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**Report on an Investigation into the
Causes of Maternal Mortality in the
City of Bombay**

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Introduction.

This investigation was made possible by a grant from the Indian Research Fund Association to which my thanks are primarily due.

The Executive Health Officer, Bombay city, very kindly cooperated whole-heartedly by sending in reports of all female deaths between 10-50, issuing instructions to all sub-registrars to give every assistance to the investigators in their work and supplying statistics and other information asked for from time to time. But for this help it would not have been possible to carry out this investigation. The investigating officers were uniform in their praise of the courtesy and attention shown to them at all the sub-registrars' offices.

Thanks are due to the superintendents of all hospitals and maternity homes and to private practitioners for the ready help and information given whenever occasion arose.

The completion of the information on maternal morbidity was made possible by honorary assistance from some of my colleagues who gave freely of their time to fill up the schedules for the different hospitals and maternity homes. Special mention must be made of Mrs. Wadia, M.D., F.R.C.S.E., the late Mrs. J. M. Desai, M.R.C.P., I.L.M., D.T.M. & H., Miss Vazifdar, M.B.B.S., the superintendents of all maternity hospitals, the Executive Health Officer for the maternity homes under him, and the Honorary Secretary, Infant Welfare Society, for the maternity centres run by that body. Some private consultants were kind enough to supply special statistics of their institutions which have proved to be of great value.

The investigators who were directly responsible for collecting all the information on the schedules deserve the greatest praise for the efficient and tactful manner in which they carried on their work and this in spite of two severe general epidemics. Mrs. Vaid, M.B.B.S., worked during the first eight months but had to give up on account of illness. Miss Aptekar, M.B.B.S., and Mrs. Kolambekar, L.C.P.S., completed the enquiry. Miss Aptekar has been very helpful in the preparation of the report and particularly in putting together the statistics and tables.

And lastly I record with sincere appreciation the help rendered by Dr. K. C. K. E. Raja in getting the statistics compiled, reading through the text, making valuable suggestions and necessary alterations, so as to make the report presentable and intelligible.

J. JHIRAD.

REPORT ON AN INVESTIGATION INTO THE CAUSES OF MATERNAL MORTALITY IN THE CITY OF BOMBAY.

CHAPTER I.

Introduction.

The subject of maternal mortality is one of the foremost public health problems under continuous study in the West. Influential committees have investigated the problem and made suitable recommendations. Interesting reports, drawn up after investigating thousands of cases spread over a number of years, are now available with respect to some of the Western countries. For India, however, the available statistics are not of much value because registration of births and deaths is unsatisfactory in most parts of the country. Medical certification of the cause of death is in force only in a few cities and, even in those cities, large numbers of deaths take place without being treated by qualified medical practitioners. The available figures in public health reports are therefore unreliable and give an incorrect picture of the problem. Within recent years, however, a few special enquiries in limited areas have produced valuable information regarding the causes and the probable incidence of maternal mortality in those areas. Dr. A. L. Mudaliar carried out an investigation in Madras city in 1933 and produced an excellent report. In 1935 the Indian Research Fund Association decided that the study of this pressing problem should be undertaken and that investigations should be carried out both in urban and rural areas in different parts of the country. An enquiry was carried out by Dr. M. I. Neal Edwards in Calcutta in 1936-37 and she produced an illuminating report. A similar investigation was started in Bombay in July 1937 and lasted for one year. In the following report an endeavour has been made to give some idea of the problems presented by this enquiry in Bombay.

Maternal mortality rate.

During the year under consideration 38,243 births (including 2,451 stillbirths) were registered. The total number of cases of maternal mortality investigated was 525. Of these, ten were not cases of maternal mortality and were therefore omitted. For the purpose of this investigation the term "maternal mortality" included "any death occurring during pregnancy, labour or puerperium extending to a month from the labour or later if the death was definitely proved to be the result of the labour." Five hundred and fifteen cases fell within the definition. Of these 340 deaths or 66.1 per cent were strictly the result of pregnancy, labour or puerperium and the remaining fell into the "Associated diseases" group. The maternal mortality rate, including associated diseases, is 13.5 per 1,000 and the rate excluding associated diseases is 8.9 per 1,000. This figure has to be accepted with reserve for the obvious reason that the registration of births and deaths is still defective. Table 2 gives the available figures from special enquiries in India.

TABLE I.

Cause of maternal death.	Madras (Mudaliar, 1933).		Calcutta (Neal Edwards, 1936-37).		Bombay—(Jhirad 1937-38).	
	Number of deaths.	Percent- age.	Number of deaths.	Percent- age.	Number of deaths.	Percent- age.
1. Septic abortion	14	4.2	33	4.71	10	2.94
2. Abortion (non-septic)	22	6.6	4	0.57	4	1.18
3. Ectopic gestation	2	0.6	6	0.86	6	1.76
4. Other accidents of pregnancy	<i>Nil</i>	..	7	1.00	1	0.3
5. Puerperal hæmorrhage	55	16.5	74	10.56	32	9.4
6. Puerperal sepsis	115	34.4	224	31.95	133	39.11
7. Puerperal albuminuria and convulsions	42	12.6	126	17.97	36	10.6
8. Other toxæmias of pregnancy	38	8.7	15	2.14	6	1.76
9. Embolism and sudden death	8	2.4	11	1.57	23	6.76
10. Other accidents of childbirth.	25	7.5	26	3.71	18	5.29
11. Other or unspecified conditions of the puerperal state. . . .	<i>Nil</i>	..	10	1.43	3	0.9
12. Anaemia	50	15.0	165	23.53	58	17.06
13. Acute yellow atrophy	1	0.3	..	..	10	2.94
	334	100.1	701	100.00	340	100.00

The Public Health Commissioner has stated that an approximate estimate of maternal mortality rate in India is 20 per 1,000 live-births. The Director of Public Health, Bombay Presidency, gives the rate as 4.2 per 1,000 births for 1936 and the Executive Health Officer shows the mortality rate for the city of Bombay as 4.4 per 1,000 births for 1937. In England a rate of 3.8 per 1,000 live-births was reported in 1936. Compared with the English figure our mortality rate is high and the problem needs very thorough investigation.

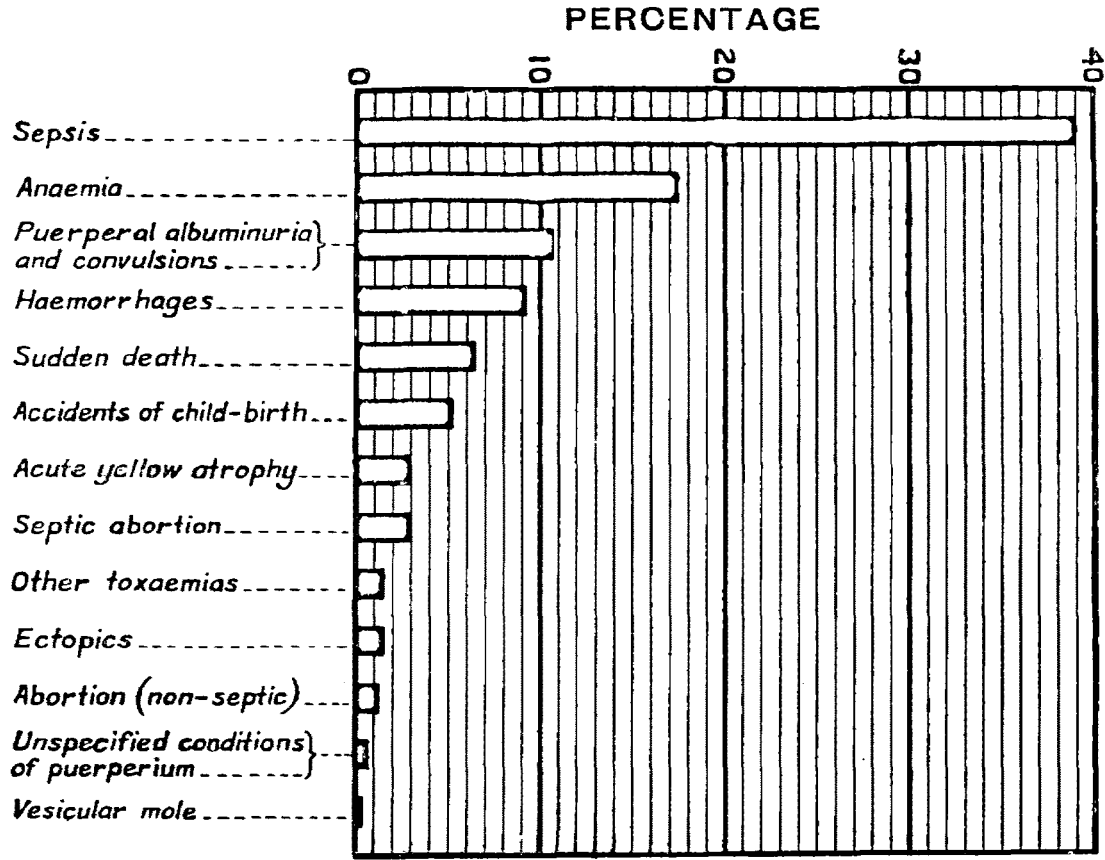
The great difficulty in collecting correct information arises from the absence of proper certification of the cause of death. It is quite a common experience to see no mention of an association with pregnancy or recent delivery in the death certificates. This is probably the explanation of the discrepancy between the rates given by the Health Officer and the rate worked out during this investigation.

TABLE 2.

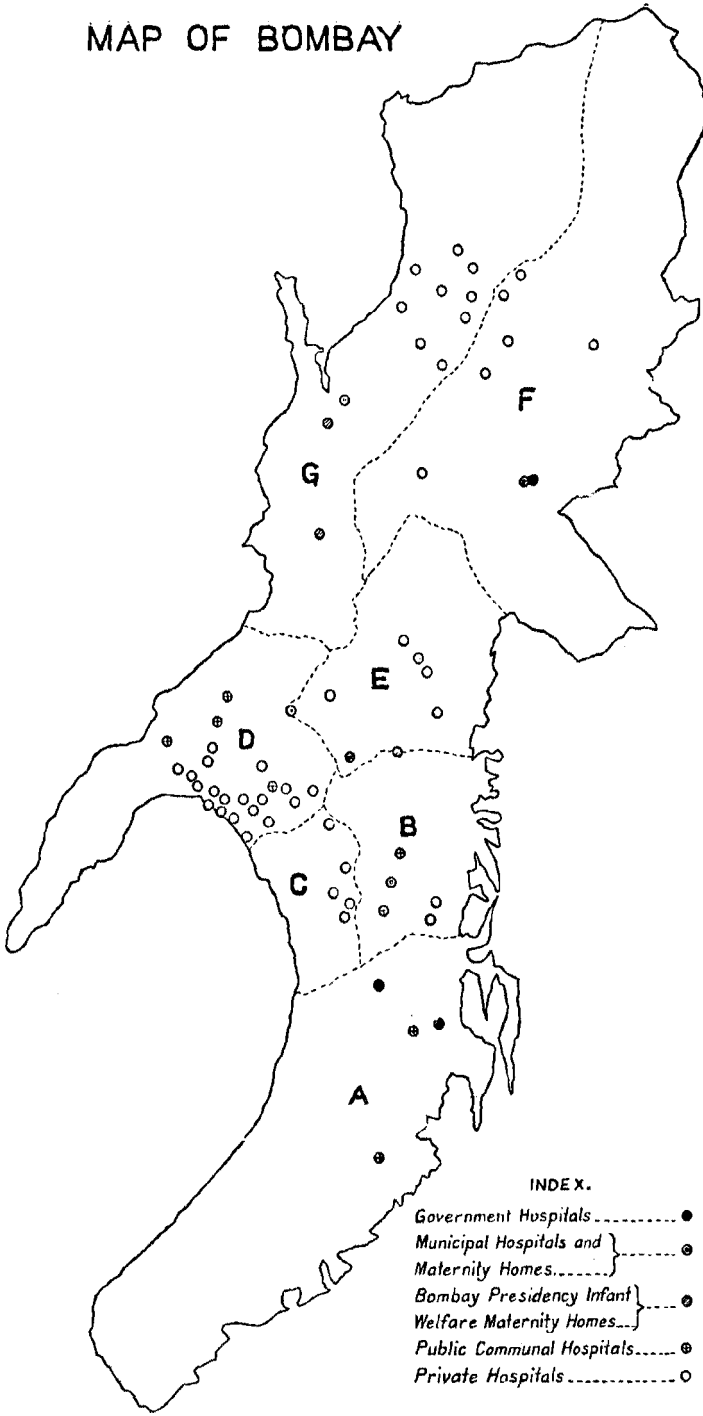
Maternal mortality rates.

Madras—Mudaliar—1933—16.6 per 1,000 total births .	(inclusive of associated diseases).
Calcutta—Neal Edwards—1936-37—24.4 per 1,000 live-births.	(exclusive of associated diseases).
Bombay—Jhirad—1937-38—8.9 per 1,000 total births	(exclusive of associated diseases).
England and Wales—1936—3.8 per 1,000 live-births	(exclusive of associated diseases).

PERCENTAGE DISTRIBUTION
OF CAUSES OF MATERNAL DEATHS



MAP OF BOMBAY



Area under investigation.

Bombay city has an area of 24.19 square miles, its length being about nine miles against a width of four miles. For the convenience of municipal administration the area has been divided into seven wards. (See map facing this page). Of these, ward A has most of the offices and big commercial firms. The residential population in this ward consists of better class families, with families of attendants. Ward D is mostly residential and here most of the better and middle class families reside. The remaining wards have many congested areas in them. In wards B and C live mostly the lower middle class population, who are employed as assistants in commercial firms and shops in the neighbourhood. E, F, and G wards are the mill areas and these wards present the real problems of poverty and ignorance among the people.

A glance at the ward distribution of maternal deaths shows strikingly that the highest number occurred in wards E, F, and G. This is particularly true for sepsis and anaemias (see appendix III). Distribution of maternal deaths by wards is dealt with in greater detail later in the report.

Facilities.

Bombay has a good supply of maternity beds compared to most towns. There are three large public hospitals open to all communities and the situation of each affords opportunities for turning these into useful centres for specialised consultation and maternity work. The total number of beds in these hospitals is 275. In addition, the municipality has five maternity homes with 134 beds. The Infant Welfare Society runs three maternity homes with 69 beds. The situation of all these is shown on the map facing this page. Most of them are concentrated near E and G wards. It is understood that the opening of a new maternity hospital in the vicinity of B and C wards is under contemplation by the municipal authorities. Besides the above institutions a large number of sectarian institutions has been opened within the last few years. A few, for example, the Parsee Lying-in Hospital, have been some of the oldest and foremost in maternity relief. There are, moreover, a number of private nursing homes, some under the management of leading consultants and some run by midwives or general practitioners. The municipality and the Infant Welfare Society maintain a number of midwives for attending on cases at home. A free ambulance service is maintained by the municipality.

TABLE 3.

Beds at public maternity hospitals.

	Beds.	Number of deliveries.	Percent- age.
Nowro-ji Wadia Maternity Hospital	150	5,197	17.93
Bai Motlibai and Sir D. N. Petit Hospitals	40	1,402	4.84
Cama and Albess Hospitals	85	3,205	11.06
Municipal Maternity Homes	134	4,939	17.02
Infant Welfare Maternity Homes	69	2,427	8.37
Sectarian Maternity Homes	236	3,937	13.58
General Hospitals	77	1,258	4.34
Private Maternity Homes under consultants	327	4,985	17.02
Maternity Homes conducted by general practitioners and midwives	171	1,577	5.4
	1,289	28,977	100.0

It is thus seen that 28,977 deliveries were managed with a total accommodation of 1,289 beds on an average of one bed for 22 deliveries per year. This, at first glance, seems a very favourable proportion, allowing of a length of stay of over 16 days per case. Conditions, however, are not quite as satisfactory for the general public. In a number of sectarian hospitals, patients stay for periods extending over 20 days or more to suit certain communal customs, and not all the beds in private maternity homes are continuously full. The greatest pressure is noticed on the beds of the three large maternity hospitals and the Municipal and Infant Welfare Society's maternity homes. Reckoning the deliveries in these, apart from those in sectarian and private homes, there exists a proportion of one bed for 36 cases in the public institutions.

Again if the beds (50) reserved for antenatal complications are deducted, a proportion of one bed for 40 cases is obtained. The beds in the three large hospitals also accommodate cases of abortions and postnatal admissions, and these latter as well as certain complicated cases would involve longer periods than the usual ten days, thus making for continuous overcrowding.

Plan of enquiry.

The Executive Health Officer, in whose area of jurisdiction this enquiry was being carried on, had kindly undertaken to send duplicate forms of death reports on all female deaths between the ages of 10 and 50, which stated whether the woman was pregnant at the time of death and whether she died during labour or within three months following labour or abortion. A number of cases returned as "remittent fever" in the childbearing period and said to be not connected with pregnancy, labour or puerperium were specially investigated by the research workers and it is felt that the information supplied by the Executive Health Officer is fairly reliable. In many cases of maternal deaths which were investigated, however, there was reason to think that the diagnosis or the certified cause of death was often incorrect. A case shown as 'pneumonia' was probably one of "puerperal sepsis with pyaemic emboli". Another returned as 'anaemia' was more likely to have been a case of 'phthisis', yet another diagnosed as 'anaemia' was one of 'puerperal sepsis' and a fourth also put down as 'anaemia' was a case of 'pulmonary embolism'.

Such errors can be minimised if proper certification of the cause of death exists as in the West. Many cases had not been seen by a registered practitioner and often the cause of death put down by the sub-registrar of the ward was based on vague information, with perhaps a cursory inspection of the body, even this is not allowed at times on the ground of religious scruples and customs such as the purdah. In the absence of regular postmortems, the data collected by the investigator have had to be relied on for arriving at the most probable diagnosis and this obviously permits of a certain margin of error in assessing the true cause of death.

Scope of the enquiry.

All the reported deaths were carefully sorted out and those shown to be definitely associated with pregnancy, labour or puerperium were fully investigated. This involved home visits and visits to institutions or private doctors and often meant repeated calls to meet the person concerned. The institutions and doctors cooperated fully and treated the investigator with great consideration. The relatives were also quite civil and communicative in the majority of cases, when the object of the enquiry was explained to them, only an occasional household being suspicious and resentful. There was necessarily some delay in carrying out the investigation of each death, as the reports of deaths took time to reach the office of the Health Officer from the sub-registrars of the

respective wards, and thereafter to be passed on to us. A report was rarely received in less than three to four days after the event. The home visits were done with the assistance of the attendants at the sub-registrars' office, who knew the localities well and could guide the investigator. In a number of cases the head of the family could not be found in spite of repeated visits, as the family had either moved into another part of the city or left for the country. This is the explanation for a number of home enquiries being incomplete. During the course of the investigation a change had to be made in the investigator owing to illness of the first one appointed. During the first eight months the work was carried out by a whole time investigator and during the last four months two part-time investigators were employed to complete the enquiry.

Each case was carefully discussed with the investigator and occasional omissions in the information collected were supplied by repeating the visits to the institution or home concerned. Some cases were, however, never seen by a practitioner either during pregnancy, at the time of labour or during the course of the puerperium and in these cases all that could be done was to come to the most probable diagnosis. As far as possible the cause was assigned to a puerperal condition rather than to an associated disease, so that it is not unlikely that the figures, particularly under 'puerperal sepsis' and 'anaemia' might be unduly high. Again cases of anaemia running a pyrexial course during the puerperium unless definitely proved to be non-septic were taken as septic. A glance at the 'puerperal sepsis' columns shows that a large proportion, roughly 5·2, were preceded by illhealth or artificial interference. Of the home deliveries about half the number had not been seen by any practitioner. Again in none of the cases were full bacteriological examinations done, for example uterine and blood cultures. This is probably due to lack of laboratory facilities on the spot. It may be noted that, for such information to be of any value, the investigation must be carried out by a reliable bacteriologist.

Of the anaemia cases about half the number had blood examination done but a full blood picture was obtained in only a few cases.

Some cases of toxæmia and pyelitis were difficult to diagnose and classify.

The cases of shock and embolism again presented difficulties. Shock after difficult labour is not referred to here. Three cases of shock and at least ten cases of embolism were not seen by any one. In the absence of full clinical investigation in every case and particularly post-mortem examination, when even clinical diagnosis was absent in some cases, it is felt that, from the data available, clear-cut diagnoses of the causes of death cannot be made with accuracy.

The value of the investigation must not, however, be minimised. There is a high mortality associated with maternity and it is therefore necessary to take prompt measures for preventing such a large waste of young promising lives. The year under investigation was marked by two serious epidemics of smallpox and enteric fever, which took a large toll of the general population. This naturally helped to swell the figures of deaths under associated diseases. In spite of these epidemics, tuberculosis accounts for the highest figure under associated deaths. The recent campaign against the disease initiated by Her Excellency the Marchioness of Linlithgow is a welcome step which it is hoped will help materially to reduce maternal mortality.

Primary avoidable factor.

The Departmental Committee on Maternal Mortality and Morbidity laid down certain criteria for assessing the primary avoidable factor so as to get at

the first departure from the established practice. The following were the criteria laid down by the Committee :—

- (i) The patient should “ book ” and make arrangements for the confinement, should report any obvious deviation from the normal, and should carry out the instructions of the doctor or midwife.
- (ii) The patient should receive such antenatal care from her doctor, midwife, hospital or clinic as should lead to the detection of albuminuria, malpresentation or marked disproportion between the foetal head and the mother’s pelvis. The examiner should obtain details of previous difficult labours and of serious illnesses.
- (iii) The confinement should not be undertaken in an entirely unsuitable environment.
- (iv) Such antiseptic and aseptic precautions as are generally recognised to be necessary should be taken.
- (v) A doctor or midwife should be available and should bring to the case a fair average degree of skill, knowledge and attention.
- (vi) Such hospital, consultant and transport services as are essential should be available, and the doctor should take advantage of them as and when necessary.
- (vii) A second doctor, acting as anaesthetist, should be obtained in severe cases.
- (viii) The hospital should provide suitable facilities and their officers should show evidence of special skill.

Judging by these standards the cases can be classified as follows :—

(1) Cases showing an avoidable factor	234
(2) No departure from established practice	69
(3) Unavoidable—	
(a) abortions	4
(b) Ectopic gestation	6
(c) Acute yellow atrophy	10
(4) Insufficient data	17

Omitting the unavoidable cases and cases with insufficient data, 77·2 per cent of the cases showed an avoidable factor.

In this series, nine cases of abortion sepsis have been classified in the ‘avoidable’ group. Acute yellow atrophy, according to the International List of Causes of Death (1929) should have been taken as an associated disease, but in this series this has been classified as a puerperal cause. Dr. Mudaliar (1933) also takes it as a puerperal cause.

The Departmental Committee separated all cases of abortion and ectopic gestation as irrelevant for the purpose. Following their classification the figures will read thus:—

<i>Group 1.</i> —Cases showing a primary avoidable factor	223
<i>Group 2.</i> —Cases in which no departure from established practice having a causal relationship to the death has been found	69
<i>Group 3.</i> —Cases not strictly relevant to this part of the investigation—abortion and extra uterine gestation	21
<i>Group 4.</i> —Cases in which the information was insufficient	17
	<hr/>
	330
Acute yellow atrophy	10
	<hr/>
	340

The Departmental Committee, basing their enquiry on the criteria quoted above, grouped the cases with a primary avoidable factor under four headings.

