of prolonged labor Recognition of maternal / foetal distress and dehydration	Giving antibiotics and IV fluids Early referral
Retained placenta	Diagnosing retained placenta Monitoring vitals and bleeding	Inject oxytocic drugs Start IV fluids Controlled cord traction Referral for manual removal
Postpartum haemorrhage	Recognise PPH and its cause Inspect cervix and vagina to identify lacerations	Inject oxytocic drugs (& carboprost in severe cases) Start IV fluids Bimanual compression of uterus
Puerperal sepsis	Recognise signs and symptoms of puerperal sepsis Examination of a woman with puerperal fever	Start antibiotics Monitoring for improvement & referral

Venue of training: The training at ARTH centres covered outpatient care related to antenatal, postnatal care, contraceptive counselling and provision, pelvic examinations, management of reproductive tract infections (RTIs), and treatment of sick children. The nurses also received classroom training, for 2 days every week for about 8 weeks at ARTH office in Udaipur. In the beginning, when the delivery load was low at ARTH's centres, it was difficult to provide practical training in deliveries and obstetric emergencies at ARTH's centres. Therefore, initially, practical experience in conducting deliveries was gained at a Community Health Centre (CHC), where the nurses spent two days a week for about 4 weeks. For neonatal care, they spent time at the Medical College hospital in Udaipur, and in a private lab on laboratory techniques (2 days). Subsequently, the new nurses gained the necessary practical training and experience at the ARTH RCH centres where the delivery caseloads had gained momentum.

Training faculty: For the first few nurses, a team of trainers including obstetricians, paediatricians and public health experts of ARTH conducted the training. Doctors from government institutions and guest faculty also acted as trainers. Subsequently, 2 nurse midwives at ARTH were promoted as trainers, who provide most of the training.

Methodology of training: The practical hands on training was provided in a ARTH's RCH centre, a CHC, medical college, and a private lab, while classroom training was carried out in Udaipur. A tailor made was carried out on counseling and management aspects. In addition, case reviews of all referred cases, and in depth discussions of verbal autopsy findings were carried out for cases of maternal deaths picked up in and around field area.

Based on research evidence about beneficial, non-essential and harmful forms of care, the nurse midwives were guided to use the most effective and beneficial forms of care. For example, they were advised not to use enema, not to give episiotomies in all cases, and to keep the women mobile during labour, etc. Many interpersonal skills such as humane treatment with clients, sympathetic behavior, concepts of counseling in practice, building rapport with clients, understanding their constraints and family situation, providing extra subsidy to poor patients were acquired through day to day clinic management.

4. The service package and roles of nurse midwives

i. Services at the Reproductive & Child Health centre:

Since October 1999, the nurse-midwives have been providing 24-hour delivery and obstetric first aid services, and outpatient services. The doctors visit the centre on 2 fixed days a week, and provide additional outpatient services. The range of services provided has been shown in table 2. Basic laboratory tests (such as hemoglobin, urine albumin & sugar, blood group and pregnancy test) can be provided at RCH centres, while arrangements are also made for low cost laboratory tests in Udaipur for patients who needed more tests.

Table 2. Services offered by different providers at the RCH center

RH need	*Nurse-midwife*	*Gynaecologist (for RH services)* *Pediatrician (for CH services)*
Contraception	• Counseling • Provision of oral pills, condoms, copper-T, copper-T removal • Instructions for natural methods • Follow-up of DMPA	Same as services by nurse midwives, plus • Provision of DMPA • Post abortal Copper-T insertion • Difficult Copper-T removals • Emergency contraception
Abortion	• Confirmation of pregnancy • Counseling of women with unwanted pregnancy • Follow up of abortion clients • Detection & initial management for complicated abortion including illegal abortion	Same as services by nurse midwives, plus • Menstrual regulation and first trimester MTP • Management of complications of abortion
RTIs, STDs, gynecological conditions	Provisional diagnosis and treatment using syndromic approach, referral as relevant	Management of gynecological conditions including infertility, menstrual disorders, prolapse, reproductive tract infections, STDs, etc
Maternal health	• Antenatal & postnatal care • 24 hours delivery services at home and health centre • Management of maternal complications • Referral services (arrangement of transport and accompanying to hospital)	• Antenatal & postnatal care • Management of complicated antenatal & postnatal cases & those referred by NMs.
Child health	• Immunization • Counseling • Care of newborn, including early management of neonatal emergencies	Same as services by nurse midwives, plus • Treatment of chronic / serious childhood illnesses and all children referred by paramedics
	• Treatment of childhood illnesses using IMCI approach	
Other	Any other health problem	

In RCH centres, the deliveries are conducted in a designated delivery room that is equipped with all the necessary equipment and supplies. With the electricity in the village being erratic, often, deliveries are conducted using an emergency light or gas lit lamp. After delivery at the ARTH clinics, the mother remains at the health centre for a minimum of 24 hours with the nurse-midwives regularly monitoring the mother's and newborn's condition.

The nurse-midwives also provide immunisation for children as well as treatment of sick children using the Integrated Management of Childhood Illnesses (IMCI) approach. If the nurses feel the child needs a higher level of care, but is not serious, the family is asked to visit the clinic on the day the paediatrician is present. However, if the condition of the child is considered critical, the child may be referred to the hospital in Udaipur.

ii. Obstetric services at home level:

On being called to attend a delivery or complication in a pregnant or recently pregnant woman, a nurse-midwife and a male worker reach the woman's home on a motorcycle. They carry an essential drug and equipment kit with them. The nurse-midwife carries out a home delivery or provides management for an obstetric emergency as per the need. She looks for signs of maternal complications, manages them as per clinical protocols and refers if required.

iii. Postnatal care visits

The nurse-midwives also make visits to women's houses for postnatal check-ups. After being discharged, the nurse makes a visit to the mother's home within the next three days to follow up on both the mother and the baby's progress. If, during these visits the nurse-midwife decides that the woman needs hospital care, she refers the patient to the hospital in Udaipur. In addition, nurse midwives also provide postnatal care if they are called to attend to a woman's or newborn after a delivery has been conducted by a family member or TBA.

iv. Emergency transport and referral

The nurses were trained about referral criteria for each of the conditions. In case the nurse-midwife finds, on the basis of clinical assessment, that a woman needs a higher level of care, she encourages the family to opt for referral care, and arranges subsidized transport[16,17]. Local jeep owners in Kuncholi and Kadiya villages have been contacted to fix a price. All the referrals for maternal and newborn complications were to the government medical college, Udaipur.

However, since many rural (especially tribal) families are reluctant to go to Udaipur, because of fear of high cost, transport and poor familiarity with hospital staff, the nurse-midwife accompanies the patient to the referral hospital. During evening and night hours, one male worker also accompanies the patient and nurse-midwife during referral. During transport, the nurse takes with her a medical kit with essential life saving medicines & supplies enroute to the hospital. She also carries a referral note with her and facilitates the woman's admission without delay at hospital.

After arriving, the nurse contacts a social worker of ARTH at Udaipur, who has been provided with a mobile phone. The social worker subsequently maintains daily contact with the patient's family and hospital staff to follow up on any urgent matters. He helps families to get subsidy schemes, free food, etc. and guides them to blood bank if needed. The social worker inquires about any difficulties that they might have faced in receiving services and about their treatment by the staff. He also maintains contact with the hospital staff and acts as a link between patient's family and hospital staff.

v. Village level outreach clinics:

The nurse-midwives have been operating once-a-month village level clinics (field clinics) with support from field workers and women volunteers in 22 project villages of Kuncholi cluster and 6 villages of Kadiya cluster. These outreach field clinics last about half-a-day and occur on predetermined days at predetermined venues[18] once a month (at 26 sites) or once a week (at 4 sites). The clinic is usually held in one room of an Anganwadi, a government run child development centre, or at the house of an ARTH volunteer[19]. Services offered include antenatal care, counselling, pregnancy confirmation, contraception (oral pills, condoms, counseling), immunization and treatment of minor ailments and childhood illnesses.

