ORIGINAL ARTICLE

An Initial Assessment of the Risk Approach to Antenatal Management in Malaysia

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Summary

This study was the first assessment of a nationwide risk approach system to antenatal management introduced to Malaysia in 1989. Three rapid, record-based surveys on three different study groups were conducted to determine risk factor prevalence, accuracy of risk assignment, action after risk assignment and the relationship of risk level and place of delivery. The most frequent risk factors were short birth interval, high parity and first pregnancy. Accuracy of risk assignment was highest at the lowest levels of risk and poorest at the highest levels. Women at the lowest levels of risk were more likely to be seen by a doctor than women at highest risk. There was a trend to deliver in hospital, rather than at home, as level of risk increased; but many women at high risk still delivered at home. Recommendations are made on modifications to the system prior to future evaluation.

Key Words: Prenatal care, Risk, Risk factors, Risk management

Introduction

"Something for all and more for those in greater need"[1].

It has been estimated that at least 500,000 women die from causes related to pregnancy and childbirth each year[2]. Ninety-nine per cent of these deaths take place in developing countries, and the vast majority of these occur among "unbooked cases", that is women who have had no antenatal care[3].

Antenatal care provides an opportunity to screen for those women at high risk and select those who need special care. Contributory or directly causative conditions, such as cephalopelvic disproportion, previous caesarean section or multiparity, can be detected at the first antenatal visit. Other conditions, such as hypertension, toxaemia and anaemia, can be controlled and monitored.

A system is necessary whereby risk factors are assessed and appropriate action, including referral, can be taken

according to the level of severity of the risks. Since Nesbitt and Aubry[4] published their paper, "High Risk Obstetrics", in 1969, many different numerical risk scoring systems have been developed. In theory, the higher the score, the greater the risk of developing a problem in the course of pregnancy. Wall[5] reviewed over 50 of these scoring systems and found that they had an overall sensitivity of 50%. Scoring was time-consuming and finally no more accurate than clinical judgment. For these reasons, risk scoring systems are not widely used in developed countries.

In essence, the risk approach can be considered a managerial device for the rational distribution of scarce resources[6]. Training of health personnel, continuous supervision, a simple layout of the record card and a clear definition of risk factors are essential for risk identification at the primary health care level[7].

Lesinski[8] reviewed many studies of the risk approach in developed and developing countries. He found that most screening methods made use of arbitrarily selected risk factors derived from either the personal experience of the investigator or from prior perinatal studies. The weighting of various risk factors was also assigned arbitrarily. Indicators used to identify individuals at special risk must be adapted to local conditions and be relevant to local needs[9].

Knowledge of the prevalence of specific local risk factors is essential in formulating referral criteria that will make optimal use of health facilities, without overloading them. In Hulu Terengganu District, State of Terengganu, Ghee[10] classified 33% of the total number of new antenatal attenders as high risk. Of those so classified, 55.6% were grandmultiparas (para 6 and above) and 38.3% primigravidae. Koay and Kumar[11] reported that 38.1% of pregnant women in Machang, State of Kelantan, and 36.1% of pregnant women in Kuala Muda, State of Kedah, were at high risk. High parity was the most common risk factor. Thirty-four per cent of high risk women in Machang had more than one risk factor.

In Pasir Mas District, Faisal bin Hj. Ibrahim[12] reported 39% of pregnant women as high risk. The prevalence of common risk factors in this high risk group is displayed in Table I.

Table I
Prevalence of risk factors in high risk pregnant women in Pasir Mas District
(from Faisal Bin Haji Ibrahim 1989)

Risk factor	Percentage of high risk women
Age less than 19 years	4.6
Birth interval less than 2 or greater than 5 years	38.0
Age 35 years or greater	41.0
Gravida 6 or greater	61.5
Poor obstetric history	66.5

After a study in Krian District, Perak, which identified the nature and prevalence of local risk factors, a national, four-tiered risk system was instituted in Malaysia in September, 1989[13]. In this system, antenatal attenders are colour coded as one of four colours: white, green, yellow or red.

