ECTOPIC PREGNANCY

(Review of 56 cases)

by

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Ectopic pregnancy is in many cases an acute emergency. It has to be differentiated from other acute abdominal conditions before any surgical intervention is undertaken. Clinical features are often so variable that at times the diagnosis becomes a challenging problem to the obstetrician. The following is an account of our experience with cases of ectopic pregnancy admitted in Assam Medical College Hospital, Dibrugarh.

Incidence

Fifty-six cases of ectopic pregnancy reported for treatment in this hospital. There was a total of approximately 14,600 confinements during this period, which gives a ratio of ectopic pregnancy to deliveries as one in 250.

It has been noted by many workers recently that the incidence of ectopic pregnancy is gradually increasing. The reason for this increase in the incidence is stated to be the frequent use of antibiotics in inflammatory conditions of the pelvic appendages. This keeps the tubes partially blocked (Krohn, *et al*, 1952) and though fertilization occurs, the movement of the ovum is retarded through the damaged tube (Poddar, 1957-58). This is particularly true in the case of tuberculous salpingitis (Halbrecht, 1957).

There is marked disparity in the incidence of ectopic pregnancy quoted by different workers in India and abroad. Beacham of New Orleans (quoted by Taylor, 1965) reported the ratio as one is to 139 pregnancies. Eastman (1966) in 1942 found it to be 1 in 118, and in 1953 it was 1 in 83. Jeffcoate (1962) reported it as 1 in 300-1000 deliveries, whereas the ratio of 1 in 300 pregnancies was reported by Peel (1963), 1 in 70 pregnancies by Greenhill (1965-66) and 1 in 116 deliveries by Webster *et al* (1965). In India, it was described as 1 in 300 by Upadayaya *et al* (1955), 1 in 333 by Mitha (1965), 1 in 89 by Mokadam and Kalpana (1968) and 1 in 72 by Wagh and Patel (1968).

Age group

Table I shows the number in the different age groups. The maximum number was found in the 21-30 years' age group. This was also the observation of other workers. Mokadam and Kalpana (1968) found 68.69% in 21-30 years group while Mitha (1965) found 25.5 as the average age. The greatest frequency of ectopic pregnancy found by Bea-

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cham (quoted by Taylor, 1965) was between 25 and 31 years. Ghose and Ghosh (1968) found two third of his cases in this age group. Our youngest patient was 18 years and the oldest was 40 years.

TABLE I
Incidence in relation to age

Age in years	Number	Per cent
15-20	10	17.8
21-30	35	62.6
31-40	11	19.6
Total	56	100

Parity: Table II shows the incidence of ectopic pregnancy in relation to parity. Multiparous women (43 cases) suffered more from ectopic pregnancy than the nulliparous (13 cases). The incidence was high in para 1 to 3 (28 cases) than in the rest. Sandmire and Ramlal (1959) reported 73.6% of their cases in women having had one or more deliveries in the past and 26% in those who had had one or more abortions in the past. What role is played by previous pregnancy and labour is unknown.

TABLE II
Incidence in relation to parity

Parity	0	1	2	3	4	5	6	7
No. of cases	13	10	9	9	5	7	1	2

Prolonged infertility: Table III shows the period of infertility in association with ectopic gestation. A period of infertility varying from two years to as long as eleven years was noted. In fourteen cases, it ranged from 2-6 years. Ghose and Ghosh (1968) reported a period of over five years in 51 cases (42.85%). Soissan and Moran (1959) had found three years or more in 16%. Webster *et al.* (1965) observed a period of infertility of five years or more in 22.5%. According to Iffy (1961), tubal narrowing and delayed ovulation are the two important factors responsible for this close relationship between prolonged infertility and ectopic gestation.

TABLE III
Period of infertility in association with ectopic gestation

Number in years	Number of cases
2-4	10
4-6	4
6-8	4
8-10	6
over 10	1
Total	25

History of abortion: Eight cases (14.2%) had previous abortions. Wagh and Patel (1968) reported previous abortion in 12.8% of their cases.

Clinical features: The clinical features (Table IV) are of varying nature. Amenorrhoea followed by pain in the abdomen and vaginal bleeding, though characteristic, are by no means constant. Leff and Winson (1947), on the other hand, believed that at least two features are constant. In our own experience, the most constant and characteristic symptom is pain in the abdomen. The intensity and location of the pain depends on the type of ectopic and nature of bleeding. The pain is dull and diffuse in chronic cases and coli-

TABLE IV

Clinical features of ectopic pregnancy

1.	Amenorrhoea	31
2.	Vaginal bleeding	42
3.	Acute abdominal pain	26
4.	Dull and diffuse pain	25
5.	Fever	8
6.	Loss of appetite	1
7.	Lump in the abdomen	12
8.	Lump in pelvis	47
9.	Shoulder pain	5
10.	Tenderness	43
11.	Constipation	1
12.	Vomiting	6
13.	Bearing down sensation during defaecation	1
14.	Difficulty in passing urine	1
15.	Giddiness	1
16.	Blurring vision	1
17.	Pallor	34
18.	Decidual cast	1

cky in acute ones. Pain was present in 51 out of 56 cases; it was acute in 26 and subacute in 25 cases. Mokadam and Kalpana (1968) found pain in 90.51% of their series of 358 ectopic gestations. Poddar (1968) noted it in 94% of his cases.

Vaginal bleeding: The next characteristic feature is vaginal bleeding. This was found in 42 cases. Poddar (1968) reported vaginal bleeding in 80% of his cases. Eastman (1956) and Peel (1963) found this symptom in 75% of their cases. Webster *et al* (1965) noted it in 63.4%. The amount of bleeding varies from simple spotting, reddish discharge to frank and profuse bleeding. In many cases, where the embryo is living or the gestation sac is not disturbed, there is no bleeding. Vaginal bleeding is often neglected because it is considered to be dysfunctional uterine bleeding, particularly when there is no history of amenorrhoea.

Passing of a decidual cast has been much stressed as an important feature by some workers. It is said to be present in about 30% of the cases. We found it only in one case. Poddar (1968) did not find any in his long series of cases. Novak and Woodruff (1967) observed that expulsion of the cast occurred more frequently than has been reported, and that either the patient was ignorant of it or the physician did not get an opportunity to study it.

Amenorrhoea: It is very difficult to elicit a history of amenorrhoea of just a few days in our cases because most of them are ignorant. Amenorrhoea was found in 31 (55.3%) of the cases in this series. It was less than three months in 22 cases. The duration of amenorrhoea is often misleading and unconvincing, as six of our cases reported an amenorrhoea of four to six months and three cases had amenorrhoea of more than six months though actually in this series there was only one case of advanced ectopic gestation. One patient of this former group (6 cases) had lactational amenorrhoea and the remaining 5 cases were 'old' tubal ectopics without any history of vaginal bleeding. Two of the latter group (3 cases) had lactational amenorrhoea and the third case was one of advanced secondary abdominal pregnancy, as mentioned earlier. Thus, a history of lactational amenorrhoea (3 cases in the series) is important though ectopic pregnancy during this period is rare (Iffy, 1961).