Outreach clinics provide women an opportunity to develop rapport with the nurse-midwives and to plan their delivery. If nurses identify a complication that they cannot manage, they advice the patient to come to the RCH centre on the day when doctors visit. The nurses carry a bag with all necessary items required for these services. For example, items for an antenatal check-up include items required to carry out haemoglobin test, urine test for albumin, blood pressure etc. They also carry contraceptive samples and educational material so that they are able to counsel properly. Village volunteers and social animators play an important role in promoting the utilisation of outreach field clinic services. During the initial years, women volunteers received a small incentive foreach case she referred to the field clinic.

vi. Community based education & distribution

As a part of its outreach programme, ARTH has been running a community-based education and distribution (CBED) programme covering a range of contraceptives, with emphasis on reversible methods. Women volunteers and field workers of ARTH have been distributing condoms and oral pills within the community. They refer those who want a copper-T (CuT 380A or CuT 200B) or injectable (DMPA) to the RCH centre. All women attending the clinic for their own or children's needs are counseled about the various contraceptive methods. Those willing to use sterilization are guided to the government facilities.

vii. Free-standing and team roles of nurse midwives

The free-standing roles of nurse midwives have been outlined in tables 1 & 2. In addition, they assist the visiting gynecologists and pediatrician that visit the clinic on fixed days a week during the provision of other services such as management of infertility and other gynecological disorders, treatment of serious childhood illnesses, etc. The nurse-midwives also assist the doctor in providing safe abortion services by confirming pregnancy, counseling women with unwanted pregnancy (including contraceptive counseling), lab tests, preparation of instruments, assisting during the procedure, etc. They also provide follow-up services after elective abortion, for women who visit the clinic on days other than those of doctors' visits with questions or complaints. With regards to their clinical roles, the nurse midwives are guided by a well-defined management and referral protocols. The nurse-midwives are also responsible for a range of non-clinical roles involving maintaining an inventory of medicines, supervision of clinic attendants and the everyday running of the clinic, managing imprest advance, maintaining records of services, etc.

5. Results

5.1. Delivery services

Caseload over the years

In the beginning, the nurse-midwives lacked experience and confidence about conducting deliveries, but gained the confidence over time. The first six months of this service saw a total of only 8 deliveries being conducted. As the trust of the community increased and the nurse-midwives' competence strengthened, the utilization of delivery services rapidly grew. The nurse-midwives attended 311 deliveries over the year 2004-05, out of which 48 women needed referral for maternal or fetal complications (table 3). All such women were provided with obstetric first-aid. The nurse-midwife and field worker arranged transport to Udaipur and helped admit the women at the hospital. Over the years, the proportion of women needing referral has declined - in earlier years, more than 20% women needed referrals, while only 12.5% were referred in the year 2004-05.

Table 3. Delivery cases attended and referrals at Kuncholi & Kadiya health centres [20]

Period	*Delivery cases attended*	*Referral advised*	*Referrals carried out*	*% Referrals*
Oct 99- Mar00	8	2	2	25.0%
Apr00-Mar 01	62	16	14	22.6%
Apr01-Mar02	154	28	23	14.9%
Apr02-Mar03	201	26	23	11.4%
Apr03-Mar04	266	48	40	15.4%
Apr04-Mar 05	311	47	39	12.5%
Total	1002	163	142	14.2%

Place of call, place of delivery, birth attendant, mode of delivery

We publicized that nurse midwives would be providing the delivery services at health centre as well as at woman's home. However, for all labors we were notified of, all except 42 (4.2%) chose to come to the health centres for delivery (table 4). Of those who sought care for delivery, 82.1% delivered at the ARTH clinic, 4.2% at home, 1.7% delivered during transport, while 12% were referred and delivered in the city hospital.

Majority of women had come directly to the ARTH clinic, while some had called the nurse-midwives home. While during the initial months the proportion of women who called nurse midwives home for deliveries was higher, it gradually reduced. One of the reasons for this was that nurses found it inconvenient to stay for several hours in women's houses with the length of labour periods being uncertain. Another reason was that the communities perceived that if a professional service provider is present, the delivery should take place as early as possible, and would pressure the nurses to give injections or drips to speed up the labour[21]. Sometimes, the women from the hamlet would gather around, and interfere with the care, creating friction between the nurse and the community. Moreover, there were days when one of the nurses was on field, while the nurse at the RCH centre was busy attending another woman in labour – on such days, nurses had to decline if there was a home delivery call, and had to advise the family to bring the woman to the clinic.

Of all women who attended for delivery, 97.9% had a vaginal delivery (including 3% with vaginal breech delivery and 1.1% with a twin delivery) and caesarean section was needed for 2.1% women.

Table 4: Delivery details and outcome for those who attended for delivery (n=1002)

Place of delivery	*Total (n= 1002)*	%
• Home[22]	43	4.3%
• ARTH clinic	815	81.3%
• City hospital	126	12.6%
• Transport	18	1.8%
Birth attendant		
• ARTH Nurse	856	85.4%
• ARTH doctor	7	0.7%
• City doctor	126	12.6%
• Relative / TBA	13	1.3%
Mode of delivery		
• Normal vaginal delivery	938	94.3%
• Breech delivery	30	3 %
• Twin delivery	11	1.1%
• Caesarean section	21	2.1%

Referrals among women who came in labour

Out of 1002 women who sought care from ARTH for delivery between Oct 1999 and March 2005, referral was advised for 163 women, of these 142 (14.2% of all women, and 87% of those advised referral) complied with the advice. This referral rate is within expected limits; it also suggests that women with complications were detected in time and referred. The majority of the referrals were for prolonged labour, abnormal position of the fetus, pre-term labor, ntepartum hemorrhage and fetal distress (table 5). Our data shows that among these women, 35.6% were referred mainly for fetal reasons, while 64.4% were referred for maternal reasons.

As the experience of nurse-midwives increased, referrals for certain conditions reduced. For example, once their skills related to detection of onset of labour, distinguishing between latent and active phases, and ability to make decisions based partograph improved, referrals for prolonged labour reduced. Similarly, initially nurses were guided to refer for all breech and twin deliveries. Experience has shown that some women were very reluctant about referral, or some women came very late in labor. We therefore decided to train the nurse-midwives to manage breech and twin deliveries if referral was not feasible. Moreover, several women who suffered postpartum hemorrhage improved after receiving first aid by nurse-midwives, and did not need referral.

Table 5: Reasons for referral among women who came for delivery

Reasons for advising referral	*Attended complication (n= 236)*	*Referral advised (n= 163)*	*Referral carried out (n= 142)*
Before delivery – maternal reason			
• Prolonged labour/ obstructed labour	44	39	33
• Abnormal presentation – transverse lie	7	7	7
• Twin pregnancy	7	3	1
• Pre-eclampsia	15	13	11
• Eclampsia	3	3	3
• Ante-partum haemorrhage	15	15	15

• Severe anemia	12	12	11
• Other direct complication	8	7	7
• Other indirect complication	8	8	8
Before delivery - foetal reason			
• Foetal distress	24	18	17
• Breech presentation	36	26	14
• Rh incompatibility	1	1	1
• Foetal death/ anomaly	5	3	3
• Preterm labour/ PROM	28	22	16
• Cord prolapse	2	2	2
• Precious baby	1	1	1
After delivery - maternal reason			
• Postpartum haemorrhage	25	9	7
• Retained placenta	14	8	7
• Puerperal sepsis	3	1	1
Desire of family members, other	2	2	2
Total (multiple referral reasons allowed)	257	196	167

Maternal and fetal outcomes for those who came in labour

There were no maternal deaths among women who attended for delivery. Among 860 women who delivered by ARTH nurses, there were 7 stillbirths and 21 neonatal deaths. On the other hand, there were 22 stillbirths and 15 neonatal deaths among women who were referred - this could be because referred women constituted a group with maternal or fetal complications. This translates as a stillbirth rate of 28.9 per 1000 births and neonatal mortality rate of 37 per 1000 live births. On comparing this with the neonatal mortality rate of 49 per 1000 live births for Rajasthan[23], it appears that our intervention has made some difference. We do not have data on stillbirth rate for Rajasthan, however, the stillbirth rate according to community-based studies in other states of India (Maharashtra and Punjab), is between 30.9 - 32 per 1000 live births[24], and our rates are marginally lower.

Table 6: Maternal and fetal outcome for those who attended for delivery (n= 1002)

Maternal outcome	*Not referred*	*Referred*	*Total*
• Alive	860	142	1002
• Dead	0	0	0
Child outcome			
• Stillbirth	7	22	29
• Live birth	853	120	973
o Neonatal death	21	15	36
o Alive at 28 days	832	105	937

5.2. Obstetric emergencies

Caseloads

We have used the term "obstetric emergencies" for women who attended with emergencies related to complications of pregnancy, postnatal period, or abortions, and were not in labour. Women who had less serious problems of pregnancy (e.g. mild & moderate anemia, mild pre eclampsia, urinary tract infections, fever etc.), or of postnatal period (e.g. breast problems) or were advised elective referrals have not been included under the ategory of obstetric emergencies. Over these years, 120 such women with life threatening obstetric emergencies were attended by our nurse midwives -- of these 54 had a complication of abortion, 52 had a complication of pregnancy[25] and 24 came with postnatal complication (table 8).