The main innovation of this scheme is that it does not involve scoring. After history-taking and examination, a risk checklist is completed at each attendance. If there is more than one risk checked, the colour code is decided by the highest risk. At present, the risk checklist is on a separate piece of paper that is attached to the antenatal card. The ultimate intention is to incorporate the checklist into the antenatal card.

A self-adhesive coloured tag is then placed in the upper right-hand corner of the antenatal card. This colour coding determines further action, according to prescribed guidelines. "Red" signifies a life-threatening condition and immediate labour ward admission. "Yellow" indicates risk factors that require antenatal monitoring and treatment by a doctor. "Green" implies that complications may develop and progress should be monitored by a senior nurse. "White" indicates no risk and these women can be monitored by the community nurse or midwife. Women coded "red", "yellow" or "green" should deliver in hospital. "White" cases are considered

suitable for supervised home delivery, but in fact all women are urged to deliver in hospital.

This study was the initial assessment of the Malaysian risk approach system. The objectives were: to determine the prevalence of risk factors in the study population; to calculate the sensitivity of colour coding by clinic staff according to level of risk; to calculate the difference in colour coding sensitivity with and without the use of the risk checklist; to assess action after colour coding and to determine the relationship between assigned level of risk and place of delivery.

Methods

The assessment was made up of three distinct surveys. The target population of the first survey consisted of all pregnant women attending antenatal clinics within a defined area of Pasir Mas District, Kelantan State, for the first time over a five-week period in 1990. The defined area is that geographically distinct area of responsibility of the health centres at Pasir Mas Town (PKB Pasir Mas) and Tendong (PKK Tendong), and includes the District Hospital – 15 clinics in total. The population of the study area is 96,837, including 22,977 women aged 15 to 44 years[14]. For each attender her antenatal card was reclaimed after processing and colour coding by clinic staff. Information recorded on the antenatal card was transcribed to the researcher's questionnaire. If the risk checklist or colour coding were not completed by clinic staff during the session, records were re-examined one week later.

The second survey consisted of a retrospective check of the antenatal cards of all attenders, not just first attenders, within the study area over a one-week period in January, 1990. The colour code on each card and the recorded caregiver at next contact with the health service were noted in order to determine action after colour coding.

The third retrospective, record-based survey targeted all women who delivered in the study area during February, 1990. The colour code on each card and place of delivery were recorded.

In addition, an inventory check was carried out at each clinic for equipment vital to identification of risk factors.

Results

The first survey group consisted of 279 antenatal first attenders as defined above. Of these, 275 with standard antenatal cards were assessed to determine risk factor prevalence, risk checklist usage and sensitivity of colour coding.

Risk factor prevalence

Information was recorded from clinic antenatal cards and risk factor prevalence tabulated, which is summarised in Figure 1. The three most common risk factors were short birth interval, multigravidity and first pregnancy.

Colour coding

Colour coding and risk checklist use

Of 275 standard antenatal cards assessed, 86.2% were colour coded (Fig. 2). 62.2% were coded during the clinic session and 24% by one week later. 44.4% (112/275) of antenatal cards contained a completed risk checklist (Fig. 3). 26.9% were completed during the clinic session and 17.5% by one week later.

