A PROSPECTIVE STUDY OF EARLY PUERPERAL MORBIDITY IN KUMASI, GHANA

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BY

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ABSTRACT

The objectives of this study were to; (1) describe the incidences and determinants of early puerperal morbidities in women in Kumasi; and (2) provide information for use in improving the postpartum health care of these women.

A cohort of 472 women from home, who had vaginal deliveries at the Komfo Anokye hospital in Kumasi, Ghana, were recruited and followed up during their early puerperal period. Morbidity was assessed through interview, physical examination and haemoglobin investigation. An overall 81% follow-up rate was obtained. Forty-eight percent of subjects scheduled for follow-up failed to attend the special clinic and had to be traced to their homes.

The subjects were mostly from low socioeconomic levels. Their mean age and parity was 25.4 years and 2.8 deliveries respectively. While three-quarters of them (78.4%) had at least one identifiable pregnancy or labour risk factor (nearly 40% were anaemic at labour) they had relatively uneventful deliveries.

Nine out of every ten women seen postpartum reported at least one health complaint. The most frequent symptoms were fever (28%), abdominal pain (64%), perineal soreness (31%) and

dysuria (26%). Nearly 60% of the study women self-treated with potent medications ranging from analgesics to antibiotics.

On assessment, 66.6% of the women discharged home routinely after delivery, were found to have at least one puerperal health complication requiring medical attention. In 46% of subjects morbidity was severe enough to warrant medical attention within 72 hours or less. The incidences of puerperal upper and lower genital tract infection in the study sample were 180 and 151 per 1000 deliveries respectively. Postpartum anaemia occurred in 35.1% of women. The incidences of postpartum hypertension, acute urinary tract infection, and mastitis were 88.2, 52.2 and 13.1 per 1000 respectively.

The findings in this study suggest that high rates of puerperal complications occur in women in Kumasi who are discharged home in a "satisfactory" health condition within a few hours after delivery. Postpartum health care services should address this need. It is recommended that: (1) a routine early postpartum clinic be organised for all women discharged home within hours after delivery; (2) women receive health education about the hazards of self-medication, and (3) further attention be paid to identifying the determinants of the specific morbidities.

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CHAPTER 1

INTRODUCTION

As more information on the high maternal death rates in the developing world has become available, world attention has been drawn to the neglected tragedy of maternal ill-health and death in these disadvantaged countries [1]. It is estimated that half a million women die from pregnancy-related causes each year world wide; 99% of these occur in the developing countries of Africa, Asia and South America [1]. In Africa, the currently estimated maternal death rate is 6.4 per 1000, as compared with rates of less than 0.1 per 1000 in Europe and North America [2,3,4]. In fact some studies have even recorded rates of 20 per 1000 in some parts of the African continent [5]. In today's world, these horrific maternal death rates are reminiscent of rates in pre-nineteeth century Europe [6,7], and child bearing rightly described by some as still a dangerous gamble for these unfortunate women [8].

Deaths are just the tip of the iceberg of maternal suffering. It is estimated that, for every woman who dies another 10 to 15 more suffer severe health consequences from their pregnancies [9]. In Africa an estimated two to three million women are believed to be disabled or incapacitated to varying degrees by past pregnancies [1]. Some of these women described as the living dead, only continue to live at the

fringes of health and silently bear bitter social and personal consequences.

The actual extent of the problem of maternal ill-health in Africa is still not known however, because data are lacking from many parts of the continent. The majority of the data available describe the direct causes of mortality, especially peri-partum deaths and morbidity during pregnancy. Data on the health of the women who have apparently "successfully" survived labour are scanty.

The few studies that have looked at the puerperium in Africa have shown the significant contribution deaths in the puerperium make to the overall high mortality rates in the region [5,10]. These mortality findings suggest too that significant morbidity occurs in the puerperium on the continent. The findings of some hospital-based studies which indicate that postpartum complications such as infection, anaemia, haemorrhage and vesico-vaginal fistulae account for a noticeable proportion of admissions and deaths in gynaecological wards, further support this view [8,11].

Since the time of Semmelwies, the role that unhygienic labour management plays in contributing to maternal morbidity and mortality has been well known; this situation remains common in many parts of Africa [12]. Of note too, is the fact that in some African societies, the puerperium is characterised by traditional cultural practices that could

impair maternal health [13]. The already existing burdens of endemic infectious diseases and malnutrition which plague the health of these women further add to these odds. When all the above hazards are considered, high rates of puerperal morbidity can be expected in the region.

The lack of accurate data on puerperal health status of African women however, has created difficulties in judging the extent and severity of puerperal morbidity, and has impaired the planning of health measures to deal with the problem. Postnatal care on the continent is generally deficient and appears to be lagging behind other aspects of obstetric care [14]. If maternal lives are to be saved, this aspect of maternal health needs to be more closely examined.

The majority of deliveries in Africa, particularly in the rural areas, still occur at home and data on these group of women are very hard to obtain. In urban African communities however there is a rapidly increasing trend for women to deliver at health centers [15]. Despite this change, information on the puerperal health of even these "fortunate" women is still not forthcoming, as postpartum monitoring remains inadequate.

In Ghana, the great demands on the very few urban obstetric facilities, have resulted in women being discharged home from most centers within a few hours of delivery. Reports indicate that this situation prevails in many other develop-

ing countries [6,16]. The present postnatal health care system in the Ghana, is that inherited with the introduction of western medicine, where women are seen at the end of their six week puerperal period. In Europe, where this practice evolved, women are kept in hospital for several days after delivery and therefore any early puerperal complications are quickly identified and dealt with before discharge.

In Ghana, women manage their puerperium in their own ways with only the occasional warnings issued by the discharging hospital midwives to guide them. The experience of this author and others is that, once home, these women influenced by their peers, frequently resort to traditional puerperal care practices used by women who deliver at home [9,13]. No other postnatal monitoring occurs, and if the women do not report with complications to a health facility, then their health status during the critical period of the puerperium is unknown.

At six weeks postpartum, they may report to the specially organised maternal and child post-natal clinics, a combined clinic where their infants also receive their first vaccinations and growth monitoring. The experience of this author, is however that the maternal component of the clinic is often neglected in favour of child health. This fact is even evident in the way mothers refer to this clinic, as "Weighing".

Many African countries like Ghana, are taking measures to reduce the unnecessary toll of maternal ill-health and death. To achieve their aims, however, they require accurate and detailed information on the maternal health situation in each specific area. This prospective cohort study was carried out primarily to describe the puerperal health status of women in Kumasi, to identify the predominant causes of ill-health, and to provide information for use in improving postnatal health care. If we believe however that these urban women have better access to health and obstetric care than their counterparts in the rural area, then the findings may be of benefit in estimating the extent of puerperal morbidity in the less fortunate rural group, and could assist health care providers to take necessary measures to alleviate the suffering of all mothers in Ghana.

The socioeconomic problems and health system inadequacies described in this paper are also similar to those found in many other urban communities of the developing world, and the results of this study could well apply to them, and be of relevance. To quote Dr. Halfdan Mahler, the former director of the World Health Organisation:

> "If we are effectively to apply existing knowledge in a wide range of different conditions, much further research is essential. In each country's circumstances the preventable causes of maternal deaths must be clarified and the potential for improvement in that country's own context must be identified" [9].

CHAPTER 2

BACKGROUND INFORMATION

2.1: THE COUNTRY AND STUDY AREA

GHANA: The country, is located on the west coast of Africa, between latitudes 4.25 to 11.11 degrees north of the equator and longitudes 1.14 east to 3.03 degrees west. It has a total area of 238,539 square kilometres. A former colony of the British Empire, it was called The Gold Coast in its pre-independence days (APPENDIX A).

Ecologically the country is divided into 3 main zones namely: the coastal savannah, the closed forest, and the northern savannah. The climate is tropical, with temperatures ranging between 25-30C most of the year. There are two major seasons of the year, the rainy and the dry. The amount of rainfall generally decreases as one moves from south to north.

The total population is presently estimated to be about 14.6 million with an annual growth rate of 2.6% [17]. More than 50% of the total population lives in the southern half of the country. Like other populations of the developing world, Ghana's population is characterised by its youthfulness; children aged 0-15 years comprise 47% of the total population; women of childbearing age comprise about 20% [17]. Other health and demographic indicators are as follows [17-20]:

Sex ratio (M/F)(1989).....0.98

Rural to urban population (%)..... 69:31

Population density per sq. km.....52

GNP per capita (US $)(1990).....461

Percentage literate (age>9yrs) 1990.... male 61

female 51

Life expectancy at birth.....average 56 years

male 53 years

female 57 years

Crude birth rate ..... 42 per 1000

Crude death rate ..... 11 per 1000

Total fertility rate 6.4

Infant mortality rate(1988)..90/1000 live births

Maternal mortality rate ...5-10/1000 live births

Physician population ratio(1988) 1:15,130

Popu. access to health services (%).....Urban 92

Rural 45

Total 60

Ethnic groups: Although there are more than 90 minor ethnic groups in Ghana, the population can be classified into two major language groups. The Kwa in the south comprising mostly of Akans (44%), Ewes (13%), and Ga-Adangbe (8%). The Gur in the north comprising of the Mole-Dagbani(16%), Grushi(2%), and Gruma(4%) [19].

Two traditional systems of inheritance are practised by the tribes in the country, matrilineal and patrilineal. The former is practised entirely by the Akans, whilst the latter is practised by all the other ethnic groups.

Religion: Three types of religious practices exist in the country, Christianity 50%, Traditional 22%, and Islam 14% [19].

Occupation: Farming is the single most important occupation for the majority of Ghanaians; over 61% are involved in small scale farming [20].

Administrative Structure: The country is divided into 10 administrative regions and each region is further divided into districts. In all there are 110 districts presently. In coexistence within this modern structure however are also traditional administrative areas of "chiefdoms" which play important administrative roles at the community level [19].

ASHANTI REGION: This region which is centrally located in the country, has an area of 24,390 sq.km and a population of about 2.4 million (about 17% of national population) with an annual

growth rate of 2.5% [21]. It is divided into 18 administrative districts, including Kumasi district, the location of the present study. Geographically the region falls predominantly in the tropical deciduous forest zone with a maximum monthly rainfall level of 310 millilitres in June.

It is inhabited mostly by the Ashanti, who form the largest ethnic group within the Akan linguistic group, and a few other migrant tribes. The Ashanti are a people with a rich culture and history, and are noted for their legendary Golden Stool. Ruled by a powerful king, the Asantehene, the Ashanti in the past conquered many neighbouring groups and created a powerful kingdom.

Like other Akans, they have a matrilinear system of inheritance. This system of inheritance appears to grant women more political and economic rights than does the patrilineal system practised by the other tribes [19].

In Ashanti culture, life's experiences are taken very seriously. Events like death, ill-health and infertility are viewed with suspicion. Pregnancy, labour and the puerperium are considered special milestones and are marked by specific norms and practices aimed at protecting the health of mother and child. For instance, to mark a successful outcome of pregnancy, the woman is expected to dress up in "whitish" garments and rich jewellery whenever she goes out.

Agriculture, trading, mining, and timber logging are the major industries in the region, and together with social service related jobs, are the major forms of employment. The region is considered one of the richest in the country in terms of natural resources.

Other socio-demographic and health indicators are as follows [19,21,22]:

Population density per sq. km.	86
Urban to rural proportion	32:68
Infant mortality rate	70 per 1000
Maternal mortality rate	4 per 1000
Total fertility rate	5.9
Physician population ratio (1987)	1:18,291

KUMASI DISTRICT: This is a major urban trading center, consisting mostly of Kumasi city, the regional capital, and the second largest city in the country. With a total population of 553,414 (1989), it has about a quarter of the region's total population; 81.7% of whom reside in the urban sector [21,22]. Being an important trading center the district also has a high rural-urban population drift with about 200,000 people moving in and out of the district each day. Some of its health and socio-demographic indictors are as follows [21,22]:

Sex ratio (M as a % of F)	94.9
Crude birth rate	52.0 per 1000
Crude death rate	15.4 per 1000
Infant mortality rate	60 per 1000
Maternal mortality rate	5.6 per 1000
Reported supervised deliveries 1989 (%)	82.9

The district is relatively well-endowed with health facilities when compared to other districts in the country and health service is accessible to over 95% of residents.

2.2: THE STUDY CENTRE

The Komfo Anokye Teaching Hospital (KATH) and its ancillary public health division, the Maternal and Child Health Centre (MCHC) were chosen as the centres for the study.

The Komfo Anokye Teaching Hospital: is the second largest hospital in the country, and it serves as a regional hospital as well as the teaching hospital for the country's second medical school. Being a major referral center, it has a catchment area far beyond regional boundaries and serves virtually all of the northern half of the country. Although

planned as a 500 bed hospital, it usually has a patient occupancy well over a 1000, resulting in many patients lying on the floor, overcrowding and chronic shortages of personnel and supplies. A government-owned institution, it is open to the general public. The subsidized rates charged make it accessible to the general public.

The hospital has a very busy obstetric and gynaecology department that handles about 65% of all institutional deliveries in the district. On the average about 9800 deliveries occur each year at the hospital, with a daily average of about 25 deliveries. The labour ward which handles all these deliveries, had at the time of the study only ten first stage beds, five second stage/delivery beds, and six immediate postpartum beds. It is therefore not uncommon to have patients sharing beds on most days. There are two other lying-in wards, each with about 36 beds which cater to post-caesarean section patients and other puerperal admissions. These are almost always fully occupied. Because of the lack of space, patients delivered normally are discharged home within 24 hours of delivery if no severe health complications occur at labour.

There are no restrictions whatsoever as to who delivers in the hospital and prior booking is not needed. It has been observed that many women come to the hospital in the late stages of labour and therefore frequently spend less than 24

hours in the hospital. Normal deliveries are done by nurse midwives; doctors are called in only for the complicated labours. The caesarean section rate in the hospital is about 12%, and the average maternal mortality rate at the hospital is 8.7 per 1000 [22].

The Maternal and Child Health Centre: This is a special unit set up to deal with the special public health aspects of maternal and child health care. The unit offers ante-natal, post-natal and family planning services but has no delivery unit. Child health programmes at the unit include growth monitoring, nutritional rehabilitation and immunization services.

The unit is open to the general public, and like the hospital is also heavily subsidized by government. Postnatal clinics are organized twice weekly for women in their sixth postpartum week. The clinic, like others in the country, offers a combined health care service in which infant growth monitoring and immunisation are also began. Since Komfo Anokye Hospital does not offer any special postnatal clinics the majority of persons delivering at the hospital report to this unit for this postnatal visit. Information about the post-natal attendance rates, and the morbidities presented to this unit are not available to this author at this time.

2.3: MATERNAL HEALTH

Ghanaian society, like many other African societies, are strongly pro-natalistic. Marriage and childbearing are considered the essential vocation for women and therefore many women marry and child-bear early. One national study, for example, observed that by ages 15-19 years, 17% of women were already married, and by 25 years less than 5% had never been married [17]. Child-bearing, in most instances, immediately follows marriage. A mother of many children is well-respected, while the infertile woman is stigmatized. Fertility rates in the country have therefore been high; the average Ghanaian woman today expects to deliver 6.4 children during her reproductive years [23].

There has been a trend for fewer children in recent times. The fertility rate has decreased from the rate of 6.9 observed in 1955-60 [23]. The proportion of pregnant women with four or more children reporting to antenatal clinics has also dropped from 64% in 1987 to 40% in 1990 [24].

For Ghanaian women, the increased exposure to pregnancy from this high fertility increases their risks for pregnancy-related complications, particularly since the majority of women face a vicious cycle of poverty, ignorance and disease. The maternal mortality rate in the country is high, and has since the mid 1970's been estimated to be 5-10 per 1000 live

births [19]. Although no community-based studies have been carried out to validate this figure, it is considered realistic and is still the accepted rate in current use. Two studies at hospitals in the Greater Accra region, reported maternal mortality rates of 10.8 and 7.9 per 1000 in 1963-67 and 1986-89 respectively [25,26]. Maternal mortality rates (per 1000 live births) in 1990 reported from the Western and Upper East regions of the country were 6.0 and 5.8 respectively [27,28].

The immediate causes of maternal death are due mostly to peri-partum related complications of haemorrhage, septicaemia and eclampsia which account for 42% of all deaths [19]. Indirect causes such as anaemia, infections like hepatitis, and other cardio-respiratory conditions, account for another 32% of deaths [19].

Maternal morbidity figures, however, are less readily available. The evidence suggests that poor health in these women is often a combination of pregnancy-related complications, poverty and the sanitation-related diseases which also affect the general population [19]. Common problems during pregnancy include anaemia, infections such as malaria, hepatitis, hookworm, etc.[19]. In 1990 for example, 71% of women visiting an antenatal clinic for the first time were found to have haemoglobin levels below 10.0 gm/dl [24]. In the Ashanti region, in 1987, about a third of pregnant women

presented at clinics with a febrile condition, 12% with diarrhoeal disease, and 19% with a respiratory infection [29].

Information on puerperium ill-health in Ghana is lacking; this probably reflects the little attention paid to the problem.

The Ghanaian government is committed to improving the health of its mothers and efforts are continually being made to facilitate and improve pregnancy care and also promote smaller family sizes. Progress is being made; present reports indicate that in 1990 nationally, 65.5% of pregnant women utilized available antenatal service, an increase from 56% in 1987 [24]. The average number of visits per woman, however, has remained low; only 2.1 in 1990 [24].

National statistics indicate that supervised delivery rates are still generally very low, although they have increased from 19% in 1987 to 42% in 1990 [24]. Supervised delivery coverage is usually higher in urban than rural areas; for example 82.9% in the Kumasi district [21], while only 11.0% and 27.8% in Upper East and Western regions [24,27] respectively. It is of concern presently that many of the women who seek ante-natal care from trained personnel during their pregnancy still prefer to deliver their babies in their homes. Attendance at the six week postnatal clinic, though poor, is better than the supervised delivery rates, and has stabilised around 40-50% over the past two years [24].

It is obvious from the above information that the goal of adequate care for all mothers in Ghana is far from achieved. Reducing maternal mortality and morbidity, is still an immense task which requires all possible help in developing needed clinical and public health strategies.

CHAPTER 3

A REVIEW OF THE LITERATURE

The puerperal period, which has been arbitrarily defined as the first 42 days (six weeks) postpartum is the period during which most of the physiologic changes which occurred during pregnancy revert to their pre-pregnancy status.

For many women, this period is often uneventful, but for others the period can become very complicated; severe ill-health or even death can occur. Events that occur during pregnancy, and particularly at the time of labour, have all been observed to have important effects on the puerperal health status. During the entire process of child-bearing, the puerperal period could probably be identified as second to the peri-partum period in terms of health risks.

Disease processes, which commonly complicate the puerperium include the following: infections, particularly of the genital tract, urinary tract and breast; haemorrhage; intra-vascular thrombosis; and anaemia. In fact fever due to infective complications in the puerperium was such an ominous sign in the past that it earned the name "Child birth fever" (or puerperal fever), and became an important clinical sign of puerperal ill-health [30].

The need for adequate puerperal care became obvious during the 18 and 19th centuries when outbreaks of "Child birth (puerperal) fever" with its resulting high fatality rates occurred in lying-in birthing units in Europe [7]. Today however, in these same countries, this and most other threats to puerperal health have been virtually eliminated or significantly controlled by advances in science and medicine [7]. An important contributing factor too, has been the improved standards of living in these developed countries which assures women better nutritional and health status to cope with the extra demands of childbearing.

In the poor countries of Africa, Asia and South America, despite all the achievements in science and medicine of the 20th century, the maternal health situation appears to be similar to that of "yesterday's" Europe [6,7]. The true extent of the problem, however, is not yet known, because these countries continue to suffer severe shortage of information on all aspects of maternal ill-health and death. Progress is slowly being made, however, and since the early 1960's, data on maternal health have accumulated and drawn the world's attention to the tragedy faced by women in poor nations [1]. Although these studies remain few and often limited in scope, they provide some insight into the extent of maternal ill-health. The morbidity and mortality rates frequently

reported are usually 15-20 times greater than those in developed nations [1].

Available maternal health data from Africa and other poor countries are predominantly mortality data with far less information existing on morbidity. When we consider puerperal morbidity, this information is even scantier. This finding is not surprising. In poor nations, death is much cheaper and easier to count than ill-health, which requires more expensive and intensive research methods. Since maternal deaths, however, include all deaths occurring during pregnancy, labour and the puerperium, and death is usually the result of very significant morbidity, these mortality data also provide essential clues to the extent of puerperal morbidity.

In reviewing puerperal morbidity in the developing world, this paper will examine in its first part the reported rates and causes of deaths in the puerperium. The second part will review the prevalence of specific puerperal morbidities and their determinants, and will reflect also on some reported traditional postpartum practices with severe puerperal health consequences.

3:1 PUERPERAL MORTALITY IN THE THIRD WORLD

Available mortality reports show that most maternal deaths in the world's poor nations occur soon after delivery or later on in the puerperium and are often the result of complications arising from the time of labour [8,14].

In Menoufia, Egypt for example, from 1981-1983, 56% of the 383 recorded maternal deaths occurred in the postpartum period, as compared to 12% during pregnancy and 29% during labour [10]. As is often the case in most developing countries, and also noted in this Egyptian study, the majority of deliveries had occurred at home. Fifty-three percent of the reported deaths also occurred at home and 62.6% of deaths were related to direct obstetric complications such as haemorrhage, infection and hypertensive disorders.

Many other mortality studies from the African continent list postpartum complications such as sepsis, haemorrhage, anaemia and hypertension as among the major causes of death [8,31-34]. In Harare, Zimbabwe, in 1983 puerperal sepsis was noted to be the number one cause of death accounting for 23.5% of all maternal deaths at the Harare hospital, and was followed closely by haemorrhage with 21.6% [32]. Another extensive study of 737 maternal deaths also in the Southern African region from 1980 to 1982 by Boes, noted postpartum sepsis to be the third major cause of death accounting for 19%, with haemorrhage and hypertensive disorders accounting

for 30% and 20% respectively [33]. Of note, also is the fact that of the 140 sepsis deaths recorded in that study, over three-quarters followed delivery, while approximately one-quarter were associated with abortions [33]. Fifty-one deaths from puerperal sepsis, had been associated with ceasarean sections, 15 with prolonged labour, 11 followed an uncomplicated hospital delivery, and 12 had been after home delivery [33].

The picture is not very different in the other parts of Africa. In a large prospective community-based study in Kenya, East Africa, of the 2,223 pregnant women who delivered the only maternal death that occurred was in the puerperium, and in a woman who had been discharged home after an uneventful hospital delivery [35]. Another study, also in Kenya, which reviewed mortality in gynaecological patients admitted to hospital, reported that postpartum complications such as puerperal sepsis and eclampsia accounted for a major proportion of pregnancy-related gynaecological deaths [11]. In neighbouring Uganda, puerperal complications also were second only to immediate labour complications as causes of death [36].

When we consider mortality data from West Africa, the findings are similar. In a prospective community-based study in Gambia in 1982/83 of the 15 maternal deaths that had occurred among the 672 women studied, four deaths occurred

between 4 to 42 days of the puerperium and one in the eight postpartum week [5]. All these puerperal deaths had occurred at home even though two subjects had had hospital deliveries. The causes of these deaths included anaemic cardiac failure, sepsis, eclampsia, hepatic coma and tuberculosis [5]. Haemorrhage, which was noted as the major cause of maternal death in this study, accounted for 33% of all deaths, all of which occurred within twelve hours following delivery [5]. If this number died from severe haemorrhage, a question is raised as to how many more women had survived postpartum haemorrhage with resulting anaemia.

The large study by Kelsey Harrison in Zaria, Nigeria, of 22,774 consecutive births from 1976-1979 perhaps throws more light on the puerperal health situation in poor sub-Saharan communities [8]. An overall maternal mortality rate of 10.5 per 1000 was recorded in the study. As in the other parts of the continent, postpartum complications such as sepsis, anaemia and hypertensive disorders were the major causes of death in the study [8]. Puerperal morbidities noted in the study were as follows: puerperal hypertension (1812), anaemia (1217), genital and wound sepsis (1058), obstetric fistulae (79), psychosis (40), acute genital prolapse (26), tetanus (5) and meningitis (6). Even more troubling was the finding that the patients frequently had combinations of these complications which further reduced chances of survival.

The Zaria study [8], also revealed the large numbers of emergency admissions for severe life-threatening puerperal complications. Of the 1638 women who were urgently admitted after having delivered at home, if only cases with late postpartum complications are considered; 557 women were admitted with anaemia of whom 27 (4.8%) died; 244 with genital sepsis of whom 21 (9.4%) died; admissions for septicaemia totalled 15 of whom 10 (66.7%) died; and those admitted with secondary postpartum haemorrhage totalled 47 and one (2.1%) death occurred. If we remember, however, that the above numbers included only the few individuals severely ill enough to warrant hospital admission and not the many more treated as out-patients or who did not even seek treatment, we may then begin to appreciate the extent of puerperal morbidity on the continent.

The Zaria study [8], did not indicate the overall rate of puerperal re-admissions following discharge after an uneventful hospital delivery. Maternal mortality rates among "booked" cases was observed to be a lower 3.7 per 1000 than the overall 10.5 per 1000 recorded. Of the 19 deaths that occurred among "booked" hospital delivered patients, two however, had been patients discharged home within 24 hours after uneventful labour, and who were readmitted 10 days later with severe postpartum hypertension and pneumonia [8].

In Ghana, hospital-based studies on maternal mortality have also shown that most maternal deaths are the result of delivery complications which lead to puerperal complications and then death [25]. The mortality rate from puerperal sepsis was observed to be 68.2 per 100,000 live births in Accra from 1963-1967 by Ampofo [25]. In 1986/87 at the Komfo Anokye Hospital, Kumasi, the maternal mortality rate recorded was 8.6 per 1000, and haemorrhage, eclampsia, anaemia, and infection were identified as the four major causes of maternal death [22].

This pattern of a complicated or unsafe labour, in an already health-compromised pregnant woman, resulting in death later in the puerperium is characteristic not only of Africa but of other poor nations in the world [14]. In Indonesia [37] for example, haemorrhage was the number one cause of death (46%), followed by postpartum sepsis (11%). In Bangladesh [38,39], between 10-20% of maternal deaths are related to haemorrhage and another 7-17% are caused by postpartum sepsis. In India the figures for haemorrhage and postpartum sepsis are 20% and 14% respectively [40].

In the rich countries of the world not only are maternal mortality rates very low but the proportion of deaths resulting from haemorrhage or infection are reduced [41,42]. In 1987 in Ontario, Canada, 13 deaths were reported in pregnant females, of these only one, due to amniotic fluid

embolism could be classified as a direct obstetric death [42]. A second death due to a ruptured aortic aneurysm in a patient with Marfan's Syndrome was classified as an indirect obstetric death. The other remaining eleven deaths were stated to be unrelated, accidental or incidental deaths and included the following: motor vehicle accidents (3); suicide (1); intra-cerebral haemorrhages (3); and four, related to preexisting diseases [42].

In New York City, United States [41], with a maternal mortality rate of 0.082 per 1000 in 1980-84, the proportion of deaths due to haemorrhage was 2.6%, obstetric infection 2.2% and toxaemia 10.3% [41]. The first four major causes of mortality reported, in descending order of importance had been ectopic gestation, embolism, hypertension and cardiac arrest.

If any conclusions are to be drawn from these mortality findings, it is that the women in the poor countries of the world, unlike their counterparts in the rich countries, are more likely to die from their pregnancies. If they do not die from haemorrhage in the immediate peri-partum period, then they frequently die a few days later from sepsis or anaemia or most likely both.

3:2 THE PUERPERAL MORBIDITIES

Since mortality reports indicate that puerperal deaths in developing world are caused principally by infection, hypertensive disorders and anaemia, to what extent then do morbidity from these disorders also occur in these countries? This section will examine the incidence and prevalence of specific puerperal complications in the developing world with particular attention to Africa.

3:2.1 THE INFECTIOUS MORBIDITIES

Puerperal infectious morbidity remains a major obstetric complication in both the developing and developed countries, and is often one of the three major causes of death [14]. The frequently involved sites of infection associated with occurrence of puerperal fever include the following; genital tract (25-55%), urinary tract (30-60%), breast (5-10%), and other sites (2-5%) [43].

In the developed world, the overall incidence of puerperal infection is low and still dropping, and recently reported rates range between 1-7% of parturients [44,45]. These lowered incidence rates are the result of greatly improved obstetric and delivery practices, with a virtual elimination of risk for septic contamination during vaginal delivery. Although the risk of infection is higher among subjects with operative deliveries, most cases suffer no very

serious health consequences because of the availability of potent antimicrobial agents in these rich countries [45].

In developing countries however, prevailing obstetric conditions are such that high rates of exposure to infective agents occur before pregnancy [46,47], during and after labour [48]. Facilities for controlling and even managing cases when they occur are also very limited [46]. Women in these poor communities are not only at increased risk of developing puerperal infective conditions but also suffer from their sequelae [47,48].

Puerperal upper genital tract infection:

Since historical times this type of puerperal complication has commanded a great deal of attention, and is still the most important puerperal disorder in many countries [12,45,49,50]. It is now well known that after parturition the resulting placenta bed and decidua are an opportune site for infection. The infecting agents could be newly introduced pathogens by unhygienic labour practices or may arise from the mothers own vaginal flora [30,49].

In the developed world, extensive studies have been done to identify causative agents and specific risk factors [51,52]; in the poor countries, accurate data, on the actual incidence of this complication is still unavailable in most parts. The few studies done however, have shown that in the

poor countries postpartum genital infection is probably the most important cause of puerperal ill health and death and frequently also leads to long-term reproductive morbidity [8,16,46,48,53].

Reported admission rates for puerperal genital tract infection range from one to ten percent of admissions to gynaecological wards in most developing countries [46,48]; compared to the 0.03-0.10% reported in some developed countries [46]. Puerperal genital tract infection accounted for 15.3% of all admissions for pelvic inflammatory disease in hospital wards in South Africa (1972) and India (1978) [46]. In Ethiopia, the figure was much higher 24.9% [48].