- A. Omission or inadequacy of antenatal examinations.
- B. Error of judgment in the management of the case.
- C. Lack of reasonable facilities.
- D. Negligence of the patient or her friends.

Taking these as the bases of classification, the cases have been regrouped as below:—

(A) Omission or inadequacy of antenatal (care) examination.—

	Primary factor.	Subsidiary factor.
(1) Neglect to book	96	76
(2) Neglect to follow advice or irregular attendance	14	1
(3) Neglect to report symptoms	7	..
(4) Inadequate antenatal care	8	1
(5) Delay in detecting disease	3	1

(B) Error of judgment—

(1) Unskilled attendant	4	..
(2) Specialist not sought or sought too late	4	..
(3) Too drastic treatment	4	..

(C) Lack of reasonable facilities—

(1) Institution with imperfect facilities	1	1
(2) Lack of transfusion service	11	4
(3) Unsuitable surroundings . . . . .	..	59

(D) Negligence of the patient and her friends.

(1) Neglect of asepsis and antisepsis	71	3
(2) Untrained attendant	11	62
	<hr/>	<hr/>
	234	208
	<hr/>	<hr/>

It is difficult to assess the first departure from recognised practice by relying solely on the data collected and it is not possible to give an opinion on errors of judgment in the absence of a personal knowledge of the case concerned. The deeper obstetric problems are investigated the more clearly is it realised that a multiplicity of factors are associated with the successful termination of a case. Recognition of deviation from the normal demands a thorough knowledge of the limits of normality. Moreover, a careful judgment is needed to limit interference to the minimum and to assess the value of conservative or radical treatment in a given case. Allowing for all these considerations it is felt that at least 12 cases were attributable to errors of judgment (see table of primary avoidable factors facing this page).

TABLE 4.—PRIMARY AVOIDABLE FACTOR.

	Number showing departure from established practice.	Unavoidable.	Insufficient data.	Omission or inadequacy of antenatal care.					Error of judgment.			Lack of facilities.		Negligence.		Total by cause.	Remarks.
				Neglect to book.	Neglect to follow advice.	Neglect to report symptoms.	Inadequacy antenatal care.	Delay in detecting disease.	Unskilled attendant.	No specialist.	Too drastic treatment.	Imperfect facilities.	No transfusion.	Ascpais etc.	Untrained attendant.		
Sepsis N. L. Dais	57	...	57	Includes 1 doctor's case.
Sepsis op. del. dais . . . . .	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Sepsis N. L. Institution	9	...	...	10	...	...	...	...	...	...	...	...	...	3	...	3
Sepsis C. L. Inst.	13	...	...	22	...	...	...	...	...	...	...	...	...	...	...	22
Sepsis op. del Inst.	1	...	...	12	1	...	...	...	...	1	1	...	...	1	1	12
Antepartum H.	4	...	...	2	...	3	...	...	...	1	1	2	...	5	2	19
Postpartum H.	4	...	...	...	...	...	...	...	1	...	...	...	4	...	4	13
Sudden Death	9	...	11	...	...	...	...	...	...	...	...	...	...	...	3	23
Albuminuria and eclampsia	11	...	...	13	9	2	1	...	...	...	...	...	...	...	...	36
Other toxemias	5	...	...	1	...	...	...	...	...	...	...	...	...	...	...	6
Anæmias	4	...	6	35	1	1	6*	3	2	58	*Includes 1 Postnatal case.
Acid. of childbirth	6	...	...	...	3	...	1	...	3	2	1	1	...	...	1	18
Abortion sepsis	1	...	...	...	...	...	...	...	...	...	...	...	...	9	...	10
Abortion hæm.	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Vesicular Mole . . . . .	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Ectopic . . . . .	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Breast abscess . . . . .	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Insanity	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Acute yellow atrophy . . . . .	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	10
Total	69	20	17	96	14	7	8	3	4	4	4	1	11	71	11	340	
Percentage of the total (340)	20.29	5.88	5.00	28 37.65					12 3.53			12 3.53		21 24.12			

The data available make it difficult to draw definite conclusions regarding preventability, but the general impression is that the majority of the women under investigation started labour in a debilitated state, if not already in the grip of a disease. To improve this state of affairs organisations are needed for dealing with the growing child, the adolescent, and the young adult, so as to ensure that the woman starts her pregnancy with a healthy body. Daily experience at medical institutions for women reveals a state of malnutrition amongst the majority of patients, pregnant and non-pregnant, partly due to ignorance of the principles of dietetics but largely due to poverty. A scheme for the supply of food and particularly milk to expectant mothers, side by side with educative propaganda at antenatal centres, will help much towards the mitigation of the situation. Extension of accommodation for antenatal cases at the larger centres will give better facilities for combating the initial stages of such diseases as anaemias and toxæmias.

It is obvious that, however popular institutions may grow, a certain percentage of women will always wish to be confined at home for various reasons. For these, a well organised domiciliary service is essential. It is highly regrettable that in this city so much scope is still allowed to the untrained *dai*. A Midwives' Act on the basis of those in the West is long overdue to eliminate the untrained woman and to maintain an efficient service of State and private midwives. A scheme for the supervision of all confinements conducted at home by midwives and *daïs* (until these latter are eliminated) as well as of the work carried on in public maternity homes, by a specially trained woman assistant to the Executive Health Officer is necessary to enforce the Act.

It is also necessary to have an Act passed for the registration of private maternity hospitals and nursing homes to permit of the regular supervision of these institutions. The question of compulsory notification of pregnancy has been discussed for years in the West but for obvious reasons it has never been enforced. It is, however, essential that a service of efficient and conscientious health visitors supplemented by the activities of social service organisations, should help to bring as many expectant mothers as possible under supervision from the early months of pregnancy and thus provide opportunities for detecting incipient signs of disease.

The problem of the primary avoidable factor is largely one of efficient antenatal care supplemented by proper intranatal methods and postnatal treatment. Two hundred and thirty four cases or 68.5 per cent of the total, showed an avoidable factor. Of these 117 were due to neglect on the part of the relatives to 'book', follow advice or report symptoms. If the cases attended by untrained *daïs* (82) and classified under negligence are added to these, 199 cases represent the part played by ignorance and sometimes perversity of the public. This leaves 35 cases which could be directly laid at the door of the doctor or institution. The need for intensive propaganda for bringing expectant mothers under early and regular supervision and for proper preparation for the expected delivery cannot be sufficiently strongly urged. Most of the 35 cases were conducted at institutions, and it is noticed that 11 cases could be ascribed to either inadequate antenatal care or delay in detecting symptoms. In 12 cases there seemed to be an error in judgment; one occurred in an institution not offering sufficient facilities and eleven cases were primarily due to want of facilities for transfusion. Four others mentioned under "subsidiary factors" seemed also to have needed transfusion urgently. Thus at least

fifteen cases might have derived material benefit if facilities for prompt transfusion existed in the city. This stresses the urgent need for the organisation of a transfusion service on the lines of the London Transfusion Service. At present transfusions depend on a supply of donors from the unemployed men at the Salvation Army and volunteers from the relations or medical students.

It is possible that, in the absence of such a service, the medical profession is not transfusion minded enough to feel the early need of a transfusion in certain cases. In most of the cases mentioned above, it seems that a transfusion was not thought of. Again it requires an expert, combining the best qualities of a pathologist, physician and surgeon for assessing the value of transfusion in certain cases and for employing careful technique in the carrying out of the operation. The selection of cases is most important as for instance a case with embarrassed right heart leading to failing circulation may be mistaken by an inexperienced person for collapse from hæmorrhage and an attempt made to overload the already distended right heart which would lead to disaster. When a service is formed, a series of demonstrations by a team of experts may help much to ensure careful selection of cases and the use of proper technique.

In the list of cases where no primary avoidable factor could be ascribed, it will be noticed that 23 cases of puerperal sepsis and one of abortion sepsis are included. In these, according to the information elicited, the usual aseptic precautions seem to have been taken and yet it is felt that the possibility of the attendant being responsible in some way for the sepsis cannot be completely excluded.

Antenatal care.

The value of antenatal care in the prevention of maternal mortality and morbidity cannot be too strongly emphasised. Antenatal care affords the opportunity for the preparation of the woman for safe delivery, anticipating and overcoming possible complications in a large percentage of cases. The majority of cases of anæmia, eclampsia and toxæmia should be preventable by adequate antenatal care; abnormal presentations can be corrected and contracted pelvis detected and treated properly. Antenatal care is the paying ground for proper intranatal work; in some cases, *e.g.* contracted pelvis much depends on a carefully carried out intranatal technique. The preventability of puerperal sepsis depends on antenatal work to the extent of ensuring maintenance of good health, elimination of septic foci and contact with infective cases, prevention of anæmia and toxæmia, both of which make the person more prone to infection, prevention of abnormal presentation which if detected only during labour, means unnecessary intrauterine manipulations and adequate arrangements for confinement. Much of the actual prevention of sepsis depends on the maintenance of asepsis during labour.

Antepartum hæmorrhages, though considered unavoidable, are noticed to have a lower incidence in 'booked' cases. These hæmorrhages would however, come under observation earlier if the patients were receiving regular antenatal care.

Statistics from two hospitals in Bombay for 1937 are given below.

TABLE 5.

Hospital.	Booked.					Emergency.				
	Total cases.	Accid. A. P. H.		Placenta prævia.		Total cases.	Accid. A. P. H.		Placenta prævia.	
		Number.	Percentage.	Number.	Percentage.		Number.	Percentage.	Number.	Percentage.
A . . .	1,825	12	0.7	14	0.8	1,143	30	2.62	20	0.8
B . . .	2,954	2	0.1	13	0.6	3,016	13	0.5	42	1.7
St. Mary's Hospital, Manchester.	1,010	8	0.8	5	0.5	682	44	6.6	37	5.4

It is difficult to lay down a definite criterion for adequate antenatal care. In the present series antenatal care has been taken to have been satisfactory if two or more regular visits had been paid and if the patient had carried out all the instructions. The number of visits cannot always be taken as an absolute guide. Two examinations are considered the absolute minimum, one at the eighth month and one within two weeks of term. The Scottish Report (3) suggests three examinations, the first at six months, the second a month before term and the third two weeks before delivery. The final result reflects the amount of antenatal care, which was absolutely necessary in a certain case, *e.g.*, a woman seen in the last month and found to be quite healthy and normal may die of puerperal sepsis. In so far as the pregnancy was normal and resulted in a normal confinement, the antenatal care may be considered sufficient. The majority of complications, however, require repeated visits at weekly or fortnightly intervals. Again mere examination and prescription at a centre can hardly be taken as sufficient unless this is followed up at home by a sympathetic health visitor to see that the advice is acted upon and also, a most important detail, that the proper hygienic conditions exist and that food is adequate in quality and quantity. To help women to carry out the essentials of antenatal care, assistance may be needed in the way of food-centres and convalescent homes.

A sufficient number of antenatal beds, at each of the large maternity centres, is needed to admit cases showing incipient diseases for observation and prompt treatment. In the absence of a sufficient number of beds, the authorities are compelled to limit admissions to advanced cases of anæmia, toxæmia, etc.

Only 72 out of 340 puerperal deaths had anything like adequate antenatal care. The causes of death for these cases are shown below :—

Cause of death.	Number of deaths.
Puerperal hæmorrhage (A. P. H.)	3
Puerperal hæmorrhage (P. P. H.)	6
Sepsis	22
Eclampsia	6
Toxæmias	3
Accidents of childbirth	11
Shock	1
Embolism	2
Acute yellow atrophy	1
Anæmia	17
Total	72

Some comment on the types of case in this series is needed to explain particularly the complications which are usually considered preventable.

Sepsis.—The preventability of sepsis depends largely on intranatal care, but much rests on general good health. In this series most of the cases were reported to have had complications of anæmia, toxæmia, or lung diseases, which apparently lowered their resistance. Two cases developed peritonitis, one after an operation and the other after a caesarean hysterectomy.

Eclampsia.—Four cases were described as fulminant, had been seen regularly and two of them were treated for persistent œdema, the other two having had no symptoms. All of them developed fits suddenly and got worse in spite of treatment. These cases illustrate the irreducible minimum in this serious complication. Two of these cases probably had their prognosis worsened by other complications; one needed craniotomy for deep transverse arrest, and one required manual removal of placenta.

The three cases under other toxæmias were all cases of chronic kidney disease which often makes pregnancy a grave complication.

Accidents of childbirth.—A detailed discussion has been given in the appropriate chapter. Most of the deaths were due to shock after operative delivery, each of which seemed to be carefully chosen. One occurred under spinal anaesthesia preparatory to caesarean section; one died of shock at the end of a trial labour, when she was being prepared for a caesarean section. Only two cases seemed to have had errors of judgment in treatment.

Anæmia.—These cases were reported to have had regular treatment; a few of the cases who were kept in the wards for variable periods showed progressive anæmia in spite of treatment. In a few, the onset of diarrhoea or facial cellulitis during the puerperium hastened the end.

Fortyfive cases had inadequate antenatal care. This includes cases where one visit had been paid some time previously but the interval was too long to warrant safety. Others had been seen fairly recently but had ignored advice or had not reported symptoms arising after the visit. Yet others, fortunately few, but still a regrettable number of 11 cases, had been seen by doctors who had either failed to examine the urine, to detect contracted pelvis or to take enough note of certain symptoms which were ominous.

Two hundred and three cases had no antenatal care and in 20 the history was indefinite as the relatives could not be interviewed. Those who received adequate antenatal care formed 21·2 per cent of the total maternal deaths.

Intranatal care.

With the emphasis laid on antenatal care in recent years, intranatal work has been given a secondary place, but it should be realised that all the good that antenatal care may have achieved, can be completely undone if intranatal care is defective. The high percentage of deaths from sepsis is a direct reflection on intranatal methods, for in the majority of cases some flaw in the aseptic and antiseptic technique must be held responsible for the result.

A reference to the section on difficult labour reveals error in judgment in some cases. Intranatal work is the tactics of obstetrics and only a prolonged and persistent study of cases can provide a feasible and elastic plan to deal with emergencies as they arise.

Much preventive work is possible if cases are seen early enough in labour, when the first departure from normality can be rectified. Given a certain plan for diagnosis of the normal state vaginal or even rectal examinations may be reduced to the absolute minimum, which will go a long way towards prevention of infection. A labour can be conducted almost without touching the patient's parts. Timely diagnosis of abnormality will reduce artificial interference to the minimum. At the same time timely aid, *e.g.*, low forceps in cases of anæmia, eclampsia and heart disease, will prevent undue strain on the heart and sudden heart failure. A reference to the section on operative deliveries will show that the indications were not unduly multiplied, and there were very few, if any, cases showing undue haste. It is gratifying to note that most hospitals and maternity homes have given up routine vaginal examinations in labour cases. Antiseptics are used freely and Dettol is being used exclusively at the large centres and at some of the maternity and nursing homes. It is common knowledge that, at most of the public and some private institutions, the aseptic draping of the patient which is carried out for operative purposes is not the routine for normal labour cases, nor are gloves used for conducting normal cases. Opinions will differ as to the absolute necessity or otherwise of this technique but, from the point of view of economy, it will be difficult to enforce this rule. The great factors in the prevention of infection are a clean labour room, separate staff for labour and lying-in wards in a large institution, thorough disinfection of the patient's parts and the attendants' hands, avoidance of spray infection and proper technique in the conduct of labour.

Postnatal care.

Careful and intelligent nursing is very helpful in preventing postnatal infection and particularly the spread of infection. All the large centres have separate staff for the management of labour and lying-in cases as well as facilities for isolating septic cases. Most maternity homes, however, have a senior nurse who does the deliveries and attends also to the puerperal women. Instances are common where cases with puerperal pyrexia are nursed for a number of days by the same staff in a maternity home, before transferring the case to a large centre. Such practices are a distinct danger to the remaining cases at the maternity homes and a certain way of spreading infection. Administrative authorities must see to it that any institution providing for a number of cases should have separate units for labour and lying-in cases and that even the apparently mild cases of puerperal morbidity should be nursed in a unit separate

from the normal lying-in cases. It is only thus that a proper check can be kept on possible sources of widespread infection. Then again the diagnosis and treatment of cases of puerperal sepsis can most advantageously be carried out under the direction of a specialist, and hence the earlier a case of pyrexia is transferred to a large centre the better chances the case may have. The present day treatment of septicæmia of streptococcal origin by sulphanamide preparations depends for its efficacy on the earliest exhibition of the drug. Cases of complicated labour, *e.g.*, anæmias, toxæmias, heart or lung conditions, require great care during the lying-in period and prolonged rest. A form of progressive anæmia has been noticed in the postnatal period, and at least three such cases occurred in the present series, each patient dying 1—1½ months after confinement. The usual number of days of institutional care is not enough to prevent such fatalities. Regular home visits at weekly intervals by health visitors should help to get such cases early under medical supervision. A case of breast abscess admitted very ill and dying soon after has also been investigated. Many a case of tuberculosis may be taken in hand early, if regular postnatal care is instituted.

CHAPTER II.

FACTORS INFLUENCING MATERNAL MORTALITY.

Introduction.

In a discussion of the factors influencing maternal mortality, such as age and gravidity, the value of the information collected by the enquiry is but limited. The distribution of pregnant women by age and gravidity during the period of the enquiry is not available. Therefore the populations at risk giving rise to the maternal deaths under examination are not known and the deductions that can be drawn from the collected figures are, in consequence, severely restricted in scope. In view of these limitations, data were collected from all the important maternity institutions in the city and information relating to 57·8 per cent of the deliveries during the period under consideration was received. A detailed study of these figures is given later in the report. In the meantime the total maternal deaths investigated in Bombay during the period of the enquiry may be examined.

Age.

The total number of maternal deaths was 340 and their distribution by age and cause is shown below :—

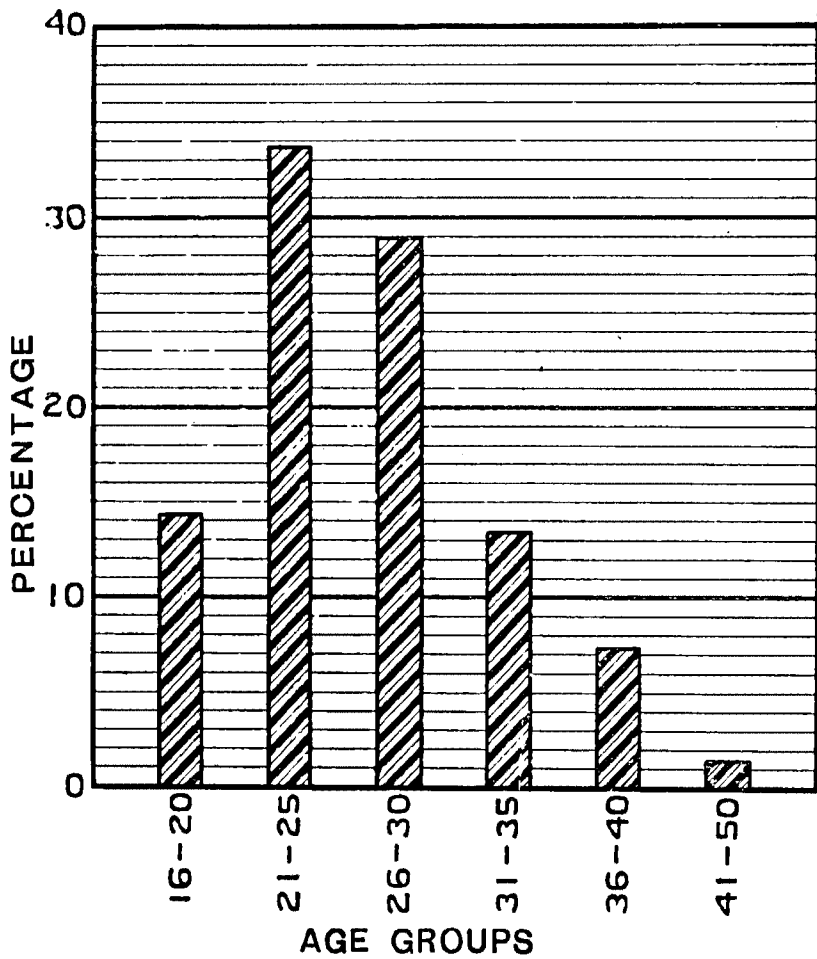
TABLE 6.—CAUSE OF DEATH BY AGE.

(Excluding associated diseases.)

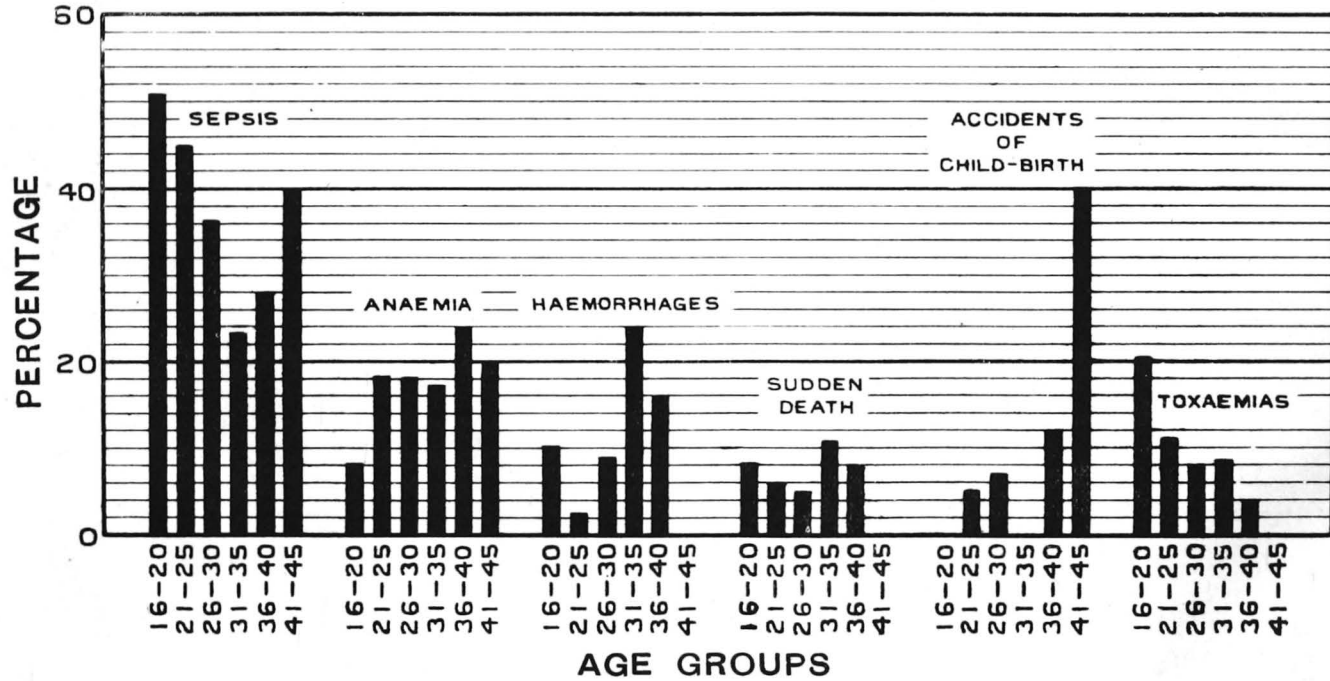
Cause of death.	Age group.						No information available.	Total by cause of death.
	16—20	21—25	26—30	31—35	36—40	41—45		
Septic abortions . . . . .	..	2	4	3	1	..	..	10
Abortions non-septic . . . . .	..	1	2	..	1	..	..	4
Ectopic gestation . . . . .	..	3	2	1	..	..	..	6
Accidents of pregnancy . . . . .	..	..	1	..	..	..	..	1
Puerperal hæmorrhages	5	3	9	11	4	..	..	32
Puerperal sepsis	25	52	36	11	7	2	..	133
Eclampsia and albuminuria	10	13	8	4	1	..	..	36
Other toxæmias	1	2	1	2	..	..	..	6
Sudden death	4	7	5	5	2	..	..	23
Accidents of childbirth . . . . .	..	6	7	..	3	2	..	18
Unspecified conditions of the puerperium . . . . .	..	1	2	..	..	..	..	3
Anæmias	4	21	18	8	6	1	..	58
Acute yellow atrophy . . . . .	..	4	4	1	..	..	1	10
Totals	49	115	99	46	25	5	1	340
Percentage	14·41	33·82	29·12	13·54	7·35	1·47	0·29	..

