ASSESSING THE UTILITY OF RISK FACTORS INDEX IN PREGNANCY

By

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I INTRODUCTION

Pregnancy is a period of great anabolic activity when most rapid rates of growth known to medicine takes place. As it is known that the foetus develops at the expense of the mother she should remain in good health throughout pregnancy so as to provide for optimum development of the foetus and still remain healthy (Gopalan, 1976).

Indian Council of Medical Research (1984) has estimated that infants and women in the reproductive age group (15-45 years) comprise about 37 percent of the total population in India. Stembera (1981) points out that in terms of morbidity and mortality, mothers and children particularly infants are still amongst the most vulnerable groups in the population. Bhandari (1983) warns that India's infant mortality rate of 125 per 1000 is the highest in the world. Gopalan (1978) has computed that in a developing country one out of every fifty women in the reproductive age die during pregnancy. Rao (1979)has estimated that maternal mortality stands at a staggering figure of 370 per 100,000 births accounted for by poor obstetric care, malnutrition and postpartum infections.

Madhu Nath (1973) states that since life for an infant starts before birth, during its perinatal stage it becomes imperative that the attention is focussed on the health and nutrition of the mother right from pregnancy.

Perinatal mortality has been extensively studied in different parts of the world. In India, several studies have reported high perinatal mortality about 43 per cent of which were attributable to preventable causes which were directly or indirectly related to maternal diseases, malnutrition, complications of pregnancy and method of delivery.

Schneider (1971) defines high risk pregnancy as "any gestation in which the prospects of optimal outcome for either mother or child is reduced". If this is accepted then most pregnancies in developing countries are "high-risk".

Muller et al (1973) opine that women with documented disorders are often referred to as high-risk patients and are and must be advised medical treatment in order to prevent additional losses during subsequent pregnancies and save both the mother and child. Gopalan (1976) explains that identification of the high risk mother during the anti-natal period or at the time of labour with adequate supervision during pregnancy and labour could bring down perinatal mortality to less than half without recourse to any modern equipment or expensive layout.

Certain expectant mothers are at special risk of disease or complications because of factors in their biological make-up, environment and food intake. Such factors,

called risk factors exert their effects both simply and in combination. Identification of risk factors become necessary with the observation of the association of certain characteristics with an undesired result (WHO, 1981).

UNICEF (1981) observes that maternal malnutrition, closely spaced pregnancies, severe anaemia, adolescent pregnancies, anti-natal infections, a heavy workload during pregnancy, hypertension, a shorter gestation period, smoking and placental abnormalities are associated with low birth weight, and poor outcomes of pregnancy such as perinatal mortality.

Shah (1983) states that perinatal deaths were five times more common in low birth-weight babies than in those with a normal birth-weight. She also states that 70.6 per cent of the neonates who died were low-birth-weight babies. Shah and Shah (1979) concluded that maternal nutrition had a significant relationship to birth weight, the pre-pregnancy weight being the determinant factor affecting foetal nutrition.

The incidence of pre-eclampsia is high in developing countries. Anusuya and Raman (1979) opine that pre-eclampsia is one of the major causes of high perinatal mortality and morbidity. Since this condition is preventable if detected and treated at an early stage, it is essential to diagnose the disease at an early stage and to institute proper medical care in time.

Nutritional anaemia is one of the major health problems of India. Shukla et al (1981) states that in about 43 percent of women anaemia was either caused or precipitated by pregnancy. Madhu Nath et al (1978) and NIN (1980) point out that anaemia is a factor known to influence birth outcome. Nutrients such as iron, folic acid, Vitamin B_{12}, protein and Vitamin C are necessary for blood formation. Lack of these nutrients give rise to anaemia.

Chowdhury (1980) reports that apart from widespread malnutrition, poor socio-economic conditions, high parity, non-assessment of the foetal well-being and inadequate antinatal services are the causes for high perinatal mortality, the main cause being non-assessment of the foetal well-being during pregnancy. There is a definite need to continue searching for greater precision in already formulated tests to predict pregnancy outcome.

ICMR (1980) opine that in view of the high rate of maternal and infant mortality in the country a study to collect baseline data for determing the prevalence of mothers at risk, factors which contribute to these risks and the problems of low birth weight of infants must be developed. This study must provide valuable information of practical utility on the identification of high risk mothers by simple clinical criteria, and thus aid in reducing 'obstetric crisis'.

Punjabi (1979) points out that one of the problems encountered in obstetric practice is the lack of a precise and specific test that accurately reflects the intra-uterine foetal growth and well-being especially in high risk conceptions.

Realising the great need for a precise index to identify the high risk mothers Vijayalakshmi and Devadas (1981) have evolved an index which could be applied for expectant mothers and risk levels during pregnancy identified.

The major aim of the present study is to assess the validity of this index already formulated to identify high-risk patients amongst the expectant mothers in order to save the mother and child through the course of pregnancy. It is hoped that the study will be of help in assessing the index and suggesting suitable modifications to make it more reliable and useful.

II REVIEW OF LITERATURE

The literature pertaining to this study "Assessing the Utility of Risk Factors Index in Pregnancy" is reviewed under the following headings.

A. Need for identifying the risk factors

B. Criteria for identification of high risk pregnancies

C. Weight gain and the outcome of pregnancy

D. Anaemia and the outcome of pregnancy

E. Nutritional/Non-nutritional complications of pregnancy and the outcome

and F. Other factors affecting pregnancy.

A. Need for identifying the risk factors

Hobel (1978) states that risk assessment by itself is part of a structured perinatal data collection system. Assessment of risk determines the likelihood of a poor outcome at any point along the continuum. Thus risk assessment is a time-oriented function which bridges the prenatal, intrapartum and neonatal periods. Manning et al (1981) reports that antepartum detection of the fetus at risk for death or damage in utero remains a major challenge in modern obstetric practice, and hence needs further investigation. Wennergren and Karlsson (1982) opine that antinatal identification of a risk group with a high incidence of fetal

growth retardation provides the possibility of intensified supervision of pregnancy and delivery and thus save both the mother and child's lives.

Fortney and Whitehorne (1982) point out that the concept of the high-risk pregnancy is important in obstetrics. The ability to predict the birth of a jeopardized infant before its delivery means that decisions about the optimal management of the pregnancy can be made and the chances of a favourable outcome can be increased. Risk indices can contribute greatly to the overall management of a high-risk pregnancy by providing a mechanism for screening.

McCarthy (1982) states that the absence of prenatal care and the presence of obstetric or non-obstetric complications during pregnancy increase the risk of neonatal death. The difficulty of predicting pregnancy outcome is derived from the complexity of medical and nutritional problems. Better identification of these determinants whether they be genetic, social or economic, will result in more accurate prediction.

Rousseau (1982) suggests that the control of prematurity and low birth weight and the prevention of neonatal disabilities and infections are achieved through increased monitoring of pregnancy. Early detection of abnormal obstetric symptoms

towards the end of pregnancy permits a calm approach to possible occurrences during delivery and the avoidance of "obstetric crisis".

B. Criteria for identification of high risk pregnancies

Murali and Kali (1975) state that certain common characteristics with perinatal deaths can be observed and using them the following criteria can be formulated to identify the "high risk" mothers.

1. Those over 30 years.
2. Those with primiparity or grand multiparity.
3. Those with history of previous foetal loss.
4. Multiple pregnancy.
5. Those belonging to lower socio-economic status.
6. Those with history of medical or obstetric complication in the current pregnancy.

and 7. Those with no prenatal care.

Babson et al (1975) and Gupta (1980) list certain high-risk factors in women contributing to perinatal mortality and morbidity. About 10-20 percent of women fall into these groups and account for over half the foetal and neonatal deaths. Hereditary and familial abnormalities, prematurity or small for date births, teenage pregnancy or a gravida over thirty-five years of age, absent prenatal care,

are few of the factors which adversely affect pregnancy. A heigh under sixty inches and a prepregnant weight of less than 20 percent under or over the standards for weight and height, multipara, anaemia, stressful events, heavy smoking, obstetric complications, minimal or no weight gain, abnormal presentations, and a fetus over 42 weeks gestational age are a few more of the important factors which lead to undesired results of pregnancy.

Gupta (1980) also includes Rh iso-immunization, incompetent os, and twins as the present pregnancy factors which may effect the outcome of pregnancy. He also states that the factors in labour such as premature rupture of membranes, cord complications, prolonged labour, unskilled attendant and place of delivery can lead to an undesired product of pregnancy.

WHO (1991) reports that for intervention at an earlier stage the risk factors involved in fetal death before labour must be considered and treated if possible. The factors detected are based both on history, including maternal characteristics and on events during pregnancy. Unmarried mothers, poverty and starvation, previous abortions, vaginal bleeding, viral infections, and signs of fetal hypoxia are some of the other risk factors which affect pregnancy.

Shah (1981) includes pre-pregnancy weight of 38 kg. or less, and a previous delivery of a child who weighed less than 2 kg. at birth as predisposing risk factors in any present pregnancy.

C. Weight gain and the outcome of pregnancy

NIN (1975) has shown that women belonging to the well to do groups gain 12-14 kgs. whereas those belonging to the poorer section gain only about 6-7 kgs. This is due to the low dietary intake and their activity uses up all the available energy allowing no sufficient fat storage in the body. NIN (1975) have also observed that perinatal mortality rises steeply as the birth weight falls (75 percent of deaths occur in infants below 2500 g.).

NIN (1976) has proved that anemia leads to complications like low birth-weight and increased maternal mortality due to excessive bleeding. Fedrick and Anderson (1976) have shown that low maternal weight at the start of pregnancy is strongly associated with spontaneous pre-term birth.

Mudaliar and Menon (1973) say that initially heavy women are liable to gain more than small and thin women and extremes of feeding in either direction influences weight-gain.

Jaffin (1979) states that young women tend to gain slightly more than elder women, primigravidas more than

multi-gravidas and thin women more than fat women. He also reports that inadequate weight gain in pregnancy increases the incidence of low birth weight infants. Villas (1979) points out that low birth weight is an important cause of perinatal and infant disease and death and of subsequent retarded development. WHO Bulletin (1979) report that many studies have shown a direct correlation between non-pregnant weight of the mother, weight gain during pregnancy and birth weight. The more the mother gains the heavier her baby will be with less chance of being small-for-date.

Mudaliar and Menon (1979) point out that in general, the range of weight gain is between 8 and 9 kg. and this gain is directly related to the birth weight of the foetus. Rajarathnam et al (1979) observed that a normal healthy woman gains about 8-10 kgs. during the course of pregnancy. He also predicts that a failure to increase in weight in the first two semesters as well as being initially underweight increases the probability of premature labour.

Raman (1980) proves that several studies indicate that the weight gain of Indian women belonging to the lower socio-economic groups is about 6-7 kg. during pregnancy. Devi (1980) stresses that higher incidence of toxaemia, prematurity or dysmaturity show a close association with poor weight gain during pregnancy. Raman (1980) says that the usual pattern of weight gain consists of a minimal

gain of 1-2 kg. during the first trimester and a more or less linear rate of 0.4 kg./week in the second and third trimester.