Table 7: Obstetric emergency cases attended and referrals

Period	*Obstetric emergency cases attended*	*Referral advised*	*Referrals carried out*	*% Referrals*
Oct 99- Mar00	4	1	1	25.0%
Apr00-Mar 01	9	3	1	33.3%
Apr01- Mar02	24	23	12	54.2%
Apr02-Mar03	23	18	8	34.8%
Apr03-Mar04	30	28	20	56.7%
Apr04- Mar 05	30	24	28	46.7%
Total	120	97	70	46.7%

Table 8: Phase of obstetric emergencies and referral reasons

Reason for advising referral (Multiple responses allowed)	*Total attended (N=120)*	*Referral advised (N= 97)*	*Referral carried out (N=70)*
Complication of spontaneous or induced abortion	54	36	28
Complication during second half of pregnancy			
• Severe pre-eclampsia	4	4	3
• APH	17	17	13
• Multiple pregnancy	2	2	2
• Severe anemia	20	20	16
• Transverse lie	1	1	1
• Other direct complication of mother	4	3	2
• Other indirect complication of mother	6	6	4
• Fetal death	3	1	1
Post partum complication			
• Postpartum hemorrhage	7	2	2
• Retained placenta	7	3	2
• Eclampsia	2	2	2
• Sepsis	6	3	1
• Other indirect complication	3	3	3
Total (multiple referral reasons allowed)	136	103	80

Referrals for obstetric emergencies

For these 120 women with emergencies, nurse-midwives or doctors[26] provided basic treatment, and 75 were advised referral, of which 56 (47%) eventually complied with our advice (table 7). In some cases of obstetric emergencies, women did not need further treatment (e.g. postpartum haemorrhage, or incomplete abortion) since their problem improved. In other cases, this first aid helped to stabilize women's condition while referral was arranged. The most common antenatal complications attended were antepartum haemorrhage and severe anaemia, the most common postpartum complications attended were retained placenta and postpartum hemorrhage. Complications of unsafe abortions were responsible for 40% of these referrals.

Maternal and fetal outcomes among women with obstetric emergencies

Maternal for women who came with other obstetric emergencies shows that there have been 2 deaths among the 120 women that approached the centre with obstetric complications. One of these was a girl with an unsafe abortion at 26 weeks, who was diagnosed to have perforation of uterus and died 21 days after she was referred; while the other was a pregnant woman with anemia and heart failure, who was referred, but could not receive blood transfusion. The child outcomes are not available for 25 of these women, since some women who were referred for antenatal complications could not be traced after delivery due to incomplete or wrong addresses. Similarly, some women who delivered at home and came with a postpartum complication had to be quickly referred, and data on neonatal outcomes could not be recorded.

Table 9: Maternal and fetal outcome for those who attended for delivery and obstetric complications

Maternal outcome (n=120)	
• Alive	118
• Dead	2
Child outcome (n= 120)	
• Not relevant – abortion complication	54
• Stillbirth	9
• Live birth	29
o Neonatal death	1
o Alive at 28 days	28
• Not available	25

5.3 Profile of women coming for delivery and obstetric emergencies

The profile of 1122 women who sought delivery or obstetric first aid services by ARTH shows that the average age was 24 yrs, and nearly forty-three percent were from the tribal or scheduled caste community. We consider this to be significant in view of our findings from the earlier surveys, which had shown a great discrepancy in institutional delivery rates between tribal and other communities -- 23 percent of women belonging to "upper castes" had utilized institutional delivery services, the rate was 3% for women of tribal and scheduled castes.

Nearly 45% of those seeking delivery services from our programme did not have any living child, probably because the community perceives first time pregnant women to be at higher risk, and is more willing to encourage the use of services for them. All except 7% of women were from project villages. However, among women who came for obstetric emergencies other than deliveries, the proportion from non-project villages was higher (table 10).

Table 10: Profile of women who were attended by nurse midwives for delivery or obstetric complications (n= 1122)

Caste	*Number*	*%*
• ST/SC	479	42.7%
• Other	643	57.8%
Age		
• 15-19	95	08.5%
• 20-29	783	69.8%
• 30-39	224	20.0%
• 40-49	20	01.8%
Mean age	24.2 years	
Number of living children		
• 0	507	45.2%
• 1-2	388	34.6%
• 3-4	173	15.4%
• 5 and above	54	4.8%

Residence		
• Project villages	1042	92.9%
• Other villages	80	7.1%
Place of call		
• Home	72	6.4%
• Clinic	1050	93.6%
Received ANC		
• Had received ANC	776	69.2%
• Had received tetanus injection	831	74.1%
• Had received iron tablets	727	64.8%

5.4 Referrals

Support provided by ARTH for referral service

Nurse-midwives have carried out a total of 212 referrals – these include 142 women who came for deliveries, and 70 of those with obstetric emergencies. Of all referral cases, 75.6% utilized the jeep transportation services and ARTH staff has accompanied 60.5% of women, the nurse-midwife accompanied most of them. In all these cases, they ndependently contacted staff members of the medical college to facilitate quick initiation of treatment. In more than two thirds of admissions, contact with the ARTH social worker at Udaipur was possible, who then maintained contact with the family after admission and helped negotiate care in hospital, e.g. by guiding how to use BPL card, where to get the free food from, where to go for blood donation, how to avoid corruption etc.

Table 11: Support by ARTH in referral services

Purpose of referral	*Total (n=212)*	*Percent*
• Delivery related	142	70.5%
• Obstetric emergency related	70	29.5%
Mode of Transport		
• Jeep	160	75.5%
• Bus	31	14.6%
• Other	21	9.9%
Accompanied by ARTH staff		
• Yes	128	60.4%
• No	84	39.6%
Person who accompanied (where ARTH staff accompan ied)		
• ARTH nurse (with or without male worker)	107	83.8%
• Male worker / others	21	16.2%
Contact with social worker at Udaipur possible		
• Yes	132	62.3%
• No	80	37.7%
Subsidy provided by ARTH (Rs 100 or more)		
• Yes	45	21.2%
• No	167	78.8%

Sovni's case exemplifies the support provided by ARTH's service to women who need referral[27].

Sovni was a 17-year-old girl with a 7-month pregnancy. She had received one antenatal check-up. Her parents lived in a hamlet about 3 km from the village bus stop. One day, her father came to the clinic to call the nurse-midwife. On reaching their house, the nurse-midwife learnt that Sovni had been having strong abdominal pains along with vaginal bleeding for the past few hours. She discovered that the hand of the foetus was coming out ("hand prolapse"). This meant that the foetus was in a transverse (horizontal) position, a condition that requires delivery by caesarean section operation. The nurse started intravenous fluids for Sovni and informed the family about the need to refer. The father did not have any money to arrange for transport and treatment, and hence was reluctant to go to the city. The local TBA suggested that she be taken to the local ayurvedic dispensary. The family and the TBA were persuaded to go to a city hospital for admission followed by possible operation and blood transfusion. The nurse-midwife also reassured them that most expenses related to transport and treatment would be borne by ARTH. The accompanying field supervisor arranged for a jeep and Sovni was taken to the medical college hospital accompanied by the nurse-midwife. Although a stillborn foetus was delivered by caesarean section within 2 hours of arrival, Sovni herself did well and returned home 8 days later. A large part of treatment costs were borne by ARTH from a project subsidy fund.

Perception about referral

One hundred and thirty-four women who were referred were later contacted by a research investigator at their homes and administered a questionnaire regarding their experience of referral and what they thought about ARTH's role in referral. Most families (79%) appreciated the fact that someone from ARTH accompanied them for referral; they felt reassured about delivering in ARTH health center since they knew that in case of a problem, they would be taken right up to the hospital in Udaipur and the nurses would get her admitted.

However, there were some families who did not like being referred – they felt that if they had to eventually go to Udaipur, they would have gone right from the beginning, and that the reason they came to ARTH health centre was that did not wish to go to Udaipur. About 20% felt that they should have been sent earlier, or not sent at all. Nearly eighty percent of women were satisfied about referral, while the rest were annoyed with ARTH service.

Table 12. Perception about referral

Feelings about referral	*(N= 134 who were later contacted at home)*	*Percent*
• Referral was necessary	106	79.1%
• They should not have sent at all	9	6.7%
• They should have sent us earlier	5	3.7%
• They are incompetent/ broke our trust	4	3.0%
• Non medical cause/ affect of evil spirits	3	2.2%
• No response	7	5.2%
Whether referral was necessary		
• Yes	114	85.1%
• No	13	9.7%
• No response	7	5.2%
Satisfaction		
• Satisfied	118	88.1%
• Annoyed	9	6.7%
• Very annoyed	7	5.2%
Behaviour of hospital staff		
• Good	105	78.4%
• Bad	8	6.0%
• NA	21	15.7%

Some women and their families were of the view that referral was carried out because it was necessary to save the life the woman or child. Although they fe lt that an upgrade of ARTH's health center could prevent the need to refer, they were by and large satisfied.