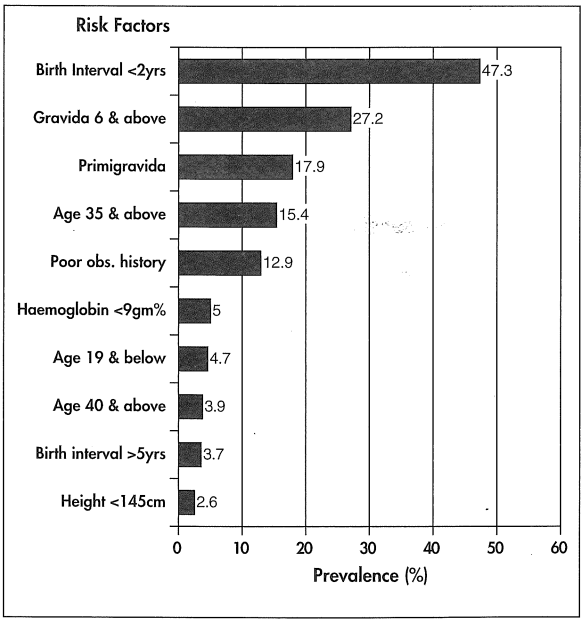

Fig. 1: Prevalence of risk factors amongst all first attenders at Antenatal Clinics in Northern Pasir Mas District

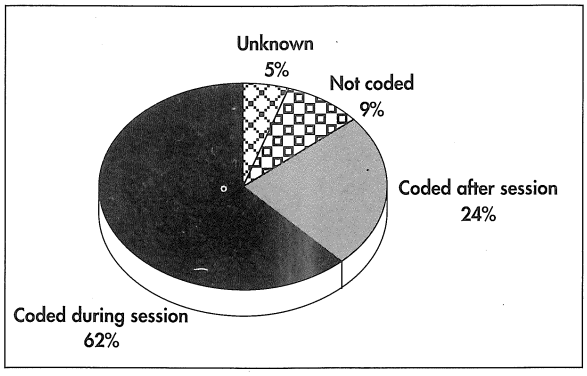

Fig. 2: Colour coding of 275 antenatal cards

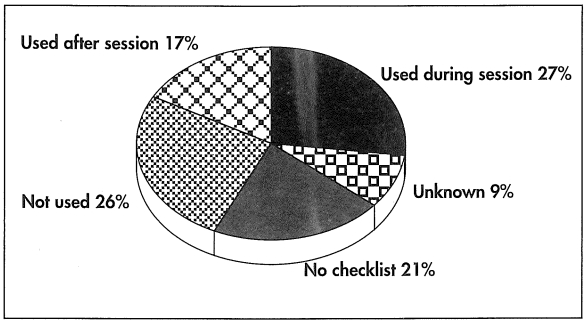

Fig. 3: Use of the risk checklist of 275 antenatal cards

20.7% (57/275) of antenatal cards had no risk checklist at all one week after the first clinic attendance.

Colour coding sensitivity – overall

The clinics coded 74.7% (177/237) of women as either green, yellow or red, that is, as high risk. 75.1% (178/237) of women were coded as high risk by the study team, *using the same data from antenatal cards collected by health staff.* However, there were only 137 women identified by both clinics and the study team as high risk. Using the study team coding as the true coding, the overall sensitivity for detection of high risk women by clinics was 77% (137/178).

Colour coding sensitivity – red

Four women were coded red by the clinics. Based on data collected by the clinic staff, only two cases were coded red by the study. However, there were no cases in common.

The four cases coded red by clinic staff originated from two clinics. All of these women had a history of previous premature labour and were incorrectly recorded on the risk checklist as being in "preterm labour with gestational age less then 37 weeks", thus requiring a red code and immediate admission to hospital.

In two cases coded red by the study team and yellow by the clinics, information was correctly recorded on the antenatal card and then incorrectly recorded on the risk checklist, resulting in incorrect colour coding.

Colour coding sensitivity – yellow

There were 25 women coded as yellow by the clinics, and 44 coded by the study team, with 19 common cases (Fig. 4). This gives a sensitivity of 43.2%. Of the 25 women not coded yellow who should have been, 15 had risk checklists completed. Of these 15, 10 were recorded on their antenatal cards as having an abnormal lie, but their risk checklists were not so marked. All 10 women were at less than 32 weeks gestation. If these cases are eliminated, then the clinics' sensitivity improves to 62.9%.