The United Nations University World Hunger Programme (1981) reports that weight gains during pregnancy for women belonging to a developing country are much below those in well-fed women and thus maternal mortality rates are high and foetal losses are elevated. Simic (1983) on investigation has found a positive relationship between relative body mass of women, weight gain and the birthweight of infants.

D. Anaemia and the outcome of pregnancy

Prema (1979) states that anaemia is a major public health problem in the developing countries especially amongst those in the low-income group. Luwang and Gupta (1980) say that anaemia during pregnancy has been claimed to be a result of specific haemopoetic substances.

NIN (1975) has brought out the fact that the incidence of anaemia during pregnancy increases with gestational age and parity particularly after a woman has had two or three pregnancies. Benson (1977) warns that severe iron deficiency anaemia is associated with definitely increased perinatal morbidity and mortality rates. Mudaliar and Menon (1978) stresses that due to anaemia of the pregnant women the baby may die in utero from anoxia and from prematurity in the neonatal period.

ICMR (1975) reports out that the incidence of prematurity and low birth weight were much higher in infants born to anaemic mothers. Fedrick and Anderson (1976) have associated a low haemoglobin level in pregnancy with spontaneous preterm birth.

NIN (1975) reports that about 1 in 5 of our expectant mothers suffer from severe degrees of anaemia as judged from their blood haemoglobin levels which tend to be below 10 g./100 ml. during the last 3 months of pregnancy. In complicated cases, toxaemia of pregnancy may set in, and still births and severe growth retardation of the foetus may also occur.

Hall et al (1976) have found that serum folate concentration falls in pregnancy, especially in women in the lower socio-economic classes, in women of higher parity, in smokers and in women with twin pregnancies, but there is no evidence that pregnant women with low serum folate concentrations suffer more often from complications of pregnancy such as congenital malformation of the foetus or abruptio placentae.

Shukla et al (1981) state that in about 43 percent of women anemia was either caused or precipitated by pregnancy. Prema (1982) has determined that the mean birth weight of infants born to women who had parenteral iron therapy was

significantly higher than that of the untreated group and that for optimal perinatal outcome the treatment of anemia should be initiated at the latest by 20 weeks of gestation.

E. Nutritional/Non-nutritional complications of pregnancy and the outcome

Pregnancy is a physiological stress for a healthy well nourished woman and even a greater hazard for the woman whose body stores have been depleted.

Gupta (1979) states that poverty and undernutrition are the causes of pregnancy failures or still births and high infant mortality rates. Administering nutritious diets during pregnancies to poor mothers improve maternal nutritional state and birth-weights of new born babies. Jaffin (1979) has found that newborn infants who have a low birth weight for gestational age was due to malnutrition of the mother and their mortality rate is between 3-5 percent.

Rasheed et al (1976) say that the clinical nutritional assessment revealed that 76 percent mothers showed one or more deficiency signs which was consequent to an inadequate intake of protective foods in their diet. Bressens et al (1978) have found that malnutrition of the mother may lead to foetal growth retardation. Moghissi (1978) points out that adequate fetal growth and development in uterus depends on a steady supply of nutrients from the mother to the fetus.

Deficient dietary intake, inadequate absorption of the nutrients from the gut, abnormal metabolism of proteins, lipids, carbohydrate and micronutrients in the maternal organism, insufficiency of placental circulation and abnormal utilization of nutrients by the fetus may lead to impairment of fetal development. Devadass et al (1978) state that maternal nutritional status influences the course and outcome of pregnancy.

Fedrick et al (1976) showed that three times more women who had gone into premature labour had diets which were considered poor when compared with controls. Delgado et al (1977) studied the effect of food supplementation on infant growth and development. A consistently high association between maternal nutrition and birth weight was observed. Thus the risk of delivering low birth weight babies among highly supplemented mothers was roughly half that of the group receiving low supplements. Grover (1982) points out that the dietary intake consumed by the mothers during the second half of pregnancy period was found to affect the birth-weight of the new born to a considerable degree. Kaur et al (1982) have found that income also influences nutrient intake of women.

Ramm and Rao (1978) have proved in a study that a chronically low supply of carbohydrate seems to some extent lead to intrauterine growth retardation. Adams et al(1978) showed that the problem of low birth weight infants from

poorly nourished mothers can be corrected by protein and caloric supplements during pregnancy. Luwang et al (1980) have found a significant positive correlation of daily dietary intake of iron, folic acid and protein with haemoglobin level of pregnant women.

NIN (1975) have showed that Vitamin A status is known to deteriorate with the advance of pregnancy. Xerosis and keratomalacia are the outcomes of this deficiency. Vitamin B complex deficiency is quite common during the last trimester of pregnancy, vomitting and giddiness during early months of pregnancy are known to be produced by Vitamin B_6 deficieney. John (1979) says that a deficiency of Vitamin D can cause fetal rickets but only when the mother suffers from severe Vitamin D deficiency.

NIN (1975) reports that another important nutrient essential during pregnancy is calcium and its deficiency is associated with osteomalacia. John (1979) has said that an iodine deficient mother may fail to provide sufficient minerals for the fetus and features of cretinism which are retarded bone growth, etc. are present at birth. Sholtan and Jenkins (1982) have associated low plasma zinc and fetal abnormality and consider it to be a factor for congenital abnormalities.

Murali and Bali (1975) point out that the pregnancy complications such as toxaemia and antepartum hemorrhage and the mode of delivery have important bearing on the condition of the foetus. The well-established association between breech delivery and perinatal mortality is mostly due to prematurity, uterine dysfunction, prolapsed cord and premature rupture of membranes. Fedrick and Anderson (1976) opine that a history of antepartum haemorrhage was associated with an increased incidence of spontaneous pre-term birth.

The risk of maternal mortality is four to ten times higher after caesarean section than after vaginal delivery (Krone and Matthews, 1975). Pal et al (1979) have determined that the foetal outcome of those who had premature elective termination of pregnancy by caesarean section was better than those who had spontaneous onset of premature labour.

Chase (1977) says that maternal mortality increases with age and pavity either in combination or separately and that the safest age for parturition is 20-25 years. Varner et al (1982) have found that in women aged 35 years or over the risks are three to four times greater, whereas for women having their fifth or subsequent pregnancy the risks are over three times greater.

Taber (1979) has proved that eclampsia is one of the most serious emergency problems during the latter half of

pregnancy. Edward and Alberman (1980) have related hypertension and pregnancy and point out that it is one of the most common contributors to perinatal mortality and morbidity and that pregnancies complicated by severe pre-eclampsia are at highest risk for foetal distress.

Pal et al (1976) and Keirse et al (1978) have reported from a study that patients with a history of pregnancies which ended spontaneously before 37 weeks gestation had an increased risk of spontaneous pre-term labour and delivery in future pregnancies.

F. Other factors affecting pregnancy

Rao (1982) has found that rupture of the uterus is responsible for 5-20 percent of maternal deaths in developing countires. Little is known about the reasons for rupture of the fetal membranes before the onset of labour and when it is preterm, there is an increase in perinatal mortality principally because of immaturity (Antiseptic, 1982).

Bobitt and Ledger (1977) have suggested that amniotic fluid infection, often with intact membranes is a significant cause of preterm labour and resultant perinatal death, particularly in the lower socio economic group. Taber (1979) say that in premature separation of the placenta fetal mortality may be as high as 35 percent, the main causes being hypoxia and prematurity.

Infertility and abortion are increased in poorly controlled diabetes and the risk of fetal death is heightened particularly after the 36th week because of maternal acidosis and placental insufficiency (Benson, 1977). A study conducted by Singh et al (1981) revealed that an increased risk of foetal distress, small for gestational age babies and birth asphyxia were present in all pregnancies which had gone beyond the expected date of delivery.

Mandal et al (1991) say that viral hepatitis, is the major cause of jaundice complicating pregnancy, in our country and has a deleterious effect both on the mother and child. Hare and White (1977) emphasise fetal death in utero during the last month of pregnancy is a frequent complication when diabetic patients have a complicating vascular lesion. Alvarez (1978) report that acute glomerulonephritis is a syndrome in which early spontaneous abortion or delivery of a premature fetus may occur. It occurs more frequently early in pregnancy and in the very young gravida. Welt et al (1978) associates concurrent hypertension and pregnancy with an increased incidence of abruptio placental and increased perinatal mortality and maternal morbidity. Antimalarial drugs cause teratogenic effects but untreated malaria in a pregnant patient may cause abortion or foetal damage (Antiseptic, 1983).

III EXPERIMENTAL PROCEDURE

The experimental procedure for the study entitled "Assessing the utility of risk factors index in pregnancy" is discussed under the following headings:

I. Selection of the problem
II. Selection of the venue
III. Selection of the sample
IV. Selection of the methods
V. Conducting the study
VI. Analysis and interpreting the data

I. Selection of the problem

Sebastian (1977) states that while bearing children is the unique privilege and function of women, this biological function exposes women to certain special risks and dangers. These risks must be detected early and the women must be given proper antinatal care in order to avoid unnecessary loss of lives. In order to identify these risk factors an index was formulated by Vijayalakshmi and Devadas (1981). Any newly formulated index must be checked for its validity. The present study was undertaken to check the formulated index for its validity in predicting high-risk pregnancy.

II. Selection of the venue

The hospital selected for the study was the "Government Kasturba Gandhi Hospital for Women and Children", Madras.

The hospital was selected because of the large number of deliveries being conducted there thus, aiding in the easier collection of data. Moreover the hospital authorities were very co-operative and helpful.

III. Selection of the sample

Sampling is simply the process of learning about the population on the basis of a sample drawn from it. Simple random sampling refers to the sampling technique in which each and every item of the population has an equal and independent chance of being included in the sample. Thus in the sampling technique instead of every unit of the universe only a part of the universe is studied and the conclusions are drawn on the basis for the entire universe. It is possible to collect more detailed information in a sample survey. Follow-up work can also be undertaken much more effectively in the sampling method according to Gupta, (1982).

Hence the samples were collected at random. The number of samples was two hundred and fifty expectant mothers totally, one hundred and twenty-five of them belonged to the low income their per capita income being 0-100 Rs./month. The remaining one hundred and twenty-five samples belonged to the middle income their per capita income being 101-200 Rs./month

The samples selected were expectant mothers in the third trimester of pregnancy. It was not possible to start from the first trimester of pregnancy due to the limited

time available.

IV. Selection of the methods

The nutritional status index is given in the following pages in Table I and the criteria and scores helpful in assessin, the risk levels are also presented side by side.