Of these maternal deaths, 14·4 per cent took place among women aged 16-20, 33·8 per cent at the age period 21-25, 29·1 per cent among those aged

AGE DISTRIBUTION OF MATERNAL DEATHS



MAIN CAUSES OF MATERNAL DEATHS BY AGE GROUPS



26-30, 13·5 per cent during 31-35 years of age, 7·4 per cent at 36-40 and the remaining 6 deaths in women aged 41 years and over. No inference can be drawn from these percentages regarding the relative incidence of maternal mortality at the different age periods because, as has been pointed out already, the populations at risk are not available.

Table 6 shows the deaths due to different causes in each age period as percentages of the total number under that age group.

TABLE 7.

	Age periods.					
	16—20	21—25	26—30	31—35	36—40	41—45
Septic abortions	0·00	1·74	4·04	6·53	4·00	0·00
Abortions non-septic	0·00	0·87	2·02	0·00	4·00	0·00
Ectopic gestation	0·00	2·61	2·02	2·17	0·00	0·00
Accidents of pregnancy	0·00	0·00	1·01	0·00	0·00	0·00
Puerperal hæmorrhages	10·20	2·61	9·09	23·91	16·00	0·00
Puerperal sepsis	51·03	45·21	36·37	23·91	28·00	40·00
Eclampsia and toxæmias	20·41	11·30	8·08	8·70	4·00	0·00
Other toxæmias	2·04	1·74	1·01	4·35	0·00	0·00
Sudden death	8·16	6·09	5·05	10·87	8·00	0·00
Accidents of childbirth	0·00	5·22	7·07	0·00	12·00	40·00
Unspecified conditions of the puerperium	0·00	0·87	2·02	0·00	0·00	0·00
Anæmias	8·16	18·26	18·18	17·39	24·00	20·00
Acute yellow atrophy	0·00	3·48	4·04	2·17	0·00	0·00
Total	100·00	100·00	100·00	100·00	100·00	100·00

It will be seen from the previous table that many of the percentages shown above are based on very small figures. In regard to puerperal sepsis and the toxæmias of pregnancy the figures are relatively larger. The outstanding causes of maternal mortality at the earlier age periods were sepsis and toxæmias of pregnancy. Anæmia increased in importance from the twenty-first year onwards while hæmorrhages were prominent as a cause of death between 31 and 40 years of age.

Gravidity.

The gravidity distribution of the total series of maternal deaths is shown in appendix I. Here again absence of information regarding the populations at risk for each pregnancy renders it impossible to compare the rates of mortality for individual pregnancies among themselves. Of the total maternal deaths 22·9 per cent were among primigravidae and the corresponding percentages among women undergoing the second to the fifth pregnancies varied from 14·7 per cent to 10·0 per cent.

The percentage incidence of each cause of death among primigravidæ and multigravidæ is shown below.

TABLE 7.—PERCENTAGE INCIDENCE OF CAUSE OF DEATH BY GRAVIDITY.

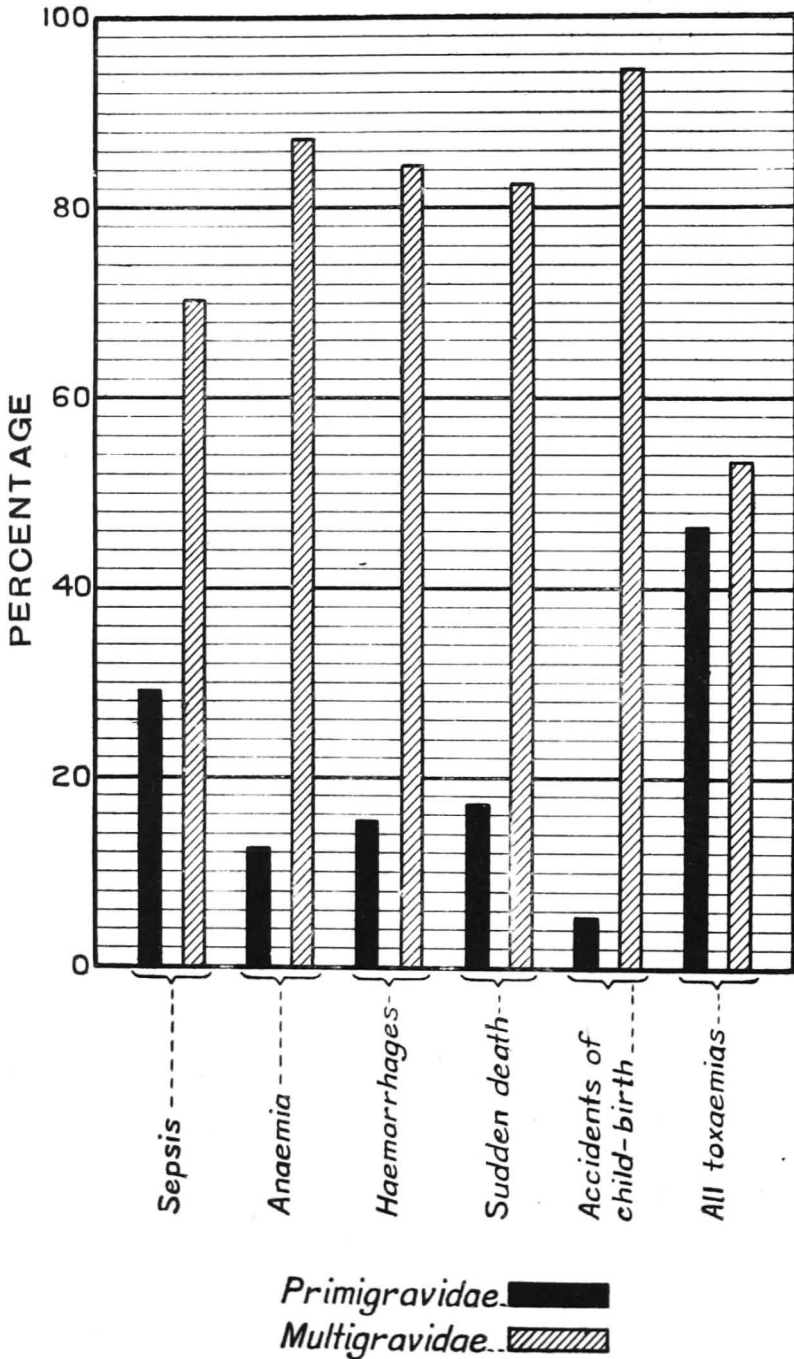
	No infor- mation available.	Primigravidæ.		Multigravidæ.	
		Number.	Percentage.	Number.	Percentage.
Septic abortions	1	..	..	9	3.54
Abortions non-septic . . . . .	..	..	..	4	1.57
Ectopic gestation	2	1	1.28	3	1.19
Accidents of pregnancy . . . . .	..	..	..	1	0.39
Hæmorrhages . . . . .	..	5	6.41	27	10.63
Puerperal sepsis	1	39	50.00	93	36.62
Eclampsia and albuminuria	1	17	21.80	18	7.09
Other toxæmias . . . . .	..	2	2.56	4	1.57
Sudden death . . . . .	..	4	5.13	19	7.48
Accidents of child birth . . . . .	..	1	1.28	17	6.69
Unspecified conditions of puer- perium	1	..	..	2	0.79
Anaemias	2	7	8.97	49	19.29
Acute yellow atrophy . . . . .	..	2	2.56	8	3.15
Total	8	78	100.00	254	100.00

The importance of puerperal sepsis and toxæmias as causes of mortality among primigravidæ is emphasised. On the other hand hæmorrhages and accidents of childbirth are relatively of higher incidence among multigravidæ. More detailed information regarding the percentage distribution of causes of maternal deaths in relation to the number of pregnancy is given in appendix II. These figures confirm, in general, the above findings.

As pointed out already, information is available for detailed study regarding 20,678 deliveries which took place in Bombay city during the period of the enquiry. There is a tendency for the more serious cases to be admitted to hospital. It is therefore desirable to investigate whether this group of cases can be taken as an unbiased sample of the total deliveries that took place in the city. If it be so, the deductions drawn from a study of these hospital cases can, with some degree of confidence, be applied to all the cases of maternal mortality under investigation. There were altogether 38,243 births during the period of the enquiry and 340 maternal deaths were associated with them. On the other hand, the hospital cases gave rise to 208 maternal deaths. A comparison of the rates of maternal mortality in the two cases shows that the difference in the rates is statistically significant and that the rate associated with hospital cases was higher. Further, the distributions of the causes of death in the two series (340 and 208) show divergence. For instance, for puerperal sepsis and toxæmias of pregnancy, the differences in the proportional mortality rates among hospital and outside cases are also statistically significant. In regard to anæmia, on the other hand, the proportions due to this cause in the two groups of maternal deaths show no significant difference. This brief examination indicates that the hospital series cannot be considered as an unbiased sample of the total group of maternal deaths.

An examination of the information collected from the maternity institutions of the city may still be useful, because the information available regarding

DISTRIBUTION OF MATERNAL DEATHS
BY MAIN CAUSES AMONG
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the cause of death and age of the patient is likely to be more accurate in the hospital series than in respect of maternal deaths which took place outside.

Table 8 sets out the cause and age distribution of the maternal deaths which took place among the 20,678 deliveries in institutions in the city.

TABLE 8.—AGE AND CAUSE DISTRIBUTION OF MATERNAL DEATHS WHICH OCCURRED AMONGST 20,678 DELIVERIES.

Cause of death.	Age.							Total by cause
	16-20	21-25	26-30	31-35	36-40	41-50	51 and over.	
Septic abortions . . .	...	2 (28)	3 (47)	3 (162)	...	...	...	8 (39)
Abortions non-septic . . .	...	...	...	...	...	...	...	...
Ectopic gestation . . .	...	2 (28)	1 (16)	1 (54)	...	...	...	4 (19)
Accidents of pregnancy . . .	...	...	1 (16)	...	...	...	...	1 (5)
Puerperal hæmorrhages . . .	3 (66)	3 (41)	9 (140)	6 (325)	1 (185)	...	...	22 (106)
Puerperal sepsis . . .	12 (263)	29 (401)	15 (233)	3 (162)	1 (370)	1 (2,564)	...	62 (300)
Eclampsia and toxæmias . . .	10 (219)	10 (138)	7 (109)	4 (217)	...	...	...	31 (150)
Other toxæmias . . .	1 (22)	...	1 (16)	2 (108)	...	...	...	4 (19)
Sudden death . . .	...	3 (41)	2 (31)	2 (108)	1 (185)	...	...	8 (39)
Accidents of childbirth. Unspecified conditions of the puerperium . . .	...	6 (83)	7 (109)	...	2 (370)	1 (2,564)	...	16 (77)
Anæmias . . .	1 (22)	14 (193)	13 (202)	8 (433)	5 (926)	1 (2,564)	...	42 (203)
Acute yellow atrophy . . .	...	4 (55)	2 (31)	1 (54)	...	...	1	8 (39)
Total . . .	27	73	63	30	11	8	1	208
Age distribution of 20,678 deliveries . . .	4,560	7,239	6,447	1,847	540	39	...	20,678 (includes 6 deliveries in the age group below 16).

The figures shown in brackets are the rates per 100,000 based on the number of deliveries under each age group. The figures for individual causes of death are small in the last two age groups. We may therefore confine ourselves mainly to an examination of the figures under the first four age groups. These rates, based as they are on the populations at risk, are more appropriate for comparison among themselves than the rates of proportional mortality shown for the total series of maternal deaths (340) in a previous table. However, there is a large measure of agreement in the general findings of these two tables. Puerperal sepsis and toxæmias of pregnancy are outstanding causes of maternal death in the earlier age groups in both tables while ectopic gestation, accidents of childbirth and anæmia grow in importance after the first age period, 16-20. As regards hæmorrhages both tables emphasize their importance after 25 years of age. For the first two age periods the hospital series show relatively low rates of incidence compared with the later age groups but the table of proportional mortalities shows a fairly high figure for the period 16-20. It is difficult to state how far these differences are due to the fact that the hospital series cannot be considered to be a sample of the total group of 340 maternal deaths or to the fact that the rates shown in the two tables are not similar since they represent proportional mortality in one case and rates based on the populations at risk in the other.

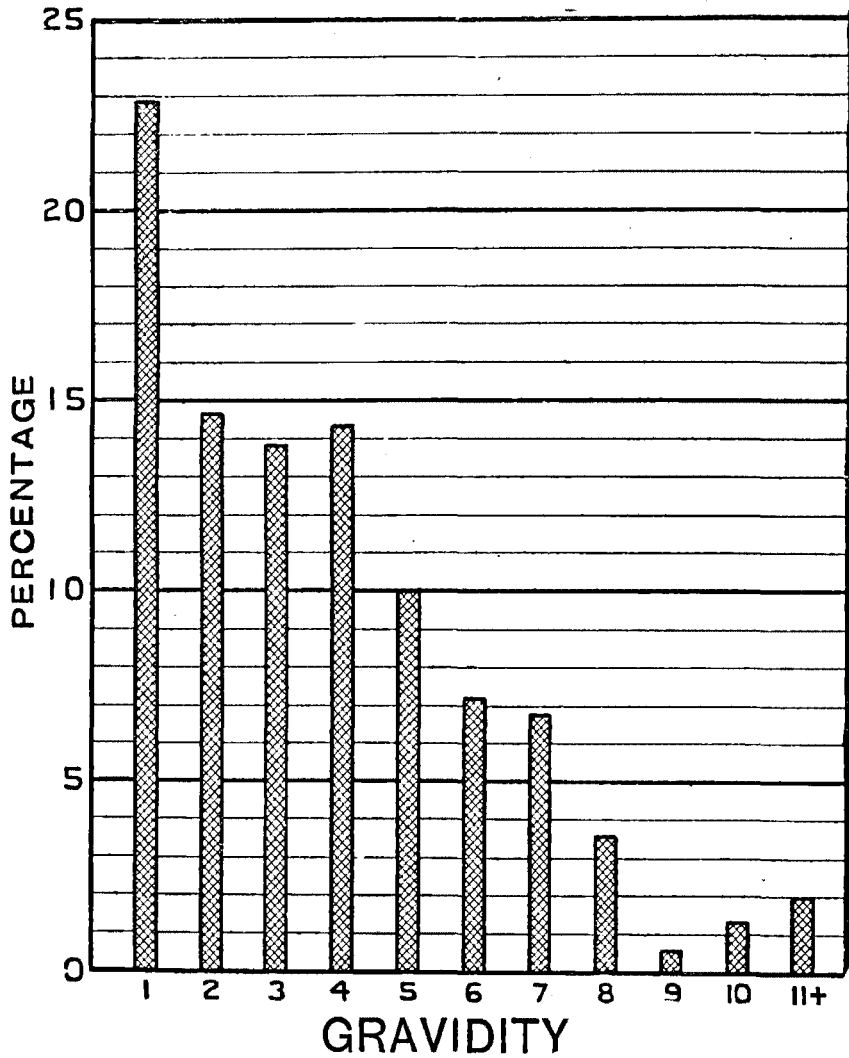
Table 9 presents similar information correlating causes of death and gravidity among the 208 cases of maternal mortality.

The figures in brackets are percentages based on the totals for individual columns.

TABLE 9.—CAUSE AND GRAVIDITY DISTRIBUTION OF MATERNAL DEATHS AMONG 20,678 DELIVERIES.

Cause of Death.	Gravidity.													Total by cause.
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	?	
Septic abortions . . .	...	...	1 (3)	2 (7)	4 (21)	1 (5)	...	...	...	...	...	...	...	8 (4)
Abortions non-septic . . .	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ectopic gestation . . .	...	1 (4)	1 (3)	...	...	...	...	...	...	...	...	...	2 (67)	4 (2)
Accidents of pregnancy . . .	...	...	...	...	...	1 (5)	...	...	...	...	...	...	...	1 (0)
Puerperal hæmorrhages . . .	4 (8)	2 (8)	1 (3)	1 (3)	3 (16)	3 (14)	4 (26)	3 (30)	...	1 (33)	...	...	...	22 (11)
Puerperal sepsis . . .	20 (41)	5 (22)	10 (31)	11 (39)	5 (26)	6 (28)	3 (20)	1 (10)	1 (100)	...	...	...	...	62 (20)
Eclampsia and toxæmias . . .	16 (33)	3 (12)	5 (16)	2 (7)	...	1 (5)	3 (20)	...	...	...	...	...	1 (33)	31 (15)
Other toxæmias . . .	1 (2)	1 (4)	...	...	1 (5)	1 (5)	...	...	...	...	...	...	...	4 (2)
Sudden death . . .	2 (4)	2 (8)	...	2 (7)	1 (5)	...	1 (7)	...	...	...	...	...	...	8 (4)
Accidents of childbirth . . .	1 (2)	4 (17)	3 (9)	...	2 (11)	1 (5)	1 (7)	2 (20)	...	1 (33)	...	1 (50)	...	16 (8)
Unspecified conditions of the puerperium . . .	...	...	...	...	...	1 (5)	1 (7)	...	...	...	...	...	...	2 (1)
Anæmias . . .	4 (8)	4 (17)	7 (22)	10 (34)	3 (16)	6 (28)	2 (13)	4 (40)	...	1 (33)	...	1 (50)	...	42 (20)
Acute yellow atrophy . . .	1 (2)	2 (8)	4 (13)	1 (3)	...	...	...	...	...	...	...	...	...	3 (4)
Total . . .	49 (100)	24 (100)	32 (100)	29 (100)	19 (100)	21 (100)	15 (100)	10 (100)	1 (100)	3 (99)	...	2 (100)	3 (100)	208 (100)

GRAVIDITY DISTRIBUTION OF MATERNAL DEATHS



This table brings out again the importance of puerperal sepsis and toxæmias of pregnancy among primigravidæ.

Anæmia is relatively of less importance during the first pregnancy than in the subsequent pregnancies, while hæmorrhages become important from the fifth pregnancy onwards. Accidents of childbirth show a variable distribution in relation to the number of pregnancy but the figures are small. For other causes of maternal mortality also the figures are small and no useful purpose will be served by examining them in detail.

Proper antenatal care combined with efficient management of labour should go a long way towards reducing these risks. The facts stress the importance of advising primigravidæ and multigravidæ to seek admission to large institutions where expert advice and assistance are available. Second, third and fourth gravidæ with a past history of normal labour may be safely relegated to the care of maternity homes, or even allowed to be delivered at home by trained mid-wives.

Primigravidæ, as they are likely to take longer for the dilatation of their *os uteri* and as they are likely to need aid in delivery, require the most scrupulous aseptic precautions which it is difficult to obtain in any ordinary one-room tenement. Multigravidæ with their liability to hæmorrhage are best treated in a large institution, which will have easy access to a consultant and facilities for transfusion.

Term.

The majority of cases particularly under sepsis, difficult labour, sudden death and post partum hæmorrhage were delivered at full term. Under eclampsia 50 per cent were premature.

Among the deaths due to antepartum hæmorrhage only 5 out of 19 went to term.

Under anæmia only about two-fifths of the cases went to term and another two-fifths were delivered between the eighth and ninth months. Anaemia, toxæmia and antepartum hæmorrhage are seen to be the commonest causes of premature delivery in this series, and early and thorough antenatal care should go a long way towards reducing their incidence.

The following figures from two large institutions are instructive :

TABLE 10.

Hospital.	Booked.			Emergency.		
	Total cases.	Premature.	Percentage.	Total cases.	Premature.	Percentage.
A.. . . .	1825	108	5.9	1143	282	24.6
B.	2054	183	8.9	3016	356	11.8

Seasonal variation.

The distributions of the different causes of maternal mortality by months and by the four quarters of the year are shown in appendix V. Here again lack of information regarding the number of pregnant women by months makes it impossible to study the monthly variations in the rates of mortality under

the different heads. The diseases which are likely to be affected by seasonal factors are puerperal sepsis, anaemia and eclampsia. The varying numbers of pregnant women from month to month make it essential that the rates based on these numbers should be compared and not the actual deaths recorded each month under the different causes of mortality. As it is not possible to carry out this comparison we may examine the figures recorded and note the differences, under each cause, from month to month.

In the present series, deaths from sepsis were definitely higher in the first and last quarters, which include the cold season when respiratory complications are common among the population. A glance at the monthly variation suggests a practical division of the quarters as from November to January, February to April and so on. Nearly 37 per cent of the total deaths from sepsis took place during the three months of November, December and January.

The mortality from anaemia appears to be more evenly distributed, although the highest mortality was again recorded during the three months of November, December and January. The minimum number of eclampsia deaths was recorded during the second quarter and the maximum during the third quarter.

Information is available from the records of the Cama Hospital for a period of eight years regarding the numbers of deaths from eclampsia and the total numbers of deliveries each month. These figures are shown in the table below :—

TABLE 11.

Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Total number of eclampsia deaths	17	7	17	9	16	9	11	18	16	8	17	12
Total number of cases	1893	1642	1770	1737	1905	1790	1923	2176	2297	2444	2218	2164
Percentage	0.90	0.43	0.96	0.52	0.84	0.50	0.57	0.83	0.70	0.33	0.77	0.56

It will be seen that the percentage incidence of eclampsia mortality varies from month to month and that the first and third quarters show higher rates than the others. If a quarter is reckoned as from November to January the highest rate of mortality from eclampsia occurred during this quarter. A comparison of the monthly rates per thousand deliveries shows that the highest rate of eclampsia mortality was recorded in March and the next highest in January.

Ward distribution.

Maternal deaths distributed according to cause and ward are shown in appendix III. Of the total number of deaths large proportions were recorded in wards E, F and G which include the mill area. The following table gives for each ward the population at the 1931 census, the number of live-births, total female deaths between 10 and 50, the number of maternal deaths and the maternal mortality rate per 1,000 live-births. No information was available for 26 deaths, which occurred mostly among imported cases.