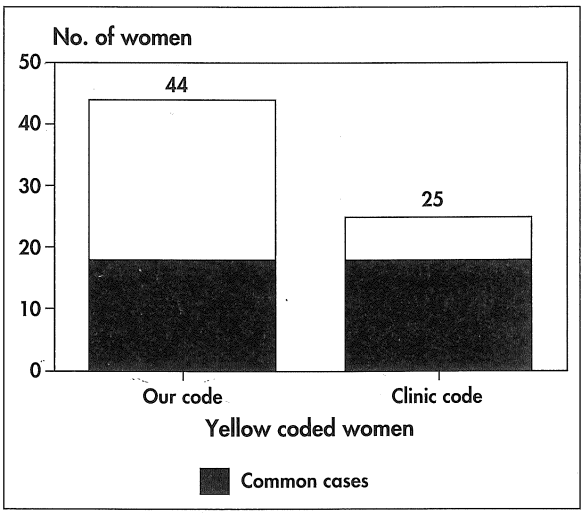

Fig. 4: Comparison of coding of yellow cases by clinic staff and study team

Colour coding sensitivity - green

There were 148 and 132 women coded as green by clinic staff and the study team, respectively. 94 were common, resulting in a sensitivity of 71.2% (Fig. 5). There are two major reasons for the discrepancy. Firstly, clinic staff code all primigravidae as green, not just those at the extremes of reproductive life, as defined by the checklist. Secondly, 13 women with a birth interval of less than 2 years were not coded green, but should have been according to colour coding guidelines. If primigravidity at any age is considered a risk factor, then sensitivity rises to 75%.

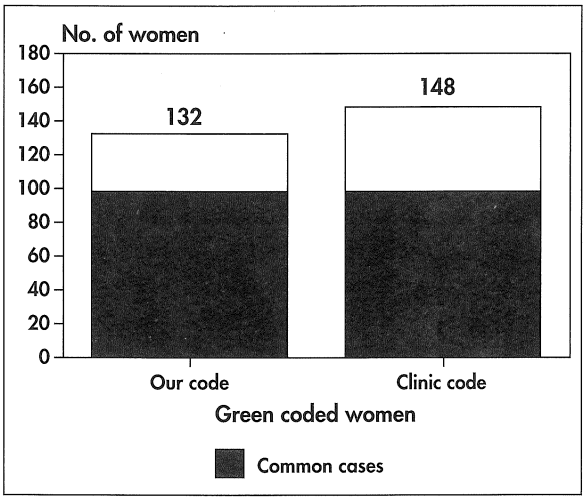

Fig. 5: Comparison of coding of green cases by clinic staff and study team

The effect of the risk checklist on sensitivity of coding

Table II compares the sensitivity of colour coding between the 122 records with a completed risk checklist and the 98 without. The sensitivity is only slightly higher for each colour, or level of risk, in the group who used a checklist.

Equipment used to measure risk factors

All health service facilities in the study area had the equipment necessary to measure risk factors. A stethoscope, sphygmomanometer, scales, height measurer, thermometer, measuring tape, foetoscope and haemoglobinometer were present in all clinics. There

Table II
Comparison of the sensitivity of colour coding of 220 cases coded with and without the risk checklist

Colour	Sensitivity	
	Checklist used (n=122)	Checklist not used (n=98)
Red	0	0
Yellow	44%	40%
Green	72%	70%
All high risk	80%	73%

is one anachronism on the risk checklist. For the detection of glycosuria, the checklist lists colour changes appropriate to the use of Benedict's Solution. Testing in all clinics is performed using urine dipsticks, which have different colour changes for glycosuria. Midwives mentally convert one set of colour changes to the other.

Caregiver after colour coding

The second survey group consisted of all attenders, not just first attenders, at 11 *Klinik Desa* in the study area during a one week period in early 1990 (n=161). Of the 161 women, 138 did not deliver before or at their next visit. The 138 antenatal cards were examined after their next visit, in order to determine the relationship between colour coding and caregiver at that next visit.

28 women were first attenders, who routinely see a doctor at the next visit, regardless of level of risk. This routine antecedes the new risk approach system. 64.3% of them saw a doctor at their next visit (Fig. 6).

