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

PART I.

INTRODUCTION.

THE question of Maternal Mortality is one so prominently before the attention of the public in all civilized countries that it was felt that no apology was needed to make an investigation into the conditions pertaining to the causes and the extent of maternal mortality in the City of Madras and to submit a report dealing as fully as possible with all aspects of the problem in a big city like Madras. The large number of maternal deaths, occurring particularly at an epoch of life, when the incidence of death should be at a minimum, has naturally attracted the attention of many people interested in the welfare of the mothers. Large as these figures are in comparison with similar figures from any other City in the civilized countries, their significance is even greater when it is realized that the majority of these deaths are preventable, and that death following child-birth should except occasionally be a very rare event. It is not merely the number of women that die, but to a greater extent perhaps, the number of women that are permanently incapacitated and damaged that must arouse greater interest in the Public Health official, in those connected with the medical administration of the Province and in the general public. The serious effects of a high maternal mortality rate and a high maternal morbidity rate, upon the health and welfare of hundreds of families every year, and primarily upon the health and welfare of the infant population, can hardly be over-estimated. Most of the women are in the prime of life and should naturally expect a long span of usefulness to the community at large and the family in particular. To be cut away at that most useful period of one's life, is not merely tragic, but a catastrophe to the nation as well. Any steps therefore calculated to analyse the conditions which bring about such a high incidence of maternal mortality and morbidity should be welcomed.

To understand aright the measures that are needed for a reduction of maternal mortality in any particular area, it is necessary at the beginning to adequately assess the causes and the particular circumstances that may favour the high incidence of maternal mortality. The measures that might have been launched to prevent the incidence of maternal mortality, are themselves liable to prove inadequate if care were not taken periodically to verify by actual findings from results, how far such measures have

proved useful. Periodic investigations seem therefore to be absolutely necessary if the effort put forward, financial and otherwise, is to result in a tangible progress from time to time.

HISTORY.

It is for these various reasons that this inquiry was suggested in a letter, dated the 16th December 1929, addressed by me to the Surgeon-General with the Government of Madras, through the Superintendent, Government Hospital for Women and Children, Madras, wherein it was submitted:—

“It need hardly be stated that reliable statistics as to the extent and the causes of maternal mortality are not available either from municipalities or from rural areas. The statistical reports presented, while they give much of useful information in many ways, do not give any detailed information as to the causes underlying deaths either of pregnant mothers or of women who died after delivery. I venture to submit that for a proper appreciation of the methods on which antenatal work should be carried out, and to assess the danger marks in the antenatal period in a community, it is desirable—nay, very essential—that a broad survey should be undertaken as to what such causes are; and such a survey necessitates a thorough investigation into the causes of maternal mortality. At present, owing to the fact that there is no provision, as in many of the western countries for a certificate of death to be issued by a qualified medical practitioner, it is inevitable that the returns do not contain the very information that one would require, to know exactly the conditions under which a pregnant woman or a woman in the puerperium died. As we are now proposing to launch on an extended and intensive antenatal work, I submit that it would be very useful simultaneously to take up the question of maternal mortality and to investigate its causes thoroughly as suggested by the Surgeon-General, in at least a few important centres. So far as the City of Madras is concerned, the investigation really limits itself to the study of the causes of about 3,700 deaths in the year. Our object being to find out the causes of maternal mortality only, the deaths of females in the child-bearing period, say, between 12 and 50 years, may be taken into consideration; and I notice from the reports of the Health Officer of the Corporation of Madras that the number of women between these age periods who die every year ranges between 3,500 and 4,000. It should not be difficult for us to investigate every one of these deaths with the thoroughness required of a maternal mortality investigation, through the help of the Health Visitors and the Birth and Death Registrars; and when these reports are all collected together, they may from time to time be scrutinized with a view to assess the real cause of death and to draw what inferences there may be from these records.”

In pursuance of this proposal which was favoured by the then Surgeon-General, I submitted in a demi-official letter to the Surgeon-General, dated the 3rd February 1930, the necessity of

obtaining the assistance of a young, intelligent medical graduate in the inquiry that I had chalked out for myself. The Corporation was pleased to appoint a medical assistant for a period of six months in the first instance and the work was started from 1st July 1930. After a few months, it was felt that six months was too short a period for such an investigation to be carried out and in my letter, dated the 22nd December 1930, I submitted that the period of the investigation should be extended by another six months, so that the material at my disposal may be sufficient to warrant fair conclusions and fair inferences. This proposal was accepted by the Corporation who were kind enough to extend the appointment of the medical assistant for a further period of six months, but as the sanction of the Corporation was received only in November 1931, the work had to be discontinued in January 1931 and was restarted from 1st October 1931. It is no doubt unfortunate that the twelve-months period was not a continuous period and there was a break in the middle; but as fortunately public health conditions in the City of Madras were not affected by any epidemics and as the death-rate during the whole of this period did not show any particular inclination for a rise or fall, the twelve-months period during which this investigation was carried out may be considered as a normal period and the break has not therefore affected the conclusions that have had to be drawn.

SCOPE OF INQUIRY.

As has been stated above, the inquiry was limited to a general consideration of the causes of death of all women between the ages of 12 and 50, occurring during this twelve-months period in the City of Madras. This inquiry was conducted with the help of the Birth and Death Registrars, the Health Visitors and the staff of the Child Welfare Scheme of the Corporation, and the heads of the different maternity hospitals in the City of Madras. Where, after a preliminary investigation, it was found definitely that the death was in no way associated with pregnancy or parturition, further investigation was not carried on. In cases, however, where the factor of pregnancy or parturition was involved, and in all doubtful cases, a detailed investigation was carried on, which included an inquiry at the house of the deceased and in the different hospitals where such deaths occurred, of patients who were admitted at any time during the course of the disease. A special investigation form for this purpose was adopted, based very much on the maternal mortality investigation form approved by the Departmental Committee of Maternal Mortality and Morbidity appointed by the Ministry of Health in England, a copy of which is printed as Appendix I. As many particulars as were available, were entered on the inquiry form, and after a thorough investigation of all available material, a final assessment as to the cause of death and the factors that were either primarily or secondarily responsible for the death, was recorded. The work was not as smooth or easy as was at one time contemplated, as apart from

those cases that were admitted into the hospitals about which a fairly complete report was available, in the large majority of cases considerable hesitation was felt by the relatives in communicating the actual facts of the case; and in a fair proportion, far from any ready compliance with the requests of the investigating medical officer, the relatives took up an attitude of defiance and were none too pleasant to deal with, when particular questions were asked of them. To a certain extent, this was easily understood, as temperamentally, few of the relatives were inclined to discuss a death which had recently taken place and about which painful impressions were still only too acutely felt. In some cases, the disinclination to be communicative was due to the fact that a vague sense of uneasiness as to what would follow a complete elucidation of all the circumstances connected with the mortality, was probably responsible. To such an extent was this prejudice felt that it was impossible to get the names of the persons who conducted the delivery or who had attended the patients in their own houses. In spite of these necessary defects, a large amount of valuable information was collected and collated and it is hoped that this information would serve a useful purpose.

INQUIRIES IN OTHER COUNTRIES.

Investigations into the causes of maternal mortality have been carried out from time to time in many other countries. Perhaps one of the most useful of such investigations pertaining to a single City was that launched by the Scottish Board of Health. The Scottish Departmental Committee on Puerperal Morbidity and Mortality issued a report in 1924, wherein the suggestion was made "that every death occurring within four weeks after the termination of pregnancy should be fully investigated by a person designated by the local authority and the facts communicated to the Scottish Board of Health." This proposal however was not a new one. It had previously been made and put in operation in New Zealand and elsewhere. A few local authorities in Scotland had made investigations into the maternal deaths for some years but the most comprehensive enquiry was launched by Professor Mathew Hay, Medical Officer of Health, Aberdeen, in 1917, and a report for the ten-year period 1918-27 on "maternal mortality in Aberdeen with a special reference to puerperal sepsis" was submitted to the Scottish Board of Health in 1928. One of the most useful contributions on the subject of maternal mortality was a report by Dame Janet M. Campbell to the Ministry of Health, submitted in 1924 on "Maternal Mortality associated with child-birth." In a circular issued by the Ministry of Health in England on the 30th June 1924, it was suggested that there should be an investigation in every area by a competent and experienced medical officer, of all maternal deaths and of all cases of puerperal fever, with a view to ascertaining and preventing the causes likely to lead to maternal mortality. At the same time, the British Medical Association, representative of the medical profession of Great Britain as a whole, appointed a committee on

maternal mortality in 1925 to review the causes of puerperal morbidity and mortality. A final fillip was given to all these recommendations by the Ministry of Health appointing a Committee in June 1928, the terms of reference to this Committee being: "To advise upon the application to maternal mortality and morbidity of medical and surgical knowledge at present available and to inquire into the needs and directions of further research work." The Committee submitted an interim report in August 1930 and the Final Report was issued in July 1932. Simultaneously with these inquiries that were carried on in Great Britain, inquiries were conducted from time to time in various States of the United States of America which culminated in the calling of a Whitehouse Conference on Child Health and Protection by President Hoover in 1931. The Conference dealt exhaustively with all aspects of the problem so far as it referred to the United States and has issued a very valuable report.

It would thus be seen that the need for inquiry into the conditions pertaining to maternal mortality has been very generally recognized and most countries have taken steps to appoint committees of inquiry and to launch on schemes of investigation from time to time. One looks in vain to the several provinces of India to find any reports of previous investigation in this direction * and so far as intensive investigation of the causes in any particular city is concerned, it may therefore be said that the report now submitted is the first of its kind. It would easily be seen that in drafting a report of such a description, one is naturally handicapped in not having any comparative figures pertaining to conditions in India and in not being in a position to verify or correlate one's findings with the findings of previous workers. On the whole, perhaps this is not a disadvantage.

SYSTEM OF INQUIRY.

The Aberdeen Maternal Mortality Report to which reference was made earlier, was a report based on the investigation of 252 deaths in a ten-year period 1918-27 during which period the total number of births registered was 37,984. Any case of death certified as due to puerperal conditions, although the death occurred beyond the four weeks, was included, as well as all deaths which occurred within the four weeks, or during pregnancy. In Madras owing to the fact that there is no certification of death required, the difficulties were greater to investigate into the causes of death in relation to maternal mortality. The scheme of inquiry that was adopted was to investigate into the causes of death of every female between the age periods of 12 and 50 and ascertain how far these deaths were due to conditions pertaining to pregnancy or parturition. If a death occurred in a pregnant woman or a woman who had been recently confined, the investigation was carried further according to a scheme laid down and all details required in a printed

* An interim report on some aspects of Maternal Mortality by Dr. R. Adiseshan, Assistant Director of Public Health, was published in the Report of the Director of Public Health, 1929.

circular (referred to above) were filled in by the investigating medical officer in regard to all deaths of women who died during pregnancy or within one month after the date of parturition. Deaths of women who died even beyond this period, if due to puerperal causes, have been included within the scope of this investigation. It may be mentioned here that consequent upon the method of registration of deaths, the essential facts pertaining to pregnancy or parturition are very often overlooked. Cases of diarrhoea or dysentery or fever are recorded wherein the associate condition of pregnancy is not mentioned. The number of certified deaths in the City of Madras ranges between 13 and 15 per cent, so that a large majority of deaths are recorded according to the statement given by the relations, which statement, in the absence of a detailed investigation with particular emphasis on pregnancy and parturition, naturally does not help us much further in assessing the total number of maternal deaths and the causes of such deaths. Later it will be seen that the number of maternal deaths according to the present investigation, is naturally in excess of the number of deaths reported from year to year in the Health Officer's Report of the City of Madras.

COMPARATIVE STATISTICS.

For the twelve-month period for which this investigation was carried on, the total number of maternal deaths was 436 and the total number of births (still and live births) was 26,207. During the same period, the total number of deaths from child-birth as per the records of the Health Officer was 293. The total number of deaths of women between the ages of 12 and 50 was 3,136. The maternal mortality rate per 1,000 births is therefore 16.6. The sub-joined table (I) gives the total number of deaths from child-birth recorded year after year in the records of the Health Officer of the Corporation.

Table I.

Year.	Number of deaths.	Year.	Number of deaths.
1921	216	1927	398
1922	293	1928	366
1923	330	1929	...
1924	322	1930	328
1925	344	1931	299
1926	352		

In the absence of definite certification of death, it would appear that the figures quoted must necessarily err on the side of conservatism very much, and this factor has been recognized by the "City High Mortality Committee" appointed in 1926 with Lt.-Col. A. J. H. Russell, I.M.S., the then Director of Public Health as Chairman, who state that "the recorded figures pertaining to deaths from child-birth cannot, however, be used as a reliable guide to the actual death-rate from this cause and further comment is uncalled for." Even with all the precautions that have been taken to verify as far as possible every single death, it

is impossible to maintain that the figure 16.6 per mille represents the actual state of affairs so far as maternal mortality is concerned; and it can only be stated that the mortality is not less and perhaps may be slightly more.

When this figure is compared with maternal mortality figures of other countries or cities, the difference is at once obvious. The following table gives the maternal mortality statistics of some of the civilized countries of the world :—

Period.	Country.	Rate per 1,000 births.
1923-27	Denmark	2.6
	Norway	2.8
	Finland	3.1
	England and Wales	4.0
	Switzerland	4.4
	New Zealand	4.8
	South Africa	4.9
	Germany	5.1
	Australia	5.5
	Belgium	5.6
1925-27	France	2.5
1921-25	Holland	2.4
1922-26	Italy	2.8
1921-25	United States of America	8.3
1926-28	Australia	5.7
	Irish Free States	4.8
	Japan	2.8
	Northern Ireland	5.2
	Scotland	6.6
	Sweden	2.6

It will thus be seen that several countries report a maternal mortality of less than 3 per mille and notably Denmark, Norway, Sweden, France, Holland, Italy and Japan have some of the lowest rates as compared with other European countries. A study of the maternal mortality rates in England and Wales during the period 1911-31 given in Table II would show that the mortality has been more or less stationary and has in fact shown a slight increase in certain directions. It is this stationary feature of the maternal mortality in spite of all the great improvements that have taken place in the field of Medicine, Surgery and Preventive Medicine, that has attracted such wide attention to the condition especially pertaining to maternal mortality and that has compelled the Ministry of Health and public authorities generally to take concerted and drastic action to lower the mortality rates.

Table II.

England and Wales—Mortality of women in, or associated with child-birth per 1,000 children born alive, 1911-1931.

Year.	Puerperal sep- sis.	Other puerperal conditions.	Total puerperal mortality.	Non- puerperal causes.	Total maternal mortality.
1911-15	1.42	2.61	4.03		
1916-20	1.51	2.61	4.12	0.99	5.02
1921-25	1.40	2.50	3.90	1.68	5.80
1911	1.43	2.44	3.87	1.14	5.04
1912	1.39	2.59	3.98	1.04	4.91
1913	1.26	2.70	3.96	0.97	4.95
1914	1.55	2.62	4.17	0.91	4.87
1915	1.47	2.71	4.18	0.25	5.12
1916	1.38	2.74	4.12	1.09	5.27
1917	1.31	2.58	3.89	0.94	5.06
1918	1.28	2.51	3.79	0.95	4.84
1919	1.67	2.70	4.37	3.81	7.60
1920	1.81	2.52	4.33	1.08	6.30
1921	1.38	2.53	3.91	1.13	5.46
1922	1.38	2.43	3.81	1.09	5.00
1923	1.30	2.51	3.81	1.35	5.16
1924	1.39	2.51	3.90	1.01	4.82
1925	1.56	2.52	4.08	1.16	5.06
1926	1.60	2.52	4.12	1.07	5.15
1927	1.57	2.54	4.11	1.02	5.14
1928	1.79	2.63	4.42	1.32	5.43
1929	1.80	2.53	4.33	1.20	5.62
1930	1.92	2.48	4.40	1.49	5.82
1931	1.66	2.45	4.11	1.19	5.59
				1.44	5.55

Difficult as it is to obtain even approximately correctly the maternal mortality rates of the large cities in India, the position with regard to mortality statistics pertaining to child-birth in the rural areas and in provinces generally, is one beyond all hope of possible assessment. Conditions being what they are, and vital statistics being so largely relegated to those who have neither the interest nor the intelligence to appreciate at their real worth the value of such statistics, it is futile to try and draw any comparative figures for large districts or provinces—figures comparable even in a very remote manner to the figures quoted in the various countries. It can only be suggested that if such be the conditions in a city like Madras where facilities are certainly not lacking, as will be shown later, in regard to the prevention and cure of certain of the factors influencing mortality in child-birth, the position in rural areas must be infinitely worse, and no useful purpose will be

served by attempting to assess the relative analytical study of mortality figures of rural areas in this Presidency, for instance, with the figures of western countries.

Table III.

Analysis of the causes of maternal mortality.

Total number of births, (live and still)	..	..	..	..	..	26,207
Total maternal deaths	..	..	..	..	..	436

Principal causes.	Maternal deaths.		Other co-existing conditions.
	Number.	Percentage.	
Puerperal sepsis	115	26.4	Anæmia 10 Albuminuria 2 Anæmia and Albuminuria 1 Hæmorrhages 4 Dysentery 1 Pneumonia 4 Malaria and other fevers. 2 Eclampsia 3 Cystitis 2
Abortions septic	14	3.2	Pneumonia 1 Anæmia 2 Albuminuria 1 Anæmia and Ch. malaria 1 Anæmia and hæmorrhage 1 Hæmorrhage 3 Dysentery 5 Pneumonia 4 Enteric 1 Cancerum oris 1 Shock after abortion .. 1
Abortions other than septic.	22	5.1	Puerperal sepsis 1 Puerperal sepsis and albuminuria. 1 Post-partum hæmorrhage. 1 Toxæmia of pregnancy. 1 Toxæmia and anæmia of pregnancy. ..
Hæmorrhages—Accidental	11	2.5	Anæmia 5 Albuminuria 1 Toxæmia 1 Antepartum hæmorrhage. 1 Malaria and other fevers. 1 Dysentery and fever .. 1
Placenta prævia.	5	1.2	Puerperal sepsis 3 Hæmorrhage 1
Post-partum	39	9.0	Anæmia 1 Puerperal sepsis 2 Hæmorrhage 3 Pneumonia 1 Hyperpyrexia 5 Hyperpyrexia and cerebral hæmorrhage. 1
Accidents of labour.	25	5.7	Anæmia 3
Toxæmias of pregnancy—Eclampsia	38	8.7	Anæmia 3
Nephretic Toxæmia.	4	0.9	Anæmia 3

Analysis of the causes of maternal mortality—*cont.*

Principal causes.	Maternal deaths.		Other co-existing conditions.
	Number.	Percentage.	
Acute yellow atrophy of liver.	1	0.3	..
Anæmia of pregnancy.	50	11.5	{ Dysentery 2 { V.D.H. 2 { Toxæmia of pregnancy .. 1 { Hæmorrhage 4 { Dysentery and fever .. 1 { T. P. and diarrhoea during pregnancy and puerperium. { Anæmia and dysentery .. 1 { Anæmia, asthma and malaria. { Puerperal sepsis 3
Other diseases and accidents of pregnancy.	57	13.1	{ Anæmia 1 { Albuminuria 1 { Hæmorrhage 1 { Toxæmia of pregnancy .. 1 { Anæmia and V.D.H. .. 1 { Malaria and pneumonia .. 1 { Dysentery and fever .. 1 { Pernicious anæmia .. 1
Embolism and sudden deaths.	8	1.8	
Other diseases and accidents of puerperium.	45	10.3	
Ectopic gestation.	2	0.5	
	436		

Analysis.