These hospital admission figures, however, are only the tip of the iceberg and reflect the significant contributory role played by puerperal genital infection to in-patient hospital admission. In the underdeveloped communities, the availability and use of hospital facilities are limited to only a few, so that these hospital figures poorly reflect the incidence of disease in the general populations.

A recent prospective study of women delivering at a hospital in Nairobi, Kenya, perhaps throws a little more light on the true incidence of puerperal genital infection in an urban African population [16]. Of 1013 women followed up after hospital discharge the overall incidence of upper genital tract infection (UGTI) was 20.3%. This incidence is ten times

greater than that recently reported in Helsinki, Sweden [50]. The prevalence of clinical signs for genital infection was also found to be exceedingly high in the study, with up to at least 53% of subjects having at least one sign. The authors reported that the onset of UGTI in their study population had occurred almost universally by day seven of the puerperium and that its development was associated with chlamydia and gonococcal infection, labour of greater than 12 hours duration, the occurrence of ophthalmia neonatorum in the neonate, and lastly the place of residence [16].

Although this is a "biased" hospital-based study whose findings cannot be broadly generalised, as the majority of deliveries in Kenya and in the other developing countries occur at home, it still provides very useful information on what possibly happens to the numerous women discharged home within a few hours of delivery from crowded urban or even rural hospitals in poor African countries, and who are not seen again. It could also be a useful indicator of the possible extent of puerperal UGTI in women delivering at home under less hygienic labour conditions.

This is only one such study however, and no other similar studies have been located by this author. Many more studies are needed before any meaningful conclusions can be drawn on the accurate incidences of puerperal genital sepsis in Africa, and its determinants.

Because of concerns about pelvic inflammatory disease (PID) rates generally, a large number of studies have being done on sexually transmitted disease agents Africa and the other developing countries. These studies have frequently included pregnant, parturient and puerperal subjects [47,48], and their findings have revealed the much higher risk for puerperal genital sepsis from these agents in the tropics [54,55].

High rates of gonococcal and chlamydia infection of the reproductive tracts are reported all over Africa [54-56]. Studies screening asymptomatic pregnant patients in Cameroon, Gambia, Zambia, Senegal, Zimbabwe and Ghana have reported gonorrhoea and chlamydia infection rates ranging from 2 to 25% [47,56-60]. In the other developing countries of Asia and South America, the reported prevalence rates are also similarly high in antenatal patients [61]. For example, gonococcal infection rates reported in Thailand, Jamaica and Chile were 12%, 11% and 2% respectively [59,62,63]. These levels are far greater than the 1.0% and 0.2% reported in Scotland and Switzerland respectively [59].

A vaginal flora survey of 214 labour patients in Harare Zimbabwe, showed that 7% had gonorrhoea, 13% had chlamydia, and 19% had trichomonas [56]. Another survey of the microbial flora of 187 women admitted in labour in Zaria, Nigeria found that 63.6% of the women had a positive culture for at least

one known pathogen [54]. Candida topped the list in that study with 20.9%, followed by klebsiella 15%, E. coli 9.1% and Strep. faecalis 6.4%. No gonococci were found in the study and chlamydia was not sought. These Nigerian findings suggest that, not only sexually transmitted agents are important but many other pathogens could also play an important role in causing puerperal infections in African mothers.

It is evident from these antenatal findings that in the poor countries most women enter labour with an already increased risk for upper genital tract sepsis later in the puerperium. Bacteriological surveys of asymptomatic postpartum subjects in some countries also confirm these high infection rates [47,48]. In Cameroon [47], for example, 10% of 296 asymptomatic postpartum subjects were found to harbour the gonococcus. In Ethiopia the figure was 9% of 200 subjects [48].

It is therefore not surprising that these sexually transmitted pathogens have been found to be important contributors to the occurrence of puerperal sepsis in these poor countries [16,64]. In the study by Plummer et al. [16] in Kenya, gonococcal and chlamydia infections were found to be independently correlated with increased risk for ascending genital infection. Among women with gonococcal infection, 58% of their upper genital sepsis was attributed to their infection [16]. About 21% of symptomatic postpartum sepsis

patients in the Cameroon had associated gonococcal infection [47]. In Ethiopia and Ghana the figures were 28% and 7.7% respectively [48,65]. In Harare, Zimbabwe, of 95 puerperal sepsis and post-abortion sepsis patients studied, gonococci were isolated in over 20%, chlamydia antigen in 16-20%, and G. vaginalis in 20% [64].

Studies on infertility and ectopic pregnancy in the world's poorer nations indicate that, unlike the richer states, these problems are more the result of pelvic infection [53,66]. In Africa, the particularly high rate of secondary infertility has raised questions about the role of puerperal genital infection [53,66,67]. In the industrialised countries of Europe and North America not only is the incidence of puerperal UGTI far less, as already stated, but sexually transmitted agents such as the gonococci appear to play far less important roles [49]. When they occur they are quickly detected and treated in the antenatal period, before they can cause problems in the puerperium.

For the unfortunate women in the poor countries of the world therefore, the scenario may be described as follows; they go through pregnancy and enter labour with untreated "colonised" genital tracts, and if labour should be mismanaged or become complicated, then risk for puerperal genital sepsis is even greater. Severe health consequences result because

adequate treatment for this complication is often delayed or not obtained at all.

Urinary tract infections:

Infections of the urinary tract are a recognised common complication of pregnancy and the puerperium, and a frequent cause of puerperal fever [45,68]. In the developed world, many studies have been done, which have shown that about 4-7% of women have asymptomatic bacteriuria during pregnancy; about 20-40% of these women will develop symptomatic disease during pregnancy or the puerperium, if not treated [68-72].

A prospective study of 5000 pregnant women in London, England, by Little (1966) for example, found 5.3% of them to have bacteriuria and 25% of them to develop pyelonephritis in pregnancy and in the puerperium [68]. Many other studies have also reported similar findings, and have noted that, bacteriuria in pregnancy persists into the puerperium and even for longer if not treated [71,73].

Events however, at the time of labour, also additionally contribute to the development of bacteriuria in the puerperium [69,73]. In a study of 3554 puerperal women, who delivered at a hospital in Finland from 1977-78, Rehu et al., found 5% of them to have significant bacteriuria [69]. Subjects with vaginal deliveries had a bacteriuria prevalence of 4.5% as compared with 7.3% for those who had caesarean deliveries. The

study, also found that subjects who had urethral catheterization during delivery, who had records of urinary tract infection during pregnancy, and who had postpartum endometritis all had higher prevalence of bacteriuria during the puerperium [69].

Similar findings were also reported in a recent study of 6803 postpartum women in Oslo, Norway [73]. Here too, the prevalence of bacteriuria was reported to be 8.1% when midstream urine samples were collected, but a lower 3.7% on bladder sampling. Twenty-one percent of the affected women in the Oslo study [73], had complained of dysuria however; in these asymptomatic untreated cases, bacteriuria had persisted for over 10 weeks in 27% of them.

Other factors found in studies to be associated with higher prevalence of bacteriuria in pregnancy and the puerperium are low socio-economic status [72,74], anaemia [75], and sickle cell trait [76-78]. These predisposing factors, are of particular relevance to developing countries, where they are even more prevalent.

Much less information exists on the incidence of urinary tract infection or bacteriuria in pregnancy or the puerperium in developing countries. Two studies from Ibadan, Nigeria reported high prevalences of asymptomatic bacteriuria of 12% [79] and 9.7% [80] during pregnancy. In one study [79], about 80% of the 31 bacteriuric patients found were multigravidae.

Three of the 31 bacteriuric cases were anaemic, one of whom was due to sickle cell (SC) disease. Puerperal pyrexia, also developed in 3 of 24 bacteriuria cases who delivered and one was because of severe genito-urinary tract infection. This case also happened to be the subject with haemoglobinopathy [79].

Another study in Benin, Nigeria reported the incidence of acute urinary tract infection during pregnancy to be a low 0.8%, despite the previously reported high bacteriuric rates in the country [81]. The authors correctly pointed out that their figure had been based only on patients admitted to hospital and was therefore likely to be inaccurate since many patients were likely to be treated as out patients [81]. Other notable findings of the study were that 11% of the 70 cases investigated had had recurrence of the disease during pregnancy, whilst another 8.6% had recurred in the puerperium, and this occurred in spite of earlier treatment [81]. Unlike the bacteriuria findings in the Ibadan study [79], in this study [81] a significantly higher incidence of acute infection was noted in primipara as compared with multiparous women.

In Assiut, Upper Egypt, the incidence of asymptomatic bacteriuria in 830 pregnant women surveyed was 9.0% [82]. Another 1.5% of the 752 women with initially sterile urine developed bacteriuria in late pregnancy but no new cases were observed after labour in the study sample [82]. A third of the

bacteriuric patients later developed symptomatic disease, a finding which is similar to that reported in the western studies [72,83].

In South Africa and Uganda the incidence of bacteriuria in studies were 10.3% and 12.2% respectively [84,85]; these figures are similar to the high rates also obtained in Nigeria and Egypt [79,80,82]. In Nairobi, Kenya, 7.4% of 1017 pregnant patients seen at an antenatal clinic were found to have significant bacteriuria, but in only 5.5% of them was this finding asymptomatic [86].

Much lower rates of bacteriuria in pregnancy have been reported in studies in the african countries of Zambia, and Sudan [87,88]. In Zambia approximately 4.0% of low income pregnant women were found to have asymptomatic bacteriuria at their first antenatal visit [87].

In Khartoum, Sudan, the prevalence of aysmptomatic bacteruiria was 5.6% [88]. Bladder catheterization of women was used during urine sample collection in Khartoum, instead of the routine mid-stream urine sampling, and the researchers explained that, this method was used because they felt that in their circumcised female population, mid-stream urine samples were likely to become contaminated as a result of the genital deformity of female circumcision. This methodological difference however, could have influenced their findings,

since direct bladder sampling has been observed to give lower bacteriuric rates [73].

Despite these reported high pregnancy bacteriuria rates, little attention has been paid to puerperal urinary tract infections in Africa and no studies on the condition have been found for review in this presentation. From western studies, we know that bacteriuria in pregnancy is usually carried forward into the puerperium, so that puerperal bacteriuria rates in Africa can be expected to be high. The extent to which labour also contributes to increasing this already high prevalence is not known. Also unknown is the proportion of puerperal pyrexia which is due to urinary tract infection.

The prevalence of predisposing factors for urinary tract infection are higher in Africa than in the western world. In addition to the contributory factors noted in the western world, other predisposing factors also occur in Africa, and many other tropical climates. Two notable examples are urinary schistosomiasis and the hemoglobinopathies which are associated with very high rates of bacterial urinary tract infection [76,89-91]. The incidence of acute urinary tract infection, during pregnancy and the puerperium in 78 sickle cell pregnancies reviewed in Ibadan Nigeria, for example were 36% and 19% respectively [91].

The occurrence of puerperal urinary tract infections is associated with the puerperal genital sepsis [69]. Untreated

urinary tact infection can aggravate other puerperal complications such as anaemia and hypertension, which also frequently occur in sub-Saharan Africa. Urinary tract infection in the puerperium, therefore, requires greater attention in these developing countries than it has presently been accorded and many more studies are needed.

Breast infections:

The process of breast-feeding which follows pregnancy, increases the risk for developing breast infections and other breast disorders in women. In the puerperium, infective breast disorders range from minor problems such as chaffed nipples to more severe conditions such as mastitis and abscesses.

Puerperal breast infections have for a long time been recognised as one of the important infective complications of the puerperium [92-95], and in the past epidemics of puerperal breast infections were reported in North America and western Europe [92-95]. In Winnipeg, Canada, epidemics of breast abscesses were reported in the late 1940's with incidences reaching levels of 10-15% of all deliveries in 1947 [95]. In England, during the same period, 5 such outbreaks were also reported, with infection rates as high as 50% reported in one outbreak [93].

Apart from these epidemics however, sporadic episodes of breast infection are a well-recognised feature of the

puerperium [96,97]. A study by Marshall et al [97] in the early 1970's found that about 2.5% of lactating mothers develop sporadic mastitis, with 4.6% leading to abscesses formation. Much higher mastitis rates however, were reported in a 1990 survey by Riordon and Nichols [98]. A third of mothers in their survey reported an episode of mastitis during lactation and in most it had occurred during the first three months postpartum. A third of the cases never contacted a physician during their mastitis episode, and half never used an antibiotic [98]. These findings indicate, that perhaps because most episodes of sporadic mastitis are mild, they may be frequently under-reported and that incidences based on hospital data may be underestimated.

The incidence of puerperal breast abscess in the developed world is fast dropping with the availability of modern antibiotics and better postpartum care as most cases of mastitis are quickly treated before they can progress to abscess formation [97-102]. Thus, most breast abscesses now seen in hospitals in these countries are more likely to be related to other chronic non-puerperal breast conditions [99,100].

In developing countries today the incidence of sporadic puerperal breast infection is unknown and there appears to be no reports of puerperal breast infection epidemics. Some hospital-based studies of benign breast conditions in a few

developing world countries have included puerperal breast abscesses, and give an idea of how frequently the condition is seen at hospitals in these countries [103-105].

In a review of a 1000 cases of breast disorders seen at two hospitals in Jordan, 98 cases of mastitis were reported in lactating women and 12 others presented with lactating adenomas [103]. In Nigeria, over a 10 year period, only 8.6% of 671 breast cases seen and biopsied at one hospital were pyogenic breast abscesses associated with lactation [104]. The authors cautioned that their sample included only subjects who had biopsies taken and because the majority of breast abscesses seen in the hospital were drained without a biopsy being taken, their reported incidence was likely to be very much lower than truly occurs [104].

Breast infection however, was found to account for a much higher proportion of all breast disorders seen at a hospital in Riyadh, Saudi Arabia [105]. In a three year prospective study of 304 breast patients, postpartum mastitis accounted for 53 (17.5%) of cases seen; 40 (75.5%) of the mastitis patients seen had abscesses requiring drainage [105].

If we consider that, even in the richer community of a developed country, a third of women with mastitis did not seek medical attention for their condition, then in poorer countries where patients are known to be less likely to seek any medical help, hospital records will be an even poorer

source of information on the true extent of puerperal breast infection in these countries. More broadly based studies are therefore needed.

The generally accepted pathogenesis of puerperal breast infection is that it starts with cracked or sore nipples. This commonly occurs after the first few days of suckling and is associated with breaches in the protective epidermal covering, which facilitates the entry of pathogenic organisms into deeper breast tissue, with development of mastitis and its abscess sequelae [106]. The most frequently identified causative organisms are the Staphylococci, which may arise from the mother's own skin flora or the infant's naso-pharyngeal flora [94-97,107].

Sore nipples are known to occur frequently in breast-feeding mothers especially in the first weeks of breast-feeding and with the first child [107]. No data on the actual incidence of sore or cracked nipples nor on the extent to which this contributes to mastitis have been found by this author. Sporadic mastitis is often a late puerperal disorder seen frequently after the second postpartum week; most western studies indicate that most cases occur between the second and fifth postpartum week [45,97,106,107]]. Mastitis is frequently bilateral and can be recurrent in about 12% of women in subsequent births [107].

Unlike the developed world, breast-feeding is virtually universal in developing countries and most women in these countries breast-feed a greater number of babies, for longer periods of times, and under less hygienic circumstances. When these facts are considered, one expects the incidence of puerperal breast infection to be much higher in the poor countries of Africa, Asia and South America, than in western countries. The poverty of information presently on its occurrence should, therefore, not be misconstrued as low incidence. As more information becomes available in the future, a better picture of the situation will be obtained.

Other Infections:

Numerous other sites of infection can cause fever in the early puerperium, and are classified under puerperal pyrexiae, since the existing definition of puerperal pyrexia is based solely on temperature readings and not on the sites involved. Thrombophlebitis, infections of the episiotomy and cesarean section incision sites, and incidental infections of other organs or systems are some of the less common sites associated with fever in the early puerperium.

Studies in the western world indicate that together these sites account for about 2-5% of the early infectious morbidity and individually they each often account for less than one percent [43]. Little information generally is available on

these other infections in the developing countries as they are very infrequently mentioned. It is more likely that they will be the less important causes for puerperal morbidity and mortality in these countries.

Incidental infections:

Marked differences exist in the types of the incidental puerperal infections reported in developed and developing countries, which reflect the prevailing environmental and social conditions in these two worlds. Tetanus for example was reported as a puerperal complications in 5 subjects in Zaria [8], and in one case in Menoufia, Egypt [10], but has not once been reported in the numerous articles reviewed from developed countries [41-42].

Other important infections which contribute to puerperal infectious morbidity and mortality particularly in the tropics are viral hepatitis [108-110], bacterial meningitis [8] and tuberculosis [5]. Although, at present there are little supporting data, it is very likely that the higher prevalence of endemic infectious diseases may result in greater proportions of incidental puerperal infections in developing world women than the low proportions reported in industrialised nations.

Because many of these endemic infections are associated with fever it is also likely that a higher incidence of fever

in the puerperium will occur in the tropical countries. Malarial fever for example occurs with increased frequency during pregnancy and possibly in the puerperium since its increased incidence is attributed to the loss of immunity during pregnancy, a physiological feature that persists into the early puerperium [111,112]. Fevers due to endemic disease like malaria therefore, could easily create difficulties in diagnosis of puerperal fever if the current definition is considered.

There have been calls in recent years for a better definition of puerperal sepsis and pyrexia, with the arguments being that the current definitions which were obtained in past years when the causes of "child birth" fever were unknown are no longer valid for today's world [30,45]. In Africa these arguments are even more true.

Post-caesarean wound infection:

Generally, infectious complications following caesarean section are more frequently reported in the developing world than in the developed countries [33,113,114]. In the poor countries emergency cesarean sections are often performed on moribund patients with prolonged labours, who were already infected from home by unhygienic delivery attempts, or because of long delays in seeking medical help [113,114]. Surgery in

these regions, therefore, not surprisingly is frequently followed by sepsis and death [113-114].

In Ghana, for example, 25% of 100 patients receiving cesarean section in one study developed wound infection post-operatively and there was a 4% sepsis mortality rate [114]. In another hospital study in Kenya [115], the incidence of wound infection was 11% despite the routine administration of penicillin to these patients post-operatively. The researchers in the Kenyan study [115], however, were able to reduce significantly the wound infection rate to 0.85%, by improving surgical aseptic techniques and using potent pre-operative antibiotics.

Much lower post-caesarean section wound infection rates are generally reported in the western world [45,51,116]. In Finland of 761 caesarean section cases reviewed only 3% were observed to have wound infection [51]. In the United States, the overall post cesarean operative wound infection reported from two hospitals in Wayne County, Michigan, was 6.3% [45]. A much higher rate on the other hand, in excess of 15% has been reported from Wycombe hospital, Bucks, also in the United States for 1985 and 1987, though the authors stated that bacterial pathogens were isolated in about 12% or less subjects in both years [116]. Variations in the criteria used for diagnosing this complication may explain these differences however.

Episiotomy wound infection:

Information on episiotomy rates in developing countries is very scanty. The available data suggest that the use of episiotomy for labour management in developing world hospitals may be far less frequent than the rates reported from developed countries [117-121]. Episiotomy rates reported from studies in the United States, Britain, and Australia were 62.5%, 44.9% and 43% respectively [117,119, 122], compared to about 5.7% of all deliveries at a teaching hospital in Yaounde, Cameroon [120], and 0% of 2447 deliveries at two maternity units in Brazil [121].

Two types of episiotomy, namely the mid-line and medio-lateral, are used in current obstetric practice. Although they each have specific advantages and disadvantages, both are generally considered safe and in the developed countries are not frequently complicated by infection. For example, in one follow-up study of 7477 mid-line episiotomy recipients in Virginia, United States, only 7 persons were reported to have developed an infectious complication [123]. In a British study in 1982, by Reading et al, 13.4% of 101 women followed-up after episiotomy developed infection with delayed healing [124]. A recent study from Australia [125], however reports a higher infection rate of 32.7%, although most infections were described as mild. Despite its high safety rates, severe and

fatal infections have been known to follow episiotomy even in developed countries [126-128].

No reports on the infective complications of episiotomies in the poor communities of the developing world have been located so far by this author. From my own experience, they do occur frequently but have not been reported in the literature.

Wound infections with delayed healing, are conditions usually associated with malnutrition and poor hygiene. These predisposing factors are very prevalent in the majority of women who receive episiotomy in poor countries. If we remember too, that high prevalences of infectious pathogens which could cause episiotomy wound sepsis, have been identified in the genital tract of many women reporting in labour in these countries, one is left wondering how safe episiotomy has been in the developing world.

Thrombophlebitis:

The physiologic changes, which occur with pregnancy are associated with increases in blood coagulation factors such as fibrinogen, platelets, factors VII, VIII and X, and a decrease in fibrinolytic factors [43]. After delivery, these pregnancy changes slowly revert to normal, although they persist into the early puerperium and together with the postpartum haemo-concentrating blood changes, lead to an increased risk of intravascular thrombosis in the puerperium.

The incidence of deep vein thrombosis in pregnancy and the puerperium is reported to be five to six times higher than that in the non-pregnant non-contraceptive-pill taking female [129]. In the United States, for example, 50% of all thrombo-embolic events in females less than 40 years were said to be related to pregnancy and the puerperium [130].

The majority of thrombotic episodes however, occur during the early postpartum period [131,132]. For example, 85% of the 357 cases of thrombophlebitis studied by Aaro et al, occurred in the postpartum period up to 24 days [132]. In England and Wales, it was observed that two-thirds of pulmonary embolism episodes in women from 1979-81 occurred postnatally [131]. The incidence of antepartum and postpartum deep vein thrombosis was reported to be 0.13 and 0.61 per 1000 respectively in Boras, Sweden from 1975-80 [133]. Another retrospective study over a 28 year period in the Netherlands reported rates of thrombosis and pulmonary embolism to be 0.7% in pregnancy and 2.3% in the puerperium [134].

Thrombosis may be classified by whether it is associated with an infective process (thrombophlebitis) or not (phlebo-thrombosis) [43]. In practice however, diagnosing thrombosis itself is often difficult, let alone distinguishing between the two types of conditions. Many articles and reports on puerperal thrombosis have not attempted to separate these two conditions [132-137]. In this discussion therefore, even

though the subject of interest is mainly puerperal thrombophlebitis, puerperal thrombosis is reviewed generally.

Thrombosis in the lower extremities is also classified by whether it involves superficial veins or deeps veins [132]. In studies in the developed world, reported incidences of superficial and deep vein thrombosis during pregnancy and the puerperium range from 0.4% to 1.4% of deliveries [132-137]. Patients with only superficial vein thrombosis, have lower risk for pulmonary embolism, but about 17% of them have associated deep vein thrombosis which increases the risk [135]. In Tecumsah, United States the combined incidence of deep vein thrombosis and pulmonary embolism was observed by Coon et al., to be 1 in 200 deliveries or 5.9 per 1000 pregnancies [137], a rate similar to that in the Netherlands study [134].

Despite the low incidence, thromboembolic disease ranks highly as an important cause of maternal mortality in the developed world [41,131]. In England and Wales, for example, with a reported incidence of 0.7 per 1000 deliveries it was observed to be the second most important cause of maternal death from 1979-1981 [131].

On the other hand, it ranks as a much less important cause of maternal mortality in the poor countries. In Menoufia, Egypt [10], and Uganda [36], for example, it accounted for only one percent of all maternal deaths, and two

percent in Bali, Indonesia [37]. The difference in importance is only because in the developed countries, the other common causes of death such as infection and haemorrhage have been sufficiently controlled.

Risk factors which have been identified to predispose to pregnancy-related thrombosis include: age greater than 35 years; high parity; obesity; prolonged immobility and operative delivery [138]. One case report also questioned the role of sickle cell disease in causing recurrent and fatal puerperal thrombophlebitis [139].

The incidence of puerperal thrombosis in Africa and Asia, is stated to be about 0.1%, much lower than the rates in the industrialised countries [43]. Thrombosis and its complications are not an easy conditions to diagnose clinically and often require expensive and sophisticated diagnostic tools [140]. These tools are not available in poor developing world hospitals. It is possible, therefore, that the reported low incidence in these poor countries, may be because the condition is under-diagnosed, in addition to its being under-reported in these settings.

In support of this view are the findings of studies done on postoperative subjects in some developing countries which used sophisticated diagnostic techniques. These studies found the incidences of thrombosis to be similar to those in the

western countries; previously, lower incidences had been reported in this group of patients [141-144].

Although obesity may not be as prevalent in the developing world as in the developed world, all the other risk factors exist. High parity women bear children into older ages, and puerperal sepsis is frequent. The risk for developing puerperal thrombophlebitis is higher in developing countries when we consider the prevalence of the noted risk factors. It is therefore very likely that as the sophisticated facilities for its accurate diagnosis become available in the developing world hospitals, higher incidence rates will be reported.

3:2.2 NON-INFECTIOUS PUERPERAL MORBIDITIES

Just as in pregnancy, many non-infective disease conditions can complicate and/or be aggravated by the puerperium. There is a long list of such diseases, but with the exception of a few, most do not occur frequently. This review will therefore focus on the few common disorders such as anaemia, hypertension, peri-partum cardiac failure and psychosis that are important causes of puerperal morbidity, particularly in the developing world.

Postpartum Anaemia:

Anaemia in pregnancy, defined by the World Health Organisation (WHO) as haemoglobin levels below 11.0 gm per decilitre at sea level, is a frequent complication of pregnancy world-wide [145,146]. In the developing countries where a high prevalence of nutritional anaemia in pregnancy is reported, it remains the issue of major concern during antenatal care [146-149].

Postpartum anaemia on the other hand has received far less attention and unlike pregnancy anaemia is not currently defined by a specific haemoglobin level. In identifying the condition, therefore, a difficulty arises as to which haemoglobin level to use, that for pregnant subjects (11.0 gm/dl) or for non-pregnant women (12.0 gm/dl).

The occurrence of postpartum anaemia is dependent on pre-pregnancy, pregnancy and labour events. It can be influenced indirectly by preventive obstetric strategies which aim at controlling anaemia in pregnancy. However, excessive blood loss which occurs particularly at the time of labour, can quickly nullify all the gains of successful antenatal care, and lead to anaemia in the puerperium. For the already compromised patient, with poor antenatal preparation, only small blood losses are needed to tilt the balance from mild or moderate to severe anaemia. This is a common situation for many developing world women [146].

Reported rates of anaemia in pregnancy are very high in developing countries and range from 20 to 90% of all pregnant patients seen at antenatal clinics [146,148]. The situation is particularly poor in sub-Saharan Africa where a higher prevalence of anaemia and severity rates are reported [146]. The causes of anaemia in these regions are multiple and include inadequate nutrition, infections including malaria, and the hemoglobinopathies [91,146,148-155].

For various reasons, a great many pregnant women in these regions, do not receive adequate antenatal care, and therefore have no treatment for their anaemia, and thus enter labour with compromised haemoglobin levels. In Chad and Casablanca, Morocco, for example, 25% and 18% of pregnant women respectively seen at the time of delivery were observed to be anaemic [152,156]. If at the time of delivery these women do not receive adequate labour management then excessive blood loss could occur. If they do not succumb to the direct effects of torrential blood loss, they face a puerperium complicated by severe anaemia.

Excessive postpartum haemorrhage is defined as post-partum blood loss in excess of 500 mls [43]; for most practising physicians and midwives, this level also marks the beginning of concern. Repeated studies however have shown that blood volume losses often estimated or recorded in birthing units are much less than the accurately measured levels of

study situations and may be up to about 50 percent lower [157-159]. Many studies indicate that average normal postpartum blood losses range between 300-700 mls [157-160]. In a comparative study by Braut in 1967, for example, he noted that whereas only 6% of subjects were recorded as having had postpartum haemorrhage by medical staff using conventional measuring methods and estimates, the figure rose to 21.5% when accurate blood measurement readings were used [159].

In an anaemic patient, this difference is important, especially since a small estimated blood volume loss could give a false sense of security, when in fact significant and potentially hazardous loss has occurred. In a retrospective study of severely anaemic pregnant patients in Malaysia, for example, only 1.5% were recorded as having postpartum haemorrhage but the researchers observed that these anaemic subjects were more prone to shock even when their recorded losses were stated to be small [147].

In developing countries, many anaemic women go through repeated pregnancies with little chance of recovery in between, and therefore even small amounts of postpartum blood loss can be an important contributing cause to the development of chronic anaemia during the child bearing years.

Some 50 years ago, in a North American study, the incidence of postpartum haemorrhage in some studies was observed to be about 15% of vaginal deliveries [161]. Today,

with improvements in labour management, the reported levels now range between about 4 to 8% [43,162]. There are few reports on the incidence of postpartum haemorrhage in developing countries. In Africa, rates which have been reported so far from hospital-based studies are generally low, even though maternal mortality figures indicate that haemorrhage and anaemia are the major causes of postpartum deaths [120,163].

In the Cameroon, West Africa, postpartum haemorrhage rates reported from one hospital from 1982-86, ranged from 0.4 to 2.0% [120]. In neighbouring Nigeria, the rates reported have ranged from 2 to 5% [8,163]. Because labour management in hospitals is a lot better than that which occurs at home, where the majority of women still deliver, the actual incidence of postpartum haemorrhage in these communities is likely to be higher than the hospital reported rates.

In a prospective study of 300 women admitted in labour in Egypt in 1962, their observed haemoglobin levels before delivery ranged from 7-14 g/dl with a mean of 11.0 g/dl [164]. Sixty-six percent of them were judged to be anaemic by the researchers who used a cut off level of less than 12.6 g/dl. Six days after delivery their haemoglobin levels now ranged from 5.5-14.0 g/dl, with a mean of 9.75 g/dl; an average haemoglobin decrease of -1.29 g/dl was recorded. The study also noted that the reductions in haemoglobin were greatest in

women with caesarean deliveries (-3.46 g/dl), and in subjects with difficult vaginal deliveries (-1.59 g/dl) and smallest in those with easy vaginal deliveries (-0.87 g/dl) [164].

The well-nourished women in the Western world will probably adjust to these reductions in haemoglobin level with ease and also quickly correct the deficiency in the next few days after delivery. For the already anaemic females in the poor developing world communities, these blood losses can predispose to long-term chronic anaemia with resulting poor health because many of the factors such as malnutrition and infection which caused anaemia in the first place, also prevail after parturition [164,166].