TABLE I

INDEX FOR ASSESSING NUTRITIONAL STATUS OF EXPECTANT MOTHERS

S.No.	Risk Factors	Indicative Levels and Scores					
		Low Risk	Scores	Medium Risk	Scores	High Risk	Scores
1.	Prepregnant weight of the expectant mother in Kg.	45 and above	10	40-45	5	Below 40	0
	or						
	Weight of the expectant mother in Kg. at term of pregnancy	50 and above	10	45-50	5	Below 45	0
	or						
	Weight gain during pregnancy in Kg.	7 and above	10	5-6.9	5	Below 5	0
2.	Height of the mother in cm.	150 and above	10	140-150	5	Below 140	0
3.	Haemoglobin levels in g/100 ml.	10.5 and above	10	9-10.4	5	Below 9	0
	or						
	Pallor of skin	Healthy	10	Pale	5	Severely Pale	0
4.	Obvious clinical symptoms like oedema, blood pressure or albuminuria	Nil	10	Mild	5	Severe	0

S.No.	Risk Factors	Indicative Levels and Scores					
		Low Risk	Scores	Medium Risk	Scores	High Risk	Scores
5.	Nutritional status	Good	10	Medium	5	Poor	0
6.	Mother's age at primipara	20-29	10	18-20 or 30-35	5	Below 18 or Above 35	0
7.	Para of pregnancy	2, 3	10	1, 4, 5	5	Above 5	0
8.	History of miscarriage, still birth or neonatal mortality	No such history	10	Tendency for miscarriage, bleeding, and severe intra-uterine pains	5	Miscarriage, still birth or neonatal mortality	0
9.	Type of previous delivery	Normal	10	Prolonged labour or mild toxemia and the like	5	Complicated delivery with eclampsia or toxemia, caesarian, forceps or breech	0
10.	Birth weight of the previous children in kg.	Above 2.5	10	2-2.5	5	Below 2	0
		Total scores	100		50		0

High risk mothers scores below 40

Medium risk mothers scores 40-69

Low risk mothers 70-100

Table I outlines ten criteria through which the risk levels of expectant mothers could be assessed. The details regarding the method of assessing the risk levels through these criteria are presented in the following pages.

1. Weight gain during pregnancy

Jelliffe (1966) points out that the spring balance is adequate to measure the weight, provided the balance is checked consistently against standard weights. Hence the body weight of the expectant mothers was recorded with the help of a spring balance with an accuracy of 250 g. which was checked from time to time for its accuracy with the help of standard weights.

The term weight was recorded just a day or two before delivery. The weight of the mother was recorded again one week after delivery. The difference between these two eights was taken as the weight gain of the mother during pregnancy.

2. Height of the mother

The selected mothers were made to stand erect on a flat floor, barefooted against a fibre glass tape which was fixed to a wall. The arms of the individual were made to hang at the sides in a natural manner.

A wooden scale was placed gently on the head, at an angle perpendicular to the wall and the height was measured correct to 0.1 cm. The height of the mother was recorded in order to enable the investigator to find any correlation with the performance of the delivery.

3. Haemoglobin level

Jeliffe (1966) states that anaemia can occur from deficiency of various nutrients, the principal ones being iron, folic acid and vitamin B_{12}. Haemoglobin values are of great practical value in the assessment of the severity of anaemias in the expectant mothers. 0.02 ml. of fresh blood was drawn from the finger, without squeezing and this was collected on a strip of whatmann filter paper (2 cms. x 4 cms) and allowed to dry. The specimens were put into small individual covers and later dissolved for ten minutes in the Drabkin's solution and the haemoglobin level was estimated.

For the estimation of haemoglobin of the expectant mothers cyanmethaemoglobin method of Varley (1981) was followed. The procedure is presented in Appendix I.

4. Complications of pregnancy

Evidences in the past have proved that the presence of oedema, blood pressure, albuminuria and such other

complications are most likely to affect the normal course of delivery. Hence the presence or absence of these factors were determined by the medical practitioner and recorded for all the mothers by the investigator.

5. Nutritional status of the mothers

A questionnaire was formulated in order to determine the food intake of the mothers. The details of the questionnaire are presented in Appendix II. The nutritional status of the mothers were determined to be good, medium or poor based on the information in the questionnaire. The regular meal pattern for any one day by recall method was recorded. The cooked weight was noted and this was converted into its raw equivalent for the various food groups. This was then compared with the ICMR (1981) recommended balanced diets. If the amounts ingested and those recommended were almost equal then the nutrition of the mother was considered good. If the ingested amount was a little lower than the amount recommended then the mother was enjoying medium nutrition. But if the values of the ingested and recommended did not correspond even slightly then the mother was suffering from poor nutrition.

6. Mother's age at primipara

National Institute of Nutrition (1980) reports that perinatal, neonatal and infant mortality rates were singnificantly

higher in infants born to adolescent girls under 16 years and women above 35 years of age. Mortality rates were lowest among infants born to women between 20 and 29 years of age. Hence an age group of below 18 and above 35 are considered to be factors leadings to high risk. A low risk was expected in the age group between 20 and 29 years and a medium risk in the age group of 18-20 years or 30-35 years.

7. Para of pregnancy

NIN (1980) reports that primi gravidas, and women having fifth or more than fifth pregnancy require consideration as a high risk group. The mothers were asked about their parity and women who were in the second or third parity were expected to be at low risk. Women who were undergoing their primi, fourth or fifth parity were considered to be at medium risk. Under the high risk column were categorised women at the fifth or above parity.

8. History of miscarriage, still birth or neonatal mortality

The mother's previous obstetric history has a close relation with perinatal mortality in the present pregnancy. If a mother had a bad obstetric history with repeated abortions or miscarriages then she was considered to be a medium or high risk depending on the severity of the problem.

But if any such complicated history was absent in the previous pregnancy then she was categorised as a low-risk patient.

9. Type of previous delivery

The type of previous delivery is an important foreteller on the forthcoming pregnancy. If the mother has had a caesarean section or forceps delivery she is likely to be a high risk patient. If she has a history of toxemia or prolonged labour then she may be a medium risk and if the delivery had been a normal one then even the forthcoming was, expected to be normal, and the patient was considered to be at low-risk.

10. Birth weight of previous children

If the birth weight of the previous child was below 2 kg. then the delivery was considered high risk and if the weight had been between 2 to 2.5 kg. then, the delivery was considered to be medium risk. If the weight of the previous child had been above 2.5 kg. then the present delivery was considered to be low-risk.

V. Conducting the study

Making use of the methods mentioned, above the stated ten criteria were determined for each mother in the present study. These included weight at term of pregnancy and weight gain, height of the mother, haemoglobin level, complications of pregnancy, the nutritional status, para of

pregnancy, age at primi para, history of miscarriage, still birth, neonatal mortality, type of previous delivery and the birth-weight of previous child. Based on these factors the mothers were placed in the high risk medium risk or low risk category.

VI. Analysis and interpreting the data

Each stated criteria was determined and marked according to the scores given in the formulated index for all the mothers. If a mother had scored below 40 then the delivery was expected to be a high risk one. If the score ranged between 40-69 the delivery was expected to be a medium risk one. If the mother had got a score of 70-100 then her delivery was expected to be a low risk one.

The actual delivery was then observed with the help of a gynaecologist who classified the delivery as low risk, medium risk or high risk. If in at least 75 percent of the mothers the expected and observed risks were similar the particular criteria of the index was proved to be valid. But if in 75 percent or more of the samples the expected risk and the observed risk did not agree then the criteria was considered to be invalid. Applying these procedures the validity of the different criteria in the index was assessed. This in turn will assess the validity of the index in general in identifying the risk levels. Suitable modifications will be suggested if found necessary.

IV RESULTS AND DISCUSSION

The results and discussion pertaining to the study on "Assessing the utility of risk factors index in pregnancy" are presented under the following headings:

1. Risk levels based on pre-pregnancy weights of the expectant mothers.
2. Risk levels based on weights of the expectant mothers at term of pregnancy.
3. Risk levels based on weight gained during pregnancy by the expectant mothers.
4. Risk levels based on the heights of the expectant mothers.
5. Risk levels based on haemoglobin levels of the expectant mothers.
6. Risk levels based on toxemia of pregnancy.
7. Risk levels based on the nutritional status of the expectant mothers.
8. Age and para of pregnancy related to the risk involved in pregnancy.
9. History of previous pregnancies related to risk levels in the present pregnancy.
10. Risk levels based on the birth weight of previous children.

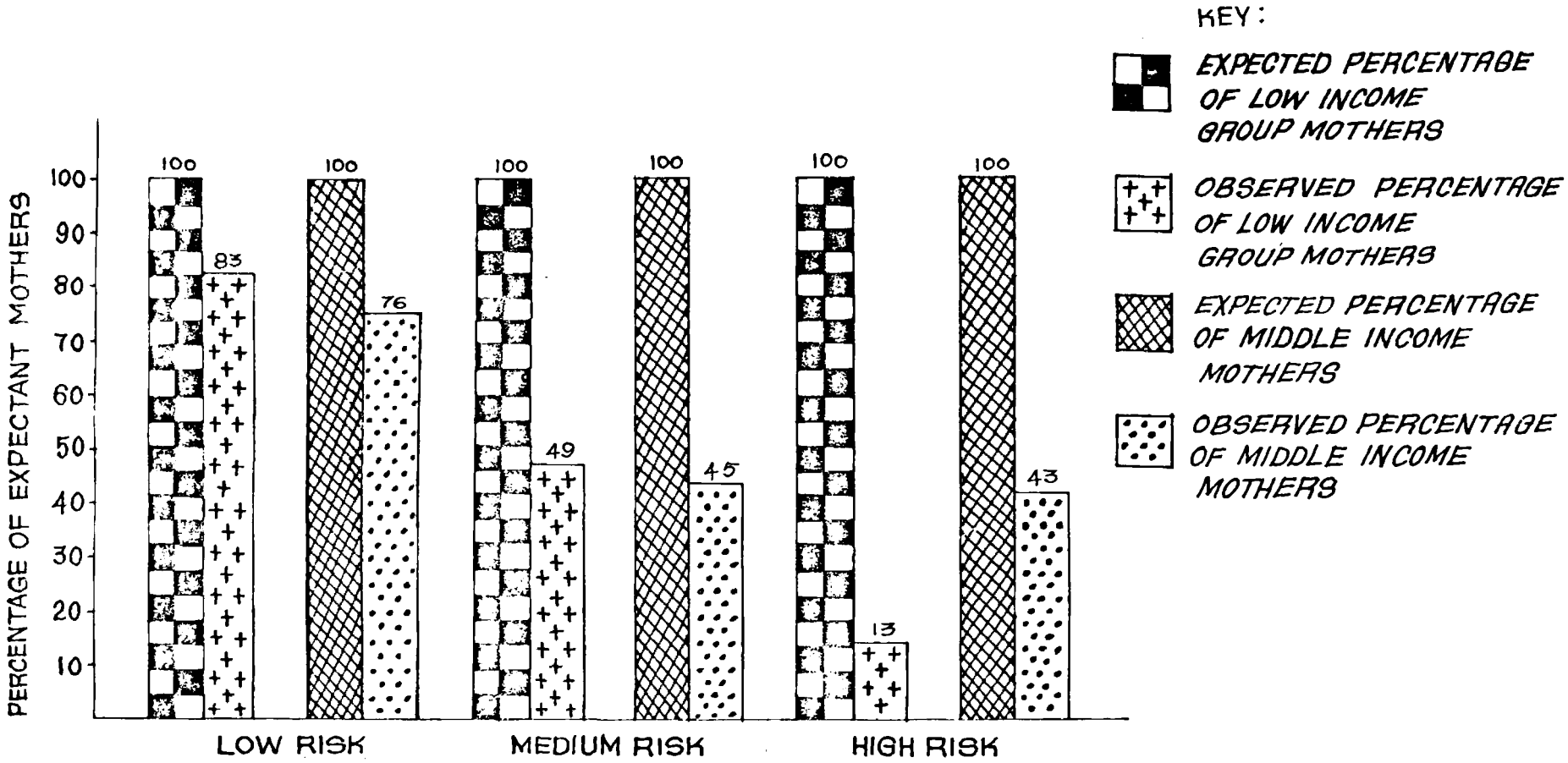
1. Risk levels based on pre-pregnancy weights of the expectant mothers

Table II represents the percentage and number of expectant mothers falling under different ranges of weight before the onset of pregnancy in the two income groups. They have been divided into three main categories namely: those who have a pre-pregnant weight of 45 kg. and above, those who have a weight between 40-45 kg. and those who have registered a weight below 40 kg. The individual data regarding this criteria for low and middle income groups are presented in the Appendix III-A and B respectively.

