Introduction

Over 100,000 Indian women die annually from pregnancy and childbirth-related causes, thus accounting for one-quarter of maternal deaths worldwide. The most recent statistics indicate an average maternal mortality ratio of 407 per 100,000 live births at the national level. The government had hoped to reduce maternal mortality to 200 by 2000, but it is clear that this was not achieved. This paper explores the reasons why the most populous state of Uttar Pradesh continues to have one of the highest reported maternal mortality ratios in India. Data from two districts of Uttar Pradesh on mother and child health care utilization and the readiness of the public sector to provide antenatal and emergency obstetric services are used to illustrate the reasons why maternal mortality has not declined. While blueprints for safe motherhood programmes exist, the equipment and technical competence to provide services is weak at the present moment. Reductions in maternal mortality would require interventions to improve service delivery as well as community mobilization to improve utilization of services, especially in life-threatening situations.
Government of India programmes

The Reproductive and Child Health (RCH) Programme launched in October 1997 is the newest initiative introduced by the Government of India to improve the survival both of mothers and their children. As the RCH programme builds on the Child Survival and Safe Motherhood (CSSM) Programme, launched in August 1992, we describe the latter in detail. The programme was designed to address the major causes of morbidity and mortality in women and children. It integrated maternal and newborn care and, with loans from the World Bank and UNICEF, strengthened first level referral facilities for emergency obstetric care. The CSSM strategy was expected to lower maternal mortality to 200 per 100 000 live births by the year 2000 (Government of India 1991), a goal which is still quite distant.

The safe motherhood component of the CSSM programme aimed to redress the neglected components of maternity services, with the provision of essential obstetric care for all, early detection of complications, and emergency obstetric care. The overall focus was on the prevention of maternal deaths. Antenatal services included early detection and management of complications such as anaemia, preeclampsia, malpresentation and obstructed labour. Since most deliveries take place at home, traditional birth attendants were trained about the importance of clean delivery practices, called ‘the five cleans’; infection prevention during delivery through the use of safe delivery kits was encouraged. The programme envisaged emergency obstetric services and referral for those in need of it. It used a high-risk approach in traditional birth attendants and sub-centre staff were told to refer women with poor obstetric histories, with heart and kidney diseases, or suffering from tuberculosis or malaria to hospitals for institutional deliveries. A network of first referral units was planned under the CSSM programme (Government of India 1993). These units were to be identified from sub-district health facilities and equipped with personnel, drugs and supplies. They were to be equipped and staffed to conduct vacuum extractions, provide for spinal and general anesthesia, blood transfusion, caesarean sections and abdominal surgery, manual removal of placenta, suction and curettage, IUD insertions and removals, and sterilization operations.

An assessment of the CSSM programme conducted 5 years after the programme began suggests that the programme’s goals were too ambitious and the results were disappointing. Even where equipment and supplies were available, emergency obstetric care was not provided because obstetricians and anesthetists were not in place and operating theatres did not have blood for emergency transfusion (MotherCare 1996).

Methodology

Data presented in this paper are from three different surveys conducted in Agra and Sitapur districts of the state of Uttar Pradesh. The first is a baseline survey along the lines of the Demographic and Health Survey; the second is a situation analysis of public sector facilities; the third is a feedback survey of knowledge and current practice of Auxiliary Nurse Midwives (ANMs) working in the primary health care facilities. The analysis reviews the knowledge and decision-making capability of ANMs to identify and manage obstetric complications. Each of these surveys is described below.

The baseline surveys are representative of the two districts and provide district level information on utilization of antenatal and delivery services for pregnancies that had occurred within 2 years of the survey date. Specifically, data on the source of antenatal care (private, public), timing of first antenatal visit, coverage of iron and folic acid tablets and tetanus toxoid injection, place of delivery (public institution, private institution, home), and person assisting delivery (medical personnel, trained birth attendant, untrained birth attendant, family member) are presented. The community-based baseline survey in Agra district covered 2864 ever-married women in the age group 13–49 years and was conducted in 1995 (Population Council and MODE 1995). The baseline survey of Sitapur district interviewed 2521 ever-married women in 1993–94 (Population Council and ORG 1995).

At the same time a situation analysis of public sector facilities was conducted in 1995 to assess the availability, functioning and quality of services. In this survey, primary health centres (PHCs) and sub-centres were the two levels of facilities covered. Data was gathered on services provided, equipment and supplies available, including drugs and vaccines. It also included information about current personnel detailing their training and experience. A total of 19 PHCs, 93 sub-centres, 107 health personnel (ANMs and Lady Health Visitors) and 183 villages were covered in Agra district (CSD and the Population Council 1995a). In Sitapur district, 22 PHCs, 113 sub-centres, 113 health personnel and 270 villages were covered (CSD and the Population Council 1995b).