Fever: In eight cases, there was a low-grade fever. It was noted mostly in the subacute cases and was probably due partly to the peritoneal irritation around the effused blood and partly to the absorption of

blood (MacLeod, 1955). It seldom exceeded 100° to 102° F. Lahiri (1968) recorded 70.8% of low grade fever in his series.

Pallor: Soissan and Moran (1959) recorded pallor in 42% of their cases. We observed this in 60.79% of our cases. This depends upon the amount of bleeding and the degree of shock.

Palpation of lump in the abdomen and the pelvis: In 12 cases (21.4%) of this series, a lump of varying size in the lower abdomen was palpated. Webster *et al* (1965) were able to palpate a lump in the lower abdomen in 47.6% of their cases. A twisted ovarian cyst and a tubo-ovarian mass should be excluded in the differential diagnosis. Palpation of a tender mass through the fornix is of more important diagnostic value and this was noted in 47 (83.9%) of our cases. The characteristic finding of tenderness on movement of the cervix is missed when examination is made under general anaesthesia Another finding of importance in ectopic gestation on vaginal examination is fullness of the pouch of Douglas.

Shoulder pain: In five cases, shoulder pain was present. The pain is due to irritation of the diaphragm by the blood in the peritoneal cavity. Poddar (1968) stressed upon this feature in the diagnosis of ectopic gestation.

TABLE V

Different types of ectopic gestation

1.	Tubal	47
2.	Ovarian (?)	1
3.	Site undiagnosed at laparotomy	1
4.	Secondary abdominal pregnancy	1
5.	'Chronic' ectopic refusing treatment	6

Types of ectopic gestation: Table V shows the different types of ectopic pregnancy. Tubal gestation was found in 47 cases (83.9%) out of which it was in the right tube in 28 and in the left in 18. In one case, as the gestation sac was found embedded in Douglas' pouch, it was not possible to say to which side it belonged. Jeffcoate (1962) and Beacham and associates (Greenhill, 1960) also experienced that there were more involvements of the right tube. Other observers, like Campbell (1952), Draa and Baum (1951), were of the same opinion. But Moir (1956) observed that both tubes were affected equally. Walmiki *et al.* (1968) found ectopic gestation on the right side in 53.4% and on the left side in 46.6%. The cause of frequency on the right side is not known.

There was one case of doubtful ovarian pregnancy in this series. The generally accepted criteria of diagnosis are those originally postulated by Spiegelberg (Novak and Woodruff, 1967). In our case, there was a very big haematoma involving the whole right ovary. Both tubes were found to be healthy. The biopsy report of the resected sac was not convincing.

There was one case of secondary abdominal pregnancy. The patient continued her pregnancy upto eleven months when she was admitted for treatment. A dead baby was delivered at laparotomy. The incidence of advanced abdominal pregnancy in this institution is roughly about one in 7,000 deliveries.

Special investigations

The clinical picture of ectopic

pregnancy is so characteristic that the diagnosis is made by good history-taking and careful examination. At times the picture is atypical and the diagnosis may be missed.

In the acute variety, there is no time and need for any investigation except to do blood grouping, cross-matching and immediate laparotomy. The problem is with the so-called sub-acute and chronic cases, where the diagnosis is confusing, and in such cases the following investigations may be of help.

(1) *Examination under anaesthesia:* This is done routinely only in those cases prepared for laparotomy. The author remembers a case diagnosed clinically as extra-uterine pregnancy which turned out to be a uterine pregnancy when examined under anaesthesia. Examination under anaesthesia should be done with great care for fear of rupture with profuse intraperitoneal bleeding. Hawkins (1962) has particularly stressed on this danger.

(2) *Aspiration of the pouch of Douglas:* This is helpful if free blood is obtained. It is a simple procedure and does not require anaesthesia. Webster *et al.* (1965) performed and recommended it as a routine office procedure, but there are others (Jeffcoate, 1962; Draa and Baum, 1951) who do not favour it. In cases of intra-ligamentary pregnancy, unruptured ectopic gestation and where the sac is anterior, it may be falsely negative. If pus is aspirated, it does not rule out an infected ectopic, though it goes in favour of pyosalpinx. Russel *et al* (1961) and Hutchinson (1961) reported positive aspiration in 88.6% and 84.5% respectively. In twenty cases of this series where aspiration was done it was positive in 16 and negative in 4 cases. The author recollects a so-called ectopic gestation case in which dark stained fluid was aspirated at culdocentesis but which at laporatomy was a case of splenic rupture.

(3) *Posterior colpotomy:* It is likewise helpful and occasionally definitive treatment can be carried out by this route. But it is not for general routine application. Armstrong and co-workers (1959), Malkinson and associates (1958), Draa and Baum (1951) recommended it both for diagnosis and therapeutic purposes.

(4) *Diagnostic curettage:* When decidual tissue is found on histological examination without any evidence of chorionic villi, an extra-uterine pregnancy is suspected. Decidual reaction without chorionic villi is reported to be present in 25—39% of the ectopic gestation. More interesting is the fact that most of these cases report with vaginal bleeding which means the death of the ovum with shedding of the decidua. Curettage in these cases show normal endometrium. Novak and Woodruff (1967) found normal endometrium of postmenstrual or interval type in 50% of these cases, while in the 25% there was definite decidual reaction. Women taking progesterone may also show "decidual stromal response" (Novak and Woodruff, 1967). Hence, curettage does not find favour in general. We are also not in its favour.

(5) *Arias-Stella reaction:* In ectopic pregnancy, some atypical changes in the endometrium resembling adenocarcinoma have been described by Arias-Stella and Gutterrez (1957).

Birch and Collins (1961) found it in 60% of tubal gestation and thought this to be hormonal in origin. Recently, Lloyd and Fienberg (1965) found it in 70% in intra-uterine and extra-uterine pregnancies.

(6) *Culdoscopy and coelioscopy:* These methods require special instruments, some technical skill and experience and hence are of very limited practical value. They are not popular in this country and we do not have any experience.

(7) *Biological tests of pregnancy:* They do not help much in ectopic gestation. These tests become negative when the trophoblasts die or are dislodged by bleeding, as in pelvic haematocele, tubal mole or tubal abortion. A positive pregnancy test has been reported in some cases, but it does not designate the site of pregnancy, whether intra-uterine or extra-uterine. Hall and Todd (1961) found biological tests very helpful. Te Linde (quoted by Lahiri, 1968) feels that a positive result is of definite value in the non-urgent cases. We do not do these tests routinely.

Management

The treatment of ectopic gestation is abdominal operation. The procedure depends upon the site of implantation and nature of the disturbance. In such cases, excision of the affected tube is the usual treatment. Conservative surgery, like salpingostomy, in some selected cases gives good result.

In the presence of diffuse intraperitoneal bleeding, immediate laparotomy is necessary. Shock and collapse are the rule in such cases. The operation should not be delayed because of the possibility of subsequent massive haemorrhage. In our experience, we have found that many serious patients return gradually to normal after clamping the bleeding vessels. Blood transfusion is no doubt the chief sheet anchor in such cases. 'Quick in and quick out' should be the principle of such surgery. As soon as the peritoneal cavity is opened a hand is passed down the pelvis, the affected tube is brought out of the wound and excised after clamping. Often difficulty may be encountered because of adhesions of the ruptured tube to the ovary, in which case the latter should also be removed. Routine removal of the ovary, as suggested by Jeffcoate (1962), is not followed by us. The associated condition of the adnexae on the contralateral side should be inspected and treated when necessary. In a young patient, conservative surgery of the affected tube should be considered. In 4 such cases, reconstruction of the tube was done. Its success depends on the maintenance of full haemostasis and asepsis.