TABLE II

PERCENTAGE OF EXPECTANT MOTHERS FALLING UNDER DIFFERENT RANGES OF WEIGHT BEFORE ONSET OF PREGNANCY IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	45 Kg. and above						40–45 kg.						Below 40 kg.					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	59	100	0	0	0	0	0	0	43	100	0	0	0	0	0	0	23	100
	Income	Observed	49	83	7	11.9	3	5.1	15	34.9	21	48.8	7	16.3	10	43.5	10	43.5	3	13.0
2.	Middle	Expected	30	100	0	0	0	0	0	0	31	100	0	0	0	0	0	0	14	100
	Income	Observed	61	76.3	11	13.7	8	10	12	38.7	14	45.2	5	16.1	6	42.9	2	14.2	6	42.9



THE VARIOUS EXPECTED AND OBSERVED RISK LEVELS AMONG THE EXPECTANT MOTHERS OF LOW AND MIDDLE INCOME WITH REFERENCE TO THEIR PRE-PREGNANT WEIGHT

Figure.I

Among the 185 mothers who were chosen for the study in the low income group, 59 mothers had a pre-pregnant weight of 45 kg. and above. This constituted 100 percent and these mothers were expected to have a low risk during delivery according to the index. But actual observation of the delivery of these cases showed that 83 percent had a low risk during pregnancy, 11.1 percent and 5.1 percent of the cases had medium and high risks respectively during delivery. Forty-three cases fell under the medium-risk category with a weight range of 40-45 kg. according to the predictions of the index. Out of these 34.9 percent had low risk, 43.5 percent had moderate risk and the remaining 16.3 percent had high risk during delivery. The remaining 83 cases with a weight of below 40 kg. were expected to have high risk during delivery according to the index. Among these only 13.0 percent had high risk, 43.5 percent had moderate risk and another 43.5 percent had low risk.

Another 125 mothers belonging to the middle income group also participated in the study. Eighty mothers who constituted 100 percent were considered to be low risk because they had a weight of 45 kg. and above. Among these 76.3 percent had low risk delivery, 13.7 percent had medium risk and 10.0 percent had high risk. Thirty-one cases had a weight between 40-45 kg. and hence were expected to be medium risk according to the norms of the index,

45.8 percent had medium risk during delivery, 38.7 percent had low risk and 16.1 percent had high risk. Falling under the high risk group with a weight of below 40 kg. were 14 cases of whom 42.9 percent were determind to be high risk, 42.9 percent were found to be low risk cases and only 14.2 percent were found to have medium risk.

These results with reference to their pre-pregnant weight both among the mothers in the low income group and middle income group indicate that the index is reliable in 76.3-83.0 cases with reference to low risk, 45.2-48.8 percent cases in medium risk and 13.0-42.9 percent cases in high risk.

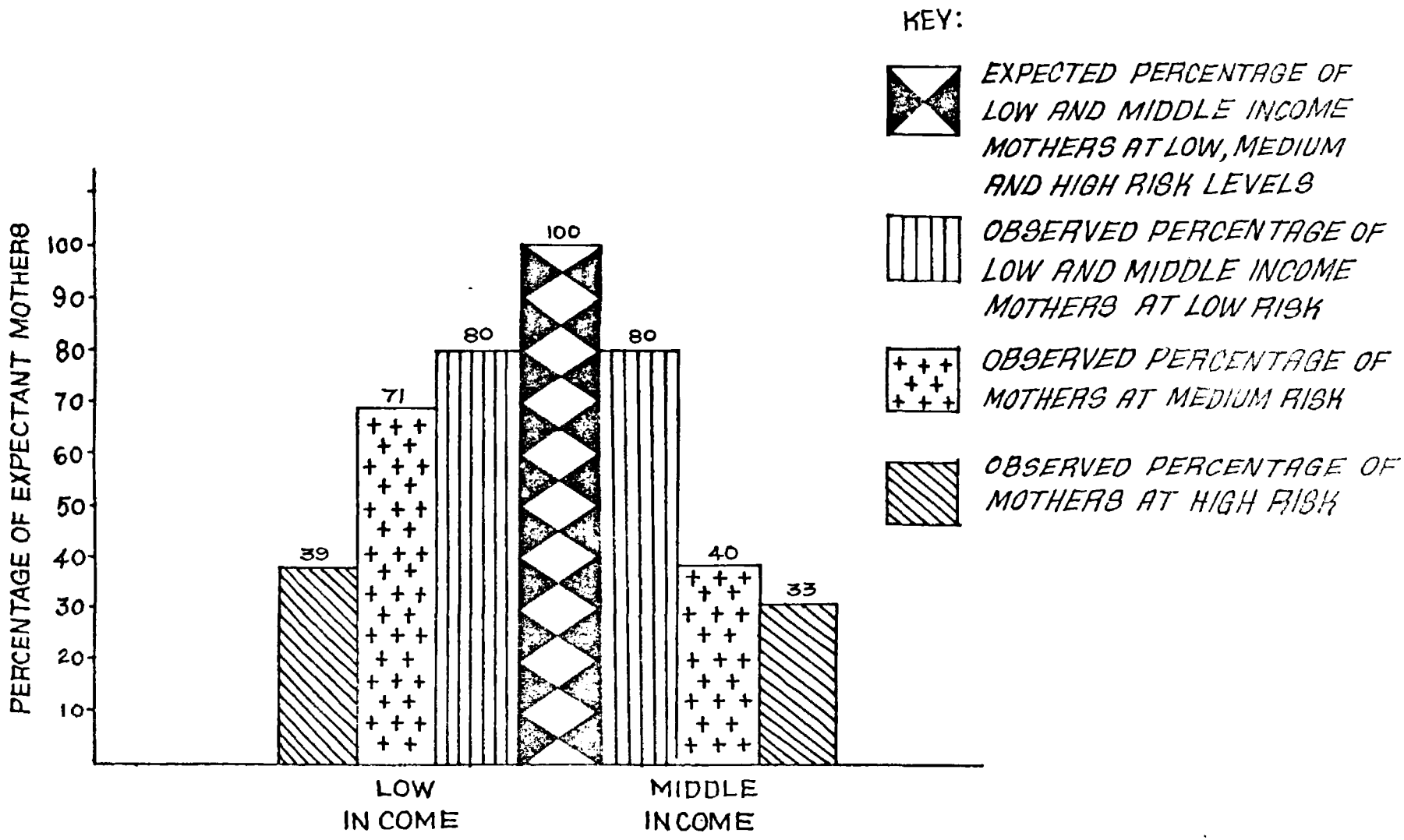
2. Risk levels based on weights of the expectant mothers at term of pregnancy

Table III figures out the percentage of expectant mothers falling under different ranges of weight at term of pregnancy. The grouping was done based on the following weights, 50 kg. and above was considered as low risk, 45-50 kg. as medium risk, and below 45 kg. as high risk. The individual data regarding this criteria for low and middle income groups are presented in the Appendix IV-A and B.

TABLE III

PERCENTAGE OF EXPECTANT MOTHERS FALLING UNDER DIFFERENT RANGES OF WEIGHT AT TERM OF PREGNANCY IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	50 kg. and above						45-50 kg.						Below 45 kg.					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	65	100	0	0	0	0	0	0	42	100	0	0	0	0	0	0	18	100
	Income	Observed	52	80.0	9	13.8	4	6.2	8	19.1	30	71.4	4	9.8	2	16.7	8	44.4	7	38.9
2.	Middle	Expected	39	100	0	0	0	0	0	0	30	100	0	0	0	0	0	0	6	100
	Income	Observed	71	79.8	11	12.3	7	7.9	10	33.3	12	40.0	8	26.7	3	50	1	16.7	2	33.3



THE EXPECTED AND OBSERVED RISK LEVELS WITH REFERENCE TO THE TERM WEIGHT OF THE EXPECTANT MOTHERS OF LOW AND MIDDLE INCOME

Figure. II

In the low income group the expected number of low risk cases based on their term weights was 66 but when the actual delivery was observed 80.0 percent of the cases had low risk and 13.8 percent of them had medium risk, 6.2 percent faced high-risk. Under the medium risk category 42 cases were expected to have medium risk during delivery. Amongst these 71.4 percent had medium risk, 19.1 percent had low risk while 9.6 percent had high risk. Eighteen cases were expected to have high risk delivery because of their term weight which was below 45 kg. Out of these 38.8 percent had high risk, while 44.4 percent had medium risk and 16.7 percent had low risk.

Among the 125 cases belonging to the middle income 89 cases were predicted to have low-risk according to the index. But on observation it was found that 79.8 percent had low risk delivery. Medium risk was observed among 12.3 percent of the cases, while 7.9 percent had high risk deliveries. In the medium risk category 30 cases were listed and during observation it was found that 40.0 percent had medium risk, while 33.3 percent, had low risk and 26.7 percent had high risk during delivery. There were 6 cases who were below 45 kg. and were hence categorised as high-risk. Amongst these 33.3 percent had high-risk when observed, whereas 50.0 percent had low risk and 16.7 percent had medium risk.

The index in both the income groups is reliable in 79.3-80.0 percent in low risk cases, 40.0-71.4 percent in medium risk and 33.3-34.9 percent in high risk cases.

3. Risk levels based on weight gained by the expectant mothers

Table IV explains the percentage of mothers having different ranges of weight gain during pregnancy in both the income groups. Those who had a weight gain of above 7 kg. were considered low risk cases, and those who gained 5-7 kg. were considered to be in medium risk and those cases who gained below 5 kg. were considered high risk according to the index.