Of the remaining 110 women, two were coded red. Neither of them was seen by a doctor on their next contact with the health service. Of 16 women coded yellow, 3 were seen by a doctor at the next visit, and the rest seen by a midwife (Fig. 6).

There were 50 women coded green. 13 were seen by

a doctor at the next visit, 2 were seen by a sister and the remainder were seen by a midwife. 10 out of 30 women coded white were seen by a doctor at the next visit (Fig. 6).

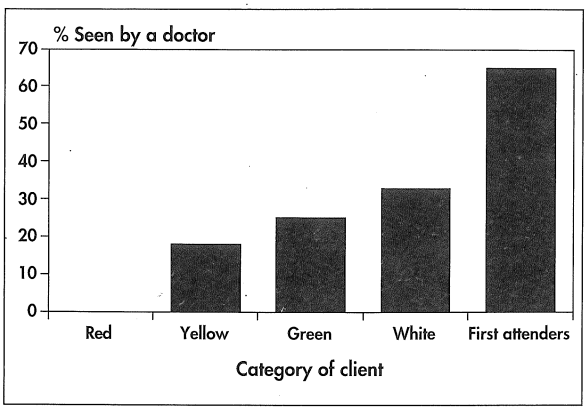

Fig. 6: Percentage of antenatal clinic attenders, by category, seen by a doctor at their subsequent visit

Colour coding and place of delivery

The third survey group consisted of all women who delivered in the study area during the calendar month of February, 1990. Their records were examined in order to determine the relationship between colour coding and place of delivery.

Of 221 deliveries, 205 were colour coded. There was a trend to hospital delivery with increasing level of risk (Fig. 7). However, 40% of "red" cases and 23% of "yellow" cases still delivered at home.

Discussion

75% of women in the main study group were classified as high risk, both by clinic staff and the study team. Short birth interval and high parity were the most prevalent risk factors. This is not unexpected in a population in which only 3.7% of women use contraception. Women of high parity or short birth interval who have had no previous problems in pregnancy or labour are coded green and advised to deliver in hospital. Many of them disregard clinic advice, as evidenced by the fact that almost half of surveyed women coded green who delivered did so at home (Fig. 7).

These results highlight the inherent paradox in risk approach systems. It is difficult to predict poor pregnancy outcome from a consideration of antenatal risk factors[5]. To ensure that a high proportion of poor obstetric outcomes are predicted using a risk system, a large proportion of pregnant women need to be considered high risk. This strains limited health resources and disaffects those women who are referred unnecessarily. "In practice, referral only works when it is very selective"[3]. We recommend that risk criteria should be revised in order to decrease the proportion of pregnant women classified as high risk. Health service resources can then be directed to women at the highest levels of risk ("red" and "yellow" under the present scheme).

The correct coding of pregnant women at risk by health service staff was assessed. Sensitivity varied at different levels of risk. It was better at a lower level of risk, namely green, than at higher levels. The reasons for misclassification were examined.

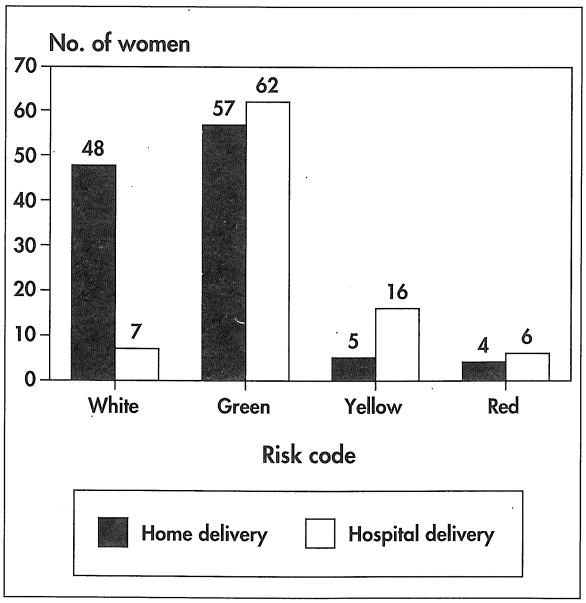

Fig. 7: Colour coding and place of delivery of 205 antenatal clinic attenders

At the highest level of risk, red, correct information was elicited, but women were incorrectly coded. One woman had glycosuria and the second had a haemoglobin of 7.2 gm/dl. These were mistakenly transcribed to the risk checklist as "urine sugar test – green and yellow" (rather than "orange") and "Haemoglobin 8 to 9 gm%", respectively. In consequence they were coded yellow.