MAIN CAUSES OF MATERNAL DEATHS BY WARDS

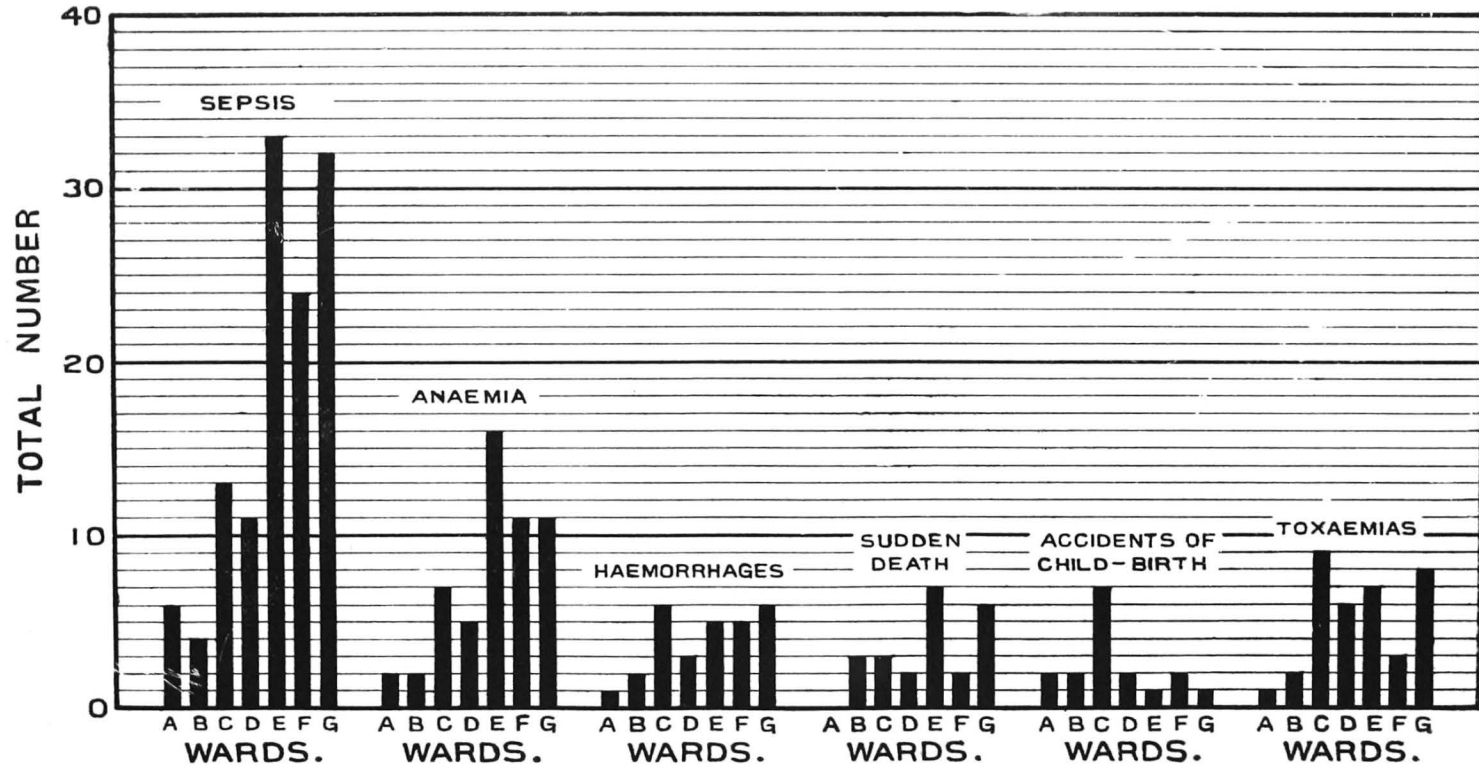


TABLE 12.—WARD DISTRIBUTION OF BIRTHS AND DEATHS.

Ward	Total population ; census 1931.	Total live-births.	Total female deaths.	Total maternal deaths.	Mortality per 1,000 live-births.
A	64,020	2,085	201	14	6.7
B	114,365	3,535	471	18	5.4
C	205,476	5,886	729	55	9.5
D	153,593	4,883	499	32	6.5
E	273,050	7,422	1,258	73	9.8
F	159,514	5,500	804	53	9.6
G	163,775	6,481	805	69	10.6

It will be seen that wards E, F and G give higher rates than the remaining four wards, of which ward C alone has its rate approximately the same as those of E, F and G. The combined population of these three wards is about 60,000 higher than that of A, B, C and D; the ratio being roughly 10 : 9. On the other hand, the numbers of maternal deaths in the two groups of wards are in the ratio of 10 : 6. Taking the deaths from all causes among females between 10 and 50 years of age the proportion is about 10 : 7. Although the maternal mortality rate should, strictly speaking, be calculated on the combined figure for live and still-births the above rates based on live-births are sufficiently accurate to justify the drawing of conclusions regarding the distribution of maternal mortality by wards.

Taking these live-births as the approximate populations at risk in the respective wards the following table sets out rates per 100,000 for the figures of maternal deaths shown in appendix III.

TABLE 13.—CAUSE OF DEATH AND WARD.

Cause of death.	Ward.						
	A	B	C	D	E	F	G
Septic abortions . . . . .	..	28	68	..	..	55	..
Abortions non-septic . . . . .	..	..	17	20	13	..	15
Ectopic gestation	48	24	34	..	13	..	..
Accidents of pregnancy . . . . .	..	28	..	..	..	..	..
Puerperal hæmorrhages	48	57	102	61	67	91	93
Puerperal sepsis	288	113	221	225	445	436	494
Eclampsia and albuminuria	48	57	153	123	94	55	123
Other toxæmias . . . . .	..	..	17	..	..	..	46
Sudden death . . . . .	..	85	51	..	94	36	93
Accidents of childbirth	9	57	119	41	13	36	15
Unspecified conditions of the puerperium	48	..	..	20	13	..	..
Anæmias	96	57	119	102	216	200	170
Acute yellow atrophy . . . . .	..	..	34	20	13	55	15
Total	671	509	934	655	984	964	1,065
Live-births during the period of enquiry	2,085	3,535	5,886	4,883	7,422	5,500	6,481

The figures in this table are comparable because they represent rates based on the populations at risk. When all the causes are taken together the high rates of mortality in wards C, E, F and G are clearly shown. A comparison of the distribution of the causes of maternal mortality in ward C with those of wards E, F and G is interesting. High rates for mortality from sepsis are recorded in the last three wards while the rate for C is relatively much lower. On the other hand the rates for puerperal hæmorrhages, toxæmias of pregnancy and accidents of childbirth are relatively higher in ward C.

In E, F and G wards high rates of mortality were recorded for puerperal sepsis in respect of both *dais* and institutional cases. Anaemia shows a similar distribution. As regards eclampsia E, F and G wards had half the cases and the other half were in wards C and D. Thirtytwo cases of puerperal hæmorrhages, after excluding four imported cases, were distributed almost in equal numbers in the two groups E, F and G, and A, B, C and D. It seems therefore reasonable to assume that eclampsia and hæmorrhages as compared with sepsis and anaemia, took a proportionately higher toll of life among the better classes.

Community.

The following table gives the 1931 census populations for the different communities, the numbers of live-births, the maternal deaths and maternal mortality rates per 1,000 live-births in these communities during the period of the enquiry :—

TABLE 14.

Communities.	Population by the census of 1931.	Live-births.	Maternal deaths.	Maternal deaths per 1,000 live-births.
Hindus	802,283	25,527	244	9.5
Mohammedans	209,246	5,924	60	10.1
Indian Christians	64,269	2,653	10	3.7
Parsees	57,765	1,028	9	8.7
Others	27,818	660	17	25.7
Total	1,161,383	35,792	340	

It will be seen that the smallest rate was recorded among Indian Christians, that the Hindus had a rate intermediate between Parsees and Mohammedans and that the "others" group had the highest rate of mortality.

The distribution of maternal deaths according to cause and community has been given in appendix VI. Here again, taking the live-births shown against each community as the approximate population at risk, the following table gives the rates per 100,000 for the different causes of maternal death in each community :—

TABLE 15.—CAUSE OF DEATH AND COMMUNITY (RATES PER 100,000 LIVE-BIRTHS) (Excluding associated diseases).

Cause of death.	Community.				
	Hindus.	Mohammedans.	Indian Christians.	Parsees.	Others.
Septic abortions	31	..	38	..	152
Abortions non-septic	16	..	..	..	..
Ectopic gestation	16	..	38	..	152
Accidents of pregnancy . . . . .	..	17	..	..	..
Puerperal hæmorrhages	94	101	..	195	..
Puerperal sepsis	407	355	113	292	303
Eclampsia and toxæmias	94	84	38	97	758
Other toxæmias	16	17	..	..	152
Sudden death	63	101	..	97	..
Accidents of childbirth	51	51	38	..	152
Unspecified conditions of the puerperium.	8	17	..	..	..
Anaemias	137	253	75	..	909
Acute yellow atrophy	24	17	38	195	..
Live-births during the period of the enquiry	25,527	5,924	2,653	1,028	660

The incidence of puerperal sepsis was the highest among Hindus, the next highest rate being among Mohammedans, while Indian Christians had the lowest rate. As regards toxæmias of pregnancy, puerperal hæmorrhages and accidents of childbirth, the rates in the Hindus and Muhammedans appear to be approximately the same. Among Parsees a relatively high rate has been recorded for puerperal hæmorrhages. In discussing these rates, it must be remembered that, in some cases, they are based on very small figures and that no significance can be attached to such rates.

Economic status and cause of death.

The distribution of the causes of death according to economic status is given in Appendix VII. It will be seen that of the total 340 deaths, 135 or nearly 40 per cent took place among people whose income was Rs. 30 or below. This large proportion of maternal deaths in this particular income group may be due to the fact that the proportion of the total population of pregnant women in the city belonging to this group of incomes may also have been high. As no information is available regarding the numbers of pregnant women in respect of the different income groups, it is not possible to study in detail the effect of income on the distribution of the different causes of mortality.

Wards B, C and E contain some of the most congested localities in the city with narrow lanes between the buildings, dark passages leading to ill-ventilated rooms and often a common tap for the tenements. The Improvement Trust chawls are not much of an improvement as they also possess dark passages with rooms on either side, the living room being next to the passage and thus deprived of sunlight and ventilation. The only apertures for the admission of sunlight and fresh air are fixed shutters placed quite high in each room. During their visits the investigators came across many dwellings which were absolutely unfit for human habitation. In F and G wards some of these were only tin sheds. Even in ward D isolated instances of groups of tin sheds and huts were met with and in some of these no windows existed at all.

At most of the places visited, the surroundings of the houses were in an extremely insanitary condition, but the interior was quite often spotlessly clean. The accumulation of filth and dirt naturally breeds flies and germs and gives rise to unpleasant, offensive odours which vitiate the atmosphere. This state of affairs contributes to the ill-health of the population by providing conditions which are extremely favourable for the spread of the disease.

In some of the chawls the tenants are put to considerable inconvenience for want of water. It is supplied only during limited hours of the day and in one of the chawls which consisted of about three buildings, there was only one tap in the courtyard and the supply of water was limited to one hour morning and evening. The difficulty that these people have to face in regard to the water supply in this block of buildings can well be imagined. At all the chawls provision exists only for common sanitary blocks for each floor, and in some places the basket system still prevails. In some of the dwellings the floors and walls were plastered with cowdung, while in others goats share the same room with human beings while a number of deliveries take place under such conditions. In a cobbler's house the living room was used also for working on leather, which gives out a foul smell.

As regards congestion, ward E is perhaps the worst. It is gratifying to note that the municipal authorities are proposing to take steps to clear in stages the slum areas in this ward.

This is a brief description of the sanitary condition of the houses in which the maternal deaths took place. It indicates that a considerable advance is essential before the conditions favourable for healthy life can be brought into being. There is need for education in hygienic modes of living and for the development of a sense of civic responsibility among the people for keeping their immediate surroundings clean and healthy.

Education.

Much educative work is already being done by the Infant Welfare Society's health visitors, municipal nurses and regional Baby and Health Week Exhibitions but much more remains to be done. Only by intensive propaganda can the existing evils be remedied.

Diet.

A large number of the maternal deaths fell into the mixed diet group but the use of meat or fish was only occasional. Eggs were also only sparingly used. A certain number took rice freely and used wheat, vegetables, etc. as minor supplements. Only a few partook of milk regularly in any appreciable quantity. In the sepsis and anaemia groups about a third of the cases had one *pau* (a quarter seer) or more. The eclampsia group showed 50 per cent cases taking milk. The necessity for the diet to be sufficient in quantity and quality is demonstrated by the physical condition of the patients at the time of delivery. A large number went to term in a very poor state of health, *e.g.*, as many as 50 per cent of the sepsis group were shown as being in this condition. Besides the 58 cases of deaths from anaemia, 86 others were put down as definitely anaemic. This shows a dietetic deficiency. In this connection the experiments carried on at Rhonda Valley, a mining area on the Welsh border, are instructive. The maternal mortality in this area was noted to be 6·9 per 1,000 (seven years' figures). In 1934 special medical aid was organised and it was noticed that the mortality in 2,400 births was 11·3 per 1,000. This may have been an apparent increase due to better methods of registration and notification. In 1935, 720 necessitous mothers were given food costing 2s. 6d. per head per week in addition to the other facilities offered to them and the mortality fell to 3·9 per 1,000. It was noticed that, of the 13 deaths, not one occurred in those who received food. In another area where only extra food was given and no attempt was made to improve maternity conditions the mortality was shown to have fallen from 6·6 to 1·6 per 1,000. Surely better living conditions and a well balanced diet should go a long way towards improving resistance to infection as well as reducing the incidence of anaemia, toxæmia and haemorrhages.

Place of delivery and attendant.

Of the 340 puerperal deaths, 98 were confined at home. Only three of these were attended by doctors, the rest being attended by relations or *dais*. This gives a percentage of 28·8 deliveries at home amongst the total number of maternal deaths investigated. The proportion of institutional to home deliveries among the total births registered by the Health Department for the year under consideration was as 75 : 25.

The percentage of deaths which occurred in cases attended by untrained women was 27·9 and most of these cases occurred amongst the poor and ignorant people.

❧ Talks with the relatives revealed the fact that, in a number of cases, there was a definite desire to be confined at home by the family *dai*, but in other

cases it was shown that the people were ignorant of the facilities offered by public bodies such as the municipality and the Infant Welfare Society. In some cases, as the husband was away at work from the early hours of the morning till late in the evening and as there were no other inmates in the house, the woman was unattended and at times it was too late to get medical aid. The municipality maintains a free ambulance service for transport of maternity cases. This fact and the availability of municipal and the Infant Welfare Society's midwives for deliveries at home must be brought home to the people in every part of the city. There is much scope for extension of educational propaganda by health visitors.

Some cases need expert treatment on the spot before removal to an institution, and in such cases an ambulance service with a nurse, practitioner and consultant on the lines of the "Flying squads" organised in some countries in the West, will be a life saving measure.

The majority of deaths occurred in cases delivered at large maternity hospitals. Of the total maternal deaths 44.4 per cent took place among deliveries carried out in maternity institutions. Of the total cases of puerperal sepsis 37.3 per cent were among those confined at maternity homes. The majority of these deaths occurred in confinements at public maternity homes which are intended only for normal deliveries. A careful perusal of the records indicates that a number of these cases were in poor health and that they should have been directed to large institutions during their antenatal period. A number of the private maternity homes are run by private practitioners or midwives and are in urgent need of reform in management, particularly with respect to overcrowding and cleanliness, as both these factors contribute to make such institutions a real danger to the public. An Act to regularise the running of maternity homes and nursing homes on modern lines is urgently required.

CHAPTER III.

DETAILED ANALYSIS OF MATERNAL DEATHS FROM CHILD-BEARING CAUSES.

Puerperal sepsis.

There were 133 deaths under puerperal sepsis. Whenever two or three factors contributed to a death, sepsis was given precedence in classification.

Fifty-nine deaths occurred in cases conducted at home. Of these 57 were conducted by *dais* or by relatives. Of the remaining two, one occurred in the practice of an old midwife whose methods were questionable and the other was conducted by an experienced medical woman.

The largest proportion of deaths from sepsis was recorded from E, F and G wards. Fifty-one cases were returned as poor. It was in some of these cases that the investigators came across extremely unhygienic surroundings, some of the dwellings—mere huts or tin-sheds—being quite unsuitable for human habitation. There were three cases of puerperal tetanus in this list.

Forty-five of these sepsis deaths were among Hindus, mostly of the lower castes. Sixteen women were primigravidae; of the multigravidae all had normal labours in the past, only one having had a history of puerperal pyrexia.

Thirtysix cases were stated to have enjoyed good health. Sixteen women gave a history of fever, anæmia, œdema, etc. and for the rest no history was obtained. Delivery was normal in 54 cases, in three no history could be obtained as the people had left the place. Only one case had manual removal of placenta and she was admitted later into hospital with signs of peritonitis. Twentynine cases were not seen by any practitioner and the diagnosis was a mere conjecture from the data available.

The case of home delivery conducted by an experienced medical woman was a multigravida with a history of manual removal of the placenta and sepsis in past labours. Her delivery was marked by inertia and had to be terminated by low forceps and manual removal of the placenta for postpartum hæmorrhage. She had a typical course of septicaemia and pyaemia. Antistreptococcal serum and bacteramide injections in full doses were exhibited early in this case.

Seventy-four cases occurred at institutions. They may be classified as follows:—

Hospital deliveries (good health)	. . . . .	11	} 19
Maternity home deliveries (good health)	. . . . .	8	
Hospital deliveries (complicated)	. . . . .	21	} 35
Maternity home deliveries (complicated)	. . . . .	14	
Hospital deliveries (artificial interference)	. . . . .	15	} 17
Maternity home deliveries (artificial interference)	2	
Maternity home deliveries (probable diagnosis)	3

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Nineteen cases were said to have been in good health at the time of confinement; of these three were admitted with signs of antepartum infection. One of these died undelivered. Of the cases of complicated labour, 17 were noted as definitely anaemic, most of the others having some general complication particularly pulmonary or intestinal. Three cases had toxæmia and one has

antepartum haemorrhage. During the year under investigation 831 cases of sepsis were reported in 20,678 deliveries giving an incidence of 4.01 per cent.

Nature of delivery.—The delivery was normal in 53 cases, one case came in with leaking membranes but was delivered normally; two others had premature rupture of membranes. One case died undelivered, of antepartum sepsis.

The remaining cases were dealt with in the following manner :—

Caesarean section, classical	2
Caesarean section, lower segment	1
Caesarean hysterectomy	1
Craniotomy	3—1 Failed forceps.
Craniotomy and internal podalic version	1
Internal podalic version	1
Forceps	2—1 also M. R. P.
Forceps after incision of cervix	1
Manual removal of placenta	3
Hand replaced	1
Vaginal plugging, twice for placenta praevia	1
	17

The cases requiring artificial interference at maternity homes were those requiring manual removal of placenta; one of these was in a private maternity home run by a general practitioner. There was a general lack of cleanliness and absence of facilities for meeting emergencies in this institution.

Vaginal examinations.—Fiftytwo cases had no vaginal examination, two had only rectal examination, one had vaginal plugging and in four cases the history was indefinite. Only 15 cases had one, two or three vaginal examinations. Of these two cases were examined by *dais* before admission. One ended normally and one in craniotomy. Two cases of antepartum sepsis had vaginal examinations. One of these died undelivered and one delivered normally. Two others, apparently quite normal, had vaginal examinations. The remaining patients who had vaginal examination were cases who received artificial aid. It will thus be seen that only four cases of natural delivery had vaginal examination and about 73 per cent of cases of maternal deaths from puerperal sepsis had no examination.

Antiseptic.—In 41 cases dettol was used, 24 cases had lysol, four others had lysol and perchloride of mercury or mercurochrome, and in two the information given was indefinite. In three cases only boric powder was used. This is apparently the practice at one of the old private hospitals. Most of the larger hospitals have taken to dettol.

According to reports from Queen Charlotte's Hospital, London, where dettol was first introduced, the incidence of morbidity has been definitely lowered. Dettol, however, is more expensive and this may tend to prevent its use at institutions with limited incomes.

Treatment.—Of the home deliveries only a few had treatment but usually the cases were seen too late for treatment to be of any avail. A case of manual removal of placenta by *dai* was brought into hospital the same day seriously ill with acute dilatation of the stomach. She had a full course of Prontos

injections. Another case attended by a doctor at home had also full treatment early in the puerperium. Of the institutional deliveries 28 cases were given a variable number of Prontosil injections. Two had sulphanilamide tablets; one had antigas gangrene serum and one antistreptococcal serum. One case was given six transfusions in addition to Prontosil and serum. In two cases the peritoneal cavity was drained. Only three cases had uterine drainage, two by glycerin and one by a drainage tube.

It is significant that glycerin drainage and antistreptococcus serum are going out of vogue. At Queen Charlotte's Hospital, London, mortality has been lowered from 20 per cent to 4.5 per cent in cases of infection by haemolytic streptococcus, by use of Prontosil soluble. The report of the Medical Research Council early in 1939 on sulphanilamide and allied preparations showed a reduction of maternal mortality in London from 1.57 per 1,000 births between 1930-35 to 0.75 per 1,000 in 1936.

Sulphonamide preparations are specific for the haemolytic variety of streptococcus, the most virulent organism in puerperal infection. It is advised that the drug should be exhibited early and in adequate dosage to produce the full benefit. Its indiscriminate use tends to produce complications and therefore a careful study of the action of the drug and control by regular bacteriological examinations of high vaginal swabs are essential.

TABLE 16.—INTERVAL TO DEATH.

Days.	1—4	5—7	8—10	11—14	3rd week.	4th week.	5 or more weeks.	Un-known.
Number of cases	14	19	21	17	24	16	18	4

Fiftyfour maternal deaths from sepsis took place within the first ten days after delivery. The length of interval to death was in respect of two maternal deaths ten and eleven weeks after delivery.

Deaths due to sepsis (133) are shown below classified according to age gravidity, term, ward, community and economic status.

TABLE 17.

Age.	16—20	21—25	26—30	31—35	36—40	41—45	Total.		
	25	52	36	11	7	2	133		
Gravidity.	I	II	III	IV	V	VI	VII	VIII or more	Total.
	39	18	20	21	13	8	7	7	133
Term.	Premature.	Full term.				Not known.		Total.	
	20	111				2		133	
Ward.	A	B	C	D	E	F	G	? Im-ported.	Total.
	6	4	13	11	33	24	32	10	133
Community.	Hindus.	Mohammedans.	Indian Christians.		Parsees.	Other		Total.	
	104	21	3		3	2		133	
Economic status.	Poor.		Middle class.	Rich.		?		Total.	
	115		12	1		5		133	

Of the total number of deliveries in Bombay during the period of the enquiry approximately 25 per cent were conducted at home. The proportion of deliveries conducted by *dais* must therefore have been less than this figure. On the other hand, among the total number of maternal deaths due to sepsis (133) 43·6 per cent had been attended by *dais*. It seems therefore fairly certain that the risk of death from sepsis must have been relatively higher among the cases conducted by *dais* than among those delivered through other agencies. The majority of the sepsis deaths occurred in patients from wards E, F and G, which are the localities inhabited by the poorer sections of the community.

Of the total 133 sepsis deaths 51 were stated to be in a debilitated condition and 55 to be in good health. Of the latter 36 were cases conducted by *dais* and 19 were institutional deliveries. Nineteen had artificial interference, one being by a *dai* and one at a private house by a doctor. Dettol is being used in most hospitals while the majority of maternity homes use lysol probably on economic grounds.

Recent literature has proved convincingly the dangers of droplet infection. The routine use of adequate masks, the proper preparation of the attendant's hands and the patient's parts and maintaining them sterile right through the conduct of labour are points needing repeated stress. No antiseptic, however powerful it may be, can compensate for the slipshod ways of a careless and callous attendant.