In a two year prospective study from 1965-66 in Singapore, the overall prevalence of anaemia (below 10 g/dl) in obstetric patients admitted to the study hospital was 1 in 54 [165]. A significant 44% of the 1434 anaemic patients reviewed were found to be anaemic after their delivery and in 12.3% of them the anaemia could be attributed solely to peripartum haemorrhage [165].

About five percent of severe postpartum anaemia cases occurred among the 22,774 deliveries reviewed in Zaria, Nigeria [8]. Twelve percent of the un-booked cases (persons with inadequate or no antenatal care) seen in that study had postpartum anaemia, and a third of urgently admitted subjects who had delivered at home had been admitted because of severe

anaemia [8]. Of the 391 cases admitted with severe postpartum haemorrhage, 6.8% died and the others survived probably with severe anaemia [8].

Many other studies on anaemia in lactating mothers in Africa, have reported prevalence rates ranging from 30 to 99%, further emphasising the higher occurrence rates of postpartum anaemia in these regions [146]. After pregnancy the anaemic new mother in these countries is still faced with the extra demands of lactation, at a time when her reserves are at their lowest. It should also be remembered that breast-feeding is done almost universally in the develping world, for longer periods and repeatedly as fertility rates are high, and therefore the depleting effects of lactation on maternal resources can be quite marked in these populations.

Anaemia in the puerperal period is associated with an increased risk of puerperal infective complications [7,8,30] which could in turn also aggravate the anaemia. In Zaria, for instance, many of the puerperal anaemia patients seen also presented with infective conditions [8]. Controlling puerperal anaemia can, therefore, contribute significantly to reducing morbidity and mortality from puerperal sepsis in these communities.

A study of the nutritional factors in 100 puerperal anaemic subjects with haemoglobin levels less than 10 gm/dl in Johannesburg, South Africa, found 90% of them to be iron

deficient, 50% folate deficient and 7% to be vitamin B12 deficient [166]. Similar findings were also observed in Singapore [165]. This indicates that the lack of nutritional factors, particularly iron and folate, plays a major role in the pathogenesis of postpartum anaemia as haematopoiesis after labour blood loss is severely impaired. In a study in The Gambia for instance, nutritional supplementation of postpartum women significantly reduced the occurrences of fever and other health complaints, and also increased their haemoglobin levels [167].

Unlike in the developed world, postpartum anaemia is a very frequent and important cause of puerperal morbidity in developing world countries. It has been quite neglected as most attention currently is paid to pregnancy anaemia. The evidence, however, suggests that if maternal morbidity and mortality are to be reduced in the poor countries, and particularly in Africa, then postpartum anaemia needs to be awarded greater attention than it presently receives.

Postpartum hypertensive disorders:

Hypertensive disorders are a well-recognised major cause of mortality and severe morbidity during pregnancy and the early puerperium. In the developed world between three and eight percent of pregnancies are noted to be complicated by this disorder [168,169] and up to 40% of maternal deaths are

related to the condition [170]. In the developing countries, on the other hand, the proportion of deaths is lower, up to about 15% [170]. It should be remembered, however, that these proportions, in the poor countries represent about 150 per 100,000 births whilst in the developed world they represent only 4 per 100,000 births [170].

The different types and frequencies of hypertensive diseases in pregnancy and the puerperium are as follows: pregnancy-induced hypertension (PIH) or pre-eclampsia 80%; essential hypertension 18%; chronic renal disease 2%; and eclampsia 0.1% [168]. The cause(s) of pre-eclampsia, which is the commonest disorder and its sequelae eclampsia are still unknown. The known predisposing factors include nulliparity, age less than 20 or greater than 35 years, low socioeconomic status, multiple pregnancy, the presence of hydatidiform mole, diabetes mellitus, chronic hypertension and renal diseases [168-172].

Hypertension in pregnancy often persist into the early puerperium, but it generally improves after birth, with a gradual return of blood pressure to normal by the end of the puerperium [168]. About 50% of eclampsia cases occur antepartum, 30% intrapartum and the remaining 20% occur postpartum [168].

Postpartum hypertension on the other hand can also be a newly developed complication appearing only after delivery.

Since the 1930's there have been many reports of transient postpartum hypertension which appeared mostly in previously normotensive black women [173-177]. Stout in 1934, observed that 102 (17.2%) of 592 patients, with normal uncomplicated pregnancy and labour were hypertensive at six weeks post-partum when they reported to the postnatal clinic [173]. He also observed that the majority of cases, 68.3% were black and that three-quarters were multiparous women. In 67 patients blood pressures returned to normal within 2 to 6 months postpartum, while in six cases it persisted beyond one year of follow-up. Recurrence of postpartum hypertension occurred in 7 of 27 patients who had a subsequent normal pregnancy [173].

Since this first study, several other studies in North America have also reported postpartum hypertension in most cases, transient and recurrent, and affecting predominantly black subjects [174-177]. In 1951 Kalteider et al, noted, that in most instances the hypertensive changes began in the early puerperium [177]. In 50% of the 165 (164 black and one white) postpartum hypertensive women they studied, the blood pressure elevation developed between the third and fifth postpartum day [177]. These early findings have been confirmed in recent studies by Walters et al. 1986/87 who also observed that in both previously normotensive and hypertensive pregnant subjects, there was a tendency for blood pressure to rise significantly, especially between the 3rd and 6th postpartum

days [178,179]. In a study of previously normotensive subjects for example, 12% were observed to have diastolic blood pressures greater than 100 mmHg during the first postpartum week [178].

There remains controversy as to whether or not post-partum hypertension is not of the same pathogenetic basis as the pregnancy-induced hypertensions [179]. In light of this controversy this article in its discussion of postpartum hypertension in the developing world, will also examine pregnancy-induced hypertension in the region.

There is little information on the incidence of pregnancy and postpartum hypertensive disorders in the developing world. Until very recently it was believed that that these disorders rarely occurred, since earlier researchers in these poor communities often reported that they saw very few cases in hospitals where they worked [180,181]. Recent findings have shown that hypertensive disorders are not infrequent and that the earlier findings were due to the lesser use of health facilities by the populations in those early periods [170-172]. Although the true incidence is still unknown, as more women now seek pregnancy care in these regions, a clearer picture of this condition is being gained.

Reported incidence of pre-eclampsia in primi-gravidae in Tanzania, Nigeria and Zambia were 11%, 16.4% and 3.8% respectively [182-184]. In South Africa, the recorded

incidence of hypertensive disorder in pregnancy in one study was even higher, 41% [185]. High rates of eclampsia are also reported by studies in Africa and other developing countries which reflect the poorer obstetric care in these regions [170].

In studies in Nigeria, incidence rates of eclampsia have ranged between 0.1-2.5% [8,163,186]. In Tanzania [182], about a tenth of pre-eclamptic primigravidae were observed to developed eclampsia. About 10 percent of these eclampsia cases also die from the disorder [182]. In South Africa, the incidence of eclampsia in one study was observed to be 2.3 per 1000 with a case-fatality rate of about 12% [187]. In studies in Nigeria and Mexico similar eclampsia case-fatality rates of 14.4% and 13.9% respectively are reported [186,188].

These high eclampsia incidences can be compared to the very low incidence of 0.2 and 3.2 per 1000 in Sweden and Memphis, U.S.A respectively [189,190]. The reported eclampsia case fatality rates in the developed countries are also very low and range from 0-5% [190-193]. As can be seen from the figures in these poor countries, the increased occurrence of eclampsia, is accompanied by high case fatality rates as most hospitals in the region lack adequate facilities to care for those with this very severe condition.

In the large Zaria study [8], the incidences of pre-eclampsia, eclampsia, and postpartum hypertension among the

22,774 births studied were 6.1%, 2.3%, and 7.9% respectively. When the unbooked emergency admissions seen in the study are considered, hypertensive disorders occurred in 18.8% of all the cases. The proportions of the various hypertensive disorders in these un-booked subjects were eclampsia (27.1%), pre-eclampsia (34.1%) and postpartum hypertension (38.8%)[8].

The prevalence of asymptomatic postpartum hypertension reported in another study in northern Nigeria was a high 57% of 260 Hausa women who had not been hypertensive during pregnancy or labour [194]. In Ibadan, southern Nigeria, a much lower incidence (18%) was reported among the Yoruba [195]. This level is similar to those reported in the earlier North American studies [173].

In the northern Nigeria study too, 41 (87%) of the 47 pre-eclamptic subjects followed up remained hypertensive during their puerperium [194]. The risk for developing postpartum hypertension was also observed in the study to be higher in the very young and old and least in subjects aged 15 to 29 years [194]. Also found to be at higher risk were multiparous women and women with twin pregnancies; the 10 twin pregnancies observed in that study all developed postpartum hypertension [194].

No other reports on postpartum hypertension in Africa have been found for review, but it is obvious from these two studies in Nigeria that significant variation can occur in

incidence, even within the same region. If we consider the results of these Nigerian studies, together with that of the American studies [173,176,194,195], it is probable that the incidence of postpartum hypertension in sub-Saharan Africa could range from 15-50% in the region. Postpartum hypertension therefore could be a disease of importance in the puerperium.

The risk for developing postpartum hypertension in the poor African communities is high, if one considers the prevalence of known predisposing factors. Women, for instance, start child bearing at much younger ages, continue into much older ages and with higher parities than their counterparts in the developed world. The incidences of other predisposing factors such as multiple pregnancies, hydatidiform moles, essential hypertension, and renal diseases, are also much higher [196-200].

Of great importance too, are the findings that essential hypertension, pre-eclampsia and transient post-partum hypertension, occur more frequently in negroid persons, futher predicting that higher incidences will occur in the tropical countries of Africa [201-203]. In a study in Guyana, which also observed hypertensive disease to be higher among Blacks than Indians, it was noted that about 18.6% of the hypertensive black women reported having had hypertensive disease during pregnancy [203]. Perhaps too, the occurrence also mostl · in blacks of another diseases entity, postpartum

cardiac failure, associated with postpartum hypertension are a indicators of the important role the disease may play in causing puerperal morbidity in Africa [194,195,204].

Hypertensive disease in pregnancy or during the puerperium has been observed to be recurrent and is also known, in some cases, to progress to chronic hypertension [205,206]. Preventive strategies to control hypertensive disease in females, and especially in Africa, must pay attention to the hypertensive disorders of the childbearing years. Because most cases of postpartum hypertension are silent and because current postpartum care practices in most developing countries, do not entail frequent clinic attendances as occurs in late pregnancy, the condition may go undetected until much later when significant damage has occurred. More research therefore is urgently needed, to describe the incidence of the condition, and also its natural history in Africa and other developing communities.

Peri-partum Cardiac Failure:

Since the 1930's, there have been reports of postpartum cardiac failure of uncertain cause in predominantly black subjects with normal uneventful pregnancies [204,207,208]. More recently the condition, has been called peri-partum cardiac failure as studies have shown that the disease presents in the third trimester in some cases [194,209,210].

No single accepted definition of Peri-partum cardiac failure (PPCF) exists at present. Criteria often used for diagnosis include the development of cardiac failure of an indeterminate course in the last month of pregnancy or within the first six postpartum months, in a subject with previously normal cardiac function prior to the last month of pregnancy [209,210]. The majority of patients present within the first three postpartum months, although cases presenting much later than five months are reported [194,195,204]. Signs and symptoms at presentation are mostly those of biventricular cardiac failure with cardiomegaly, and hypertension [194,195].

The disease was first reported in the 1930's among North American blacks where the incidence rates were reported to be between 1 in 1300-4000 deliveries [204, 210,213]. Since these first reports, the condition has been reported in many other countries world-wide [194,215-218]. Most of the studies, however, indicate the disease to be predominantly affecting blacks [204,211,214].

The exact cause of peri-partum cardiac failure is unknown, although researchers have alluded to diseases such myocarditis, autoimmune disorders, hypertensive disorders, infections etc. [195,214,219-221]. Its occurrence however is associated with pregnancy and postpartum hypertensive disorders, twin pregnancy, higher age and parity, and a positive family history [194,195,209-214].

In Africa, the first reports of the disease came from South Africa, where 23 episodes in 22 black subjects were noted [211]. In these South African women, the onset of disease occurred within the first ten postpartum days in two thirds of those subjects; in 3 subjects symptoms began in the third trimester of pregnancy. The authors estimated the incidence for their area, to be 1 in 3000 deliveries [211]. This African report however, was soon quickly followed by many other reports which indicated that the disease also occurred in most other parts of the continent [194,195,218].

The most extensive studies of the disease in Africa, however, have been in Nigeria, West Africa where particularly high occurrence rates have also been noted in the northern parts of that country [194,195,219,222]. Studies in Zaria, report that about 1% of postpartum subjects develop the disease; a rate 10 to 20 times higher than that reported in the United States [194].

Sanderson et al., reported that the condition, at certain times of the year accounted for up to 10% of all female admissions to the hospital in Zaria [219]. A seasonal variation in incidence has been noted, with the peak incidences said to occur in the month of July [194]. In a study in Ibadan, Southern Nigeria, the disease accounted for 29% of admissions for cardiac failure in women of child-bearing age during a one year period [195]. The high incidence

of the disease in Zaria has been attributed, in part, to the traditional postpartum practices of body heating and the intake of a salt rich "Kanwa" which is said to predispose to blood volume overload [194,219].

A study by Davidson and Parry of 224 patients reported that 40 (18%) had first noticed symptoms in late pregnancy while the remaining 60% had first observed symptoms postpartum [194]. A significant delay between onset of symptoms, and time of presentation to hospital was noted. The mean time of onset of symptoms was 3.3 weeks postpartum and the mean time of presentation to hospital was 9.4 weeks [194]. Only four (2%) subjects, for example, presented during pregnancy while 97 (47%) presented during the puerperal period and the rest presented after six weeks [194]. The time of onset of disease in Zaria, however, was similar to that reported earlier in South Africa [211]. In Ibadan also, about 80% of the 59 episodes in 50 patients studied had started within three months; a third had started in the first month of the puerperium [195].

Five (8.5%) of the 59 episodes in Ibadan and 15 (6.8%) of the 224 cases in Zaria had followed twin deliveries [194,195]. Eighty-seven percent and 76% of all subjects in Zaria and Ibadan respectively, had elevated blood pressures at presentation [194,195]. The authors in Ibadan remarked that, in 15% of their subjects, the blood pressure elevations were

severe enough, that they alone, could easily have been blamed for the heart failure. They therefore suggested that hypertension must play a role in the pathogenesis of the disease [195]. The Ibadan study [195], however was done much earlier than the Zaria study, and the researchers probably had not suspected any traditional postpartum practices as possible contributory factors. Their study population, it should be noted, also consisted of Yoruba's who are a different ethnic group with different traditions from the Hausas in northern Nigeria [195].

Long-term studies, in patients who develop peri-partum cardiac failure, have shown a relatively poor prognosis [195,219]. Between 24 to 45% of subjects have been observed to develop chronic hypertension [195,219]. A high mortality rate of 11% within the first year of disease was noted in Zaria [219]. Heart failure, unrelated to pregnancy, later occurred in 13% of subjects and 9% of affected cases developed dilated cardiomyopathy [219]. A recurrence of the condition with subsequent pregnancies also occurs [194, 195,219]. In the Zaria and Ibadan studies for example, 26% and 22% respectively of the study subjects developed the condition with subsequent pregnancies [194,195]. About fifty percent of cases however have been observed to recover without further episodes [219].

With the exception of these detailed Nigerian studies, there is little reported about the disorder in other parts of

Africa, and the incidence is still unknown in most parts. Mortality and other data indicate that it is one of the less common postpartum complications. If however we consider that the disease occurs predominantly in blacks and that a high prevalence of associated factors such as twin pregnancies, higher ages and parity, and postpartum hypertension also occur on the African continent, then the disease is likely to be a more frequent cause of maternal morbidity in sub-Saharan Africa than elsewhere.

If the hypothesis that the higher incidences of disease among the Hausa and/or Fulanis are due to prevailing postpartum traditional practices is correct, then the disease could be an even more important cause of morbidity and mortality in the West African, since these peoples occupy in an extensive area of the region. Many other African tribes may also practice similar traditions with the same effects, and therefore more research is needed on this disease and its determinants in Africa.

Puerperal mental disorders:

Psychiatric disorders are one of the recognised disease problems that appear with increased frequency during the puerperium [223]. Its occurrence at this particularly crucial time in the life of a mother and her child, brings untold

hardship to not only one, but two very "delicate" individuals. In recent times, there has been a lot of attention paid to puerperal psychiatric disorders especially in the western world. The literature today from the developed nations includes many articles describing its incidence, types, and identified contributory conditions [223-226].

The three commonly occurring psychiatric disorders noted after childbirth include third day blues, postpartum depression, and puerperal psychosis [43]. Third day blues is a transient condition lasting less than one week. It affects about 70 to 80% of mothers between the third to sixth postpartum days and is characterised by emotional lability [43,227]. Depressive illness, following child birth has been identified as the most frequently occurring disorder and the reported incidences in the developed world range between 2 to 20 percent [224,228-230]. Puerperal or postpartum psychosis is the severest and most incapacitating mental disorder. The incidences reported in Europe and North America range between 1 to 2.5 per 1000 births [223,225, 231,232].

That pregnancy and delivery are stressful times could by themselves explain the increased incidence of puerperal mental disorders. Results of some studies however also indicate that the hormonal changes in pregnancy and the puerperium may be an important contributory factor [233,234]. Psychiatric disease following molar pregnancy has been reported [235]. An

increased occurrence of psychiatric disorders in early and late pregnancy has also been noted [236,237]. The majority of morbidities however occur after child birth.

Predisposing and triggering factors which have been identified include primiparity, unstable family background, lack of support, a positive family history and past history of psychiatric disorder, obstetric complications and loss of the infant [224-226]. Puerperal psychosis is recurrent in about 15% of cases [223,225].

As noted with the other puerperal conditions, less information is also available on puerperal psychiatric disorders in the developing world and especially in Africa. The estimated incidence of puerperal psychosis from hospital-based studies in South Africa and Tanzania were 0.7 per 1000 and 0.4 per 1000 births respectively [238,239]. In Zaria [8], 40 cases were seen among 22,774 deliveries which gives an incidence of 1.8 per 1000. This is similar to the rates in Europe [223].

In the Assir region of Saudi Arabia, the reported incidence of puerperal psychosis is 3 per 1000 [240] a rate which is slightly higher than those reported in the western world and sub-saharan Africa. The incidence of puerperal depressive illnesses in Uganda was found by J.L. Cox to be 10%, a figure similar to rates observed in the developed world [241].

The studies of puerperal psychiatric patients in Nigeria and Tanzania, showed that the onset of the disease in the majority of cases was within the first two weeks postpartum; a finding also observed in western countries [225,226,241-243]. In Ibadan, Nigeria, for example, in over 60% of cases symptoms started in the first week; the figure rose to 80% by the end of the second week [243].

In Tanzania, 60% of patients had had symptoms within two weeks but only 40% had presented to the clinic during that period [239]. Schizophrenia was the major type of disease reported in Dar es Salaam and Ibadan [239,243], whilst in Northern Nigeria depressive illness was identified to be the dominant disorder [244].

It is important to note that in Africa the more severe illness such as the schizophrenias are more likely than the others to be seen at hospitals. This may explain differences between the African and western findings in the types of diseases seen in the hospitals. A second factor too, has been the differences in classifications of psychiatric disorders between the various studies which makes the interpretation of these findings difficult.

A striking finding in the African studies has been the higher frequency of other puerperal disease complications among the psychiatric patients studied [238,239,243]. Thirty-seven percent and 49% of patients in the Tanzanian and South

African studies respectively had had postpartum complications of haemorrhage, infection, malnutrition, and hypertension, while in Ibadan 62% of patients had complained of a postpartum fever [238,239,243]. Another Nigerian study, by Makanjoula, also reports that 20 of 57 patients observed had obstetric complications; these had occurred in pregnancy (5 cases), during labour (5 cases) and in the puerperium (10 cases) [244]. Also of note in these African studies are the findings that between 12 to 30% of cases presented with confusional states which could have been attributed to the other occurring puerperal complications and therefore created difficulties in diagnosis [238,239,243].

Similar findings have also been reported from India where 42 (25%) of the 144 psychiatric patients reviewed in one study also had some other obstetric complication [245]. Of these 42 cases, 20 had puerperal sepsis [245].

In western studies, although complications of pregnancy and labour such as preeclampsia, difficult labour, and caesarean delivery are frequently recognised as important contributory factors to the occurrence of psychiatric disorders, puerperal complications (especially of the kinds mentioned in the African studies) are rarely mentioned [226,229,246].

In the developing countries, therefore, other non-psychiatric puerperal complications are an additional

contributory factor to the occurrence of psychiatric disorder. Of even greater importance is the fact that these diseases may mask and/or also be masked by the psychiatric disorder thereby interfering with the treatment of both disorders. In the Ibadan study, a number of patients had delayed psychiatric referrals because they had other severe puerperal complications such as sepsis, anaemia and pyrexia, which are known causes of functional organic psychosis by themselves [243].

Cultural practices are important modifiers in the occurrence and presentation of psychiatric diseases in general. In developing world societies where child birth is often marked by elaborate ceremonies the traditional practices could be important factors in the epidemiology of the puerperal psychiatric disorders. In the Northern Nigerian study, for instance, the authors remarked on the particularly young ages of their patients and attributed this to the younger age at marriage and child bearing in the region. These young females who were less well-prepared to cope with the stresses of child bearing were probably therefore at higher risk for puerperal psychiatric disorders [244]. The study, also noted that the dramatic behaviourial changes were often related to the elaborate child naming ceremonies performed on the seventh postpartum day [244].

In South Africa [238], 80% of the puerperal psychiatric patients as compared with 30% of controls, were concerned

about their marital status, which they considered illegal because certain traditional rites had not been performed. In India, the birth of a female infant was observed to be an important contributory factor to the occurrence of puerperal psychosis [245]. The populations in the developing world include large numbers of different ethnic groups and there are as many postpartum cultural practices as there are ethnic groups. The incidences of puerperal mental disorders, and of its determinants, may need to be studied separately in each ethnic society if effective measures for modifying the occurrence of puerperal psychiatric morbidity are to be undertaken.

The devastating effects of puerperal psychosis in the African setting however, can be best appreciated when the findings presented by Makanjuola's study in Nigeria are reviewed [244]. Of the 57 psychosis cases seen in a year, 30 had stopped breast-feeding because of their illness. For the infant in this region this marks the beginnings of mal-nutrition since artificial feeds are expensive and are not readily available. Seven babies died and seven others needed hospital admission for severe ill-health. Eleven husbands deserted their wives [244]. These findings can be compared with that of Da Silva et al, in the United Kirgdom where only 2 of 50 babies from 47 puerperal cases died. Of these deaths only one could be attributed to the mother's illness because

the other was the result of a congenital heart disease and another two infants became ill from neglect [246].

Summary:

In concluding this review of the literature, a few comments are worth noting. Firstly, there is a general paucity of information on puerperal morbidities in developing countries. Secondly, it is evident from the few studies available that the vicious cycles of ignorance, poverty and disease contribute significantly to the occurrences and severity of most puerperal disorders. The true extent of morbidity is still unknown in most countries, and many more studies are urgently needed if we are to take an initial step to solving the tragedy of maternal ill-health.

CHAPTER 4

METHODS

4.1: THE STUDY DESIGN

The design was basically that of a prospective cohort study in which a cohort of presumably well pregnant women from home, who delivered their infants vaginally at the Komfo Anokye Teaching Hospital (KATH) labour ward, were followed up in their early puerperium, by interview and physical examination to determine the occurrences of morbidity such as anaemia, puerperal sepsis, etc..

4.2: STUDY OBJECTIVES

1. To determine the incidence of puerperal morbidity, particularly infections and anaemia, in a cohort of women delivering in Kumasi, Ghana.

2. To determine the extent to which certain socio-demographic features, pregnancy and labour experiences influence the occurrence of morbidity in these women.

3. To provide information for use in improving the post-partum health care of women in Kumasi and the country.

4.3: STUDY PLANNING AND THE CONSIDERATIONS

Because the planning stages of this study were done in St. John's, Newfoundland, Canada, a considerable distance from the study area, important methodological considerations had to be made. Two aspects of the study design, judged as most affected by these limitations, were the development of the questionnaires (the measuring instrument) for use in the study, and the time interval for achieving the desired study goals. Strategies adopted to minimise the effects of these limitations are as follows:

Instrument development: Time and financial constraints prevented the organisation of a pilot survey needed to refine study questionnaires. Samples of these questionnaires were forwarded to a number of individuals involved in maternity care in the Ashanti region, Ghana, for comments and review based on their patient experiences. Opinions were also similarly sought from a practising Obstetrician and Gynaecologist in Kumasi and in St. John's on the more technical aspects of morbidity assessment in the Kumasi setting.

Time for morbidity assessment: A one week period from the 7th to 14th postpartum days was chosen as the best time for patient follow up. This time interval was chosen because it

permitted a compromise between the medical and also cultural considerations, as well as the time limits for the study. Medical factors considered included the definitions of puerperal disorders, such as pyrexia, and the effects of the dynamic physiological changes in the puerperium which could affect measurable variables such as haemoglobin. Culturally, this time was considered as likely to be the more acceptable period to study participants, because it respected traditional practices of maternal and child isolation until after the child naming ceremony on the 7th postpartum day. With an overall three month period planned for the study, this period additionally allowed adequate time for recruiting, and later follow up of the 450 intended study subjects, and also permitted time for initial data cleaning before returning to Canada.

4.4: STUDY SUBJECTS

Sample size: An estimated minimum sample size of 369 subjects for study was calculated with the following considerations;

1. The estimated proportion of anaemia expected postpartum of 0.40 (40%)
2. A selected 95% confidence level
3. A confidence interval of 0.40 ± 0.05

Bearing in mind the fact that this was a prospective study and therefore some 20% or even more subjects could be lost during follow-up, the minimum number of study subjects was elevated to 450.

Subject Recruitment and Eligibility: Because about 25 patients deliver each day at the study center, a three week period was chosen for subject recruitment. During this period, all consecutive subjects reporting from home to the labour ward for delivery, were considered as the intended sample. Of these, those who delivered vaginally and gave informed consent were eligible and were recruited into the study for follow-up. Excluded from the sample were the following subjects:

- Subjects not from home eg. referred or admitted for more than 48 hours,
- False labours,
- Those who had operative abdominal delivery, and
- Subjects who did not give consent.

Subjects were enrolled by a trained research assistant who was also a qualified nurse-midwife. Patients were contacted after they had successfully delivered their babies, were transferred to lying-in wards, and were ready for discharge. The recruited subjects were provided with a special identity card (APPENDIX B) for use in attending the follow-up clinic and also for other clinics if they required prior medical attention.

Eligible subjects who were admitted (ie. detained for more than 24 hours) or who later died from some complications of labour were monitored by the research assistant responsible for subject enrolment, and details of reasons for admission and other outcomes were recorded.

Since pre-delivery haemoglobin level was not routinely measured in the hospital because of limited laboratory service, the study undertook this investigation on all the intended study subjects coming to the ward from home. Blood samples were collected by the admitting nurses.

4.5: ENHANCING PARTICIPATION

Recognising that the success of the study depended largely on successful subject participation, strategies for enhancing participation were deemed necessary and pre-planned. Attractive incentives offered to subjects in the study included the following:

- The provision of free treatment drugs for common puerperal disorders,
- A month's supply of haematinics, (ferrous sulphate and folic acid),

- Free medical consultation for study subjects and their new infants outside scheduled visits and during the entire period of the study,
- Facilitated referral to other specialists, when this was required, and
- an opportunity for them to discuss pertinent issues such as contraception, infant feeding and immunisations.

Subjects who were considered as likely to be less interested in the study, for example, individuals with stillbirths, or who lived very far away from the study center were targeted and received extra attention and encouragement during recruitment.

4.6: BASELINE DATA

Baseline data on socio-demographic status, antenatal history and delivery details were obtained by (1) interview from the eligible subjects (2) from hospital labour charts and (3) from antenatal record charts. They included the following information:

Socio-demographic: Age Occupation
Ethnic group Educational level
Name/residential address Next of kin

Obstetric and antenatal history:

Parity

Number of antenatal clinic attendances

Gestation at first attendance

Risk factors related to present pregnancy

Labour outcome: Duration of labour*

Type of delivery

Peri-partum complications and blood loss

Infant details and outcomes

Prepartum haemoglobin level: This was obtained from blood sample collected at admission.

These baseline data were collected by the research assistant during enrolment and recorded on Study Form A, (APPENDIX C).

* The recorded durations of labour are calculated from the reported onset of labour by patients, often corroborated with time stated by relatives.

4.7: FOLLOW-UP MORBIDITY ASSESSMENT

The cohort of recruited subjects, was directed to report back in 7 to 14 days to a specially organised postpartum clinic at the well-known Maternal and Child Health center

located in the vicinity of the hospital. Each day's cohort of about 20-30 women were, however, urged to visit the clinic a week after their discharge in order to prevent overcrowding at clinics. Individuals who delivered on weekends were scheduled for the next most appropriate weekday.

The clinics were run from March 4th to April 19th 1991, and held each weekday from 08:00 hr until the last subject had been attended too, which was often around 14:00 hr. Morbidity assessment at the clinic was done by the principal investigator (a trained physician), through interview and physical examination.

The Interview:

Subjects were interviewed about their health in the days following discharge from hospital. They were questioned about specific symptoms such as fever, abdominal pain, breast soreness etc. using a carefully designed questionnaire, Form B, (APPENDIX D), and also for any other complaints they might have. Questions were translated into the local languages by the interviewer who is fluent in the three commonest local dialects. Only on a few rare occasions was the help of translators needed for subjects who spoke other languages. The translators used on these rare occasions were usually accompanying relatives of the patient.

Examination:

Subjects were examined by a standard clinical examination procedure. First, a general assessment for pallor, icterus, pedal oedema, and the taking of body temperature, blood pressure and pulse measurements was done with the patient in sitting posture. Next, with the patient lying on the examination couch, breast, abdominal and further leg examination were done followed by lochia and perineal inspection and finally by a bimanual pelvic examination, where indicated.