TABLE IV

PERCENTAGE OF MOTHERS HAVING DIFFERENT RANGES OF WEIGHT GAIN IN BOTH THE INCOME GROUPS

S.No.	Income	Delivery	Above 7 kg.						5-7 kg.						Below 5 kg.					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	11	100	0	0	0	0	0	0	113	100	0	0	0	0	0	0	1	100
	Income	Observed	7	63.6	4	36.4	0	0	84	74.3	16	14.2	13	11.5	0	0	0	0	1	100
2.	Middle	Expected	37	100	0	0	0	0	0	0	83	100	0	0	0	0	0	0	5	100
	Income	Observed	26	70.3	6	16.2	5	13.5	51	61.4	16	19.3	16	19.3	1	20.0	2	40.0	2	40.0

Within the 125 cases belonging to the low income 11 mothers had gained above 7 kg. indicating low risk but after observation of the delivery it was found that 63.6 percent had low risk, while 36.4 percent had medium risk. There were no high risk cases observed. One hundred and thirteen mothers were considered to be medium risk with a weight gain of 5-7 kg. according to the index. Out of this 74.3 percent were observed to have low risk during delivery. Only 14.2 percent had medium risk while 11.5 percent had high risk. Only one case was expected to have high risk during delivery because there was a weight gain of below 5 kg. It was observed that this case had high risk as was expected during delivery and thus the index was correct in predicting high risk in that case.

Thirty-seven mothers out of 125 belonging to the middle income had a weight gain of above 7 kg. and thus fell into the expected low risk category. When actually observed seventy percent were found to be at low risk, 16.2 percent had medium risk and 13.8 percent had high risk. Eighty-three cases with a weight gain of 5-7 kg. were categorised as medium risk according to the index. Only 19.3 percent were found to have had medium risk during delivery, while 61.4 percent had low risk and another 19.3 percent had high risk. The remaining 8 mothers were expected to be at high risk with a weight gain

of below 5 kg. Amongst these 40.0 percent had high risk during delivery. Another 40.0 percent and medium risk while the remaining 20 percent had low risk.

Summarising these results it was found that the index was reliable in 63.6 - 70.3 percent cases in low risk, 14.2 - 19.3 in medium risk and 40.0 - 100.0 percent in high risk.

4. Risk levels based on the heights of the expectant mothers

Table V reveals the percentage of expectant mothers falling under different ranges of height. According to the index those mothers who had a height of 150 cms. and above were labelled as low risk, those who had a height of 140-150 cm. as medium risk, and those with a height of below 140 cms. were regarded as high risk. The individual data pertaining to this criteria for low and middle income groups are presented respectively in the Appendix V-A and B.

TABLE V

PERCENTAGE OF EXPECTANT MOTHERS FALLING UNDER DIFFERENT RANGES OF HEIGHT IN BOTH THE INCOME GROUPS

S.No.	Income	Delivery	150 cm. and above						140-150 cm.						Below 140 cm.					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	83	100	0	0	0	0	0	0	38	100	0	0	0	0	0	0	4	100
	Income	Observed	64	77.1	11	13.3	3	9.6	19	50.0	14	36.8	5	13.2	1	25.0	2	50.0	1	25.0
2.	Middle	Expected	96	100	0	0	0	0	0	0	26	100	0	0	0	0	0	0	3	100
	Income	Observed	72	75.0	18	18.7	6	6.3	8	30.8	11	42.3	7	26.9	1	33.3	1	33.3	1	33.4

Eighty three cases had a height of 150 cm. and above and hence were expected to have a low risk in the low income group. Out of these 83, 77.1 percent had low risk when the delivery was actually observed, 13.3 percent and 9.6 percent cases had medium risk and high risk respectively. Medium risk cases were those who had a height of between 140-150 cm. and there were 38 cases falling under this group. Fifty percent had low risk, 36.8 percent were the ones who had medium risk and 13.2 percent had high risk. Four cases had a height of below 140 cm. and hence were expected to be at high risk. Amongst these 25.0 percent had high risk, 50.0 percent had medium risk, 25.0 percenthad low risk when observed.

In the middle income group 96 cases were expected to have a low risk delivery. During observation 75.0 percent were observed to be at low risk, 18.7 percent were at medium risk and 6.3 percent at high risk. Twenty six cases were expected to have medium risk due to their height of 140-150 cm. But only 42.3 percent were observed to be at medium risk, 30.8 percent were at low risk, and 26.9 percent had high risk. Only three cases were expected to be at high risk, amongst these 33.4 percent were under high risk, 33.3 percent were found to have medium risk, and 33.3 percent had low risk.

In this particular criteria the index was found to be valid in 75.0 - 77.1 percent cases in low risk, 36.8 - 42.3 percent cases in medium risk and 25.0 - 33.4 percent cases in high risk.

5. Risk levels based on haemoglobin levels of the expectant mothers

Table VI points out the percentage of expectant mothers falling under different ranges of haemoglobin levels in the two income groups. Mothers who had haemoglobin levels of 10.5 g. and above were considered to be at low risk, those with haemoglobin levels between 9-10 g. were considered to be at medium risk, and those who had haemoglobin levels below 9 g. were considered to be high risk cases. The individual data pertaining to this criteria for low and middle income groups are presented in the Appendix VI-A and B respectively.

TABLE VI

PERCENTAGE OF EXPECTANT MOTHERS FALLING UNDER DIFFERENT RANGES OF HAEMOGLOBIN LEVELS IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	10.5 g. and above						9-10 g.						Below 9 g.			
			Low Risk		Medium risk		High risk		Low Risk		Medium risk		High risk		Low Risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	53	100	0	0	0	0	0	0	36	100	0	0	0	0	0	0	36	100
	Income	Observed	28	52.8	20	37.8	5	9.4	18	50.0	11	30.6	7	13.4	12	33.3	14	38.9	10	27.8
2.	Middle	Expected	56	100	0	0	0	0	0	0	53	100	0	0	0	0	0	0	16	100
	Income	Observed	34	60.7	12	21.4	10	17.9	29	54-7	10	18.9	14	26.4	8	50.0	4	25.0	4	25.0

In the low income group, 53 cases were expected to have low risk delivery but when observed only 52.8 percent had low risk, 37.8 percent cases had medium risk, and 9.4 percent had high risk. Thirty-six cases fell under the medium risk category. But 30.6 percent were observed to have medium risk, 50.0 percent had low risk and 19.4 percent had high risk during delivery. Another 36 cases were grouped under the high risk section and the actual observation revealed that only 27.8 percent had high risk, 38.9 percent had medium risk and 33.3 percent had low risk during delivery.

In the middle income group 56 cases were expected to be at low risk. During observation of the delivery it was found that 60.7 percent had low risk, 21.4 percent had medium risk and 17.9 percent had high risk. Fifty-three cases were classified under the medium risk group, but the observation brought home the fact that 18.9 percent had medium risk, 54.7 percent had low risk and 26.4 percent had high risk. Under the high risk group there were 16 cases amongst whom 25.0 percent had high risk, 50.0 percent were observed to have low risk and 25.0 percent were at medium risk.

Analysing the tables the index was found to be valid in 52.8-60.7 percent cases in low risk, 18.9 - 30.6 percent in medium risk and 25.0 - 27.8 percent cases in high risk.

6. Risk levels based on toxemia of pregnancy

Table VII reveals the percentage of mothers suffering from mild or severe toxemia in the two income groups. Those who did not suffer from any symptoms of toxemia were grouped as low risk, those who were suffering from mild toxemia were treated as medium risk and those who were suffering from severe toxemia were considered to be high risk cases accordingto the index.

TABLE VII

PERCENTAGE OF MOTHERS SUFFERING FROM MILD OR SEVERE TOXEMIA IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	Nil						Mild						Severe					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	96	100	0	0	0	0	0	0	22	100	0	0	0	0	0	0	8	100
	Income	Observed	56	58.9	27	28.4	12	12.7	11	50.0	9	40.9	2	9.1	3	37.5	3	37.5	2	25
2.	Middle	Expected	107	100	0	0	0	0	0	0	13	100	0	0	0	0	0	0	5	100
	Income	Observed	57	53.3	28	26.2	22	20.5	9	69.2	2	15.4	2	15.4	3	60.0	1	20.0	1	20.

As is evident in Table VII ninety five cases were expected to be at low risk according to the index, amongst whom 68.9 percent were observed to have low risk, 28.4 percent medium risk, and 12.7 percent had high risk. Twenty-two cases fell under the medium risk group according to the index of whom only 40.9 percent had medium risk, 50.0 percent had been observed to be at low risk and 9.1 percent had high risk. Eight cases were located as high risk group, out of which 25.0 percent had high risk, and 37.5 percent each was represented by the medium and low risk cases.

One hundred and seven cases were expected to be at low risk under the middle income group. Amongst these 53.3 percent had low risk, 26.2 percent had medium risk and 20.6 percent had high risk. Thirteen cases were labelled as medium risk, out of which only 15.4 percent had medium risk, 69.2 percent were observed to have low risk, and another 15.4 percent were found to have high risk. Five cases were prone to have high risk according to the index of whom 20.0 percent had high risk during delivery, anotner 20 percent had medium risk during delivery while the remaining 60.0 percent had low risk.

The table reveals that the validity of the index is reliable in 53.3 - 68.9 percent in low risk cases,

15.4 - 40.9 percent in medium risk cases and 20.0 - 25.0 percent in high risk cases.

7. Risk levels based on the nutritional status of the expectant mothers

Table VIII illustrates the percentage of expectant mothers enjoying good, medium or poor nutrition in the two income groups. Those who were enjoying good nutrition were low risk, those enjoying medium nutrition were medium risk and those who were suffering from poor nutrition were considered as running high risk according to the index.

TABLE VIII

PERCENTAGE OF EXPECTANT MOTHERS ENJOYING GOOD, MEDIUM OR POOR NUTRITION IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	Good						Medium						Poor					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	45	100	0	0	0	0	0	0	37	100	0	0	0	0	0	0	45	100
	Income	Observed	25	55.5	15	33.3	5	11.7	18	43.7	15	40.5	4	10.3	13	41.9	17	39.5	8	18.6
2.	Middle	Expected	64	100	0	0	0	0	0	0	50	100	0	0	0	0	0	0	11	100
	Income	Observed	41	64.1	16	25.0	7	10.9	30	60.0	7	14.0	13	26.0	4	36.5	6	54.5	1	9.0

Those who enjoyed good nutrition in the low income were only 46 cases out of whom 55.5 percent were observed to have low risk during delivery, 33.3 percent had medium risk while 11.1 percent had low risk. Thirty seven cases had medium nutrition and hence were considered to have medium risk 40.8 percent had medium risk, 48.7 percent under observation had low risk, while 10.8 percent had high risk. Forty three cases had poor nutrition and hence were expected to have high risk according to the index. Out of these 41.9 percent cases had low risk, 39.5 percent had medium risk, and 18.6 percent had high risk.

In the middle income group 64 cases were expected to be at low risk because they enjoyed good nutrition. Amongst the observed cases 64.1 percent had low risk, 25.0 percent had medium risk and 10.9 percent had high risk. Fifty cases had medium nutrition and thus were categorised as medium risk cases. Of these, sixty percent had low risk during delivery, 14.0 percent had medium risk, and 26.0 percent had high risk during delivery. Eleven cases in the middle income had poor nutrition, out of this, 36.5 percent had low risk, 54.5 percent medium risk and 9.0 percent had high risk when observed, actually.