My wife was admitted at Kuncholi health center for 7 days because she had leakage. Then she delivered a baby girl, but the placenta did not come out, so she had to be referred to Udaipur. When my wife was in Kuncholi, the nurses took good care of her. She even came to get my wife admitted, therefore we did not have any difficulty in getting admitted, and her treatment started early. If they had not sent us on time, it would have been difficult to save the life of my wife.

Gallaram (Husband of Mohini)[27], Village Kanooja, February 2002

The delivery occurred in Kuncholi, but the baby was too weak, so they referred us to Udaipur. The nurse could not come with us, but someone from (ARTH) office helped in getting us admitted, so we did not have difficulty in admission. In Udaipur, the child was admitted in a nursery. But it died within one hour of admission. They (the staff at Kuncholi) sent us to Udaipur for our good, but the child was too weak ... if they could have a nursery here, it would be better.

Vasni, Ramaram[27], Village Jadfa, August 2003

I was 9 months pregnant, and started having bleeding. We went to Kuncholi, where the nurse checked us and sent us to Udaipur. She had also come along. At referral hospital, they admitted me soon after reaching and started treatment. They gave me some injections, because of which the bleeding stopped. I delivered normally. They (staff at Kuncholi health center) went not able to manage, that's why they referred me. Most of the time, they manage the case here itself, they send only if there is a genuine need.

Roopli [27], Saroopsingh, Pasun, July 2003

Some women did not comply and returned without treatment, while some had negative experiences. The experiences of these women have given us valuable insights, and in some cases have changed our practices regarding referral and continuing contact after admission.

Bhavri was a 35-year-old tribal woman who resided in a village, which is 4 km from a bus-linked village. She had conceived after 17 years of secondary infertility and came to ARTH clinic for the first time in labour. Examination showed that it was a breech baby, and considering it to be a precious pregnancy, decided to refer. Bhavri was very reluctant to go, although her husband was willing for referral. ARTH staff somehow convinced them and arranged for the transport and accompanied to get her admitted.

According to Bhavri, *"I had one child and had conceived after 17 years. I went to the ARTH clinic when my labor pains started. They said that the baby is in head up position and that I should go to Udaipur for delivery. I was reluctant to go Udaipur, but they said it was necessary... The nurse came along to get me admitted, and then she went back. They (staff at referral hospital) made us run around a lot and told us that I have lack of blood and would require blood transfusion, hence we should arrange for blood. My husband was so weak that I felt he is not fit to donate blood. They also asked us to arrange for some money for operation. We are poor people, how would we get so much money, moreover I was very scared of the operation.... and my son was alone at home. Because of this fear, we boarded a bus and headed towards our village. My pains were going on. We got down at Barwada from where we walked on foot towards our village. As soon I reached home, I delivered - it was a dead child ...If I was not so scared my child would have been alive today, but we had never seen a hospital and we couldn't even understand their language... " (May 2001)*

Bhavri[27], wife of Kaluaram, Village Sadara, 35 years

I was referred because the baby was breech. I didn't have any problem at the time of admission and no one asked for any money. The nurses at Udaipur hospital did not pay any attention. Half the baby came out at the cot itself, then the nurse came and saw ... baby's head remained inside for some time, because of which it had breathing problems ... it died after 7-8 hours"

Tamli[27] Heersingh Village Chambua Sarjela, *October 2003*

Our earlier guidelines to nurse-midwives were to refer all cases of breech presentation in early labour. After such experiences, we trained our nurses in the technique of breech delivery and relaxed the referral criteria for breech babies. We also started paying more attention to patient's and her family's willingness towards referral. Our findings show that the fetal outcomes even among referred women were not particularly good – among 14 women who were referred for breech presentation, 8 had either a stillbirth or neonatal death. On the other hand, among 22 women who were delivered by ARTH nurse midwives, only 5 had a stillbirth/ neonatal death.

The need for more complete assessment is reflected by the fact that a total of 260 of women have been given referral advice, though only 212 (81.5%) of them have heeded the advice.

"I was referred because I had bleeding during pregnancy. One person from ARTH office came and helped me in admission. Afterwards I was in bed for 3 days; no one attended to me. The person from ARTH also did not come to attend to me again. My husband was not allowed to come in, hence I also had problems in getting food. The woman from neighboring bed told me to speak to the senior doctor when she comes. On third day, the senior doctor came and I complained to her, after which they did my sonography, and gave me some injections and drip. I even started getting food from the hospital. But the senior nurse got annoyed with me, because the doctor had scolded her. Subsequently during the time that I was admitted, she used to abuse me. She told me that your placenta is down, hence you will need an operation and that since it was one and a half months left for my delivery, I should go home and return afterwards. We returned after 10 days. When we had to go back to the hospital, we could not arrange for the money. Even otherwise, we were quite disturbed / harassed with the behavior of the hospital staff, and did not feel like going. One day I started having labor pains at home, and we called a Dai to conduct delivery. The child was dead. Sister, you (ARTH) people send us there, but no-one pays attention to us poor people."

Khamani[27] / Pratapsingh, Village Oda

We felt that women who had an obvious complication (such as antepartum hemorrhage or retained placenta) were more willing for referral, whereas those who did not perceive a problem at the time of admission, were reluctant for referral (e.g. those in whom a complication such as foetal distress or severe anaemia was diagnosed).

Some women who had been coming for regular antenatal checkups, and developed a complication at time of labour, felt that ANC was of no use. The case of Premi, who was referred for fetal distress and Janki, who was referred for prolonged labor exemplify this.

We reached Udaipur at 12 pm, but I was admitted after about 3 hours. Then they gave me injections, drips, and conducted an operation (caesarean) at 8 am the next morning. It was a girl. They asked us for money at every point – on admission, at delivery, at the time of discharge. It was my bad luck that I needed an operation. In big hospitals, they very much trouble village people like us. It costed us a lot of money. We were going to ARTH health center for (antenatal) checkups every month, but in the end they told us that we needed to go to Udaipur. What is it good for if ultimately you sent us there? I had a second baby afterwards, but I did not come to ARTH and delivered at home. Everything was normal.

Premi[27] / Mangilal, Village Gundali

In some cases who were referred for prolonged labour, families felt that if a referral was required, they should have been told right away at the time of admission to ARTH's health center rather than informing them after some hours (see below).

Janki was a primigravidae and was admitted in ARTH's health center during labour pains at full term. At the time of admission, she was in latent phase of labor and the nurse did not feel any need for referral. Her labour was monitored closely using a partog arph. However, her labour progressed slowly, and she had to be referred after almost 20 hours of admission.

Her husband Khamansingh, a shopkeeper, was very annoyed with ARTH's services. *He said: "We had been regularly going there and they had cheated us They kept us admitted for so many hours and did not tell us that there is something wrong, and that we should have gone to Udaipur earlier.*

Janki[27] Khamansingh, Dhundi, April 2002

Outcome of those who were advised referral but did comply

Forty-seven women were advised referral, but did not comply. Of these, 22 were advised referral in labour, 12 were diagnosed to have a complication during an antenatal check-up, 5 had post-partum complications, while 9 had abortion related complications (table 13).

Of the 22 women who did not comply with referral advice during labour, 12 were advised referral for breech presentation and 8 were advised for pre-term delivery. Of 12 women with breech presentation who did not comply with referral advice, one resulted in one stillbirth and 3 had neonatal deaths. The foetal outcomes were better for multigravidas than for primgravidas. For 8 women with premature delivery, who did not comply with referral advice, 5 neonates died of prematurity, all these had birth weights less than 1.5 kg.

A total of 12 women were advised referral in antenatal period and refused. There were 3 women with antepartum haemorrhage; 2 women delivered at home, and one at the ARTH clinic. None of these women suffered major complications, however there were two neonatal fatalities - one was stillborn, while another died soon after birth. Five women were severely anaemic; 4 left the clinic saying they would independently reach referral hospital. However all, except one woman, delivered at home assisted by a TBA, while one delivered at the ARTH clinic – all women and neonates survived. However, we do not have data on outcomes for other problems for these women. Three women were advised referral for severe pre-eclampsia and did not comply -- two of the three women came during labour and delivered at ARTH health centre. In one case, the family returned to the village because the family was superstitious and concerned about high expenses in the city. In all cases, women did not suffer major adverse outcomes, but the home-delivery resulted in the death of the child after 2 days. Two twin pregnancies were referred, however both delivered at the ARTH clinic; three of the four neonates survived with no accompanying maternal deaths.

Of five women who refused for referral during post-partum period - 4 were diagnosed with post-partum haemorrhage (PPH) and one with retained placenta. All women were managed at ARTH and survived. Of the women with PPH, 2 had delivered at ARTH, while 2 came to ARTH after home-delivery. One woman had a cervical tear, which was stitched.