In secondary abdominal pregnancy, the diagnosis is often made at laparotomy. If it is advanced abdominal pregnancy, there is a serious risk of haemorrhage after separation of placenta as the latter may be attached to any of the important abdominal organs. When the attachment is broad, the cord is cut short and the placenta is left behind to be absorbed spontaneously. Morbidity in such cases is very high. When possible, the placenta should be removed and haemostasis maintained. In the treatment of our case of secondary abdominal pregnancy, there was difficulty during the attempt to

remove the placenta and severe haemorrhage occurred from the placental bed. This was, however, controlled later with much difficulty. Her post-operative period was very stormy.

The ovarian pregnancy was treated by resection of the sac uneventfully. Surgical excision of the gravid ovary is the usual treatment. Partial excision of the ovary along with the gestation sac may be possible if ovarian damage is not extensive.

Six cases who were suspected to be 'chronic' ectopic gestation from the history, physical examination and examination under general anaesthesia, including culdocentesis, refused operative treatment. They were, however, later discharged from the hospital after symptomatic relief.

Mortality: There was no death in the series. Eastman and Hellman (1966) reported one death in 826 ectopic gestations collected from the recent literature. This improvement in the mortality rate is due to correct diagnosis, proper blood transfusion and prompt operative treatment. But Mitha (1965) reported a high mortality of 2.9%.

Morbidity: It is not uncommon to find a low grade pyrexia for the first one or two days after the operation due to absorption of blood from the peritoneal cavity. Morbidity was high in the chronic cases which were characterised by low grade fever, peritonitis and wound sepsis. Temperature was elevated in most of our cases, from 99°-100°F, during the first two days of the postoperative period. In two cases, there was wound disruption. Paralytic ileus developed in three cases. Of these, one case was of advanced secondary abdominal pregnancy who had abdominal distension from the second postoperative day with marked rigidity and tenderness. Bowels sounds were absent. The postoperative period of this patient had not been satisfactory since 24 hours after the operation. Gradually she showed signs of return of abdominal sounds, and general improvement. The other two patients were cases of disturbed tubal ectopics with diffuse intraperitoneal bleeding and they developed paralytic ileus during the first postoperative week. However, they responded quickly to treatment.

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cal and health services, even two decades back, the rates have been reduced to below unity.

2. *Age distribution*

The age distribution of women who died and also of all maternity cases are given in the following table:—

Judged from the above analysis over a period of five years, the risk of maternal mortality is minimum in the ages 20 to 24 years.

3. *Parity*

The pattern of maternal mortality may now be considered in relation to age and parity. For this purpose it is necessary to examine the age-parity distribution of the maternity cases coming to the hospital given in Table I. Figure 3 represents the six graphs of the frequency distribution for the six parities 0, 1, 2, 3, 4 and 5.

TABLE II
Age distribution

Age in years	Maternity cases		Maternity deaths		Age specific m.m. rate
	No.	% age	No.	% age	
All	28,942	100	147	100	5
Below 20	2,140	7.4	12	8.1	5.60
20—24	7,809	27.0	28	19.1	3.58
25—29	8,291	28.7	35	23.8	4.22
30—34	6,592	22.8	39	26.5	5.92
35—39	3,203	11.7	28	19.1	8.74
40 and Over	907	3.1	5	3.4	5.51

The graphs in figure 1 represent columns 3 and 5 of the table. Both distributions are bell-shaped. The peak for all maternity cases occurs in the interval 25-29 years while that for deaths is in the years 30-34. Since the largest number of deaths occurs in the years 30 to 34, it is reasonable to assume that this age period is the most critical for maternity deaths.

A more realistic appraisal of the risk is given by the age specific maternal mortality (m.m.) rate defined as age-specific m. m. rate

$$= \frac{\text{No. of m.m. in any age}}{\text{Number of deliveries in that age}} \times 1000.$$

These are given in column 6 of Table II and figure 2 gives the corresponding graph. There is a fall in the age-specific maternal mortality rates for the ages 20 to 24 years from that for ages below 20 years. The maternal mortality rate increases consistently up to 40 years and then there is a drop in the last age-group.

It is interesting to note that the 'modal' age, that is the age at which the frequency is maximum for parity 0 and 1 is 20-24 years, that for 2, 3 and 4 is 25-29 and that of parity 5 is 30-34. In other words, most of the women in the ages of 20-24 years have their first delivery, or at the most

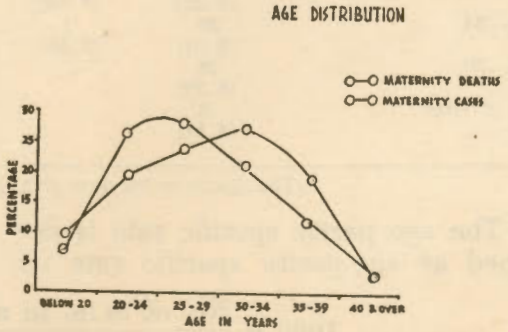

Fig. 1

Fig 2. MATERNITY MORTALITY AGE-SPECIFIC RATES

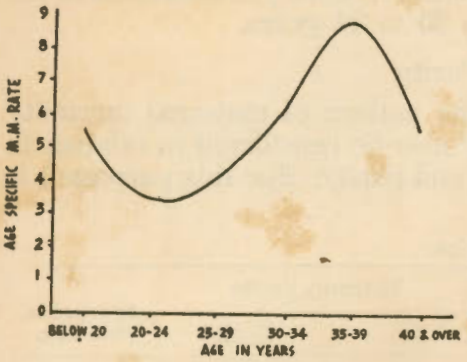

Fig. 2

Fig 3. AGE DISTRIBUTION OF MATERNITY CASES UNDER EACH PARITY

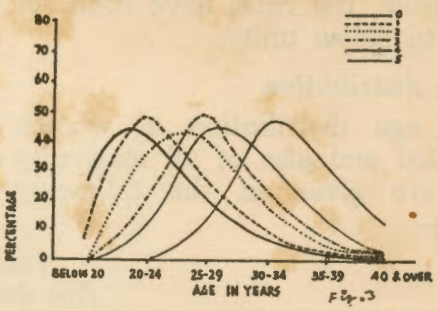

Fig. 3

their second, those in the ages 25 to 29 have had 2, 3 or 4 pregnancies and those in the ages 30 to 34 have had 5 pregnancies.