Total maternal deaths investigated	436
Total deaths from child-birth as per Health Officer's records	293
Total births registered (live and still) in the City during the period of investigation	26,203
Total live births	24,950
Total still births	1,253
Total deaths of women between the ages of 12 and 50, registered	3,133
Maternal mortality rate per 1,000 births (live and still)	16.6

It would be seen at a glance that the majority of these deaths were of a preventable nature and that nearly a third of the deaths were due to sepsis which ought certainly to be preventable. An analysis of the cases of puerperal sepsis will be found in a later page from which it will be apparent that perhaps the most striking fact to be noted about these deaths is that the majority of the severe cases of puerperal sepsis seem to have occurred in natural deliveries, at any rate quite two-thirds of the deaths from puerperal sepsis occurred in women who had a natural delivery.

The number of abortions that occurred in the City of Madras cannot possibly be estimated. But if the returns submitted by the

hospitals should be any guide at all, it may be said that quite a number of abortions occur in the City of Madras, of which no records can possibly be obtained. The extent of the number of abortions may to a certain extent be surmised from the following returns pertaining to the Government Hospital for Women and Children, Madras :—

Table IV.

Government Hospital for Women and Children, Madras.

Year.	Total number of confinements.	Number of abortions.		Total maternal deaths.
		Treated.	Died.	
1922	2,728	161	6	66
1923	2,768	158	5	72
1924	2,908	126	6	67
1925	2,923	129	2	68
1926	2,798	148	7	59
1927	3,100	198	6	50
1928	3,051	217	6	57
1929	2,894	250	9	70
1930	3,311	252	10	71
1931	3,389	270	12	84

Thirty-six deaths were recorded under the head of abortions, fourteen of which were due to septic abortions, and twenty-two to other causes. It must, however, be confessed that this may not represent the total number of deaths due to abortions, as in some cases at least it is possible that the fact that the abortion had occurred has not been mentioned for reasons to which one need not refer here. The question whether abortions are on the increase or not, and if so, whether due to factors which have any bearing upon the food values and the adequate supply of vitamins to pregnant women, is one that deserves consideration, and on which a great deal of attention should be bestowed. The impression however is left that abortions are on the increase and that they are due to causes having a bearing upon the factors affecting the general health of the woman.

HÆMORRHAGES.

There were 55 deaths from this cause, 11 due to accidental hæmorrhage, 5 to placenta prævia and 39 to post-partum hæmorrhage. The number of deaths due to post-partum hæmorrhage is large and is regrettable to note. While some of these deaths from post-partum hæmorrhage were due to associate conditions such as anæmia, albuminuria, toxæmia or fevers, the majority of deaths were due to causes which were preventable. Reference will be made to these cases again when dealing with the subject of the Primary Avoidable Factor in maternal deaths.

ACCIDENTS OF LABOUR.

Twenty-five deaths are reported under this head. The large number of deaths from rupture of the uterus must strike one at first sight and can only be ascribed to conditions which preclude proper obstetric help being obtained before such a catastrophe could occur. Rupture of the uterus ought certainly to be a very rare complication indeed, if the obstetric practice is broadbased upon proper medical aid being available at the proper time. Among the 4,655 cases that were investigated by the Departmental Committee on Maternal Morbidity and Mortality in England, it was found that all of them were directly due to child-birth: out of these only four cases were recorded as deaths from rupture of uterus. This is in striking contrast with the figures for Madras where 14 cases are recorded as due to rupture of uterus out of a total number of 436 maternal deaths. It should however be pointed out in this connexion that the majority of these deaths occurred among women who came from outside the City limits after having been in labour for several hours.

ECLAMPSIA.

The total number of deaths from eclampsia was 38. It is unfortunately not possible to state how many cases of eclampsia were actually recorded in the City. The incidence of eclampsia at least so far as hospital statistics go to show, seems to be on the increase. This can easily be noted from the records of the two of the big maternity institutions in the City, the Government Hospital for Women and Children, Egmore, and the Rajah Sir Ramaswami Mudaliyar Lying-in Hospital, Rayapuram. The following table (V) shows the total number of cases of eclampsia admitted into these two institutions during the past ten years:—

Table V.

Showing the number of cases of eclampsia treated and died in the two big maternity institutions.

Year.	Women and Children Hospital.			Ramaswami Hospital.		
	Total number of deliveries.	Cases of eclampsia		Total number of deliveries.	Cases of eclampsia.	
		Treated.	Died.		Treated.	Died.
1922	2,728	56	4	1,776	24	3
1923	2,768	64	7	1,747	26	7
1924	2,908	38	4	1,848	20	2
1925	2,923	39	5	2,047	33	...
1926	2,798	44	5	1,601	26	2
1927	3,100	52	8	2,082	45	7
1928	3,051	53	8	2,104	37	2
1929	2,894	54	8	2,018	33	2
1930	3,311	81	7	2,833	40	5
1931	3,389	80	14	2,361	43	10

It is a matter for regret that in spite of an extended maternity and child welfare scheme functioning in the City, there has been no abatement in the number of cases of eclampsia admitted to the hospitals. It shows the indifference to the potential dangers in cases of toxæmia on the part of the patient or her relatives which is largely the result of ignorance, but it cannot be gainsaid that if proper care were bestowed in the antenatal supervision of these cases by those responsible for such antenatal care, and if emphasis was laid on the risks incidental to a neglect of the early signs of toxæmia, there should be a considerable reduction in the number of cases admitted. It may also be stated that the number of deaths from eclampsia could perhaps be substantially lessened if early institutional treatment were adopted for even those cases who develop this symptom owing to lack of proper care. The routine examination of urine and the estimation of the blood pressure are two of the most important functions to be carried out at an antenatal clinic and the sooner it is appreciated the better would it be for the safety of the mothers concerned. It is not sufficiently well realized that the proper time to treat cases of eclampsia is long before they have developed the eclamptic fit and that the proper place to treat such potential cases is a hospital and not an antenatal clinic. Cases which show definitely either persistent albuminuria or a high blood pressure, or a combination of both symptoms, so suggestive of the possible onset of eclampsia, should at once be directed by the antenatal clinic to the antenatal wards of a maternity hospital. If such routine management of cases of toxæmia were conducted by all those responsible for the running of antenatal clinics in the City of Madras, one can venture to assert with some equanimity that the total number of cases of eclampsia will proportionately be less and that the death-rate of this dangerous complication will be materially diminished. At present, it is not an uncommon feature to find that patients are admitted with a severe form of eclampsia and at a late stage of the disease when, with the present knowledge at our disposal and the facilities of treatment that we have, little headway can be made to prevent the onset of fatal complications.

ANÆMIAS OF PREGNANCY.

There were 50 deaths from this cause among the 436 maternal deaths recorded for the year. In fact, anæmia of pregnancy has become an even more dreadful complication than eclampsia in the annual toll that it levies upon motherhood. Investigations carried on into this subject during the last few years have revealed that there are many cases of anæmia occurring in Madras, as compared with European cities; that the large number of these cases are associated with one of two causes; either ankylostomiasis, or a type of macrocytic anæmia which seems to be commoner in pregnant women than in others. The analysis into the causes of the anæmia of pregnancy in this City reveals the interesting fact that hook-worm infection is very much more prevalent in the north Madras than in any other place, and particularly in areas round about Rayapuram and Washermanpet, like the Tinnevely Settlement

where the general population seems to be heavily infected with hook-worm. The danger of a severe type of anæmia due to hook-worm is much greater in the gravid state than in the non-gravid. In the non-gravid condition, it is possible for a person with a hæmoglobin index of 20 to 30 per cent to carry on in a manner some of the ordinary duties of life imposed under social circumstances. In the gravid condition, however, a low hæmoglobin index predisposes to premature labour and immediately after labour a fatal collapse sets in, associated with conditions suggestive of failure of proper supply of oxygen. Hurried respirations, air hunger, fatal œdema of the lungs, are complications which occur in these cases within a few hours after delivery. There can be no doubt whatsoever that an ankylostomiasis survey is very necessary, particularly in this part of Madras; and it is impossible to lessen maternal mortality unless some measures are taken to reduce the extent of the heavy infection with hook-worm here.

Another form of anæmia has been referred to as the macrocytic type of anæmia. Recent investigations would lead one to conclude that perhaps this is more largely due to deficiencies and defects in the food available for the pregnant mothers. In any case, this anæmia responds very well, if treated early, to liver therapy and ordinary hæmatinics. The importance of recognizing this anæmia can hardly be exaggerated. It is slow and insidious in its onset, so that if care is not taken thoroughly to investigate at the antenatal centre the mothers who come for advice, it is likely to be missed. One can go so far as to say that a routine blood examination which implies the estimation of the hæmoglobin and the total number of Red Blood Cells should be insisted upon from the sixth month onwards, if not even from an earlier period and no antenatal centre can possibly be said to be sufficiently well-equipped which does not provide for these facilities. The emphasis laid on the anæmia as a causative factor in maternal mortality need hardly be justified in view of the fact that nearly an eighth of the total of the deaths from all causes associated with child-birth was due to this particular cause.

OTHER DISEASES AND ACCIDENTS OF PREGNANCY AND PARTURITION.

It is to be expected that tropical conditions being what they are, tropical diseases will play their part in increasing the number of maternal deaths. This will be apparent from the Table (VI) subjoined below:—

Table VI.

Other diseases complicating			Other diseases complicating		
Pregnancy.			Pregnancy.		
Dysenteries	...	19	Heart disease	...	6
Tubercular infection	...	7	Influenza	...	2
Pneumonia	...	7	Cholera	...	2

Other diseases complicating			Other diseases complicating		
Pregnancy.			Puerperium.		
Kala-Azar	...	2	Dysenteries	...	12
Other fevers	...	2	Pneumonia	...	9
Malaria	...	1	Malaria	...	8
Cancer	...	1	Other fevers	...	3
Asthma	...	1	Enteric	...	5
Enteric	...	1	Pleurisy	...	1
Tubercular kidney	...	1	Heart disease	...	1
Pyæmia	...	1	Cellulitis	...	1
Premature delivery	...	1	Septic throat	...	1
Smallpox	...	1	Internal hæmorrhage	...	1
Unknown	..	2	Influenza	...	1
		57	Meningitis	...	1
			Unknown	...	1
					45

ECTOPIC GESTATION.

Only two cases of death due to this condition are recorded from this cause. It is obvious that such causes can only be recorded through hospital returns, as in the absence of a proper certificate of death by a medical officer, these deaths are likely to be assigned to various causes quite remote from the real state of the disease and depending very largely upon the view-point of the person supplying the information.

THE PRIMARY AVOIDABLE FACTOR.

The Departmental Committee on Maternal Mortality and Morbidity have laid some stress upon the "Primary avoidable factor" in connexion with all maternal deaths. By the primary avoidable factor is meant some factor, the neglect of which from one or other cause, has culminated in the mortality of the mother, so that by discovering the first point at which such deviation occurred from the normal standards either before, during or after the birth of the child, you can suggest measures to rectify such defects. With a view to a clear realization of the primary avoidable factor, the Committee laid down the following standards as reasonable to adopt for all schemes calculated to promote maternal welfare:—

(1) The patient should book herself 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.

(2) 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.

(3) The confinement should not be undertaken in an entirely unsuitable environment.

(4) Such antiseptic and aseptic precautions, as are generally recognized to be necessary, should be given.

(5) A doctor or midwife should be available and should bring to the case a fair average degree of skill, knowledge and attention.

(6) Such hospital consultant and transport services as are essential should be available, and the doctor should take advantage of them as and when necessary.

(7) A second doctor acting as anaesthetist should be obtained in severe cases.

(8) The hospital should provide suitable facilities and their officers shall show evidence of special skill.

The search for the primary avoidable factor has enabled this committee to assess numerically the influence of departure from a standard of midwifery practice which should be readily attainable in England. They have also divided the primary avoidable factor under four headings :—

- (a) Omission or inadequacy of antenatal examination.
- (b) Error of judgment in the management of the case.
- (c) Lack of reasonable facilities.
- (d) Negligence of the patient or her friends.

The Departmental Committee inquiring for England, found that at least half of the maternal deaths occurring in that country were preventable. We shall now examine the maternal deaths submitted in Table (III) from this point of view, namely, in how many cases and to what extent the primary avoidable factor was present in the series of maternal deaths recorded.

(a) *Omission or inadequacy of antenatal examination.*—A large number of cases come under this heading. It is unfortunate that in spite of the facilities for antenatal examination, the majority of the patients do not have recourse to institutions where proper antenatal examination could be conducted. An even more unfortunate fact is the inadequacy of antenatal examination and care. Reference has been made to the defects in the antenatal centres and perhaps the patients who resort to these centres are not impressed with the utility of such antenatal examinations and advice. In a statement submitted later (Table XIV), it will be noted that as many as 313 out of the 436 women who died, did not resort to any antenatal clinic and availed themselves of no antenatal advice. Sixty-two others had some antenatal advice, but only for a week, either at an antenatal clinic or through a qualified doctor or midwife. Analysing the deaths attributable to this factor we find that they may be classified as under :—

(1) Absence of antenatal examination	...	...	77
(2) Inadequacy of antenatal examination and advice.	...	...	19
(3) Failure to detect abnormality through antenatal examination	...	...	5

Total ... 101

(b) *Error of judgment.*—It is difficult at all times to assess this factor in obstetrics and the criticism may justly be levelled

that, in the absence of personal knowledge of the nature and extent of the abnormality met with, arm-chair criticism of error of judgment is unfortunately too easy and uncritical. Still, it is permissible to try and understand with sympathy, the cases where such errors of judgment either on the part of the midwife or the doctor may constitute the primary avoidable factor. The cases may be classified thus :—

(1) Neglect of warning hæmorrhages	...	...	...	6
(2) Faulty treatment of third stage	...	...	...	8
(3) Improper use of forceps	...	...	...	6
(4) Failure to recognize the degree or obstructed labour	...	...	...	4
(5) Gross errors in the prevention or recognition of sepsis	...	...	...	8
(6) Miscellaneous	...	...	...	6
Total				38

(c) *Lack of reasonable facilities.*—Conditions being what they are in the City of Madras in regard to the ease with which the services of midwives or institutional treatment is available, the majority of these cases are cases coming from outside the City municipal limits. Still, there are some cases in the City where deliveries were conducted in surroundings where lack of reasonable facilities was the main factor in leading to fatal complications such as sepsis. Thirty-two deaths may be attributed to this factor alone, while it may be argued that more deaths were due to lack of reasonable facilities and thus developed sepsis or other fatal complications.

(d) *Negligence of the patient and her friends.*—There is no doubt that this accounts for a large number of deaths, more so in Southern India than in other countries. The fact that 62 of the women who died were under antenatal care only for less than a week shows the neglect so common with the majority of the patients. It is also a well known fact that many patients leave the hospital at a much earlier stage, owing to the stress of domestic difficulties and do not avail themselves of the full measure of rest and treatment needed. Exclusive of the cases recorded under group (a), it may be stated that at least 48 cases fall under this heading.

The total number of deaths then attributable to the primary avoidable factor may be summarized as follows :—

(a) Omission or inadequacy of antenatal examination.	101
(b) Error of judgment in the management of the case	38
(c) Lack of reasonable facilities	32
(d) Negligence of the patient or her friends	62
Total	233

This gives a percentages of 53.44 deaths attributable to this factor, which is a high percentage indeed.

PART II.

SOME SOCIAL AND ECONOMICAL FACTORS WHICH HAVE A
BEARING ON MATERNAL MORTALITY.

We shall now consider some of the social factors connected with maternal mortality, such as the factor of age, parity, social circumstances, the housing problem and its bearing on maternal mortality, and similar factors which may have a bearing on the problem of maternal mortality.

PUERPERAL MORTALITY IN RELATION TO AGE.

The following table (VII) shows the deaths at the various age periods, together with the cause of death under each of these age periods.

Number of births (live and still)—26,207.

Table VII.

Total maternal deaths—436.

Classified according to cause of death and age.

Cause of death.	Age.													Total
	Single years 15-19.					Five-yearly periods.								
	15	16	17	18	19	15-19	20-24	25-29	30-34	35-39	40 & above			
Puerperal sepsis	..	..	..	..	..	..	..	..	..	..	..	115		
Abortions—Septic	..	..	..	..	..	..	..	..	..	..	..	14		
Abortions—Other than septic	..	..	..	..	..	..	..	..	..	..	..	22		
Hæmorrhages—	..	..	..	..	..	..	..	..	..	..	..	..		
Accidental	..	..	..	..	..	..	..	..	..	..	..	11		
Placenta prævia	..	..	..	..	..	..	..	..	..	..	..	5		
Post-partum hæmorrhage	..	..	..	..	..	..	..	..	..	..	..	39		
Accidents of labour	..	..	..	..	..	..	..	..	..	..	..	25		
Toxæmias of pregnancy—	..	..	..	..	..	..	..	..	..	..	..	..		
Eclampsia	..	..	..	..	..	..	..	..	..	..	..	38		
Nephritic toxæmia	..	..	..	..	..	..	..	..	..	..	..	4		
Acute yellow atrophy liver	..	..	..	..	..	..	..	..	..	..	..	1		
Anæmias of pregnancy	..	..	..	..	..	..	..	..	..	..	..	50		
Other diseases and accidents of pregnancy	..	..	..	..	..	..	..	..	..	..	..	57		
Embolism and sudden deaths in puerperium	..	..	..	..	..	..	..	..	..	..	..	8		
Other diseases and accidents of puerperium	..	..	..	..	..	..	..	..	..	..	..	45		
Ectopic gestation	..	..	..	..	..	..	..	..	..	..	..	2		
Total number	5	9	11	40	17	82	108	115	85	45	1	436		
Percentage	..	..	..	..	..	18.9	24.8	26.4	19.5	10.3	0.2	..		