Nine women with abortion complications refused referral - 7 of them had incomplete abortion, while 2 had septic abortion (without perforation). Most of the patients with incomplete abortion had a pregnancy above 12 weeks and were advised referral because of excessive bleeding. Some of the patients were severely anaemic. All these cases were eventually managed at ARTH clinic, and their management included uterine evacuation or oxytocics and IV fluids. All women survived.

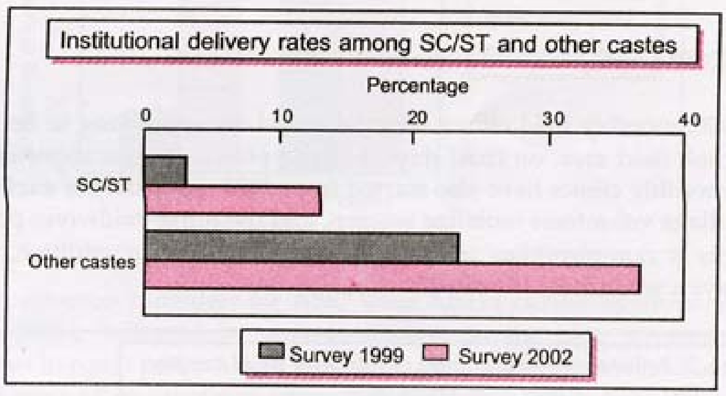
Table 13. Outcome for those who were advised referral but did not go (n= 47)

Type of complication	*Number of women referred*	*Maternal deaths*	*Foetal/neonatal deaths*
Breech	12	0	4
Pre-term labour	8	0	5
Pre eclampsia	3	0	1
APH	4	0	2
Severe anaemia	5	0	0
Twin pregnancy	2	0	1
PPH	4	0	N/A
Retained placenta	1	0	0
Abortion Related	9	0	N/A
Other direct/ indirect complications	3	0	0

5.5 Impact of delivery services

Through cross sectional surveys in field area, ARTH periodically collects data on impact of its interventions. Currently, we have findings of the surveys conducted in 1999 and 2002. However, one survey is going to start in end of year 2005, which will throw light on the current status. However, the findings from the previous 2 surveys (1999 and 2002) show that:

- The proportion of deliveries by skilled attendants almost doubled from 1999 to 2002, from 12% to 24%. Most of this increase was due to deliveries by ARTH and government nurses. The deliveries conducted by nurse-midwives increased from baseline levels of 1.6% to 16% between the two surveys. The institutional delivery rate increased from 12% to 22% during this period. Most of this increase was due to deliveries at the ARTH clinic (table 14).



- When looking at differences in delivery care between tribal/scheduled castes and other castes, it is clear that ARTH's interventions have reduced the disparity between these 2 communities. We had found that at the time of baseline study, the institutional delivery rates for dalit communities was only 3%, while it was 23% for women belonging to other caste. At the time of survey in 2002, 12.5% of dalit women and 37% of other women delivered in an institution. This indicates a four time increase in institutional deliveries by dalit women, and one and a half times increase for other women.

- Skilled birth attendants attended the deliveries of nearly 14% dalit women and 39% other women in year 2002 (table 14).

Table 14: Differences in delivery care between dalit and other caste women

	SC/ST		*Other castes*		*Total*	
	Survey 1999	*Survey 2002*	*Survey 1999*	*Survey 2002*	*Survey 1999*	*Survey 2002*
Institutional delivery rate	3.1	13.1	23.3	36.7	12.1	22.3
Skilled birth attendant	NA	13.6	NA	39.1	12.3	23.9

An analysis of sources of care show that while only 2.4% of dalit women could seek the services of skilled attendant other than ARTH nurses (doctors and government nurses), nearly 24% women of other castes were able to access other skilled attendants. This indicates that ARTH nurses have benefited dalit women the most for delivery care (table 15).

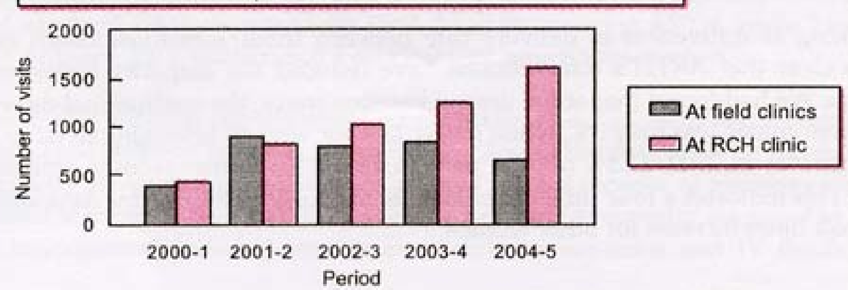
Table 15: Sources of delivery care for dalit and other castes (Survey 2002)

Place of delivery	*SC/ST*	*Other castes*
• Government SC/PHC	0.6	3.3
• City hospital (Govt/Pvt.)	1.5	18.2
• ARTH clinic	10.1	14.4
• Other/ during transport	0.9	1.0
Birth attendant		
• Relative/ self/ TBA	85.5	57.8
• Male health worker/ ayurvedic/Bengali	0.6	1.4
• Government Nurse	0.9	8.4
• ARTH nurse	11.0	14.9
• Doctor	1.5	15.8

5.6 Antenatal Care (ANC)

Since January 2000, monthly field clinics have been and are continuing to be held in 22 project villages of Kuncholi field area, on fixed days, in fixed places. In 6 locations of the Kadiya field area, weekly or monthly clinics have also started from 2003 onwards. For each field clinic, social animators and village volunteers mobilize women, and the nurse-midwives provide the service. It thus represents a non-physician mode of service delivery. In addition, antenatal care is provided on 6 days a week at RCH centres.

Figure 2: Antenatal visits at field clinics and RCH centres
April 2000- March 2005

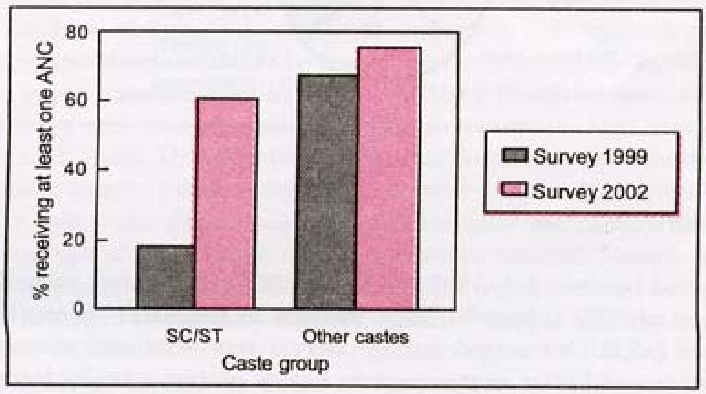


It was not easy in the beginning to get women to get an antenatal check up due to the traditional beliefs of the community. The few who came for an antenatal checkup believed that only tetanus injections were needed, and questioned the need for any other observations or treatment. Over the years, things have changed. Although, many come asking only for tetanus injections, they are provided a minimum essential package of antenatal care[28] so that complications can be detected and managed in time.

Although a range of services was offered at field clinics, they were largely used for antenatal care (data not shown). These antenatal checkups were an opportunity for contact between nurses and pregnant women, that gave women confidence to utilize delivery services. Over the years, the antenatal care services at the RCH centres has increased (figure 2), while attendance at field clinics peaked and then reduced, probably because women found that RCH centres had greater facilities.

Surveys carried out in 1999 and 2002, in Kuncholi field area, showed that the proportion of those receiving at least one checkup improved from 53% to 67%. Disaggregated data by caste shows that these services have disproportionately benefited tribal women, as reflected in the finding that the rate for antenatal contact increased from 18% to 61% for dalit women as compared to 68% to 76% for non-dalit women (fig. 3). Tetanus immunizations and iron coverage also showed significant increases. Those receiving tetanus immunizations went up from 45% to 70% and those receiving iron tablets went up from 40% to 71% and demonstrated consistency in supplementation; most consumed iron for a median duration of 60 days.

Figure 3. Changes in antenatal care for women belonging to scheduled castes/tribes compared to women belonging to other castes.



In 2002, the most common providers for ANC were ARTH nurse-midwives or doctors for both caste categories (52%), followed by private doctors in the city, government doctors and government nurses in equal proportions. However, about 38% women belonging to other castes were able to visit some other private or government provider, while only 10% women belonging to SC/ST communities could do so.