The following table summarises the data on maternal mortality in regard to age and parity:—

These rates give the risk of women dying in the specified age and parity group due to maternity. The following observations may be made on the above table:—

i. For the first delivery — parity 0 — the maximum risk is in the ages below 20.
ii. For parity 1, 2 and 3, the ages 30-34 seem to be most critical

TABLE III

Age and parity—maternal mortality

Age in years	Parity					
	All	0	1	2	3	4 and over
All	147 (5.09)	28 (4.17)	19 (4.02)	19 (4.64)	13 (3.61)	68 (6.92)
Below 20	12 (5.61)	11 (6.31)	1 (2.81)	—	—	—
20—24	28 (3.58)	10 (3.27)	9 (4.02)	5 (3.38)	2 (2.85)	2 (6.07)
25—29	35 (4.22)	6 (4.50)	6 (4.28)	6 (3.52)	7 (3.93)	10 (11.89)
30—34	39 (5.91)	1 (2.46)	3 (6.00)	7 (10.51)	4 (5.29)	24 (5.64)
35—39	28 (8.79)	—	—	—	1 (3.53)	27 (11.18)
40 & Over	5 (5.51)	—	—	—	—	5 (6.71)

(The figures in brackets give the age-parity specific rates)

The age parity specific rate is defined as age-parity specific rate =

$$1000 \times \frac{\text{No. of m.m. in a specific age \& parity}}{\text{No. of maternities in that age \& parity}}$$

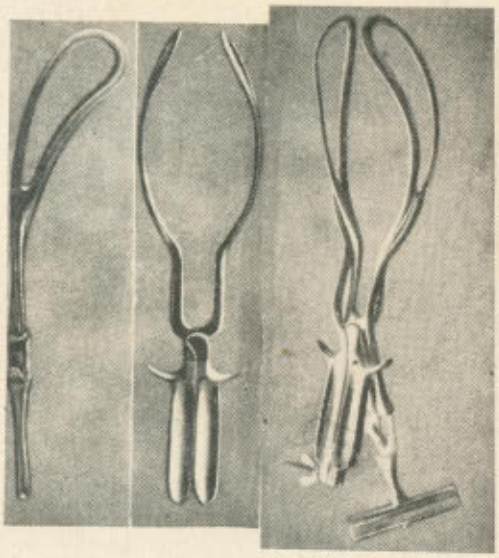

Fig. 1
Two types ordinary and axis-traction forceps (Das)

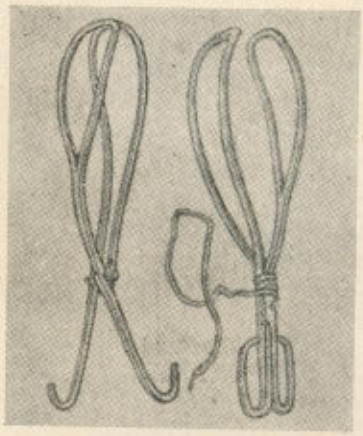

Fig. 2
Chamberlen forceps, two early models (Das).

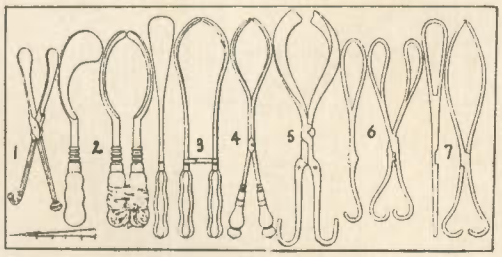

Figure 3

Fig. 3
1. Reuff's forceps "Longa et Tarsa"
2. & 3. Palfyn's forceps—Iron Hands of Palfyn"
4. Unknown (? Dusee's modification of Palfyn)
5. Dusee's forceps
6. Giffard's forceps
7. Chapman's forceps (Das).

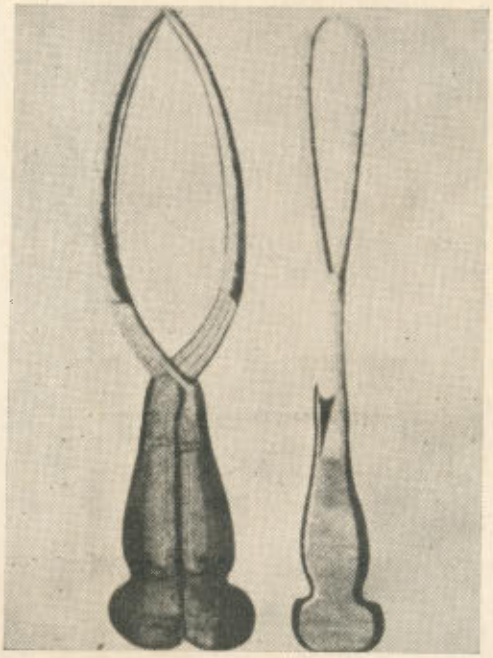

Fig. 4
Smellie's short straight forceps. Note the leather wrapped blades. Tips touch one another (Johnstone).

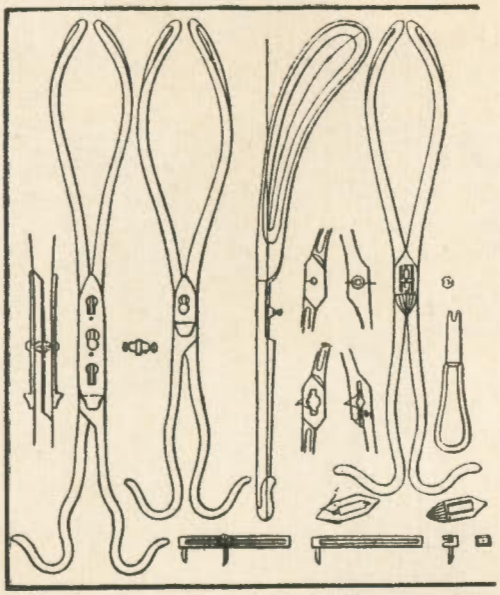

Fig. 5
Levret's forceps. The models are shown (Das).

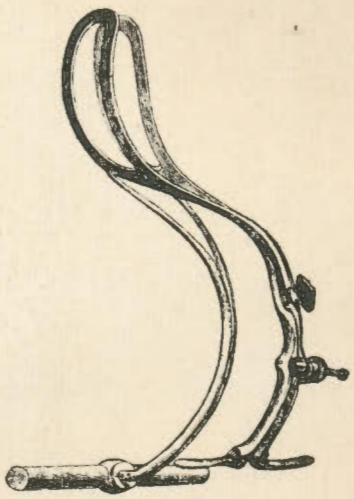

Fig. 6
Tarnier's axis-traction forceps early model (Das).

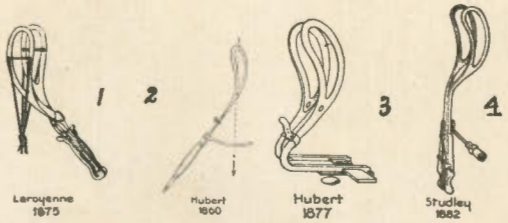

Figure 7

Fig. 7
Development of axis-traction showing four groups (1, 2, 3, 4) (Caldwell et al).

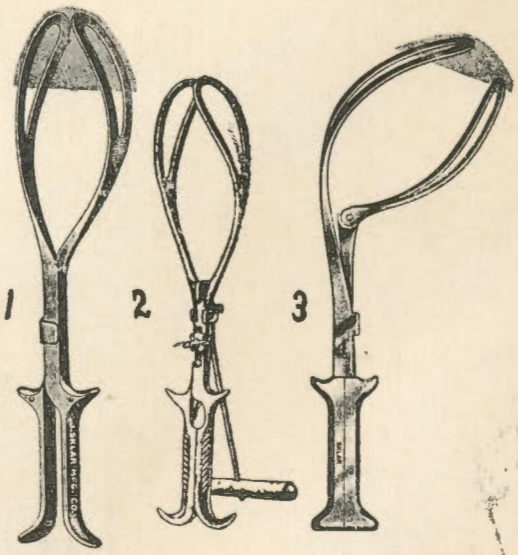

Fig. 8
1. Kiellands's
2. Zweiffel
3. Barton.