The validity of the index with reference to this criteria is reliable in 56.6 - 64.1 percent cases in the

low risk category, 14.0 - 40.5 percent cases in the medium risk, and 9.0 - 18.6 percent cases in the high risk group.

8. Age and para of pregnancy related to the risk involved in pregnancy

Table IX pictures out the percentage of expectant mothers falling under different age groups at primipara in both the income groups.

TABLE IX

PERCENTAGE OF EXPECTANT MOTHERS FALLING UNDER DIFFERENT AGE GROUPS AT PRIMIPARA IN LOW AND MIDDLE INCOME GROUP

S.No.	Income	Delivery	20 - 29 years						13-20 or 30-35 years						Below 13 or above 35 years					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	63	100	0	0	0	0	0	0	61	100	0	0	0	0	0	0	1	100
	Income	Observed	51	80.9	10	15.9	2	3.2	30	49.2	21	34.4	10	16.4	0	0	0	0	1	100
2.	Middle	Expected	58	100	0	0	0	0	0	0	67	100	0	0	0	0	0	0	0	0
	Income	Observed	45	77.6	8	13.8	5	8.6	36	53.7	24	35.8	7	10.5	0	0	0	0	0	0

In the low income group mothers who had their primipara between 20-29 years were 63, and these cases were expected to have low risk deliveries. 80.9 percent had low risks during delivery, 15.9 percent had medium risk and 3.2 percent had high risk. Sixty one cases were grouped under medium risk having had their primipara between 18-20 or 30-35 years. Amongst these 49.2 percent had low risk, while 34.4 percent had medium risk and 16.4 percent had high risk. The high risk group had only 1 case with the age group of below 18 or above 35 years. This case was observed to have a high risk delivery and the index proved to be 100 percent dependable.

Amongst the middle income category 58 cases were expected to have low risk while on observation it was found that 77.6 percent had low risk, 13.8 percent medium risk and 8.6 percent high risk. Sixty seven cases were expected to have medium risk while the observed cases revealed that 53.7 percent had low risk, 35.8 percent cases had medium risk and 10.6 percent had high risk. There were no cases under the high risk category in the middle income group.

Hence the table reveals the validity of the index at 77.6 - 80.9 percent cases in low risk, 34.4 - 35.8 percent in medium risk and 100 percent in high risk cases.

Table X reveals the percentage of expectant mothers classified according to the number of pregnancies in the two income groups.

TABLE X

PERCENTAGE OF EXPECTANT MOTHERS CLASSIFIED ACCORDING TO NUMBER OF PREGNANCIES IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	2, 3						1, 4, 5						Above 5					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	55	100	0	0	0	0	0	0	69	100	0	0	0	0	0	0	1	100
	Income	Observed	35	63.6	13	23.6	7	12.8	24	34.8	30	43.5	15	21.7	0	0	1	100	0	0
2.	Middle	Expected	60	100	0	0	0	0	0	0	66	100	0	0	0	0	0	0	0	0
	Income	Observed	43	71.7	12	20.0	5	8.3	33	50.8	24	36.9	8	12.3	0	0	0	0	0	0

Those mothers in their second or third para were expected to have low risk deliveries and the number was 55. Out of these 55 cases, 63.6 percent were found to have no complications or were at low risk during delivery, 23.6 percent had medium risk and 12.8 percent had high risk. Sixty nine cases in their first, fourth or fifth para of pregnancy were expected to be medium risk cases. The observation revealed that 34.8 percent had low risk, 43.5 percent had medium risk while 21.7 percent had high risk. Only one case was expected to have high risk under the category of above the fifth para. But this case had medium risk during observation.

Under the middle income group 60 cases were expected to have low riskbut 71.7 percent were observed to have low risk during delivery. While 20 percent had medium risk, and 8.3 percent had high risk. Sixty five cases were categorised as medium risk but 50.8 percent were set away as low risk on observation, 36.9 percent were included under the medium risk group and 12.3 percent as high risk after observation. There was no case expected to have high risk.

The validity of the index was proved in 63.6 - 71.6 percent cases in low risk, and 36.9 - 43.4 percent in medium risk.

9. History of previous pregnancy [redacted] levels in the present pregnancy

Table XI represents the percentage of the mothers who had miscarriages, neonatal mortality or still births in the two income groups.

TABLE XI

PERCENTAGE OF MOTHERS WHO HAD MISCARRIAGES, STILL BIRTHS AND NEONATAL MORTALITY IN THE TWO INCOME GROUPS

S.No.	Income	Delivery	Low risk						Medium risk						High risk					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	110	100	0	0	0	0	0	0	1	100	0	0	0	0	0	0	14	100
	Income	Observed	56	50.9	42	38.2	12	10.9	0	0	0	0	1	100	3	21.4	5	35.7	6	42.9
2.	Middle	Expected	115	100	0	0	0	0	0	0	2	100	0	0	0	0	0	0	8	100
	Income	Observed	53	50.4	30	26.1	27	23.5	1	50.0	1	50.0	0	0	2	25	3	37.5	3	37.5

Hundred and ten cases of the low income were expected to have low risk, while the actual performance revealed that 50.9 percent had low risk, 38.2 percent had medium risk and 10.9 percent had high risk. One case was adjudged to be medium risk but she had a high risk during delivery. Fourteen cases were expected to be at high risk but out of this 21.4 cases were low risk, 35.7 percent medium risk, and 42.9 percent high risk.

In the middle income group 115 cases were expected to have low risk. However observations revealed that 50.4 percent had low risk, 26.1 percent had medium risk and 23.5 percent had high risk. Two cases under the medium risk category had undergone delivery and it was observed that 50.0 percent had low risk while the remaining 50.0 percent had medium risk. Eight cases were expected to have high risk but 37.5 percent each were categorised as high risk and medium risk respectively after observation and only 25.0 percent had low risk during delivery.

The table proved the validity of the index in 50.4 - 50.9 cases in low risk, 50.0 percent in medium risk, and 37.5 - 42.9 percent in high risk cases.

Table XXI illustrates the percentage of mothers presenting history of previous delivery in both the income groups.

The low risk cases were those who had a normal past delivery, medium risk were the ones who had prolonged labour and toxemia, the high risk cases were those who had previous caesarean, forceps or breech type of delivery.

TABLE XII

PERCENTAGE OF MOTHERS PRESENTING HISTORY OF PREVIOUS DELIVERY IN BOTH THE INCOME GROUPS

S.No.	Income	Delivery	Normal						Prolonged labour, toxemia						Caesarian, forceps, or breech					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	58	100	0	0	0	0	0	0	4	100	0	0	0	0	0	0	9	100
	Income	Observed	24	41.4	20	34.5	14	24.1	1	25.0	2	50.0	1	25.0	4	44.4	1	11.2	4	44.4
2.	Middle	Expected	73	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	100
	Income	Observed	50	68.5	13	17.3	10	13.7	0	0	0	0	0	0	0	0	2	50.0	2	50.0

In the low income the number of expected low risk cases were 58. Amongst these 41.4 percent had low risk deliveries, 34.8 percent had medium risk, and 24.1 percent had high risk on observation. Four cases were classified as medium risk, 50.0 percent proved to have medium risk on observation, 25.0 percent had low risk, while the remaining 25.0 percent had high risk. Nine cases were grouped under high risk cases out of which 44.4 percent had high risk, 11.2 percent had medium risk and the remaining 44.4 percent had low risk on actual observation of the deliveries.

Analysing the middle income samples 73 mothers were expected to have low risk. However 68.5 percent of the mothers only had a low risk delivery, whereas 17.8 percent had medium risk and 13.7 percent had high risk. There were no medium risk cases in the middle income group. There were four cases with a previous history of high risk deliveries. Out of these 50.0 percent of the present deliveries also proved to be high risk, whereas 50.0 percent proved to be medium risk.

The results of the table reveal that the index is reliable in 41.4 - 68.4 percent cases in low risk, 50.0 percent in medium risk and 44.4 - 50.0 percent in high risk.

10. Risk levels based on the birth weight of previous children

Table XIII clearly points out the percentage of previously born children falling under different weight ranges.

TABLE XIII

PERCENTAGE OF PREVIOUSLY BORN CHILDREN FALLING UNDER DIFFERENT WEIGHT RANGES

S.No.	Income	Delivery	Above 2.5 kg.						2 - 2.5 kg.						Below 2 kg.					
			Low risk		Medium risk		High risk		Low risk		Medium risk		High risk		Low risk		Medium risk		High risk	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1.	Low	Expected	35	100	0	0	0	0	0	0	25	100	0	0	0	0	0	0	6	100
	Income	Observed	23	65.7	8	22.9	4	11.4	6	24.0	13	52.0	6	24.0	1	16.7	1	16.7	4	66.6
2.	Middle	Expected	45	100	0	0	0	0	0	0	38	100.0	0	0	0	0	0	0	0	0
	Income	Observed	37	82.2	8	17.8	0	0	22	57.9	16	42.1	0	0	0	0	0	0	0	0

Thirty five cases were expected to have low risk, out of these 65.7 percent had low risk while 22.9 percent had medium risk and 11.4 percent had high risk deliveries. Twenty five cases were classified as medium risk according to the index because they had previously given birth to children weigh ing 2.25 kg. Out of the suspected cases 24.0 percent had low risk, 52.0 percent medium risk and 24.0 percent high risk on observation. Six cases were expected to have high risk because the previously born children weighed below 2 kg. Amongst these 66.6 percent proved to be true by having high risk deliveries whereas 16.7 percent had medium risk and another 16.7 percent had low risk.

Out of a total of 125 mothers forty five cases were predicted to have low risk deliveries according to the index in the middle income group. However 82.2 percent of these cases had low risk on observation and 17.8 percent had medium risk. There were no cases of high risk. The number of cases under medium risk were 38. On observation it was determined that 57.9 percent of the cases had low risk while 42.1 percent of them had medium risk. There were no high risk cases observed. Amongst the middle income group there were no high risk cases expected.

The index was proved to be valid in 65.7 - 82.2 percent cases in low risk, 42.1 - 52.0 percent in medium risk and 66.6 percent in high risk cases.

V SUMMARY AND CONCLUSION

The main objective of this study "Assessing the utility of risk factors index in pregnancy" was to assess the validity of the index which was developed by Vijayalakshmi and Devadass (1981).

The index places a woman as having, low, medium or high risk based on 10 different criteria. The present study compared the expected levels of risk with the actual observation and the results are summarised below:

With reference to the pre-pregnant weight of both low and middle income mothers the index is reliable in 76.3 - 83.0 cases with reference to low risk, 45.8 - 43.8 percent in medium risk and 13.0 - 42.9 percent cases in high risk.

While assessing the validity of the index based on the weights of the expectant mothers at the term of pregnancy in both the income groups, it was found to be reliable in 79.8 - 80.0 percent in low risk cases, 40.0 - 71.4 percent in medium risk and 33.3 - 38.9 percent in high risk cases.