The indications for bimanual pelvic examination included a complaint of lower abdominal pain, the finding of a lower abdominal tenderness and/or a pelvic mass during abdominal palpation and the presence of bright red lochia.

Where there were other symptoms or signs suggestive of other system disorders such as respiratory, or cardiac disorders, then a more detailed examination of that system was performed. A sample of blood was then finally taken for haemoglobin analysis. All examination findings were recorded on Study Form B (APPENDIX D).

Oral temperature readings were taken using a digital centigrade thermometer and blood pressure was measured with subjects in the sitting posture and after they had been at rest for at least 15 minutes. A digital sphygmanometer with standard adult cuff width (5.5 inches) was used. If blood

pressure readings were found to be abnormally elevated then subjects had a second reading taken an hour later after rest or on the next day, before any conclusions were drawn.

Previously prepared clinical guidelines were used for assessing subjects, and for diagnosing the common puerperal conditions of interest (APPENDIX E). Study participants who were found to have conditions requiring medical attention were either treated or referred to the appropriate quarter for further medical management. Referred patients were usually sent to a selected group of specialists who had previously consented to see study subjects and give feedback.

Other morbidity information:

Through the regional Ministry of Health offices, all health centers in the Kumasi district received prior information on the study and about their expected roles. Subjects who had consulted other health professionals with a problem during the interval prior to coming to the study clinic, were asked to have information about that attendance recorded on the special identity card provided by the attending health officer. Where no entries were made on the card but subjects reported having consulted a professional, then other evidence such as prescription forms, home-based hospital cards, etc. were used to ascertain the reasons or

diagnosis. Where it was necessary, the health centers or the attending health officer were contacted for details.

4.8: OPERATIONAL DEFINITIONS

Puerperal fever:

-Fever with oral temperature greater than 38•C (100.4•F) measured within the 7-10th postpartum days during examination in the clinic: AND/OR

-A report by the patient of a fever which occurred between the second to tenth postpartum days.

Anaemia: A haemoglobin level of less than 11.0 g/dl.

Severe anaemia: A haemoglobin level of less than 8.0 g/dl.

Upper genital tract infection: Three or more of the following symptoms and signs:

-Fever at examination or reported by patient.

-Lower abdominal tenderness and/or guarding on abdominal palpation.

-Purulent lochia.

-Uterine and/or adnexal tenderness on bimanual examination.

Lower genital tract infection: Three or more of the following listed signs:

-Fever

-Local oedema and redness of greater than 0.5 cm on sides of wound.

-Exquisite local tenderness

-A discharge of pus

-Gaped and/or delayed wound healing

Secondary postpartum haemorrhage: the finding of lochia rubra at the time of examination.

Breast lesions: Three types of breast disorders as follows:

I: Mastitis: The presence of at least two of the following signs:

-Fever

-Swollen, tender and reddened breast

-Cracked/sore nipples

II: Breast abscess: All the above criteria for mastitis plus a fluctuant mass lesion and/or discharge of pus.

III: Nipple disorder: The presence only of a chaffed, cracked and inflamed nipple(s).

Postpartum hypertension: Blood pressure readings of 140/90 mm Hg or higher recorded on two occasions at least an hour apart and in a subject in the sitting posture.
Severe hypertension :Blood pressure readings of 160/100 mm Hg or higher.

Thrombophlebitis/thrombotic lesion of lower limb: The presence of at least three of the following signs.
-Systemic fever
-Tenderness along the path of a blood vessel
-Palpable tender cord like lesion along the path of a vein.
-A warm oedematous swelling of affected limb
-A positive Homan's sign

See APPENDIX E for a more detailed description of the definition of terms and the diagnostic criteria.

4.9: NON-ATTENDING PARTICIPANTS

Despite the incentives offered, a number of recruited subjects failed to show up at the morbidity clinic for assessment as requested, and had to be traced. At the end of each week, the list of all persons who failed to attend the clinic was prepared by the research assistant responsible for

follow-up (a community health nurse) and subjects grouped by area of residence.

On two days of each week, usually Saturdays and Thursday afternoons, trips were made to various parts of the Kumasi district to find these non-attending subjects in their homes. Furthermore, at the end of the overall scheduled follow-up period, an additional two weeks was utilized to locate the remaining non-attending study subjects. Home visits were the only available means for contacting these subjects because of the poor communication facilities in this part of the world.

On the average at least two attempts were made to locate the homes of each client before they were finally given up as lost. Where subjects were absent from their home, messages were left with relatives requesting their attendance at the next clinic. Because of financial and time constraints however, no attempts were made to trace the few "individual" subjects who lived in communities more than 25 miles outside the city of Kumasi.

Subjects who were found, were questioned diplomatically about their reasons for non-attendance, and then interviewed in the same way as clinic attendants, using the study forms. Blood samples were also obtained routinely. Physical examination was carried out with subjects lying on their bed or on mats but did not include bimanual pelvic examination. Subjects who required this type of examination or further

clinical assessment and management were again directed and convinced to attend the next clinic. Care was taken to ensure that all these assessments were done in the best possible environmental setting which was quiet and also private.

4.10: LABORATORY INVESTIGATIONS

Haemoglobin analysis was the only laboratory investigation routinely carried out on all study subjects. Two millilitre venous blood samples were taken from the forearms of subjects using EDTA Vacutainer tubes. Blood samples were obtained on two occasions; the first in the pre-partum period when subjects were admitted in labour, and the second during morbidity assessment. All samples were collected from study centers at the same time once each day and transported to the University of Science and Technology (UST) Hospital laboratory where analysis was carried out by one technician. All blood samples were analyzed within 24 hours of collection.

Haemoglobin levels were analyzed by the cynmethaemoglobin concentration method with spectrophotometry. The haemoglobin standard preparation used conformed to B.S 3985, with a concentration of 14.3 g per decilitre. The instrument used was Spectronic 20 (Bausch & Lomb), and measurements were taken at a wavelength of 540 nanometres.

When the results of haemoglobin analysis were found to be less than 7.0 g per decilitre the principal investigator was notified immediately so that the subject could be further followed up. However in most cases the severe anaemia cases were often diagnosed clinically.

Other laboratory investigations requested were undertaken only as part of patient management and included mostly urine, stool, and sickling electrophoresis. These were usually done in the hospital's routine laboratory.

4.11: DATA MANAGEMENT AND ANALYSIS

The data generated by the study could be classified into two major categories:

-the baseline data (socio-demographic, antenatal and labour variables),

-morbidity assessment data (interview and examination findings).

The EPI INFO Database and statistical package was used to store data on the computer and to carry out primary descriptive analyses. More sophisticated data analyses were done with the SPSS-X program, and graphical presentations prepared with HAVARD GRAPHICS software.

Sample description: The characteristics of the study sample were described by analysis of baseline data which included; (i) socio-demographic variables such as age, education, ethnic origin and parity, (ii) antenatal experiences which included antenatal care and identified pregnancy risk factors, (iii) labour experiences which included variables such as duration of labour, occurring complications and the pregnancy outcomes.

Descriptive statistical measures such as frequencies, means and standard deviations were used to describe these data and they are presented in tables, and bar and pie charts.

Morbidity assessment: The data consisted of two parts (1) the interview and (2) the examination findings. Interview data were recorded mostly as categorical variables and were analyzed by non-parametric descriptive statistics using frequencies and proportions for specific complaints. These data were also presented by simple descriptive graphics and tables.

Examination findings, on the other hand, consisted of both quantitative and qualitative variables and data analysis was directed mainly at describing the frequency of abnormal clinical findings and of the specific clinical disease conditions of interest to the study. The incidence rates for overall morbidity and for the specific conditions such as anaemia, upper and lower genital tract infections, breast

disorders, secondary postpartum haemorrhage and other complications of childbirth were determined using the following stated formula;

$$\text{Incidence rate} = \frac{\text{Number of new cases of a specific disease condition}}{\text{Total number of subjects examined on follow-up or admitted.}} \times 1000$$

Since some subjects were lost to follow up, overall morbidity incidence rates are also calculated for an "at worst" situation; ie, all subjects lost were ill; or an "at best" situation ie, all subjects lost were well. The denominator used for this calculation was all expected subjects at the clinic.

Identifying the determinants of morbidity: To determine if certain socio-demographic, pregnancy, and labour variables are identifiable risk factors for specific morbidities, the prevalence or distribution of these variables were compared among those with and without the specific morbidity.

Univariate comparisons were done by Chi-square test and Students t-test for categorical variables and continuous variables respectively. Two by two table analysis was also performed to obtain the relative risk ratios, their confidence intervals, and p-values.

Further multivariate logistic regression analyses were also performed to identify risk factors for the specific morbidities. These were done because many of the variables recorded in the study are known to be associated with each other and could therfore confound risk factor identification during univariate analysis. The PROBIT/LOGIT model of SPSS-X was used in performing this logistic regression analyses [247,248].

The PROBIT/LOGIT procedure estimates the effects of one or more independent variables (continuous and categorical) on a dichotomous dependent variable [247,248]. The procedure calculates the maximum likelihood estimates for the parameters of the requested response model. For any given independent factor, a high regression coefficient relative to its standard error indicates it to be an important predictor of the dependent variable [247,248].

Comparative analysis of clinic non-attenders and attenders:

Persons who did not come to the morbidity clinic as requested were compared with those who came as scheduled, by their socio-demographic, antenatal and labour experiences (the baseline variables) and also by their reported ill-health complaints during the interview. These factors are believed to be the most likely to have influenced their attendance at the morbidity clinic.

The various groups of subjects, characterised by whether they attended the clinic or not; were later found or not; were compared with each other by the baseline factors. Univariate comparisons using Chi-square and Students t-test were performed to identify those factors with important predictive effects.

Because some of these baseline variables are also associated with each other, further comparison of the non-attenders to attenders was done by multivariate logistic regression analysis. The PROBIT/LOGIT model of SPSS-X was again used because these baseline variables included both measured and categorical variables.

The interview findings, on the other hand, were comprised of categorical data. Using the SPSS-X program of HILOGLINEAR and LOGLINEAR, a multivariate regression analysis was performed to identify those health complaints with important predictive effects for clinic attendance.

The HILOGLINEAR procedure estimates parameters of hierarchical log-linear models for frequency tables. The saturated model used in this analysis, performed a backward elimination procedure to generate the important levels of interaction for the model and also estimated the measures of partial association [247,248].

The LOGLINEAR procedure is the procedure that does model fitting, hypothesis testing, and also computes parameter

estimates for any model which has categorical variables as its major components [247,248]. Thus a LOGLINEAR analysis was next performed, using the recommendations of HILOGLINEAR, to determine the most significant associations and best fitted model. Note that the more non-significant the "goodness-of-fit" chi-square the better the fit [247,248].

Attenders and non-attenders, were also compared where necessary, on selected clinical examination findings using the Students t-test, and Chi-square tests with Yates correction, where appropriate.

Other study data: To give a more complete research presentation, a brief descriptive analysis of the characteristics of persons who were excluded from follow-up such as those who had abdominal delivery is also presented, even though they are not the subjects of major study interest.

CHAPTER 5

RESULTS

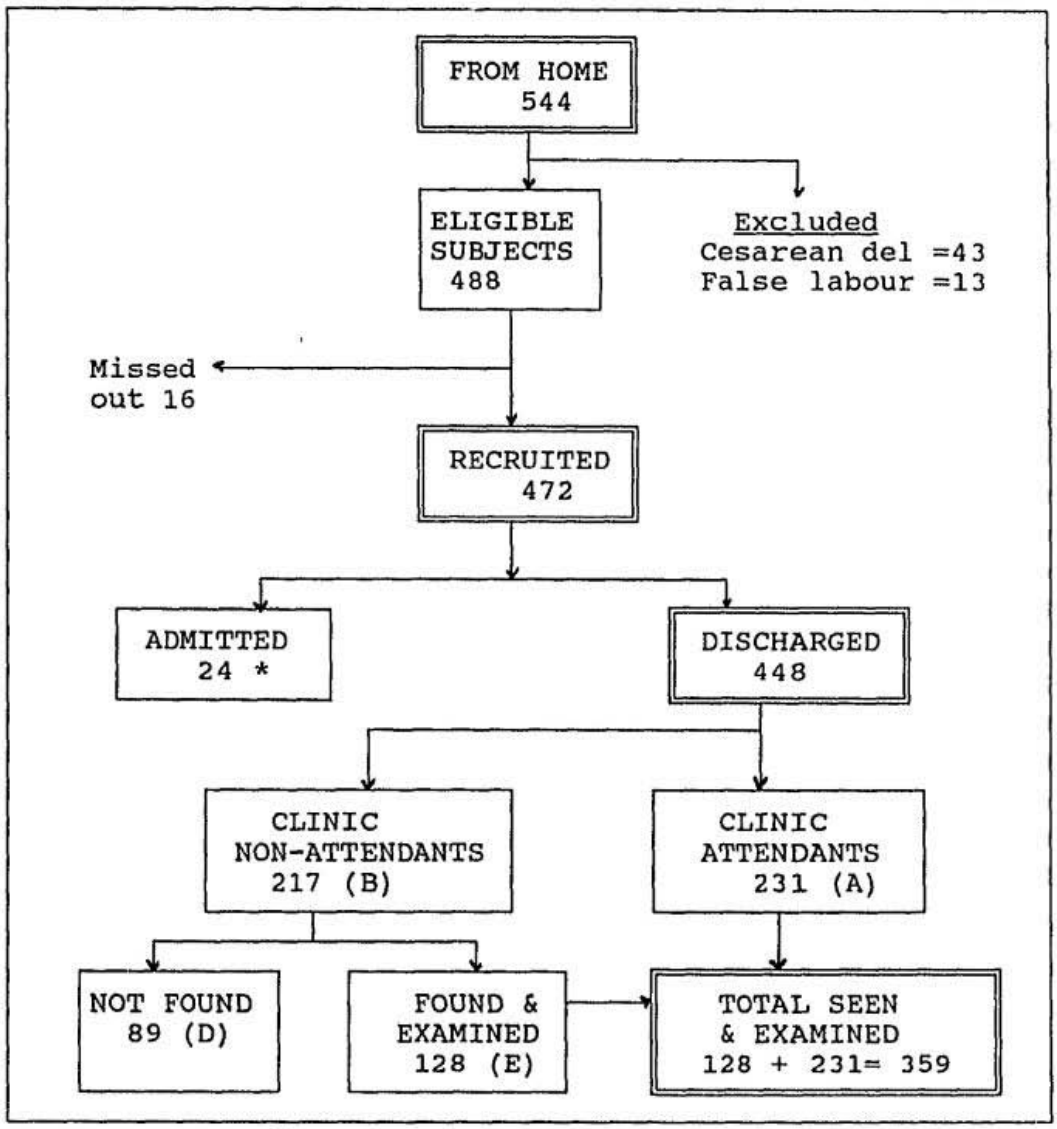
During the three week period of subject recruitment, a total of 587 women in labour were admitted to the labour ward. Of these, 544 came from home and were, therefore, eligible for the study. Of the remainder, 28 were referred from some other health centre, and 15 were transferred from obstetric wards in the hospital, where they had been admitted for more than one day. These subjects were all excluded from the study.

Of the 544 subjects who came to the hospital from home, 13 had false labours and were discharged home; they did not come back to the centre to deliver during the period of recruitment. Forty-three subjects required an emergency cesarean section and were excluded, and another 16 subjects were not recruited because of the following reasons; two were missed because they had been scheduled for operative delivery but had delivered vaginally in the operating room ; 11 subjects were discharged earlier than usual, mostly because they had requested and had been granted this favour by medical staff with whom they were well acquainted. The reasons in the last three cases were not entirely clear.

All 472 remaining eligible subjects consented to participate in the study when contacted. Six of these individuals, however, had to be contacted after hospital

discharge since they were also discharged unusually early. A flow chart outlining subject recruitment and follow-up is presented in Fig 1.1:

FIG.1.1 FLOW CHART OF SUBJECT RECRUITMENT AND FOLLOW-UP



Twenty four (5.1%) subjects were admitted to the lying in ward for various indications. The remaining 448 were discharged routinely within 12 to 24 hours after delivery, and they were scheduled for follow-up morbidity assessment at the special study clinic.

5.1: BASELINE CHARACTERISTICS OF RECRUITED SUBJECTS

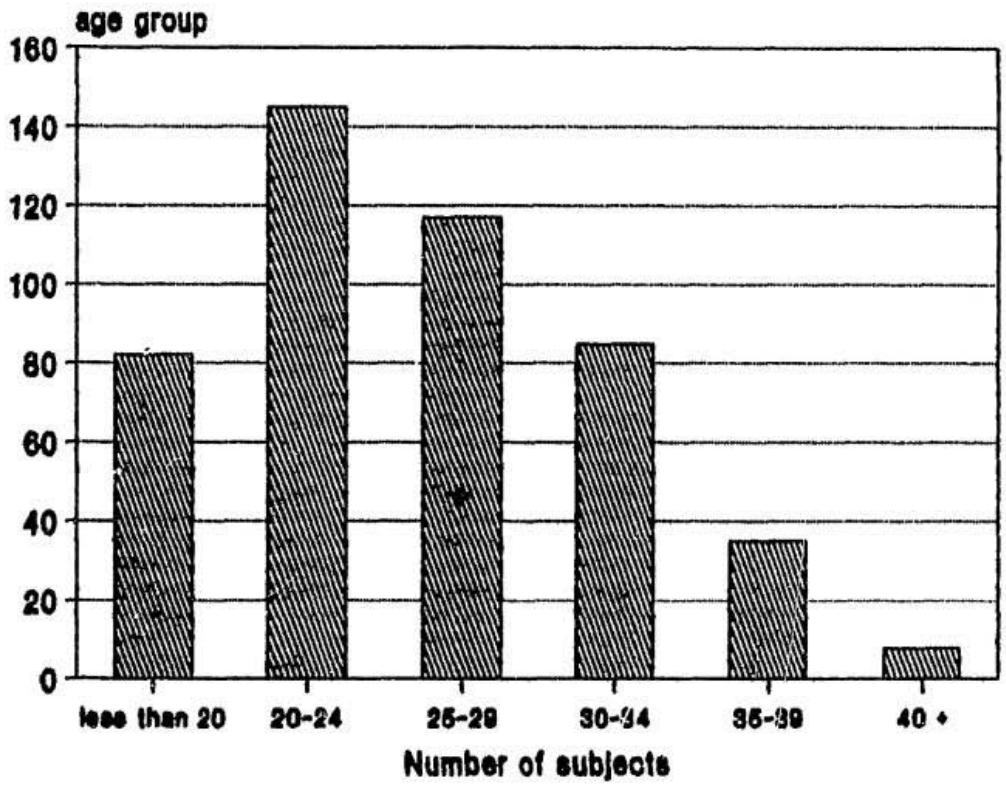
The baseline characteristics, including the socio-demographic features, pregnancy and risk factors, antenatal care, and the labour outcomes of the of the 472 recruited subjects to the study are presented in this section.

I: The Socio-demographic characteristics

AGE: The ages of study subjects ranged from 15 to 48 years with a mean age of 25.4 years (Standard deviation (SD) ± 5.9 yrs). An observed feature in the age distribution, which is not evident in FIG. 2.1 of age distribution presented below, was the tendency for subjects to round off their ages to the nearest fifth year. For example, person of ages 23 and 24 rounded off to 25; those of 29 years rounded off to 30 years,

and so on. There were therefore much larger numbers of subjects in these "rounded off" ages. Teenagers less than 20 years formed 17.4 % of the sample. Most women however, were in the age group 20 to 29 years, which formed 55.5% of the study population.

FIG 1.2
AGE DISTRIBUTION OF SUBJECTS



Number of subjects=472

ETHNIC ORIGINS: The majority of subjects 66.7%, were Ashantis, the ethnic group of the region. The remaining 33.3% were from the four other migrant ethnic groups, the predominant group among these being the subjects from northern Ghana. See TABLE 1.1.

TABLE 1.1 THE ETHNIC GROUPS OF STUDY PARTICIPANTS

Tribe group	Number of Subjects	Percent(%)
Ashanti	315	66.7
Other Akan	52	11.0
Northern	90	19.1
Ewe	12	2.5
Ga/Adangbe	3	0.6
TOTAL	472	100.0

EDUCATIONAL LEVEL: Ninety subjects (19.9%), had never received formal education. The levels of education for those with formal education, have been grouped by the type of school completed. The majority of subjects (60.0%) had elementary school level education, a school system with 10 grades, leading to a Middle School Leaving Certificate at the end of the tenth grade. This system was an old school system, which has now been replaced by a newer model of primary and secondary schools. Few subjects (1.8%), had post-secondary education. See TABLE 1.2.

TABLE 1.2 THE EDUCATIONAL LEVELS OF STUDY PARTICIPANTS

School level	Number of Subjects	Percent(%)
Nil	90	19.9
Primary	48	10.6
Elementary	271	60.0
Secondary	35	7.7
Univ./Post Sec.	8	1.8
TOTAL	452*	100.0

* Note data missing for 20 persons.

SOCIO-ECONOMIC STATUS: Western socio-economic classifications were found to be very difficult to apply and also inappropriate for this study population. Subjects have been classified into seven new categories based on their occupations. See TABLE 1.3. The experience of this researcher however, is that little difference actually exists between the income levels of the first three socio-economic classes listed in the table.

Most women, 248 (53.3%) were small-scale traders, who may have possibly been classified as unskilled labour if western classification were applied. The majority of these traders are vendors of fresh or processed foods, and even water. The types of items sold by these women often varies with their seasonal availability. The second largest occupational group were the

apprenticeship-trained occupations, such as dressmaking and hairdressing. Training for these occupations often requires no literacy skills. These subjects could also have been classified as skilled or semiskilled by the western criteria.

Farmers, who form a small 3.7% of the study sample also acquire the skills of their trade by apprenticeship learning from peers and have no formal training.

The formally trained professionals in this sample included teachers, nurses, and accountants and are those with the highest socio-economic level in the sample; they comprise a small 2.4% of subjects.

The majority of subjects in this study can therefore be described as indigent and from low socio-economic backgrounds.

TABLE 1.3
THE OCCUPATIONS OF THE STUDY PARTICIPANTS

Type of Occupation	Number of subjects	Percent(%)
Farmer	17	3.7
Small scale trader (petty trade/food vendors)	248	53.3
Apprenticeship trained (hair dresser & seamstress)	55	11.8
Clerical & other partially skilled	7	1.5
Professional (Skilled)	11	2.4
Home maker	72	15.5
Unemployed	55	11.8
TOTAL	465*	100.0

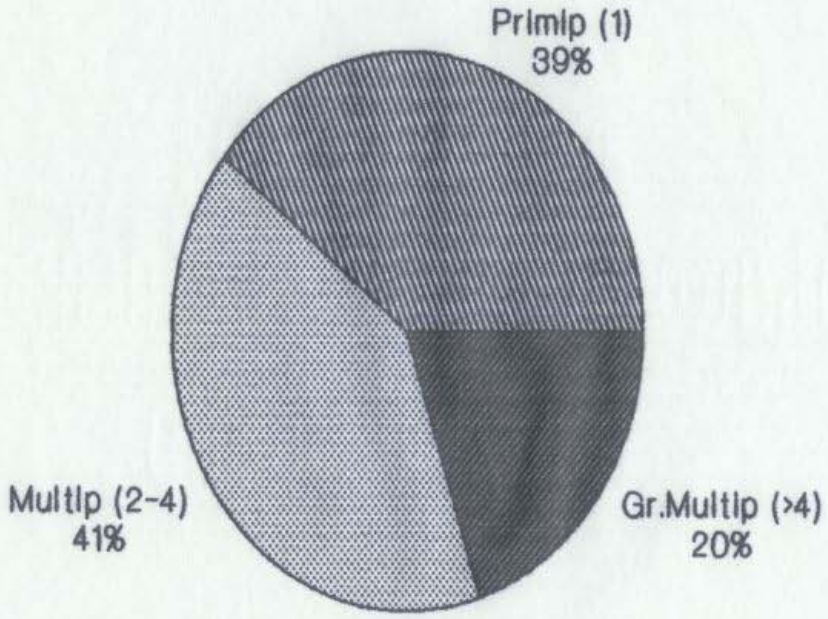
* data missing in 7 cases

Antenatal care and pregnancy risk characteristics

PARITY: The maximum parity recorded for subjects was twelve. The mean parity recorded was 2.8 (SD ± 2.0 births). About sixty percent (60.7%) of subjects were multiparous and 39.3% were primipara. Grand-multiparous women comprised 20.0% of the overall sample. There were 5 multiparous women who were teenagers under 20 years. Five primipara were also between 30 to 35 years of age. FIG. 1.3.

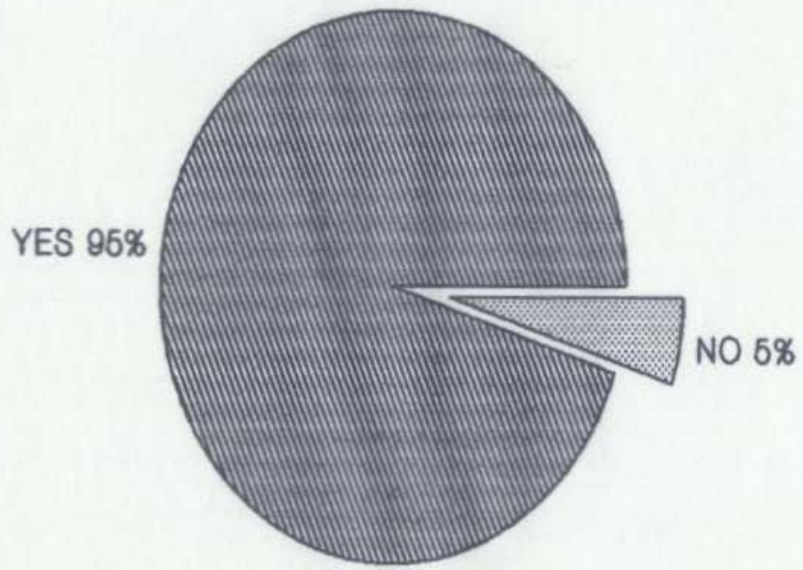
ANTENATAL CARE (ANC): The majority of subjects, 95.0% (433) had had at least one antenatal clinic attendance and only 23 subjects had never attended an antenatal care clinic. See FIG 1.4. More than half, 55.2%, of those who had antenatal care, started their clinic attendance in their second trimester. The modal time of onset of antenatal care for all subjects was at four months gestation. Thirty-nine subjects (9.3%) started the clinic in their last trimester and two of these subjects actually started attending the clinic in their ninth month. See TABLE 1.4.

FIG. 1.3
PARITY DISTRIBUTION OF SUBJECTS



Number =471

FIG. 1.4
ANTENATAL CARE



Data missing 16 cases

TABLE 1.4 ANTENATAL CARE; GESTATION AT ONSET AND THE QUALITY OF CARE

ANC	Number of subjects	Percent(%)
Gestation at onset of ANC		
First trimester	149	35.5
Second trimester	232	55.2
Third trimester	39	9.3
TOTAL	420*	100.0
Quality of ANC (no.of attendances)		
1-4	115	27.5
5-8	193	46.2
9 +	110	26.3
TOTAL	420	100.0

* Data missing for 13 cases

The number of clinic attendances usually reflected the time of onset of antenatal care. The mean number of attendances was 6.7 $\pm$ 3.3, and the modal 6 attendances. Subjects with less than 5 clinic attendances formed 27.5% of the study population. See TABLE 1.4 above.

RISK FACTORS: In all, 366 (78.4%) of subjects were identified as having at least one pregnancy or labour risk factor of note. Age- and/or parity-related risks were the most common risk factors followed by anaemia. The frequency distribution of risk factors is shown in TABLE 1.5.

TABLE 1.5 PREGNANCY AND LABOUR RISK FACTORS IN STUDY PARTICIPANTS

Risk factor	Number of subjects	% of study subjects
Obstetric		
Age related (<20years)	82	17.4
Parity related (>4)	94	20.0
Multiple pregnancy	13	2.7
Premature rupture of membranes	12	2.5
Poor pregnancy/labour history	11	2.3
Pre-eclampsia	9	1.9
Antepartum haemorrhage	9	1.9
Previous Cesarean section	7	1.5
Post date pregnancy	6	1.3
Intrauterine death	2	0.4
Others **	5	1.1
Medical		
Severe anaemia	27	5.7*
Hepatitis	13	2.7
Sickle cell disease	11	2.3
Others ***	5	1.1

* Identified before pre-delivery samples were collected
** Includes Cervical cerclage (1), Polyhydramnios (1) Kyphoscoliosis (1), breech presentation (2).
*** Includes Diabetes (1), Ascites (1), Asthma (1).