History and Evolution of Forceps—Das pp. 147-160

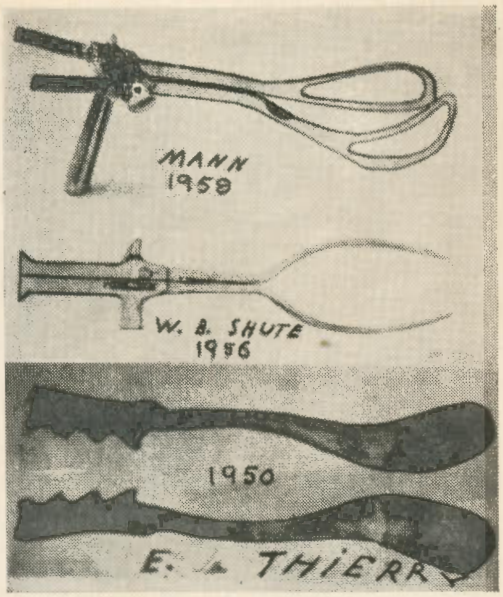

Fig. 9
Three recent forceps.

Ovarian Pregnancy—Saxena & Pathak
pp. 248-253

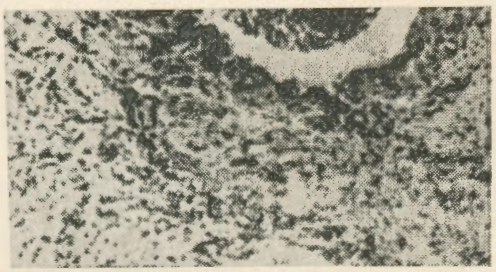

Fig. 1
Microphotograph of cut section of the specimen.

In the top middle is seen the trophoblastic tissue surrounded by the cavity of corpus lueteum. Ovarian tissue is seen in the lower part of the section. This suggests that the implantation may be in the corpus luteum. Well formed chorionic villi are not seen in this section. (H. E. x 100).

Arborization Test in the Diagnosis of Ruptured Membranes—Gupta & Sachan pp. 204-207

Fig. 1
Amniotic fluid showing typical arborization.

Massive Removal of Small Bowel during Criminal Abortion—Shanti Razdan & Razdan
pp. 254-255

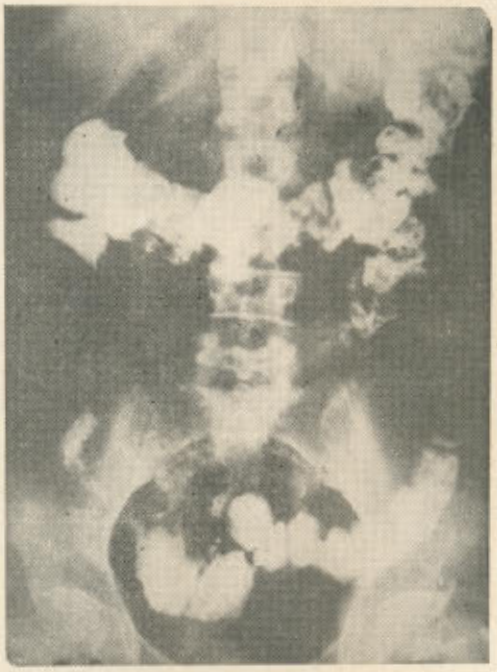

Fig. 1
Barium meal examination showing almost the whole of the barium in the colon, 35 minutes after ingestion.

Fig. 4
Placenta showing normal vascularity.

Fig. 5
Mild toxaemia—live birth.

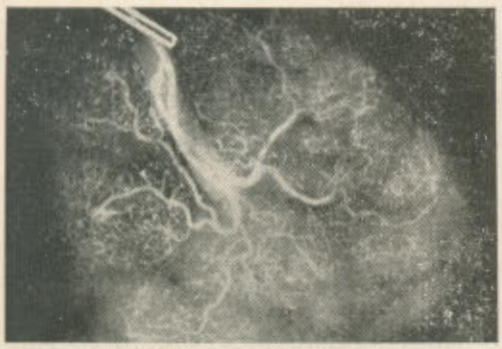

Fig. 6
Moderate toxaemia—live birth.

Fig. 7
Severe toxaemia—live birth.

Fig. 8
Multiple congenital anomalies—single umbilical artery.

Figs. 1, 2, 3 in text

Fig. 9
Foetal distress—live birth

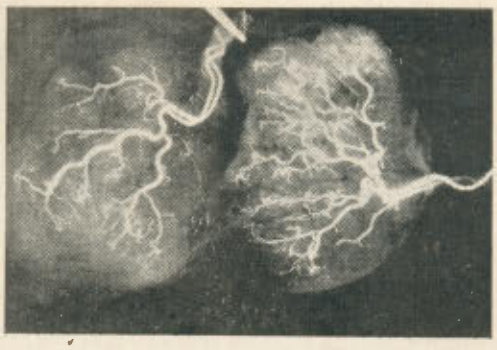

Fig. 10
Binovular twins.

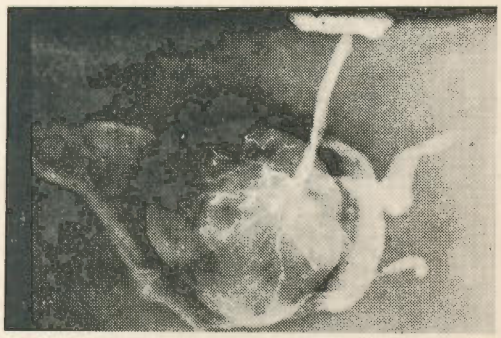

Fig. 11
Missed abortion.

Fig. 12
Still birth—fresh.

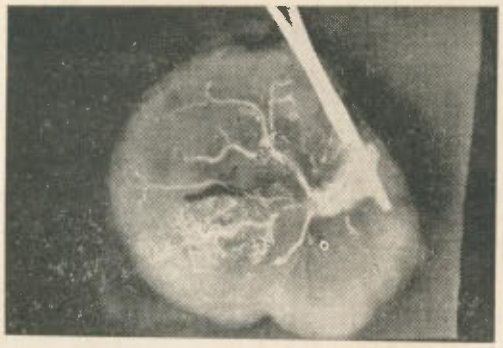

Fig. 13
Still birth—macerated.

Fig. 1
The patient showing the suprapubic mass.

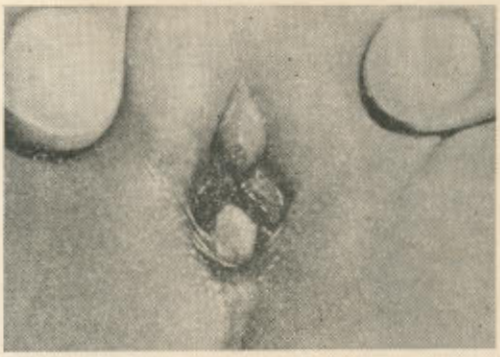

Fig. 2
The tense, bulging membrane at the introitus.