The third source of information was a survey of ANMs working in PHCs and sub-centres in Agra, Sitapur and Jhansi districts, which was conducted soon after the situation analysis in 1996 (Khan et al. 1996). Fifty-one ANMs in Sitapur, 22 in Agra and 20 in Jhansi district were interviewed to ascertain their training needs in order to design refresher training. Approximately half of the group had received in-service training to upgrade their skills. The trained ANMs had undergone an in-service competency-based training at selected training institutions such as community health centres, post-partum centres or district hospitals for 3 weeks followed by a week of training in information, education and communication (IEC) at the ANM Training Centre (IPP VI 1987). The training covered antenatal care, assistance in normal deliveries, infant care especially of the newborn, and family planning emphasizing IUD insertions. Since this paper specifically deals with maternal mortality, the knowledge assessed related to maternal survival. The aspects of antenatal care...
included are the ability to recognize complications during pregnancy and delivery, management of complications, awareness of where emergency services are available and actions required for a safe delivery.

In addition to the data presented above, we also present information on antenatal and delivery care from the National Family Health Survey (NFHS) conducted in Uttar Pradesh in 1992-93. The survey collected information from a representative sample of 11,438 ever-married women aged 15-49 residing in 101,100 households (IIPS 1995). These data are representative of the state of Uttar Pradesh as a whole.

As the purpose of the paper is to describe the situation of services and current health seeking behaviour, the data are presented in univariate or bivariate form.

Findings

Data from the three surveys have been analyzed to assess levels of utilization of antenatal and delivery services and the readiness of the health centres for management of routine and emergency obstetric care.

Utilization

Less than half of the pregnant women in rural Uttar Pradesh had sought any antenatal care; the situation in the two districts is considerably worse with over three-quarters of women in Sitapur and three-fifths of women in Agra reporting no antenatal care. Even when care is sought, it usually tends to be in the second trimester and field observations indicate the primary purpose is to confirm the pregnancy. Such poor levels of antenatal care are not surprising in contexts where women’s health care utilization in general is low and pregnancy is not considered an event requiring any special medical attention.

In terms of iron and folic acid coverage, though data on actual intake is not known, a third of the women interviewed in Agra district reported receiving iron and folic acid tablets compared to a fifth in Sitapur district. Tetratonic toxoid injections are encouraged due to the need for immunity against tetanus arising from unhygienic delivery conditions. However, the data indicate that tetratonic toxoid administration ranges from 35% in Sitapur to 45% in Agra. Such low levels of coverage should be looked upon as a missed opportunity to provide care to women who do come into contact with the health care system.

Close to 90% of deliveries in Uttar Pradesh were conducted at home and in nearly half the cases the baby was delivered by family or kin. The situations in Agra and Sitapur districts echo the same pattern of a great proportion of home deliveries. Over 90% in Sitapur and nearly 75% in Agra district. When deliveries occur at home, typically family members, or untrained birth attendants, known to the household attend them – in Sitapur untrained birth attendance was at 90% and at 60% in Agra. Thus most deliveries in both districts occur in situations that may not be ready to identify or respond to obstetric complications. Timely recognition of a complication and effective referral can be life-saving.

In summary, these data demonstrate the low level of use of the modern health sector for antenatal or delivery services. Current scientific opinion indicates that providing skilled attendance to detect and manage obstetric complications, backed with the tools for effective management, is the most important factor in preventing maternal death (WHO 1999b). Thus, possibilities of reducing maternal mortality without commensurately increasing trained deliveries are not optimistic.

Readiness

In this sub-section, we examine the ability of health centres to handle five specific conditions which have often been cited to be important causes of maternal death: hypertension, haemorrhage, obstructed labour, sepsis and anaemia. In particular, we look at the availability of equipment and supplies to handle each of these complications. We also look at the knowledge of ANMs to detect and manage them. We focus on the ANM as she is the frontline health worker approached most by clients.