PRE-DELIVERY HAEMOGLOBIN LEVEL: Pre-delivery haemoglobin levels were determined for a total of 367 women who were recruited. In 105 subjects haemoglobin levels were not obtained for the following reasons: sixty women arrived in late second stage labour needing immediate obstetric attention, and blood samples were not collected; in another 38

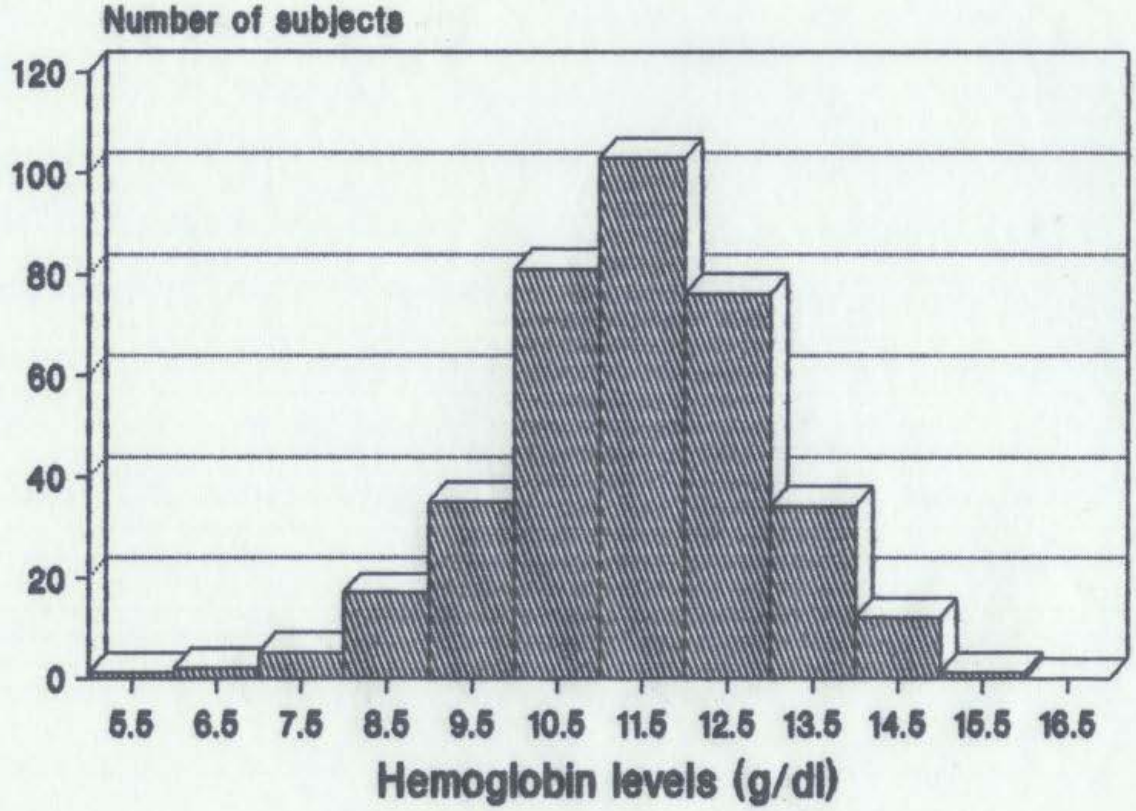
cases, blood samples were not collected because the nursing staff on duty were busy, this situation occurring mostly during night shifts, since there were fewer nurses on duty. Nine collected blood samples were accidentally lost in the laboratory before analysis.

The available pre-delivery haemoglobin levels for the recruited subjects ranged from 5.6 to 15.6 g/dl with a mean of 11.4 g/dl (SD ± 1.5 g/dl). One hundred and forty-one subjects (38.4.%) of the 367 subjects were anaemic (haemoglobin levels less than 11.0 g/dl). Severe anaemia of less than 8.0 g/dl occurred in only 8 (2.2%) subjects.

Subjects who had pre-delivery anaemia, were noted to have a lower mean age, 24.5 (± 6.1) than those who were not anaemic, 25.9 (± 5.9). This difference was statistically significant (Probability value (p)=0.03). However the distribution of subjects by age groups was not statistically different for the two groups. The occupations also differed significantly with more anaemic subjects being unemployed, or homemakers (p=0.02).

Further analysis of the other socio-demographic and pregnancy variables such as education, ethnic origin, parity and antenatal care did not indicate any association with the occurrence of pre-delivery anaemia in these subjects. FIG 1.5 presents the distribution of pre-delivery haemoglobin levels of study subjects.

FIG.1.5 THE DISTRIBUTION OF PRE-DELIVERY HAEMOGLOBIN LEVELS IN STUDY SUBJECTS



Labour events, complications and outcomes

TYPE OF DELIVERY : The majority of subjects 98.1% (463), had spontaneous vaginal deliveries, and only 9 subjects had vacuum-assisted delivery. Obstetric forceps are rarely used at this hospital and no subject was delivered by this method during the period of study. Mediolateral episiotomy was performed in the management of 21.6% of labours. TABLE 1.6.

DURATION OF LABOUR: Only 454 subjects had records of the total duration of labour; data were missing for 18 cases. The total duration of labour was calculated by attending midwives from the patient's reported onset of labour to the end of the third stage. Values recorded ranged from 2 hrs. 20 min. to 30 hrs. 33 min. with a mean of 11 hrs. 58 min. (SD $\pm$ 5 hrs. 29 min.). The mean duration of labour for the primiparae was 13 hrs. (SD $\pm$ 5hrs. 4 min.), and that for the multiparae was 11 hrs. 8 min. (SD $\pm$ 5 hrs. 4 min.). Twenty-three (5.1%) of these 454 subjects had prolonged labours of greater than 24 hours. The frequency of prolonged labour among primipara and multipara were 6.1% and 4.4% respectively. See TABLE 1.6.

BLOOD LOSS: The immediate blood loss at delivery was recorded for 459 cases; data were missing for 13 subjects. Recorded estimated blood losses ranged from 80-2800 ml. (millilitres),

with a mean of 252.7 ml. (SD ± 212.2 ml.). It was evident from the volumes recorded that there was a tendency to round off volumes to the nearest 50 ml. Thirty-four subjects (7.4%), had primary post-partum haemorrhage (loss greater than or equal to 500 ml).

TABLE 1.6
LABOUR AND ITS COMPLICATIONS IN STUDY PARTICIPANTS

	Number of subjects	Percent(%)
Type of delivery		
Spontaneous	370	78.4
Spontaneous + episiotomy	93	19.7
Vacuum + episiotomy	9	1.9
TOTAL	472	100.0
Duration of labour		
Normal (< 24 hrs)	431	94.9
Prolonged (> 24 hrs) all	23	5.1
	454	100.0
Complications of labour		
Genital tract injury		
All perineal tears	59	12.7
Cervical	1	0.2
Retained placenta	6	1.3
Dystocia	31	6.6
Primary postpartum haemorrhage	34	7.4
Pre-term labour	14	3.0

OTHER IMMEDIATE COMPLICATIONS OF LABOUR : Genital tract injury occurred in 12.7% (60) of the women. One subject had a cervical tear, another had a vulva haematoma, and the remaining 58 had perineal tears. Of those subjects with tears, the majority, 47, had a first degree tear, 10 women had a second degree tear, and one subject had a third degree tear. Other immediate complications of labour are listed in TABLE 1.6 above.

INFANT OUTCOMES: 485 babies were born to the 472 mothers. There were 13 pairs of twins, giving a twin pregnancy rate of 2.8%. Seventeen infants (3.5%) were stillbirths, two of whom were born macerated. Data were missing on the life status of three infants.

The male to female ratio was 1.08. Birth weights for singleton infants ranged from 0.99 to 4.82 kg.(kilograms) with a mean of 2.98 kg $\pm$ 0.51. Fourteen percent of singleton birth were low-birth-weight infants weighing less than 2.5 kilograms (kg). When we consider all infants, including twins, the percentage of low-birth-weight infants was 16.9%.

Summary of the baseline characteristics

The study sample can be described as comprising an indigent population of women over half (55.5%) of whom were in their twenties and about a sixth (17.4%) of whom were teenagers. The majority of subjects had just had their first, second or third baby at the time of recruitment to the study. Most (95%) had some antenatal care during their pregnancy. Despite the high prevalence of pregnancy and labour risk factors (78.4%), particularly age and/or parity-related risk and anaemia, they had uneventful labour with few complications. Ninety-five percent of them were discharged home routinely after delivery.

5.2: FOLLOW-UP AND MORBIDITY FINDINGS

Twenty-four persons were admitted to the lying-in ward postpartum. Twenty-two were for reasons of labour or early postpartum complications. Of these 22, three were re-admissions after hospital discharge. Another two cases were admitted because of post-minilaparotomy sterilisation complications. One subject admitted with primary postpartum haemorrhage died 26 hours after delivery and also after surgery had been performed for uncontrollable haemorrhage associated with disseminated intravascular coagulopathy. The maternal mortality rate was 1.8 per 1000 for this study population. TABLE 2.1 presents the reasons for hospitalisation of the 24 subjects.

TABLE 2.1 REASONS FOR ADMISSION IN THE 24 HOSPITALISED PATIENTS

Reason	No. of Subjects	Percent(%)
Postpartum haemorrhage *	9	37.4
Puerperal sepsis *	4	16.7
Severe Hypertension	4	16.7
Puerperal psychiatric disorder	2	8.3
Complications post-sterilisation	2	8.3
Severe anaemia	1	4.2
Hepatitis	1	4.2
Gaped infected episiotomy *	1	4.2
TOTAL	24	100.0

* Includes one subject who was re-admitted after discharge home.

Of the 448 subjects who were discharged home, 231 (51.6%) presented to the clinic for follow-up as requested while 217 did not. Of the 217 subjects, 128 were later found on follow-up in their homes and were interviewed and examined. The mean interval of follow-up for clinic attenders was 8.3 days (SD ± 2.0 days). Those who did not attend but were later found, were seen in postpartum periods ranging from 15-51 days with a mean of 27.1 days (SD ± 8.2 days), and a median of 27 days. Four subjects were found after the puerperal period of the first 42 postpartum days.

In all, therefore, 80.1% (359) of the normally discharged subjects were successfully followed-up. If we include the 24 individuals who were admitted to hospital then an overall follow-up rate for the 472 recruited subjects is 81.1%. The reasons given for non attendance by the 128 subjects who did not attend but were later found, are presented in TABLE 2.2.

Eighty nine-subjects (18.9%) were never found for follow-up examination. The homes of 19 subjects had been traced but they were absent from those addresses at the times of our visit, and they also did not later visit the clinic as requested. Sixteen of these subjects had travelled to their home towns to live with their parents, a common traditional practice after child birth. Household members who were in touch with these subjects said they were alive and well.

Sixty individuals were never found because of poor or incorrect addresses given. Another ten subjects were not traced because they were the only subjects living in villages more than 25 miles outside Kumasi, and logistic limitations did not permit travelling to these villages. It was ascertained from hospital staff and records that 6 of the individuals not found were alive and "well" in the first postpartum week because they had been seen during the period in the hospital attending to their admitted infants.

TABLE 2.2 REASONS GIVEN BY NON-ATTENDERS FOR NOT ATTENDING THE MORBIDITY CLINIC

Reason	No. of subjects	Percent (%)
Related to child		
Child naming/circumcision	9	7.0
No baby-sitter	8	6.3
Child unwell/admitted	6	4.7
Child died	6	4.7
Related to study subject		
No reason	26	20.3
She was unwell	22	17.2
Misinformed about date/place	20	15.6
Had no money	8	6.3
Travelled to village	6	4.7
Forgot	5	3.9
Had other family concerns	5	3.9
Misplaced identity card	3	2.3
Others*	4	3.1
TOTAL	128	100.0

* Includes Was busy (2), Had no complaints (1), Was booked for sterilisation on appointment day (1)

5.2.1 Comparing clinic attenders and non-attenders: Baseline characteristics

Because morbidity findings based solely on study subjects who were successfully followed up in the study is likely to be biased if significant differences existed between the characteristics of subjects who attended the clinic as requested and those who failed to attend, it was necessary to compare the two groups of subjects by their baseline characteristics to determine if specific characteristics influenced clinic attendance, and therefore the morbidity findings. If any generalisations are to be made of the study findings obtained from successfully followed subjects, then significant differences should not also occur between those seen and those not seen.

All clinic attenders (A) (FIG 1.1), were compared to non-attenders (B) by the various baseline variables using Chi-square test and Students t-test for univariate testing where appropriate. Similarly all who were seen (C), that is including non-attenders who were later found, were compared to those who were never found (D). Lastly those non-attenders who were never found (D) and were compared to those non-attenders who were found (E). The probability values (P) obtained from these univariate comparisons are presented in TABLE 2.3.

TABLE 2.3
P-VALUES OBTAINED ON UNIVARIATE COMPARISON OF BASELINE CHARACTERISTICS OF THE DIFFERENT GROUPS OF STUDY SUBJECTS AS REGARDS CLINIC ATTENDANCE AND FOLLOW-UP OUTCOME

Variable	Test used	P-Value A x B	C x D	D x E
Socio-demographic				
Age	t-test	0.79	0.69	0.76
Age groups	**Chi-square**	**0.02**	**0.005**	**0.32**
Education	"	0.44	0.37	0.66
Occupation	"	0.32	0.30	0.66
Tribal groups	"	0.21	0.73	0.73
Pregnancy				
Parity groups	"	0.67	0.33	0.14
Antenatal care	"	0.49	0.40	0.28
Time of onset	"	0.26	0.90	0.50
Attendances(No.)	"	0.16	0.51	0.22
Obst. Risk factors	"	0.93	0.25	0.12
Labour				
Duration	t-test	0.88	0.27	0.80
Blood loss	"	0.61	0.76	0.96
Complications	Chi-square	0.25	0.97	0.94

Key: A=all clinic attenders, B=all clinic non-attenders C=all subjects seen and examined (A + E), D=non-attenders never found, E=non-attenders later found.

With the exception of age groups where a statistically significant difference was found, no other significant differences occurred between the groups of subjects. The age groups difference was due to the fact that older women, especially those over 40 years, were found more in the non-attendant group of subjects, and hence also among those not later found. Further multivariate comparison by logistic

regression of non-attenders and attenders however did not reveal any significant differences in the two groups. See APPENDICES F and G.

Non-attendant subjects can therefore be said to be similar to those who came to the clinic in terms of baseline socio-demographic, pregnancy and labour experiences.

This finding, therefore, permits an unbiased combined presentation of the morbidity findings in subjects for all subjects who were seen and assessed and also permits some careful generalisation of study findings to the entire study population.

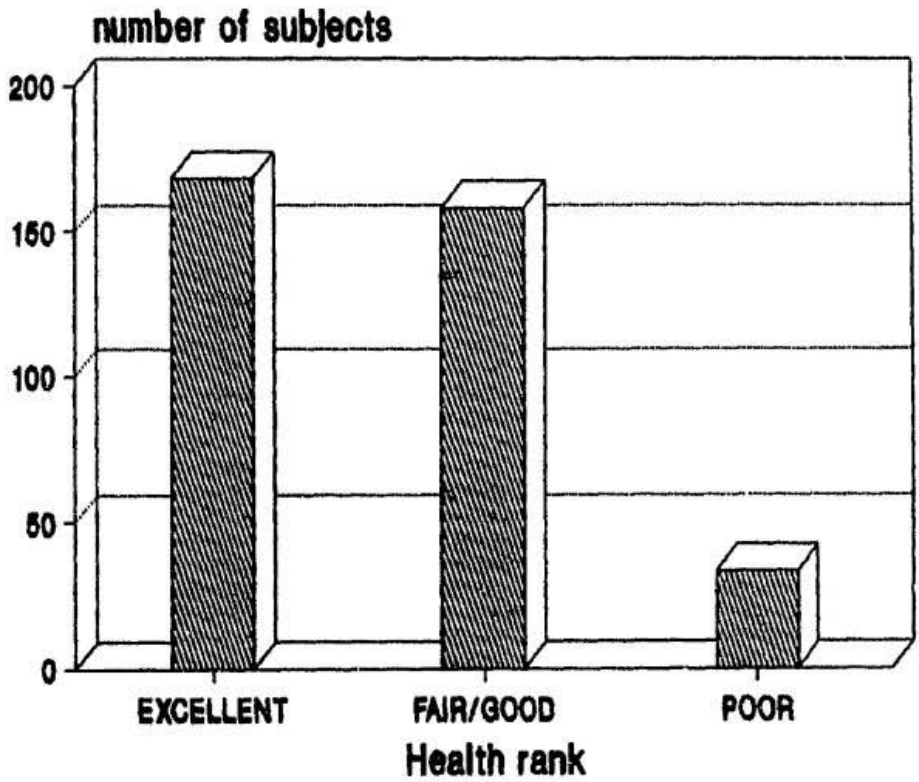
5.2.2 Health complaints at interview

The various health complaints reported by the 359 persons who were interviewed are presented in this section.

HEALTH RANKING: Asked how they ranked their health on a three point scale, 168 (46.8%) ranked their health as excellent, 158 (44.0%) ranked it as fair to good and only 33 (9.2%) stated that their health was poor, FIG 2.1.

FEVER: In all, one hundred persons (27.9%), reported having had fever during the interval period after discharge. The reported time of onset of the fever ranged from the first to the eighth day postpartum, with a mean of 3.6 days (SD $\pm$ 1.8 days). In about a third of subjects (31.0%) the fever started on the third postpartum day. About three-quarters (76.0%) of subjects with fever had some treatment for it, while 24 did not seek any treatment. Of those who had treatment, six had been discharged home with a prescription, nine consulted a health professional, and 61 (80.3%) subjects treated themselves at home. Drugs taken by persons who self-treated ranged from simple antipyretics to antibiotic agents. (See Section on self-medication on page 134). FIGs 2.2 and 2.3 summarize the distribution of the occurrence, management and the onset of fever in study subjects.

FIG. 2.1 :HOW SUBJECTS RANKED THEIR HEALTH POSTPARTUM



Number=359

FIG. 2.2:The occurence of fever and its management in subjects discharged home

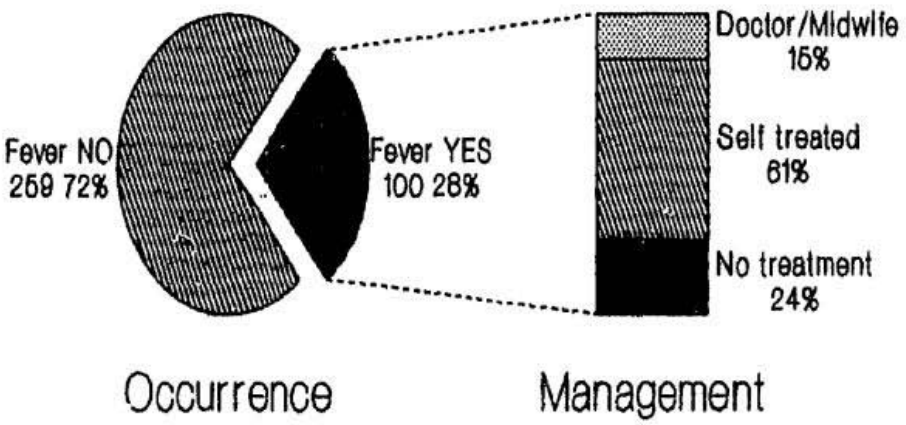
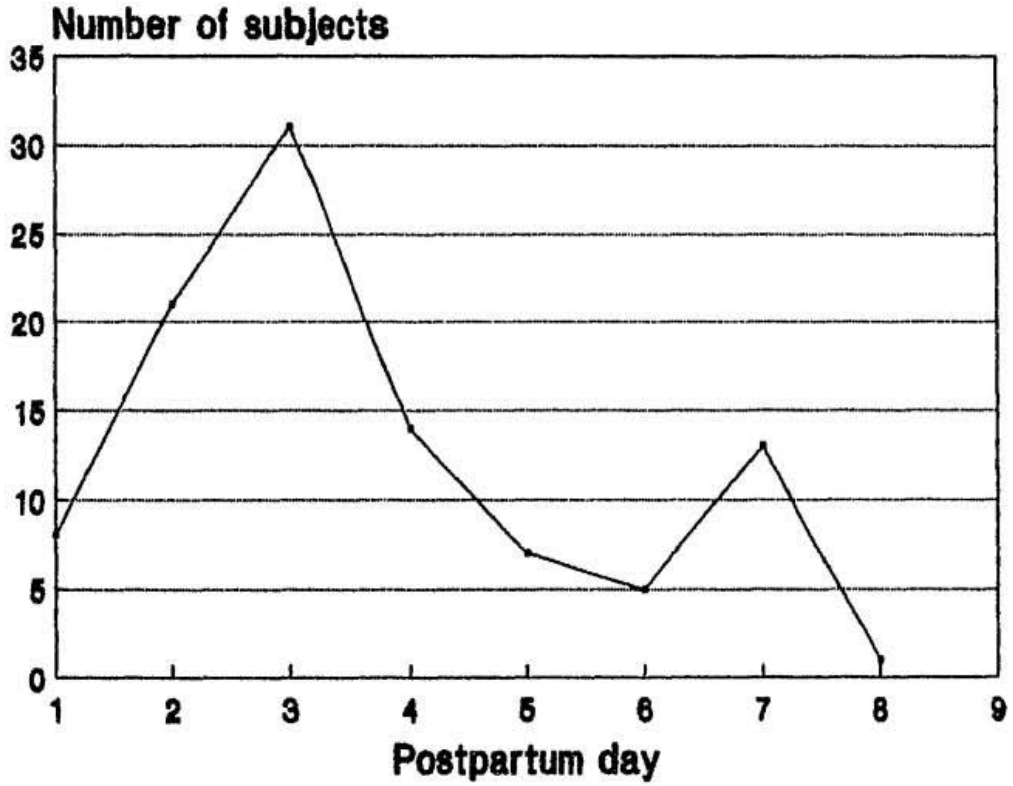


FIG.2.3: THE DAY OF FEVER ONSET REPORTED BY SUBJECTS



Number=100

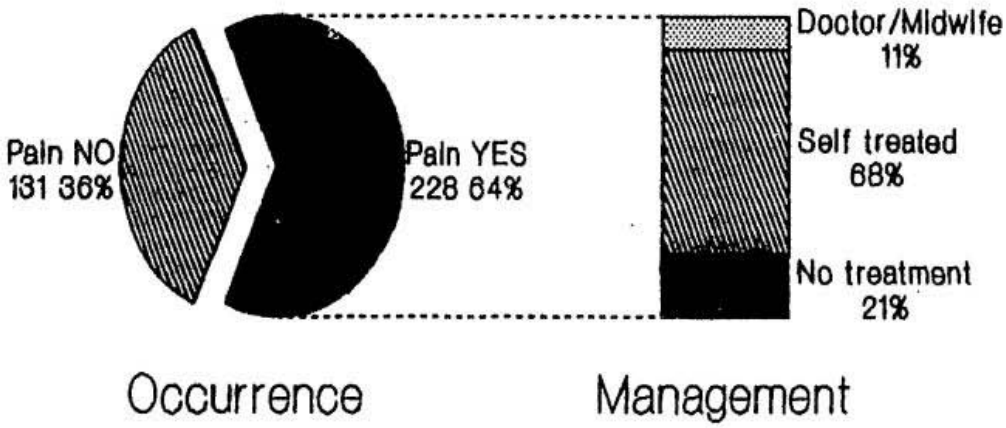
ABDOMINAL PAIN: Sixty four percent (228) of subjects interviewed said they had abdominal pain at home after discharge; 79.4% (181) of subjects had some treatment for this pain. A majority of 86.1% treated themselves at home. Only 13 subjects consulted a trained medical professional, and 12 used prescription drugs with which they were discharged. See FIG 2.4.

At the time of interview, 61 (17.0%) subjects still had complaints of lower abdominal pain, even though 49 (80.3%) had previously treated themselves or had some treatment.

In all, 83 (23.1%) individuals had both complaints of abdominal pain and fever at home. One hundred and forty five (40.4%) subjects had abdominal pain with no fever, 17 (4.7%) had fever but no abdominal pain and 114 (31.8) had neither.

SELF TREATMENTS FOR FEVER AND/OR ABDOMINAL PAIN : How subjects managed their symptoms of fever and abdominal pain as regards where help was obtained, was a question included in the study questionnaire in the planning stages. However it became quickly obvious at the start of the interviews, that this question needed to be expanded to include a listing of the drugs used in self-treatment, if morbidity incidence was to be correctly assessed. A question to this end was therefore added. The reported self medications used by subjects are presented in TABLE 2.4.

FIG.2.4: Occurrence of lower abdominal pain and its management in subjects



In all 212 (59.1%) subjects used some medication at home, of which 122 used only one type, 58 used 2 types, 26 used 3 types, and 6 used 4 different types of medications. It should be noted here that the medications listed here were used by subjects for multiple purposes and not always solely as intended treatments for treatment of fever and/or abdominal pain alone. How they were used also often varied from person to person.

TABLE 2.4 MEDICATIONS USED BY SUBJECTS FOR SELF TREATMENT

The medication	No. of subjects	% of n=212
Antibiotics (all)	125	60.0
Ampicillin	104	
Procaine penicillin inj.	5	
Metronidazole	4	
Tetracycline	2	
A Sulphonamide	2	
Chloramphenicol	1	
Septrin	1	
Analgesic/antipyretic (all)	134	63.2
Paracetamol	122	
Aspirin & related	5	
Others	7	
Haematinic (all)	59	27.8
Multivitamin preparation	39	
Vitamin B complex	18	
Folic acid tab.	1	
Iron tab.	1	
Others*	6	2.8

* Includes Unknown drug (3), Local gin (1), Herbal preparation (1), Glucose drinks (1).

LOCHIA: Eighty-three (23.1%) subjects no longer had lochia at the time of examination. Of the 276, who stated they had some discharge, 33 (9.2%) described it as still bright red. The majority (40.1%) reported a pinkish, or serosanguineous colour, see TABLE 2.5.

Twenty-nine percent (80), of those with lochia described their discharge as having an offensive odour and the duration over which the offensive nature had been noticed ranged from one to eight days with a mean of 3.25 $\pm$ 1.45 days.

TABLE 2.5 THE CHARACTERISTICS OF LOCHIA AS REPORTED BY STUDY SUBJECTS AT INTERVIEW

	Number of subjects	Percent (%)
Colour of lochia		
No discharge	83	23.1
Clear/yellowish	94	26.2
Bloodstained/Pinkish	144	40.1
Bright red	33	9.2
Other	5	1.4
TOTAL	359	100.0
Odour of lochia		
Foul	80	29.0
Not foul	196	71.0
TOTAL	276	100.0

PAINFUL MICTURITION AND PERINEAL SORENESS: About a quarter (25.9%) of the subjects seen complained of burning pain at micturition, and 111 (30.9%) complained of perineal soreness. In 73 subjects, perineal soreness was in association with an episiotomy wound, and in 25 with a perineal tear. Three other subjects had perineal soreness associated with other perineal lesions, namely Bartholin's abscess (2) and vulval ulcers (1).

BREAST COMPLAINTS: With the exception of one subject with lactation failure due to failed milk production, all the mothers (339) with living infants were breast-feeding. The 19 mothers who were not breast feeding had lost their babies at delivery or during the early neonatal period. Of the mothers who were breast-feeding, 10.6% (38) complained of nipple soreness and/or cracks, and 1.7% (6) complained of painful swelling of the breast tissue itself. Four subjects complained of both nipple soreness and breast tissue symptoms.

SWELLING AND/OR PAIN IN LEGS: Sixteen women (5.4%) had complaints of pain and or swelling of their lower limbs. In five subjects the symptom was noticed before delivery; in 11 it developed after delivery.

OTHER HEALTH COMPLAINTS: Asked if they had other health complaints other than those enquired about above, 134 (37.3)

subjects said they did. A wide range of complaints involving practically all body systems was reported by these subjects. These other health complaints have been grouped into categories and are presented in TABLE 2.6.

TABLE 2.6 OTHER HEALTH COMPLAINTS REPORTED BY PARTICIPANTS AT INTERVIEW

Complaint	Number of subjects	Percent of n=134(%)
Headaches	37	27.6
Malaise/fatigue/weakness	30	22.4
Low back pains	24	17.9
Gastrointestinal symptoms	15	11.2
Chest (cough/dyspnoea/pain)	13	9.7
CVS (palpitations/dizziness)	11	8.2
Painful thigh muscles	11	8.2
Chills/night sweats	9	6.7
Puffy face	5	3.7
Loin pains	4	3.0
Localised pyogenic infections	4	3.0
Peripheral nervous symptoms	4	3.0
Skin rashes	3	2.2
Psychiatric symptoms	2	1.5
Stress incontinence	2	1.5
Others*	10	7.5

* Others include Insomnia(2), No breast milk(1), Coccygeal pain(1) Ear ache(1), Painful neck(2), Post-minilaparotomy pain(1), painful haemorrhoids(1) Painful knee(1).

Eighty-two women had only one complaint, 42 had two complaints, while 10 individuals had 3 complaints. The most frequently reported symptoms were, headaches (37), malaise and

fatigue (30), low back pain (24), gastrointestinal symptoms (15) and respiratory symptoms (13).

Eight subjects who had complaints of low back pain (3), skin rashes (2), pain and numbness in the hand (2), and anxiety symptoms (1) stated definitely they had noticed these symptoms before delivery; all others said their symptoms were recent.

Summary of interview findings

Although the majority of women stated they thought they were in satisfactory health, with less than 10% descibing their health as poor, they had high frequencies of health complaints with over eighty-five percent of subjects (87.2%) reporting at least one complaint.

Over 60% of women reported abdominal pain at home and about 17% of them still had abdominal pain at the time of interview. About a quarter of them also reported fever. Other common complaints were dysuria (26%), and perineal soreness (31%). Athough breast feeding was universal, breast complaints were relatively infrequent, occurring in about a tenth of subjects.

Self-treatment with "prescription" drugs was the most frequent means by which subjects managed their health problems, and this occurred in about 60% of subjects.

Findings at clinical examination

BODY TEMPERATURE: Oral body temperature readings ranged from 36.4 to 40.5Ĉ with a mean of 37.4Ĉ (SD ± 0.4Ĉ). Only five subjects (1.4%) met the criteria for puerperal pyrexia, ie. temperature greater than 38.0Ĉ. The distribution of temperature readings recorded in subjects are presented in TABLE 2.7.

TABLE 2.7 THE DISTRIBUTION OF BODY TEMPERATURES OF SUBJECTS AT EXAMINATION

Temperature class (Ĉ)	Number of subjects	Percent(%) n=353
< 37.0	43	12.2
37.0 - 37.4	199	56.4
37.5 - 37.9	106	30.0
38.0 or higher	5	1.4
TOTAL	353	100.0

Note data missing for 6 subjects.

BLOOD PRESSURE : Blood pressure readings were available for 355 subjects; data were missing for four subjects. Systolic blood pressures ranged from 56 to 180 mm Hg. with a mean of 123.3 mm Hg (SD ± 15.6 mm Hg) and a median reading of 123 mm Hg. Forty-nine subjects (13.8%) had systolic blood pressures greater than 140 mm Hg.

Diastolic blood pressure readings ranged from 45 to 131 mm Hg with a mean of 79.4 mm Hg (SD ± 13.6 mm Hg) and a median value of 77 mm Hg. Seventy-five subjects (21.1%) had diastolic blood pressures greater than 90 mm Hg.

Thirty-five subjects (9.9%) could be classified as having postpartum hypertension using the criteria of blood pressures greater than 140/90 mm Hg. Seven of the 35 subjects had severe hypertension with blood pressure readings greater than 160/100 mm Hg. Two of the 35 hypertensive subjects had a history of hypertensive disease in pregnancy. One subject, on the other hand, was found to have low blood pressure with readings recorded on two different days averaging 72/51 mm Hg.