Fig. 3
Visualisation of vaginal cavity after incision of the membrane.

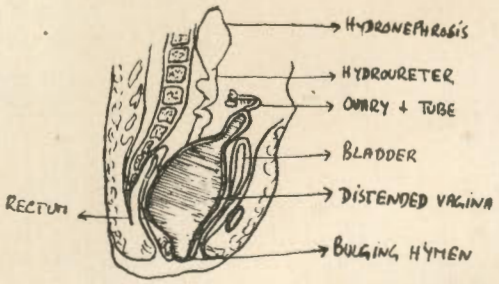

Fig. 4
Diagramatic representation of pathological changes in hydrometrocolpos.

Fibroma of Vulva—Sarmah & Sridhara pp. 266-268

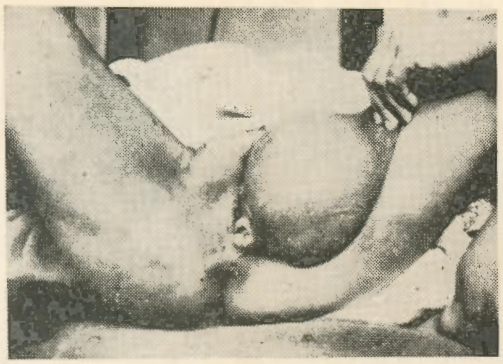

Fig. 1
Shows the huge fibroma arising from the left labium majus.

Fig. 2
Microphotograph of fibroma of vulva showing a number of fusiform cells between intersecting bundles of fibres.

Myxoma of the Broad Ligament—Ashar & Purandare pp. 269-272

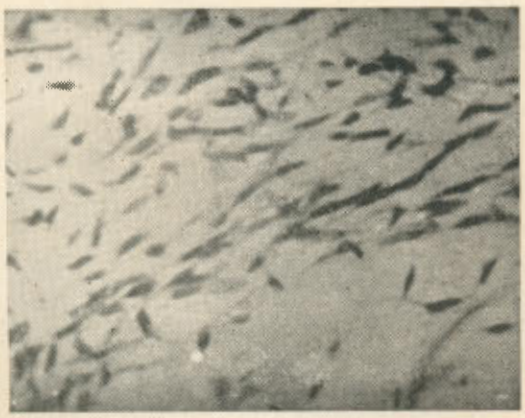

Fig. 1
The microscopic examination revealed stellate cells which were separated by loose homogenous appearing stroma.

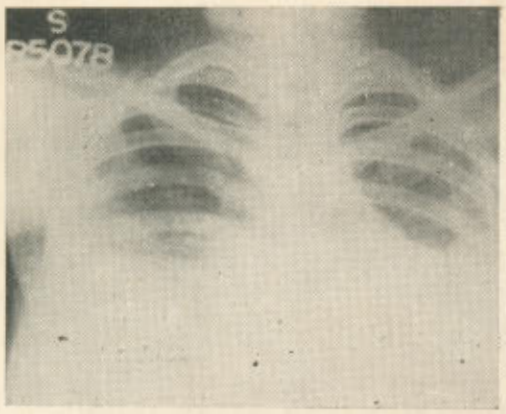

Fig. 1
X-ray of chest taken on 20.6.1968. Both the domes of diaphragm are raised. Both costophrenic angles are hazy. Bilateral pleural effusion. Paracentesis yielded haemorrhagic fluid.

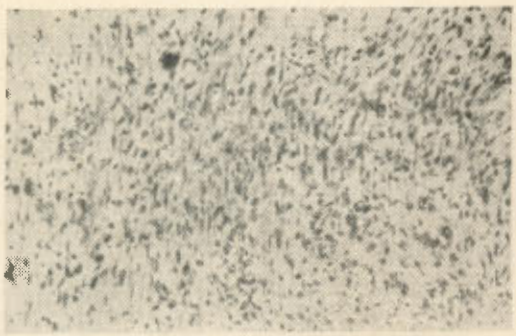

Fig. 2
Microscopic appearance of the tumour. It shows broad anastomosing columns of cells, without any attempt at formation of tubules. The nuclei are arranged at right angles to the column, the so called 'palisade effect'. Arrhenoblastoma, undifferentiated type (H E x 100).

iii. For parities 4 and over the ages 25-29 and 35-39 appear to be relatively dangerous. Further, in almost all age-groups, the age-parity m.m. rate is very much higher for parity 4, than that for any lower parity. (The only exception is the age group 30-34).

These observations lead to a positive recommendation to the effect, that mortality risk could be minimised if pregnancy in women occurs only after 20 years and stops with the third pregnancy.

4. *Occurrence of death in relation to pregnancy, labour and puerperium*

The time of occurrence of death has been classified under three heads — during pregnancy, labour and puerperium. The following table gives the distribution for this study:—

Clearly the period of labour is associated with the maximum number of deaths (63 out of 147) and the age-groups below 20 and in the 25-29 years group record the highest relative frequencies of maternal mortality—viz., 67% and 57%. Further, the frequency of maternal mortality during pregnancy and puerperium increases with parity, while that during labour is very high for the first and after the fourth deliveries.

5. *Contributary causes*

The complications noted in these cases have been studied and classified under the headings antepartum haemorrhage, post-partum haemorrhage, heart disease, eclampsia, rupture uterus, septic abortion and puerperal sepsis. The column 'others' include all the other causes which had been responsible for the death, like meningitis, cerebral thrombosis, hepatic coma, cirrhosis of the liver, etc. Ectopic gestation, vesicular mole and anaemia complicating pregnancy are also included under this group, because the numbers in each group were too small to merit separate headings.

TABLE IV

Age, parity and time of occurrence of maternal mortality

	All	Time of occurrence		
		Pregnancy	Labour	Puerperium
A. Age				
All	147	42	63	42
Below 20	12	2	4	6
20—24	28	6	12	10
25—29	35	8	20	7
30—34	39	13	15	11
35—39	28	10	10	8
40 & Over	5	3	2	—
B. Parity				
0	28	4	12	2
1	19	4	13	2
2	19	7	6	6
3	14	5	3	6
4 and Over	67	17	20	15

The most common causes of death have been found to be the haemorrhages of pregnancy and labour, each carrying a toll of 17 deaths out of 147, i.e. 11.5%. Next in importance is heart disease, responsible for 9.8% of maternal deaths. Then follow eclampsia, 8.8%, rupture uterus, 8.1%, septic abortion, 4.7% and puerperal sepsis, 4.0%.

tepartum haemorrhage treated during this period were 432, with a mortality of 3.9%. None of these 17 patients had any antenatal care, all being emergency admissions in a state of haemorrhagic shock. The maximum number were in the age group 35-39 years and of parity above 4.

The details regarding these 17 patients are given below:

17 cases	Acc. haemorrage Grade III	12	4 cases of coagulation failure		4 patients		—32-36 weeks
			1 bilateral cortical renal necrosis	12	4		—36-40 weeks
			7 Hemorrhagic shock		4		—cannot be ascertained
	Pl. Praevia	4	Type III	2	32 weeks	2	
			Type IV	2	36-40 weeks	2	
	Unclassified	1					

The cause of the death in relation to the age-groups, parity and the time of occurrence of death is shown in Table I.