Pre-eclampsia and eclampsia

Pre-eclampsia is a disorder in pregnancy relating to hypertension with proteinuria and oedema. If untreated pre-eclampsia can lead to eclampsia or convulsions. Pre-eclampsia can be detected by measuring blood pressure; readings of the order of 140/90 can be considered abnormal (Marshall and Buffaloing 1991). Presence of protein in urine along with oedema and high blood pressure also indicates pre-eclampsia. Other less specific signs include headaches, dizziness and visual problems, which can be discerned in a medical history. The guidelines for managing severe pre-eclampsia and eclampsia in primary health care settings are referrals for appropriate care.4

Basic equipment such as sphygmomanometers are available in a little over half the sub-centres (55% in Agra and 57% in Sitapur) and about 70% of PHCs (74% in Agra and 68% in Sitapur). Facilities for testing urine for sugar and albumin are not available at sub-centres and are marginally better at PHCs. For example, a third of PHCs in Sitapur district reported having capacity to do urine testing. Emergency equipment to keep nasal and oral airways free are available in only 11% of PHCs in Agra and 14% of PHCs in Sitapur. Given the lack of equipment, the propensity to detect and manage hypertensive disorders of pregnancy is constrained.

We next examine the knowledge of ANMs to detect pre-eclampsia in pregnancy. As can be seen from Table 1, the symptoms of pre-eclampsia – high systolic blood pressure and abnormal weight gain – are not well recognized among both trained and untrained ANMs. Weight gain of over 5 kg per month in the last trimester was not related to pre-eclampsia; just one trained and one untrained ANM reported it being related to pre-eclampsia. Among those who reported weight gain to be a ‘pregnancy complication’, the most frequent response was the difficulty of delivering big babies. In general, convulsions were well recognized as a danger sign if they occur during labour or after delivery: at least seven out
of ten ANMs (35 trained and 33 untrained) reported convulsion as a symptom of eclampsia. From these data, it is clear that training does not seem to have improved the knowledge levels of ANMs who have undergone it.

Adequate antenatal care is compromised by the inability to recognize pre-eclampsia. Further, when blood pressure is not measured, urine not tested and swelling not noted, pre-eclampsia is likely to go unnoticed unless it is specifically brought up as a complaint by the woman.

Haemorrhage

Haemorrhage, whether it is in the antepartum, delivery or postpartum periods, is a cause for concern. The recommended course of action for antepartum haemorrhage is management for shock and referral to a hospital (WHO 1994). Haemorrhage during delivery and postpartum is more serious and managed by treatment for shock – administration of oxytocin, antibiotics and IV fluids – and referral to a hospital.

Numerous discussions with various doctors posted at different facilities – PHCs, community health centres, postpartum centres – indicate that management of shock or stabilizing the haemorrhaging woman before transfer and referral is not common practice in the study districts. Patient stabilization, if done at all, tends to be restricted to postpartum centres; after stabilization the patient is referred to the nearest district hospital. Oxytocin is available only at big facilities like PHCs and postpartum centres. Transportation to higher levels of care tends to be primarily a community responsibility and ambulances, even if available, are found only in district hospitals.

Table 1. Knowledge of pre-eclampsia and eclampsia

<table>
<thead>
<tr>
<th>Symptoms of pre-eclampsia</th>
<th>Number of ANMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>High systolic blood pressure (140+)</td>
<td>24</td>
</tr>
<tr>
<td>Weight gain ≥ 5 kg per month in last trimester</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reasons for abnormal weight gain*</th>
<th>Number of ANMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related to pre-eclampsia</td>
<td>1</td>
</tr>
<tr>
<td>Water in uterus</td>
<td>21</td>
</tr>
<tr>
<td>Swelling in body</td>
<td>13</td>
</tr>
<tr>
<td>Pregnancy complication</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms of eclampsia*</th>
<th>Number of ANMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convulsions</td>
<td>35</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>20</td>
</tr>
<tr>
<td>Vomiting</td>
<td>16</td>
</tr>
<tr>
<td>Severe headache</td>
<td>10</td>
</tr>
</tbody>
</table>

| Total number | 48 | 45 |

* Multiple responses possible.

ANM = Auxiliary Nurse Midwife.

In terms of knowledge, a high proportion of ANMs, both trained and untrained, were able to indicate that bleeding in the antenatal, intrapartum and postpartum periods required immediate referral to a first referral unit. It is not clear, however, whether ANMs reported referrals because of their own lack of confidence and skills in managing such complications or whether it stemmed from a correct knowledge of procedures. That knowledge of procedures is inadequate is clear from questions on management of antepartum and postpartum haemorrhage; for example, less than half could report that postpartum haemorrhage could be managed by administering ergometrine injections (see Table 2). Associated knowledge concerning time to death from the onset of haemorrhage is also weak. Thus, although there is recognition that haemorrhage is a serious condition, complete knowledge of its symptoms and management is lacking.