It will be noticed from the above table that over two-thirds of the deaths occurred before the 30th year and that the majority of the deaths occurred between the 15th and 29th years. Such a statement, however, does not give a correct idea of the mortality at the different age periods, for in the absence of the total number of women who are delivered within these age periods, it is not possible to state how far age affected the incidence of mortality. It must be remembered that the maximum fertility is generally between these age periods and under Indian conditions, the maximum number of women confined is also within these periods. No useful purpose would be served by merely stating that nearly 65 per cent of the deaths occurred among women below the age of 29, for although this may appear at first sight to be a large proportion of deaths, still the statistical error involved in coming to these conclusions without an idea of the total number of the women who are confined within that age period is obvious. It may be said in this connexion that even in the Interim Report of the Departmental Committee on Maternal Mortality and Morbidity in Great Britain, such a statement appears. The report says :—

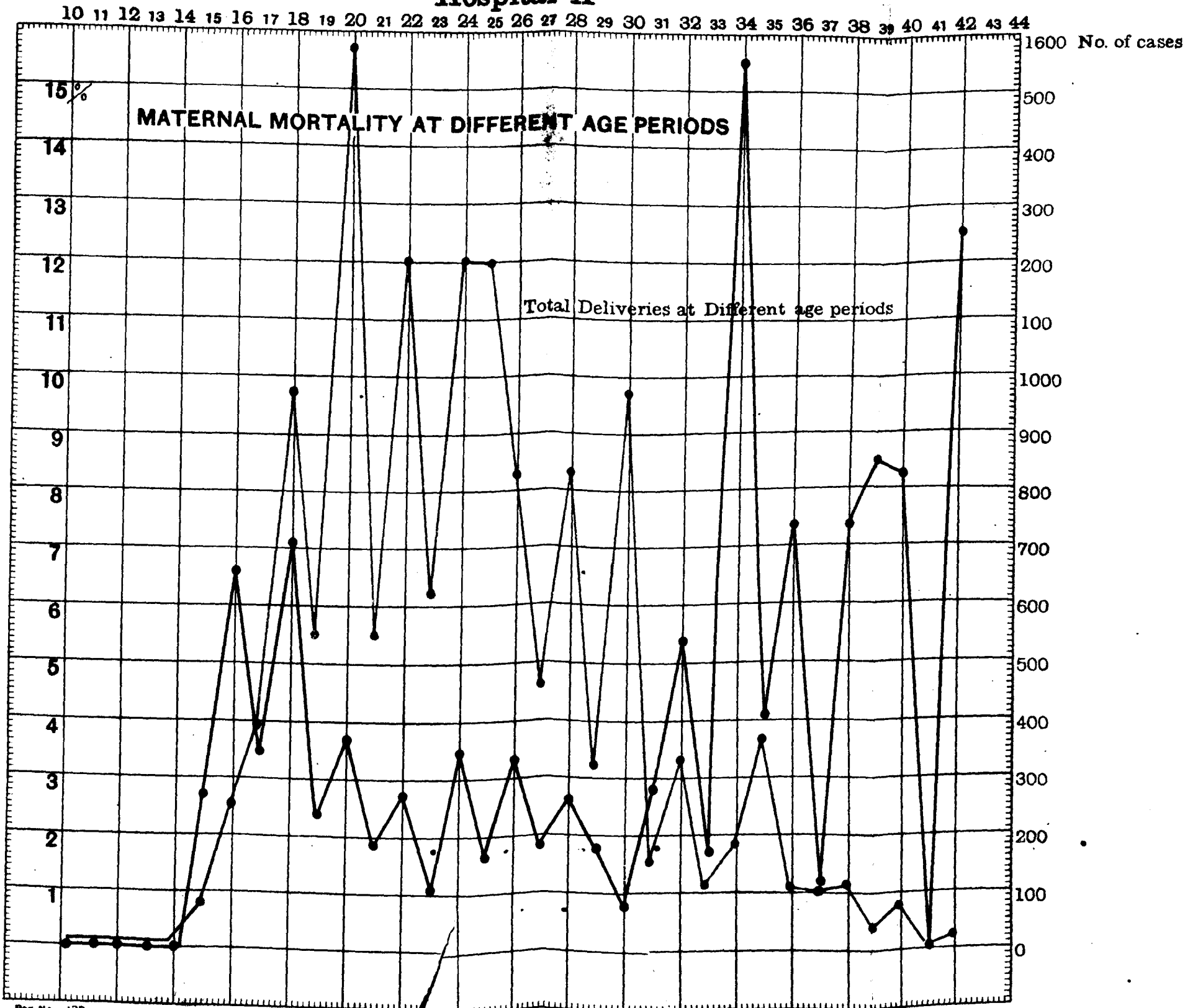
“ The figures support the common experience that the burden of mortality falls most heavily upon younger women and mainly upon those of 25 to 35 years of age. One thousand four hundred and sixty-three women were under 35 years of age, that is, 71 per cent of the total. No less than 455 or 23 per cent were aged 25 or less.”

Turning to another report, the Report of the Assistant Director of Public Health, which was a preliminary study of maternal mortality published in the Report of the Director of Public Health for 1928, we find that “ the proportion of confinements below 15 was 0.59 per cent, and that the mortality was highest when confinements occurred before 15 years of age and dropped by nearly 50 per cent in the ages of 15 to 19.” According to this report, the death-rate per 1,000 confinements at the different age periods works out as follows :—

Age period.	Death rate per 1,000 con- finements.	Age period.	Death rate per 1,000 con- finements.
Under 15	...	25 to 29	14.30
15 to 19	46.51	30 to 34	13.92
20 to 24	28.74	35 and above	14.06
	17.91		

In this connexion it may be well to quote the figures arrived at from an analysis of 64,000 confinements at the Government Hospital for Women and Children, Madras. The graph shows both the total number of deliveries at the different age periods, as well as the maternal mortality.

Hospital A



It will be noticed that there were no deaths between the ages of 12 to 14, but it might be stated that there were very few cases during this age period. Between the ages of 15 and 18, there is a rise specially marked at 16 and 18; and then between 19 and 30 also the mortality shows slight oscillations but is definitely lower than at any other age period. The optimum is reached at the age of 23 and 30, and this is specially interesting in view of the fairly large number of deliveries after 30, the risks of maternity seem to be great and in spite of one or two dips in the curve, the altitude is very high indeed. It would thus appear that the optimum age for maternity is between 19 and 30.

A study of the table would also show the predominance of two causative factors in the earlier period of life, namely, eclampsia and puerperal sepsis, of which there were 30 and 38 deaths, respectively, between the ages of 15 and 19. Post-partum hæmorrhage claims a heavy incidence between the ages of 15 and 19 and can only be accounted for by the delayed labour and the consequent exhaustion of the uterus soon after delivery, whether natural or artificial. Accidental hæmorrhage and placenta prævia are relatively commoner at the later epochs of life, while anæmias of pregnancy occur practically at all epochs of life.

PARITY.

The next table (VIII) classifies the deaths according to parity.

The majority of deaths are among primiparæ. Here also it may be stated that in the absence of the total number of women who were delivered as primiparæ or multiparæ, correct conclusions cannot be drawn from the total number of deaths according to parity. But the incidence of certain causative factors needs a special mention. Eclampsia again is much more frequent as a causative factor among primiparæ than among multiparæ, while puerperal sepsis and post-partum hæmorrhage again dominate the field in primiparæ rather than in multiparæ. The heavier risks incidental to a primipara's labour are well known to all obstetricians. A first labour is in reality a trial labour and in the absence of proper antenatal care and sufficient amount of attention being bestowed upon the possibility of abnormal conditions present whether before the onset of labour or during labour, the risk of sepsis and hæmorrhage must necessarily be great. It must however be mentioned that after a certain stage, there is an increase in the incidence of mortality in the multiparæ. This will be evident again from a study of the following table based on an analysis of the cases that occurred at the Government Hospital for Women and Children, Madras:—

Pregnancy.	Total number of cases.	Total number of deaths.	Average percentage mortality.
I	4,008	175	4.30
II	2,870	60	2.10
III	2,326	65	2.80
IV	1,636	44	2.80
V to XV ...	4,191	129	3.10

The table would therefore go to show that in primiparæ and in old multiparæ, the mortality incidence is much greater than in the other classes. The analysis of the Assistant Director of Public Health referred to above, would seem to support the conclusions drawn herein.

THE SPACING OF PREGNANCY.

Even more important than the age incidence or multiparity in the production of added risk to women in child-birth, seems to be the factor of what may be termed "the spacing of pregnancy." The analysis of the history and the end results of multiparity go to show that too frequent child-birth seriously impairs the vitality of the individual, if the interval between successive child-births is very limited. Even in the absence of any definite factor or pathological entity, the patient runs a grave risk at the time of delivery.

Table VIII.

Total maternal deaths—436.

Number of births (live and still)—26,207.

Classified according to parity.

Cause of death.	Number of pregnancy.											Total.
	I	II	III	III	III	III	III	III	III	III	III	
Puerperal sepsis	47	9	13	15	2	2	2	2	2	2	2	115
Abortions—Septic	2	1	3	4	1	1	1	1	1	1	1	14
Abortions—Other than septic	3	6	3	4	1	1	1	1	1	1	1	22
Hæmorrhage—												
Accidental	2	1	1	2	2	2	2	2	2	2	2	11
Placenta prævia	11	1	5	5	1	1	1	1	1	1	1	39
Post-partum hæmorrhage	4	2	2	1	1	1	1	1	1	1	1	25
Accidents of labour	20	4	7	1	3	3	3	3	3	3	3	38
Toxæmias of pregnancy—												
Eclampsia	2	1	1	1	1	1	1	1	1	1	1	11
Nephritic toxæmia	13	4	5	10	3	3	3	3	3	3	3	50
Acute yellow atrophy of liver	11	7	12	3	2	2	2	2	2	2	2	57
Anæmias of pregnancy	3	1	1	1	1	1	1	1	1	1	1	8
Other diseases and accidents of pregnancy	4	11	12	5	3	3	3	3	3	3	3	45
Embolism and sudden deaths in puerperium	1	1	1	1	1	1	1	1	1	1	1	2
Other diseases and accidents of puerperium	1	1	1	1	1	1	1	1	1	1	1	8
Ectopic gestation	1	1	1	1	1	1	1	1	1	1	1	8
Total number	123	48	64	49	23	23	23	23	23	23	23	436
Percentage	28.2	11.0	14.7	11.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	..

It may be a condition of hypo-piesis or hypo-vitaminosis, or hypo-adrenalenema, or perhaps a combination of two or three factors. The following cases are illustrative of the condition referred to:—

VII para, age 30, had six children within a period of eight years, the last child born a year ago. She was admitted in labour of 18 hours duration. The condition on admission was fair; blood pressure 95 m.m. vertex presenting. The child was helped with forceps. The patient died two hours after delivery from shock.

VIII para, age 25, has had seven children in the course of seven years; previous deliveries—five natural and two by forceps. Mother in poor state of health, ill-nourished; child helped with forceps; patient collapsed suddenly and died within half an hour.

Cases of this description are not infrequent and whether the labour is terminated by natural forces or aided by instruments, the lack of vitality of the patient consequent upon the frequency of child-birth within a limited period seems to favour a sudden collapse either soon after delivery or in the first few days of the puerperium. A comparative table showing the causation of death in primiparæ and multiparæ (after the VI para) is given below, for the deaths studied in Madras as well as for the deaths investigated by the Departmental Committee in Great Britain:—

British and Madras figures giving the cause of death in relation to parity.

Cause of death.	Primiparæ.		British statistics.		Madras statistics.	
			PER CENT.		PER CENT.	
Puerperal sepsis	..	..	252	53	47	38.3
Eclampsia-toxæmia	..	..	75	16	22	17.8
Embolism	..	..	28	6	3	2.4
Hæmorrhages	..	..	26	5	13	10.5
Difficult labour	..	..	24	5	4	3.2
Pneumonias	..	..	22	5	..	..
Morbus cordis	..	..	21	4	..	..
Syncope, shock	..	..	15	3	..	..
Miscellaneous	..	..	13	3	29	23.5
Abortions	..	..	..	..	5	4.2
Multiparæ.						
Hæmorrhages	..	..	39	28	42	13.4
Puerperal sepsis	..	..	33	24	68	21.7
Eclampsia-toxæmia	..	..	23	16	21	6.7
Pneumonias	..	..	15	11	..	..
Syncope	..	..	9	6	..	..
Embolism	..	..	9	6	5	1.6
Difficult labour	..	..	5	3	21	6.7
Morbus cordis	..	..	5	3	..	..
Miscellaneous	..	..	4	3	88	28.1
Abortions	..	..	..	..	31	9.9
Anæmias of pregnancy	..	..	..	..	37	11.9

The problem of reducing maternal mortality in multipara is a little bit more complicated than in a primipara. While antenatal supervision may play a large part in reducing the incidence of mortality in primiparæ, it is necessary to realize that in multiparæ, other factors are also needed. "Women who have already had many children," says the report of the Departmental Committee, "are often particularly in need of something more than the ordinary antenatal supervision which would be sufficient for the younger mother. Yet it is just these patients with whom it is often difficult to get into touch. Poverty is naturally more frequent and more acute among them because of the large family, and for the same reason, living conditions are apt to be overcrowded and less sanitary. Often she is weary, under-nourished, dispirited and thus even more inclined to let matters lie and hope that all will be well. Therefore it is not only important to give every encouragement to these tired mothers to seek assistance, but also to ensure that the advice given is sound and that particular attention is paid to the special conditions and to the possible need for nourishment, rest or domestic assistance during pregnancy as well as at the time of confinement."

These remarks are particularly applicable to conditions in Southern India, and there can be no doubt whatsoever that the problem of maternal mortality cannot be solved till attention has been bestowed on two factors:—

- (1) The factor suggested by the Departmental Committee of Great Britain as to the need for a deeper understanding of the necessities of multiparæ, and the greater amount of intensive work that should be carried on among them, if the sense of satisfied security that many of them feel on account of previous labours, is not to be allowed to lead them into unhappy pit-falls.
- (2) The question of the 'spacing of pregnancies' on which some emphasis has been laid above, is a matter that requires attention, and undoubtedly mothers must be told of the added risk that they submit themselves to by frequent pregnancies at short intervals. What form of advice this should take, and whether it is at all justifiable or necessary in antenatal clinics to offer advice which will really be practicable, is a consideration that has got to be borne in mind. Contraception, from the point of view of the prevention of maternal mortality, seems undoubtedly to have a place in the scheme of things for the promotion of maternal welfare.

We shall next take some of the social factors that may be held to be responsible or that might have a part to play in the incidence of maternal mortality. The bearing of general sanitation of the locality, the size of the house and the standard of living, may all be taken to be factors in the incidence, if any, of maternal mortality, and are worth considering.

The following table (IX) gives an analysis in regard to the general sanitation of the locality:—

Table IX.

Maternal mortality in relation to sanitation (usual residence).									
Number of births (live and still)—26,207. Total maternal deaths—436.									
Cause of death.	I. Bungalow area.	II. Fair.	III. Poor.	IV. Dirty.	V. Cheri.	Not known.	Outside the City.	Total.	
Puerperal sepsis	2	15	36	24	6	32	23	115	
Abortions, septic	1	1	3	3	3	4	3	14	
Do. other than septic ..	1	1	6	7	2	6	2	22	
Hæmorrhages—									
Accidental	2	2	1	3	..	5	4	11	
Placenta prævia	1	..	1	1	..	2	2	5	
Postpartum hæmorrhage ..	2	14	11	4	8	5	39	39	
Accidents of labour	4	2	4	1	14	14	25	25	
Toxæmias of pregnancy—									
Eclampsia	1	5	11	10	2	9	3	38	
Nephretic toxæmia	..	..	3	1	..	..	..	4	
Acute yellow atrophy of liver	..	..	..	..	..	1	1	1	
Anæmia of pregnancy	1	5	15	18	1	10	7	50	
Other diseases and accidents of pregnancy ..	1	5	14	15	7	15	6	57	
Puerperal embolism and sudden deaths	..	1	2	1	..	4	2	8	
Other diseases and accidents of puerperium ..	1	2	22	13	1	6	2	45	
Ectopic gestation	..	..	..	1	..	1	1	2	
Total number	7	43	130	112	27	117	74	436	
Percentage	1.6	9.8	29.8	25.7	6.3	..	17.0	..	

It will be seen that the heaviest incidence was in classes III and IV which have been classified as 'poor' and 'dirty.' Perhaps, a little explanation is needed as regards the classification of the different forms of localities. Bungalow areas are well known, where generally houses are situated in separate compounds and overcrowding is not prevalent and the sanitation of the streets is fair. The second classification is a fair standard of sanitation which is found in certain of the main streets and in some of the suburbs where there is not the same amount of overcrowding. Sanitation is poor in some of the thickly congested areas, in lanes and in some of the thickly populated centres like Triplicane, Chintadripet, Georgetown, Tondiarpet, etc. The fourth is where the sanitation is positively poor, below the standard, and is classified as 'dirty.' The fifth is the 'cheris' where the poorest live in thatched sheds, with very little of the sanitary amenities provided for them, with but a common tap or two to satisfy the needs of the locality. It will be seen that the majority of the deaths occurred in 'poor' and 'dirty' sanitary surroundings; while surprisingly enough, a very small number of deaths occurred in cheris. This, however, is easy of explanation. It is common

knowledge that fortunately the majority of the people in the cheris resort to lying-in institutions for their confinement and therefore do not suffer, at the time when they should be best looked after, either from lack of attention or lack of proper sanitary care.

The next table (X) which gives the incidence of maternal mortality in relation to the size of the house, shows that the incidence again is heaviest in the overcrowded localities in the single-room tenements where little or no provision is available for the needs of a safe and aseptic delivery:—

Table X.

Maternal mortality in relation to size of house (usual residence).									
Number of births (live and still)—26,207. Total maternal deaths—436.									
Cause of death.	I. Bungalow.	II. Separate house.	III. Tenements.				IV. Destitute.	Not known.	Outside the city.
			A. Three rooms.	B. Two rooms.	C. One room.	Total.			
Puerperal sepsis	1	15	15	22	29	66	..	23	22
Abortions, septic	..	1	1	1	6	8	1	4	3
Do. other than septic	..	..	2	6	8	16	..	6	2
Hæmorrhages—									
Accidental	..	1	2	2	..	4	..	6	4
Placenta prævia	1	..	1	..	1	2	..	2	2
Postpartum hæmorrhage ..	..	5	5	8	13	26	..	8	5
Accidents of labour	..	4	1	4	2	7	..	14	14
Toxæmias of pregnancy—									
Eclampsia	1	5	4	2	17	23	..	9	..
Nephretic toxæmia	..	..	1	1	2	4	..	..	..
Acute yellow atrophy of liver	..	..	..	..	..	..	..	1	1
Anæmia of pregnancy	1	5	3	12	18	33	1	10	7
Other diseases and accidents of pregnancy ..	1	1	9	5	23	37	1	17	6
Puerperal embolism and sudden deaths ..	..	..	..	1	3	4	..	4	2
Other diseases and accidents of puerperium ..	1	6	8	8	15	31	1	6	2
Ectopic gestation	..	..	..	1	..	1	..	1	1
Total number	6	43	52	73	137	262	4	121	74
Percentage	1.4	9.8	..	..	..	60.1	0.9	..	..

