

# Cost-effectiveness of Interventions to Lower Maternal Mortality: The Role of Quinacrine Pellet Nonsurgical Female Sterilization

Elton Kessel, M.D., M.P.H.  
Clinical Professor  
Department of Public Health and Preventative Medicine  
Oregon Health Sciences University  
Portland, OR 97201 USA

For Presentation at the --

Pan African Maternal & Child Health International Conference  
May 25 - 27, 1994  
Marriott Hotel, Cairo, Egypt

## **Cost-effectiveness of Interventions to Lower Maternal Mortality: The Role of Quinacrine Pellet Nonsurgical Female Sterilization**

The Safe Motherhood Initiative was launched in 1987 at an international conference (1) in Nairobi, Kenya, following a decade of studies (2-10) by the World Health Organization (WHO) and other agencies showing unacceptably high maternal mortality with little evidence of improvement in recent years (11,12). Several approaches have been proposed as cost-effective ways to lower maternal mortality including the risk approach (13), expanding antenatal care (14) and training traditional birth attendants (TBAs) (15). More recently the need to improve first referral facilities to care for complications of pregnancy, delivery and the postpartum period has been advocated (16). While improved contraceptive prevalence has been recognized as an important primary preventative of maternal mortality (17), it has seldom been taken into account in assessment of risks and benefits of a new contraceptive method.

### **The Risk Approach**

The risk approach as developed by WHO (13) proposes to screen women to identify those at high risk of maternal complications. They would then be provided extra care, while those at low risk would receive basic care. It can be shown that those at high risk are, indeed, more likely to have a complication which can, hopefully, be referred for treatment or the complication even prevented if discovered early.

The problem with this approach is that the sensitivity and specificity of screening is generally poor and most high risk cases identified for referral do not develop the expected complication, while most complications occur to women at low risk. This has been revealed in numerous studies, such as for the risk of obstructed labor in Zaire (18). Women who had stillbirth, or an early neonatal death, or who had required a medical intervention during a previous delivery were nine times as likely to have an obstructed labor in the current pregnancy as women without this kind of obstetric history. However, only 29% of all obstructed labors were predicted by this obstetric history.

A further difficulty with the risk approach is the assumption that effective treatment is available for identified high risk women. In this respect, the risk approach has greater potential for success in industrialized (19) than in developing countries, where most maternal deaths occur.

A still further limitation of antenatal screening is the lack of evidence for the value of antenatal care, per se (20-22). Research to evaluate the value of various accepted components of antenatal care is inhibited by the undocumented assumption of its value, which makes it unethical to have a control group needed for research. The association of antenatal care with improved pregnancy outcome events is probably related in part to healthier women of higher

socioeconomic groups using antenatal services and the availability of adequate treatment for referred cases rather than preventive measures of the antenatal visit.

### Training of TBAs

In spite of vast training programs for TBAs, there is little evidence that these programs have reduced maternal mortality. Training is generally of short duration without a continuing education component and trainees seldom conduct deliveries. The illiterate status of most trainees is no doubt a further obstacle. Training programs that have demonstrated a reduction in perinatal mortality (23) have been intensive and costly.

### Essential Obstetric Functions

The evidence that a religious group in the United States that refuses medical treatment (24) has the same maternal mortality risk as obtains in rural India illustrates the need for available essential obstetric functions if maternal mortality is to be lowered WHO defines these as (16):

- . perform cesarean sections
- . administer anesthesia
- . give blood transfusions
- . perform vacuum extractions
- .. perform vacuum aspiration for incomplete abortion
- insert intrauterine contraceptive devices
- .. perform surgical sterilization

In addition, manual removal of placentas is considered essential. However, the cost of providing facilities, medical supplies and training for these essential obstetric functions at peripheral health centers and rural hospitals where women are likely to be referred when in serious obstetric difficulty is burdensome for economically depressed countries. Despite these high costs, Maine (25) estimates the cost per prevented maternal death of this service compares well with other service programs, as seen in her estimates as follows (in US \$):

Antenatal	care	.....	\$17,692
TBA	Training	.....	17,692
Health centers and urban hospital		. . . . .	6,014
Family	planning	.....	5,750
Health centers and rural hospital		.....	3,735

These estimates were made for a population with maternal mortality of 800 per 100,000 live births. It assumed a cost of \$40 for services and supplies to prevent a pregnancy and that the family planning service would prevent 20% of obstetric deaths and 50% of abortion deaths.

## **The Quinacrine Pellet Method (Q Method) of Nonsurgical Female Sterilization**

The Q Method (26,17) involves transcervical administration of 252mg of quinacrine twice at a monthly interval in the proliferative phase of the menstrual cycle. The pellets (Fig. 1) are made to accommodate a Copper T IUD inserter (Fig. 2) and are inserted at the fundus (Fig. 3). Quinacrine causes a sterile inflammation and scar that is limited primarily to the intramural segment of the tube (27). The method is safer than surgical sterilization in terms of early complications or case fatality (17). With quinacrine alone, pregnancy failures are 2-3 at one year per 100 women but can be reduced to less than one by addition of an antiprostaglandin, such as ibuprofen, and three months additional contraception from first insertion (28). The cost of materials is only \$1 per insertion and the extra cost of the entire procedure in most developing countries would be about \$5.

Each sterilization prevents an average of two pregnancies. For each 1,000 additional sterilizations by the Q Method, the lives of 16 women would be saved in an area with eight maternal deaths per 1,000 live births, at an estimated cost of \$5,000 or \$316 per prevented maternal death.