Sulphonamide preparations are being used freely in most institutions.

Deaths due to sepsis formed 39·1 per cent of the total maternal deaths in this enquiry. Dr. Mudaliar gives a percentage of 26·4 for Madras and the Calcutta enquiry revealed 31·9 per cent of sepsis deaths. Most reports from abroad show that about a third of the total maternal mortality is due to puerperal sepsis. The finding of the present enquiry is therefore in accord with those in other parts of India and abroad.

Anæmia.

Anæmia ranks second in the list of causes of maternal mortality. Its importance is thus self-evident. In the West the disease is hardly known in sufficient frequency to demand separate classification. Dr. Wills had made a special study of the problem and described a typical macrocytic anæmia which seemed peculiar to pregnancy. The advent of liver therapy has revolutionised the treatment of this dreaded complication and has also improved the prognosis, if the case is taken in hand early.

The onset is usually insidious and requires careful watching. Antenatal care started early and carried out vigilantly month by month to ensure proper hygienic and dietetic treatment may minimise the incidence of anæmia. Further, cases of anæmia, if detected early and treated promptly on the right lines, can be cured and the pregnancy allowed to proceed to term. Before the advent of liver therapy and blood transfusion the mortality rate from this condition was high whereas of late every institution shows a definite lowering in the rate. This, of course, can only be true of cases coming under observation early. Unfortunately even to this day many cases are seen far too late for treatment to be of any avail. It was a common experience only a few years ago to see a case coming to hospital in a profoundly anæmic condition, getting into labour and dying immediately after the birth of the child. Much has been

done to minimise the incidence of such deaths by early treatment, and by following a definite plan for the cases during labour to prevent undue strain. The prophylactic application of forceps early in the second stage and prevention of sudden dilatation of the splanchnic area have helped much to relieve strain and sudden heart failure.

In the present series 58 cases were classified in this group, of which 30 had blood examinations done. Twentythree were probably diagnosed only clinically. Five cases were not seen by any practitioner. Among 20,678 deliveries which took place in institutions, 561 received treatment for anæmia. On these figures the incidence of anæmia among pregnant women is 2·7 per cent. But, as a definite tendency exists for abnormal cases to be institutionalised, this figure may prove to be an overestimate of the actual rate. Maternal deaths attributed to anæmia among the deliveries conducted in institutions numbered 42 and the case mortality rate for this cause is therefore 7·5 per cent. This rate is likely to be an underestimate of the mortality from anæmia among pregnant women in general, because these hospital cases would have received much more medical care than patients who did not seek admission to hospital.

The anæmia deaths investigated showed a definite seasonal variation, the largest number occurring in November, December and January. Very few deaths were reported during April—August, the total number being only seven as against thirty during November—January.

Religion.—There were 35 Hindus, 15 Mohammedans and 8 Christians and others.

Ward distribution.—Large numbers were recorded in E, F and G wards, the total number in these wards being 38 out of 58. A and B wards recorded the lowest number of deaths from anæmia. (See appendix III).

Social status.—Fortyseven deaths were classed as "poor", five "lower middle" and five "middle class". There was no information available for one case.

Diet.—Twelve were vegetarians; 25 cases had no milk.

Age.—The majority were between 21 and 30. The largest number *viz.*, 21 occurred between 21 and 25. There were only 4 under 20 years. (See table 6 on page 16).

Gravidity.—(See appendix I).

Term.—Twentyfour cases went to full term. Twenty were between 8 and 9 months.

Antenatal care.—Fifteen received regular antenatal care. Nine others had inadequate care or attended irregularly. Two had only been seen by a doctor and in five cases the history could not be obtained. Two cases were admitted into hospital and were inpatients for 3—8 weeks but did not respond to treatment. Twentyfive cases had no antenatal care. Except in two cases there was no history suggestive of anæmia in the past.

Type.—Of those with blood examination, 15 were classed as "primary," 14 "secondary" and one "doubtful". Eight cases without blood examination were also described as "primary".

Seventeen cases had a blood count of a million or less. The lowest was in a postpartum case, the figure being 300,000 per c. mm.

Delivery.—Fortyone cases were delivered naturally, eight cases had artificial aid, three died undelivered and in three the history was insufficient. Three cases ended in abortion.

Thirtysix cases were delivered in hospital, four in maternity homes, 11 were delivered at home, of which one was admitted to hospital after delivery at home for retained placenta, and one was delivered in a *garry*.

Anæmia was noted in 86 other cases, 22 of whom were cases of associated diseases.

Treatment.—Only ten cases had injections of liver extract and iron therapy for any appreciable length of time. Two cases had iron and marmite. Four cases were given blood transfusions and two were given blood intra-muscularly.

Summary.—Anæmia ranks second in frequency among maternal deaths. Its incidence is high in the colder months following the monsoon, during which period proper supplies of fresh food are difficult to obtain. It seems to be very prevalent in the areas inhabited by the poorer classes. The incidence of the disease is commonest in the third decade. More than 50 per cent of the cases received no antenatal care. Mortality can be prevented to a large extent by detecting this disease early and treating it promptly along the right lines.

Eclampsia.

There were 20 deaths of eclampsia, about 6 per cent being puerperal deaths and five of albuminuric toxæmia.

Eclampsia and albuminuric toxæmia, including pyelitis and nephritis in accordance with the international classification, rank third in frequency of puerperal causes of deaths. Omitting pyelitis and nephritis, they rank fourth. Mudaliar reported 38 cases in his series of 436, and Neal-Edwards reported 126 cases in his series of 701.

Bombay	25—7·4	per cent of the total maternal deaths.
Madras	38—8·7	” ” ”
Calcutta	126—18·0	” ” ”

The following remarks apply only to eclampsia.

The incidence of eclampsia among the 20,678 institutional deliveries during the period under consideration was 92. As the main maternity centres in the city are included, it is probable that the figure very nearly represents the total incidence of eclampsia in Bombay. On this assumption, the incidence of eclampsia among 38,243 (including still-births) births which took place during the period of the enquiry was 0·24 per cent, which is definitely smaller than the rate of 0·45 per cent estimated by Dr. Chamanlal Mehta through an enquiry into the incidence of the disease during the quinquennium, 1929-34. If the figure 92 can be taken to represent the total number of eclampsia cases that occurred during the period of the enquiry, the case mortality rate is 26·1 per cent.

A glance through the statistics of the main maternity centres for the past few years shows that, apart from the general increase in the number of cases admitted for delivery, there is a definite increase in the proportion of abnormal cases, which suggests that the public have begun to realise the value of institutional care for abnormal cases. At the same time this increase emphasises the need for extensive propaganda for regular antenatal care and early report of abnormal symptoms. Perhaps in no disease of pregnancy can so much be

achieved in the way of prevention as in eclampsia. Early hospitalisation, if symptoms of toxæmia supervene, can go far in preventing the development of eclampsia.

The following statistics speak for themselves :—

TABLE 18.

	Booked.		Emergency.	
	Total cases.	Eclampsia.	Total cases.	Eclampsia.
A.	1,825	5—0·27%	1,143	12—1·05%
B.	2,054	8—0·39%	3,016	31—1·2%
St. Mary's Manchester .	1,010	2—0·19%	6,82	21—3·06%

A and B are two hospitals in Bombay. The higher incidence of eclampsia among the emergency cases in comparison with the booked cases is clear from the above table.

In the present series only 9 cases had antenatal care ; for six of these the care may be stated to have been adequate and for the remaining three inadequate.

Of the latter, two were seen 3-4 weeks ahead, and one was seen by a doctor six days earlier, when the only symptom was vomiting. The patient was advised to get her urine examined but failed to send it till the day the fits set in. Of the six cases with antenatal care four were described as "fulminant". One of these occurred at a private nursing home run by a leading consultant. She had been seen only two days prior to the attack, when there were no signs of toxæmia. Two cases occurred in public hospitals and had been in hospital from 4—7 days during which they seemed to be improving ; the attack came on suddenly and each patient died within a day. One case was admitted deeply comatose. She had been seen two weeks previously and found to be normal. There was a history of œdema for ten days which the patient unfortunately did not report. These cases may explain the irreducible minimum, the small percentage which no antenatal care or immediate treatment can either prevent or save. At the same time they stress the need for greater vigilance in the evaluation of symptoms and for an earlier termination of pregnancy in some cases.

Ten cases had no antenatal care ; in one the data were insufficient, but the probability is that there was no antenatal care. Three of the cases occurred at home, only two of which were seen by a practitioner. In the last case the diagnosis was a mere conjecture.

Premonitory symptoms.—Seven cases had some symptoms but the histories are too indefinite for the majority of the cases to allow of further discussion. Two cases were already in hospital for 4—7 days and one developed a fit on the fifth day of the puerperium.

Number of fits.—Nine cases had 1—7 fits, the rest had ten or more. The highest number was 30 in a case who had been inpatient for nearly a week. One case had no fits and went into deep coma.

Signs.—Albuminuria was marked in nine cases. Œdema was marked in four cases. In seven cases there was no œdema. Blood pressure was 160 m.m. and above in eight cases. Five cases had 130 m.m. or less.

Place of attendance.—Of the total eclampsia deaths, 11 took place in public hospitals, four at private hospitals, two at public maternity homes and three in the homes of the patients. Among these five patients died undelivered.

Nature of delivery.—Four cases had artificial rupture of membranes of which two died undelivered. Three had forceps and one craniotomy. The rest were delivered normally, except three who died undelivered. It is significant that there was very little tendency, if any, to undue interference, and not a single case was delivered by cæsarean section.

Treatment.—The majority of the cases had morphia in small doses followed by mild sedatives. In addition intravenous glucose and calcium gluconate were given freely. Only one case had intravenous magnesium sulphate; three injections were given.

Ward distribution:—

	A	B	C	D	E	F	G
Deaths	5	5	5	1	4

Fifty per cent of the eclampsia deaths took place in wards C and D, which have a relatively higher percentage of middle class population than the other three wards.

Economic status and religion.—Fourteen cases were classed as “poor”, two “lower middle class” and four as “middle class”. Of the latter three were Hindus and one Parsee. There were three Mohammedans in the whole series and fifteen Hindus.

Diet.—Twelve cases had mixed diet, and ten cases took one *pau* or more of milk daily.

Term.—Ten cases went to full term and eight cases were between seven and nine months at the time of death.

Gravidity.—Of the 20 deaths from eclampsia, ten were primigravidæ, seven occurred among those undergoing the second and third pregnancies and three among those having their sixth or seventh pregnancy.

Age.—Thirteen cases were between 21—30. The youngest was 18 and the oldest 38.

There is no definite seasonal variation.

Summary.—Half the number of cases had no antenatal care. Eleven cases had ten or more fits.

Most cases had a natural delivery or had very little artificial aid. Five cases died undelivered.

Fifty per cent occurred in primigravidæ.

Thirteen cases were between 21—30 years.

Morphia in small doses, combined with mild sedatives and intravenous injections of glucose and calcium gluconate, was the treatment of choice in most cases.

Albuminuric toxæmia.

There were five cases of toxæmia, of which two died undelivered, two had normal deliveries one of which had postpartum hæmorrhage due to cervical tears, and the fifth had artificial rupture of membranes and forceps. This last case was admitted after antepartum hæmorrhage and was very anæmic. She was given a blood transfusion and other treatment for toxæmia. She however developed hyper-pyrexia, coma and hemi-paresis towards the end.

All the cases were classed as "poor", two of them were from B ward, another middle class locality. They were all between 20 and 30. Two were primigravidæ and the others in their second, third and seventh pregnancies. Only one had adequate antenatal care.

Pyelitis.—Of the total number of seven deaths under this head, two patients had abortion during the course of the disease. One died during early pregnancy. All the four who were delivered nearer term were already ill for variable periods during pregnancy. One patient was in her first pregnancy, three in the fourth, one in the second, one in the seventh and in the case of the last the number of pregnancy was not known.

Uræmia and nephritis.—Of four deaths from these causes one patient was admitted acutely ill in early pregnancy and died within 12 hours. Two others delivered near term and died at the end of two and three weeks respectively. One was a case of recurrent kidney of pregnancy and showed signs of acute exacerbation.

Other toxæmias.—Of these one was a case of hyperemesis gravidarum admitted too late for treatment. Another case gave a history of incessant vomiting throughout pregnancy, went to term and died nine days after delivery. A third case had vomiting during the last month of pregnancy, showed signs of general toxæmia and died soon after labour. Three were classed as cases of obscure toxæmia and another of seven months pregnancy had purpuric hæmorrhages. Two others died in early pregnancy, one associated with jaundice, and one marked by delirium, convulsions and coma. In this last case a postmortem did not reveal any lesions in the viscera.

Acute yellow atrophy.

In the international classification this cause of death is shown as an associated disease, but the number of cases collected and the fact that the disease has a special predilection for pregnancy seemed to justify its inclusion among the puerperal causes. Dr. Mudaliar has also done the same. Munro Kerr is also of the same opinion. In his book on Maternal Mortality and Morbidity (page 40), he goes on to say "This disease very rarely occurs apart from pregnancy. When it occurs in pregnancy it is almost invariably due to toxæmia (sepsis very occasionally) and is in most instances preventable if suitably treated prior to the development of its grosser manifestations—*It should be included in the diseases directly due to pregnancy and placed in a sub-division of the toxæmia of pregnancy.* It is included by the Registrar General for Scotland under "Other diseases of pregnancy".

There were ten cases in all, only one of which had a postmortem examination. The majority of cases were between the ages 22—30. None was below 22. One was aged 35. The gravidity distribution was wide. Only three cases reached full term. There were six Hindus, one Mohammedan, two Parsees and one Indian Christian.

Previous history.—Two cases were imported during labour and their history could not be obtained. Others gave a history of either vomiting, diarrhœa or fever during pregnancy. Six cases started symptoms during pregnancy and four early in the puerperium. Delivery was normal in five cases. One had an abortion at six months. One had forceps delivery for rigid perineum and three died undelivered. The forceps case had been given blood transfusion for progressive anæmia.

Antepartum hæmorrhage.

There were 19 cases in all. Eleven cases were definitely put down as placenta prævia. Of the remaining eight cases under accidental antepartum hæmorrhage one was a doubtful case. She was aged 20 and in her second pregnancy. She died on the way to hospital.

There were 246 cases of antepartum hæmorrhage in 20,678 institutional cases, and 15 deaths in these giving 6.0 per cent as the rough incidence of mortality.

There seemed to be a proportionately larger number of middle class patients in this list, this being particularly noticeable in the placenta prævia group, six out of eleven belonging to A, B and C wards. There were only three from E and F and none from G ward. The largest number of cases of antepartum hæmorrhage occurred in the age group 26—30, whereas in placenta prævia the incidence was highest between 31—35. Five out of eight cases of accidental antepartum hæmorrhage occurred after the fourth pregnancy and in placenta prævia 9 out of 11 cases occurred from fourth pregnancy upwards. There were only 3 primigravidæ in the combined list. A large number of cases in both groups ended prematurely.

Antenatal care.—Only three cases had received adequate antenatal care, one was a case of suspected placenta prævia and was advised admission to hospital but came in only after much bleeding.

Of the 19 cases, one died at home practically without treatment as medical aid was sought too late. She had been in hospital on two occasions previously for antepartum hæmorrhage and left hospital the second time against medical advice. One case died on the way to hospital. The remaining cases (17) were admitted to hospital, except one who was treated at a maternity home by a consultant.

Only three cases were described as having been admitted in good condition; a fourth case had hydramnios but was otherwise well. One patient was admitted in a fairly good condition with rather a rapid pulse and 12 cases were brought in in a low state after much hæmorrhage, one of these having travelled thirteen miles in a car.

One case of accidental antepartum hæmorrhage and three cases of placenta prævia had postpartum hæmorrhage as well, which must have tipped the balance considerably.

TREATMENT DURING DELIVERY.

Accidental antepartum hæmorrhage.—Three cases were delivered naturally and another case required only artificial rupture of the membranes. Two died undelivered after artificial rupture of the membranes, and one died in the conveyance undelivered without treatment. Only one case had craniotomy after artificial rupture of the membranes, apparently to hurry on labour in a case of concealed antepartum hæmorrhage with toxæmic symptoms. She had postpartum hæmorrhage. This case was an inpatient for six and a half hours and was treated entirely by residents. Another case of antepartum hæmorrhage was noted under albuminuric toxæmia.

Placenta prævia.—Three cases had Willet's forceps application of which two died undelivered. Three were treated by internal podalic version and one

had bipolar version. One case had De Ribe's bag, and one had vaginal plugging after artificial rupture of the membranes under anæsthesia, and died undelivered. One of the cases of internal podalic version was followed by rapid extraction. The case of bipolar version also required manual removal of placenta for delay, and a cervical tear was suspected. She showed signs of shock. Two cases had no time for treatment, one dying at home, and the other admitted rather low, developed a rigor soon after intravenous gum saline infusion and died two hours after admission.

None of the cases had transfusion of blood. In two cases preparations were being made for blood transfusion when death took place. In most others it was either not thought of or there were no facilities available.

Time of death.—Five cases died within six and a half hours of admission. Seven cases died in 7—12 hours, two in 16—20 hours, one died after 33 hours and one case of placenta prævia was in hospital for six days, but died within two and half hours of delivery.

* A case of placenta prævia followed by postpartum hæmorrhage died of sepsis.

Postpartum hæmorrhage.

There were in all 13 deaths. Most of these seem to have been of the atonic type. There were 157 cases of postpartum hæmorrhage in 20,678 institutional deliveries and 7 deaths in these giving 4·5 per cent incidence of mortality. Ten were described as poor, two middle class and one rich.

Ward distribution.—There were three cases each from wards C and D; the rest were from F and G wards except one who came from Ghatkoper.

Age.—Except for two cases at 19 and 20 years of age respectively both of whom were primigravida, the remaining cases were between the years 20 and 40.

Gravidity.—Eight out of thirteen cases occurred from the fifth pregnancy onwards, one case occurring at the eleventh pregnancy.

Eight cases were delivered at full term.

Place of delivery.—Eight cases were delivered in institutions, four were attended at home by either *dais* or relatives, of whom, one was admitted into hospital and one was attended by a medical woman at home there being delay in getting consultants.

Labour.—Normal labour took place in ten cases and another normal delivery in a case of twins. One had forceps application for P. O. P.

One case had internal podalic version for prolapsed hand. The bleeding occurred after expulsion of placenta in 11 cases, in one of which, a case of pneumonia, it occurred five hours after delivery. Only two cases needed manual removal of placenta for postpartum hæmorrhage.

Time of death.—Four cases died with intervals ranging between 15 minutes and one hour after delivery. In respect of five others death took place between two and a half and four and a half hours after delivery. Two cases died after 11 hours, one after 15 and one after 24 hours. The patient who lived for a day was a case of pneumonia and had reactionary postpartum hæmorrhage. The case of P. O. P. who had forceps and manual removal of placenta lived 15 hours and probably remained in a condition of shock. So did the case attended at home by a doctor, who lived 11 hours. One case died at home after 11 hours and medical aid was not sent for.

Of the other home deliveries, in two there was no time to get medical aid, both dying within an hour of delivery. One was taken to hospital with postpartum hæmorrhage and died within half an hour of admission. The placenta was removed manually on admission and there was no more bleeding.

Postpartum hæmorrhage was noticed in 14 other cases classified under different causes. Four followed after placenta prævia of which one died of sepsis. Another case of sepsis occurred after manual removal of placenta for postpartum hæmorrhage. Of the rest there was a single case each of accidental hæmorrhage, eclampsia, toxæmia of pregnancy, anæmia, two of difficult labour and three of associated diseases.

SUMMARY.

Puerperal hæmorrhages rank fourth in frequency amongst puerperal causes of death.

The incidence of risk is greater above the age of 30, 25 per cent of deaths under this head occurring in the higher age groups. Multigravidæ from the fourth pregnancy upwards are more prone to fatal hæmorrhages. There were only three primigravidæ in the antepartum hæmorrhage group and two in the postpartum group.

As for ward distribution, almost equal numbers were distributed between the poor and middle class areas, this particular complication being responsible for a high mortality amongst the better classes. Only three cases under antepartum hæmorrhage and six under postpartum hæmorrhage received adequate antenatal care.

The preventability of these "unavoidable" complications of pregnancy and labour has been discussed in the chapter on antenatal care. Accidental antepartum hæmorrhage can be prevented to the extent of detecting cases of toxæmia early as well as by the proper management of the particular type which is commonly associated with it. This and the unavoidable type can be brought under treatment early if under regular antenatal care and this should go a long way towards helping to save a number of cases.

Accidents of labour.

Eighteen deaths are included in this group. Most of the patients had regular antenatal care and the majority of deaths might have been due to some miscalculation or misjudgement. Border-line cases of disproportion present some of the most difficult problems, requiring very careful evaluation of the factors connected with the particular labour. It is heart-rending enough to lose a child after a carefully planned labour, but the disappointment is all the greater when the woman also meets her death.

In this list there are six cases of ruptured uterus which will be discussed separately, one case of acute inversion of the uterus and a death under spinal anæsthesia.

This leaves ten cases where the condition of the patient or the course adopted was directly responsible for the end.

Nine cases had regular antenatal care.

Eight cases were treated and died in public hospitals, one died in a maternity-home and one was admitted into hospital after the birth of the child at home. This latter case had no antenatal care but was said to have had postpartum hæmorrhage at home; but on admission to hospital her condition was

good and there was no hæmorrhage. The placenta was removed for delay, after which the patient got into a condition of shock.

The case of the maternity home also died after removal of the placenta.

Two cases were induced for anticipated disproportion with artificial rupture of membranes. Both had prolonged labour. One showed signs of shock before delivery, had an easy forceps extraction and succumbed a few hours later. The other case developed marked distension during labour, which ended in craniotomy, and led to paralytic ileus.

A case of trial labour developed shock and died undelivered while being prepared for cæsarean section. The child was removed postmortem and no tear was detected.

One patient had craniotomy after symptoms of shock set in. Similarly another woman was delivered by low forceps because of shock.

The following table gives a short summary of the cases :

TABLE 19.

Antenatal care given.	Difficulty anticipated.	Indication for interference.	Nature of operation.	Complication.
Yes	No.	Adherent placenta	M. R. P.	Obstetric shock.
No.	No.	Do.	Do.	Do.
Yes	Yes	Contracted pelvis.	Induction mid-forceps.	Obstetric shock before forceps.
Yes	No.	Inertia	Low forceps	Do.
Yes	Yes	Contracted pelvis	..	Obstetric shock undelivered prepared for cæsarean section.
Yes	Yes	Do.	Cæsarean section cl.	Post operative shock.
Yes	No.	Do.	Do.	Do.
Yes	Yes	Do. P. O. P.	Man. Rotation & forceps failed C. S. L. S.	Toxæmia and anæmia.
Yes	No.	P. O. P.	Craniotomy	Obstetric shock before craniotomy.
Yes	Yes	Disproportion	Induction craniotomy.	Paralytic ileus.

In addition to the above, operative interference was noted in 55 cases where death was due to other causes.

Rupture uterus.—There were six deaths under this head. Only two cases had regular antenatal care. One was diagnosed as a transverse presentation a month earlier and advised to go into hospital but did not turn up till a month later in labour. It is unfortunate that the presentation was not diagnosed even during labour, but the fact that the patient died within two hours of rupture of membranes indicates that the rupture was probably the result of a weak spot; she died undelivered and the rupture was diagnosed postmortem. Another case, who had regular antenatal care by a very junior medical woman was brought into hospital late with obstructed labour and suspected rupture. A large hydrocephalic head was perforated and the child extracted easily.