There was also misclassification of four "green" cases as "red". This did not affect sensitivity. The incorrect coding resulted from a misunderstanding of coding criteria on the risk checklist. The four women had histories of premature labour, but were classified as being in premature labour. This criterion on the risk checklist requires clarification to indicate that it refers to premature labour during the present pregnancy, not a past history of premature labour. Despite the red code, none of these four women were immediately transported to hospital, as required by the risk guidelines. In each case, routine antenatal care continued. It was our impression that the midwives concerned acted with considerable clinical acumen, and ignored the conflicting message of the colour coding.

The major cause of poor sensitivity in the "yellow" group was failure to code for abnormal foetal position, which is a criterion on the risk checklist which does not specify gestational age. Breech presentation is not considered a problem before a gestational age of 32 weeks and oblique lies are not a problem prior to 36 weeks[15]. As all the women thus misclassified were of less than 32 weeks gestation, this is not an unreasonable action. With adjustment of coding criteria to correspond with this practice, sensitivity improved from 43% to 63%. It would appear in this instance that midwives coded according to their clinical judgment, rather than to the risk checklist.

Discrepancies in the coding of antenatal attenders coded green arose mainly from failure to code for birth interval of less than two years. In addition, all primigravidae were coded green regardless of age.

In summary, incorrect coding by health staff arose from a misunderstanding of risk criteria, or coding according to their own clinical judgment. On the whole, we found midwives to be knowledgeable, competent and to know their communities and clients well. We recommend that risk classification criteria need to be clarified in consultation with service delivery personnel in relation to : the classification of primiparous women; wording concerning the coding of premature labour as distinct from a history of premature labour; the classification of abnormal foetal lie requires specification of gestational age threshold; urine dipstick colour changes which indicate grades of glycosuria need to replace colour changes of Benedict's solution, which is no longer used.

Each antenatal card should have an attached risk checklist, which is completed by health staff at each antenatal attendance. Its purpose is to help staff to correctly identify those women at high risk, and to grade them according to level of risk. Less than half of risk checklists were used at all. Over one third of these were completed after the clinic. Risk checklists give the health worker more work to do. There seems to have been little consideration of the opportunity costs to health workers of checklist use. Moreover, there was negligible difference in the sensitivity of colour coding between those coded with and those coded without a risk checklist.

Consideration should be given to replacing the risk checklist by one or more laminated reference checklists displayed prominently in each clinic.

Antenatal cards of 138 *Klinik Desa* attenders over a one-week period were examined after their subsequent visit. The health professional by whom they were seen was recorded. Two thirds of the 28 first attenders were seen by a medical officer. Of 13 women who should have been seen by a doctor under the coding scheme, only 4 were. Of the 50 women who should have been seen by the staff nurse, only two were. The two "red" cases saw a midwife. In brief, those at lower levels of risk were more likely to see a doctor than those at higher risk (Fig. 6).

One function of the risk approach is to act as "a tool for the reappraisal and reorganization of health and other services"[16]. This rapid sketch of action after coding indicates that the new risk approach has had little impact on the redirection of scarce professional

resources to those at highest risk. Pre-existing antenatal protocol prescribes that first attenders should see a doctor on their next visit. Our results confirm that this is the case. Those classified as at highest risk under the new system, however, did not see a doctor. Doctors and senior nurses were observed giving public health lectures in *Klinik Desa*, but not attending those women coded as yellow in the same clinics. We recommend further training of staff at all levels as to the principles and procedures of the new risk approach in order to promote a sense of staff ownership and better integrate it into antenatal management practices.