An analysis of the Madras statistics would therefore go to show that the single-room tenants do suffer in proportion to those living in more spacious surroundings. It may be stated that the conclusions drawn herein are not however similar to the conclusions drawn in the other maternal mortality reports. Thus, the Aberdeen Report says: "It would seem possible to arrive at the conclusion that the size of the house does not materially affect the puerperal mortality rate and that there is no evidence to show that congested areas have any definitely larger puerperal mortality in Aberdeen more than may be inferred from the tables relating to the size of house, crowding of occupants and want of cleanliness." On the other hand, the same report makes it clear that the percentage of septic deaths to all the puerperal deaths in the three different groups of houses is lowest (25 per cent) in the houses of least crowdedness, as against 32 per cent and 37 per cent for the other two higher degrees of crowdedness. The Interim Report of the Departmental Committee of Great Britain offer the following observations: "The patient's home is, in ordinary circumstances, a safe place for a normal confinement even under the usual conditions of working-class life; but a dirty condition, whether of the patient herself, her house or her general surroundings, may predispose to septic infections even in a straightforward labour and is even more likely to do so when any complications arise." Dame Janet Campbell, in her report on Maternal Mortality submitted in 1924, states: "In point of fact, insanitary conditions appear to have a less injurious effect upon maternity than might be supposed. It is well known that a woman delivered without antenatal examination in the most deplorable surroundings, often makes a perfect recovery, while a clean, convenient dwelling is no bar to the occurrence of sepsis, if infection is introduced from without." Without differing from the generality of the conclusions arrived at in the three reports, it may however be stated that conditions in Southern India are peculiarly apt to cause a relatively higher incidence of maternal mortality in the thick, congested, overcrowded localities, where both the general sanitation outside and the sanitation inside the house is far from satisfactory: nay, even primitive. One has only got to look into the circumstances of some of these so-called single-room houses to realize the grave dangers that are incidental to the mother in labour. In this connexion, it is but right to take note of the peculiar social convention that is prevalent at least in the large majority of Hindu society, wherein it is an established rule that the woman in labour should be segregated generally to a portion of the dwelling, shut out from all ventilation and perhaps never exposed to sun light and not cleaned or kept in a fit condition for use for months together. This one factor materially affects the possibility of a clean midwifery being practised even though persons who are responsible for the conduct of delivery have any correct notions of clean midwifery.

The phenomenal overcrowding in recent years in the city of Madras must necessarily conduce to the increased incidence of child-birth in such unhealthy surroundings. Thus, it will be seen

from a study of the census report of the city in 1921 and 1931, that while the population in 1921 was 526,911, in 1931 it had gone up to 647,230; roughly, an increase of about 120,000. Compared with this increase of population, the total number of inhabited houses in 1921 was 65,048, while in 1931 it was only 73,845. Thus, while the population increased by 120,000, the total number of inhabited houses increased by 8,803 only—an increase of one inhabited house for an increase of 14 persons. The position of overcrowding is even more significantly brought to our notice when it is realized that the majority of these buildings have been built in the extensions by people with some means, so that the trend of overcrowding in just the population of limited means is very much on the increase; and here lies one of the chief crucial problems in the sanitation and public health of the city, which it will be well worth for anybody interested whether in the question of maternal mortality, or the infantile mortality, or the general mortality of the population, to take note of. There can be no gainsaying that so long as there is no proper, well-conceived, well-planned and effectively carried out scheme of housing in the City of Madras, so long as even those areas which are opened out under the Town-Planning scheme are allowed gradually to be crowded out of all decency, so long as even the bungalow areas are encroached upon by houses of all descriptions without any care being taken by the authorities concerned to preserve the particularly attractive feature of these areas—very little of fruitful results will come from any of the larger schemes calculated to improve the public health and to lessen the mortality in various age periods. It is thus apparent that overcrowding in this city has a share in increasing the percentage of mortality; and housing schemes do have a part to play in the lessening of maternal mortality.

The next table (XI) gives the maternal mortality in relation to the standard of living and does not call for much comment:—

Table XI.

Number of births (live and still)—26,207.

Total maternal deaths—436

Maternal mortality in relation to standard of living—Income.

Cause of death.	I. Rich (above Rs. 500).	II. Well to do.			III. Poor (Rs. 20 50).	IV. Very poor (below Rs. 20).	V. Destitute.	Not known.	Total.
		A. (Rs. 100).	B. (Rs. 200).	C. (Rs. 500).					
Puerperal sepsis ..	1	10	5	1	16	47	35	16	115
Abortions, septic ..	..	1	..	..	1	7	..	4	14
Do. other than septic ..	..	..	..	..	..	8	9	5	22
Hæmorrhages—	..	..	..	..	..	..	..	..	..
Accidental ..	..	1	..	..	1	5	3	2	11
Placenta prævia ..	..	..	1	..	1	2	..	2	5
Postpartum hæmorrhage ..	..	2	2	1	5	19	12	3	39
Accidents of labour ..	..	4	..	1	5	5	6	9	25
Toxæmias of pregnancy—	..	..	..	..	..	..	..	..	..
Eclampsia ..	..	4	1	1	6	9	16	7	38
Nephretic toxæmia ..	..	..	..	..	4	..	..	..	4
Acute yellow atrophy of liver ..	..	..	..	..	..	..	..	1	1
Anæmias of pregnancy ..	..	4	2	1	7	22	13	1	50
Other diseases and accidents of pregnancy ..	1	..	..	..	29	17	1	9	57
Puerperal embolism and sudden deaths ..	..	..	..	..	6	1	..	1	8
Other diseases and accidents of puerperium ..	..	4	1	..	5	22	13	5	45
Ectopic gestation ..	..	..	..	..	1	..	..	1	2
Total number ..	2	30	12	5	47	180	132	3	436
Percentage ..	0.5	..	..	..	10.8	41.2	30.3	0.7	..

Table XII.

Duration of pregnancy in relation to the cause of death.

The table subjoined below gives the particulars of the period of pregnancy at which death took place in the different cases :—

Classified according to term of pregnancy.

Cause of death.	Term.				Total.
	Six months and under.	Premature, 7-9 months.	Full term.	Not known.	
Puerperal sepsis ..	..	11	98	6	115
Abortions, septic ..	14	..	..	..	14
Do. other than septic ..	22	..	..	..	22
Hæmorrhages—	..	{ 3	{ 2	..	11
Accidental hæmorrhage ..	..	{ * 4	{ * 2	..	5
Placenta prævia ..	..	{ 2	{ 1	..	39
Postpartum hæmorrhage ..	..	8	29	2	25
Accidents of labour ..	..	..	{ * 1	1	..
Toxæmias of pregnancy—	..	{ 14	{ 17	..	38
Eclampsia ..	* 3	{ * 2	{ * 2	..	4
Nephretic toxæmia ..	..	{ 1	{ 1	..	1
Acute yellow atrophy of liver ..	* 1	..	..	..	50
Anæmia of pregnancy ..	* 1	{ 17	{ 18	6	7
Other diseases and accidents of pregnancy ..	* 3	{ * 7	{ * 2	1	8
Puerperal embolism and sudden deaths ..	..	..	{ 6	1	45
Other diseases and accidents of puerperium ..	..	10	33	2	2
Ectopic gestation ..	1	..	1	..	..
Total ..	37	95	244	13	389
	* 8	* 23	* 10	* 6	* 47

* Denotes cases that died undelivered.

N.B.—Ectopic gestation—one case was a secondary abdominal pregnancy which went to full term; the other a ruptured ectopic, second month.

It will be seen that 254 women reached the normal period of gestation including the 10 who died undelivered, while 163 women died before term. The large number of deaths from anæmia before term relatively to the total number of deaths that occurred in mothers who were premature, is striking. It may also be noted that three cases of eclampsia died under six months gestation. The heavier incidence of ante-partum hæmorrhage is to be

expected. That other diseases complicating pregnancy play an important part in the causation of maternal mortality will be evident from the fact that 39 deaths occurred before term, while 17 deaths occurred at full term. In a tropical country, where other diseases complicating pregnancy occur to a greater extent than in some of the temperate zones, it need hardly be emphasized that maternal mortality figures must necessarily be vitiated so long as the presence of these factors should go to increase the incidence of maternal mortality particularly in the later months of pregnancy.

Table XIII.

Maternal mortality in relation to general health of mothers during pregnancy.
Number of births (live and still)—26,207. Total maternal deaths—436.

Cause of death.	Good.		Unsatisfactory.			Total deaths.
	Number of deaths.	Percentage of total.	Number of deaths.	Percentage of total.	Unrecorded.	
Puerperal sepsis	52	43	46	19	17	115
Abortions, septic	4	3	6	3	4	14
Do. other than septic.	4	3	15	6	3	22
Hæmorrhages—						
Accidental hæmorrhage ..	4	3	4	2	3	11
Placenta prævia	1	1	4	2	..	5
Postpartum hæmorrhage.	12	10	18	7	9	39
Accidents of labour ..	10	8	3	2	12	25
Toxæmias of pregnancy—						
Eclampsia	15	12	18	7	5	38
Nephretic toxæmia	..	..	4	2	..	4
Acute yellow atrophy of liver	..	..	..	..	1	1
Æmia of pregnancy ..	2	2	45	18	3	50
Other diseases and accidents of pregnancy ..	7	6	44	18	6	57
Puerperal embolism and sudden deaths	1	1	3	1	4	8
Other diseases and accidents of puerperium	9	7	33	13	3	45
Ectopic gestation ..	1	1	1	..	..	2
Total ..	122	..	244	..	70	436
Percentage of total ..	27.9		55.7		16.3	100

The above analysis (Table XIII) shows that two-thirds of the mothers who died were in 'poor' state of health. While some of them were definitely suffering from diseases, is in the case of

others, it was a condition of low vitality partly due to lack of care, partly due to other conditions incidental in the stress of an exacting social circumstance. It is interesting to note that puerperal sepsis played a more dominant part in the causation of deaths of those who were in good health, than even in those who were in an unsatisfactory state of health. This is a striking commentary on the fact that will be emphasized later on, that puerperal sepsis is in the majority of cases an avoidable disease and should find no place in a well-conducted scheme of maternal relief. While the 52 with good health died essentially of puerperal sepsis, it cannot be stated with any amount of confidence that the 46 deaths returned under puerperal sepsis were due only to that cause.

Accidents of pregnancy and puerperium are relatively much more frequent in those with an 'unsatisfactory' state of health, than in those with 'good' health. So are the sudden deaths also in a measure more frequent in those with an unsatisfactory state of health. There can be no gainsaying that the surest method of preventing maternal mortality consists in raising the general standard of health of the pregnant women, so that most of the incidental factors arising out of complicated labours may play a minimum part in adding risks whether at the time of labour or during the puerperium. This is no doubt the fundamental work of an antenatal clinic, but this by itself will hardly yield such good results unless we go a step further and begin to look after the mothers even before they reach to motherhood. In other words, the proper care of the pregnant woman begins with girlhood, and to the extent to which a community looks after the health and welfare of the girls long before they become mothers, to that extent will the community be in a position to ward off many of the accidental and incidental factors which may increase the risks of maternity. This fact is becoming more and more clearly realized in western countries where it is now considered as a necessary factor to be taken into account in all schemes of maternity relief that the care of the health of the adolescent in the school-going age is the surest way of improving the general health of the mothers of the nation. Of this aspect we shall dwell at greater length later.

ANTENATAL CARE IN RELATION TO MATERNAL MORTALITY.

While the problem of looking after the health of the adolescents of the nation is a real problem, it may be argued that it is too vast and financially too big a proposition to be tackled successfully. Under such conditions, there is no denying that efficient care of pregnant women will yield surprisingly good results, provided the machinery for such efficient care is sound and thoroughly reliable. The following table (XIV) gives an analysis of the number of deaths in relation to the care of pregnant women either at an antenatal clinic of the Child Welfare Scheme, or in an institution, or through a private nurse or doctor.

Table XIV.

Showing the causes of death and the period of antenatal care the women had either at the Child Welfare Scheme, or from private nurse or doctor or hospitals.

Number of births (live and still).—26,207

Total maternal deaths—436.

Cause of death.	No antenatal care.	Period of antenatal care.						Not traceable.	Total.
		Under one week (one or two consultations).	One week and under two weeks.	Two weeks and under one month.	One month and less than two.	Two months and more.	Not known.		
Puerperal sepsis ..	91	15	1	1	1	1	1	1	115
Abortions, septic ..	14	..	..	..	..	..	..	..	14
Abortions other than septic ..	18	1	1	..	..	..	..	..	22
Hæmorrhages—									
Accidental ..	7	1	..	..	..	..	..	2	11
Placenta prævia ..	3	1	..	..	..	1	..	2	5
Postpartum hæmorrhage ..	28	9	1	..	..	..	1	..	39
Accidents of labour.	21	2	..	1	..	..	..	1	25
Toxæmias of pregnancy—									
Eclampsia ..	27	6	1	2	..	1	..	1	38
Nephretic toxæmia ..	2	2	..	..	..	..	..	..	4
Acute yellow atrophy liver ..	..	..	..	..	..	..	..	..	1
Anæmia of pregnancy ..	25	9	4	5	..	1	2	4	50
Other diseases and accidents of pregnancy ..	35	12	3	2	1	1	1	2	57
Puerperal embolism and sudden deaths.	7	..	..	..	..	..	..	1	8
Other diseases and accidents of puerperium.	33	4	2	1	1	3	..	1	45
Ectopic gestation ..	2	..	..	..	..	..	..	..	2
	313	62	13	12	3	8	5	20	436

The table is indeed a very graphic story of how far neglect plays a part in the causation of maternal mortality. Out of 436 deaths investigated, as many as 313 did not receive any antenatal care at all! and out of these 313, 27 were cases of eclampsia, 25 anæmias of pregnancy, 35 other diseases during pregnancy, 21 accidents of labour and as many as 38 due to hæmorrhages, ante-and post-partum. There can be no gainsaying that if all the

women had been subjected to efficient care, a very large portion of these deaths could have been prevented. We know that eclampsia is to a very large extent a preventable disease; that anæmia of pregnancy, if treated in time, yields surprisingly good results; that even in regard to hæmorrhages, a great deal can be done to prevent the severity of the hæmorrhage, either ante- or post-partum, with efficient antenatal care. The deaths under the Child Welfare Scheme also reveal the interesting fact that the majority of them are due to lack of continued and efficient antenatal care. This is very likely the result of indifference on the part of the mothers concerned, in not seeking advice as frequently as may be necessary, or in not following up that advice to the extent to which it was required. It is well to emphasize the fact that inefficient antenatal care is worse than useless, and in fact constitutes a serious menace to an effective administration of the maternity and child welfare departments, as it leads to a false sense of security and exposes the mothers to even greater risks. Antenatal centres are springing up everywhere, but it is regrettable to note that hazy ideas are prevalent as to what constitutes an efficient antenatal clinic. Inadequacy of antenatal care may result from several causes:—

- Insufficiency of clinics.
- Faulty organization and administration of these clinics.
- Ignorance or neglect on the part of the patient and her friends.

It cannot be said that in the City of Madras, there is any insufficiency of antenatal clinics as they are termed. But whether the organization and administration of these clinics is all that it should be, is a matter for consideration. A recent Committee appointed by the Corporation of Madras, which consisted of representatives of the Corporation and certain outsiders, went into this question very carefully and submitted a report which has been accepted by the Corporation; and many of the salient features worth noting in the administration and management of the antenatal clinics have been brought out in that report. While the antenatal clinics started by the Corporation have been doing some amount of good work, there can be no gainsaying that the efficient working of these clinics is very urgently called for. The same difficulty has been experienced in England also, and the Departmental Committee on Maternal Mortality and Morbidity have had at a very early stage of their report to draw the attention of the Ministry of Health to the principle which ought to govern the administration of these antenatal clinics. They have laid down:—

“It is important to obtain for every pregnant woman a high standard of examination and treatment, and it appears certain that a definite standard for such work would be helpful to those responsible for organizing and administering antenatal clinics as a further step in the reduction of the present high mortality rate.”

Dealing with the principles of antenatal care, the Committee recommended the following six proposals :—

- (1) Every pregnant woman should receive sufficient antenatal care to ensure that a difficult labour will be foreseen, as far as this can be done, by efficient examination. Such examination should include not only the pelvic and abdominal organs, but the general physical condition. The home conditions of the patient should be investigated as well.
- (2) Every woman should receive sufficient antenatal supervision to ensure the early detection and treatment of toxæmia within the limits of our present knowledge.
- (3) Antenatal care should include measures directed against infection, e.g., dental care, the treatment of infection of the cervix and measures to increase the resistance to infection as well as directions as to preparation for labour and puerperium.
- (4) Measures should be taken to include within the scope of antenatal care, the diagnosis and treatment of venereal disease.
- (5) The closest co-operation should be maintained between the clinic and all persons in whose charge the pregnant woman may be during pregnancy, labour and the puerperium.
- (6) In order that the high standard of antenatal care which is necessary may be maintained by midwife and doctor, the educational effect of a well-organized clinic must always be kept in mind.

The question of who should be in charge of the antenatal clinics has been a vexed question in most countries and perhaps extraneous conditions have had to be imported into a rational consideration of this problem, due to causes not entirely germane to the consideration of the main problem. Thus, in Great Britain, the question of the family doctor or general practitioner has crept in to a very considerable extent and everything has had to be considered from the point of view of the general practitioner or family doctor, and what part each should play in the scheme of maternity relief. There can be no doubt whatsoever that for the larger realization of the benefits of any scheme, the closer the general practitioner is brought into touch with the scheme, the better would be the results thereof. At the same time, one must frankly confess that antenatal care is a speciality and the medical officer in charge of the antenatal clinic is bound to be, if good work is to be turned out, an obstetrician of repute. While in the majority of women, supervision at an antenatal clinic may be a comparatively simple matter, in a fair proportion of the cases that are complicated, considerable judgment and experience is required to assess at their proper value the complicating factors that may become apparent. It is for this reason that the suggestion to have

two types of antenatal clinics must commend itself : the consulting clinic and the clinic for routine examination. The consulting clinic may serve both purposes, but it should necessarily be staffed by obstetricians of standing ; and to this clinic must be referred all cases wherein any doubt is felt or where perhaps a second opinion is judicious. In the City of Madras, consulting clinics of this description are available at some of the hospitals, and it would be well for antenatal clinics working in the different parts to get into more and more close co-operation with these consulting clinics for two essential reasons : first, as has already been stated, in cases of doubt or for border-line cases, the opinion of a consulting clinic will not be useless ; secondly, in the majority of cases with complications, the need for institutional treatment will arise, when a consulting clinic in close touch with a hospital will probably be more suited to get the patient treated in the antenatal ward whenever it is necessitated. The point need not be further elaborated as regards the urgency of tackling the problem of efficient antenatal care in the City of Madras, as indeed elsewhere.