The Q Method is clearly the most cost-effective way to prevent a maternal death. However, it can contribute to reduction in maternal mortality only by serving the unmet need for a permanent method of family planning, which is approximately 10% in Africa, but rising, and higher in Asia where desired family size is lower.

### **Conclusion**

The reduction of maternal mortality will require a variety of program inputs. The most cost-effective of these would be the Q Method. However, it may contribute to only 10% of the needed reduction in Africa, but a higher percent in Asia where desired family size is smaller and sterilization services are difficult to provide, especially in remote rural areas where it is most needed (29).

## REFERENCES

1. Starrs A. Preventing the tragedy of maternal deaths: a report on the International Safe Motherhood Conference, Nairobi, February 1987. Washington D.C., World Bank, 1987.
2. Alauddin M. Maternal mortality in rural Bangladesh: the Tangail District. *Stud Fam Plann* 1986; 17(1): 13-21.
3. Bhatia JC. Levels and causes of maternal mortality in southern India. *Stud Fam Plann* 1993; 24(5): 310-8.
4. Kwast BE, Rochat RW, Kidane-Mariam W. Maternal mortality in Addis Ababa, Ethiopia. *Stud Fam Plann* 1986; 17(6): 288-301.
5. Chen LC, Rahman M, D'Souza S, Chakraborty J, Sardar AM, Yunus MD. Mortality impact of an MCH-FP program in Matlab, Bangladesh. *Stud Fam Plann* 1983; 14: 199-209.
6. Khan AR, Jahan FA, Begum SF. Maternal mortality in rural Bangladesh: the Jamalpur District. *Stud Fam Plann* 1986; 17(1): 7-12.
7. Lingmei Z, Hui D. Analysis of the causes of maternal death in China. *Bull WHO* 1988; 66(3): 387-390.
8. Mola G, Aitken I. Maternal mortality in Papua new Guinea 1976-1983. *Papua New Guinea Med J* 1984; 27(2): 65-71.
9. Fortney J, Susanti I, Gadalla S. et al. Reproductive mortality in two developing countries. *Am J Public Health* 1986; 76(2): 134-8.
10. Harrison KA. Childbearing, health and social priorities: a survey of 22,774 consecutive hospital births in Zaria, Northern Nigeria. *Br J Obstet Gynaecol* 1985; 92(S5): I-120.
11. Royston E, Armstrong S. Preventing maternal deaths. Geneva: World Health Organization, 1989.
12. Zahr CA, Royston E. Maternal mortality: a global factbook. Geneva: World Health Organization, 1991.
13. Backett EM, Davies AM, Petros-Barvazian A. The risk approach in health care - with special reference to maternal and child health, including family planning. Public Health Papers No. 76, World Health Organization, 1984.
14. US Department of Health and Human Resources. Caring for our future: the content of prenatal care. Washington D.C.: Department of Health and Human Resources, 1989.
15. Maglacas AM, Simons J. The potential of traditional birth attendants. WHO Offset Publication No. 95, Geneva: World Health Organization, 1986.
16. World Health Organization: Essential obstetric functions at first referral level. Report of a technical working group, Geneva, 1984. Document FHE/86.4. Geneva: WHO, 1986.
17. Hieu DT, Tan TT, Tan DN, Nguyet PT, Than P, Vinh DQ. 3 1,781 cases of non-surgical female sterilisation with quinacime pellets in Vietnam. *Lancet* 1993; 342: 213-7.
18. Kasongo Project Team. Antenatal screening for fetopelvic dystocias. A cost-effectiveness approach to the choice of simple indicators for use by auxiliary personnel. *J Trop Med* 1984; 87(4): 173-83.
19. Stembera Z. Countrywide perinatal surveillance in Czecholovakia. *Int J Gynecol Obstet* 1989; 30: 17-22.

20. Enkin M, Chalmer I. Effectiveness and satisfaction in antenatal care. London: William Heinemann Medical Books, Ltd, 1982.
21. Kessel E. Maternity care: Its opportunities and limits to improve pregnancy outcome. In: AR Omran, J Martin, B Hamza (eds) High Risk Mothers and Newborns. Thun: Ott Publishers, 1987.
22. Rooney C. Antenatal care and maternal health: How effective is it? Geneva: World Health Organization, 1992.
23. Rahman S. The effect of traditional birth attendant and tetanus toxoid in reduction of neonatal mortality. Dhaka: National Institute of Population Research and Training, August 198 1.
24. Kaunitz AM, et al. Perinatal and maternal mortality in a religious group avoiding obstetric care. *Obstet Gynecol*, 1984; 150(7): 826-31.
25. Maine D. Safe motherhood programs: options and issues. Center for Population and Family Health, Columbia University 199 1: 46-5 1.
26. Zipper J, Cole LP, Goldsmith A, Wheeler R, Rivera M. Quinacrine hydrochloride pellets: preliminary data on a nonsurgical method of female sterilization. *Int J Gynaecol Obstet* 1980; 18: 275-90.
27. Bhatt RV, Paricio A, Laufe LE, Parmley T, King TM. Quinacrine-induced pathologic changes in the fallopian tube. *Fertil Steril* 1980; 33: 666-7.
28. Merchant RN, Prabhu SR, Kessel E. Clinicopathologic study of fallopian tube closure after single transcervical insertion of quinacrine pellets. *Int J Fertil* 1994; in press.
29. Kessel E, Zipper J, Hieu DT, Mullick B, Mumford SD. Quinacrine pellet method of nonsurgical female sterilization. In: *Proceedings of the VIIIth World Congress on Human Reproduction*. Carnforth, UK: Parthenon Publishing, 1994; in press.