The condition of the patient was too bad for a laparotomy and suture subsequently.

The other four cases had no antenatal care. One case was being attended by a *dai*, was seen by a nurse and sent into hospital with signs of complete rupture. The patient died 8 hours after a laparotomy and suture.

Another case was under the supervision of an inexperienced general practitioner and was sent into hospital too late for any treatment. She died undelivered. A third was admitted late and was delivered by craniotomy and manual removal of placenta when a partial tear was detected.

The fourth case, a woman in her seventh pregnancy, had a prolonged labour with breech delivery and was attended by a general practitioner. She died two and a half hours later. This case was not definitely proved to be one of rupture.

All the 18 cases of difficult labour including the six cases of ruptured uterus went to full term.

There was only one primigravida. Of the five women in their second pregnancy one had only an abortion previously and the other four had normal labour. Three of these cases had ruptured uterus and one inversion of uterus.

There were two in the third pregnancy, both with histories of difficult labour. One had a cæsarean section for the second time and the other died before operation.

Two undergoing their fifth pregnancy had ruptured uterus. Both had history of normal labour. Another patient in her sixth pregnancy had craniotomy for P. O. P. She gave a previous history of normal labour. Brief notes about other maternal deaths occurring in the seventh, eighth, tenth and twelfth pregnancies are given below :—

Two VII gravidæ—one had adherent placenta and breach delivery and rupture. The former gave history of manual removal of placenta at each labour.

Two VIII gravidæ—one had adherent placenta and the other had craniotomy for contracted pelvis.

Two X gravidæ—both had contracted pelvis.

One XII gravida—suffered from inertia and shock.

Ages.—None were under 20. Thirteen of the deaths were between the ages 21 and 30 and 5 between 36 and 45.

Religion.—The distribution according to religion showed that there were 13 Hindus, 3 Mohammedans and 2 Indian Christians.

Wards.—A-2. B-2. C-7. D-2. E-1. F-2. G-1. Kalyan 1. The largest number was in C ward.

Economic status—

Poor 13, lower middle class 2, and middle class 3.

MATERNAL DEATHS WITH OPERATIVE INTERFERENCE.

Cæsarean section.—There were eight cases of cæsarean section, of which five were classical and three lower segment operations. Three cases of classical cæsarean had each undergone a previous cæsarean operation. One of these had marked intra-peritoneal oozing from separation of adhesions, probably got anaerobic infection and developed peritonitis. The abdominal cavity when drained showed dark brown offensive fluid. Lochial discharge was also

dark and offensive. Prontosil had been given in maximum doses to this case. The second case, a very weakly individual, was kept as an inpatient for nearly a month prior to full term and an attempt was made to build up her general health. She tolerated chloroform badly and died four and a half hours after operation in a condition of shock.

The third case also had intra-peritoneal oozing from separation of adhesions. Peritoneal drainage was established on the third day but there was no infection. The patient progressed well but had a sudden embolism on the tenth day and died within five minutes.

Of the other two classical operations, one was a case of toxæmia and was found to have a contracted pelvis during the course of labour. It was unfortunate that the condition was not detected in the antenatal period. She had prolonged labour and died in less than two hours after operation. Perhaps a craniotomy would have proved less drastic under the circumstances.

The fifth case done early in labour developed peritonitis and died on the seventh day.

There were three lower segment operations. One was a case of persistent occipito-posterior (No. 326) who was operated on after attempts at manual rotation and forceps application had failed. She developed "paralytic ileus" and died three days later. She was in her second pregnancy with a history of one full term normal labour. Disproportion had been suspected in the antenatal period. This case was treated at an institution where very little midwifery is done during the year.

The second case developed an embolus on the fourth day.

The third was a case of cervical stenosis; she had "leaking membranes" for three days and showed signs of intra-partum infection. She died of sepsis ten days later. It is likely that a caesarean hysterectomy might have proved more beneficial. This case had no antenatal care, and had a history of a forceps still-birth.

The first seven cases had regular antenatal care except that one case of repeated caesarean who developed peritonitis was out of town for two months and came in during labour. She denied any interference before admission. The following list summarises the indication and the cause of death for these caesarean cases.

Indication.	Cause of death.
Contracted pelvis 6	Post operative shock 2
P. O. P. 1	Peritonitis 2
Cervical stenosis 1	Sepsis peritonitis 1
	Pulmonary embolism 2
	Paralytic ileus 1
<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 8	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 8

The following table is compiled from statistics received from different institutions which together managed 20,678 deliveries.

Total caesareans reported in 20,678 deliveries	95
Total caesarean deaths	7
Percentage of mortality from operation	7.37

There was only one case of death after a *cæsarean hysterectomy*. She had full antenatal care and was a repeated *cæsarean* done early in labour. It appears the uterus was removed by way of sterilising the patient. She died of peritonitis two days later.

Craniotomy.—There were 11 cases of craniotomy.

One case of disproportion was induced with artificial rupture of membranes and died of 'paralytic ileus'. In the absence of a postmortem it is difficult to say if there was a partial rupture. Two cases were admitted late and had suspicion of antepartum infection. Both died a few hours after delivery. A case of hydrocephalus was brought in from the suburbs about 12 miles away, with signs of threatened rupture. She was under the care of a very junior practitioner. One seemed to be rather rapid extraction after internal podalic version in a case of central placenta *prævia*. Two were cases of failed forceps, one in a case of contracted pelvis and the other a case of transverse arrest.

The following list gives the indications, the cause of death and incidence.

Indication.	Cause of death.
Contracted pelvis 3	Obstetric shock 1
Transverse arrest 2	Paralytic ileus 1
Delay 3	Partial rupture 2
Hydrocephalus 1	Concealed A. P. H. and P. P. H. 1
Central placenta <i>prævia</i> after coming head 1	Central placenta <i>prævia</i> 1
Accidental A. P. H. 1	Puerperal sepsis 4
	Eclampsia 1
<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 11	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 11

The following table gives an idea of the incidence of mortality after the operation.

Total craniotomy cases reported in 20,678 deliveries	55
Total craniotomy deaths	11
Percentage mortality incidence of operation . . . . .	. 20.0

Forceps.—Twentytwo cases had forceps delivery.

One was a case of induction for disproportion. She got into a condition of shock and died a few hours later. The application and extraction were fairly easy and no tear was detected on digital exploration of the uterine cavity post-mortem. A full postmortem was, however, not permitted. Four cases had forceps for inertia, one for persistent occiput posterior, five others for maternal

or foetal distress and one for difficulty with the after-coming head. In nine cases forcep was used to prevent undue strain in cases of anæmia, eclampsia and tuberculosis.

Indication.		Cause of death.	
Disproportion	1	Obstetric shock	2
Inertia	4	P. P. H. and shock	1
Maternal or foetal distress	5	Sepsis	4
P. O. P.	1	Anæmia	5
Difficulty after coming head	1	Toxæmia	1
Anæmia, eclampsia, tuberculosis	9	Subacute yellow atrophy	1
		Pyelitis	1
		Dysentery	1
	21	Tuberculosis	1
			21

Total incidence of forceps in 20,678 deliveries was 283 giving a rough percentage of 7.4 for the operation.

Podalic version.—Internal or bipolar version was performed on six occasions for placenta prævia or transverse presentation. The total incidence of version was 62.

Manual removal of placenta.—Nineteen cases had manual removal of placenta including one in a case of acute inversion. Three cases died of shock and six of sepsis.

Indication.		Cause of death.	
Acute inversion	1	P. P. H.	2
Adherent placenta	5	A. P. H. and P. P. H.	1
Retained placenta	8	Puerperal sepsis	6
P. P. H.	4	Pyelitis	1
Maternal distress	1	Anæmia	4
		Eclampsia	1
	19	Inversion	1
		Obstetric shock	3
			19

The incidence of operative delivery in this list of maternal deaths is 68. Two of these were in associated diseases thus leaving 66 cases of operative delivery. Deducting the early pregnancies and undelivered cases there were 280 delivered cases giving a proportion of 66 : 214 or about 2 : 7 of operative as compared with natural delivery.

Sudden death.

Under this term only two morbid conditions have been included, *viz.*, obstetric shock and embolism. The ætiology of both these conditions is obscure and these terms may be used to cover ignorance. An attempt has been made to exclude cases with the possibility of other underlying ætiological factors, as for example undiagnosed rupture leading to shock.

In the absence of a fuller knowledge of these conditions it is not possible to suggest preventive measures, but careful preparation of the patient during the antenatal period bringing her to term in a good healthy state should go a

long way towards preventing these sudden deaths. It is a well known fact that the incidence of pulmonary embolism has definitely decreased in the majority of institutions of recent years, since more latitude of movement in bed is allowed and encouraged from the first day of the puerperium.

Obstetric shock.

There were five cases in this group. Labour was normal in four cases and in the fifth case there was a suggestion of precipitate labour. Three deliveries occurred at home, one at a maternity hospital and one at hospital. In four cases there was a definite history of preceding ill-health. Only one case had antenatal care. Three of the cases (home deliveries) were not seen by any one. Four deaths occurred in less than three hours and one at the end of seven hours.

Embolism.

Eighteen cases were classified under this head, two being suggestive of cerebral embolism and the rest pulmonary.

Two cases occurred after cæsarean section, one dying on the fourth day and the other on the tenth. The others underwent normal labour, except that one patient had a temperature of 101° F. at the time, and died at the end of 16 hours quite suddenly. Eleven cases were confined at home and of these eight had not been seen by a doctor, two were seen just towards the end by general practitioners and in one the information was insufficient. Two cases occurred one and two days after early abortion and there was nothing in the history to suggest hæmorrhage. Both the cases were not seen by practitioners. Death occurred during the first day in seven cases, from 2—4 days in three cases and from 7—10 days in seven cases. One death occurred on the 13th day.

Abortion sepsis.

Out of a total of ten deaths from this cause, all were admitted infected, seven having aborted already. One aborted after admission and two others died with signs of severe infection during the course of abortion. One case had a history of enteric fever immediately preceding the abortion. In three cases there was definite suspicion of criminal intent. All three had peritonitis.

One case admitted a few days after abortion showed signs of acute septi-cæmia and gas gangrene infection. The only case who aborted in the hospital had profuse bleeding on admission, and died three weeks later of secondary hæmorrhage.

Abortion hæmorrhage.

Of the three deaths under this head one case of six months gestation was admitted in extremis and died within two hours of admission.

Two cases, three months each, died at home. One expired before medical aid could be obtained. The other was seen by a doctor who found bleeding with a retained placenta but did not take immediate steps to evacuate the uterus.

A case of six months gestation expired at home. The data were too meagre for a diagnosis.

Ectopic gestation.

There were six deaths under this head. Three were operated. One died a few hours after; the second died two days later of paralytic ileus and the third died of acute dilatation of the stomach within 24 hours. This last case was given autotransfusion.

Two cases were diagnosed in the postmortem room, one being admitted into hospital moribund and dying within five minutes. The other case was in hospital for nearly 16 hours but the diagnosis was obscure.

In the sixth case the diagnosis is a mere conjecture from the history. She had attacks of pain during which she was seen by two doctors who did not suspect gestation. She died during the third attack.

Vesicular mole.

There was only one case. She was admitted in a very toxic condition with history of amenorrhœa of 4 months. There was enlargement of the abdomen during the previous 5 days with bleeding. The abdomen was bigger than an ordinary full term size. Evacuation of the uterus was preceded by a blood transfusion of 150 c. c. The patient was too ill to stand any drastic treatment *e.g.*, hysterectomy which might have shortened the stage of evacuation and minimised blood loss.

CHAPTER III.

MATERNAL DEATHS FROM ASSOCIATED DISEASES.

There were 175 deaths under this head and they are shown classified below :—

Pneumonia	9
Miscellaneous lung diseases	4
Pulmonary tuberculosis	34
Generalised tuberculosis	14
Tubercular meningitis	4
Meningitis	4
Intestinal diseases	16
Cardiac diseases	3
Enteric fever	13
Malaria	3
Smallpox	33
Miscellaneous diseases	18
Total	<u>175</u>

Pulmonary complications predominated, pulmonary tuberculosis showing the highest incidence among the difficult cases of mortality.

The year was marked by two severe epidemics, smallpox earlier in the year 1938, and enteric fever from April 1938 onwards. Along with the general population these have taken a high toll of pregnant and parturient women. Cardiac diseases account for only three deaths. Experience at large maternity centres shows a relatively low incidence of valvular disease of the heart complicating pregnancy, as compared with statistics from abroad, the commonest general complications being intestinal and pulmonary disorders. Improvement in sanitation and living conditions, and adequate control of food supplies will go a long way towards reducing this incidence.

MATERNAL DEATHS IN UNDELIVERED CASES.

The causes of death in cases dying undelivered are shown below :—

Antepartum sepsis	1
Anæmia	3
Eclampsia	5
Toxæmia	2
Acute yellow atrophy	3
Accidental antepartum hæmorrhage	3
Placenta prævia	5
Preparation for cæsarian section (1 under spinal)	2
Rupture uterus	2
Total	<u>26</u>

Cases of early pregnancy ending in death are classified according to the cause of death :—

Abortion sepsis	10
Abortion hæmorrhage, etc.	4
Ectopic gestation	6
Vesicular mole	1
Abortion anæmia	3
Abortion-pyelitis	2
Early pregnancy-pyelitis	1
Early pregnancy uræmia	1
Hæmorrhæsis gravidarum	1
Obscure toxæmia	2
Acute yellow atrophy and abortion	1
Embolism	2
Total	34

THE FATE OF THE FOETUS IN CASES OF MATERNAL DEATH.

The following table 20 shows the result to the foetus and the main cause of maternal death :—

TABLE 20.

Cause of maternal death.	No information.	Born.		Still living.	Since dead.	Total.
		Alive.	Dead.			
Anæmia	7	35	16	21	14	58
Eclampsia and albuminuria.	11	9	16	7	2	36
Puerperal sepsis	6	114	13	83	31	133
A. P. H. . . . .	..	1	10	1	..	11 (8 undelivered).
P. P. H. . . . .	..	8	5	3	5	13
Difficult labour . . . . .	..	5	9	4	1	14 (4 undelivered).
Sudden death	1	15	5	12	3	21 (2 abortions).
Total	25	187	74	131	56	..

It will be noticed that the still-birth rate is high, it being particularly marked in the anæmia, toxæmia, antepartum hæmorrhage and difficult labour groups. About 50 per cent of the infants ultimately survived the mother. Prematurity and still-birth are often common factors in anæmia, toxæmia and antepartum hæmorrhages. Proper antenatal care will go a long way towards reducing the incidence of these complications and will simultaneously reduce the maternal and foetal death rate. As is to be expected, puerperal sepsis and sudden death show a correspondingly lower immediate foetal mortality. In cases of difficult labour it was noticed that the treatment adopted often jeopardised both maternal and foetal life. Four cases in this group died undelivered during labour.

The ideal in midwifery is to save both mother and child and have them quite healthy at the end of the ordeal, but at times the interests are so much at variance that it is necessary to sacrifice one in the interests of the other, and with most obstetricians a potential life gets less consideration under such circumstances.

CHAPTER IV.

A NOTE ON PUERPERAL MORBIDITY.

At about the time the maternal mortality enquiry was to be started, it was felt that an enquiry into puerperal morbidity at the various institutions will prove a helpful guide, particularly as it will provide information regarding the incidence of puerperal sepsis. As this proposal had not been put up for the consideration of the Indian Research Fund Association no grant was forthcoming for this investigation, and I had to depend entirely on voluntary help. A questionnaire was drawn up and some past and present members of the Cama Hospital honorary staff made themselves responsible for the collection of the information, each for a certain number of institutions. Some consultants were kind enough to send information independently regarding their own nursing homes. This enquiry covered the same period as the enquiry into maternal mortality.

Most of the details were filled up from the case-sheets kindly placed at our disposal by the different institutions, and only an occasional patient was directly interviewed. The diagnosis of the cause of morbidity was made by the investigator by a careful perusal of the details, and whenever the facts were not conclusive enough, a probable diagnosis only could be made.

The standard of reckoning morbidity was the same as that laid down by the British Medical Association, *viz.*, "temperature continuing for 12 hours, or two or more rises to 100° F or above in the bi-daily temperature reading, reckoning from the second day of the puerperium". The British Medical Association included the first eight days as the period of morbidity. It is obvious that, as many cases are discharged from hospital by the fifth or sixth day, a certain percentage of cases of late temperature would be missed and that in consequence the incidence of morbidity as considered by the enquiry would be an understatement. The Ministry of Health, England, extended the period of puerperium to twentyone days, but a reckoning on this standard was not possible for the same reason.

The institutions supplying the information were responsible collectively for 20,678 deliveries or 57·8 per cent of total births in Bombay during the period of the enquiry and the total morbidity amongst these was 1,374 cases or 6·6 per cent. It may be stated that the deaths included in this list are only those resulting after a morbid temperature. The purpose of this investigation was more with a view to getting an index of puerperal pyrexia and puerperal fever.

Differentiating the causes of morbidity it was found that the cases could be classified as follows :—

Septic.	Probably septic.	Non-septic.	Bacilluria.	Total.
647	184	515	28	1,374
831				

If the septic and 'probably septic' cases are combined, the rate of septic morbidity among 20,678 cases of delivery becomes 4·0 per cent and that of non-septic morbidity 2·5 per cent. Of the total morbidity (1,374) sepsis, including probable sepsis, accounted for 64·5 per cent.

From the same institutions, 132 cases of morbidity after abortion were collected. Of these 63 were definitely septic and 11 probably septic. No more comment can be made on these figures as it was not possible to get the incidence of abortions at these institutions.

The following remarks will be confined to the 1,374 cases of morbidity occurring after full-term or premature labours.

TABLE 21.

Type of delivery.

	Normal.	Compli- cated.	Prolonged	Instru- mental.	Episio- tomy.	Lacera- tions.
Cases	622	417	9	192	9	125
Percentage of total (1,374)	45.3	30.4	0.7	14.0	0.7	9.1

It will be noted that the rate of morbidity after normal delivery is high. A large proportion of patients admitted into the hospitals and maternity homes are undernourished and weakly and thus make poor risks.

The morbidity at three large centres averaged 11 per cent of their total deliveries. Of this 40.6 per cent were after normal delivery and the remaining 59.4 per cent occurred after complicated, instrumental and other deliveries.

Of the total morbidity 9.8 per cent occurred after lacerations, artificial and accidental, and 14.0 per cent after operative delivery. The incidence of operative interference amongst the 20,678 deliveries investigated was 550 or 34.9 per cent of the total morbidity (1,374).

Internal examinations.

Seven hundred and nine cases had no examination. Two hundred and fortysix had vaginal examination and 20 others were admitted after vaginal examination at home; thus 266 cases had vaginal examination. Three hundred and forty cases had rectal examinations only. These cases were all reported from one institution where it seems to be the routine. Six hundred and fortynine cases of morbidity were reported from this particular institution thus showing that a little over 50 per cent of the morbid cases had a rectal examination. Incidentally it may be stated that this institution is situated in the mill area and draws a large mill population. Considering normal labour without complications, it is noticed that at this centre where routine rectal examinations are made, only 5.2 per cent of the cases had vaginal examination, and the rest had rectal examination. On the other hand, of the morbid cases after normal labour at the other two large centres 17.9 per cent had vaginal examination, the others having had no examination.

	Total deliveries.	Morbid after normal labour.	P. V. in normal labour morbid cases.
Hospital A	5,197	284 (5.7 per cent).	5.2 per cent.
Hospitals B and C	4,607	145 (3.2 per cent).	17.9 per cent.

It is thus for consideration whether a routine rectal examination tends to lower the liability to infection. Routine vaginal examination does not seem to be encouraged at most institutions, and it is gratifying to note that the staff are being educated to perfect their methods of abdominal examination.

Antenatal care.

Six hundred and forty or 46.6 per cent were said to have had antenatal care. This includes cases seen even once and thus is not sufficient index of antenatal care.

The distinction of these patients according to religion is shown below :—

Hindus.	Mohammedans.	Christians.	Others.	Total.
956	224	157	37	1,374

Social status.

The majority were classed as poor.

Poor.	Middle class.	Rich.	Doubtful.	Total.
1,180	154	17	23	1,374

Seasonal variations.

The number of deliveries is highest in the last five months of the year and morbidity is correspondingly high. The lowest incidence of morbidity is noticed from April to July but the number of deliveries is also proportionately low. There is thus no definite seasonal variation. January and February however show a proportionately higher figure although the total number of deliveries is lower. A comparison of septic and non-septic morbidities shows a higher incidence of non-septic cases in November.

Term of pregnancy.

Full term.	Premature.	Doubtful.	Total.
1,040	301	33	1,374

Less than a third were premature labour.

Gravidity.

Primigravidae.	Multigravidae.	Doubtful.	Total.
512	859	3	1,374

(37·3 per cent)

The gravidity distribution in the total deliveries under investigation shows a percentage of 22·94 primigravidae. The incidence of morbidity amongst primigravidae thus seems to be high. This is probably due to more artificial interference in respect of first pregnancies.

Time of onset of morbid temperature.

A few cases were admitted with temperature dating back over a variable period before labour; omitting these, it is noticed that 71·4 per cent of the cases started temperature within the first three days of puerperium, 22·6 per cent started between the fourth and the seventh day and 3·7 per cent started after that date.

Thus 93·9 per cent of the total morbidity cases started fever during the first week of puerperium.

Duration of morbidity.

In 32·2 per cent of cases the duration of illness lasted for 1—3 days, in 40·3 per cent its duration was 4—7 days, in 20·1 per cent it extended into the second week and only in a small percentage of cases (6·1 per cent) was there prolonged pyrexia lasting 3—4 weeks.

The time of onset and the duration of temperature are often an index of the severity of infection and of the response of the patient to treatment. No further conclusion can, however, be drawn as the figures are worked out from collected statistics and not from personal observation.

No information is available in regard to cultural examination of the patients.

CHAPTER V.

CONCLUSIONS AND RECOMMENDATIONS.

A statistical enquiry into maternal mortality spread over a year from July 1937 to June 1938, brought 525 cases under detailed investigation. Of these ten were omitted as irrelevant, 175 were due to associated diseases and 340 or 66·1 per cent were directly connected with childbearing.

The total births registered during the period were 38,243 giving a mortality rate of 8·33 per 1,000 births. Puerperal sepsis accounted for the highest proportion of mortality, *viz.*, 39·1 per cent. Anæmia came next in frequency being responsible for 17 per cent deaths. The next in order were eclampsia and puerperal hæmorrhage.

According to the report of the Health Officer 75·7 per cent of the births occurred in institutions and 24·3 per cent at home. The present enquiry shows that 28·8 per cent of maternal deaths occurred in these home deliveries. Most of these were attended by untrained women. Of the total deaths under sepsis 43·6 per cent occurred in deliveries by untrained women. Bombay has a good network of public and private maternity institutions, having a total of 1,289 beds for a population of just over 11½ lakhs, or about one bed to 900. In spite of this, much latitude seems to be allowed to the untrained *dai*. It should be possible, in these enlightened days, to eliminate the untrained *dai* at a very early date. Intensive efforts should be put forth for creating public opinion in this respect by the leading social service organisations and women's associations. The Government and Municipality must co-operate in bringing into force a *Midwives' Act* on the lines of similar Acts in the West.