NATURE OF ATTENDANCE AT DELIVERY.

The following table (XV) gives the details with regard to the nature of attendance at delivery.

Table XV.

Showing the nature of attendance at delivery.

Number of births (live and still)—26,207

Number of births (live and still)—26,207

Total maternal deaths—436.

Cause of death.

Cause of death.	Attended to at institutions.						Attended by qualified nurse or doctor.			Attended by unqualified persons alone.	Unknown.	Undelivered.	Total.				
	After attendance by qualified doctor or nurse or both.			After attendance by unqualified person.			Private nurse or doctor alone.	Child-welfare scheme alone.	After attendance by unqualified person.								
	Alone.	After qualified doctor or nurse or both.	After attendance by unqualified person.	Alone.	After qualified doctor or nurse or both.	After attendance by unqualified person.											
Puerperal sepsis	25	10	10	10	1	19	1			48	2		115				
Abortions, septic	1		3		1		1			7	2		14				
Do. other than septic	10	4				3					5		22				
Hæmorrhages—																	
Accidental	4	1								1		5	11				
Placenta prævia	2											2	5				
Post-partum hæmorrhage	13	4	2	2	1	7	1		2	9	1		39				
Toxæmias of pregnancy—																	
Eclampsia	17	6				4				4		7	38				
Nephretic toxæmia	1	1										2	4				
Acute yellow atrophy of liver												1	1				
Anæmia of pregnancy	17	3			3	6	3			6	2	13	50				
Other diseases and accidents of pregnancy	22	2			2	7	2		1	10	1	13	57				
Puerperal embolism and sudden deaths	2									5		1	8				
Other diseases and accidents of puerperium	18	2			1	9	1			14	1		45				
Ectopic gestation	2												2				
Total	146	37	21	10	57	3	104	15	43	436							
Percentage	33.5	8.5	4.8	2.3	13.1	0.7	23.9		9.8								

It will be seen that the deaths have been classified according to whether the patients were attended to in institutions, or by qualified nurses or doctors, or by unqualified persons. It may perhaps be well to state that so far as attendance in institutions is concerned, it cannot be stated that the patients were admitted and attended to in institutions alone. Many of these cases must have received some form of treatment, perhaps through unqualified persons; but as often as not, this fact is not mentioned at the time of admission, and only indirectly comes to be known at a later stage. It may also be stated that in some of these cases, the patients are admitted at a stage when very little effective treatment is possible in the institutions concerned. Thus, it will be seen that 204 deaths occurred among patients who were treated in institutions, of whom 37 are reported to have been attended to outside by a qualified doctor or nurse, or both; and 21 are said to have been admitted by unqualified persons. The 146 deaths in institutions are, according to the statement of the relations of the patient at the time of admission, supposed to have been among those who were not attended to by others. The incidence of puerperal sepsis is fairly high, but the deaths from post-partum hæmorrhage, eclampsia, anæmia of pregnancy and abortions other than septic, occurred in the majority of cases among patients who were brought in at a late stage or when conditions were very unfavourable for effective treatment. Seventy women died who were attended by qualified nurses or doctors, three of whom are reported to have been attended to originally by unqualified persons. Here again, the high incidence of puerperal sepsis is a matter for consideration. One hundred and four women died under circumstances where no qualified person was available or did actually attend. Forty-eight deaths from puerperal sepsis, or nearly 50 per cent of the deaths due to puerperal sepsis, is an interesting revelation of the fact that many of these people might perhaps been saved if precautions had been taken.

At first sight, the number of maternal deaths in institutions would appear to be rather high, and if one were not to take into consideration all the factors bearing upon these cases, the impression may perhaps prevail that the percentage of deaths in institutions is higher than under other circumstances. If the institutions serve their proper purpose in drawing in the more serious cases and perhaps those almost past the stage when effective assistance can be rendered, this state of affairs must continue. The peculiarity is not only with the statistics furnished above, but has been noted in other investigations carried on elsewhere. Thus, in the maternal mortality investigation carried on in the City of Aberdeen, when an analysis was made of the effect of the nature of skilled attendance so far as maternal mortality figures went, it was found that the death rate per 1,000 maternity cases was 2.8 in the practice of midwives, 6.9 in the practice of doctors, and 14.9 in in-patient institutional practice. The report continues: "The most striking feature of the table is the extraordinarily high mortality especially from puerperal sepsis among institutional

cases, even when the institutional cases are corrected so as to comprise only such cases as have had no previous interference and have been admitted to hospital without the intervention of doctor or midwife." Discussing the causes of this high mortality rate of 14.9 in maternity institutions, as also the causes of the difference in the mortality rate of 6.9 in the practice of doctors as contrasted with that of 2.8 in the practice of midwives, the report continues: "Young is of opinion that there is evidence that trauma is the most important cause of the death rate from sepsis, this view being based largely on the higher incidence of puerperal sepsis in the practice of doctors as contrasted with that of midwives." But for various reasons set out in the report, the Committee come to the conclusion that the evidence does not warrant the conclusion that trauma is the dominant factor in producing the higher maternal death rate including death from sepsis in the practice of doctors as contrasted with that of midwives. Discussing the question of puerperal sepsis in institutions, the report says: "The outbreaks of puerperal fever as investigated in Aberdeen and New York serve to emphasize the danger there is of the spread of puerperal infection in maternity hospitals in which the administration is lax or in which the aggregation of patients is such as to make the administrative control of contagion impracticable. As Young puts it, the well-established risks of contact infection in hospitals call for care in the extension of the hospital system of maternity service; in other words, if contagion is to be restricted, then the number of patients and their spacing in maternity wards must be rigorously controlled." The institutional problem will be discussed in Part III of the report. The problem of puerperal sepsis will be discussed presently, but the institutional problem is one which will have to be dealt with separately.

Table XVI.

Maternal mortality in relation to live and still-births.

Number of births (live and still)—26,207	Total maternal deaths—436
Number of live-births as registered	24,954
Number of still-births as registered	1,253
Proportion of still-births to live births—50.2 per 1,000.	

Puerperal deaths in relation to

		Live-births.		Still-births.		Abor- tions.			
		of Number deaths.	per 1,000.	of Number deaths.	per 1,000.	of Number deaths.	Unknown.	Undelivered.	
All causes		{ 204 * 2	8.2	{ 121 * 3	98.9	36	25	{ 44 * 1	
Puerperal sepsis		{ 80 * 1	3.2	{ 23 * 1	19.1	14	11	.	
Toxæmias of pregnancy		16	0.6	16	12.6	..	1	9	
Hæmorrhages		24	0.9	21	16.7	4	3	7	
Anæmia of pregnancy		16	0.6	17	13.5	..	3	14	
Accidents of labour		{ 3 * 1	0.1	{ 20 * 1	16.7	1	..	1	
Other causes		65	2.4	{ 24 * 1	19.9	17	7	{ 13 * 1	

* Denotes twin cases which were three in number.

N.B.—One secondary abdominal pregnancy with macerated fœtus.

One ruptured ectopic in the second month.

One acute yellow atrophy of liver died undelivered.

An analysis of the statistics in relation to live-births and still-births given above shows that the death-rate per 1,000 among those with live-births is decidedly much less than the deaths among those with still-births. Taking all things into consideration, while 8.2 mothers die for every 1,000 of those confined of live-births, 98.9 per thousand mothers die among those confined of still-births. In a measure, a difference, if not so pronounced, is to be expected; for, in the large majority of cases, factors which increase gravely the risk to the mothers are certain to produce death of the infant, perhaps much earlier. But the very heavy incidence among those with still-births must be due to a combination of factors, namely, inadequacy of care during the antenatal period, insufficiency of means and stress of social circumstances, improper or inefficient help at the time of delivery and lack of proper care or even neglect during the puerperium; and taking the several causes into consideration, we find, for instance, that puerperal sepsis accounted for six times the number of deaths among those with still-born children; in other words, this was probably due to lack of proper care or attention at the time of delivery, resulting in delayed labour, death of the fœtus, prolonged compression of the head, lacerations and infection and the subsequent death of the mother as well. Similarly in regard to other causes like toxæmias of pregnancy, the incidence of the higher death-rate implies a greater

amount of damage being permitted on the mother, so serious to have resulted in the death of the foetus in the first instance. The total number of still-births is also very high, being 50.2 per 1,000. Comparing these figures with the Aberdeen statistics, we find that the percentage of deaths due to all causes among the mothers with live-births was 3.9, while that among mothers with still-births was 32.3, while sepsis accounted for 1.3 and 3.9, respectively. If this table emphasizes anything at all, it is the need for efficient antenatal care and for the proper conduct of delivery.

PUERPERAL SEPSIS.

The role of puerperal sepsis in the causation of maternal mortality has been widely recognized; in fact, it has been accepted as one of the crying stigmas of modern obstetric practice, that in spite of all the improvements that have taken place in regard to the technique, aseptic and antiseptic, of modern surgery, and in spite of all our modern knowledge as regards causative factors and the modes of prevention of puerperal sepsis, little or no material improvement has so far taken place in the incidence of puerperal sepsis. Thus, the Departmental Committee of the Ministry of Health in Great Britain report that sepsis played the dominant part in maternal mortality returns, and that in the whole series of 4,655 deaths directly due to child-birth, no less than 1,727, or 37.1 per cent of the deaths were due to this single factor. An analysis of our statistics goes to show that 115 out of the 436 deaths were due to puerperal sepsis alone, while in 24 other cases it was also a co-existing condition. Classified according to the mode of delivery of the 115 deaths primarily due to puerperal sepsis, we find the following results:—

Natural process (vertex and breech)	...	...	...	75
Forceps	...	...	...	27
Failed forceps and version	...	...	...	1
Version	...	...	...	4
Manual removal of placenta	...	...	...	4
Forceps and manual removal of placenta	...	...	...	1
Forceps and natural symphysiotomy	...	...	...	1
Failed forceps and manual removal of placenta	...	...	...	1
Unknown	...	...	...	1

115

A classification according to parity of these 115 deaths shows:—

Para.	Deaths.	Para.	Deaths.
I.	47	IX	1
II	9	X	1
III	13	XII	1
IV	15	Unknown	1
V	4		
VI	10		
VII	5		
VIII	2		

That over a third of the deaths should have occurred in primiparæ, proves how much more the risks of prolonged labour add materially to the incidence of puerperal sepsis, when unfavourable or faulty technique is employed. One must however confess that the larger incidence proportionately of deaths from puerperal sepsis in the II, III and IV paræ can only be ascribed to some defects inherent in those responsible for the delivery. As in these cases the labour terminated in the majority of them through natural powers, puerperal sepsis should never have played any part in the causation of the mortality.

While these statistics give us an idea of the mortality directly referable to puerperal sepsis, they do not by any means give us an indication as to the incidence of puerperal sepsis among the women confined. In the absence of any provision for the notification of puerperal fever and in the absence of any reliable statistics as to the incidence of morbidity among the women who are delivered, it is impossible to state with any definiteness how many of these cases really run the risks of puerperal sepsis. In England, however, there is a definite provision for this purpose. Puerperal fever was made a notifiable disease under the Infectious Diseases Act of 1889. This Act however contained no definition of the conditions covered by the term 'puerperal fever' and notification was imperfectly carried out. After the issue of the report on Maternal Mortality by Dame Janet Campbell in 1924, and the discussions of the Obstetric Conference held in London, the desirability of further information and improved opportunities for action became evident. In 1926, 'Puerperal Pyrexia' defined as "any febrile condition occurring in a woman within 21 days after child-birth or miscarriage in which a temperature of 100.4° F., or more has been sustained during a period of 24 hours, or has recurred during that period" was added to the list of notifiable diseases by the Public Health Notification of Puerperal Fever and Puerperal Pyrexia Regulations, 1926. Under existing conditions, it is vain to hope for any such notification becoming a practicable measure through the legislature of this country. But that the problem of puerperal sepsis requires to be tackled very seriously, if there is to be any improvement in the incidence of maternal mortality, needs no emphasis. At the same time, the problem of puerperal sepsis in regard to institutions is one that has got to be seriously tackled and this aspect of the question will be dealt with in a separate part of this report.

MATERNAL MORTALITY IN RESPECT OF THE SEVERAL DIVISIONS OF THE CITY.

An interesting analysis of the different causes of death in the different divisions of the Corporation of Madras, together with the total number of births and the total number of deaths of women between the ages of 12 and 50, will be found in the table (XVII) appended below.

Table XVII.

Number of births (live and still)—26,207.

Municipal division.	Cause of death.										
	Abortions.		Hæmorrhages.		Toxæmia of pregnancy.						Anæmia of pregnancy.
	Puerperal sepsis.	Other than septic.	Accidental.	Placenta prævia.	Postpartum hæmorrhage.	Accidents of labour.	Eclampsia.	Nephretic toxæmia.	Acute yellow atrophy of liver.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
I	5	2	2	1	1	1	1	4	1	1	1
II	5	2	2	1	1	3	2	3	1	1	4
III	3	2	2	1	1	4	1	1	1	1	1
IV	8	2	1	1	1	2	1	1	1	1	2
V	4	1	1	1	1	1	1	1	1	1	1
VI	2	1	1	1	1	1	1	1	1	1	1
VII	2	1	1	1	1	1	1	1	1	1	1
VIII	1	1	1	1	1	1	1	1	1	1	1
IX	4	1	1	1	1	1	1	1	1	1	1
X	4	1	1	1	1	1	1	1	1	1	1
XI	1	1	1	1	1	1	1	1	1	1	1
XII	6	1	1	1	1	2	1	1	1	1	1
XIII	2	1	1	1	1	1	1	1	1	1	1
XIV	1	1	1	1	1	1	1	1	1	1	1
XV	3	1	1	1	1	1	1	1	1	1	1
XVI	5	1	1	1	1	5	1	2	1	1	1
XVII	3	1	1	1	1	2	1	1	1	1	1
XVIII	1	1	1	1	1	1	1	1	1	1	1
XIX	14	1	1	1	1	3	6	2	1	1	1
XX	4	1	1	1	1	2	1	3	1	1	1
XXI	3	1	1	1	1	3	1	3	1	1	1
XXII	7	1	1	1	1	3	1	3	1	1	1
XXIII	7	1	1	1	1	3	1	3	1	1	1
XXIV	6	1	1	1	1	3	1	3	1	1	1
XXV	1	1	1	1	1	3	1	3	1	1	1
XXVI	2	1	1	1	1	3	1	3	1	1	1
XXVII	1	1	1	1	1	3	1	3	1	1	1
XXVIII	1	1	1	1	1	3	1	3	1	1	1
XXIX	3	1	1	1	1	3	1	3	1	1	1
XXX	1	1	1	1	1	3	1	3	1	1	1
(Unknown)	3	1	1	1	1	3	1	3	1	1	1

Table XVII—cont.

Municipal division.	Cause of death—cont.							Total maternal deaths—436.			
	Cause of death—cont.		Cause of death—cont.		Cause of death—cont.			Total births (live and still, registered).	Maternal mortality per 1,000 births.	Total number of deaths of women between 12 and 50 years of age.	Deaths among cases coming from outside the city.
	Other diseases and accidents of pregnancy.	Puerperal embolism and sudden deaths.	Other diseases of puerperium.	Ecto pig gestation.	Total deaths.	Total births (live and still, registered).	Maternal mortality per 1,000 births.				
(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
I	2	1	1	1	12	898	13.4	77	1	77	1
II	4	1	1	1	30	1,357	22.8	149	18	149	18
III	3	1	1	1	21	1,123	18.8	152	18	152	18
IV	3	1	1	1	21	904	23.2	141	18	141	18
V	1	1	1	1	8	295	27.1	44	18	44	18
VI	1	1	1	1	7	447	15.7	43	18	43	18
VII	1	1	1	1	6	459	13.1	61	18	61	18
VIII	1	1	1	1	6	184	10.8	26	18	26	18
IX	1	1	1	1	15	772	19.4	12	18	12	18
X	1	1	1	1	13	776	17.0	155	18	155	18
XI	1	1	1	1	8	179	44.7	39	18	39	18
XII	3	1	1	1	19	895	21.2	112	18	112	18
XIII	1	1	1	1	11	718	15.3	68	18	68	18
XIV	1	1	1	1	2	107	18.7	51	18	51	18
XV	1	1	1	1	12	603	19.9	94	18	94	18
XVI	1	1	1	1	19	1,713	11.1	173	18	173	18
XVII	3	1	1	1	20	1,295	15.4	139	18	139	18
XVIII	3	1	1	1	15	1,134	13.2	121	18	121	18
XIX	5	1	1	1	7	791	9.1	106	18	106	18
XX	5	1	1	1	44	1,546	28.5	175	18	175	18
XXI	1	1	1	1	13	878	14.8	92	18	92	18
XXII	2	1	1	1	14	981	14.3	97	18	97	18
XXIII	5	1	1	1	21	1,218	17.2	149	18	149	18
XXIV	3	1	1	1	21	1,370	15.3	178	18	178	18
XXV	2	1	1	1	15	801	18.7	86	18	86	18
XXVI	2	1	1	1	9	755	11.9	74	18	74	18
XXVII	1	1	1	1	8	852	10.6	102	18	102	18
XXVIII	1	1	1	1	8	1,143	7.0	127	18	127	18
XXIX	2	1	1	1	11	1,249	8.8	112	18	112	18
XXX	5	1	1	1	14	774	11.6	73	18	73	18
(Unknown)	5	1	1	1	26,207	26,207	11.6	73	18	73	18

PART III.

THE ROLE OF MATERNITY INSTITUTIONS IN THE PREVENTION OF MATERNAL MORTALITY.

In the consideration of the problem of maternal mortality in any city, the large part played by well-equipped maternity institutions has naturally a considerable bearing upon several aspects of the question. It is becoming increasingly clear that institutional treatment is the only safe method to be adopted in the care of the pregnant and parturient women in certain types of conditions. No emphasis need be laid to-day on the necessity, for instance, of institutional methods of treatment in severe types of toxæmia, in cases of hæmorrhage in the later months of pregnancy, in complicated labours and in those border-line cases of difficult labour where so much of judgment, care and frequent attention are needed for a safe delivery. It is possible that occasionally, in well-to-do circumstances, a patient may have the facilities and command the necessary convenience which institutions may afford, but even here the limitations are well known and anyone connected with institutions and accustomed to both institutional methods of treatment and treatment as carried out in private homes, will be willing to confess that in several types of cases, the institutional method is the safest, and with a very large number of the class of patients who can neither afford nor command the facilities necessary, the only safe place is the institution. It would therefore appear that a problem which has always to be confronted is the efficiency and the sufficiency of institutional accommodation for such complicated cases.