Obstructed labour

Malpresentation and cephalo-pelvic disproportion are two principal reasons for obstructed labour. Monitoring the progress of labour, prompt detection and referral to a health facility with capacity to conduct caesarean sections are the ways of managing obstructed labour. Drugs to improve the pattern of contraction monitored by a doctor and caesarean sections can alleviate the complication of obstructed labour.

Obstructed labour can be handled only at first referral units that have staff including female gynaecologists, anaesthetists, drugs and emergency supplies, as well as the physical facilities to conduct caesarean sections. Sub-centres and PHCs can only refer and arrange transport for cases onwards to first referral units immediately after detection of the complication.

In terms of knowledge, both trained and untrained ANMs had a fairly high level of information about obstructed labour.
and its management (see Table 3). For example, nearly nine-tenths of all ANMs (43 trained and 39 untrained) were aware that prolonged labour lasting more than 18 hours in multipara women required immediate referral to a first referral unit, and three-quarters knew that oxytocin was not to be administered; less than half of ANMs could report that a retained piece of placenta (22 trained and 18 untrained) could be causes for puerperal sepsis. On the other hand, stress on asepsis and hygienic IV dispensing equipment including needles, sterilizers, soap and disinfectant. Sub-centres are not required to provide IVs and ANMs are not allowed to prescribe antibiotics. Such facilities are available only at PHCs and higher levels of care. Thus issues of access become important in dealing with puerperal sepsis, as adequate care is available only at higher levels. The issue of access is further compounded by the inability of family and midwives in the community to recognize puerperal sepsis.

Even among ANMs, knowledge is limited: less than half of those trained (23) knew that puerperal fever could indicate sepsis, compared to over three-fifths (29) of those untrained (see Table 4). As noted in earlier sections, knowledge is fragmented: less than half of ANMs could report that a retained piece of placenta (22 trained and 18 untrained) or infection of the birth canal (24 trained and 20 untrained) could be causes for puerperal sepsis. On the other hand, stress on asepsis during delivery has been clearly understood using the

memory aid of the five cleans: clean hands, clean delivery surface, clean blade to cut the cord, clean string to tie the cord, and clean cord are well known among all ANMs irrespective of training status. While nine out of ten ANMs were able to report the first four cleans, only two-thirds were able to cite keeping the cord stump clean. Unclean cords are the most likely cause of tetanus and septicaemia in the newborn.

### Anaemia

Anaemia has been posited to be an indirect cause of maternal death; it has been hypothesized that in its severest form, it increases the risk of haemorrhage. As more than 50% of Indian women are anaemic, ANMs are required to examine the women for visible signs such as pallor of nails, eyelids and gums, to advise about iron and folic acid rich foods, and to distribute iron and folic acid tablets.

Testing of blood to measure haemoglobin levels is often not possible at the sub-centre level, as they are not equipped with the equipment and reagents to do so. Even bigger facilities such as PHCs may not have the capacity to conduct haemoglobin tests. Situation analysis data from Sitapur district indicates that less than a third (32%) of PHCs had the necessary equipment in working order. However, the availability of equipment does not guarantee availability of the blood testing facility if lab technicians are not available. Body weight can be used as an indicator of nutritional status and to monitor weight gain over pregnancy; however, less than 10% of the sub-centres in Sitapur (5%) and Agra (6%) districts had adult weighing scales. The situation in PHCs was better with over half (53% in Agra and 59% in Sitapur) being equipped. Field visits to several facilities in these districts indicate that the supply of iron and folic acid tablets is good and they may be the one commodity that is almost universally available at all health centres.

ANMs were asked about the recommended dosage of iron and folic acid tablets for severely anaemic pregnant women and about two-thirds reported that they would prescribe 200 tablets, with no discernible difference between those who had undergone training (32) and those who had not (28). Thus,
Despite the widespread prevalence of anaemia, many ANMs are unaware of how to redress this condition.

In the above sections we have looked at the readiness of the primary health care system to detect and manage complications of pregnancy and delivery. In brief, rudimentary capacity in terms of equipment and supplies and staff competence to handle some complications exist, but there is considerable scope for improving the readiness of services to detect and manage obstetric emergencies.