Even if this Act is brought into force immediately it will take five years to eliminate the untrained women and this means delay in the progress of reduction in maternal mortality. This, however, appears to be the first measure necessary in the programme of reform.

The majority of deaths occurred amongst the poor living in one room tenements (71·2 per cent) particularly in the most congested areas. Wards E, F, and G had the highest mortality. A vigorous campaign for clearing the slum area rapidly and building well ventilated and cheap dwellings for the working class population is urgently needed. The price of food-stuffs and other essential articles should be brought down to the level of the paying capacity of the working classes or *vice versa* living wages need to be raised. A generous ration of wholesome milk, cheap enough to be within the reach of the poor, and a plentiful supply of green vegetables and fresh fruits throughout the year will go a long way towards building up resistance in the people against disease. The need for free food centres and milk depots for necessitous expectant mothers seems great. Unhygienic overcrowded dwellings and undernourished bodies are hardly suitable preparation for future maternity. The general impression that has been gathered from all the large maternity centres is that the majority of women start pregnancy in a poor state of health. Barely 25 per cent of the deaths from sepsis in institutions in the present series were noted to be in good health prior to confinement. Tuberculosis causes a high rate of mortality amongst the general population and the pregnant and parturient woman is no exception.

Education of the public.

For the proper care of the expectant mother by keeping her under regular supervision and by making adequate arrangements for her confinement, social

service organisations, health visitors and municipal midwives can do much to popularise antenatal centres which are being run in connection with each hospital and maternity home. At the same time vigilance needs to be kept that the advice given is followed regularly in the interval between visits and that regular attendance is ensured.

In this series 77·2 per cent of cases showed an avoidable factor, the majority of these being due to omission or inadequacy of antenatal care and negligence of the patient or her relatives. Only 21·2 per cent of cases had adequate antenatal care.

Institutional midwifery.

There are three large maternity centres providing collectively for about a third of the total confinements. They are properly situated, one being towards the south, another in the northern part of the city and the third about the centre, while their personnel of specialists make them real centres for consultations and specialised work. The public maternity homes dotted all over look after a little over a third of births. They are primarily meant for normal cases and their equipment and personnel are arranged accordingly. Each of these homes has an antenatal clinic and an ideal arrangement will be for these homes to confine their activities entirely to normal work and refer every abnormal case even from the antenatal centre to the larger centres. This reference should include cases of toxæmia and anæmia in addition to cases of pelvic disproportion which should always be under the direction of specialists. Co-operation between the various institutions is essential for ensuring efficiency of treatment as well as for providing for the convenience of the public.

In the present enquiry it was noticed that 37·3 per cent of the cases ending in puerperal sepsis were confined in maternity homes. This is parallel to the percentage deliveries in the homes and seems a very high incidence if the cases attended to were all normal deliveries. A careful study, however, revealed the fact that a large number of cases were already debilitated by some general complication such as anæmia, toxæmia or intercurrent disease. Such cases should primarily have been treated at one of the larger centres which are perhaps allowed to be overcrowded with normal cases, some of which at least could very well have been diverted to maternity homes. A large number of large and small maternity homes has cropped up in different parts of Bombay within the last few years while some, particularly those under leading consultants, are equipped and managed on modern lines. A fairly large number of small homes under general practitioners and midwives are not any better than third class hotels and need drastic reform in the matter of overcrowding, sanitation and methods of work. Nothing short of an Act to regularise the opening and management of all private nursing and maternity homes can remedy this real danger to the public. Again the management of cases turning septic, in a unit separate from the normal lying-in ward and with a separate staff, is a detail no maternity institution can afford to neglect.

Domiciliary midwifery.

There is a definite move in certain circles in Bombay to discourage domiciliary midwifery. Delivery in a modern maternity hospital is certainly ideal, but to meet the entire needs of the public the present accommodation may need to be almost doubled. The available beds have great pressure thrown on them continuously and there is constant danger of overcrowding which is detrimental to the normal lying-in period as also harmful to the new-born baby. A certain proportion of cases has to be discharged by the fifth or sixth day to

make room for others. Such a state of affairs is far from ideal and unless a sufficient number of beds is provided to meet the growing demand, it will be better to popularise home delivery to a certain extent. At present the Municipality maintains a few midwives (one for each district) and the Infant Welfare Society has a small number as well. The tendency of these midwives however is to induce patients to seek admission to maternity homes or hospitals. It is often noticed that a number of women prefer to be confined at home particularly if they have little children on whom they want to keep an eye and from whom they do not wish to be separated. For such, a good domiciliary service will be highly beneficial. Confinements in one room tenements are certainly difficult to manage, but arrangements can be made to keep an end room in a chawl apart for confinement cases from that chawl. A couple of beds may suffice for the needs of the occupants.

Unforeseen complications, *e.g.*, antepartum or postpartum hæmorrhage occurring in the patient's house may require immediate attendance. Every hospital and maternity home should have a midwife and a doctor ready to answer emergency calls and in addition a service of consultants to help with emergencies. It is often felt that in certain emergencies like hæmorrhage the patient's chances of survival can be improved by expert treatment on the spot. At times a transfusion may have to be done in the patient's house before she can be moved. A service organised on the lines of the "Flying squad" will be highly beneficial. The Municipality maintains a free ambulance service for maternity cases but this fact is not known widely enough to the public. A Midwives' Act to regularise practice and registration of maternity homes, will naturally bring adequate supervision in its wake. The Municipality must appoint a woman assistant to the Health Officer to organise this work. She may also form a link between the various centres and bring about good understanding and friendly co-operation.

Antenatal care.

This is the ground work for proper maternity and much preventive work can be done at an antenatal centre, particularly detection of pelvic disproportion, abnormal presentation, anæmia, toxæmia, chronic heart, lung or kidney disease, venereal disease and so forth. Conditions where the presence of pregnancy will adversely affect the patient's health can be detected early and the pregnancy terminated. In others early and adequate supervision will detect the earlier deviation from normal and the institution of proper treatment will allow the pregnancy to progress normally. Antenatal centres need to be opened as near the patient's home as possible so that regular attendance can be ensured; the work should include, in addition to the usual routine examination, collective and individual talks to patients giving them instruction as to their habits, diet and general care during the pregnant state, emphasising the need for regular supervision and the danger of neglecting to report certain symptoms. The centre in short must be an educative centre as well as one for detecting the earliest deviations from the normal. Certain diseases occurring in pregnancy are best treated as inpatients, *e.g.*, anæmia, toxæmia, hæmorrhages etc. and an adequate number of antenatal beds is an essential factor in every modern maternity service.

Postnatal clinics.

Many a chronic illness can be prevented by proper following up of confinement cases and the linking up of a contraceptive centre will help to prevent conception in cases where pregnancy is contra-indicated.

Transfusion service.

A service on the lines of the London Transfusion Service will be highly beneficial particularly in certain intractable cases of anæmia and in emergencies such as hæmorrhages.

Training of the medical practitioner.

Midwifery is one of the subjects in medicine where a practitioner may be, nay often is, called in to deal with emergencies and hence the subject must be taught in such a way that the practitioner is really fitted to meet these emergencies. Far too often does a doctor qualify after having done his or her "twenty cases", which may mean being sent for to take the case just about the time that the baby is being born. The student then has little idea of the beginnings of the case and the normal progress of the delivery. The student is thus hardly fitted to detect signs of abnormality. Moreover, with the idea of hurrying through the "twenty cases" the student may hardly give time to abnormal cases or perhaps be content again to see a dramatic caesarean, a forceps delivery or a craniotomy without having taken the trouble to follow the case through. Such haphazard teaching may make for an impatient and inefficient midwifery attendant, who can be no credit to any midwifery service.

In India, much of the midwifery practice goes to medical women and every medical woman must see to it that she is well equipped to attend to such emergencies. Regular post-graduate courses should be held at all the large centres and arrangements made for residence of the post-graduates, so as to enable them to be on the spot to follow all abnormal and emergency work.

Regular refresher courses will help those working in out-of-the-way places to come in contact with the work at the main centres and follow the progress made.

Training of midwives.

It is noticed that a general trained nurse is able to follow the midwifery course much better than one taking midwifery alone. This is due to the background of training received by the nurse which has sharpened her intelligence as well as quickened her conscience.

However, a number of women on economic grounds find the full training which takes $3\frac{1}{2}$ years far too long. A good background of general education is essential as only then can the midwife pupil follow the intricacies of the subject and rise to be a conscientious and intelligent midwife. The three great tasks a midwife has in her practice are: (i) management of normal cases on absolutely aseptic lines, (ii) detection of abnormality during pregnancy and labour to be referred to the doctor and (iii) dealing with emergencies in the absence of the doctor and till the doctor arrives. The teaching of the midwife must be directed with these objects constantly in view.

Midwives in practice are apt to get slack and need regular supervision to keep them up to the mark. Regular refresher courses are also needed to allow them to follow the latest developments.

Statistics and research.

Carefully kept statistics are valuable for showing the results of the varying methods and different policies followed at different institutions. Every modern institution should bring out detailed clinical reports on the lines followed in the West.

Encouragement and facilities are needed for clinical and scientific research in the various causes of maternal mortality and morbidity, in methods of treatment and their results. By these means preventive measures can be formulated for the reduction of maternal mortality.

SUMMARY OF RECOMMENDATIONS.

1. A Midwives' Act to eliminate the untrained *dai* and to maintain an efficient midwifery service under the supervision of a woman assistant to the Health Officer.
2. Registration of nursing homes and maternity homes.
3. Co-ordination of the work of different institutions, particularly the large maternity centres and the public maternity homes and domiciliary service, with the institution of antenatal and postnatal clinics within easy reach of the public.
4. Organisation of "Flying squads" at each large maternity centre to attend to urgent emergencies in the patient's home.
5. Adequate number of antenatal beds at each centre.
6. A sufficient number of beds for septic cases in a separate unit at each centre.
7. Improvement in the teaching of the medical student.
8. Post-graduate and refresher courses for medical practitioners.
9. Adequate training of the midwife.
10. Refresher courses for midwives.
11. Urgent improvement of housing conditions for the working classes.
12. Bringing down the price of foodstuffs and commodities.
13. Education and enlightenment of the public in balanced diet, the rules of sanitation and personal hygiene, the advantages of proper antenatal care, the need for adequate arrangements for confinement, avoidance of infection, spacing of children and postnatal care.
14. Organisation of a Transfusion service.

References.

1. Interim Report of Departmental Committee on Maternal Mortality and Morbidity. 1930.
2. Final Report of Departmental Committee on Maternal Mortality and Morbidity. 1932.
3. Report on Maternal Morbidity and Mortality in Scotland. 1935.
4. Report on an Investigation into the Causes of Maternal Mortality in the City of Madras—by A. L. Mudaliar, M.D., F.C.O.G.
5. Ministry of Health. Report on an Investigation into Maternal Mortality. 1937.
6. Maternal Mortality and Morbidity. Munro Kerr. 1933.
7. { The New Outlook—July 1936.
Poverty, Food and Health—Lady Williams.
8. Lancet. 19th March 1938. Medical Research Council Report.
9. Chamanlal Mehta—Journal of Obstetric & Gynæcology, British Empire, 1936, Vol. 43, 267.
10. Cama Hospital Reports.
11. Sir Nowrosji Wadia Maternity Hospital, Clinical Report. 1937.
12. Report of the Maternity Department of St. Mary's Hospitals, Manchester. 1937.
13. White House Conference Report—Foetal, New-born, and Maternal Morbidity and Mortality. 1931.
14. Maternal Mortality in New York City. 1933.

APPENDIX I.—CAUSE OF DEATH AND NUMBER OF PREGNANCIES.

Cause of death.	Number of pregnancies.														Total infor- mation cause avail- able. of death.	
	1	2	3	4	5	6	7	8	9	10	11	12	16	22		
Septic abortions . . . . .	..	..	1	2	4	2	..	..	..	..	..	..	..	..	1	10
Abortions non-septic . . . . .	..	1	1	1	..	..	..	..	..	..	..	..	1	..	..	4
Ectopic gestation	1	1	1	1	..	..	..	..	..	..	..	..	..	..	2	6
Accidents of Pregnancy . . . . .	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Puerperal hæmorrhages	5	4	1	4	6	3	4	3	..	1	1	..	..	..	..	32
Puerperal sepsis	39	18	20	21	13	8	7	2	2	1	..	1	..	..	1	133
Eclampsia and albumi- nuria	17	4	6	2	0	2	4	..	..	..	..	..	..	..	1	36
Other toxæmias	2	2	..	..	1	..	1	..	..	..	..	..	..	..	..	6
Sudden death	4	7	2	5	2	..	1	1	..	..	1	..	..	..	..	23
Accidents of childbirth	1	4	3	..	2	1	2	2	..	2	..	1	..	..	..	18
Unspecified conditions of the puerperium . . . . .	..	..	..	..	..	1	1	..	..	..	..	..	..	..	1	3
Anæmias	7	7	8	12	6	6	3	4	..	1	..	1	..	1	2	58
Acute yellow atrophy	2	2	4	1	..	1	..	..	..	..	..	..	..	..	..	10
Total	78	50	47	49	34	25	23	12	2	5	2	3	1	1	8	340
Percentage	22.94	14.70	13.82	14.41	10.0	7.35	6.77	3.53	0.59	1.48	0.59	0.88	0.30	0.30	2.36	100

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APPENDIX II.—MATERNAL DEATHS.—PERCENTAGE AGE DISTRIBUTION IN RELATION TO GRAVIDITY (BASED ON 331 SCHEDULES).

Age periods.	Pregnancies.													
	1	2	3	4	5	6	7	8	9	10	11	12	16	22
16—20	50.00	20.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21—25	42.30	42.86	61.70	42.86	5.88	8.00	8.70	8.33	0.00	0.00	0.00	0.00	0.00	0.00
26—30	3.85	26.53	34.04	32.65	64.71	52.00	39.13	25.00	50.00	0.00	0.00	0.00	0.00	0.00
31—35	2.56	4.08	4.26	20.41	20.59	28.00	30.43	58.33	0.00	20.00	0.00	33.33	0.00	0.00
36—40	1.28	6.12	0.00	4.08	8.82	12.00	8.70	8.33	0.00	60.00	100.00	66.67	100.00	100.00
41—45	0.00	0.00	0.00	0.00	0.00	0.00	13.04	0.00	50.0	20.00	0.00	0.00	0.00	0.00

APPENDIX III.—CAUSE OF DEATH BY WARD.

Cause of death.	Ward.							No infor- mation available.	Total by cause.
	A	B	C	D	E	F	G		
Septic abortions . . . . .	..	1	4	..	..	3	..	2	10
Abortions non-septic . . . . .	..	..	1	1	1	..	1	..	4
Ectopic gestation	1	1	2	..	1	..	..	1	6
Accidents of pregnancy . . . . .	..	1	..	..	..	..	..	..	1
Puerperal hæmorrhages	1	2	6	3	5	5	6	4	32
Puerperal sepsis	6	4	13	11	33	24	32	10	133
Eclampsia and albuminuria	1	2	9	6	7	3	8	..	36
Other toxæmias . . . . .	..	..	1	..	..	..	3	2	6
Sudden death . . . . .	..	3	3	2	7	2	6	..	23
Accidents of childbirth	2	2	7	2	1	2	1	1	18
Unspecified conditions of the puerpe- rium	1	..	..	1	1	..	..	..	3
Anæmias	2	2	7	5	16	11	11	4	58
Acute yellow atrophy . . . . .	..	..	2	1	1	3	1	2	10
Total	14	18	55	32	73	53	69	26	340

APPENDIX IV.—CAUSE OF DEATH BY DURATION OF PREGNANCY.
(Excluding associated diseases.)

Cause of death.	Month of pregnancy.										No infor- mation available.	Total.
	2	3	4	5	6	7	8	9	10			
Septic abortions	3	..	3	3	..	..	..	..	..	1	10
Abortions non-septic	2	..	..	1	1	..	..	..	..	..	4
Ectopic gestation	3	1	1	..	..	..	..	..	..	..	1	6
Accidents of pregnancy	1	..	..	..	..	..	..	..	..	1
Puerperal hæmorrhages	5	8	6	13	..	..	32
Puerperal sepsis	4	8	8	11	2	..	133
Eclampsia and albuminuria	1	1	1	3	11	3	14	2	..	36
Other toxæmias	3	..	..	1	..	..	2	..	..	6
Sudden death	1	..	..	1	2	..	1	18	..	..	23
Accidents of childbirth	18	..	..	18
Unspecified conditions of puerperium	1	..	1	1	..	3
Anæmias	2	3	6	15	5	24	3	..	58
Acute yellow atrophy	1	3	3	..	3	..	..	10
Total	3	7	6	6	10	25	46	23	204	10	..	340

APPENDIX V.—CAUSE OF DEATH BY MONTH AND QUARTER.
(Excluding associated diseases.)

Cause of death.	1st Quarter.				2nd Quarter.				3rd Quarter.				4th Quarter.				Total by cause.
	January.	February.	March.	Total quarter.	April.	May.	June.	Total quarter.	July.	August.	September.	Total quarter.	October.	November.	December.	Total quarter.	
Septic abortions . . . . .	..	..	2	2	2	..	1	3	2	..	..	2	3	..	..	3	10
Abortions non-septic . . . . .	..	..	1	1	1	..	..	1	..	..	..	..	..	1	1	2	4
Ectopic gestation . . . . .	..	..	..	..	1	..	1	2	1	1	1	3	..	..	1	1	6
Accidents of pregnancy . . . . .	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	1
Puerperal hæmorrhages	4	1	3	8	1	2	5	8	1	4	4	9	4	1	2	7	32
Puerperal sepsis	14	12	8	34	8	15	6	29	8	8	9	25	10	19	16	45	133
Eclampsia and albuminuria	4	2	1	7	4	1	1	6	4	5	5	14	3	3	3	9	36
Other toxæmias . . . . .	..	..	1	1	..	1	1	2	..	1	1	2	1	..	..	1	6
Sudden death	3	2	5	10	1	..	..	1	..	3	1	4	3	3	2	8	23
Accidents of childbirth	2	..	..	2	5	..	1	6	1	1	1	3	4	..	3	7	18
Unspecified conditions of the puerperium	1	..	..	1	..	1	..	1	1	..	..	1	..	..	..	..	3
Anæmias	8	4	5	17	2	2	..	4	2	1	6	9	6	11	11	28	58
Acute yellow atrophy . . . . .	..	2	1	3	1	1	..	2	..	2	..	2	..	..	3	3	10
Total	36	23	27	86	26	24	16	66	20	26	28	74	34	38	42	114	340

APPENDIX VI.—CAUSE OF DEATH AND COMMUNITY.

(Excluding associated diseases.)

Cause of death.	Community.					Total.
	Hindus.	Moham- medans.	Indian Christians.	Parsees.	Others.	
Septic abortions . . .	8	..	1	..	1	10
Abortions non-septic . . .	4	..	..	..	..	4
Ectopic gestation . . .	4	..	1	..	1	6
Accidents of pregnancy . . .	..	1	..	..	..	1
Puerperal hæmorrhages . . .	24	6	..	2	..	32
Puerperal sepsis . . .	104	21	3	3	2	133
Eclampsia and albuminuria . . .	24	5	1	1	5	36
Other toxæmias . . .	4	1	..	..	1	6
Sudden death . . .	16	6	..	1	..	23
Accidents of childbirth . . .	13	3	1	..	1	18
Unspecified conditions of the puerperium . . .	2	1	..	..	..	3
Anæmias . . .	35	15	2	..	6	58
Acute yellow atrophy . . .	6	1	1	2	..	10
Total . . .	244	60	10	9	17	340
Percentage . . .	71·76	17·65	2·94	2·65	4·5	..

APPENDIX VII.—CAUSE OF DEATH AND ECONOMIC STATUS.

Cause of death.	Economic status.			No infor- mation available.	Total by cause of death.
	Poor.	Middle class.	Rich.		
Septic abortions . . .	8	1	..	1	10
Abortions non-septic . . .	2	2	..	..	4
Ectopic gestation . . .	4	1	..	1	6
Accidents of pregnancy . . .	1	..	..	..	1
Puerperal hæmorrhages . . .	23	6	1	2	32
Puerperal sepsis . . .	115	12	1	5	133
Eclampsia and albuminuria . . .	26	6	2	2	36
Other toxæmias . . .	4	1	..	1	6
Sudden death . . .	22	1	..	..	23
Accidents of childbirth . . .	15	3	..	..	18
Unspecified conditions of the puerperium. . .	2	..	..	1	3
Anæmias . . .	52	5	..	1	58
Acute yellow atrophy . . .	6	2	..	2	10
Total . . .	240	40	4	16	340
Percentage . . .	82·35	11·76	1·15	4·71	..

APPENDIX VIII.—CAUSE OF DEATH AND ECONOMIC STATUS BY PAY.

Cause of death.	Economic status by pay.										Not known.	Unemployed.
	Rupees.											
	10—30	31—50	51—75	76—100	101—150	151—200	201—250	260—300	301—500	500—1,000		
Abortions	6	4	1	1	1	..	1	..	..	..	..	..
Ectopic gestation	1	2	..	1	..	..	..	..	..	..	2	..
Accidents of pregnancy . . . . .	..	1	..	..	..	..	..	..	..	..	..	..
Puerperal hæmorrhages	7	6	5	4	1	1	..	..	1	1	6	..
Puerperal sepsis	70	29	11	7	4	1	1	..	2	2	6	..
Eclampsia and albuminuria	10	10	3	4	1	2	..	..	1	2	2	1
Other toxæmias	2	2	..	..	1	..	..	..	..	..	1	..
Sudden death	11	7	4	1	..	..	..	..	..	..	..	..
Accidents of childbirth	4	6	3	2	..	1	..	..	..	..	2	..
Unspecified conditions of the puerperium	2	..	..	..	..	..	..	..	..	..	1	..
Anæmia	18	21	10	6	1	..	..	1	..	..	1	..
Acute yellow atrophy	4	2	..	1	1	..	..	..	..	..	2	..
Total	135	90	37	27	10	5	2	1	4	5	23	1

N.B.—Income-levels taken for classifying economic status were :—“ Poor”, 1 to 100 ; “ Middle Class ” 101 to Rs. 500 ; and above that as “ Rich”, except in a few cases where the income was low and the living conditions suggested a better class. Similarly a case with income of Rs. 1,000 was taken as “ Middle Class ”.

APPENDIX IX.—CAUSE OF DEATH BY WARD AND OVERCROWDING.

Cause of death.	Wards.														Total by cause and over-crowding.		No information available.	Total.
	A		B		C		D		E		F		G		Yes.	No.		
	Yes.*	No.	Yes.*	No.	Yes.*	No.	Yes.*	No.	Yes.*	No.	Yes.*	No.	Yes.*	No.				
Septic abortions . . . . .	..	..	..	1	2	2	..	..	..	..	..	1	..	..	2	4	4	10
Abortions non-septic . . . . .	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	2	2	4
Ectopic gestation . . . . .	..	..	..	1	..	2	..	..	..	1	..	..	..	..	..	4	2	6
Accidents of pregnancy . . . . .	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Puerperal hæmorrhages . . . . .	..	1	1	1	3	3	2	1	2	3	2	3	1	3	11	15	6	32
Puerperal sepsis	3	3	3	1	5	8	5	6	15	17	9	15	17	15	57	65	11	133
Eclampsia and albuminuria	1	..	1	1	2	7	1	4	4	3	2	1	3	4	14	20	2	36
Other toxæmias . . . . .	..	..	..	..	..	1	..	..	..	..	..	..	1	1	1	2	3	6
Sudden deaths . . . . .	..	..	1	2	2	..	1	1	3	4	1	1	1	5	9	13	1	23
Accidents of child-birth . . . . .	..	1	..	2	2	5	1	1	..	1	1	1	1	4	12	2	18	
Unspecified conditions of the puerperium	1	..	..	..	..	..	..	..	..	1	..	..	..	..	1	1	1	3
Anæmias	1	1	1	1	4	3	..	5	5	10	3	8	4	6	18	34	6	58
Acute yellow atrophy . . . . .	..	1	1	..	..	..	..	..	1	..	1	1	1	..	4	2	4	10
Total	6	7	9	10	20	32	10	18	30	40	19	31	28	36	122	174	44	340

* Death occurred in an overcrowded part of the ward.