A few observations can be made on the basis of this analysis for a five-year period.

(i) In the age group below 20, there were no deaths due to heart disease, antepartum haemorrhage, rupture uterus and septic abortion.

(ii) In the age group 20-24 years there has been no deaths due to septic abortion.

(iii) In the age group 40 and over, there were no deaths due to heart disease, post-partum haemorrhage, eclampsia, rupture uterus, septic abortion and puerperal sepsis.

Antepartum Haemorrhage was responsible for 17 out of 147 deaths, i.e. 11.5%. Total number of cases of an-

Postpartum Haemorrhage caused 17 deaths or 11.5% of maternal deaths. During this period there were 138 cases of post partum haemorrhage, death occurring in 12.2% of these.

The maximum number of deaths occurred in the age-group- 35-39 years and in the parity 4 and above. The highest parity among these deaths was 11. It is also very significant that the younger age-group and the primiparae were no exception, because there were 3 deaths in primiparae between 20 to 25 years due to severe atonic haemorrhage.

Among the antenatal complications responsible for this, the role played by hydramnios, twin pregnancy, infective hepatitis and fibroids complicating pregnancy were significant, being responsible for 6 of these

deaths. Three of these patients were admitted for retained and adherent placenta after delivery at home.

Six out of these 17 were 'booked' cases who had had antenatal care and who delivered in the hospital.

6 booked cases	Twin pregnancy (III and VI parae)	2 cases
	Grande multiparae (VII and X parae)	2 cases
	Hydramnios	1 case
	Fibroid complicating pregnancy	1 case

To control bleeding sub-total hysterectomy had to be done in 3 cases during lower segment caesarean section undertaken for obstetric indications.

Heart disease was responsible for 14 deaths, or 9.8% of all maternal deaths and 14% of all cases with heart disease. The type of lesion found in these cases were as follows:-

1. Mitral stenosis ..	3
2. Mitral stenosis with incompetence	2
3. Mitral stenosis with incompetence and auricular fibrillation	1
4. Mitral stenosis with aortic incompetence ..	1
5. Mitral stenosis with mitral incompetence and acute pulmonary oedema	2
6. Supra-ventricular tachycardia	1
7. Ventricular septal defect with congestive failure	2
8. Not made out (due to the severe dyspnoea and associated lung signs) ..	2
Total ..	14

The deaths were maximum (4 cases) in parity 4 and above, with more or less equal distribution in the other groups. The majority of the deaths were in the age group 25-35. Six deaths occurred during pregnancy, five during labour and three during puerperium. Where the death occurred during pregnancy, the term of gestation was 20 weeks in 3, and 24 weeks in 3. In all the other cases, the pregnancy had advanced up to 36-40 weeks. There were five 'booked' cases among this group. Their details are as given below:

5 booked cases	Pregnancy— 2 deaths	Auricular fibrillation Acute pulmonary oedema
	Labour—3 deaths	Mitral stenosis Mitral stenosis with incompetence Supra ventricular tachycardia

Their duration of stay in the hospital varied from 2 weeks up to 3 months. Out of the remaining 9 cases who were emergency admissions, 6 were in a very serious condition and died soon after admission.

Eclampsia caused 13 deaths out of 147, i.e. 8.8% of all maternal deaths. The total number of eclampsia cases treated during this period was 299, the percentage of mortality in these being 4.7.

Five of these deaths were in patients below 20 years and four were between 20-29 years. Out of the total 13, eight of the deaths were in primigravidae, which proves that eclamp-

sia is a grave complication which threatens a young primigravida.

13 cases	3 during pregnancy 6 during labour 4 during the puerprium.	

Causes of death were

Pulmonary oedema	4 cases
Myocardial failure	2 „
Cerebral haemorrhage	3 „
Cerebral thrombosis	1 case
Hyperpyrixia	1 „
Uncontrolled fits	2 cases

In 2 cases, where the fits could not be controlled, caesarean section was undertaken but the fits still recurred. All these patients had no antenatal care and were emergency admissions, most of them with a history of having had a large number of fits at home.

Rupture Uterus was the cause of death in 12 cases, 8.1%. During this period, the total number of rupture uterus patients treated was 66, 18.2% being fatal.

The maximum incidence of rupture uterus was between the ages of 25-29 years and in the parity 4 and above. The rupture had occurred during labour in 11 cases. In one case the rupture occurred at the 20th week of pregnancy, when a previous classical caesarean scar had given way. The present pregnancy was also complicated by twins and hydramnios. The immediate cause of death was shock in 10 cases. The rupture had occurred a long time before the patients could reach the hospital from far off places. In 2 cases repeated haemorrhage was the cause of death.

The exact cause of the rupture could not be made out in the majority of cases soon after the rupture. Two cases were of neglected shoulder presentation, one was of brow presentation and in one, there was a history of failed forceps applied outside.

None of these patients had any antenatal care, all being emergency admissions. Two of them were in a moribund condition and died before any operative treatment could be undertaken.

Septic abortion: Seven deaths were due to septic abortion, 4.7% of all maternal deaths. One hundred and eighty-four cases of septic abortion were treated during the above period, the mortality rate among these being 3.8%. Six of these cases were between 30-40 years of age and all were above parity 4. In none of these cases, a definite history of interference was forthcoming.

The cause of death was diffuse peritonitis in 5 cases, bilateral pulmonary tuberculosis in one and cerebral venous thrombosis in one. The period of gestation varied between 8-12 weeks. In three cases death occurred within 24 hours of admission.

Puerperal sepsis: There were 6 deaths, accounting for 4.0% of all maternal deaths. There were 334 cases of puerperal sepsis treated during this period with a mortality of 1.8%.

The deaths are more or less evenly distributed between the various age groups. But it seems significant that 80% of these deaths occurred at the first delivery, due to septicaemia and general peritonitis. Five of these were emergency admissions who had delivered outside. In one case a classical caesarean section was done in this hospital. She developed peritonitis and paralytic ileus and died on the 5th postoperative day.

Rupture ectopic gestation was responsible for 7 deaths. All these cases were admitted in a serious state of shock and died within a few hours after the operation.

Vesicular mole caused 4 deaths. Two were in a moribund condition on admission and died immediately, while the other two died a few hours after admission in spite of blood transfusions to combat the haemorrhagic shock.

Pulmonary embolism was suspected to be the cause of death in 5 cases, one during pregnancy and four during the puerperium.

Severe anaemia was the cause of death in 3 cases; all were admitted with a haemoglobin level of less than 20 per cent and with congestive cardiac failure. Milder degrees of anaemia were present along with other complications and must have contributed to some more of these deaths. According to Krishna Menon (1963), in Madras, anaemia was responsible for nearly 20 per cent of all maternal deaths and in another 20 per cent it was an associated factor.

Obstetric shock was responsible for death in 2 cases and acute inversion of the uterus in one. There was one instance of anaesthetic death due to laryngeal spasm during a caesarean section. Medical complications which by themselves would have been fatal apart from pregnancy, like cerebral haemorrhage, acute lymphatic leukaemia, cirrhosis liver, hepatic coma, lobar pneumonia, etc. were responsible for 30, or 20.4%, of these deaths.