PALLOR AND ICTERUS: Fifty-five persons (15.5%), were judged clinically to be anaemic, based on mucosal membrane examination. Icterus was noted in two subjects; one was a known Sickle cell disease patient and the other had been previously diagnosed with viral hepatitis during pregnancy.

BREAST: Breast pathology was present in 35 (9.9%) subjects. Findings ranged from minor disorders such as inflamed nipples to severe lesions such as a breast abscess. Nipple inflammation involving the left breast alone occurred in 14 subjects, the right alone in 3, and both nipples in 13 subjects. Four persons had clinical evidence of mastitis which

involved the left breast in 3 cases, and the right in one case. One subject had a discharging breast abscess which involved the left breast, and which she said had been recurrent with previous pregnancies.

ABDOMINAL FINDINGS: On abdominal palpation, 77 subjects (21.9%), were found to have lower abdominal tenderness and 123 (34.9%) subjects had a palpable suprapubic uterus. Fifty-five (15.3%) subjects were found to have both lower abdominal tenderness and a palpable uterus on palpation. In 22 subjects only abdominal tenderness was present and in 68, a palpable uterus was present without accompanying tenderness.

Many other abnormal abdominal findings were also noted on examination and these are presented in TABLE 2.8 below.

TABLE 2.8 ABDOMINAL FINDINGS ON CLINICAL EXAMINATION

Pathology	Number of subjects	Percent(%) n = 359
Palpable uterus (>12 weeks)	123	34.3
Tender lower abdomen	77	21.5
Previous laparotomy scar	12	3.3
Renal angle/loin tenderness	11	3.1
Hepatomegaly	11	3.1
Splenomegaly	8	2.2
Abnormal pelvic masses	7	1.9
Other abdominal tenderness	3	0.8
Other lesions *	6	1.7

* Includes ascites (2), umbilical hernia (1), gaseous distension (1), palpable gall bladder (1), mass lesion left iliac region (1).

In 12 subjects hepatic and/or splenic enlargements ranging up to 8.0 cm below the costal margins were found. Eleven subjects had loin tenderness, and in seven subjects other abnormal pelvic masses were felt. Two other subjects also had clinical evidence of ascites.

PERINEAL AND LOCHIA FINDINGS: Although 276 subjects had stated they still had lochia, only 271 subjects had lochia present on inspection at the time of examination. The colours of these lochia are presented in TABLE 2.9. Thirteen subjects (3.6%) had a bright red blood colour indicative of secondary postpartum haemorrhage. In 49 (18.1%) cases the lochia was judged to be purulent.

TABLE .. LOCHIA FINDINGS AT CLINICAL INSPECTION

Lochia	Number Of subjects	percent(%)
Colour		
No lochia	89	24.8
Lochia alba/serosa	131	36.5
Lochia sanguinolenta	125	34.8
lochia rubra	13	3.6
Other	1	0.3
TOTAL	359	100.0
Status		
Purulent	49	18.1
Non purulent	222	81.9
TOTAL	271	100.0

In all, 58 women had a septic perineal lesion. Of these 47 (81.0%) were infected episiotomy wounds, 9 (15.5%) were infected tears, and two had Bartholin abscesses, one of which was in association with an infected episiotomy. Other perineal lesions noted, were condylomata acuminata in one subject and shallow but clean vulval ulcerations in another.

Fifty other episiotomy wounds inspected, were healing satisfactorily without complication. Forty subjects with mostly first degree tears or perineal cracks, also had their lesions healed or healing satisfactorily.

Six subjects however failed to show up for perineal inspection after they had been contacted at home. They included two subjects with episiotomy and four with minor perineal tears. (Note, no bimanual pelvic examination or perineal inspection were performed on home visits). These subjects had no complaints of perineal soreness, however.

LOWER LIMB FINDINGS: Fourteen subjects were found to have pitting pedal oedema. In only one case, was the oedema very extensive, above knee levels and was also associated with anasarca. Three of these 14 cases were suspected of having venous thrombosis, which in two cases were associated with unilateral leg oedema, and in the third case with a bilateral but non-symmetrical leg oedema. The suspected disorder in two

cases was pelvic thrombophlebitis and in the third, a deep leg vein thrombosis.

One other subject who complained of a painful calf had no other additional clinical findings. Grossly dilated varicose veins were also observed in one subject who also complained that they were sometimes painful but she had no clinical evidence of thrombosis.

FINDINGS OF BIMANUAL PELVIC EXAMINATION: This procedure was performed in 139 (38.7%) of the 359 subjects seen. On bimanual examination, 86 (61.9%) were found to have uterine sizes of greater than 12 weeks gestation size, and 70 (50.4%) had markedly tender uteri. Adnexal tenderness was present in 58 (41.7%) subjects, and 56 of these cases occurred together with uterine tenderness. An open cervical os was found in 16 subjects.

Additional pathologies also noted on bimanual pelvic examination were as follows: Five women had irregular uterine masses thought to be due to uterine myoma, and one of these also had a suspicious cervical nodule. Four cases had adnexal masses, one was associated with a bulging posterior fornix. One subject, who had an exquisitely tender coccygeal region was thought to have a possible coccygeal fracture. Lastly one subject who also presented with florid signs of pelvic peritonitis, had packs of herbal preparations inserted vaginally.

OTHER PATHOLOGICAL FINDINGS: A wide variety of other pathological findings was also found in 31 subjects, and these are presented below in TABLE 2.10. With the exception of a small number, most of these pathologies were chronic disorders that were present prior to delivery in these subjects.

TABLE 2.10
OTHER PATHOLOGICAL FINDINGS IN THIRTY ONE SUBJECTS.

Pathology	No. of subjects
Other dermatological lesions	6
Musculoskeletal	5
Obstetric nerve palsies	4
Localised skin sepsis	4
Abnormal urine findings	3
Goitres	2
Minor psychiatric pathology	2
Puffy face and/or anasarca	2
Prolapsed haemorrhoids	2
Eye pathology	1
Cardiac pathology	1
TOTAL	32 *

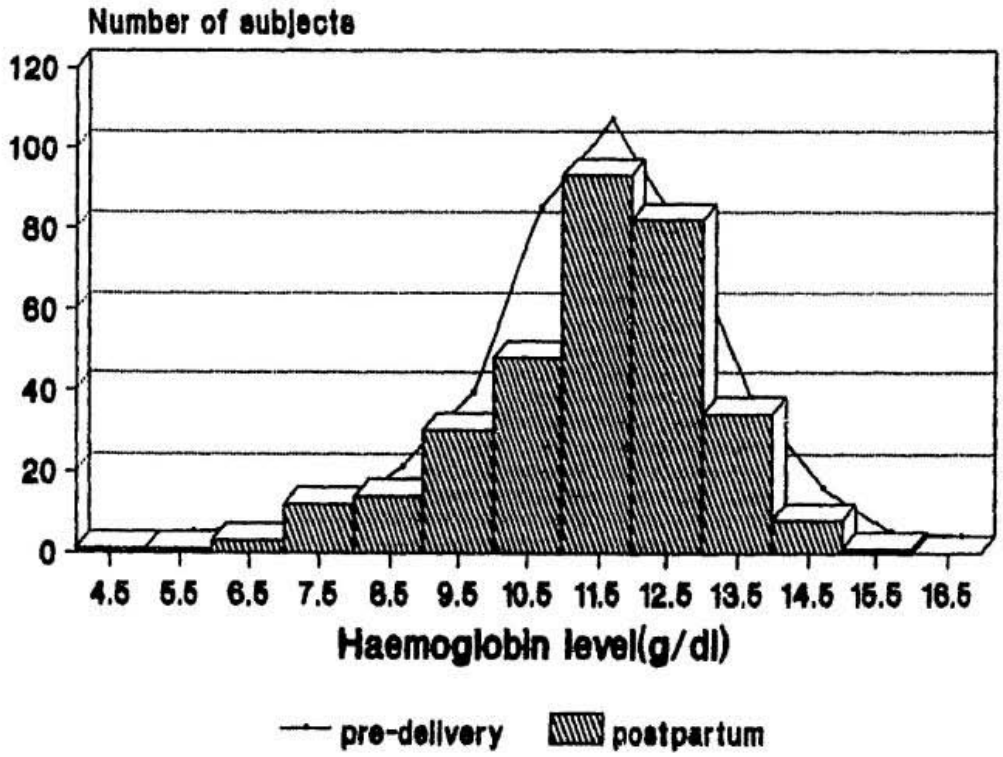
* Note one subject had two types of pathology.

POSTPARTUM HAEMOGLOBIN LEVELS: Postpartum haemoglobin levels were available for 327 subjects with data missing for 32 subjects. No blood samples were collected for four subjects seen outside the puerperal period, and from 6 other subjects seen at home. Twenty-two blood samples were lost to accidents in the laboratory or during transportation.

Postpartum haemoglobin levels ranged from 4.9 to 15.6 g/dl, with a mean of 11.5 g/dl (SD ± 1.7 g/dl). One hundred and nine subjects (33.3%) could be classified as anaemic (haemoglobin levels less than 11.0 g/dl). Severe anaemia of less than 8.0 g/dl occurred in 17 (5.2%) subjects.

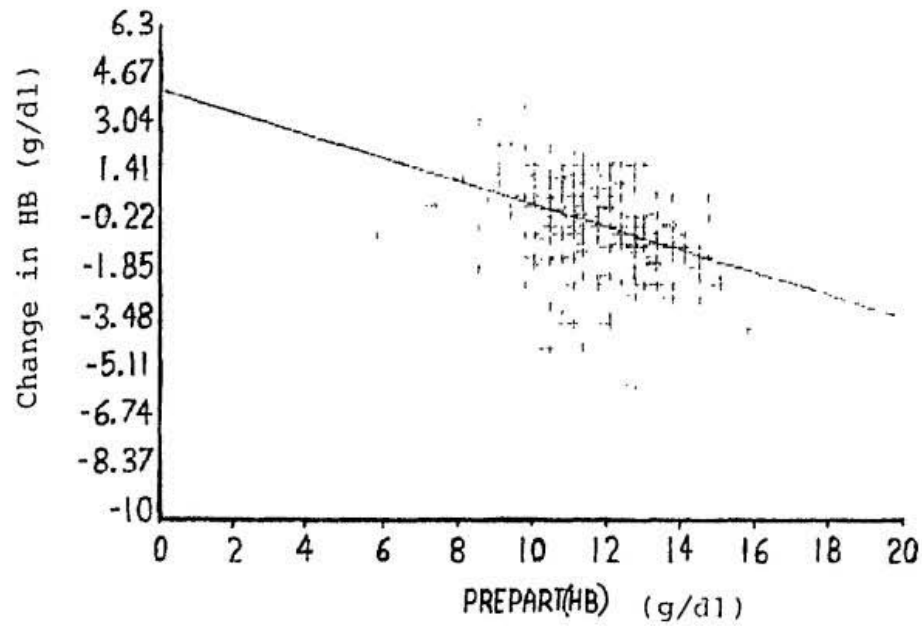
FIG 2.5 presents the distribution of postpartum haemoglobin levels in the subjects.

FIG.2.5 The distribution of postpartum haemoglobin levels in study subjects.



The changes in haemoglobin levels for 252 subjects who had both pre-partum and postpartum levels measured, ranged from -5.3 to +5.3 g/dl with a mean of +0.2 ± 1.4 g/dl. In 90 (35.5%)subjects the haemoglobin levels dropped after delivery. In 29 (11.5%) subjects there was no change in level and in 132 (53.0%) subjects the haemoglobin levels increased. FIG 2.6. presents a scatter graph of the change in haemoglobin level in relation to pre-delivery haemoglobin. As evident from the graph, there was a tendency for subjects with lower pre-delivery haemoglobin to hemo-concentrate after delivery.

FIG. 2.6: CHANGES IN HAEMOGLOBIN LEVEL AFTER DELIVERY



FOLLOW-UP OUTCOMES: At the end of the morbidity assessment, based on the interview and clinical examination findings, the 359 subjects seen at follow-up were classified as "well" or "needed further medical attention".

One hundred and twenty (33.4%), were considered to be well needing no medical attention, while 239 (66.6%) had conditions requiring medical intervention. Of these 84 (23.4%) were referred for further care and 155 (43.2%) were treated or managed in the clinic. The diagnoses for the 239 subjects who were treated and/or referred for various disorders are presented in TABLE 2.11.

TABLE 2.11
DIAGNOSIS IN TREATED AND/OR REFERRED STUDY SUBJECTS.

Diagnosis	No. of Cases	Percent(%) n= 359)
Upper genital tract infection	64	17.8
Lower genital tract infection	58	16.2
Other genital tract pathology	21	5.8
Delayed uterine involution	11	3.1
Suspected uterine myomas	5	1.4
Adnexal mass lesions	4	1.1
Condyloma acuminata	1	0.3
Urinary tract infection	19	5.2
Anaemia	109	30.4
Postpartum hypertension	35	9.7
Secondary postpartum haemorrhage	13	3.6
Breast and/or nipple infection	35	9.7
Venous thrombosis/thrombophlebitis	3	0.8
Obstetric neuropathies	3	0.8
Puerperal Psychiatric disorder	2	0.6
Puerperal pyrexia (PUO)*	2	0.6
Other medical diagnosis	16	4.5
Other surgical diagnosis	14	3.8

Of these 239 subjects, 128 had only one diagnosis, 75 had two diagnoses, 35 had three diagnoses, while 3 had four diagnosis.

Feedback was obtained on 55 subjects who were referred for treatment. The diagnosis remained unchanged in 51 cases and they were being managed for their disorders without further mishap. Feedbacks on the four other cases who were referred to the obstetric and gynaecology department included the finding of trophoblastic disease in one subject who was referred with secondary postpartum haemorrhage and an enlarged uterus. Another subject also referred with postpartum haemorrhage had retained products and was admitted for surgical evacuation of the uterus. One subject with an adnexal mass was found to have a broad ligament haematoma and lastly one subject referred with a suspected uterine fibroid was found to have delayed uterine involution.

5.3: INCIDENCE OF MORBIDITY

5.3.1: Overall morbidity incidence

Of the 383 subjects (including the 24 admitted) who were successfully followed up in this study, morbidity was observed in 266 subjects, giving an overall morbidity incidence rate of 694.5 per 1000 deliveries.

The overall rate for the "at worst situation", where the 89 subjects who were not found were all ill is 752.1 per 1000 deliveries. The incidence rate for the "at best situation" where the 89 subjects were all well is 563.6 per 1000 deliveries.

Thus the actual incidence of early postpartum morbidity in this sample of presumably well Ghanaian women from home, who delivered vaginally at the hospital, may therefore be said to range between 563.6 to 752.1 per 1000 deliveries.

In FIG 3.1 and TABLE 3.1 (pages 148 & 149) the outcomes and morbidity in the 359 subjects seen at follow-up are summarised. Morbidity is also classified into three categories of severity based on an optimum period for medical intervention if serious health sequelae are to be prevented.

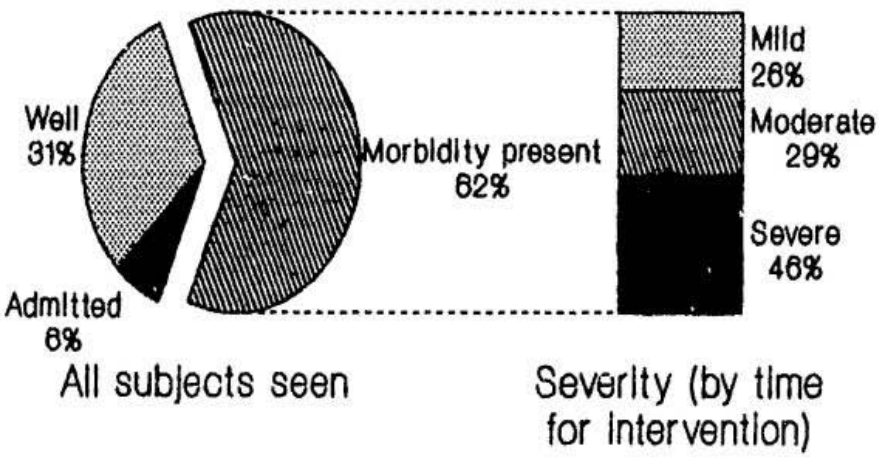
Disease conditions for example included in the first and most severe category, that is "medical attention necessary within 72 hours", included all upper genital tract infection (UGTI), severe hypertension using diastolic pressures greater

than 100 mm Hg., postpartum haemorrhage, mastitis, urinary tract infection and severe anaemia less than 8.0 g/dl associated with a second pathology.

Category 2 included lower genital tract infections (LGTI), other hypertensives, the non-pelvic thrombosis, and pelvic mass lesions. Category 3 included conditions perceived as least severe morbidity which could be "safely" ignored for seven or more days such as, the obstetric neuropathies, simple nipple inflammatory lesions, some pre-existing chronic problems such as dermatological lesions, and moderate anaemia above 8.0 g/dl.

It should be noted that this classification is imperfect and frought with many difficulties. Many subjects had two or more diagnoses which together altered the actual degree of morbidity and placed them in a higher level of severity. Frequently, therefore, this classification had to be adjusted to allow for the overall clinical judgement of the subject's health situation. One example, is the subject with anaemia of 8.3 g/dl, a delayed uncomplicated uterine involution and who also has psychiatric depression associated with the loss of her twin infants. Placing this subject in category 3 together with others who had only moderate anaemia or delayed involution may be considered "unfair" and this subject was thus placed in category 2 where it was judged she would benefit from an early medical intervention.

Fig.3.1 Postpartum health status of all subjects successfully followed up



Total number=383

TABLE 3.1 THE CLASSIFICATION OF MORBIDITY IN STUDY SUBJECTS BY DEGREE OF SEVERITY

Level of morbidity (intervention period for an optimum outcome)	Number of subjects	Percent (%)
72 hrs or less	109	45.6
4 - 7 days	69	28.9
Greater than one week	61	25.5
TOTAL	239	100.0

5.3.2 :Incidence of specific morbidities

UPPER GENITAL TRACT INFECTION : Sixty-four subjects, were found on examination to have upper genital tract infection (UGTI), another two subjects who were considered well at the time of examination, had been treated by other medical professionals for the disorder, and three individuals were also admitted with this diagnosis. In all 69 of 383 subjects developed UGTI postpartum, and therefore the incidence of UGTI in this study population is 180.2 per 1000 deliveries.

LOWER GENITAL TRACT INFECTION: In all, 58 subjects had a septic perineal lesion, of which 47 were infected episiotomy and nine were infected tears. One subject had a Bartholin's abscess together with an infected episiotomy and another had only a Bartholin's abscess. The overall incidence of lower genital tract infection (LGTI) is thus 151.4 per 1000. Episiotomy wound sepsis occurred in 47 of the 99 episiotomy performed in this sample, giving a wound infection rate of 47.5%. The infection rate for the 53 perineal tears that occurred in the study sample is 17.0%.

POSTPARTUM HYPERTENSION: Thirty-five persons examined at follow-up were hypertensive with blood pressures greater than 140/90 mm Hg. Four more were admitted to hospital because of severe hypertension, and therefore the prevalence of postpartum hypertension is 101.8 per 1000 deliveries (10.2%).

Nine subjects were stated to be hypertensive prior to delivery including the four who were admitted postpartum. Of those discharged home, two were still found to be hypertensive at follow-up. Thus when these nine subjects are excluded, the incidence of postpartum hypertension is 88.2 per 1000 deliveries.

POSTPARTUM ANAEMIA : In all 109 of 327 postpartum blood samples collected were found to have haemoglobin levels less

than 11.0 g/dl. An additional eight subjects were admitted to hospital following severe postpartum haemorrhage followed presumably by anaemia. One subject was admitted with severe anaemia not attributed to haemorrhage. The prevalence of postpartum anaemia in the study population was therefore 35.1%.

Because pre-delivery haemoglobin was measured and a number of subjects were found to be anaemic prior to delivery, the "true" incidence of postpartum anaemia can be calculated for study subjects who were not previously anaemic. Of the total of 252 subjects who had both pre-delivery and postpartum haemoglobin measured, 20 (7.9%) who were not anaemic pre-partum became anaemic postpartum giving an incidence of postpartum anaemia as 79.4 per 1000 births.

Of the 109 subjects with postpartum anemia, 74 subjects had had their pre-delivery haemoglobin levels measured. Of these 74 subjects, 20 (27.0%) were not anaemic prior to delivery; the vast majority of patients (73.0%) however had previously been anaemic.

When we also consider the 54 subjects who were found to be anaemic both pre-partum and postpartum the prevalence of severe anaemia, increased from 7.4% pre-partum to 18.5% postpartum; an incidence of severe anaemia after delivery in previously moderately or mildly anaemic subjects of 120 per 1000 deliveries.

ACUTE URINARY TRACT INFECTION: This diagnosis was made clinically in 18 subjects seen at follow-up. One other individual who was well when seen had a medical record of being treated for this complication, and one patient hospitalised was for this reason. In all 20 of 383 subjects had acute urinary tract infection postpartum, an incidence rate of 52.2 per 1000 deliveries.

The incidence of complaints of dysuria alone however, was about five times higher in the study population, 259.0 per 1000 deliveries.

BREAST AND NIPPLE INFECTIONS: Mastitis and/or breast abscess occurred in five patients, giving an incidence of 13.1 per 1000 deliveries. Nipple inflammation was observed in 30 other individuals and in two subjects with mastitis, giving an incidence rate of 89 per 1000 deliveries for nipple disorders.

VENOUS THROMBOSIS/THROMBOPHLEBITIS: Three subjects out of 383 were identified clinically as having this disease complication, which gives an incidence rate for the disorder of 7.8 per 1000 deliveries for this study sample. Since the vascular thrombotic lesions are difficult conditions to diagnose clinically, it is very likely therefore that this incidence is understated.

PERIPARTUM CARDIAC FAILURE: In only one subject was this diagnosis considered, giving an incidence rate of 2.6 per 1000 deliveries for this study sample. The subject presented with bipedal oedema, breathlessness and fatigue of three days duration and was found to have tachycardia, a blood pressure of 138/94 mm Hg., a gallop rhythm and cardiomegaly. She denied any past history of cardiac disease or occurrence of these symptoms and was referred for further management.

SECONDARY POSTPARTUM HAEMORRHAGE: Thirteen of the 383 subjects were observed to have lochia rubra during clinical examination. The incidence rate of secondary postpartum haemorrhage is therefore 33.9 per 1000 deliveries.

Summary: The occurrence rates for the various frequently noted post-partum health disorders in this study sample are presented below in TABLE 3.2.

TABLE 3.2
SUMMARY TABLE OF THE INCIDENCE AND PREVALENCE RATES OF SPECIFIC POSTPARTUM COMPLICATIONS NOTED IN THIS STUDY

Postpartum condition	Rate per 1000 Prevalence	Incidence
Postpartum anaemia	351.2	79.4
Upper genital tract infection	-	180.2
Lower genital tract infection	-	151.4
Hypertension	101.8	88.2
Inflammatory nipple lesions	-	89.0
Mastitis	-	13.1
Acute urinary tract infection	-	52.2
Secondary postpartum haemorrhage	-	33.9
Venous thrombosis	-	7.8
Peripartum cardiac failure	-	2.6

5.4: THE DETERMINANTS OF SPECIFIC MORBIDITIES

This section reviews the contributory role of important baseline factors such as age, parity, education, occupation, ethnic origin, antenatal care, labour and its immediate complications, and pre-partum anaemia to the occurrence of three major morbidities noted in this study, namely UGTI, postpartum anaemia, and postpartum hypertension.

UPPER GENITAL TRACT INFECTION

The socio-demographic, pregnancy and labour characteristics of persons with UGTI were compared with that of those without the condition to determine if any of these factors was an identifiable risk factor.

Individual t-tests and chi-square tests of the socio-demographic variables of age, ethnic origin, occupation and education did not reveal any significant differnces for those with or without UGTI. See APPENDIX H. The mean age of subjects who had UGTI was slightly younger (24.8 years) than those who did not have the condition (25.3 years), but this difference was not significant ($p=0.55$). Although the proportion of subjects in four age group categories had also not differed statistically between the two groups ($p=0.44$), a higher proportion of subjects in the 20-29 year age group was noted

among those with UGTI, where they formed 66.7%, as compared to 55.7% of those with no UGTI.

Parity status, and antenatal care characteristics were not found to differ statistically when these variables were compared for the two groups. Labour experiences in terms of the type of delivery, total duration of labour, blood loss at delivery and labour complications were also found to be similar in the two groups on univariate testing. The mean duration of labour was slightly longer, (12.75 hours $\pm$ 5.69) in subjects with UGTI as compared to that of those without UGTI (11.51 hours $\pm$ 6.28), but this difference was not statistically important (p=0.13). Perineal trauma, including tears and episiotomy were also found not to be risk factors for developing UGTI in the study population. See APPENDIX H.

While 50% of subjects with UGTI had been anaemic prior to delivery, the proportion of anaemia in subjects with no UGTI was 34.5%. The relative risk (RR) for UGTI in persons with pre-delivery anaemia was 1.68 (95% Confidence interval (CI) of 0.97 to 3.69) but this higher risk was found to be only marginally significant (p=0.06). Comparing the mean pre-delivery haemoglobin levels for the two groups did not reveal a statistical difference in the two values (p=0.20).

Because many of the baseline variables compared here are known to be frequently associated with each other and will therefore confound each other, a multivariate logistic

regression was performed, to identify the more important predictive factors. The results of this analysis are presented in TABLE 4.1 below.

TABLE 4.1 PREDICTORS OF UPPER GENITAL TRACT INFECTION : RESULTS OF MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

Factor (Variable)	Regression Coefficient	Standard Error	Coeff./ S.E.
Pre-delivery anaemia	0.274	0.169	1.622
Parity	-0.233	0.162	-1.440
Ethnic origin	-0.127	0.103	-1.237
Duration of labour	0.307	0.292	1.050
Delivery blood loss	-0.001	0.001	-0.684
Age group	0.107	0.170	0.628
Occupation	0.026	0.064	0.403
Education	-0.029	0.096	-0.303

* Complications includes all perineal injury ie. tears and episiotomy

See APPENDIX I for the Correlation Matrices of Parameter Estimates.

The eight variables compared in the regression analysis, are listed in rank order of importance in terms of absolute size of their coefficients relative to their standard errors. Pre-delivery anaemia ranks first in this regard, but when a careful look is taken of the coefficient/S.E. values, none of these eight variables is markedly identifiable as an important predictive factor. This finding is similar to that obtained on univariate analysis.

A Bonferroni correction test (ie. P-value x Total no. of variables) also fails to support anaemia as an important predictive factor for UGTI.

When the baseline characteristics recorded in this study are considered none so far have been found to be statistically associated with the occurrence of postpartum UGTI in the study population.

POSTPARTUM ANAEMIA

Comparing the socio-demographic characteristics of age, occupation and educational levels for persons who had postpartum anaemia to those who did not have anaemia showed these three characteristics to differ statistically in the two groups of subjects. No difference however was noted in their ethnic origins.

Persons with anaemia tended to be younger, and the mean ages recorded for those with postpartum anaemia and those with no postpartum anaemia was 23.6 years (SD $\pm$ 5.5 yrs) and 25.8 years (SD $\pm$ 5.1 yrs) respectively (p=0.008). This was due mostly to the greater proportion of teenagers in the anaemic group. Whereas teenagers were 23.4% of subjects with postpartum anaemia, they formed only 11.9% of the not anaemic group. The RR for postpartum anaemia in teenagers as compared to the older women was 1.66 (CI 1.20 to 2.29), and this risk was statistically significant (p=0.009). See APPENDIX J.

The statistically significant difference in the occupations of the two groups (p=0.01) was largely because of the greater proportion of unemployed subjects in the anaemia group, 19.8% as compared to 7.8%.

The distribution of subjects by educational level also differed significantly for those with postpartum anaemia as compared to those with no anaemia (p=0.01). This was largely because of the differences in the proportions of uneducated subjects. While those with no formal education comprised only 12.9% of non-anaemic subjects, they formed 25.7% of the anaemic subjects. Those with no formal education were also at higher risk for postpartum anaemia, RR=1.66 (CI 1.21 to 2.32) and p=0.007.See APPENDIX J.

When those subjects with formal education are also considered, there were fewer persons (6.4%), with higher than elementary level education in the anaemic group as compared to those in the non-anaemic group (15.4%), and the RR risk for anaemia in those with only up to elementary level education was 2.14 (CI 0.93 to 4.91), but this risk was not statistically significant (p=0.07).

Over half (50.5%) of subjects with postpartum anaemia were primipara as compared to 32.3% of non-anaemic subjects and this difference in parity distribution was statistically significant (p=0.001) on chi-square testing. The RR for postpartum anaemia in primipara as compared to the multipara

was 1.64 (CI 1.21 to 2.21). No increased risk (RR=1.04) however was noted when multipara (2-4 children) were compared with grand-multipara (more than 5). Teenage primipara comprised 23.9% of subjects with postpartum anaemia as compared with 11.1% of subjects without anaemia, a finding that is also statistically significant. The relative risk for anaemia in a teenage primipara is 1.73 (CI 1.30 to 4.47) and this risk was statistically significant (p=0.004).

It should be remembered that pre-delivery anaemia in the study population had also earlier been observed to be associated with a younger mean age of subjects and with occupation, but however not with age groups, educational level, or parity. The extent therefore to which these variables now contribute to the occurrence of postpartum anaemia will need to be further investigated.

Comparison by ante-natal care characteristics, in terms of whether subjects had any care, the onset of care, and the number of clinic attendances revealed no statistically significant differences in the patterns of pregnancy care in subjects who have postpartum anaemia as compared to those who do not. This finding is not surprising, since some antenatal care occurred almost universally (95.0%) in this study population.

When the labour experiences of subjects found to have postpartum anaemia were compared to those with no anaemia,

statistically significant differences were noted in the type of delivery, the mean duration of labour, and the mean blood losses of the two groups. The anaemic subjects had a longer mean duration of labour 12.7 hours (SD ± 5.6 hours) as compared with 11.3 hours (SD ± 6.2 hours) in non anaemic subjects (p=0.05). The proportion of subjects with prolonged labour (greater than 24 hours) did not, however, differ significantly.