Fortunately, in the City of Madras, we have several maternity institutions, and if one were to judge of the facilities available here, one may say that in no other city in India, and probably in few cities even elsewhere, are such facilities available for the pregnant and parturient women. There are five maternity institutions in the City of Madras, which are conducting a large number of cases, namely :—

- (1) The Government Hospital for Women and Children, Egmore.
- (2) The Raja Sir Ramaswami Mudaliyar Lying-in Hospital, Rayapuram.
- (3) The Government Victoria Caste and Gosha Hospital, Triplicane.
- (4) The Christina Rainy Mission Hospital, Tondiarpet.
- (5) The Kalyani Hospital, Mylapore.

Besides these, there is a maternity block attached to the Hospital of the Government School of Indian Medicine. The total

number of confinements per year will be noted from the following table which provides the figures for 1931 :—

(1) Government Hospital for Women and Children.	3,889
(2) Raja Sir Ramaswami Hospital	2,361
(3) The Victoria Gosha Hospital	1,874
(4) Christina Rainy Hospital	728
(5) Kalyani Hospital	...
(6) Government School of Indian Medicine	332

The percentage of cases conducted through institutions as compared with the total number of confinements in the City for the last ten years is as follows :—

1923	...	28.8	1928	...	32.5
1924	...	28.5	1929	...	34.01
1925	...	30.0	1930	...	30.09
1926	...	29.8	1931	...	29.94
1927	...	32.6			

It would thus be apparent that a large part is played by the institutions themselves in attending to the needs of the pregnant and parturient women. How far the facilities afforded by these institutions are availed of either by the patients themselves or by the various organizations which are to cater to the requirements of the patients will be examined a little later.

The extent to which a maternity institution would be helpful in any scheme of maternity relief and for a reduction of maternal mortality, depends upon several factors. A modern maternity institution should have the following provisions, if it is to work efficiently in all its branches :—

(1) *Out-patients.*—An *antenatal clinic* wherein pregnant women receive periodic advice and treatment, if necessary. The clinic may be run on specified days of the week, on two or three days, and the pregnant women should be encouraged to attend this clinic as far as possible. A more important use of an antenatal clinic attached to a big maternity institution would be its use as a consultation antenatal clinic so that cases may be referred either by practitioners or by other antenatal clinics for thorough examination and expert advice.

(2) *A postnatal clinic*, wherein some of the cases delivered in the institutions would be followed postnatally, if necessary, and where patients, after confinement, may seek advice or treatment for any postnatal complication.

In-patients.—Here, the biggest problem is how to deal with the cases of puerperal sepsis, and with abortions. It has been well recognized that no care can be adequate in the vigilance that is to be exercised in the prevention of puerperal sepsis in maternity institutions. A questionnaire sent out to the different institutions in the City elicited the fact that within the last five years at any rate, no outbreak of puerperal sepsis had been noted; but it was not at all certain whether there might not have been some spread of puerperal infection occasionally, due to factors incidental to the

overcrowding of the wards and the lack of thorough and proper segregation of different types of cases. This aspect of institutional development is receiving increasing attention in other countries. To such an extent has the segregation of puerperal sepsis been carried out, that in several of the maternity institutions in the West, no case of puerperal sepsis is allowed to remain in the maternity hospital, and in several corporations, such as, Liverpool, Manchester, Edinburgh, etc., the moment a case of puerperal sepsis is recognized in a maternity institution, such a case is transferred to the infectious diseases hospital and placed under the care of the medical officer in charge. It is a question for argument whether this is the best method of dealing with the cases of puerperal sepsis. It may be, that, from the point of view of the other patients, such a course may possibly commend itself to some; but at the same time, it is not at all certain that the transference of cases of puerperal sepsis to an infectious diseases hospital is best calculated to improve the possibilities of the patient's survival or ultimate recovery. A method that has been adopted very successfully during the past 25 years in the Government Hospital for Women and Children, Madras, is one that is well worth considering. Here, any case of puerperal sepsis or any 'possible' or 'suspect' case of sepsis, before or after delivery, is segregated to a separate pavilion in the hospital in charge of a separate medical and nursing staff, so that there is very little possibility of communication between the two, and it may be said that one method of preventing the spread of puerperal sepsis has thus been afforded. But the problem does not end here. For a thorough and rational outline of the methods of prevention of puerperal sepsis, the following accommodation is necessary:—

- (1) A separate delivery ward for 'clean' cases.
- (2) A separate puerperal ward for 'clean' cases.
- (3) Separate delivery cubicles for 'suspect' and frankly 'septic' cases.
- (4) Separate puerperal wards for 'suspect' and 'septic' cases.
- (5) Separate wards for cases of abortions, both delivery and puerperal.

The last requires some emphasis. It is now well recognized that cases of abortion should not be mixed up with general puerperal cases, or kept in an ordinary labour ward. In fact, in some institutions, it has become a practice to admit cases of abortions into gynæcological wards. A maternity institution cannot work satisfactorily unless all these provisions are available.

The answers to the questionnaire referred to above show that none of the maternity institutions in the City of Madras is fitted up in the ideal manner described above; and while some are in a much better position in the avoidance of puerperal sepsis, others again are in a very difficult position on account of overcrowding and no separate accommodation for 'clean' and 'suspect' or

'septic' cases. This is unfortunate, and it must tend to lower the standards of efficient midwifery work in such institutions. The least that ought to be possible in any maternity institution is separate delivery wards for 'clean' and 'suspect' cases, and separate puerperal wards for these two types of cases. This is a reform which is absolutely necessary.

Yet another reform in the maternity institutions of the City of Madras, which seems equally called for, is the prevention of overcrowding in puerperal wards. In one of the main maternity hospitals, with an accommodation of only 50 beds, the daily average is stated to be 70, and there are not separate delivery wards or separate puerperal wards for 'clean' and 'suspect' cases; neither are abortions kept separately from other puerperal cases. With such congestion, it is not at all difficult to surmise the extreme handicaps under which the staff will have to work in dealing with such large number of cases. The effect of this overcrowding is probably apparent from the following table pertaining to the Raja Sir Ramaswami Mudaliyar Lying-in Hospital:—

Year.	Total number of deliveries.	Total number of maternal deaths.	Deaths due to sepsis.
1922	1,776	37	5
1923	1,747	43	3
1924	1,847	44	5
1925	2,047	49	8
1926	1,601	31	7
1927	2,082	28	7
1928	2,104	40	10
1929	2,018	44	12
1930	2,357	40	11
1931	2,361	57	19

In another hospital, it is stated that both 'clean' and 'septic' cases are attended to in the same labour ward, in which cases of abortion—whether clean or septic—are also attended to. Conditions such as these preclude an efficient maternity service to the very class of patients to whom everything conducive to a safe delivery should be made possible.

A factor of considerable importance in reducing maternal mortality in institutions is also the encouragement of what may be called "booked" cases, as opposed to emergency cases. In all western countries, maternity institutions are now more and more concentrating upon the possibility of increasing the number of "booked" cases and discouraging emergency cases except such as may be sent in by doctors or midwives. The advantage in the "booked" cases is obvious. The cases are examined, advised and are under supervision, so that the antenatal care is sufficient and whatever difficulties may arise in the course of labour are difficulties that probably have been anticipated and are therefore much better dealt with. Unfortunately, in all the maternity institutions in the City, the booked cases are comparatively few, and the very

A comparison may here be instituted between the figures of the Government Hospital for Women and Children, Madras, and a large maternity hospital like the Glasgow Maternity Hospital. The following table gives the percentage mortality in the two hospitals :—

Glasgow Maternity Hospital.				Government Hospital for Women and Children, Madras.		
Year.	Total cases.	Total deaths.	Percentage mortality.	Total cases.	Total deaths.	Percentage mortality.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1926	3,653	97	2.7	..	..	..
1927	3,902	97	2.5	3,162	50	1.58
1928	3,941	108	2.7	3,100	55	1.77
1929	3,841	114	2.9	2,894	70	2.42
1930	4,469	120	2.7	3,311	67	2.02
1931	..	..	..	3,389	84	2.51

Any comparison of mortality figures between one hospital and another is not possible without a closer reference to the type of cases admitted. The chief factors that influence mortality in maternity institutions are undoubtedly the number of abnormal cases admitted to the hospital and the stage at which several of these cases are admitted. In the Glasgow Maternity Hospital, the number of abnormal cases seems to be very high—58 per cent in 1926 and 70 per cent in 1930. In the Government Hospital for Women and Children, Madras, the number of abnormal cases may be said to vary between 35 and 65 per cent. With regard to some of the complications or operative deliveries, the following table which shows the figures for five years in the two institutions, will also be found interesting:

Glasgow Maternity Hospital.					Government Hospital for Women and Children, Madras.					
Caesarean section.	Forceps.	Eclampsia.	Accidental Hemorrhage.	Placenta previa.	Year.	Caesarean section.	Forceps.	Eclampsia.	Accidental Hemorrhage.	Placenta previa.
125	260	66	115	86	1926	..	..	..	..	..
112	239	86	103	66	1927	9	345	41	17	..
127	226	75	131	80	1928	11	271	43	10	13
101	290	93	83	84	1929	14	201	48	14	12
184	297	59	112	94	1930	9	307	72	24	27
..	..	..	..	..	1931	12	322	67	31	18
649	1,312	382	544	419	..	55	1,446	271	96	22

Glasgow Maternity Hospital.												
Year.	Cases under some antenatal supervision.			Emergency cases sent in by doctors or midwives or students.			Women who applied direct (No antenatal supervision).			Total number of		
	Total.	Deaths.	Percentage.	Total.	Deaths.	Percentage.	Total.	Deaths.	Percentage.	Cases in hospital.	Deaths.	Total percentage mortality.
1926	1,785	27	1.5	1,226	60	4.9	642	10	1.6	3,653	97	2.7
1927	1,616	10	1.2	1,571	70	4.6	765	8	1.0	3,902	97	2.5
1928	1,612	22	1.3	1,496	79	5.2	833	7	1.8	3,941	108	2.7
1929	1,347	13	0.9	1,671	88	5.2	823	13	1.6	3,841	114	2.9
1930	1,790	23	1.3	1,934	85	4.4	745	12	1.6	4,469	120	2.7

The following table shows the details of the cases at the Glasgow Maternity Hospital during the quinquennial period 1926-30 showing the primary avoidable factor in these fatal cases:—

	Lack of ante-natal care.	Negligence of patients or friends.	Intercurrent diseases.	Error of judgment or faulty technique.	Unavoidable diseases of pregnancy.	Total.
Obstetrical complications ..	15	2	1	4	14	58
Accidental hæmorrhage ..	4	3	1	11	4	11
Placenta prævia ..	16	3	1	2	11	30
Postpartum hæmorrhage ..	1	3	3	2	2	6
Puerperal sepsis ..	1	12	3	29	2	90
Toxæmias of pregnancy	1	36	36	..	..	140
Heart disease ..	..	1	13	..	..	36
Pulmonary complications ..	..	..	1	..	0	19
Embolism and thrombosis ..	..	..	..	..	10	11
Abortion ..	..	..	..	..	15	28
Miscellaneous ..	6	1	0	2	..	33
Anæsthetic deaths ..	..	..	..	..	6	..
Total ..	165	38	64	66	133	466

It is interesting to note once again that in deaths in an institution such as the Glasgow Maternity Hospital, nearly a third of the deaths were due to antenatal care not having been given before

admission. One hundred and nine out of the 165 cases in this group are due to toxæmia of pregnancy, that is, 66.5 per cent. Viewed from another angle, it will be observed that there were 140 fatalities in all from toxæmias of pregnancy and 109 of these, that is, 77.8 per cent were due to lack of antenatal care.

The figures quoted here are those given by Munro-Kerr and MacLennan in an article contributed to the "Lancet" of March 19, 1932. Referring to faulty judgment or technique, they state that 66 of the deaths could be attributed to this cause, that is, 14 per cent. As Munro-Kerr observes:—

"Suffice it to say that midwives, general practitioners and obstetric specialists being fallible, contribute to institutional fatalities by their occasional errors of judgment. Putting aside personal skill, it is absolutely essential to refrain from difficult obstetric operations in inadequate surroundings."

Applying a similar standard to the quinquennial period 1926 to 1930, at the Government Hospital for Women and Children, Madras, the following table shows the primary avoidable factor:—

(1)	(2) Lack of ante-natal care.	(3) Negligence of patients or friends.	(4) Inter-current diseases.	(5) Error of judgment or faulty technique.	(6) Unavoidable diseases of pregnancy.	(7) Total.
Obstetric complications	4	3	1	15	10	33
Accidental hæmorrhage.	2	2	1	1	1	5
Placenta prævia	1	3	1	1	1	7
Postpartum hæmorrhage	1	3	1	2	4	11
Puerperal sepsis	6	9	2	2	3	13
Toxæmias of pregnancy	48	9	2	2	3	65
Abortions	8	7	1	3	16	35
Miscellaneous	8	7	1	3	16	35
	70	36	6	28	47	187

These studies are interesting and serve to show that improvement in regard to maternal mortality must result from a combined effort in every direction, both institutional and otherwise, and no care can be too great which contributes towards an efficient maternity service, whether in the institutions themselves or under other surroundings. One point, however, may be stressed, that institutions, tending as they do to draw the more serious types of cases, must necessarily contribute occasionally to a certain percentage of maternal mortality which may be said to be unavoidable.

PART IV.

THE ROLE OF THE MIDWIFE IN THE PREVENTION OF MATERNAL MORTALITY.

There is no doubt that one of the most important factors to be taken into consideration in all steps that may be taken to combat the heavy incidence of maternal mortality is the midwife. This has been appreciated in all countries, as midwifery should necessarily be very largely in the hands of trained midwives and what is more important, experience has proved in all the countries that the larger the share of the midwife in the conduct of midwifery, the better are the results available. In a comprehensive survey of maternal mortality in the City of Madras, therefore, one has necessarily to take into consideration the part played by the midwife. For the present, the practice in the City of Madras is largely in the hands of trained midwives, thanks to the scheme of maternity and child welfare inaugurated by the Corporation fifteen years ago. A few handy women, or "barber midwives" are still pursuing their practice more vigorously in some places than in others. This aspect of the question will be dealt with separately and for the present, we shall concentrate our attention upon the trained midwife and the place she occupies in any scheme of maternity service.

THE TRAINING OF MIDWIVES.

There are three classes of midwives that are at present trained in several of the institutions which act as training centres in Midwifery:—

- (1) Fully trained nurses who come for a period of six months and get themselves trained with English as their medium of instruction in certain well-organized maternity institutions.
- (2) Midwives who are trained for one year with a preliminary qualification generally up to the VI Form, in English, and who have had no previous training in nursing.
- (3) Midwives who are trained for a period of one year in the vernacular, with a preliminary qualification of reading and writing in the vernacular fluently.

After the passing of the Nurses and Midwives Act, a certain amount of inspection has been carried on and centres are being recognized for these different purposes; and recently a proposal has been accepted by the Government whereby the third class of midwives, the vernacular-midwives, will be expected to satisfy a higher standard of general education before they are accepted for training.

THE CITY MIDWIFE.

In the City of Madras, it is noticed that the bulk of Midwifery practice is in the hands of classes (2) and (3), that is, the pure midwife. Very few of the nurse-midwives have taken to the practice of midwifery, partly because of the more exacting nature of the duties, partly because of the less remunerative posts offered to them. Excepting those employed in hospitals, filling the role of midwives, there are not a large number of nurse-midwives who are actively practising the profession in the City of Madras. The conditions of service of the municipal midwife being what they are, it is impossible for anybody who holds the qualification of nurse-midwife to come forward to any of these posts and perform the duties thereof. The result has been that midwifery as conducted by the midwife at present in the City of Madras, cannot be said to be ideal and the analysis submitted in an earlier chapter as to the primary avoidable factor, bears out the truth of this statement that the midwifery service needs to be improved with a view to making it much more efficient.

THE REPLACEMENT OF THE UNTRAINED MIDWIFE.

From another point of view, the question deserves very serious consideration. Whatever may be the virtue of the untrained or hereditary "barber midwife," there can be no gainsaying that there are definite risks run, risks in particular of puerperal sepsis and occasionally other dangers which cannot possibly be minimised; and anyone who knows and has had experience of midwifery practice for some time, must admit that in an ideal state of maternity service, there is no place for the untrained midwife. The replacement of the untrained midwife has been a big problem in all countries, and is bound to be a bigger problem in India, where again sentiment and extraneous considerations are likely to play a large part in any attempt at such replacement. The only probable manner in which the untrained midwife could be effectively supplanted, is by a practical demonstration of the virtues of efficient midwifery as practised by the trained midwife and a clear realization by the general public of the advantages of clean midwifery available at the hands of the trained midwife. Looked at from this point of view, one is at once struck by the fact that the progress of midwifery, as we understand it, is intimately connected with the efficiency and progress of the trained midwife, and no steps calculated to improve the efficiency and training of the trained midwife would be considered superfluous or unnecessary. To the extent to which a well-trained, well-equipped, and well-organized set of midwives are allowed to go out into the country to practice modern methods of midwifery and carry the message of aseptic and antiseptic midwifery, to that extent will we be undermining the influence of the untrained midwife and effectively hastening the event when such untrained midwives will be a thing of the past. With these objects kept in view, a study of maternal mortality statistics in the City and

perhaps even more in the mufassal, at once reveals the urgent necessity of improving the training of midwives.

TRAINING IN OTHER COUNTRIES.

For a correct appreciation as to the necessity for improving such a training and the methods by which the training should be improved, it would be as well to turn to other civilized countries where considerable progress has been made as regards improved facilities and improved methods of training of the midwife. The problem is one which faces Great Britain to-day; and the final report of the Departmental Committee on Maternal Mortality and Morbidity appointed by the Ministry of Health, affords interesting reading as to the need for improving the training and the steps that might be contemplated. Dame Janet Campbell has in her brochure on the "Protection of Motherhood" referred to the same subject, and has discussed elaborately the need for such training. "Since May 1926, it has been necessary for a pupil-midwife who is a nurse to undergo a training of one year before she can sit for the Central Midwives Board Certificate. In extending the period of training, the Central Midwives Board took the opportunity of widening the curriculum and of requiring experience of practical midwifery under both in-patient and out-patient conditions. The midwife is now trained in the antenatal supervision of the patient as far as this can properly be exercised by her and greater attention is paid to postnatal conditions such as the management of breast feeding, the care of the infant and such abnormal conditions as puerperal fever, venereal disease, ophthalmia neonatorum. More recently, the Board have made further requirements on the antenatal examination of all patients and midwives are now expected to keep a record of their findings."