Comparison with the figures of other centres

Our maternal mortality rate, as already pointed out, is 5.07 per 1000 which if we exclude the moribund cases where death occurred very soon after admission is reduced to 4.59 per 1000. According to Krishna Menon, the maternal mortality rate which was 21 per 1000, thirty years ago has been reduced to about 7 per 1000 now (1966). Bhose (1961) has reported a maternal mortality of 4.3 per 1000.

Antepartum haemorrhage has been responsible for 11.5% of maternal deaths and 3.9% of all cases of antepartum haemorrhage. For a two-year period 1965-67, the mortality due to accidental haemorrhage was 1.9%. (Table V)

The maternal mortality rate in heart disease was 9.8% which com-

TABLE V

Name of author	Deliveries total	No. of cases	Maternal deaths
Browne (1961)	15,928	100	7 (7%)
Douglas et al (1955)	71,826	398	5 (1.2%)
Porter (1960)	54,286	283	5 (1.8%)
Naidu (1961)	30,848	161	7 (4.4%)
Krishna Menon (1961)	24,634	450	20 (4.4%)
Parikh and Masani (1961)	17,213	190	4 (2.1%)
Poddar (1961)	10,839	54	4 (6.4%)
Dass and Vohra (1961)	9,790	74	2 (2.7%)
Present Series	9,854	104	2 (1.9%)

pares favourably with the maternal mortality rate reported by various authors, varying from 3.3% to 10%. (Table VI).

The mortality rates of septic abortion and puerperal sepsis, 3.8%, 1.8% respectively, are less than the figures reported by most authors.

TABLE VI

Author	Years studied	Total No. of deliveries	Total cardiac cases	Total maternal deaths	Cardiac materinal deaths	%age of cardiac cases	Cardiac deaths %age of maternal deaths
Shastrakar and Devi (1962)	1952-60	14,564	..	593	19	..	3.45
Subhdra Devi (1957)	1950-56	15,000	107	181	13	12	..
Dodeja (1961)	1958-60	12,132	56	..	5	8.9	10
Panjabi (1965)	1961-63	24,123	60	..	2	3.7	3.3
Masani (1957)	1953-56	22,833	47	..	3	6.4	..
Kirloskar (1962)	1958-61	33,553	..	152	16	..	10.5
Present series	1962-67	28,942	100	147	14	14	9.8

Eclampsia was responsible for 8.8% of all maternal deaths and the maternal mortality among all cases of eclampsia was 4.7%. This figure is higher than the figure, 2.2%, reported by Krishna Menon (1961) and Upadhaya and Misra (1965), 3%, but is less than the figures reported by most of the other authors. Banerji (1965) reported a mortality rate of 23% in his serious cases.

Rupture uterus caused 8.1% of all maternal deaths. According to Eastman it is responsible for producing 5% of deaths due to obstetric causes. 18.2% of the rupture uterus cases were fatal.

Josey (1963)	25.91%
Prabhavathy and Mukherjee (1963)	33.3%
Shastrakar (1962)	50.9%
Rendle-Short (1960)	36.8%
Patel and Parikh (1960)	27.5%
Gulati and Shrivastava (1965)	18.5%
Das Gupta (1956)	32.5%
Swami and Patel (1960)	37.0%
Present series	18.2%

Could these deaths have been avoided?

Only 16 patients out of the total number of 147 deaths in this series were 'booked' cases of the hospital (10.1%). The rest were emergency admissions, some of them referred from other local hospitals, but all with no antenatal care. Most of the patients who reached the hospital in a moribund state were in a very poor condition having travelled from distant places with great difficulty. Most of the mortality is in the parity 4 and above group and age above 30 years. In the younger age group (below 25 years) most of the deaths had occurred at the first delivery.

Improving the socio-economic status, wider health campaign and establishment of more health centres would definitely improve the situation to a large extent, but may take quite a long time. Meanwhile, extension of the antenatal care to the villages and health education of the pregnant women should be taken up as urgent measures. The danger of multiparity

should be impressed on them along with the desirability of limiting the number of children to 3 or less. All the grande multiparae and young primigravidae should be encouraged to have their confinements in well equipped hospitals. Toxaemias and haemorrhages of pregnancy, multiple pregnancy, hydramnios, heart disease, malpresentation, etc., should be considered as definite contraindications for a home delivery. Domiciliary midwifery, which also plays an important role, has to be improved by the addition of more and better trained personnel, doctors, nurses, midwives, health visitors, etc.

The wider judicious use of oxytocic preparations and proper management of the third stage of labour would reduce the incidence of post-partum haemorrhage to a very large extent. In spite of antenatal care, 5% of the patients with post-partum haemorrhage in this series died after delivery in the hospital, as mentioned earlier. The immediate availability of blood and a liberal supply of it might have reduced this figure a little more.

Efficient treatment of placenta praevia should begin at the first antenatal visit. When the bleeding is severe, "the difference between life and death can be measured in minutes and survival may depend upon where the patient happens to be". Two out of four cases in this series were admitted in a moribund state after the first bout of bleeding and the patients died immediately after admission.

The danger the young primigravida faces as regards eclampsia has already been referred to. Prevention of eclampsia and early recognition of toxaemia alone would be able to solve this problem. The vast majority of cases of rupture uterus are preventable if the abnormalities during pregnancy and labour were detected in time.

Though the maximum load on the heart is between 28-32 weeks of pregnancy, all the 6 deaths from heart disease during pregnancy in this series were between 20-24th week. The deaths were found to be maximum in the parity 4 and above. Restricting the number of children in cardiac patients to one or two, admitting them in the hospital very early, with close supervision throughout the period, would reduce the mortality significantly.

Legalising abortion, especially for mothers with more than four children, is likely to bring down the number of deaths due to septic abortion. The odium associated with induced abortions will thus be removed by legislation.

The indications for caesarean section are increasing today. As Stallworthy and Bourne (1966) point out "No surgical technique requires more constant reappraisal than caesarean section, for when an operation is proclaimed safe, it can become dangerous."

Haemorrhage and shock, responsible for about 30% of all deaths after caesarean section, are more often due to the fact that the blood lost at operation is usually greater than what is usually appreciated. That this is so in our series also, is evident from the fact that there were five deaths after caesarean section, four of them done for obstructed labour and the other was for a woman of 40 years for cervical dystocia. The bleeding was more than usual at

the operation. Though blood transfusion was given for all these cases, the prolonged labour with increased haemorrhage was responsible for the death which occurred a few hours after the operation. Morbidity is also increased by dehydration, exhaustion and ketosis. These should be corrected before the operation. These complicated cases should be handled by a senior obstetrician.

Vigilant care during the antenatal period and efficient intra- and postpartum care, with improvement of socio-economic status, would alone be able to face this extremely important problem.

Summary

This paper deals with the maternal deaths which occurred in the S.A.T. Hospital during a five-year period 1962-67, with special reference to the age, parity, the time of occurrence of death in relation to pregnancy, labour and puerperium and the contributory factors of death. A comparison is made with the results of other centres and the preventive aspects are briefly discussed.

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