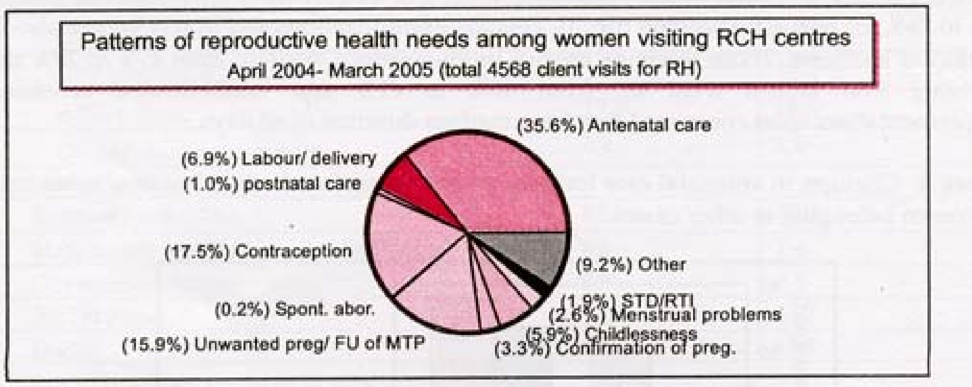
Similarly, ARTH field clinics or its health centre became the most common sites for ANC between 1999 and 2002 - their use increasing from 2.5% in 1999 to 50% in year 2002. It is also interesting to note that for dalit women, monthly village field clinics were the most important source of antenatal care (60%), while women belonging to other castes were more likely to go outside their villages to the ARTH RCH centre, local PHC or hospitals in the city (data not shown).

5.7 Clinic attendance

The number of clients attending RCH centres run by ARTH increased over the years. While initially most clients were coming on days of doctors' visits, a shift occurred, whereby more patients have started coming even on days when only nurses are available to see the patients. In the first year, the average outpatient attendance (OPD) was 60 visits per month, which increased to 663 visits per month in year 2004-05. Out of all visits, 69% visits were by women, 25% were for child health needs and the rest were by men (data not shown). Analysis of data for the year 2004-05 shows that 48% of OPD dients were seen by nurse-midwives, and 52% by doctors.

The breakup of women's reproductive health needs at the clinic in 2004-05 illustrates that 64% client visits were for needs that could be managed by nurse-midwives (antenatal care, delivery, postnatal care, contraception, confirmation of pregnancy), although several of them came on days of doctors' visits (figure 4). The remainder of client visits required examination by a doctor (unwanted pregnancy, menstrual disorders, infertility management, STD/RTI, etc.).

Figure 4. Patterns of reproductive health needs among clients between April 2004 and March 2005



5.8 Contraceptive services

During the 6-year period between July 1999 and March 2005 (after nurses started inserting IUDs independently), a total of 1377 copper-Ts were inserted in the ARTH clinic. Nurse-midwives inserted 717 copper-Ts (all IUDs inserted during interval and lactational amenorrhea periods). Considering that ANMs and LHVs in government health centres actually insert 5-20 IUDs on average per year, this is very significant and reflects on the quality of contraceptive saxvie the ARTH clinic. During the same period, nurse midwives have also continued to provide other contraceptives, including oral pills, condoms and DMPA injections. The doctors initiate DMPA injections after assessing the women's eligibility. However, nurse-midwives give the follow-up doses.

Table 16. Continuing contraceptive users over the years

Method	*1999-2000*	2000-01	*2001-02*	*2002-03*	*2003-04*	*2004-05*
Oral pills (average number of users monthly)	200	254	330	285	299	197
Condoms (average number of users monthly)	179	221	211	133	120	104

DMPA injections (average number of users monthly)	20	31	32.5	56	86	104
Total number of injections given in year	37	122	162	219	297	486
Total copper-T insertions (new insertions during the year)	109	251	286	271	239	221
Total copper-T removals	29	33	56	98	102	130

5.9 Leadership roles by nurse-midwives

Nurse-midwives manage to a great extent all clinic services, including dispensing the drugs, supplies, making their rosters for field clinics and managing them, taking decisions about home visits, providing care in cases of obstetric and neonatal emergencies, arranging transport, taking decisions about subsidy for a referral, maintaining records and registers, etc. In managing clinic attendants they faced few difficulties, clinic attendants tried to defy them occasionally, but resolution was quick after a clear delineation of authority and command was conveyed to the field staff. Nurse-midwives were not meant to directly manage or supervise the work of field workers. However, the responsibility of supervising the field worker–driver was transferred to nurse-midwives since they had to travel with them. We found that they could not adopt this role readily in the beginning, but were able to do it later.

6. Discussion

The lack of qualified physicians in rural areas of Rajasthan has led to a void that has been filled by traditional healers, unqualified village practitioners ("Bengali doctors" or RMPs) and practicing paramedics. The poor state of infrastructure and amenities in villages and small towns does not attract government doctors to interior primary health centres, except for the intrepid few who are willing and able to establish a private practice[29]. However, virtually no private doctors work in such areas. This situation is expected to persist for at least a few more decades, unless recent moves to give panchayats greater control over health institutions bear fruit. Even where doctors or ayurvedic physicians are available, they are mostly male and less oriented towards providing reproductive health care in a sensitive manner. There is a large social distance between male physicians and poor, illiterate or tribal women. The two approaches that have been attempted to improve the provision of maternal health services in rural areas are the holding of ad hoc mobile RCH camps, and the training of traditional birth attendants. Both approaches are severely limited in terms of their ability to reduce morbidity and mortality. Alternatively, the presence of a skilled birth attendant, with transport available in case of emergency, is considered the single most critical intervention in safe motherhood. It has been recognized over the years in both developed and developing countries that professional nurse-midwives, providing skilled attendance at the time of delivery in the home or health centre, can substantially reduce maternal mortality[30, 31].

In our field area we have been able to demonstrate the effectiveness of nurse midwives as skilled attendants. With proper training, professional guidance, supportive supervision, equipment and supplies, nurse-midwives can provide home and institutional delivery, recognize the need for emergency care, provide obstetric first aid, carry out timely referrals, provide contraceptives and manage childhood ailments, while assisting physicians with other RCH services including safe abortion. Additionally, measures such as providing midwives an escort with two-wheeler mobility, pairing them at the health centre, and providing them assistants have contributed to their efficacy.

Our experience shows that even in a community where nearly 90% of deliveries had been occurring in homes and by unskilled providers, there is a latent demand for institutional deliveries, especially for women considered to be high risk by their families. Such demand exists even among the most disadvantaged groups, as indicated by our findings that 42% of women who sought care were from the tribal or scheduled caste community. Such demand can be uncovered if reliable services by culturally sensitive, skilled providers were to become locally available. Community demand for the services of trained nurse-midwives is based on their track record and perception of their skills - as our data suggests this takes one- two years to develop.

Pairing of nurse-midwives and providing their mobility are crucial steps in providing reliable services. We believe that monthly village level clinics have been critical in developing a rapport between nurse-midwives and pregnant women, which allowed for a greater increase in delivery by nurse-midwives. The focus on women friendly services at RCH centres was also vital, made possible by a female majority staff and a continuous effort to respect women's decision-making and rights.

One of the crucial factors that allowed 24 hours services to be provided was that nurse-midwives stayed locally in the same village as the health centre. Previous studies conducted by ARTH have concluded that there is little incentive for trained personnel to relocate to a rural setting. Those nurse-midwives that are of rural origin are more likely to adapt to living in an interior area[32]. In order to sustain the presence of trained nurses to reside in rural areas, we instituted several measures. First, only those nurses who were wiling to live and work in rural areas were recruited; second, we gave priority to nurse-midwives that were of rural origin, and who had lived and been educated at least for some years in a rural area; third, we ensured that their accommodation was secure and had at least very basic amenities such as toilets[33]; and fourth, there were at least 2 nurses at each health centre- this reduced the feeling of isolation and gave them moral support. In addition, the management was supportive and provided motivation to nurse-midwives at regular intervals. Moreover, our employment conditions are better than most private hospitals - the salary levels are similar to regular government scales, and the nurses are provided more leave than other ARTH staff.

Although almost all nurse-midwives felt a lack of confidence in providing services at the time of joining, because of lack of experience in conducting deliveries or any service independently, we took measures to rapidly improve their skills and confidence. Except the first 2 nurses, all nurses had an opportunity to assist and learn from their senior nurses during the initial few months. Moreover, doctors also took measures to support them and to improve their skills proactively based on a skill checklist. With time, the nurse-midwives started getting a feeling of pride and empowerment in their work, because instead to working in 'shadow' of a doctor, they became the 'service providers', who not only received praise from doctors, but also from patients. In Kuncholi village, which is more remote, there has been no telephone facility (at the time of writing this report), because of which nurses were not in a position to consult doctors telephonically if they were unsure about their decision. However, Kadiya village and health centre have a telephone facility, and nurses have been asked to consult the doctors on phone whenever they have any doubt about case management - this has helped a lot in difficult situations.