She goes on: "It can confidently be asserted that midwives as a whole are doing excellent work; yet we cannot be content to accept even the present midwifery training as wholly adequate and we trust that eventually it may still further be extended and improved until it is at least equal to the training given in the best midwifery schools in, say, France, or Holland or Denmark. The equipment of the English midwife should be second to none in Europe." These remarks were written in 1927, and it is a matter to note that the Departmental Committee who submitted their report in 1932, have also been struck with the fact that there is need for improving the training of midwives in Great Britain. One can only say that the need is much greater in India, where conditions of practice of the midwife are such that more heavy responsibilities fall upon her and she is asked to take quick decisions sometimes, because of the impossibility of getting medical aid, sometimes because of the disinclination on the part of the relatives to get further help. In fact, the point requires to be noted that conditions in Southern India, even in the City of Madras, are such that Midwifery practice in India is largely akin to the practice say, in the Cantons of Switzerland or of Sweden, where it is

maintained that owing to the inaccessibility of places, the midwife has necessarily to function as something more than the midwife in other countries and has to be self-reliant to a much greater degree because of the impossibility of getting medical aid. This aspect of the question should be considered in all attempts at improving the training of midwife. Not till the training centres are in a position to let loose among the general public midwives so thoroughly trained that they can stand by themselves in many of the difficult problems of midwifery, and have such an adequate idea of the subject as to recognize early the dangers incidental or likely to arise, can midwifery practice make some headway in India and the midwife get to be much more popular than she is at present.

TRAINING IN CONTINENTAL COUNTRIES.

Let us for one moment compare the training that exists in India with the training of midwives in certain of the Continental countries, where the maternal mortality rate has indeed been very much less than even in Great Britain.

Netherlands, Denmark and Sweden.—A common feature of these three countries may at first be stated. The training of midwifery takes place in State provided or State aided schools, few in number, well-equipped and staffed by teachers of professional rank. It is a legal requirement that the authorities in each health area shall appoint the number of midwives necessary for efficient attendance and only the number likely to be required is admitted for training. In the Netherlands, the training occupies three years. There are three training schools for Midwifery, one at Amsterdam, one at Rotterdam and the third at Hærlém. Before admission to the school, the applicants must pass a Government entrance examination; they are selected in order of merit and in this selection, attention is paid to the general appearance and carriage of the aspirant. The training schools at Amsterdam and Rotterdam are under Government control and training is free. In the Catholic School at Hærlém, fees are charged. As has been stated above, the training is concentrated in a small number of schools, specially set aside and specially staffed for this sole purpose. The midwifery schools are distinct from those concerned with the training of medical students. This denotes a great difference between the Dutch and the British system, for in the latter the training is carried out in a large number of schools of greatly differing size and efficiency, in many of which the training of medical students and midwives together implies a continuous mutual competition for clinical cases, the number of which is usually restricted and insufficient for the couple purpose. The remarks with regard to the British system hold good *mutatis mutandis* to the Indian system in a very large measure. Secondly, in the Netherlands, we do not witness the phenomenon so common in Great Britain and becoming increasingly common in Southern India where a nurse with general training takes her diploma in midwifery, although she may have no intention of ultimately

practising as a midwife. In Holland, few generally trained women aspire to become midwives, and those only enter the midwifery training school who propose to devote their lives to the work. The training, both theoretical and practical, is well planned and the fact that three years are allotted implies that in Holland the standard of knowledge and skill of the midwife is of an exceptionally high order and has enabled her in after life to occupy a position of outstanding importance in the midwifery service of the country. In the first year the instruction is largely theoretical, comprising physics, chemistry, anatomy, physiology, bacteriology and obstetrics; the practical and clinical work commences in the second year and after passing an examination, the pupil is allowed in the third year to attend cases outside the hospital under the supervision of a midwife. A point of importance is the amount of attention paid to antenatal supervision and the midwife is instructed in the taking and in the significance to be attached to the blood pressure. Midwives in the Netherlands are restricted to call a doctor on the discovery of any abnormalities before, during or after labour. They are not permitted to send a case to the hospital on their own initiative.

Denmark.—It is the custom in Denmark for normal midwifery to be conducted by midwives in the patients' homes, general practitioners taking normal cases only if the midwife is not available. In cases of abnormality, the midwife calls in a general practitioner who sends all except the slightest to hospital. The training is conducted in a single hospital, the Rigs Hospital in Copenhagen which is the only school in Midwifery in Denmark and the teaching has since 1910 been in the hands of Professor Hauch, an eminent obstetrician and a man with great enthusiasm for the work. The midwifery service of the country owes a great deal of its efficiency to his personality and the centralization of the teaching makes for uniformity in the practice of midwives which eases the task of their supervision when they have left the training school. There are a large number of applicants but only the number necessary to keep up the supply are admitted for training. The course extends for two years and terminates with an examination after which the pupil takes the modified form of Hippocratic oath and is qualified to practice. It is emphasised that the most important part of the midwife's training is to give her such a thorough teaching in the use of antiseptics that she develops a conscience which will not allow her to become careless when she is no longer under observation. During their two years' residence in the Rigs Hospital, an average number of 300 deliveries take place in the wards devoted to the training of midwives and many of the pupils personally deliver over 100 cases besides watching and attending clinical demonstrations on other normal or abnormal cases. The holding of a midwife's qualification is not considered necessary or even advisable for general nurses—in fact, the midwife's profession is looked upon as entirely distinct from that of

nursing—an arrangement which effects an obvious economy in opportunities for practical instruction.

Sweden.—Owing to the geographical conditions prevailing in this country, with the difficulty of communication in large tracts and the uncertainty or even impossibility of obtaining medical assistance, the necessity for the midwife's training being exceptionally thorough has been well realized. There are only two schools for midwives in Sweden situated in Stockholm and in Gothenburg. They are supported by Government subsidies and form integral parts of the large maternity hospitals belonging to these towns. The training in each is controlled by a wholetime professor with the help of two or more assistant obstetricians and of the head midwife. The period of instruction lasts for two years, with an examination at the end of the first year as well as at the end of the course. About 25 new pupils are entered yearly at each school and there is an excess of applicants who are chiefly country girls of the yeoman class. Candidates must have completed the primary school course and passed the simple test in general knowledge before admission. The teachers however are anxious to raise the standard of general education. All candidates entering have the intention to practise as midwives. Very few trained nurses take the course and they are excused the first six months of the midwifery training, so that even a trained nurse in Sweden has to put in 18 months of the training, the practical work of the pupils is divided between the labour and lying-in wards. All deliveries take place under supervision of either the head midwife or a trained sister and from 100 to 125 cases are personally conducted by each pupil. Two review courses of two weeks each at stated intervals are compulsory before the midwife has reached the age of 50. These take place at the public midwifery schools, the clinics of the Universities of Lund and Upsala and of the maternity hospitals at Norrköping and Malmö.

THE FUTURE TRAINING OF THE MIDWIFE.

From what has been described above, it will be evident that the training given to midwives in this country is neither sufficient nor efficient and is in need of some radical changes. How far it would be possible to give effect to such changes, is a possibility for consideration by the authorities concerned. But a few observations on some aspects connected with the training of midwives particularly in view of the information regarding training in other countries given above, would not be out of place here. It is, however, to be hoped that even though the suggestions contained here may not be immediately put into operation, it would be possible for some responsible body to consider these suggestions and to frame such rules as may eventually improve the standard of training and efficiency of the midwives, on whom will eventually fall the burden of popularizing modern methods of midwifery.

Training centres.—Sufficient emphasis cannot be laid on the fact that the most important point in the consideration of the

training of midwives, is the training centre and its equipment. Unfortunately in Southern India, as in Great Britain, there is little or no State control, and a number of training centres have sprung up which could only be regarded by a stretch of imagination as coming anywhere under the category of training centres. Moreover, the impression has spread that any hospital can become a training centre in midwifery and all that is required is to arrive by a mathematical calculation at a figure which represents the number of midwives to be trained calculated *pro rata* on the total number of cases confined in the institution. It is respectfully submitted that this, by no means, connotes the possibility of giving efficient training or even any training worth the name. A great deal more is, and should be expected from a training centre. Its equipment, personnel, variety of complicated cases, opportunities of seeing difficult obstetric operations, are all factors which should be taken into consideration in determining the suitability or otherwise of a training centre. The Continental system has undoubtedly a great many advantages in this respect over the British system, for in the countries mentioned above, the number of centres are strictly limited and they are either State or State-controlled teaching centres. In Denmark, for instance, there is only one school for midwifery, and the centralization of the teaching, according to the report, "makes for uniformity in the practice of midwives, which eases the task of their supervision when they have left the training school." The equipment and personnel required for the staffing of such training centres is a matter worth consideration and the impression that anyone, particularly any medical practitioner, is inevitably competent to teach and direct the studies of midwives, is one that requires to be altered to some extent. Efficient training will only be possible with a few centres, well staffed for teaching purposes, well-equipped for demonstration purposes, and well-attended by patients for purposes of clinical instruction to the midwives concerned.

THE PRELIMINARY QUALIFICATION OF THE MIDWIFERY PUPIL.

In recent years, great advance has been made in regard to the preliminary educational standards required of midwives. Whether the training is through the English language or through the vernaculars, care has to be taken to see that the pupils selected for training have the necessary intellectual equipment and some amount of alertness, confidence and character, together with the physical stamina to stand the hard strain of midwifery practice. It is a matter for consideration whether attempts should not be made to see that only those who are likely to practise the profession in later years are admitted as pupil-midwives. It cannot now be denied that there is a great wastage on account of the fact that a large number of people are trained in midwifery, who have no inclination to practise midwifery, and who perhaps do not contemplate midwifery practice as a career in later life. This aspect of the question becomes even more urgent for consideration when it is realized that in this country there is at present a dearth of

properly trained midwives and the demand should necessarily grow for a class of superiorly trained midwives in years to come. In this connexion, it is relevant to state that the compulsory training of general-trained nurses in midwifery has led to the anomalous position that a number of them are trained who have no idea of practising as midwives in after life, and who take up this additional qualification only as a means of enabling them to obtain certain posts. That their training in midwifery is not in the interests of the midwifery practice of the country cannot be denied; and as they are stipended, it necessarily means that places which could be more usefully filled by those who are likely to practise midwifery, are given to a class of people who cannot and do not promote the extension of the midwifery service of this country either as State paid or privately practising midwives.

THE PERIOD OF THE TRAINING.

In spite of the recent improvements in the length of training of midwives in Great Britain, which again has been copied in this country, there is a feeling that that period is not sufficient for efficient training. At present, generally trained nurses are expected to complete their training in midwifery in six months, while unqualified persons are required to put in a year's attendance. Midwifery being such a wholly specialized branch of medicine, and the practice of midwifery having very little to do with general nursing, the six months training required of general nurses is very inadequate indeed; and inquiries have confirmed the impression that most of the generally trained nurses feel that at the end of their training they have not got the courage to face active midwifery practice and this is the standard by which we must judge of the efficiency of midwifery training. If the experience of Continental countries is at all to be a useful guide to us, it seems very necessary that this period should be improved, and ultimately it should be a two years course for the untrained midwife, and at least one year for the general-trained sick nurse. Any period short of this will not give them opportunities to get familiar with all the details of abnormal midwifery and how to deal with such cases in emergencies.

THE TRAINING OF MIDWIVES.

So far as the training itself is concerned, it has been stated that this should be through those specially qualified to give such training, and it should not at all be possible that any medical practitioner is good enough to teach a midwife what she has to learn. One would go further and say that only those who have had exceptional opportunities of watching the conduct of midwifery as practised by midwives, of realizing their limitations, of visualizing their difficulties—in fact those practical specialists with a good knowledge of the subject and even more of the material which has got to be trained—can be entrusted with this task. For the training, whether it be for a short or long period, to be effective, the whole attention of the pupil-midwife should be directed to the

particular aspect of that subject. This is a point well worth considering in institutions, where perhaps due to paucity of nursing staff, the pupil-midwife has to be allotted work which does not bring her for varying periods, sometimes long, sometimes short, with the actual conduct or care of midwifery cases.

Another point to be emphasized is that every opportunity should be given to pupils under training to witness as many abnormal cases as possible, and on such occasions the clinical teaching that is afforded by a practical explanation of the cases will be of the greatest advantage.

No training can be said to be complete which does not include within its scope training in domiciliary midwifery. However desirable it may be to encourage expectant mothers to enter an institution for their confinement, the majority of women still prefer to be confined at home, if they can. Domiciliary midwifery practice is different from institutional midwifery practice, and unless the midwife under training gets accustomed to the conditions under which she has to carry on her work after training, and to be self-reliant because of the hard difficulties under which she has to practise in domiciliary midwifery, she will find herself very severely handicapped in later years.

POST-GRADUATE COURSES.

Whatever may be the training that may be imparted to midwives, the need for systematic post-graduate instruction to them cannot be too strongly emphasized. Many a midwife who was very good at the time of her training, has deteriorated, imperceptibly perhaps, but almost certainly, at the end of five or ten years, and in the absence of periodic supervision of midwifery practice, the need for post-graduate instruction or "revision courses" in midwifery needs no emphasis. Such revision courses are held, for instance, in Sweden, at stated intervals, and they are compulsory for every midwife before she has reached the age of 50. It is most desirable that efforts should be made in this country to institute such post-graduate courses for midwives, and to make it compulsory at stated periods.

PART V.

GENERAL REMARKS AND SUMMARY OF CONCLUSIONS AND
RECOMMENDATIONS.

We have in the previous pages dealt with the problem of maternal mortality in the City of Madras and compared the figures for this city with figures of other countries and cities. It has been made clear that the problem is even more acute in Madras and Southern India generally, than it is in any of the western countries: and yet, while in most of the western countries, a great many steps have been taken to push on a vigorous working of maternity and child welfare and to find out the causes underlying the heavy incidence of maternal mortality, it cannot be said with any degree of satisfaction that similar steps have been taken on a large scale in this country. The position in regard to the City of Madras, however, is different. It is fortunate in having a well laid out scheme of maternity relief, in having maternity institutions which cater to the needs of a very large population, and in the many amenities it could afford, if properly well organized for the relief of motherhood. The chief drawback is perhaps a lack of organization and concentrated effort to improve certain defects in regard to the working of the scheme.

It may here be stated that the Corporation of Madras have taken steps to set right, to a certain extent, the defects associated with the working of the Child Welfare Scheme. A committee was appointed at the fall of last year, which met several times and has submitted a detailed report as to what they consider the minimum reform needed in the conduct of Maternity and Child Welfare Scheme as carried out under the auspices of the Corporation. The report has been accepted by the council, and it is hoped that ere-long its provisions will be given effect to. This, by itself, will not be sufficient, and it is obvious from what has been stated in previous pages, that a further effort is required in regard to the co-ordination of the various agencies that are calculated to meet the requirements of the situation. It is only by such concerted action, that any definite reduction of maternal mortality can be expected in this city.

Perhaps, one aspect of the problem requires to be emphasized. When we speak of a large number of maternal deaths being preventable, we perhaps mean it in a slightly different sense from what may be understood by preventable diseases usually so-called in public health reports. The difference needs some emphasis. While many of the infectious diseases are preventable, in the sense that large measures calculated to improve the sanitary surroundings and perhaps to deal with the problem as a problem of the community may help in reducing the incidence of such infectious diseases, in regard to maternal mortality, it is individual attention that is required for every single person. The personal factor has therefore to be emphasized, and from that point of view, the problem

of the prevention of maternal mortality is different from the prevention of mortality due to many other diseases. It follows therefore, that in the prevention of maternal mortality, the public health officer, by himself, would not be in a position to do all that is required, if very active co-operation of the practitioners is not available. This point has been well-elaborated in the report of the Chief Medical Officer of the Ministry of Health, Great Britain, for the year 1931. Sir George Newman, discussing the problem of maternal mortality and referring to the report of the Special Committee for investigating into the causes of maternal mortality, states:—

"The outstanding result of the Committee's labours is to demonstrate beyond all doubt, that the crucial and pressing necessity for the solution of this problem is not more elaborate administration, nor even great expenditure, but sound midwifery. Where that is available, be the organization ever so simple, the mortality falls at once. The provision of an elaborate national scheme, and a complex and comprehensive organization, is of no avail and of no security, unless there be competent professional assistance available during pregnancy, at the bedside, at the moment of delivery and afterwards during the puerperium: in a word, antenatal, natal and postnatal supervision. That 'error of judgment' should occur in 40 out of every 100 preventable deaths, is a formidable and an impressive discovery. No administrative scheme can, of itself, change that. That can only be changed by improved midwifery and greater care and skill at the bedside. Not only is this the deliberate and considered opinion of the Committee, but it is within the knowledge of every competent and experienced obstetrician. Moreover, the actual facts which force their attention upon us, confirm this view. There is no possible escape from them. What is being achieved in certain groups of cases, can be achieved in others. Where there is:

- (a) Adequate antenatal supervision,
- (b) skilled midwifery and proper attention to detail at the bedside,
- (c) vigilant postnatal care, and
- (d) hospital treatment, when necessary,

the mortality is a quarter of the national average."

These words, pregnant with meaning, deserve to be emphasized and taken to heart by all those interested in any scheme calculated to lower the maternal mortality. There is a tendency in certain quarters to believe that once antenatal clinics are established, maternity homes are opened out, midwives are entertained, and some sort of maternity service is established in the area concerned, immediately there will be a fall in maternal mortality. On the other hand, if one were to venture to make a submission, pessimistic as it may appear at first sight, there is a danger in rushing through schemes of this nature without the proper personnel and trained staff, and without proper safeguards: it is likely to lead

to disrepute and produce results far from commensurate with the expenditure involved and the pains taken.

Let us next deal with some of the special aspects that deserve some further consideration. It appears that it would be a very useful thing indeed, if, following the example of Aberdeen, a special census were to be taken for the City of Madras. Aberdeen had a special census taken for the year 1924, which, from the public health point of view, was of great value in assessing figures and in drawing correct conclusions. The need for the City of Madras is quite as great. The extent to which overcrowding exists, the special areas that have to be mapped out for city improvement, the problems pertaining to insanitary housing, the extent of maternal and infantile mortality, the bearing of the wage-earning capacity of the individual on certain aspects of maternity and child welfare problem in particular, and the general public health problem in general—these and many other questions can be tackled if a proper survey was made of the City of Madras and a census taken with a view to collect as much of information as possible on relevant points for the consideration of public health questions.

It is unfortunate that in spite of so many years of advance in various directions, the need for carrying on research on a well-organized basis in regard to the many problems pertaining to maternal mortality in the tropics, has not yet been clearly realized. Perhaps there is greater scope in Madras than in other cities for such research work being carried out. There can be no gainsaying that if work of this description is taken on hand, it will produce gratifying results before long. To quote but one example, within the last three years, some research work has been carried on in regard to the anæmias of pregnancy in the Government Hospital for Women and Children, and the direct result of what little work has been done, has been a very considerable improvement in regard to the treatment of this condition and the lessening of the mortality due to this factor. There are many diseases, particularly puerperal sepsis, toxæmias of pregnancy and tropical conditions complicating pregnancy and parturition, where there is a great scope for research and it would be in the fitness of things if such research were carried on in this city. The organization need not be elaborate; a few research scholarships given to brilliant young medical graduates, who will be working under some of the clinical teachers, will certainly produce results not at all disproportionate to the expenditure involved. This is an aspect of the question well-worth consideration at the hands of the Government and the Corporation.