APPENDIX X.—CAUSE OF DEATH BY NUMBER OF ROOMS.

Cause of death.	Number of rooms.								No information available.	Total.
	1	2	3	4	5	6	7	8		
Septic abortions	7	..	1	..	..	..	..	..	2	10
Abortions non-septic	2	..	..	1	..	..	..	..	1	4
Ectopic gestation	3	1	..	..	..	..	..	..	2	6
Accidents of pregnancy . . . . .	..	1	..	..	..	..	..	..	..	1
Puerperal hæmorrhages	19	4	1	1	..	1	..	..	6	32
Puerperal sepsis	104	10	7	1	1	..	..	2	8	133
Eclampsia and albuminuria	24	2	2	3	3	..	..	..	2	36
Other toxæmias	5	..	..	..	..	..	..	..	1	6
Sudden death	18	5	..	..	..	..	..	..	..	23
Accidents of child-birth	10	6	..	..	..	..	..	..	2	18
Unspecified conditions of the puerperium	2	..	..	..	..	..	..	..	1	3
Anæmias	43	12	..	..	..	..	..	..	3	58
Acute yellow atrophy	5	..	1	..	..	..	..	..	4	10
Total	242	41	12	6	4	1	0	2	32	340
Percentage	71·18	12·06	3·53	1·76	1·18	0·29	..	0·59	9·41	..

APPENDIX XI.—CAUSE OF DEATH BY CLEANLINESS OF HOUSE.
(Excluding associated diseases.)

Cause of death.	Cleanliness of house.				Total by cause of death.
	Clean.	Fair.	Dirty.	No information available.	
Septic abortions	5	1	2	2	10
Abortions non-septic	2	..	..	2	4
Ectopic gestation	4	..	..	2	6
Accidents of pregnancy	1	..	..	..	1
Puerperal hæmorrhages	16	4	7	5	32
Puerperal sepsis	54	43	26	10	133
Eclampsia and albuminuria	21	8	5	2	36
Other toxæmias	3	2	..	1	6
Sudden death	9	7	7	..	23
Accidents of child-birth	8	5	3	2	18
Unspecified conditions of the puerperium. . . .	1	2	..	..	3
Anæmias	28	18	8	4	58
Acute yellow atrophy	3	4	..	3	10
Total	155	94	58	33	340

APPENDIX XII.—CAUSE OF DEATH AND WATER SUPPLY.

Cause of death.	Water supply.					Total by cause.
	Tap in house.	Tap near house.	Tap far from house.	No tap.	No information available.	
Septic abortions	4	4	..	..	2	10
Abortions non-septic	1	2	..	..	1	4
Ectopic gestation	2	2	..	..	2	6
Accidents of pregnancy	1	..	..	..	..	1
Puerperal hæmorrhages	14	11	2	..	5	32
Puerperal sepsis	45	76	..	1	11	133
Eclampsia and albuminuria	21	13	..	..	2	36
Other toxæmias	1	4	..	..	1	6
Sudden death	7	16	..	..	..	23
Accidents of child-birth	12	4	..	..	2	18
Unspecified conditions of the puerperium. . . .	..	2	..	..	1	3
Anæmias	25	28	1	..	4	58
Acute yellow atrophy	1	5	1	..	3	10
Total	134	167	4	1	34	340

APPENDIX XIII.—CAUSE OF DEATH—VENTILATION.

Cause of death.	Ventilation.			Total by cause.
	Satisfactory.	Not satisfactory.	No information available.	
Septic abortions	5	3	2	10
Abortions non-septic	3	..	1	4
Ectopic gestation	4	..	2	6
Accidents of pregnancy	1	..	..	1
Puerperal hæmorrhages	23	4	5	32
Puerperal sepsis	107	16	10	133
Eclampsia and albuminuria	30	4	2	36
Other toxæmias	5	..	1	6
Sudden death	19	4	..	23
Accidents of child-birth	16	..	2	18
Unspecified conditions of the puerperium	1	1	1	3
Anæmias	47	7	4	58
Acute yellow atrophy	5	2	3	10
Total	266	41	33	340

APPENDIX XIV.—CAUSE OF DEATH BY DRAINAGE.

Cause of death.	Drainage.			Total by cause.
	Good.	Bad.	No information available.	
Septic abortions	8	..	2	10
Abortions non-septic	3	..	1	4
Ectopic gestation	4	..	2	6
Accidents of pregnancy	1	..	..	1
Puerperal hæmorrhages	26	2	4	32
Puerperal sepsis	118	5	10	133
Eclampsia and albuminuria	34	..	2	36
Other toxæmias	5	..	1	6
Sudden death	21	2	..	23
Accidents of child-birth	15	1	2	18
Unspecified conditions of the puerperium	2	..	1	3
Anæmias	52	2	4	58
Acute yellow atrophy	6	1	3	10
Total	295	13	32	340

APPENDIX XV.—CAUSE OF DEATH AND PRE-NATAL OCCUPATION.

Cause of death.	Pre-natal work.						No information available.	Total by cause.
	Nil.	House-work.	Factory.	Coolie.	Clerk, teacher, student.	Others.		
Septic abortions . . . . .	..	4	..	1	..	3	2	10
Abortions non-septic.	1	2	1	..	..	..	..	4
Ectopic gestation	1	3	..	..	..	1	1	6
Accidents of pregnancy . . . . .	..	1	..	..	..	..	..	1
Puerperal hæmorrhages	5	19	..	1	..	1	6	32
Puerperal sepsis	8	95	10	3	1	4	12	133
Eclampsia and albuminuria	12	15	2	1	1	..	5	36
Other toxæmias . . . . .	..	5	..	..	..	..	1	6
Sudden death . . . . .	..	21	1	..	..	..	1	23
Accidents of child-birth	3	13	..	..	..	..	2	18
Unspecified conditions of the puerperium . . . . .	..	..	..	..	..	..	1	3
Anæmias	11	37	1	1	..	..	7	58
Acute yellow atrophy . . . . .	..	4	..	..	..	2	4	10
Total	41	221	15	7	2	12	42	340
Percentage	12·06	65·00	4·41	2·06	0·59	3·53	12·35	..

APPENDIX XVI.—CAUSE OF DEATH AND PURDAH.
(All cases except associated diseases.)

Cause of death.	Purdah.		No information available.	Total by cause.
	Yes.	No.		
Septic abortions . . . . .	..	10	..	10
Abortions non-septic . . . . .	..	4	..	4
Ectopic gestation . . . . .	..	6	..	6
Accidents of pregnancy	1	..	..	1
Puerperal hæmorrhages	4	28	..	32
Puerperal sepsis	14	115	4	133
Eclampsia and albuminuria	5	30	1	36
Other toxæmias . . . . .	..	5	1	6
Sudden death	5	18	..	23
Accidents of child-birth	3	15	..	18
Unspecified conditions of the puerperium . . . . .	..	3	..	3
Anæmias	12	41	5	58
Acute yellow atrophy . . . . .	..	9	1	10
Total	44	284	12	340

APPENDIX XVII.—CAUSE OF DEATH AND DIET.

Cause of death.	Diet.									No infor- mation avail- able.	Total by causo.
	*Vegetarians.			Mixed.							
	R ₁	W ₁	M ₁	R ₂	W ₂	M ₂	R ₃	W ₃	M ₃		
Septic abortions . . . . .	..	..	2	1	..	1	..	..	2	4	10
Abortions non-septic . . . . .	..	..	2	..	..	1	..	..	..	1	4
Ectopic gestation . . . . .	..	..	3	..	..	1	..	..	..	2	6
Accidents of pregnancy . . . . .	..	..	..	..	..	..	..	..	1	..	1
Puerperal hæmorrhages	2	..	7	2	..	11	..	..	3	7	32
Puerperal sepsis . . . . .	..	1	34	1	..	78	..	..	9	10	133
Eclampsia and albuminuria	2	..	8	..	..	18	..	..	5	3	36
Other toxæmias	1	..	2	..	..	2	..	..	..	1	6
Sudden death . . . . .	..	..	6	1	..	13	..	..	2	1	23
Accidents of child-birth . . . . .	..	..	8	..	..	7	..	..	2	1	18
Unspecified conditions of the puerperium . . . . .	..	..	1	..	..	..	..	..	1	1	3
Anæmias	1	..	11	..	..	33	..	..	6	7	58
Acute yellow atrophy . . . . .	..	..	1	..	..	4	..	..	2	3	10
Total	6	1	85	5	0	169	0	0	33	41	340
Percentage		92 27·06			174 51·18			33 9·70		12·06	

* R₁ Rice and vegetarian, W₁ Wheat "atta" and vegetarian, M₁ Mixed (R₁ + W₁), R₂ Rice and occasional meat or fish or both, W₂ Wheat and occasional meat or fish or both, M₂ Mixed (R₂ + W₂), R₃ Rice and fish or meat both regularly, W₃ Wheat and fish or meat both regularly, M₃ Mixed (R₃ + W₃).

APPENDIX XVIII.—CAUSE OF DEATH AND MILK INTAKE.

Cause of death.	Milk.					No information available.	Total by cause.
	Nil.	-½ pau	-1 pau	-2 pau	2 pau & more.		
Septic abortions . . .	3	1	1	..	1	4	10
Abortions non-septic . . .	1	..	..	2	..	1	4
Ectopic gestation . . .	2	..	1	..	1	2	6
Accidents of pregnancy . . .	1	..	..	..	..	..	1
Puerperal hæmorrhages . . .	10	2	7	2	4	7	32
Puerperal sepsis . . .	68	8	25	13	6	13	133
Eclampsia and albuminuria . . .	10	3	11	3	4	5	36
Other toxæmias . . .	3	..	1	1	..	1	6
Sudden death . . .	9	2	6	5	..	1	23
Accidents of child-birth . . .	6	4	4	2	1	1	18
Unspecified conditions of the puerperium . . .	2	..	..	..	..	1	3
Anæmias . . .	25	4	10	9	3	7	58
Acute yellow atrophy . . .	1	..	3	..	2	4	10
Total . . .	141	24	69	37	22	47	340

APPENDIX XIX.—DEATHS FROM ASSOCIATED DISEASES BY AGE GROUPS.

Age group.	-15	16-20	21-25	26-30	31-35	36-40	41-45	Total.
Number of cases . . .	1	48	55	45	15	10	1	175

APPENDIX XX.—DEATHS FROM ASSOCIATED DISEASES CLASSIFIED ACCORDING TO THE NUMBER OF PREGNANCY.

Number of pregnancies.	No information available.	1	2	3	4	5	6	7	8	10	11	13	Total.
		7	37	38	32	23	12	8	8	5	2	1		2
Number of cases . . .	7	37	38	32	23	12	8	8	5	2	1	2	175

APPENDIX XXI.—DEATHS FROM ASSOCIATED DISEASES CLASSIFIED ACCORDING TO THE DURATION OF PREGNANCY.

Duration of pregnancy.	No information available.	Month.	Month.	Month.	Month.	Month.	Month.	Month.	Month.	Month.	Month.	Total.
		1	2	3	4	5	6	7	8	9	10	
Number of cases . . .	4	1	1	10	9	10	11	22	26	10	71	175

APPENDIX XXII.—DEATHS FROM ASSOCIATED DISEASES CLASSIFIED BY WARD.

Ward.	No infor- mation available.	A	B	C	D	E	F	G	Total.
Number of cases	13	9	14	20	24	39	33	23	175

APPENDIX XXIII.—DEATHS FROM ASSOCIATED DISEASES—OVERCROWDING BY WARDS.

Ward number.	Overcrowding.		No information available regarding overcrowding.	Total by ward.
	Yes.	No.		
No information . . . . .	..	..	13	13
A	3	6	..	9
B	9	5	..	14
C	8	12	..	20
D	10	13	1	24
E	13	23	3	39
F	17	14	2	33
G	10	13	..	23
Total	70	86	19	175

APPENDIX XXIV.—DEATHS FROM ASSOCIATED DISEASES.

Number of rooms by ward.

Ward number.	Number of rooms.							No infor- mation available.	Total by ward.
	1	2	3	4	5	7			
No Information . . . . .	..	2	..	..	1	..	10	13
A	7	1	..	..	1	..	..	9
B	9	3	..	1	..	1	..	14	
C	13	6	1	..	..	..	..	20
D	16	4	2	1	..	..	1	24
E	35	1	..	1	..	..	2	39
F	26	3	1	1	..	..	2	33
G	18	4	..	1	..	..	..	23
Total	124	24	4	5	2	1	15	175	

APPENDIX XXV.—ASSOCIATED DISEASES—TUBERCULOSIS.

Age group.	Age group.						Total.
	16-20	21-25	26-30	31-35	36-40	41-45	
Number of cases	12	18	14	5	2	1	52

APPENDIX XXVI.—ASSOCIATED DISEASES—TUBERCULOSIS.

Duration of pregnancy.

Duration of pregnancy.	No information.	Month.							Total.
		Month.	Month.	Month.	Month.	Month.	Month.	Month.	
Number of cases .	1	4	5	6	7	8	9	10	52

APPENDIX XXVII.—ASSOCIATED DISEASES—TUBERCULOSIS.

Ward.

Ward number .	No information.	Ward.							Total.
		A	B	C	D	E	F	G	
Number of cases .	5	3	3	7	7	15	8	4	52

APPENDIX XXVIII.—ASSOCIATED DISEASES—TUBERCULOSIS.

Number of rooms by ward.

Ward number.	Number of rooms.				No information available.	Total by ward.
	1	2	3	4		
No information . . . . .	..	2	..	..	3	5
A	3	..	..	..	..	3
B	2	1	..	..	..	3
C	4	3	..	..	..	7
D	2	2	1	1	1	7
E	13	1	..	..	1	15
F	7	1	..	..	..	8
G	2	2	..	..	..	4
Total	33	12	1	1	5	52

APPENDIX XXIX.—ASSOCIATED DISEASES—TUBERCULOSIS.

Overcrowding by wards.

Ward number.	Overcrowding.		No information available.	Total by ward.
	Yes.	No.		
No information . . . . .	..	2	3	5
A	2	1	..	3
B	1	2	..	3
C	3	4	..	7
D	3	4	..	7
E	4	10	1	15
F	2	6	..	8
G	2	2	..	4
Total	17	31	4	52

Strictly confidential, for medical use only.

APPENDIX XXX.—BOMBAY MATERNAL MORTALITY ENQUIRY.

Under the auspices of the Indian Research Fund Association.

(Maternal deaths during Pregnancy or within four weeks after the termination of Pregnancy, or later if illness originated during Pregnancy, Childbirth or Puerperium.)

I, II, III, Serial No.											Name.	
IV, V. Ward Under investigation.											Husband's or father's name.	
VI Religion	H.	M.	I.C.	Parsee;	others (state)						Deccani—Gujerati.	
	0	1	2	3	4							
Caste (Hindu)	Br.	Bhatia	Shudras	Others (state)	(Moh.)	Bohri	Khoja					
	5	6	7	8			9	10				
VII Province	Bombay,	Sindh,	Rajputana,	C.I. Punj.	C.P.	Madras & others	(state)					
	1	2	3	4	5	6	7	8				
VIII Age	-15,	-20,	-25,	-30,	-35,	-40,	-45,	45+				
	1	2	3	4	5	6	7	8				

Address.

Marital Status. S. M. W.

9

IX Home conditions	No. of living rooms.									
X No. of inmates	-12	1	2	3	4	5	6	7	8	9
XI	+12	1	2	3	4	5	6	7	8	9
XII Cleanliness of house	(clean,	fair,	dirty)	Overcrowding				(yes or no)		
	0	1	2			3	4			
Water supply	Tap in house,	Tap near house,	Tap far house,	No tap.						
	5	6	7	8						
Ventilation	Satisfactory,	not satisfactory.								
	9	10								
XIII Drainage.	Good	Bad								
	0	1								
Imported Case	during pregnancy	during labour	in puerperium	Not imported						
	1	2	3	4	5					

Father of Infant.

(a) occupation	(b) economic status of family	poor	middle class	rich
		6	7	8

XIV Date of death.	Duration of pregnancy.	1,	2,	3,	4,	5,	6,	7,	8,	9,	10 (in months)
		0	1	2	3	4	5	6	7	8	9
Date of confinement			Interval			(hours)					
			to death			(days)					

XV If death during pregnancy. Yes, No. If death after termination of Yes No.
 (undelivered) 1 2 pregnancy. 3 4
 Certified cause of death { 1.
 2.
 If Autopsy.

No.	Year.	Term Prem. or Aborn.	Pregnancies (if obtainable) including present one					
			Complications during			Child		
			Pregn.	Labour.	Puer.	Born alive.	Born dead.	Living.
XVI 1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Pre-Natal

XVII Pre-Natal Work Nil, Housework, Factory, Coolie, Clerk, Teacher, others, Purdah Yes No.
 Student 5 6 7 8
 1 2 3 4 5 6 7 8
 Work ceased (days before delivery)
 General health (a) before preg. (b) during preg.
 Habits (drug or alcoholic) Nutrition (thin, av., fat) Previous illness. (e.g. heart kidney, sepsis, tuber).
 XVIII Diet* R₁ R₂ R₃ W₁ W₂ W₃ M₁ M₂ M₃
 1 2 3 4 5 6 7 8 9
 XIX Milk 0 -1/2 pau, -1 pau, -2 pau, 2 pau +
 1 2 3 4 5
 Narrow Pelvis Yes Excessive sickness. Puffiness.
 6
 Varicose veins. Purulent discharge. Genital sores.
 Osteomalacia Symptoms. Yes Anæmia Doctor or midwife engaged for conf. ?

7

Only seen by doctor during pregnancy (without pre-natal examination.)

- *R₁ Rice and vegetarian.
 R₂ Rice and occasional meat or fish or both.
 R₃ Rice and fish or meat both regularly.
 W₁ Wheat, "atta" and vegetarian.
 W₂ Wheat and occasionally fish or meat or both.
 W₃ Wheat and fish or meat both regularly.
 M₁ Mixed (R₁ + W₁).
 M₂ Mixed (R₂ + W₂).
 M₃ Mixed (R₃ + W₃).

If Pre-Natal examinations by Doctor Advice followed Advice ignored
 A. N. clinic
 Yes or No No. of examinations
 8 Advice given
 Condition of urine, Alb. present or absent, not examined.
 9 10 11

Brief Summary of the case Undelivered Delivered $\frac{\text{at home } 2}{\text{in hospital } 3}$ Treated $\frac{\text{at home } 5}{\text{in hospital } 6}$
 in mat. home 4

At Home 1 Date Hour Remarks
 7

Doctor arrived (M. or F.)
 Midwife arrived.
 Indigenous dai.
 Relatives.

In Hospital or Maternity Home 8

Time of admission
 When first seen by Doctor
 Pains began
 Membranes ruptured
 { Spontaneous
 Artificial
 Os fully dilated
 Baby born { Alive 9
 still 10
 Placenta delivered

Condition of baby
 at date of report

XXI Abortion (ectopic, mole) Yes or No.
 0 1

Brief Notes of case.

Probable cause
 Duration of Pregnancy
 Date of first symptoms
 Treatment
 Daily in summoning aid
 Cause of death (1) Sepsis
 2

(2) Haemorrhage
 3

P. M. Findings

Toxæmias of Pregnancy Yes or No
4 5

Toxæmic Symptoms, if any, in earlier pregnancies.

Past history of renal disease.

Onset and nature of symptoms in pregnancy under inquiry. Alb. present—absent—not exam.

Treatment, if any, for albuminuria—at home in hospital

Blood Pressure If raised, when first detected.

Fits Yes or No ante, intra, or Number of date of first fit
6 7 post partum

Operative interference Yes or No Nature and date
8 9

Other treatment.

XXII Hæmorrhage Yes or No
0 1

Ante-Partum (Placenta prævia, accidental) Was doctor immediately available?
2 3

Had patient been told to report bleeding or faintness?

How was this treated (midwife, doctor, method)

Treatment

By midwife

By doctor

Was patient removed to hospital? If not why?

Condition on arrival at hospital

Treatment in hospital

Post Partum Yes or No
4 5

Before or after expulsion of placenta Probable cause

Treatment

By midwife

By doctor

P. M. findings

Difficult labour Yes or No
6 7

Presentation and position

Disproportion between foetus and pelvis Yes or No
8 9

Was difficulty anticipated? Steps taken, if any

XXIII Operative interference (at home—in hospital)

Forceps

3

Indication

Time of application

Condition of cervix

Descent of head in pelvis

Version

4

Caesarean section, reasons, (Classical, Lower Segment, Hysterectomy) Craniotomy

5

6

or Embryotomy

Other operative treatment, nature

7

Manual removal of retained placenta or membranes

Anaesthetic or narcotic

By whom administered

Duration

Laceration of genital tract

How treated

Condition of patient at end of labour.

Puerperal Sepsis (excluding post-abortive) Yes or No

8 9

Condition of patient at onset of labour

General

Local

Was there abnormal vaginal discharge before labour? Treatment before labour

Disinfection Precautions during and after labour—antiseptics used

XXIV 1. Patient (preparation of perineum, vulva)

2. Attendant (1) Hospital (2) non-hospital. Dr. Midwife, Dai, Relatives

0

1

2

3

4

Were sterile surgical sheets, towels, pads, etc. used?

Sutures

Vaginal examinations (number)

By whom made

Precaution taken on each occasion

Complication of labour.**Trauma**—nature and method of treatment**Placenta and membranes**—spontaneous—expressed—manual removal

Complete or incomplete

Toilet of patient after labour

Nursing During puerperium including local treatment

Day of onset of fever

Signs of local or general infection**Treatment** { at home
in hospital

offensive vaginal discharge?

Day of death

Bacteriological finding

Suggested source of infection

Associated septic cases, if any

P. M. findings

Anæmia. No Yes (1) Primary (of pregnancy) (2) Secondary (3) Doubtful
 5 6 7 8
 Any pathological reports
 9

Blood Transfusion given
 10

Was there any difficulty in the conduct of the case which, in the opinion of the Medical Officer or the attendant, might have been prevented by medical or other assistance? Has the Medical Officer or the Attendant any suggestion to offer as to the prevention of the condition which caused death?

Comments by medical investigator.

Signature.

Comments by practitioner in charge of case

Final remarks by Investigator

XXV Cause of death 140 141 142 143 144 145 146 147 148 149 150 Anæmia Assoc.
 (International list) 0 1 2 3 4 5 6 7 8 9 10 11
 XXVI 1. 6.
 (P.A.F.) 2. 7.
 3. 8.
 4.
 5.

Signature
 Date