Summarising the results of the risk levels based on weight gained by the expectant mothers the reliability

of the index was proved in 63.6 - 70.3 percent cases in low risk, 14.2 - 19.3 in medium risk, and 40.0 - 100.0 percent in high risk cases.

Analysis of the risk levels based on the heights of the expectant mothers determined that the index was valid in 75.0 - 77.1 percent cases in low risk, 36.8 - 42.3 percent cases in medium risk and 25.0 - 33.4 percent cases in high risk.

The level of haemoglobin of the expectant mothers was an important criteria in the index. In this criteria the index was found to be valid in 52.8 - 60.7 percent cases in low risk, 18.9 - 30.6 percent in medium risk and 25.0 - 27.8 percent cases in high risk.

The validity of the index was heightened in 53.3 - 58.9 percent cases in low risk, 15.4 - 40.9 percent cases in medium risk and 20.0 - 25.0 percent cases in high risk with regard to the risk levels based on toxaemia of pregnancy.

Nutritional status of the expectant mother plays a very important role in determining the quality of the product of conception. With reference to this criteria the index was found to be valid in 55.6 - 64.1 percent cases in low risk, 14.0 - 40.8 percent cases in medium risk and 9.0 - 18.6 percent cases in the high risk categories.

When the age of the mother during her first para and the number of the present para of pregnancy were taken into consideration the index was reliable in the former case in 77.6 - 80.9 percent cases in low risk, 34.4 - 38.8 percent in medium risk, and 100.0 percent in high risk cases. In the latter case the validity of the index was proved in 63.6 - 71.7 percent cases in low risk and 36.9 - 43.8 percent cases in medium risk.

The index was found to be reliable in 50.4 - 80.9 in low risk cases, 50.0 percent in medium risk and 37.5 - 42.9 in high risk cases with reference to the history of previous pregnancy, which included still birth, neonatal mortality, etc.

The assessment of the index was found to be valid in 41.4 - 68.5 percent of low risk cases, 50.0 percent in medium risk cases and 44.4 - 50.0 percent in high risk cases in relation to the type of previous delivery undergone by the mother.

The weight of the previously born child was also considered to be one of the criteria in the index. With reference to this criteria the reliability of the index was determined in 65.7 - 82.2 percent cases in low risk, 42.1 - 52.0 percent cases in medium risk and 66.6 percent cases in high risk.

Summarising the findings the index was found to be highly reliable in predicting the various risk levels of pregnancy. The investigator opines that the regularity of antinatal check-up and the Rh factor could also be included in the criteria of the index in order to predict the risk levels better.

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APPENDICES

APPENDIX I

Estimation of Haemoglobin by Cyanmethaemoglobin method

The haemoglobin is treated with a reagent containing potassium ferricyanide, potassium cyanide and potassium dihydrogen phosphate. The ferricyanide forms methaemoglobin which is converted to cyanmethaemoglobin by the cyanide.

Reagents

1. Drapkin's diluent solution
2. Sodium bicarbonate - 1 g.
3. Potassium cyanide - 0.05 g.
4. Potassium ferricyanide - 0.20 g.
5. Distilled water - 1 litre.

This solution is preserved in dark brown bottles and preferably kept under cold storage. Its preparation and handling should be done with great care. This solution should not be used after it forms a precipitation at the botton of the storage bottle.

Procedure

1. Exactly 5 ml. of Drapkin's diluent solution is measured into a dry test tube from a burette or a pipette with suction bulb.

2. Exactly 0.02 ml. of blood is transferred from a standard haemoglobin pipette into a diluent solution.

Usual care in filling and cleaning of loaded haemoglobin pipette must be observed.

3. The pipette is rinsed three times with the dilute solution without allowing the formation of air bubbles in the solution.

4. The blood of the diluent are thoroughly mixed by rotating the tube.

5. Ten minutes time is allowed for the formation of the cyanmethaemoglobin.

6. 5 ml. of diluent solution is used as blank.

7. The readings are taken in a photoelectric colorimeter at 540 micrograms.

APPENDIX II

QUESTIONNAIRE TO ELICIT THE REQUIRED INFORMATION FROM THE EXPECTANT MOTHER

1. Name of Mother : Date:

   Age of Mother : Address:

   Total Family Income:

	LOW	MIDDLE
	Upto Rs.300/month	Rs.300-1500/month

2. Height (Cms.) :

   Weight (Kgs.) :

Term Weight	Weight after delivery	Pre-Pregnant weight

   Weight gain during Pregnancy:

3. What is the para of your present pregnancy?

1st	2nd	3rd	4th	5th	6th

4. What was your age during your first pregnancy?

Age	Incidence
18 - 20	
21 - 23	
24 - 26	
27 - 29	
30 - 32	
33 - 35	

5. What was the type of delivery you had?

	Normal				Forceps				Caesarian				Breech			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Past																
Present																

6. What was the birth-weight of your previous child?

Weight (kg.)	1st	2nd	3rd	4th	Nil
Below 2.5					
2.6 - 3.5					
3.6 - 4.5					
4.6 - 5.5					
Above 5.5					

7. Measurements of the present child:

Birth weight (kg.)	Head circumference (cm.)	Chest circumference (cm.)	Body length (cm.)

8. Did you take any prophylactic measures or other medication during pregnancy?

1st	2nd	3rd	4th	5th

9. Food intake by Recall Method:

Food Groups	Cooked weight (g)	Raw weight (g)
CEREALS		
PULSES		
GREEN LEAFY VEG.		
OTHER VEG.		
ROOTS AND TUBERS		

Food Groups	Cooked Weight (g)	Raw weight (g)
FRUITS		
MILK & PRODUCTS		
FATS & OILS		
SUGAR & JAGGERY		
MEAT & FISH		
EGGS		
GROUNDNUTS		

10. Did you have any complications during your present/past pregnancy?

Type of Complications	1st			2nd			3rd		
	Mild	Mode	Severe	Mild	Mode	Severe	Mild	Mode	Severe
Toxemia									
Oedema									
Blood pressure									
Albuminuria									
Anemia									
Pernicious Vomitting									
Prolonged Labour									
Others									

11. Did you have any miscarriage?

Types	Reasons		
	1	2	3
Abortion			
Still Birth			
Neonatal Mortality			

12. Haemoglobin level in the mother during the 3rd trimester :

13. Serum protein and fractions in the mother during the 3rd trimester:

Total serum proteins :

Albumins :

Globulins :

14. Clinical symptoms in the mother

Pallor of the skin :

Angular stomatitis :

Cheilosis :

Glossitis :

Oedema :

Bitot spots :

Nails :

Any others :

15. Nutritional status during present pregnancy:

Good :

Medium :

Poor :

PRE-PREGNANT WEIGHT OF THE EXPECTANT MOTHERS OF LOW INCOME IN Kg.

1.	40	26.	45.5	51.	41	76.	44	101.	37
2.	57	27.	44	52.	42	77.	35	102.	43
3.	41	28.	46	53.	40	78.	44.5	103.	59.5
4.	34.5	29.	44.5	54.	43	79.	46	104.	49
5.	37	30.	45	55.	46	80.	44	105.	47
6.	42.5	31.	37	56.	35	81.	32.5	106.	44.5
7.	33	32.	45	57.	64	82.	40	107.	47
8.	50	33.	63	58.	40	83.	46	108.	46.5
9.	46	34.	68	59.	50	84.	50	109.	46
10.	46	35.	47	60.	51	85.	39	110.	42.5
11.	45	36.	36	61.	43	86.	54	111.	48.5
12.	52	37.	43	62.	47	87.	35	112.	40
13.	45	38.	51	63.	40	88.	40	113.	39
14.	40	39.	42	64.	46	89.	51.5	114.	37.5
15.	43.5	40.	40	65.	42	90.	43	115.	45
16.	47	41.	45	66.	44.5	91.	39	116.	47
17.	50	42.	45	67.	40	92.	44	117.	50
18.	45	43.	44	68.	51	93.	54	118.	42
19.	43	44.	45	69.	58	94.	44	119.	49.5
20.	39	45.	60	70.	35	95.	45	120.	49.5
21.	50	46.	45	71.	38	96.	38	121.	51
22.	39.5	47.	47	72.	43	97.	43	122.	36.5
23.	41.5	48.	55	73.	35	98.	45	123.	38
24.	43	49.	55	74.	46	99.	41.5	124.	49
25.	49.5	50.	40	75.	40	100.0	42	125.	42

APPENDIX III-B

PRE-PREGNANT WEIGHT OF THE EXPECTANT MOTHERS OF MIDDLE INCOME IN Kg.

1.	52.5	26.	42	51.	34	76.	53.5	101.	43.6
2.	44.5	27.	38	52.	40	77.	51.5	102.	52.1
3.	44	28.	45	53.	36	78.	54.5	103.	39.5
4.	57	29.	44	54.	49	79.	56	104.	51.7
5.	42	30.	46	55.	46	80.	50.5	105.	42.8
6.	46	31.	44	56.	43.5	81.	40	106.	56.4
7.	52	32.	51	57.	43	82.	40.5	107.	62
8.	42	33.	46	58.	42	83.	42.5	108.	62.1
9.	44	34.	57.5	59.	56	84.	44	109.	50
10.	47.5	35.	42.5	60.	41.5	85.	59	110.	57.5
11.	42	36.	49	61.	42	86.	60.5	111.	42
12.	51	37.	50.5	62.	50.5	87.	55.5	112.	41
13.	50	38.	54	63.	43	88.	44.5	113.	45.5
14.	51	39.	42	64.	40	89.	50.5	114.	44
15.	54	40.	54.5	65.	48	90.	57.5	115.	32.5
16.	43	41.	48	66.	46	91.	46	116.	42
17.	42	42.	51	67.	56	92.	56.5	117.	49.5
18.	49	43.	50	68.	41.5	93.	46	118.	53
19.	55	44.	40	69.	42	94.	53.2	119.	49
20.	45.5	45.	51	70.	49.5	95.	46.1	120.	39
21.	59.5	46.	49	71.	39	96.	44.2	121.	43
22.	53	47.	52	72.	46	97.	37.5	122.	42.5
23.	45	48.	39	73.	55	98.	46	123.	49.5
24.	41.5	49.	54	74.	63	99.	59.5	124.	40
25.	44.5	50.	58	75.	51.5	100.	48.5	125.	56.5

APPENDIX IV-A

WEIGHT OF THE EXPECTANT MOTHERS OF LOW INCOME AT TERM OF PREGNANCY IN Kg.