More of the anaemic subjects had received episiotomy (32.3%) in the management of their delivery, as compared with the non-anaemic subjects (17.9%) and the RR for postpartum anaemia if one had episiotomy was 1.6 (CI 1.2 to 2.2) p=0.003. The mean blood loss in the immediate postpartum period of persons with postpartum anaemia and of those with no postpartum anaemia were 266.9 ml. (SD ± 150.4 ml.) and 213 ml.(SD ± 95.9 ml.) respectively (p=0.0003). However the difference in the proportions of subjects with post-partum haemorrhage was not statistically significant in the two groups, even though it was a higher 8.3% in the anaemic group as compared to 4.4% in those with no anaemia (p=0.21).

Pre-delivery haemoglobin level is acknowledged as the most important determinant of postpartum anaemia. The mean pre-delivery haemoglobin levels of subjects who had postpartum anaemia was statistically different from that of those who were not anaemic postpartum, the levels being 10.3 g/dl (SD ±

1.5 g/dl) and 11.9 g/dl (± 1.3 g/dl) respectively ($p<0.0001$). The risk for postpartum anaemia in subjects who were anaemic prior to delivery was 4.31 (CI 2.72 to 6.74) ($p<0.0001$), while for subjects with no anaemia prior to delivery anaemia this risk was low 0.23 (CI 0.21-0.36). See APPENDIX J.

The mean pre- and post- partum haemoglobin levels of the 54 subjects who were anaemic prior to delivery and who also remained anaemic after delivery were 9.7 g/dl (SD ± 1.2 g/dl) and 9.5 g/dl (SD ± 1.3 g/dl) respectively, but this change in their haemoglobin values was not found to be statistically significant on paired t-testing ($0.20> p > 0.15$). Although the proportion of persons with severe anaemia (less than 8.0 g/dl) among these subjects (54), also increased from 7.4% (4) pre-partum to 18.5% (10) postpartum, this increased proportion was also not statistically significant ($p=0.15$). Thus for subjects who were anaemic before delivery, the delivery process, did not alter significantly their postpartum haemoglobin status. The small number of subjects who became severely anaemic after delivery did not practically permit a futher detailed analysis of this group.

Because many of the baseline factors found on univariate analysis to be statistically significant risk factors for postpartum anaemia are known to interact with each other and are therefore likely to confound each other, a multivariate logistic analysis was performed using nine of these variables

to determine those with the more important predictive effects. The results of this analysis are presented in TABLE 4.2 below.

TABLE 4.2 PREDICTORS OF POSTPARTUM ANAEMIA: RESULTS OF A MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

Factor (variable)	Regression Coefficient	Standard Error	Coeff/S.E
Pre-delivery anaemia	1.199	0.197	6.063
Ethnic origin	-0.335	0.126	-2.662
Delivery blood loss	0.002	0.001	2.652
Education	-0.273	0.118	-2.300
Duration of labour	0.461	0.363	1.272
Parity	-0.142	0.190	-0.751
Labour complications*	0.139	0.208	0.667
Occupation	0.027	0.076	0.367
Age group	-0.049	0.178	-0.275

* "Complications"= all perineal injury ie tears & episiotomy

Pre-delivery anaemia was found to be the most important predictive factor for post partum anaemia. Ethnic origin, which was not found to be an important risk factor on univariate analysis ranked second as a predictor in this analysis. This effect however could be easily explained by the relatively strong correlation (r=0.5) between education level which was also identified as an important predictor and the ethnic origin of subjects. See the correlation matrices, APPENDIX K.

Age and parity which were also strongly correlated (r=0.6) with each other were not important predictors for

postpartum anaemia from these regression findings, although they were found to be significant risk factors during univariate analysis. A Bonferroni correction of their univariate p-values also suggests that parity may be a more important factor than age as a predictor.

Occupation, which was found on univariate analysis to differ significantly for the two groups was not confirmed in this multivariate analysis as an important factor. A Bonferroni correction of its univariate P-value, also indicates it to be an unlikely important predictor.

On summarising all these findings, it is evident that the most important predictive factors for postpartum anaemia in this study population are pregnancy anaemia, blood loss at the time of delivery, and educational level.

The subjects who became anaemic after delivery:

On examining the baseline characteristics of the 20 subjects who became anaemic only after delivery, factors which were found to be statistically significant determinants were, again a lack of education (RR=2.77, p=0.03), episiotomy (RR=2.43, p=0.02) and an increased blood loss at the time of delivery (p=0.01).

The mean blood loss volume for persons who became anaemic after delivery as compared to those who remained non anaemic

was 280 ml (SD ± 166 ml.) and 215 ml (SD ± 98 ml.) respectively (p=0.01). There was also a statistically important difference in the changes that occurred in the haemoglobin levels after delivery in these subjects and their mean haemoglobin levels before and after delivery were 12.0 g/dl (SD ± 0.8 g/dl) and 9.9 g/dl (SD ± 1.2 g/dl) respectively (p=0.01).

For these subjects therefore their anaemia can clearly be attributed mostly to the events at the time of labour.

POSTPARTUM HYPERTENSION

The 35 individuals who were found to have postpartum hypertension at follow up, were compared to those who had normal blood pressures to identify possible risk factors. Univariate analysis revealed no statistical differences in the distributions of the socio-demographic variables of age, and education in those subjects who had hypertension as compared to those who had normal blood pressures.

The distribution of subjects by ethnic groups however differed statistically (p=0.02). The difference was clearly due to the increased proportion of subjects of northern ethnic origins in the hypertensive group; 40.0% as opposed to 11.4% in the non-hypertensive group. The RR for postpartum hypertension in subjects with northern ethnic origin was 2.75

(CI 1.40 to 5.14) with a significant p-value of 0.002. See APPENDIX L.

Occupation also differed significantly between the two groups (p=0.003) but this difference was generalised and could not be attributed to any particular occupation. A possible explanation for this statistical difference may be that, because the total number of hypertensives is small, and the occupations are divided into seven categories, the total number of subjects in each cell is small and therefore results in a significant variation.

Parity was not found to be a significant risk factor, and antenatal care did not differ in the two groups. A total of 5 subjects were noted to have a hypertensive disorder prior to delivery, and two of these subjects were found to be still hypertensive at follow-up. Pregnancy hypertension however was not found in this sample to be a statistically significant risk factor for postpartum hypertension (p=0.07) even though the RR for postpartum hypertension, if a subject had pre-delivery hypertension, was 4.29.

Labour experiences in terms of the total duration of labour, type of delivery and complications were not found to be associated with the occurrence of postpartum hypertension. A multiple birth was not a risk factor for this postpartum hypertension in this study population. See APPENDIX L.

The results of multivariate logistic regression analysis of nine baseline variables for their predictive effects are presented in TABLE 4.3

TABLE 4.3 PREDICTORS OF POSTPARTUM HYPERTENSION: RESULTS OF MULTIPLE REGRESSION ANALYSIS OF 8 BASELINE VARIABLES

Factor (variable	Regression coefficient	Standard error	Coeff. /S.E
Ethnic group	0.355	0.110	3.243
Parity	0.420	0.195	2.153
ANC attendance (No.)	0.272	0.149	1.832
Pregnancy Hypertension	0.684	0.656	1.043
Age	-0.231	0.224	-1.031
Multiple pregnancy	-0.388	0.580	-0.668
Occupation	-0.039	0.083	-0.473
Education	0.000	0.123	0.002

See APPENDIX M for Correlation matrices and Parameter estimates.

As was also found during univariate analysis, ethnic origin was the most important factor identified in the regression analysis to be significantly associated with the occurrence of postpartum hypertension in the study population.

Although parity was not found to be significantly associated with post partum hypertension on univariate analysis ($p=0.18$), it ranks second as a predictor in the above analysis. Parity was slightly correlated with ethnic origin ($r=0.2$) and also with other variables such as age, number of antenatal clinic attendances and pregnancy hypertension which had elevated coefficients/S.E. ratios.

The only factor identified positively to be an important predictor for postpartum hypertension in this study sample is being an individual from a northern ethnic origin.

5.5: HEALTH COMPLAINTS AND CLINIC ATTENDANCE

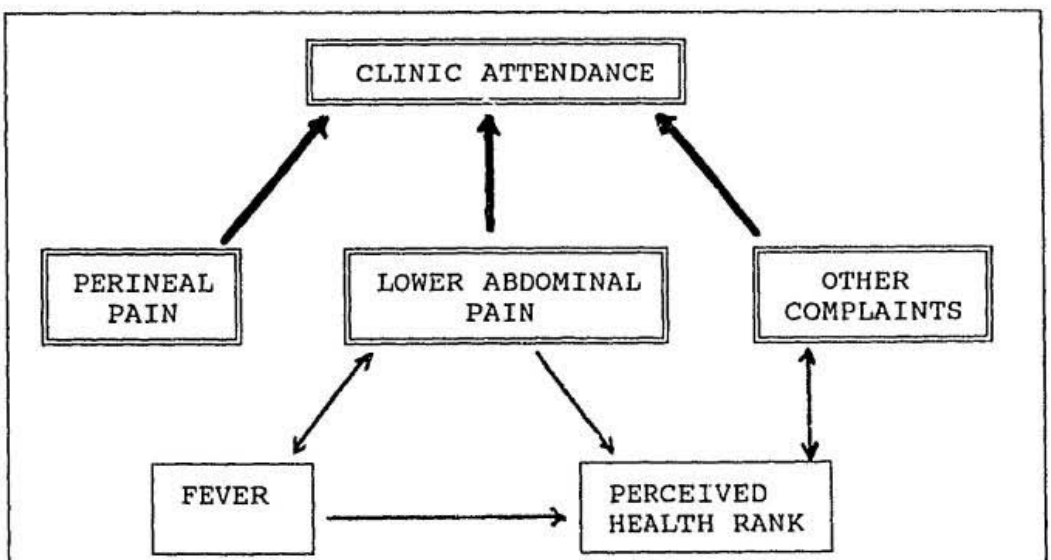
Because the socio-demographic characteristics, pregnancy and labour experiences were similar for clinic attenders and non-attenders they are further compared here by their health complaints.

Univariate analysis of the complaints reported at interv.ew by subjects who attended the clinic as scheduled were compared to that of those who failed to attend, but were later found and interviewed. The results of these univariate comparisons revealed statistically significant differences in the frequency of complaints of abdominal pain ($p=0.001$), perineal soreness ($p=0.03$) and "other" complaints reported by the two groups ($p<0.0001$). Attenders had higher frequencies of these complaints and also tended to rank their health as poorer ($p=0.002$).

A multivariate comparison of the complaints in the two groups using Hiloglinear and Loglinear regression analysis was undertaken. This analysis supported the findings of the univariate analysis.

The saturated model of the Hiloglinear test of partial association performed, identified only first and second order rank effects as sufficient for the model of association. Loglinear analysis using these select orders was next performed to obtain the best fitted model. This model is presented in FIG 5.1 below.

FIG 5.1: THE ASSOCIATIONS BETWEEN HEALTH COMPLAINTS OF STUDY SUBJECTS AND ATTENDANCE TO THE POSTPARTUM CLINIC



Goodness-of fit statistics for the model are as follows:

Likelihood Ratio Chi-square	= 36.98	DF =38	P =0.51
Pearson Chi-square	= 33.62	DF =38	P =0.67

Lower abdominal pain and perineal soreness were two symptoms enquired about during interview, which directly predicted clinic attendance by subjects. However, where subjects also had "other" (not directly enquired) health complaints, then they were just as likely to attend the clinic. Fever, lower abdominal pain and the perceived health status were associated with each other and were also indirectly predictive of clinic attendance.

If these associations between the health complaints and clinic attendance in this study sample is real then it is very likely that subjects with postpartum health complaints in Kumasi may seek help for them at a similarly organised clinic if the service were provided.

5.6 OTHER STUDY DATA: The Abdominal Deliveries

Although subjects who had abdominal deliveries were excluded from this study, some information was available on these subjects which could be of relevance to readers of this document. A brief description of these subjects, and the various indications for their caesarean delivery are therefore mentioned here.

Forty-three of the 544 subjects who came from home to deliver required an emergency caesarean section delivery, giving a section rate of 7.9%. An additional 13 subjects who were referred from another health center to the labour ward, or who had been in-patients in an obstetric ward for various reasons before they were transferred to the labour ward were also delivered by cesarean section during the study period. The overall emergency caesarean section rate at the hospital for all cases admitted to the labour ward during the entire period of the study was therefore 9.7%.

Analysis of the data available for the 43 subjects who came from home is as follows; their mean age was 26.9 years (± 5.9); and the majority (62.9%) were multipara. The pre-delivery haemoglobin level was measured in 24 of the 43 subjects and the mean level obtained was 11.4 g/dl (± 1.5 g/dl). However, 50% of these 24 subjects were anaemic by W.H.O standards (haemoglobin less than 11.0 g/dl). The major indications for abdominal delivery in these subjects are presented in TABLE 6.1.

In about half of these subjects dystocia was the primary indication for surgery. In most of these subjects, however, there was often more than one indication for caesarean section. For example 23.8% of dystocia cases were also associated with foetal distress. One cesarean hysterectomy was performed in a grand multipara with a ruptured uterus.

Although detailed information on the nature of post-operative recovery in these subjects is not available, it is known that no deaths occurred in these subjects and they were all subsequently discharged home.

TABLE 6.1 THE INDICATIONS FOR EMERGENCY CAESAREAN SECTION IN SUBJECTS WHO CAME FROM HOME TO DELIVER

Indication	Number of subjects	Percent(%) n=43
Dystocia (all)	21	48.8
Maternal	11	
Foetal	7	
Cervical	3	
Previous caesarean section	7	16.3
Foetal distress	4	9.3
Antepartum haemorrhage	3	7.0
Others (all)	5	11.6
Ruptured uterus	1	
Precious baby (Infertility)	1	
Retained second twin	1	
Cord prolapse	1	
Bad past obstetric history	1	
Indication not available	3	7.0
TOTAL	43	100.0

CHAPTER 6

DISCUSSION AND RECOMMENDATIONS

6.1: THE DISCUSSION

The major objectives of this prospective study were to, (1) describe the health status of women in their early puerperal period in the Kumasi district, (2) identify the major causes of morbidity and the determinants and (3) provide information for use in improving postpartum care in the region.

In this section the relevance of the study findings will be discussed. The results obtained in this study will also be compared to findings of other studies and the limitations highlighted.

THE SAMPLE :

The study sample included a consecutive sample of women who delivered during a three week time period at the Komfo Anokye Teaching hospital. This sample is representative of the women who arrive from home and deliver at this health centre. Because this institution also handles about 60% of all deliveries in the Kumasi district, this sample can be described as reasonably representative of the majority of women who deliver vaginally in this district.

The study sample, was made up mostly of women from low socio-economic backgrounds, reflecting basically the socio-economic situation of the majority of women in the region. An observation from the author's clinical experiences in Kumasi, is that there is the tendency for the more indigent women to deliver at the subsidised government health centres while the more well-to-do mothers seek the services of the more "expensive" private maternity homes.

Over half (55.5%) of the women were in their twenties, with less than a fifth of them being teenagers. Their parity distribution ranged from one to twelve births, with a mean of 2.8 births. Over a third of them were primipara (39.3%); grand-multipara formed a fifth of the sample. Thus in terms of age and parity-related risk, this sample can be described as having a sizable proportion of high risk subjects. Indeed over three quarters (78.4%) of study subjects were identified as having at least one pregnancy or labour risk factor.

Comparing the age and parity risk rates obtained in this study sample to the national rates reported in 1990 [24], the prevalence of these two risk factors (that is age less than 20 or greater than 35 years and parity of more than 4 births) are much less. They are about half the nationally reported rates of about 40% for the two factors.

Kumasi district is an urban district. Urban women in Ghana have better socio-economic status, better health care,

higher education levels and lower fertility rates, than their counterparts in the rural areas. The urban women therefore are more likely to have lower risk factor rates than the rural women. Because rural women form about 70% of the total Ghanaian female population, the high national risk factor rates reflect more their health situation.

About nine out of every ten subjects (95%) in this study sample had had some antenatal care. This finding is quite similar to the antenatal care coverage rate of 91% recorded nationally in 1990 [24]. While the national figures indicate that about a third (35%) of pregnant women started antenatal care in their third trimester in 1990, in this study sample the proportion was much lower, and was 9.3%.

On the average the women in this study had 6.7 antenatal clinic attendances, a figure slightly higher than the 5.1 visits recorded for the district in 1989 [21], but which is considerably higher than the national average of 2.1 visits in 1990 [24]. Subjects in this study sample can, therefore, be describe as having had slightly "better" pregnancy care than that which occurred on the average nationally. They however had similar pregnancy care to that noted earlier for women in district.

The pattern of antenatal care observed in this study sample is very similar to that observed in a study of antenatal care coverage in a rural community in Tanzania,

East Africa. There, 95% of pregnant women attended antenatal clinics and the mean attendance noted was 6.4 visits [249]. In the United States nationally, the mean number of antenatal visits per pregnant woman was 12 visits in 1987 and 76% of pregnant women started antenatal care in their first trimester [4]. When compared with these American women, the women in this study sample may be described as having had poorer anatenatal care.

Anaemia in pregnancy was observed in 38.5% of the women who presented in labour and whose pre-delivery haemoglobin levels were measured. Though only 78% of subjects had their pre-delivery haemoglobin measured there did not appear to have been biases as to whose blood samples was collected prior to delivery. This anaemia prevalence rate, therefore, can be considered as close to the true rate for the entire study sample.

National reports for 1990 [24], indicate that over 70% of pregnant women registering for antenatal care in the country are anaemic at the time of registration. In the Ashanti region an earlier report in 1987 also indicated that a high proportion (46%) of women seen in their first trimester of pregnancy were anaemic [29]. In light of the figures reported in this study, and the fact that antenatal coverage rates were high in the country, it would appear that antenatal care was successful in preventing anaemia in late pregnancy in only

about half of the women who had this condition in early pregnancy. This raises serious questions about the control of anaemia in pregnancy in the country.

The recorded rate of anaemia at the time of labour noted in this study is about twice the rates reported in studies in Chad [152] and Casablanca, Morocco [156], where the figures were 25% and 18% respectively. It is also similarly higher than the rate of 22% in Newfoundland, Canada [250]. Much higher rates of anaemia in pregnancy occur in West Africa than elsewhere and this study results thus reflects the noticed trend [146].

In spite of the high rates of pregnancy and labour risk factors noted in the study sample, the women had relatively uncomplicated vaginal deliveries. Approximately five percent (5.1%) of them had prolonged labours of 24 hours or more. Primary postpartum haemorrhage occurred in 7.4% of subjects, a rate which is comparable to rates reported currently in North America [162].

The episiotomy rate in subjects was 21.6%, a figure which is less than the rates reported in many western countries [119,122]. Perineal tears occurred in 12.7% of the women; in the vast majority (78.3%) these were first degrees tears. A third degree tear was the most severe tear noted and occurred in only one subject. This lower genital tract tear rate is

comparable to the 11.5% also reported in neighbouring west African country of Cameroon in 1986 [120],

Four hundred and eighty-five babies were born to the mothers recruited into the study, with the twin pregnancy rate for the sample being 2.8%. This multiple pregnancy rate is higher than the rates reported in many western populations, but it is still less than the rates that have been observed so far in neighbouring Nigeria [4,196,197]. Multiple birth rates in West Africa and also in Blacks are generally higher than the rates in the Western world and in Caucasians [4,196,197].

The mean birth weight of 2.98 kilograms recorded for the infants born to the mother in this study was less than the weights recorded in many developed world communities [4,251,252]. About 14% of the infants born to these mothers were low-birth-weight (LBW) infants and this low-birth-weight rate is about twice that reported nationally in the United States of America [4,253,254]. Poor maternal nutrition status, low socioeconmic levels, poor antenatal care and infections are some of the factors associated with low-birth-weight. The lower mean birth weight and high low-birth weight rates recorded here most probably reflect the higher prevalence of these factors in the Kumasi women.

The stillbirth rate was 3.5% (35.2 per 1000 births). Two liveborn infants of mothers who were seen at follow up, are known to have died in the first week after birth giving

an estimated early neonatal mortality rate of 4.3 per 1000 live births.

With the exception of 5.1% of women who were significantly ill and were admitted to hospital and another 5.9% who were discharged home with prescriptions for mild disease or prophylactically, nearly 90% of the women were discharged home apparently in good health.

THE MORBIDITY FINDINGS:

The results of morbidity assessment obtained by interview and clinical examination of these women revealed that very significant morbidity occurred in the early puerperium of these women, who, could be described as having had "normal" uncomplicated pregnancies with "adequate" antenatal care and relatively uneventful deliveries.

Many health complaints were reported by subjects and numerous morbidities were identified. Subjects often had more than one type of morbidity. This discussion will focus on the more prevalent and/or more severe health problems in the women since the many health problems they presented cannot all be elaborately discussed in detail here.

Health complaints of the women and self-medication:

Over eighty percent (87.2%) of the subjects interviewed reported some health complaint even though they commonly

ranked their health as satisfactory. Over a quarter of them (27.9%) reported having puerperal fever. In almost all cases this fever began in the first postpartum week with the peak time of onset being on the third postpartum day. About two thirds (63.0%) of subjects complained of lower abdominal pain, and over a quarter of these subjects reported they still had pain at the time of the interview. Dysuria and perineal soreness were reported by 25.9% and 30.9% of subjects, respectively.

Given the fact that breastfeeding was universal among these mothers, complaints of breast and nipple disorders were relatively infrequent with only about one in every ten mothers reporting a breast problem. Nipple soreness was the most frequent complaint and was reported by about a tenth (10.6%) of the breastfeeding mothers. Symptoms of mastitis were very infrequently reported. The very low frequency of mastitis symptoms is probably because the condition is a late postpartum disorder [107]. Women interviewed in their early puerperium would be expected to have have less disease.

The high frequencies of disease symptoms that have been reported by subjects raises questions about their validity. The lower abdominal pain reported by subjects for example, could have for instance been dismissed as normal "after-pains" unassociated with disease and thus no further attention paid to them. For most women in this study however it is evident

that these health complaints were not trivial. They were to them symptoms of disease severe enough to warrant medical intervention. Nearly 60% of subjects treated themselves with medications ranging from simple analgesics to potent antibiotics. These medications involved considerable financial cost to these individuals.

A particularly disturbing aspect of this "culture" of self-medication, is the abuse of antibiotics by subjects. This situation is made easy by the ready accessibility of drugs in the region. Most antibiotics are sold freely to individuals without a prescription.

It was very easy to recognise the drugs used by subjects because these drugs were frequently also misused for a number of other conditions. In this population they have acquired locally given nicknames which reflect their colour and/or effects. Indocid (Indomethacin) for example is known as "Abiriwa bebo ball", literally translated to mean "the old lady can now play soccer" reflecting its identified effects at relieving arthritic pain.

This high prevalence of self-medication could have affected the women's clinical examination findings because potent antipyretic, analgesic and antibiotics agents were used by the subjects. One questions therefore if the incidences of pathology detected were not less than their actually occurring rates.

Informal information obtained from these women during management for their conditions, on how they had used these medications revealed a very dismal situation of drug misuse. Many women were noted to have used these medications in inadequate dosages and for inappropriate periods of time. This observation therefore raises doubts about the effectiveness of these agents in alleviating disease in the subjects.

Thus in spite of the high rates of self-medication a high yield of clinical signs to support the presence of disease morbidity was found in study subjects.

Health complaints and the clinical examination findings:

Temperature readings were generally unimpressive and only five subjects met the clinical criteria for puerperal pyrexia (temperature>38·C). However the temperature readings of subjects who reported fever differed statistically from that of those who had not reported fever (p=0.001). Subjects who complained of fever had a higher mean body temperature reading of 37.5·C (SD ± 0.5·C) than the 37.3·C (SD ± 0.4·C) for those with no reports of fever. Whether or not they had treated this fever, was not found to have had a statistically significant effect on the body temperature distribution in the two groups (p=0.21).

Over a fifth (21.9%) of subjects had lower abdominal tenderness on palpation, and this finding correlated well with

the presence of complaints of lower abdominal pain. The relative risk for finding lower abdominal tenderness if a subject had complained of lower abdominal pain at the time of interview was 4.7 (CI 3.3 to 6.6), with a highly significant p value of less than 0.001. If they had lower abdominal pain in the past but not at the time of clinical examination, the relative risk for finding lower abdominal tenderness was 2.6 (CI 1.3 to 5.2), a finding which is also statistically significant at p=0.01.

Having had treatment for their abdominal pain was also not found to influence significantly the detection of lower abdominal tenderness in the subjects during assessment (p= 0.23). Granted that some of the complaints of lower abdominal pain may well have been the normal afterpains of the early postpartum period, the above findings suggest strongly that the complaints of lower abdominal pain were more likely to be associated with the presence of lower abdominal tenderness. This is a clinical finding which is likely to be associated with the presence of pathologies such as endometritis, parametritis and pelvic peritonitis. The complaints of the women, therefore, should be taken seriously.

Other reported health complaints which were also strongly associated with the presence of pathological findings at the related sites were perineal soreness (RR=7.0, CI 1.8 to 26.8), the reported characteristics of lochia, for example

offensiveness (RR=5.4, CI 3.1 to 9.3) and the complaints of nipple soreness and breast pain and/or swelling (RR=267.7).

Thus the complaints often reported by subjects during interview correlated strongly with the physical and clinical signs found during examination of these subjects. The high rates of self-treatment practised did not appear to have affected significantly the detection of pathological clinical signs of disease in the sample. Together, therefore, these symptoms and signs in subjects can be depended on as reliable evidence of the occurrence of postpartum morbidity in this study population.

Infectious morbidity:

Infectious morbidity was one of the two most common postpartum morbidities noted in study subjects; the other being anaemia. The incidences of upper and lower genital tract infection were 180.2 and 151.4 per 1000 deliveries respectively; that for acute urinary tract infection postpartum was 52.2 per 1000 deliveries. Mastitis was the least common infectious complication noted with a recorded incidence of 13.1 per 1000 deliveries.

When we exclude the inflammatory nipple disorders, puerperal infectious morbidity including Upper genital tract infection (UGTI), lower genital tract infection (LGTI), mastitis, and acute urinary tract infection occurred in over

a third (33.9%) of all subjects seen at follow-up. The proportion of all the infective complications attributable to the above four types of disease were as follows; UGTI (45.4%), LGTI (38.1%), urinary tract infection (13.2%) and mastitis (3.3%).

This pattern of infections differs markedly from that reported by Sweet and Ledger (1973) in the United States [45], and also by other authors [43]. In this study sample episiotomy and perineal tear wound infection occurred to a far greater extent (38%), than that observed in the western communities (1-5%) [43]. This infectious complication is clearly a more common postpartum complication in this population.

Urinary tract infection:

Acute urinary tract infection in this sample occurred to a much lower proportion than has been reported in the western world [43,45]. This difference in the urinary tract infection rates however, may be explained by the fact that in this study laboratory investigation was not used in the diagnosis of the problem, as is usual in the developed world, and therefore a less accurate identification of this disorder could have occurred in this study. This argument is more likely to be true if we also consider that complaints of dysuria occurred relatively frequently (26%) in study subjects and that

bacteriuria rates often reported on the continent are high [79-88].

Breast infections:

Mastitis and its sequelae of breast abscess are usually late postpartum infectious complications. The incidence rate recorded in this study probably tells only a part of the story of the actual occurrence of disease in the puerperium. It is not surprising, therefore, that the rate of 1.3% noted here is a less than the rates reported in western studies in which subjects were followed up for longer periods ranging up to one year or more [106,107]. To obtain a more accurate picture of the true occurrence of puerperal mastitis further studies with longer follow up periods are needed. The results of this study should be viewed more as providing evidence that mastitis is not very rare in this population.

About one in every ten breastfeeding mothers in the study had an inflammatory nipple condition which caused distress during infant feeding. These mothers obviously needed some advice and support in the management of these nipple problems. Because in the pathogenesis of mastitis, nipple inflammatory disorders are believed to be the predisposing cause, one wonders what proportion of these women will develope mastitis later on in the puerperium.

Upper genital tract infection:

Upper genital tract infection (UGTI) occurred in 18.0% of women in this study. This rate is very similar to the rate of 20.3% recorded in Nairobi, Kenya, by Plummer et al. in 1984 [16]. In the Nairobi study, subjects had been followed for up to 30 days but the authors noted that all the cases of UGTI identified had had onset of the disease by the end of the first postpartum week. So even though this study followed up its subjects for a shorter period of the puerperium the occurrence rate of UGTI recorded here is comparable to the Nairobi results.

In the Nairobi study [16] the frequencies of reported symptoms of UGTI were noted to be very high, as was noted in this study sample. This study, unlike the Nairobi study, did not include laboratory investigations of causative pathogens as part of its diagnostic criteria and one wonders if a higher incidence of UGTI would have been recorded if this more "valid" diagnostic criteria had been included [30].

In most developing countries laboratory support is usually very weak and clinicians have to depend prmarily on physical clinical signs for diagnosing such morbidity. The findings obtained here probably provide a more realistic and comparative account of the occurrence of UGTI in a developing world community.

The incidence of puerperal UGTI obtained in this study is about five to ten times higher than the rates recently reported in most developed countries [30]. This higher rate of UGTJ is probably more like the rates of 100 to 200 years ago in these same countries, and therefore reflects how "far" developing communities like Kumasi may need to go to control "child birth" fever.

No socio-demographic, pregnancy or labour factors were identified statistically as predictor variables for the occurrence of UGTI in this study sample. Anaemia prior to delivery was the only factor observed to be marginally associated with occurrence of UGTI ($p=0.06$). The weak association of anaemia still gives support to observations by other researchers that anaemia predisposes to puerperal infection and also to other infections in general [2,147,255]. Thus for this study sample it is fair to conclude that anaemia may be an important predisposing factor for the occurrence of postpartum UGTI.

Although the pathogenic agents of UGTI in the women in this study were not known, evidence from other studies on the continent suggest that sexually transmitted agents are likely to be among the important causes in the women in Kumasi [47,48,56,65,65]. It was observed that many infants brought by their mothers to the study clinic for medical attention were suffering from ophthalmia neonatorum; a condition caused

frequently by sexually tranmitted disease agents such as the gonococci and chlamydia.