The need for a further investigation of the problem of maternal mortality over a wider area of this Presidency need hardly be emphasized. Now that a preliminary report has been submitted, it is hoped that it would be possible to launch upon a scheme of maternal mortality investigation at least in a large number of municipalities, with the co-operation of the Public Health staff, so that the figures for the next one or two years may be collaborated and useful conclusions drawn therefrom. The appointment of a committee for enquiring into the maternal mortality of a wide area

of the Presidency on lines similar to those of the Committee appointed by the Ministry of Health in Great Britain, will not be inopportune. Fortunately in this Presidency, the net-work of public health organization, so perfect and so widespread, would enable any small committee to get that help and co-operation in regard to investigation of maternal mortality which would undoubtedly be of great assistance in the furtherance of measures calculated to lessen such mortality. Even the very incidence of maternal mortality not being quite correctly estimated according to present conditions of report of vital statistics, such an inquiry would be beneficial from every point of view.

In this connexion, it would be as well to state the desirability of having a uniform standard of vital statistics returns in regard to maternal mortality. At present, the reports, in some cases, do not give any details as to the causes of maternal deaths: in others again, the reports are classified under various groups, so that if the reports from the whole Presidency were to be analysed, it would be difficult from the returns submitted, to draw any figures for the Presidency in a systematised manner. It is submitted for consideration whether it would not be well for this Presidency and for the Corporation to adopt the 'International list' for purposes of maternal mortality classification. The detailed International list, as revised in 1929, is given in Appendix II.

There is another point that deserves consideration. While much may be said for individual hospitals keeping their records in the manner they like best, a plea may here be entered for uniform minimum records in regard to antenatal and maternity cases. This will greatly help a comparative study of the records of the different maternity hospitals. It should be possible to adopt a uniform standard of casetaking for antenatal and maternity cases, such that some of the essential details will be available both for purposes of statistical study, as well as for any study of the problem from the research point of view. If the records, as maintained at present, be not acceptable, it is for consideration whether a small committee cannot go into this question and draw up a case-sheet for antenatal and maternity cases, which could be the basis for adoption by all the hospitals in the Presidency.

A. SUMMARY OF CONCLUSIONS.

1. This report deals with an investigation as to the causes of maternal mortality that occurred during a twelve-month period in the City of Madras, the total number of such deaths being 436, out of a total number of births (live and still) 26,203.

2. A statistical comparison is instituted between the mortality rates of different countries and that of the City of Madras; and it would appear that the mortality rate in the City of Madras is three or four times as great as in any of the countries detailed above.

3. The causes of death have been analysed, and it has been shown that in the case of some of these, the deaths are on the

increase, and the incidence of preventable disease is also on the increase, such as eclampsia.

4. A number of deaths have been returned under the head- 'anæmia of pregnancy' and it is submitted that in some of these cases, hook-worm infection has been a factor.

5. The 'primary avoidable factor' in connexion with all maternal deaths has been investigated on the lines suggested by the Departmental Committee on Maternal Mortality instituted by the Ministry of Health. This gives a percentage of 53.44 deaths attributable to the primary avoidable factor.

6. Some of the social factors connected with maternal mortality have also been investigated and the results outlined.

7. The effect of parity upon maternal mortality has also been discussed, and while it is true that there is a heavier incidence in primiparæ and in the old multiparæ (above the fifth), it is also submitted that one of the most important factors in the production of maternal mortality in multiparæ is the factor spoken of as the spacing of pregnancy. If confinements occur at frequent intervals, there is not much time for the mother to recoup between two pregnancies, and the risks are very much increased.

8. The mortality figures have been analysed in relation to sanitation as well as in relation to the size of the house. It is submitted that the increased congestion in the city has got a bearing upon maternal mortality.

9. Statistics are furnished regarding maternal mortality in relation to the standard of living.

10. The duration of pregnancy in relation to the cause of death has also been analysed, and it was found that a large number of women die before term, and that in several of these cases, tropical diseases are responsible.

11. An analysis of cases of maternal mortality in relation to the general health of the mothers during pregnancy has been given.

12. A statistical analysis of antenatal care in relation to maternal mortality, reveals the interesting fact that in the large majority of cases, there was either no antenatal care, or inadequate antenatal care, which was responsible for the mortality. The need for efficient antenatal care has been emphasized and the directions in which antenatal clinics could best perform their duties have been given.

13. The maternal mortality figures have been analysed showing the nature of attendance at the time of delivery.

14. Figures of mortality in relation to live and still-births have been given.

15. The role of puerperal sepsis in the causation of maternal mortality has been detailed, and lastly maternal mortality figures in respect of the different divisions of the city have also been incorporated.

16. The part played by institutions in any scheme of maternity relief has been emphasized, and the improvements that are necessary with a view to an efficient working of maternity institutions have been detailed. The facilities available in the City of Madras, the number of cases that are actually treated in the different maternity institutions have also been given.

17. The last part deals with the role of the midwife in the prevention of maternal mortality, and the great need that exists for improving their training.

B. SUMMARY OF RECOMMENDATIONS.

1. *Antenatal care.*—This is the primary factor in the prevention of maternal mortality, and the existing antenatal centres require to be thoroughly overhauled and improved along the lines suggested by the Committee recently constituted by the Corporation of Madras. It is also suggested that in the maternity institutions, consultative antenatal clinics should be established which would be in a position to offer advice and assistance both to the antenatal clinics organized by the Corporation, as well as to any cases sent for antenatal advice by practitioners in the city. The need for the provision of sufficient accommodation for antenatal cases in the different maternity institutions is emphasized. Separate antenatal wards should be available in all maternity institutions for the accommodation of antenatal cases requiring institutional treatment. This is not available at present in some maternity institutions and not adequate in practically all of them. This is a direction in which urgent attention is called for.

2. *Puerperal sepsis.*—The heavy incidence of puerperal sepsis necessitates energetic measures being taken to avoid the chances of puerperal infection. This is only possible by more vigorous and rigorous attention being paid to the practising midwives' outfit and her general attitude towards puerperal sepsis. In institutions also, there is urgent need for suitable facilities being afforded for the segregation of the 'suspect' and frankly 'septic' cases, and it ought not to be possible in any maternity institution for cases, 'septic' and 'suspect,' to be confined in the same delivery wards where clean cases are confined. The need for further research in regard to puerperal sepsis is pressing, both in regard to the bacteriological investigation of puerperal sepsis and in regard to the methods of treatment, particularly the role of vitamins in the causation and prevention of puerperal sepsis.

3. *Toxæmias.*—There is great need for attention being bestowed on the early signs of toxæmia, and a routine examination of the urine and the estimation of the blood pressure, should be emphasized on all midwives and practitioners. It should also be particularly noted that in persistent cases, institutional treatment affords perhaps the only safe method of treatment.

4. *Tropical diseases complicating pregnancy.*—A large number of tropical diseases complicate pregnancy, and from this point of view, an investigation into the effects of tropical diseases on

pregnancy is very desirable. Early attention is required in many of these cases and the midwives should be instructed to bring such cases to an antenatal clinic or a maternity institution as soon as possible.

5. The need for some instruction in regard to the prevention of conception in patients suffering from tropical diseases and in those unfortunate women in whom frequent pregnancy has caused considerable deterioration of the health, is also to be noted. Whatever may be the attitude in regard to contraception, and the practicability of any advice on such a topic, it seems that in the lessening of maternal mortality, there is scope for a limited advice to be given to mothers in regard to the dangers incidental to pregnancy under certain conditions and the need for avoiding conception if the life of the mother is not unnecessarily to be risked.

6. *The housing problem.*—One of the most acute problems in the City of Madras is undoubtedly the housing problems. The amount of congestion that is prevalent in certain localities is reflexly shown in the heavier incidence of general, infantile and maternal mortalities in these areas. Sporadic attempts at construction of houses, without any serious consideration of the problems arising from overcrowding or ill-designed construction of houses, is likely to increase the acuteness of the problem of housing in the City of Madras. It seems therefore, both from the point of view of general mortality as well as of maternal mortality, that a well thought out scheme of housing for the poorer middle classes and the poor, is urgently indicated. Even in regard to those extension schemes, it is permissible to state that unless effective action is taken at an early stage to prevent indiscriminate construction of houses of all types and designs, these well-laid out city extension schemes will, in the end, result in creating the very problems that are now abundantly in evidence in the older areas of the city, where congestion, lack of free perfusion of air, overcrowding and insanitation are the order of the day.

7. *An efficient maternity service.*—The most important factor in the prevention of maternal mortality is an efficient maternity service. Well-trained midwives and trained medical practitioners, capable of meeting emergencies, or institutions where such special staff are available for the treatment of complicated cases, is a desideratum in all schemes for lowering the maternal mortality rate.

(a) *Training and employment of midwife.*—It is a matter for serious consideration whether the time is not come for overhauling the whole system of training of midwives, and on the analogy of the training that is obtainable in Continental countries such as Holland, Denmark and Sweden, it is suggested that the period of training should be extended, and that the training should be intensive and under the direct supervision of the most experienced obstetricians. The wastage involved in training nurses, who have little or no ambition to practise as midwives, and for

whom the midwifery training is a side issue, deserves to be considered, and with the limited facilities that are available, there is need to concentrate on the training of the practising midwife in the first instance. It is also for serious consideration whether the number of institutions where midwives are trained, should not be strictly limited, depending upon the facilities available for a large and intensive training of the midwives and for the midwives seeing different cases of complicated labour. A method of improving the training of midwives is the compulsory domiciliary practice under supervision, so that when the midwife passes out, she would be in a better position to assess the requirements of domiciliary practice in midwifery and to cope with the emergency situations that may arise therein. A 'refresher' course at definite periods, is also recommended for all midwives in practice.

(b) *The employment of trained midwives.*—The employment of midwives of sufficient standing and attainment so as to practise midwifery in a manner that will conduce to efficient working, is only possible if sufficiently attractive facilities are made available to them either to seek employment as midwives, or to seek practice as midwives. The present tendency to employ so-called trained midwives in rural areas on a very small salary, will necessarily lower the standards of those who seek midwifery as a career. In the mufassal, more than in the cities and towns, is there need for a better qualified set of midwives; and it is just here that the poorest remuneration is sought to be given.

(c) *Training of medical students and post-graduate instruction to practitioners.*—This is a big problem, and it is not intended to go into it in detail here. Suffice it to say, that an efficient maternity service implies improvement of the training of medical students from all points of view and the affording of adequate facilities for post-graduate instructions to medical practitioners in the large maternity institutions. Midwifery is largely a subject where practical instruction is possible only after graduation, and as such, every encouragement should be given in maternity institutions for the training of post-graduate students in the art of midwifery.

(d) *Maternity institutions.*—That maternity institutions play a large part in the control of maternal mortality needs no reiteration. It is necessary that maternity institutions should be properly equipped and should be in a position to afford treatment for several types of cases. The need for provision of antenatal wards has already been stated above. In all maternity institutions, early steps should be taken to see that separate delivery wards are available for the 'clean,' 'suspect' and 'septic' cases. A separate pavilion should be available for the treatment of cases of puerperal sepsis, whether arising from hospital or admitted

from outside. Cases of abortion should also be accommodated in separate wards. Maternity institutions should be centres for consultation for areas which may be delimited, and whether it be for antenatal advice or for postnatal advice, or for treatment of complicated cases of labour, a method of apportionment of the different localities, so as to ensure that the institutions are fully availed of, is desirable.

Co-ordination of the existing maternity service.—The fullest possible co-operation and co-ordination should be encouraged between the various maternity services in the city. The maternity and child welfare scheme of the Corporation, the work done by the Red Cross, and the work done by private agencies, if any, in this direction, should all be co-ordinated with the work done in the different maternity institutions, and the facilities that are now available for the transport and treatment of complicated cases of labour under the Child Welfare scheme of the Corporation should be extended for antenatal and postnatal cases as well. A larger use should be made of institutions for consultation in this and other directions.

Miscellaneous.—It is suggested that a census of the City of Madras should be taken in some intercurrent year, possibly 1934, with a view to get all available information for purposes of study of different aspects of public health questions, and in particular, questions pertaining to maternity and infant welfare.

The investigation carried out for the City of Madras, makes it abundantly clear that it would be well worth the while of the authorities concerned to carry on a systematic investigation into as large an area as possible, in regard to the causes of maternal deaths. If facilities for such investigation in rural areas are limited, it would be as well to carry out the investigation, with the excellent organization of public health staff that is now available, in as many municipalities as possible; and it is for consideration whether a committee may not be appointed to go into the whole question in a manner similar to the Maternal Mortality Investigation Committee that was appointed by the Ministry of Health in England in 1928. It is submitted that such an investigation would be a very valuable factor indeed in coming to some definite conclusions and in carrying out the necessary measures for combating the very heavy incidence of maternal mortality.

Lastly, the need for encouraging research into many of the conditions associated with maternal mortality cannot be sufficiently emphasized. The problems incidental to maternal mortality in Southern India are not the same as the problems that affect European countries. While a great deal of advantage is gained by the study of the materials made available through research in western countries, it cannot be said that there is not as great or as urgent a necessity for carrying on research into the various tropical conditions incidental to pregnancy and parturition. Moreover, a very fertile field for research is available in the City of

Madras through the wealth of clinical material made possible in the large maternity institutions in the city. It is strongly recommended that a few research scholarships should be made available for suitable persons to undertake research under the guidance of the clinicians who are keen on carrying out such work; and the results will be immeasurably satisfactory for the small amount of money that may have to be expended. Four research scholarships on a monthly stipend of Rs. 150 for the next five years is the least that can be set apart either by the Corporation or by the Government or by both, and much good work can and certainly ought to be done in this direction.

It only remains for me to express my great indebtedness to the various persons who have so generously helped me in this investigation that I undertook in regard to this important problem. No one is more keenly aware than myself of the limitations of this inquiry and of some of the imperfections thereof. But it is submitted that the material that has been gathered would be of some limited use for those who will undertake further work in this direction; and in any case, the conclusions and recommendations, it is hoped, will set people to a serious consideration of the problem of maternal mortality in this city. To the Corporation of Madras, I am particularly grateful for the generous assistance they have given in the employment of a research fellow for a period of twelve months. My thanks are also due to the Health Officer, the Lady Superintendent of the Child Welfare Scheme, and to the staff of the two departments for all their assistance so unreservedly given in the carrying out of this investigation. I am also indebted to the Medical Officers of Health of Liverpool, Manchester, Bradford, Glasgow, the Secretary of Scottish Board of Health, to the Secretary of the Ministry of Health in Great Britain and others, for the valuable pamphlets and reports that they had sent at my request. A special debt of gratitude I owe to the Superintendents of the Caste and Gosha Hospital, the Christina Rainy Mission Hospital, the Resident Medical Officer of the Rajah Sir Ramaswami Mudaliyar Lying-in Hospital, and of the maternity block of the Indian School of Medicine, for so readily responding to my invitation to answer a questionnaire sent out and for offering so unreservedly and freely their valuable suggestions in regard to some of the questions raised therein.

In conclusion I would like to express my very deep appreciation of the work done by my Research Assistant, Dr. P. M. Joseph, M.B., B.S., who has had to bear the brunt of the outdoor investigations necessitated in this report, under circumstances not altogether pleasant from a personal point of view. He has discharged his duties efficiently and very conscientiously, and I am truly grateful to him.

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MADRAS,
 1st May 1933.

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APPENDIX I.

MATERNAL MORTALITY INVESTIGATION.

Maternal Mortality due to Pregnancy or Childbirth.

District		Name		Age			
Date of death		Cause of death as stated in certificate					
Condition of child (alive, still-born, macerated).							
Previous Pregnancies (if obtainable).							
Number.	Year.	Term prem. or abort.	Complications during			Child.	
			Pregnancy.	Labour.	Puerperium.	Living ?	Healthy ?

Last pregnancy—
 Occupation, with dates
 Housing
 Standard of living (well-to-do, poor, destitute).
 Previous illness
 Has patient recently suffered from, or been in contact with infective illness (e.g., throat, nose, ear, skin, foci or suppuration in pelvis or elsewhere).
 General health during pregnancy (including fatigue or overwork).

	A.N. Clinic. (1)	Doctor. (2)	Midwife. (3)
Antenatal Care from—			
Number of consultations			
Examination of urine and result			

Brief summary of the case—	Date.	Hour.	Remarks.
At home—			
Doctor arrived (if engaged)			
Midwife arrived			
Doctor arrived (if called)			
Barber-midwife			
In hospital—			
Time of admission			
When first seen by doctor			
Pains began			

	Date.	Hour.	Remarks.
Membranes ruptured—			
Spontaneous			
Artificial			
Is fully dilated			
Baby born			
Placenta delivered			
Was there difficulty of admission to hospital? (E.g., ambulance, bed not available, distance, etc.)			
Abortion—			
Probable cause			
Duration of pregnancy			
Date of first symptoms			
Treatment			
Cause of death			
P.M. findings			
Toxæmias of pregnancy—			
Probable date of conception			
Past history of renal disease			
Toxæmic symptoms, if any, in earlier pregnancies.			
Date of appearance and nature of symptoms in pregnancy under inquiry.			
Date of appearance and nature of symptoms.			
Date of first and last examination of urine.			
Result			
Date of appearance (of albuminuria).			
Treatment, if any, for albuminuria—			
At home			
In hospital			
Blood pressure when first detected.			
			if raised,
Fits or post-partum.			ante, intra,
Operative interference			
Other treatment			
P.M. findings			

Hæmorrhage—		Was doctor immediately available.
Ante-partum (Placenta prævia, accidental.		
Had patient been told to report bleeding or faintness?		
Had there been previous bleeding during this pregnancy?		
How was this treated?		
Treatment—		
By midwife		
By doctor		
Was patient removed to hospital? If not, why?		
Condition on arrival at hospital		
Treatment in hospital		
Post-partum (before or after expulsion of placenta).		Probable cause.
Treatment—		
By midwife		
By doctor		
Blood transfusion		{ Available. Used.
P. M. findings		
Difficult Labour—		
Presentation and position—		
Disproportion between foetus and pelvis?		
Was difficulty anticipated? Steps taken, if any.		
Operative interference (at home—in hospital).		
Forceps		
Indication		
Time of application		
Condition of cervix		
Descent of head in pelvis		
Version		
Cæsarean section—reasons		
Other operative treatment, nature.		
Manual removal of retained placenta or membranes.		
Anæsthetic or narcotic		{ By whom administered Duration.
Laceration of genital tract		How treated.
Condition of patient at end of labour.		

Puerperal sepsis—

Condition of patient at onset of labour—

General

Local

Was there abnormal vaginal discharge?

Treatment before labour?

Disinfection—Precautions during and after labour—Antiseptics used—

1. Patient (preparation of perineum vulva).

2. Attendant (doctor, midwife, nurse)—

Hands—

Instruments

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

Sutures

Vaginal examinations—Number ..

By whom made

Precautions taken on each occasion.

Complications 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

Day of death

Bacteriological findings

Suggested source of infection