1.	46	26.	51	51.	46	76.	49.5	101.	42
2.	63	27.	50	52.	47	77.	41	102.	49
3.	46	28.	52	53.	45	78.	50	103.	66
4.	40	29.	50	54.	48	79.	51	104.	54.5
5.	44	30.	50.5	55.	51	80.	49.5	105.	51
6.	48	31.	43	56.	40.	81.	38	106.	51.5
7.	39	32.	51	57.	69.5	82.	45	107.	54
8.	56.5	33.	69	58.	46	83.	52	108.	53
9.	51	34.	73	59.	55.5	84.	55	109.	52.5
10.	51	35.	51.5	60.	57	85.	45	110.	47.5
11.	50.5	36.	42	61.	48.5	86.	59	111.	54
12.	58	37.	49	62.	52	87.	41	112.	47
13.	50.5	38.	56	63.	45.5	88.	47	113.	46
14.	45	39.	47	64.	51.5	89.	57	114.	44
15.	49	40.	46	65.	48	90.	48.5	115.	52
16.	52	41.	51	66.	51	91.	45	116.	52
17.	56.5	42.	50.5	67.	46	92.	50	117.	56
18.	51.5	43.	49.5	68.	57	93.	60	118.	49
19.	49	44.	50.5	69.	63	94.	49.5	119.	56
20.	46.5	45.	67	70.	41.5	95.	50	120.	56
21.	57	46.	51.5	71.	44.5	96.	44	121.	59
22.	45	47.	53	72.	50.5	97.	49.5	122.	41.5
23.	48	48.	61	73.	40.5	98.	50.5	123.	44.5
24.	49	49.	61	74.	51.5	99.	48	124.	54
25.	56	50.	46	75.	46.5	100.	48	125.	45

APPENDIX IV-B

WEIGHT OF THE EXPECTANT MOTHERS OF THE MIDDLE INCOME AT TERM OF PREGNANCY IN Kg.

1.	60	26.	48	51.	40	76.	58.5	101.	49.6
2.	51	27.	43	52.	48	77.	58	102.	58.4
3.	50.5	28.	53	53.	40	78.	60.5	103.	45
4.	65	29.	49.5	54.	55	79.	62.5	104.	68.2
5.	50	30.	51	55.	52	90.	56	105.	48
6.	52	31.	49	56.	50.5	81.	45	106.	62.1
7.	53.5	32.	56	57.	49	82.	46.5	107.	69.1
8.	50	33.	53.5	58.	49	83.	47.5	108.	70.1
9.	50	34.	64.5	59.	64.5	84.	49.5	109.	56.5
10.	54	35.	50	60.	48	85.	65.5	110.	63.5
11.	48	36.	56	61.	48	86.	67	111.	46.5
12.	58	37.	57	62.	57.5	87.	61.5	112.	46
13.	56.5	38.	61	63.	50	88.	50	113.	52
14.	57.5	39.	47	64.	47.5	89.	56	114.	50
15.	60	40.	61.5	65.	53	90.	63	115.	38
16.	49	41.	54	66.	52	91.	51.5	116.	49
17.	43.5	42.	58	67.	63	92.	61.5	117.	54.5
18.	56	43.	58	68.	48	93.	51	118.	59
19.	62	44.	45.5	69.	48	94.	59.4	119.	55
20.	52	45.	57.5	70.	56.5	95.	52.2	120.	45
21.	66	46.	55.5	71.	46	96.	50	121.	48
22.	50	47.	60	72.	53.5	97.	42.5	122.	48
23.	52	48.	46	73.	61.5	98.	52.5	123.	56
24.	43.5	49.	61	74.	70	99.	66	124.	46
25.	52	50.	65	75.	55	100.	55	125.	63

APPENDIX V-A

HEIGHT OF THE EXPECTANT MOTHERS OF THE LOW INCOME IN Cm.

1.	156	26.	153	51.	147	76.	165	101.	157
2.	156	27.	158	52.	152	77.	147	102.	150
3.	143	28.	140	53.	147	78.	149	103.	151
4.	146	29.	158	54.	153	79.	152	104.	153
5.	148	30.	148	55.	157	80.	156	105.	153
6.	154	31.	144	56.	153	81.	151	106.	162
7.	155	32.	155	57.	155	82.	152	107.	162
8.	156	33.	164	58.	157	83.	151	108.	157
9.	155	34.	152	59.	146	84.	152	109.	159
10.	133	35.	155	60.	158	85.	143	110.	150
11.	160	36.	152	61.	158	86.	137	111.	160
12.	156	37.	152	62.	141	87.	151	112.	156
13.	150	38.	154	63.	155	88.	149	113.	156
14.	150	39.	152	64.	153	89.	143	114.	153
15.	148	40.	142	65.	157	90.	151	115.	152
16.	159	41.	154	66.	146	91.	144	116.	156
17.	155	42.	150	67.	149	92.	146	117.	167
18.	157	43.	136	68.	150	93.	152	118.	152
19.	148	44.	161	69.	158	94.	153	119.	150
20.	154	45.	143	70.	157	95.	154	120.	152
21.	150	46.	142	71.	150	96.	153	121.	152
22.	161	47.	157	72.	149	97.	152	122.	155
23.	158	48.	152	73.	139	98.	149	123.	152
24.	160	49.	151	74.	159	99.	142	124.	148
25.	152	50.	152	75.	151	100.	155	125.	148

APPENDIX V-B

HEIGHT OF THE EXPECTANT MOTHERS OF THE MIDDLE INCOME IN Cm.

1.	141	26.	147	51.	150	76.	152	101.	155
2.	155	27.	144	52.	156	77.	156	102.	149.4
3.	141	28.	149	53.	150	78.	152	103.	151
4.	159	29.	144	54.	151	79.	156	104.	156
5.	149	30.	149	55.	150	80.	154	105.	152
6.	156	31.	154	56.	150	81.	154	106.	152.1
7.	152	32.	151	57.	157	82.	154	107.	150
8.	151	33.	139	58.	153	83.	150	108.	153.4
9.	147	34.	152	59.	154	84.	155	109.	161
10.	142	35.	155	60.	150	85.	160	110.	164
11.	150	36.	152	61.	147	86.	162	111.	159
12.	152	37.	141	62.	160	87.	159	112.	153
13.	159	38.	150	63.	145	88.	150	113.	155
14.	151	39.	155	64.	149	89.	152	114.	155
15.	160	40.	150	65.	156	90.	159	115.	153
131	146	41.	145	66.	150	91.	142	116.	152
17.	153	42.	152	67.	154	92.	162.5	117.	155
13.	154	43.	153	68.	160	93.	162	118.	160
19.	161	44.	142	69.	156	94.	149.5	119.	152
20.	160	45.	153	70.	152	95.	151.5	120.	145
21.	164	46.	152	71.	143	96.	147	121.	145
22.	161	47.	150	72.	151	97.	157.5	122.	156
23.	153	48.	152	73.	146	98.	157	123.	160
24.	143	49.	152	74.	155	99.	155.4	124.	155
25.	164	50.	156	75.	150	100.	159	125.	163

APPENDIX VI-A

HAEMOGLOBIN LEVEL OF THE EXPECTANT MOTHERS OF LOW INCOME GROUP IN g/100 ml.

1.	9.4	26.	11.5	51.	9.4	76.	7.9	101.	10.3
2.	7.9	27.	11.5	52.	11.5	77.	11.5	102.	10.1
3.	7.2	28.	8.0	53.	10.5	78.	7.9	103.	7.9
4.	9.4	29.	7.2	54.	7.2	79.	7.2	104.	10.3
5.	9.4	30.	8.7	55.	7.9	80.	11.3	105.	9.4
6.	11.5	31.	8.7	56.	10.2	81.	11.5	106.	11.5
7.	9.4	32.	11.5	57.	11.5	82.	11.5	107.	11.5
8.	11.5	33.	9.4	58.	11.5	83.	10.0	108.	8.7
9.	10.1	34.	8.7	59.	9.4	84.	7.3	109.	7.9
10.	8.7	35.	9.4	60.	9.4	85.	9.4	110.	11.5
11.	9.4	36.	11.5	61.	10.2	86.	10.8	111.	10.3
12.	9.4	37.	7.9	62.	10.5	87.	11.5	112.	11.5
13.	10.5	38.	7.9	63.	9.5	88.	9.4	113.	10.3
14.	9.4	39.	8.7	64.	11.5	89.	9.5	114.	10.8
15.	7.2	40.	8.7	65.	11.5	90.	11.5	115.	11.5
16.	9.4	41.	9.4	66.	11.5	91.	7.9	116.	9.4
17.	5.8	42.	8.7	67.	9.4	92.	11.5	117.	11.5
18.	9.4	43.	7.9	68.	7.0	93.	10.1	118.	7.2
19.	10.5	44.	7.9	69.	8.7	94.	11.5	119.	10.1
20.	9.4	45.	7.9	70.	12.3	95.	7.3	120.	10.8
21.	8.7	46.	11.5	71.	9.4	96.	9.4	121.	7.9
22.	8.7	47.	9.4	72.	9.4	97.	11.5	122.	11.5
23.	11.5	48.	9.4	73.	7.9	98.	10.3	123.	12.3
24.	10.15	49.	10.2	74.	9.4	99.	10.3	124.	11.5
25.	8.4	50.	8.7	75.	7.9	100.	8.0	125.	9.4

APPENDIX VI-B

HAEMOGLOBIN LEVEL OF THE EXPECTANT MOTHERS OF MIDDLE INCOME GROUP IN g/100 ml.

1.	11.5	26.	9.4	51.	10.0	76.	9.4	101.	9.4
2.	10.8	27.	10.8	52.	9.4	77.	9.4	102.	9.4
3.	10.8	28.	9.4	53.	10.5	78.	9.4	103.	10.2
4.	7.9	29.	11.8	54.	11.5	79.	11.5	104.	8.7
5.	9.4	30.	10.5	55.	11.5	80.	9.4	105.	9.4
6.	9.4	31.	11.8	56.	10.5	81.	9.4	106.	9.4
7.	9.4	32.	10.8	57.	11.5	82.	9.4	107.	9.4
8.	7.9	33.	11.8	58.	9.4	83.	9.4	108.	7.9
9.	11.5	34.	11.5	59.	10.5	84.	9.4	109.	9.4
10	7.9	35.	10.8	60.	9.4	85.	9.4	110.	9.4
11.	8.4	36.	9.4	61.	9.4	86.	9.4	111.	10.2
12.	7.9	37.	10.5	62.	10.5	87.	9.4	112.	10.2
13.	11.5	38.	10.5	63.	9.4	88.	9.4	113.	10.2
14.	7.4	39.	8.0	64.	11.5	89.	9.4	114.	11.5
15.	11.5	40.	6.0	65.	9.4	90.	9.4	115.	11.5
16.	11.5	41.	9.4	66.	9.4	91.	9.4	116.	11.5
17.	9.4	42.	10.5	67.	9.4	92.	9.4	117.	11.5
18.	11.5	43.	10.8	68.	11.5	93.	9.4	118.	7.3
19.	9.4	44.	7.9	69.	9.4	94.	9.4	119.	9.4
20.	10.8	45.	11.5	70.	10.5	95.	9.4	120.	7.9
21.	9.4	46.	7.9	71.	10.8	96.	9.4	121.	10.2
22.	9.4	47.	9.4	72.	11.5	97.	9.4	122.	9.4
23.	10.8	48.	9.4	73.	10.5	98.	9.4	123.	9.4
24.	10.8	49.	10.5	74.	10.5	99.	9.4	124.	9.4
25.	11.5	50.	10.5	75.	7.9	100.	9.4	125.	9.4