Discussion

Reducing maternal mortality in settings where health care utilization is low and where the capacity to provide services is inadequate is doubly challenging. In the earlier sections we have noted that the resources (both equipment and technical competence) of the public sector to provide maternity services during emergencies are weak at the current time. Primary facie, reductions in maternal mortality will not be easy without increased trained attendance at delivery backed by access to emergency obstetric care. Recognising that the scope of antenatal care per se is limited, we conclude this paper by suggesting three strategies to complement and strengthen the government’s initiative in providing essential and emergency obstetric care. First, training ANMs in accurate recognition and management of obstetric complications; second, developing messages to teach communities to recognize emergency obstetric situations and arrange transportation to a first referral unit; and third, building on the antenatal visit to provide information and sustain links between services and communities.

Data presented in this paper reveal that most training thus far has concentrated on routine antenatal and postnatal care, and not on practical life-saving skills. Most pregnancy outcomes are normal; however, every pregnancy has the potential to develop complications that could lead to death and health providers need to be trained in these aspects. They also need a sufficient number of opportunities to practice skills learnt in training and the low levels of utilization of health facilities is a real constraint to the institutionalization of training. Training combined with actual use institutionalizes competence. Some feasible examples are available from two Safe Motherhood demonstration projects in Ghana and Vietnam of the types of training and service delivery that have shown positive results (Sloan et al. 1996). These studies demonstrated that provision of life-saving skills training and emergency obstetric care equipment at high volume hospitals improved the detection and management of life-threatening complications. ANMs in rural Uttar Pradesh are capable of the same skills as ANMs in more advanced settings.

In the above sections we have looked at the readiness of the antenatal visit to be used more effectively as it is an important point of contact between the health services and the pregnant woman. Familiarity with a place where a trained provider is available 24 hours of the day, awareness of signs of impending danger, promotion of clean and hygienic delivery practices, information on sources of care, timeliness of seeking care and improved nutritional status through micronutrient supplementation (Sloan 1998) are all positive outcomes of such contact. There is growing evidence that micronutrient supplementation of vitamin A, beta-carotene and calcium may reduce maternal morbidity and mortality, though conclusive proof of their efficacy is awaited. Preliminary results from a large randomized trial in Nepal indicate that weekly doses of beta-carotene or vitamin A can reduce pregnancy-related mortality (West et al. 1997). Calcium supplementation has been recommended as a way to reduce hypertension during pregnancy, and possibly pre-eclampsia; however, the evidence of the effect is mixed. While two reviews of randomized controlled trials suggest that calcium supplementation during pregnancy does reduce blood pressure and pre-eclampsia (Caroli et al. 1994; Bucher et al. 1996), a third suggests that the efficacy of calcium supplementation to prevent pre-eclampsia is not demonstrated (Repke and Robinson 1998). As anaemia continues to be a very serious problem in India, and with 49% of reproductive aged women being anaemic in Uttar Pradesh, iron and folic acid supplementation during pregnancy as prophylaxis should continue to be a standard feature of the maternal and child health care programme.
child health programme (IPS and ORC Macro 2000). However, in the future the emphasis should be on early initiation and prolonged use into the postpartum period to decrease levels of anaemia among breastfeeding women. It is known that for folic acid to be sufficient to prevent deficiency related foetal malformations, it must be taken early, preferably pre-pregnancy, and for iron supplementation to be effective it should be taken for a long enough period to reduce anaemia (Sloan et al. 1992).

In conclusion, life-saving skills training, educating communities and building on existing antenatal efforts may be efforts worth pilot testing.

Endnotes

1 A total of 408 deaths nationally were reported in the SRS sample, with much smaller samples at the state level. Uttar Pradesh reported the highest number of maternal deaths (124) and its maternal mortality ratio is the highest in the country.

2 Both Block PHCs, which serve a population of 100 000, and the ‘new’ PHCs, which serve a population of 30 000, were represented in the survey. A sub-centre is the lowest level of health facility and serves a population of 5000.

3 A community health centre is a referral facility serving a population of 100 000. Beds are available for in-patients. A range of services is provided including mother and child health services, family planning and curative services. Four doctors and several ANMs are posted at this facility. A postpartum centre provides gynaecological and maternal and child health services, and family planning services exclusively for women. Delivery and recovery rooms are available. A district hospital is the apex referral hospital in rural primary health care.

4 In well-equipped hospital settings, magnesium sulphate is administered to prevent seizures (Repke and Robinson 1998).

5 According to the CSSM training undergone by the ANMs, death could occur within 12 hours of antepartum haemorrhage and within 2 hours of postpartum haemorrhage.

6 Other causes of puerperal infection include retained placenta, prolonged labour with ruptured membranes, unhygienic instrumentation, genitourinary tract infections and wound infections.

Also, preliminary data for Uttar Pradesh indicate that 46% of pregnant women and 51% of breastfeeding women were anaemic.

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