The colour coding of all women who delivered in the study area over a one-month period was noted from records. There is a trend to deliver in hospital as level of risk increases. The proportion of women classified as high risk who delivered at home was lower than the 71% reported by Koay and Kumar[11] in Machang or 58.5% reported by Faisal bin Hj. Ibrahim[12] in Pasir Mas. However, a perceived community reluctance to deliver in hospital and a preference to deliver at home is evident in the fact that 4 out of 10 "red" cases and 5 out of 21 "yellow" cases still delivered at home.

An excellent health service exists at *Klinik Desa* level, which provides support for those women who deliver at home. Women with no obstetric problems should not be discouraged from supervised delivery at home. Health worker efforts should be focused on correctly identifying women at risk and providing them with antenatal education concerning the risks of pregnancy and the benefits of hospital delivery.

Personal, family and cultural factors, such as past history of short labour, the desire to have a family member around and not wanting to leave other children at home, have been important reasons related to the preference to deliver at home despite medical advice[11]. Hospital-related factors, such as a previous bad experience in hospital and financial problems, were also reasons for selecting home delivery[11,12].

Hospital personnel must provide an environment which is empathetic to the social and cultural needs of the community. To this end, we recommend increased access of family members to the labour ward.

In conclusion, we recommend further evaluation of the present risk approach to antenatal management. This study provides baseline data for future comparison if the same rapid, record-based methods are employed.

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References

1. World Health Organisation. Editorial. WHO Chronicle 1977; 31 : 150-1.

2. Royston E, Lopez AD. On the assessment of maternal mortality. World Health Stat Q 1987;40 : 214-24.

3. Royston E, Armstrong S (eds). Preventing Maternal Deaths. Geneva: World Health Organisation, 1989.

4. Nesbitt RE, Aubry RH. High risk obstetrics. Am J Obstet Gynecol 1969;103 : 973-85.

5. Wall EM. Assessing obstetric risk: A review of obstetric risk-scoring systems. J Fam Pract 1988;27 : 153-63.

6. Herz B, Measham AR. The Safe Motherhood initiative : Proposals for Action. Washington:World Bank, 1987.

7. Alisjahbana A, Peeters R, Meheus A. Traditional birth attendants can identify mothers and infant at risk. World Health Forum 1986;7 : 240-2.

8. Lesinski J. High risk pregnancy: Unresolved problems of screening, management, and prognosis. Obstet Gynecol 1975; 46 : 599-603.

9. Fortney JA, Whitehorne EW. The development of an index of high-risk pregnancy. Am J Obstet Gynecol 1982;143 : 501-7.

10. Ghee LK. Response of women in high-risk pregnancies in Hulu Terengganu. Med J Malaysia 1987;42 : 16-21.

11. Koay M and Kumar C. An Exploratory Study to Examine Factors Related among High Risk Expectant Mothers to Deliver in Hospital. Kuala Lumpur: Ministry of Health Malaysia, 1985.

12. Faisal Bin Haji Ibrahim. Factors related to acceptance/or refusal for hospital delivery among the high risk pregnant mothers in rural community. Thesis for Master in Primary Health Care Management. Mahidol University, Bangkok, 1989.

13. Raj Karim. Country experience in the risk approach project Malaysia. In: Omran AR, Martin J and Hamza B (eds). High Risk Mothers and Newborns: Detection, Management and Prevention. Geneva: Ott Publishers, 1987.

14. Ministry of Health Malaysia. Demographic Statistics from Information and Documentation System Unit, 1989.

15. Danforth SI. Dystocia due to abnormal fetopelvic relations. In Danforth SI and Scott J (eds). Obstetrics and Gynecology 5th Edition. Philadelphia: JD Lippincott, 1986.

16. Backett EM, Davies AM, Petros-Barvazian A. The Risk Approach in Health Care:With Special Reference to Maternal and Child Health, including Family Planning. Geneva:World Health Organisation, 1984.