In an Egyptian study they found that the lack of appropriate facilities does not prevent many women from getting care, but more significantly distance, lack of transportation and the two coupled contribute to 16% of maternal deaths[34]. Although we did not systematically collect data about the mode of transport between women's homes and ARTH heath centres, we feel that its availability was a major factor in determining whether or not they delivered in the ARTH health centres. An Indian study demonstrated that the primary means of transport between rural areas and health facilities is a jeep[35]. Several villages and hamlets are not road linked and do not have a private jeep; women from those villages could not come for deliveries if their labour pains started in evening hours. If labour pains started in daytime, some women had to walk for a few kilometres before they could get a bus to come to the health centre. Lack of telephone facilities in most of the villages is a major barrier. Expansion of telephone facilities in the villages would improve the situation, and possibly ARTH health centres can arrange for sending a vehicle to bring them to the centres or send nurse-midwives to conduct home delivery.

In an Indian study, it was observed that 91% of women from urban referrals reached a hospital within 1 hour after referral while 83% of women referred from a rural setting took up to 4 hours to reach care. This time was found to greatly compromise maternal and foetal condition upon arrival and the success of subsequent treatment. The maternal mortality from rural places was 22/1000 live births in contrast to none from urban places. Similarly, the rural perinatal mortality was 253/1000 births against 58/1000 for urban referrals[36]. Thus decreasing the time between onset of symptoms and treatment is critical to the outcome. Our approach focused on impacting the delays at all levels that postpone care. The primary approach was to provide skilled care in an interior area at the ARTH facility, decreasing distance and offering basic emergency services, often stabilizing patients and decreasing the need for hospital referral. For those requiring referral and emergency obstetric care, ARTH's intervention has impacted on 3 identified delays -- the first delay, related to recognition of the problem, was reduced because the service was available in an interior area. Many families, especially those from tribal and other marginalized communities, are reluctant to go to the city for referral are. The nurse-midwife and accompanying male worker played an important role in facilitating referral by motivating family for referral. An assurance of subsidized treatment for poor families and the guarantee that staff would accompany the woman reduced their fears related to high cost and behaviour of hospital staff. By allaying these fears women more readily accepted referrals decreasing time between diagnoses and departure. Secondly, by arranging subsidized transport, delays related to transport were reduced because transport was pre-arranged and did not need negotiations between family and jeep owners. This model also tried to reduce the third, in-hospital, delay by facilitating admission procedures by accompanying person and procuring drugs to start treatment for poor families.

Contact by a social worker during treatment also increases the quality of care obtained at the referral site. Multiple studies have demonstrated that a significant proportion of maternal mortality is attributed to substandard care after admission[37]. The presence of a knowledgeable intermediary likely contributes to ensuring appropriate and quality obstetric care. Qualitative studies suggest that women's perceptions of care and the lack of cultural sensitivity are barriers to use of delivery services[38,39]. Regular contact by a social worker from ARTH during hospital treatment and interaction with hospital staff contributes to making the facility more receptive to the social and medical needs of rural users, and helps families to get benefits of various schmes of the government.

Although antenatal risk assessment is considered to be ineffective in reducing maternal mortality and has been shown to have very minimal compliance[40], there is a place for elective referral when complications are identified in antenatal period. Based on several studies, the indications for such elective referral can be: previous caesarean section, breech presentation, transverse lie, multiple gestation, hypertension and severe anaemia. It has been estimated that these indications would produce referral rates in the range of 6 to 10%[41]. Studies show that compliance with the advice for antenatal referrals ranges from 12%[42] to 46%[43]. While ARTH provides antenatal care, we did not collect data on elective referral rates and subsequent compliance with those referrals.

While many studies have collected data on elective referral compliance, data on emergency referral compliance is virtually non-existent. Our numbers indicate that 79% of women complied with our referral advice for a complication of labour or for an obstetric emergency. We credit the improved infrastructure, available transport, subsidies, and supportive staff for producing such a strong compliance rate. However, 21% failed to comply. Although we can only speculate about their reasoning, we believe that additional individual counselling could encourage women to make informed decisions, consequently reducing non-compliance. It is noteworthy to mention that within the last month of data collection nearly 100% of women complied with the referral advice. This may suggest that the reputation of the clinic has improved and/or women have more faith in medical practices.

Although rare, our study also assessed women's perceptions about the referral. Of the women who complied with their referral advice, most agreed that the referral was necessary, this is inclusive of those who would have preferred an earlier referral, and were satisfied with their referral. A minority of women felt that their referral was unnecessary, or were annoyed by the advice. Although we feel that inaccurate referral or occasional inconvenience is an unavoidable product of a referral system, we do desire to reduce these statistics. It is likely that a majority of this population was referred in the early stages of data collection and that increased experience reduced the number of unnecessary referrals and most likely the annoyance women experienced.

It is necessary to mention that some recent studies evaluate the competency of skilled birth attendants using model situations and role-play[44]. While we did not assess the competency of ARTH nurse-midwives according to these standards, we are confident that the observational and interactive training they received exceeds average standards to qualify them as skilled attendants.

Our experience in Rajasthan has helped us to define more clearly the resources, infrastructure, facilities and training requirements necessary for nurse-midwives to provide skilled attendance for maternal and child health. One of the greatest achievements of this experience was recognizing the capabilities of nurse-midwives to run a facility. Currently, in the government run health centres male pharmacists or male health workers take on the leadership role in the absence of doctors, without much benefit to reproductive and child health. Although doctors provided out-patient care and guidance to the nurse-midwives on 2 days a week at the ARTH facility, the nurse-midwives successfully played the primary leadership role for delivery and obstetric emergency services and management of health centre. Thus, in government PHCs, where doctors are not available at night, it is necessary to explore the possibility of upgrading the roles of locally resident lady health visitors and auxiliary nurse-midwives into leadership roles. An immediate next step is to orient and sensitize doctors to the public health importance of a greater role of nurse-midwives, and to foster a genuine desire to empower them.

While this scenario can be implemented relatively easily at PHCs where nurse-midwives stay and provide delivery services while doctors visit on an out-patient basis, it is unclear how well our experience can be translated at smaller health centres where a nurse-midwife provides services without much support from doctors. Recently, in collaboration with the government's health department, ARTH has started an intervention to train, equip and support 20 auxiliary nurse-midwives in 2 interior tribal blocks of Udaipur district. Moreover, 3 NGOs of Rajasthan supported by Population Foundation of India, have started implementing maternal and child health services, including delivery and obstetric first aid services through nurse-midwives. The experiences of both these interventions will shed light on the feasibility of this approach and will help further define the components of "supportive environment" for interiors of Rajasthan.

Training Curriculum for Nurse-Midwives

Module I. Safe motherhood and child survival programmes

Causes of maternal and child mortality and various factors contributing to it, strategies to reduce maternal deaths, role of nurse-midwives in safe motherhood and in treatment of children

Module II. Clinical skills in maternal care

1. Antenatal care:
    - Complete minimum package of antenatal care
    - Physical examination and simple laboratory tests: Hemoglobin, urine albumin, pregnancy test
    - Counseling and treatment during pregnancy
    - Detection and management for minor problems and complications of pregnancy

2. Monitoring progress of labor and conducting delivery.
    - Monitoring progress of labor using partogarph
    - Identification of complications of labour such as abnormal presentations, prolonged / obstructed labour, maternal & fetal distress etc. and take appropriate action or refer.
    - Conduct delivery
    - Management of third stage

3. Postpartum care
    - Routine postpartum care of mother and newborn
    - Detection and manage for postpartum complications

4. First aid and early management for obstetric complications
    - Antepartum hemorrhage
    - Post partum Haemorrhage and retained placenta
    - Prolonged and obstructed Labour
    - Puerperal sepsis
    - Eclampsia and pre-eclampsia
    - Complicated abortion

5. Referral
    - Care during transport
    - Negotiating care at referral hospitals

Module III. Family planning services

- Contraceptives methods
- Pelvic examination
- Confirmation of pregnancy
- Client selection and screening, counseling, procedure of use, side effects, management of side effects, and discontinuation in regards to following reversible methods:
    - Oral pills
    - Condoms
    - Copper-T
    - DMPA
- Using Copper-T quality kit

Module IV. Skills in Child health

1. Integrated management of childhood illnesses
- Assessment and classification of a sick child using IMCI approach
- Management of a sick child using the same approach
- Counseling mothers on health and nutrition
- Organizing and conducting immunization sessions

2. Newborn care:
- Immediate care of newborn, including resuscitation
- Identification and management of sepsis in newborns
- Referral of sick newborns
- Home management of bw birth weight newborns
- Counseling mothers on newborn care

Module V. Quality of care, counseling and MIS

1. Quality of care
- Quality of care in reproductive and child health services: its importance
- Elements and indicators for quality of care
- Measures to ensure and monitor quality of care.
- Management of client flow

2. Management information system:
- Maintenance of Maternal Health card, Child Health Register, Hospital/Clinic register and supervisory check list.
- Preparation of reports
- Interpretation and use of reports to improve performance

3. Counseling and Interpersonal communication skills:
- Relevance of the client communication and counseling.
- Principles, and skills and steps of counseling
- Specific situations such as counseling (pregnant women, women who need contraception, women with unwanted pregnancy)
- Education & counseling regarding childhood illnesses, childcare

Case definitions

1. Prolonged labour: Labour in which cervical dilatation is slow as depicted on partogarph, which reaches alert line or action line.
2. Transverse lie: Presenting part shoulder or hand
3. Severe anaemia: Hemoglobin level below 7 gm %
4. Moderate anemia: Hemoglobin level 7-9 gm%
5. Pre eclampsia: Diastolic BP above 90 mmHg with or without albumin urea
6. Eclampsia: Fits during pregnancy, labour or postpartum period, with signs of pre eclampsia
7. Antepartum haemorrhage: Bleeding from vagina after 28 weeks f pregnancy
8. Retained placenta: Placenta did not come out for more than 1 hour after birth
9. Primary PPH: Excessive vaginal bleeding within 24 hours of delivery as perceived by nurse midwife or doctor (when deliveries are assisted by NMs) or as perceived by families and was severe enough to seek medical attention (when deliveries were at home)
10. Secondary PPH: Excessive vaginal bleeding more than 24 hours after delivery as perceived by nurse midwife or doctor or as perceived by families and was severe enough to seek medical attention (when deliveries were at home)
11. Puerperal fever: Temperature above 38 degree C on any day between 2-42 days after delivery
12. Puerperal sepsis:
13. Abortion complication: Excessive bleeding per vaginum or moderate bleeding PV with fever before 28 weeks of pregnancy

- Spontaneous abortion complication: An abortion complication there was evidence that the pregnancy was wanted (e.g. history of infertility or bad obstetric outcome and no intervention was done to induce it)
- Probably or possibly induced abortion complication: Abortion complication in a woman with suspicion that the pregnancy was unwanted (e.g. does not desire any more children, pregnancy out of wedlock) or there is history of vaginal interference, or an object used to induce abortion was expelled in front of provider.

14. Other direct complication: Any direct obstetric complication other than antepartum hemorrhage, postpartum hemorrhage, retained placenta, puerperal sepsis, eclampsia, pre-eclampsia, abortion complication, prolonged labour, transverse lie.
15. Multiple pregnancy: Pregnancy with more than one fetus
16. Fetal distress: Fetal heart rate less than 120 per minute, or above 160 per minute or presence of meconium stained liquor
17. Breech presentation: Presenting part breech
18. Rh incompatibility: Mother with Rh negative blood group, with poor obstetric outcome (repeated still births, or mid-trimester abortions/ neonatal deaths)
19. Cord prolapse: Cord coming out of cervix before delivery
20. Intra uterine fetal death: Absence of fetal heart activity as evidenced by auscultation and confirmed by ultrasound or Dopple
21. Other indirect complication: Any indirect complication other than severe anemia. Examples include heart disease, hepatitis, tuberculosis etc.

References and notes

[1] NFHS-1 and 2

[2] World Health Organization, UNICEF and UNFPA. Maternal Mortality in 1995: Estimates developed by WHO, UNICEF, and UNFPA. WHO, 2001.

[3] Sample Registration Survey, 1998

[4] Risk assessment usually conducted by antenatal care involves a set of criteria to classify women as being at "high" or "low" risk of deveoping serious maternal complications. The women identified to be at "high risk" are meant to receive special care and attention by health system.

[5] In 1996, WHO shifted its focus from *trained* birth attendants to *skilled* attendants. This shift was based on the recognition that someone who has been trained is not necessarily skilled; "trained" implies but does not guarantee the acquisition of knowledge and ability, while "skilled" implies the ability to provide competent care and assistance during pregnancy, childbirth, and the postpartum period. A skilled birth attendant can be a midwife, a nurse with additional midwifery education, or a physician with appropriate training and experience, but does not include trained traditional birth attendants.

[6] World Health Organisation. "Reduction of maternal mortality: A Joint WHO/UNFPA/UNICEF/World bank Statement". 1999

[7] World Health Organisation. "Reduction of maternal mortality: A Joint WHO/UNFPA/UNICEF/ World bank Statement". 1999

[8] Census of India, 2001

[9] National Family Health Survey -2 (1998-99)

[10] Mohan P, Iyengar SD, Mohan SB, Sen K. *Daily Up-Down: Why would the Auxiliary Nurse-Midwife (ANM) of Rajasthan prefer to reside within her work area?.* Action Research & Training for Health (ARTH), Udaipur, 2002

[11] Baseline study for the "Copper-T Choice & Quality Project, Udaipur district. ARTH, Udaipur, 2003

[12] Mohan P, Iyengar SD, Mohan SB, Sen K. *Daily Up-Down: Why would the Auxiliary Nurse-Midwife (ANM) of Rajasthan prefer to reside within her work area?.* Action Research & Training for Health (ARTH), Udaipur, 2002

[13] Expanding the role for midwives is to an extent restricted by nursing council regulations regarding the procedures that they are allowed to perform

[14] The gynaecologist had been visiting bi-weekly since the inception of the health centre, whereas the paediatrician started providing chid health services on a weekly basis during the year 2000-2001

[15] Action Research & Training for Health, 2005. *Skilled care for Maternal & Neonatal Health: a Practical Guide for Nurse-Midwives.*

[16] Since there are no telephones in the village, the male health worker who is mobile, and spends nights at the health centre personally arranges for the vehicle.

[17] Most jeep owners in the village offer subsidised transport at Rs 500 for a trip to Udaipur for ARTH patients

[18] In Kadiya field area 2 outreach clinics are held at weekly frequency.

[19] All the ARTH volunteers are tribal women, hence most field clinics were held in tribal hamlets.

[20] Delivery services started at Kadiya health centre from April 2003 onwards

[21]tThe nurses were instructed not o give oxytocic injections during labour to hasten, since they are harmful.

[22] Overall, for 57 women, nurses were called at home, but in some cases they directly referred from home, and in some cases they had to advice women to come to health centre sincethere was a shortage of nurses and there were other women in labour at that time.

[23] NFHS Rajasthan 1998-99

[24] Govt of India, WHO, UNICEF, World Bank, NNF, Save the children. *"State of India's Newborns"* 2005.

[25] Less serious complications of pregnancy were not included in obstetric emergencies.

[26] Some women came on days when a gynaecologist was available, who provided them treatment

[27] Names of all women have been changed in this document.

[28] This is adapted on the basis of the 4visit model of WHO. This includes enquiry about danger signs, haemoglobin estimation, blood pressure, assessment of uterine growth, foetal presentation, foetal heart sounds and urine test for albumin, tetanus toxoid injection, iron tablets, treatment of other conditions, decision on need for referral, counselling about the place of delivery and education about danger signs

[29] In Rajasthan, government doctors are allowed to practice from their homes after duty hours. For those doctors who are highly "practice-oriented", many if not most working hours come to be associated with private practice. Admission or treatment in the government health centre or hospital also become linked to private consultations at the doctor's house- most rural patients acquiesce in this practice, believing it to be

the norm. However, in small towns or large villages where many PHCs are located, the community's paying capacity may be insufficient to sustain a doctor's private practice. The availability of doctors in such "remote" PHCs tends to be irregular.

[30] Paxton A, Maine L, Freedman D, Fry D, Lobis S. *The Evidence for Emergency Obstetric Care.* Int. J Gynecol Obstet 2005; 88:181-193.

[31] Van Lerberghe W, De Brouwere V. *Of blind alleys and things that have worked: history's lessons on reducing maternal mortality.* In: De Brouwere V, Van Lerberghe W, editors. Safe Motherhood Strategies: a Review of the Evidence. Stud Health Serv Organ Policy. Antwerp: ITG Press 2001:17

[32] Mohan P, Iyengar SD et al. *Daily Up Down: Why would an auxiliary nurse midwife (ANM) of Rajasthan prefer to reside within her work-area?* Action Research and Training for Health, Udaipur. 2003.

[33] Majority of houses in the villages of our field area do not have toilets and bathing area.

[34] MOHP (Ministry of Health and Population). 1997. *Rapid Assessment for the Maternal Mortality in Egypt.* Esmat Mansour (general director for Maternal and Child Health Care and Executive Director for Healthy Mother/Health child Project); Said El Sharkawy (consultant for HM/HC project). In: Koblinsky MA, editor. Reducing Maternal Mortality: Learning from Bolivia, china, Egypt, Honduras, Indonesia, Jamaica and Zimbabwe. The World Bank. Washington, DC: 2003.

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