A high resistance of gonocci to the penicillins has been observed in many countries in sub-Saharan Africa [48,56,64]. The penicillins however were the drugs most frequently used by the women in their efforts to treat themselves. The microbial resistance could also explain why the self-treatments were ineffective in alleviating symptoms and signs in these subjects.

The long-term hazards the Kumasi women face from their ineffective attempts to treat their pelvic infections are multiple. They run a very high personal risk of developing chronic pelvic infection with its sequelae of ectopic pregnancies, secondary infertility and chronic pelvic pain. The abuse of antibiotics also has public health implications, as it will result in sexually transmitted disease infections from resistant bacterial strains that will be difficult and expensive to treat. These women appear unaware of the complications associated with their practice. The situation calls for urgent public health action.

Lower genital tract infection:

Lower genital tract infection(LGTI) occurred in about 15% of subjects. With the exception of one case of Bartholin's abscess all other LGTI in subjects were infections of perineal

lacerations or incisions which occurred at the time of delivery; over 80% were infected episiotomy wounds. About half (47.5%) of the episiotomy wounds reviewed were infected and gaped.

The presence of LGTI was also found to be statistically associated with the presence of UGTI in subjects (p=0.03). The proportion of subjects with septic perineal lesions among those with UGTI was almost twice (25.8%) that of those with no UGTI (14.0%). When we also consider the pathogenesis of these two types of infection, and the fact that many causative pathogens of UGTI are also associated with wound infection, it is likely the two infections have similar pathogenic origins.

The evidence from studies of pregnant women in other parts of the African continent [54-56], indicate that many women in the region enter labour with already infected genital tracts. The outcomes of labour, such as the resulting susceptible placenta bed and the presence of a perineal wound, therefore facilitate the development of florid infection. Together these factors may explain why UGTI and LGTI occurred together in the study subjects.

Rates of LGTI found in this study are at least two to ten times higher than those reported in developed countries [30,125]. The women in Kumasi therefore have a problem of much greater magnitude. Although no subject in this study was found to have extensive or very complicated LGTI the high infection

rates raises serious doubts about the safety of the episiotomy procedure in this part of the world. Data on the outcomes of episiotomy are, however, very lacking from most parts of the developing world. As this is an isolated study, more data are needed to examine the true extent of this problem.

If we consider this study sample as representative of the majority of women delivering in Kumasi the results of this study suggest that about one in every five women who deliver in the district develop a genital tract infection in their early puerperal period. This postpartum genital tract infection is certainly the major cause of puerperal ill-health in these women.

Many researchers have reported that postpartum genital tract infections contribute significantly to the high rates of infertility noted on the continent; particularly to the high secondary infertility rates [64,65]. The high rates of "neglected" UGTI noted in this study support these observations.

Preventing or controlling puerperal genital tract infection in these women would go a very long way to reducing the overall maternal morbidity and mortality rates in the region. It could also contibute generally to improving the health of all women.

The non-infectious morbidities:

Postpartum anaemia:

Postpartum anaemia was the most prevalent morbidity found in the subjects in this study, occurring at the rate of one in every three women who were followed up. Indeed had the WHO criteria of 12.0 g/dl for the non-pregnant women been used in classifying subjects then 62.8% of these women would have been identified as anaemic postpartum. In this study however the level for the pregnant women of 11.0g/dl was used because the puerperium is considered more as a physiological part of the child bearing process.

Anaemia prior to delivery was the single most important determinant of postpartum anaemia in this study sample; 73% of subjects who had postpartum anaemia, whose pre-delivery haemoglobin levels were known, had been anaemic prior to delivery. This finding justifies the increased attention paid to prevention of anaemia in pregnancy and also reaffirms the existing adage of primary prevention.

Despite the very satisfactory antenatal care coverage noted in the study sample and also recorded for Kumasi, the rates of pre-delivery anaemia and thus of postpartum anaemia were found to be very high. If we consider that routine iron and folate supplementation and malaria prophylaxis are major components of antenatal care in the country, then these study

findings are even more worrying, and call for an evaluation of the impacts of antenatal care on anaemia in pregnancy in the country. The study results, however, suggest that controlling anaemia in mothers has to go beyond pregnancy and into the postpartum period.

Blood loss at labour could be implicated in the development of anaemia in about a quarter (27%) of subjects found to be anaemic postpartum and whose pre-delivery haemoglobin levels were also known. Blood loss at delivery was also identified as one of the important determinants of postpartum anaemia, and therefore labour blood losses should not be ignored as an important cause of postpartum anaemia in this population.

In general, however, differences in haemoglobin levels before and after delivery were not found to be statistically significant in most subjects. Labour was also not observed to have aggravated significantly the severity of anaemia in study subjects. This finding could have been due to the fact that the majority of subjects hemoconcentrated after delivery. The trend was particularly noticeable in subjects who presented with lower pre-delivery haemoglobin levels. It is difficult, therefore, to conclude that labour blood losses had in actual fact not influenced the haemoglobin levels of subjects as these results seem to suggest.

About 60% of the subjects with postpartum anaemia had a drop in their pre-delivery haemoglobin levels, despite the hemoconcentrating effects of the early puerperium. The average change in haemoglobin level in these subjects was -0.7 g/dl. This evidence strongly suggests that labour blood losses had negative effects on the haemoglobin levels of these women even if this difference was not statistically supported.

In interpreting the results of the study, one must also remember that blood samples in subjects were collected at a median time of the 9th postpartum day, and at a time when over a third of subjects (38.4%) in this study were still experiencing some blood loss in their lochia.

Literature from the developed world suggests that haemoglobin levels remain relatively stable after the first postpartum week [256]. In this study population pelvic infection rates were high, uterine involutions were delayed and continuing blood losses ocurred in lochia. The increased blood losses, therefore, could lead to lowering in haemoglobin levels. Thus, the true impacts of delivery on the haemoglobin blood levels of these study women are probably still yet to be realised. It is likely therefore that a later blood investigation may have yielded higher prevalence and/or severity of postpartum anaemia, and thus revealed a bigger impact of parturition.

Comparing results of this study to those obtained in other studies on postpartum anaemia is not easy because of the differing criteria for defining anaemia used by the various researchers. In a study in Egypt [164] for example, in which the prevalence of pre-delivery and postpartum anaemia recorded were 66% and 90% respectively, the criteria used for defining anaemia in the study was haemoglobin levels of less than 12.6 g/dl.

When we apply this criteria to the subjects in this study the prevalence of pre-delivery and postpartum anaemia in subjects will be 73% and 78% respectively. Thus the proportion of subjects presenting in labour with anaemia are quite similar in the two studies, but labour appears to have aggravated more markedly the prevalence of postpartum anaemia in the Egyptian sample.

Available evidence show that the causes of anaemia in the developing world are multifactorial, and are mostly the result of nutritional deficiencies, hemoglobinopathies and infections [146,157,158]. For the majority of women with anaemia in this study, these factors are the most likely causes of their anaemia. The only factor to have changed in their risk for anaemia postpartum is the absence of the foetus. This however is no comfort since it is now replaced by the burden of breast feeding which can also lead to a depletion of maternal nutrient stores.

The women in this study who had living infants were all breast feeding. If nothing is done to improve their haemoglobin status and also reduce the existing contributory factors of anaemia, they can be expected to remain anaemic for the duration of their child bearing years.

The vicious cycle of anaemia aggravating infection and infection aggravating anaemia, is obviously a matter for concern in this study sample, where high rates of postpartum genital tract infection have also been recorded. Pre-delivery anaemia was, for example, the factor found to be most highly associated with postpartum UGTI in the study sample. A statistically significant association was also observed in this study between postpartum anaemia and postpartum infective complications.

The relative risk for having any postpartum infectious complication of UGTI, LGTI, acute urinary tract infection, or mastitis if one also had postpartum anaemia was 1.5 (CI 1.2 to 2.0), p=0.006. Thus postpartum anaemia increased significantly the risk for all the major infective postpartum complications in this study population.

In a study in The Gambia [167], nutritional supplementation in the early postpartum period, was observed to have resulted in a marked reduction in postpartum health complaints and also improved the haemoglobin levels of subjects. Controlling postpartum anaemia therefore may be a potent means

for preventing postpartum infectious morbidity in this region.

A socio-demographic factor associated with the occurrence of postpartum anaemia in this study was education. In the rural areas of Ghana the literacy rate in women is lower than occurs in the urban settings. In these areas this factor may be an even more important determinant. This finding also reaffirms the already well recognised role that education plays in enhancing the health status of mothers in the developing world.

If we conclude from this study that one in every three of these "more fortunate" women in urban district of Kumasi who had adequate antenatal care and hospital supervised delivery are anaemic after delivery one wonders what the situation is in the less fortunate regions in the country where pregnancy care is poor.

Clearly then the results presented here indicate that postpartum anaemia is a problem of the same magnitude as pregnancy anaemia in the study population. In the early puerperal period, that this anaemia poses a great hazard to these woman postpartum infections is also evident. One therefore cannot over emphasize the need to control postpartum anaemia in this community.

Postpartum hypertension:

Postpartum hypertension was observed in about one in ten women seen at follow up. Based on antenatal care records of pregnancy hypertension, the incidence of postpartum hypertension in this study was calculated to be 88.2 per 1000 deliveries. This incidence rate did not differ markedly from the recorded prevalence rate of 101.8 per 1000 deliveries in the women. Expectedly therefore pregnancy hypertension was not found to be a major determinant of postpartum hypertension in this study sample.

Pre-delivery blood pressures were not measured by this researcher and information on pregnancy hypertension in subjects was based on antenatal care records. Pregnancy blood pressure measurements were taken at very varying intervals depending on the pattern of the subject's antenatal clinic attendances. Caution should therefore be exercised in interpreting the incidence of postpartum hypertension recorded here.

The incidence rate of 8.8% recorded here is about half the 17.2% and 15.8% reported by Stout and Piver et al. respectively in mostly North America blacks [173,176]. The prevalence rate of 10.1% noted on the other hand is quite close to a rate of 10.9% reported in black women in New Orleans, United States, by Meyer in 1934 [174]. It is however much less than the 18% reported in Ibadan, Nigeria, and not

comparable to the high 57% reported in Zaria, also in Nigeria [194,195].

The one factor found to be strongly associated with the occurrence of postpartum hypertension in this study sample was the ethnic origin of subjects. The disease occurred more frequently in those subjects whose ethnic origins were from the tribes based in the northern parts of Ghana. Although persons in the "northern" ethnic group formed 19% of the entire study group seen at follow up they accounted for 43% of the hypertensive cases. Thus one in every five individuals from a northern ethnic origin were hypertensive compared with, for example, one in every 15 Ashanti subjects; a three-fold higher risk.

This finding raises serious questions because it presents a picture similar to that observed in Nigeria. There, women in the northern savanna belts of Zaria were found to have higher rates of postpartum hypertension and also peripartum cardiac failure (a disorder associated with postpartum hypertension), than those in the southern city of Ibadan. It should be noted however, that the women grouped under "northern ethnic origin" in the present study included subjects from closely related tribes of the Gur language group who reside in the northern savanna belts of the country and are therefore not the more or less single ethnic group observed in the Zaria study.

Other factors such as age, parity, and multiple pregnancy were not found in this study to be associated with postpartum hypertension as has been observed in some earlier studies [175,194]. This may be because of the small number of the cases with this condition observed in this study.

Seven (20%) of the 35 hypertensives seen at follow up had severe hypertension with diastolic blood pressures over 100 mm Hg. Almost two-thirds (63.8%) of all hypertensives, including all seven found with severe hypertension, were subjects who had failed to attend the morbidity clinic and were found at home. Since hypertension is a more or less an asymptomatic disorder there were no symptoms to prompt subjects to attend the clinic, unlike cases of genital tract infections where the symptoms of abdominal pain or perineal soreness prompted the subjects to seek help.

Thus the subjects with postpartum hypertension without medical follow-up postpartum may remain untreated and thus develop complications of the disorder and present much later with its sequelae. Indeed during data collection it was disheartening to find mothers at home with blood pressures of 180/120 mm Hg who were unaware they were in real health danger.

The prevalence rate of one in ten subjects recorded here for postpartum hypertension is high and cannot be taken lightly. It calls for early screening of women in the early

postpartum period and also for a longer follow-up of these women to prevent long term health outcomes. Further study is also needed to identify the more specific risk factors and also to confirm the findings noted here.

Thrombotic vascular disease:

Based on clinical diagnosis alone the incidence of thrombotic vascular disease was observed to be 7.8 per 1000 deliveries. This rate is probably the least accurate in this study because this disorder is very difficult to diagnose with clinical signs alone. Sophisticated investigative procedures are required for correct diagnosis in the majority of cases.

It should also be remembered that the incidence noted here also reflects disease occurring in the early puerperium alone. Since over 95% of cases in most studies with longer follow up periods were observed to occur during the first two weeks postpartum the rate reported in this study is probably a reasonable estimate of the puerperal incidence for the study population [132,134].

Despite the diagnostic limitations, the incidence of 7.8 per 1000 obtained in this study is comparable to rates reported from studies in the western world where incidences range from 4-14.7 per 1000 deliveries [132,134].

Postpartum pelvic infection is a well-recognised predisposing factor for pelvic thrombophlebitis. If we

consider the high rates of this risk factor in this study sample one is inclined to believe that pelvic thrombophlebitis occurred to a much higher frequency than was detected.

Although the small number of cases identified in the study did not permit extensive sub-analysis, it is worth noting that two of the three cases diagnosed with thrombotic morbidity had some evidence of pelvic infection but in only one was florid clinical signs of pelvic thrombophlebitis also present.

It will certainly be a while before facilities for efficient diagnosis of thrombotic vascular disease become available to most countries of the developing world. The results of this study indicate that the condition is not rare, and may probably even occur with greater frequency than occurs in the developed world. It therefore reminds us that women in their early puerperal period in Kumasi and in developing communities must be monitored for this postpartum morbidity. The early detection and treatment offered will then alleviate its effects and prevent loss of life.

Peri-partum cardiac failure:

Only one subject in this study was diagnosed with peripartum cardiac failure this giving an "unstable" incidence rate of 2.6 per 1000 deliveries. This rate, which reflects only the early puerperal period disease in this population is,

however, about 3 to 10 times higher than the rates recorded in studies in North America, where longer study observation periods have occurred [209]. The rate in this study, on the other hand, is much less than the incidence of 1 in 100 deliveries (10 per 1000) recorded in Zaria, Nigeria by McDavidson and Parry [194].

Because, this is one of the rarer complications of the postpartum a larger cohort of women than was recruited in this study would be needed to give a more accurate incidence of the occurrence of the disease in the Kumasi population. This study finding, therefore, only gives a glimpse of the incidence of the disorder and more specific research with a larger population base is needed to confirm the incidence reported here and also to identify specific risk factors in this population.

Psychiatric disorders:

Four subjects were identified with a psychiatric disorder in this early puerperal period. Two of them were hospitalised because of this complication. The diagnoses in the two admitted cases were puerperal psychosis and an acute confusional mental state disorder of an undetermined origin. The two other subjects seen at follow-up had milder psychiatric diseases namely an anxiety disorder and a depression. The subject with the anxiety disorder had florid disease with

marked distress and admitted to having had symptoms prior to delivery which had become aggravated in the postpartum.

Only one subject among the four psychiatic cases had the specific clinical syndrome of psychosis thus giving the incidence of puerperal psychosis as 2.6 per 1000 deliveries. Although it is difficult to compare this incidence to other reported incidences of psychosis, because of the marked variations in the time periods of most studies, the incidence rate observed in this study is similar to the rates of 1 to 2.5 per 1000 births reported in North America and Europe [223,225,231]. It is also quite close to the rates of 1.8 and 3.0 per 1000 in Zaria, Nigeria and the Assir region of Saudi Arabia respectively [2,240]. It should be remembered, however, that this study rate is probably a fraction of the true incidence of the disease in this population since it reflects only early puerperal disease.

The finding that one of the four psychiatric patients in this study had an acute confusional state disorder, is of interest. Two studies on the continent, one in Nigeria and the other in Tanzania [239,243], have also noted with concern the high frequency of this type of puerperal psychiatric disorder in their subjects. The researchers in these two studies questioned the role that organic puerperal diseases and toxic traditional herbal treatments may play in these confusional mental disorders.

The very small number of patients identified with psychiatric disorder in this study does not permit detailed analysis for associated risk factors or effective comparison of specific clinical syndromes with results of other studies. The overall prevalence rate of all puerperal psychiatric disorders in this study is 10.4 per 1000 deliveries. The results obtained here, therefore, only draw attention to the possible rates of occurrence of the early postpartum psychiatric disorders and hopefully may stimulate interest for further research.

Other noted health disorders:

Two symptoms, which were not specifically associated with the disease conditions already discussed above, but were frequently reported by subjects were thigh pain and headaches. Because they could have some impacts on labour and postpartum health they are briefly discussed here.

Thigh pain was reported by 8.2% of women who had "other" complaints. In these women this myalgia involved primarily the adductor muscles groups of the inner thigh. The cause of this postpartum pain is believed by this author to be attributable to the delivery position of the women in the hospital's delivery beds. The observed practice is for the women to deliver in the lithotomy position, with their lower limbs astride rigid stirrup poles. The practice is because these old

delivery beds no longer have their original stirrups in place to support comfortably the lower limbs of the parturient lady. A more comfortable delivery posture should be sought to prevent this unnecessary cause of distress, and thus promote a more rapid postpartum recovery in subjects.

Headache was also one of the symptoms commonly reported by subjects in this study; being reported by about a third of women (27.6%) who had "other complaints". Because headache can be a symptom associated with many physical and mental health disorders, it is possible that its high occurrence simply reflects the high rates of morbidity generally noted in the study population.

Headache in the early puerperium is a recognised complaint which can occur without other associated puerperal morbidity. Between 30 to 40 percent of women in studies in England were observed to have complaints of headache particularly between the third to sixth postpartum days [227,257].

In this study sample because of the high rates of infection, anaemia and hypertension were also observed in these women with headache it is not possible to ascertain if their headaches were simply the classical headaches of the early puerperium or is a symptom associated with these other diseases. The findings here however, indicate that it is one symptom which will also be frequently encountered in

postpartum subjects in the region and care will have to be taken in the management of patients to rule out all the important causes of headache.

In summary, the results of this study clearly draw attention to a high incidence and prevalence of early postpartum morbidity in women delivering at the Komfo Anokye Hospital, and possibly also in the district who are routinely discharged home within a few hours of delivery in satisfactory health.

6.2: THE LIMITATIONS

There are, however, always limiting factors in studies which limit the interpretation of the study results and also create biases which undermine the validity of study results. The next section of this discussion therefore will review the most important limitations and their possible effects on interpretation of study results.

I. This study was carried out on a sample of women from one selected hospital thus introducing a question of a sample selection bias into the study as many factors could have

influenced the decision of these women to deliver at this institution. Selection bias, limits the generalisation of study results.

The Komfo Anokye hospital however, is the only public general hospital in the Kumasi district; all other hospitals are either private or semi-private. It also handles about 60% of all deliveries in the district and therefore an argument can be made that the study sample is representative of the great majority of mothers, in the general public of Kumasi.

Deliveries in the district on the other hand also occur at home, in private maternity homes, and in two other small government health institutions in the district. Certainly the 40% of women who have their babies at these centres must differ from the users of the Komfo Anokye hospital. With the exception of the approximately 20% of women who deliver at home, there is probably little difference in the quality of delivery care received by the other 20% of women who deliver at these other delivery centres. They too are routinely discharged home within 24 hours of delivery.

The general trend in the country is also for most women to seek antenatal care equally but to differ more markedly in their choice of delivery place. If we consider this observation then it is also likely that the sample in this study will be similar to these other women by their pregnancy and antenatal care characteristics.

Thus the women who do not deliver at this study centre are likely to be similar to the study sample, and to the other women who use this hospital. They are therefore very likely to have morbidity to the same extent as observed in this study.

Because the distribution by place of delivery in Kumasi is characteristic of most urban communities in the country, the results of this study can comfortably be generalised to the other urban communities of the region.

The generalisation of study findings to mothers in the rural areas however may not be so appropriate. This is because the health care and socio-demographic characteristics of women in the rural communities differ markedly from that of those in this urban setting. Rural mothers are more likely to have much lower socioeconomic status, poorer pregnancy care and deliver their babies more often at home.

Thus the incidence rates of disease observed in this study may also differ markedly from those occurring in rural women who unfortunately form the majority of women in Ghana and other developing countries.

Because the results obtained here can be described as representing the situation of women with a better "health" situation, it does provide essential information on the possible extent of morbidity in less fortunate mothers, and can therefore be still considered as providing invaluable

information on the early puerperal health situation of both urban and rural mothers in spite of this limitation.

II. The prospective nature of the study, exposed it to the major hazard encountered in this type of study, the problem of "subject drop out". This factor introduces a second selection bias into the outcomes of this study. A satisfactory overall follow-up rate of 81.1% was obtained in the study even though one did not entirely escape this type of limitation.

Baseline characteristics of the approximately 20% of subjects lost to follow-up, were available. They were found to be very similar to those who came spontaneously to the clinic and to those who did not attend but were later found. It was, therefore, reassuring evidence that those who were not found may not differ markedly from those seen. The selection bias thus introduced by the loss of subjects during follow-up can be considered to be small.

III. About 36% of the subjects seen at follow-up at had failed to attend the morbidity assessment clinic as requested. They were traced to their homes and assessed there. This home follow-up process was often achieved a few days later in the postpartum period and therefore introduced time biases into the findings recorded for these group of women in the study sample.

These time biases were likely to influence the detection of physical clinical signs at clinical examination and additionally also raise a question of a recall bias in the reporting of symptoms in these two groups of subject who were on the average assessed for morbidity at periods two weeks apart.

Generally the subjects who failed to attend and were later found were observed to have fewer health complaints and hence fewer rates of pathology and disease than those who came spontaneously to the clinic. When we consider the issue of recall bias in the reporting of symptoms at interview, it is reasonable to say that symptoms such as abdominal pain, perineal soreness and fever (the most frequently reported symptoms in this sample) are not complaints which could have easily been forgotten by the usual individual in the short time period of one to two weeks after they had occurred.

One therefore feels confident that a recall bias was unlikely to have affected the frequency with which symptoms in this study were reported by the non-attending subjects.

Physical findings in subjects generally correlated well with symptoms they reported and prior treatment was not observed to have influenced the detection of pathology in the subjects. One could of course argue that clinical physical findings change with time. They could become better and less evident, or on the other hand worse with time. This would

depend on the type of morbidity and especially in this study whether subjects had treated themselves.

A well recognised feature of most non-viral infectious morbidities, particularly the bacterial types noted in this study, is the likelihood for them to become worse and not better if not appropriately treated. In the non-attending subjects with these morbidities, one would expect that the associated physical signs would become more florid, or at least remain the same with time. It is more likely, that the two week time lapse would not lower the detection of these infectious disorders in these subjects, especially since the criteria for diagnosis included a complementary collection of symptoms and signs.

Haemoglobin levels in new mothers are not observed to change markedly after the first postpartum week [243]. Thus the haemoglobin levels of non-attenders seen two weeks later can be expected to be similar to levels they attained at the end of their first two postpartum weeks unless significant bleeding occurred during this period. The reported nature of the lochia, however did not indicate this to be so. In fact the non-attending subjects were more likely to have no lochia at all, or lochia alba. One can therefore conclude reasonably that the rate of detection of postpartum anaemia in this study was not affected by this time limitation.

Kaltrieder et al. [177] observed in their study that in the majority of women (95%) who develop postpartum hypertension, the onset of disease is often in the first week postpartum with only 5% more of the cases developing after the second week. This observation may not necessarily be true for this study population, but if we also consider that other researchers have observed blood pressure elevations to occur in the first postpartum week then this observation is more likely to be also true in this population [178,179].

The time lapse in the measurement of blood pressures in non-attenders is therefore not very likely to have influenced markedly the detection of postpartum hypertension in those subjects. The rate of the disorder reported here is believed to be the likely true rate in this study population.

Thus with the exception of the few rarer disorders such as mastitis, and puerperal psychosis which occur more frequently in the later puerperium the reported occurrences and/or detection of disease in non-attenders were not likely to differ markedly from that of clinic attendants and the effect of time bias on study results is likely to be small.

IV. Although attempts were made the reduce the limitations to the study of the lack of a pilot survey necessary to fine tune study measuring instruments and methods, it is obvious that

one did not fully escape the limitations of this methodological deficiency.

The study interview questions, for example had to be modified to obtain essential information on self-medication. This late modification could only be limited in scope and a more comprehensive report on how the subjects used these medications for instance was not included in the data. A pilot survey could have drawn attention to the need to record pre-delivery blood pressures thus leading to more accurate measure of incidence of postpartum hypertension.

The impacts that a good pilot survey can have on the outcomes of any study are therefore shown by these limitations.

v. This study aimed specifically at identifying early postpartum morbidity in the population in Kumasi with the simplest and also cheapest tools available. Availability of more sophisticated methods for detecting morbidity eg. laboratory investigations may have produced different results. The rates of infectious diseases reported in this study for example, could be less than the actual rates in the study population since the "measuring instruments" used in disease detection presently had low sensitivity and specificity rates.

6.3: CONCLUSIONS AND RECOMMENDATIONS

I. Over two-thirds of subjects in this study were found to have an early postpartum health problem. In these subjects, the existing morbidities were conditions requiring early medical intervention for the best possible health outcomes. The high prevalence of early puerperal morbidity, therefore calls for a postpartum health care system aimed at tackling the unmet health needs of mothers in Kumasi.

It is recommended therefore, that a postpartum clinic be routinely organised for mothers at the end of their first postpartum week and that all new mothers be encouraged to attend this clinic. The advantages of having such a clinic are obvious. The second visit of these mothers to the already existing sixth postpartum week clinic can then serve as a follow-up which ensures all is well and for timely family planning services.

II. Self-medication was prevalent in study subjects; clearly these women lack knowledge about the hazards of this practice. It is suggested that during antenatal care efforts be made to educate subjects about the hazards of drug misuse particularly in pregnant and nursing mothers. Health education of the pregnant woman and new mother should also provide some information on the early recognition of common postpartum

complications and highlight the problems associated with delayed treatment of these disorders.

This health education effort will not only benefit mothers but will also contribute in the long run to educating the general public about the abuse of prescription drugs, as mothers may become more cautious about using drugs in other circumstances.

III. Although this study has provided some information on the early puerperal morbidities in Kumasi, it was not able to provide detailed information on the determinants and characteristic of the specific morbidities.

Further research on these morbidities is needed, to provide a more complete picture of postpartum morbidity in this population. Research questions raised by this study include:

1. Why do women who have had "adequate" antenatal care in Kumasi still present at labour with a high prevalence of anaemia?

2. Are women from tribes located in the northern part of Ghana at higher risk for postpartum hypertension, and if they are what are the determining factors?

3. What is the extent of postpartum morbidity in women who deliver at home and what are the determinants?

In conclusion, it is hoped that the results of this study, and its recommendations, will contribute to improving the health of all mothers in Ghana, and also in other developing nations thus answering to the Safe Motherhood call to action [9].

REFERENCES

1. Preventing the Tragedy of Maternal Deaths. A report on the International Safe Motherhood Conference. Nairobi, Kenya, Feb. 1987 - prepared by Ann Starrs: WHO, UNFPA, WB.

2. K.A. Harrison (1989). Maternal Mortality in Developing Countries. Br J Obstet Gynaecol; 96; p 1-3.

3. Mortality; Summary list of causes 1986. (1988) Vital Statistics, Statistic Canada (1986).Ministry of Supply Services Vol. 3; p 24

4. Vital and Health Statistics (1990). Supplement to the monthly vital statistics report ; Advance reports 1987: Compilation of data on natality, mortality, marriage, divorce and induced terminations of pregnancy. U.S. Dept. of Health and Human Services, Maryland. Series 24; p 1-13

5. Greenwood AM, Greenwood BM, Bradley AK, Williams K, Shenton FC, Tulloch S, Byass P, Oldfield FSJ (1987). A prospective study of the outcome of pregnancy in a rural area of Gambia. Bull WHO; 65; 5; p 635-643.

6. Dobbie BM (1982). An attempt to estimate the true rate of maternal mortality in sixteenth to eighteenth centuries. Med Hist; 26; p 79-90.

7. Hogberg U, Wall S, Brostrom G (1986). The impact of early medical technology on maternal mortality in late 19th Century Sweden. Int J Gynecol Obstet; 24; p 251-261.

8. Harrison KA, (1985). Child bearing, health and social priorities: A survey of 22,774 consecutive hospital births in Zaria, Northern Nigeria. Br J Obstet Gynaecol [Suppl 5]; p 1-119.

9. Mahler H, (1987). The safe motherhood initiative: A call to action. Lancet; i; (8534); p 668-670.

10. El Kady AA, Saleh S, Gadalla S, Fortney J, Bayoumi H. (1989). Obstetric deaths in Menoufia Governorate Egypt. Br J Obstet Gynaecol; 96; p 9-14.

11. Rogo, KO, (1989). Mortality in acute gynaecology: A developing country prospective. Int J Gynecol Obstet; 30; p 343-347.

12. Semmelweis IP. 1861 die Aeitologie, des Begriff u die prophylaxis dis kin dbethfiebers, Pest, Vienna and Leipzig.

13. Mabogunge OA (1989). Burn injuries during the puerperium in Zaria, Nigeria. Int J Gynecol Obstet; 30; p 133-137.

14. Mothers' lives matter. Maternal health in the community. (1988). Popul Rep; Issues in World Health Series [L] (7); p 1-31.

15. Cannon DSH, Hartfield VJ (1964). Obstetrics in a developing country. A survey of six years work in a Nigerian hospital. J Obstet Gynae Brit Comm; 71; p 940-950.

16. Plummer FA, Laga M, Bruham RC, Ronald AR, Bhullar V, Mati JY, Ndinya-Achola JO, Cheang M, Nsanze H (1987). Postpartum upper genital infections in Nairobi, Kenya; Epidemiology, Etiology and Risk factors. J Infect Dis; 156; (1); p 92-97.

17. Ghana, Demographic and Health Survey 1988. Final Report: Statistical Services Accra, Ghana, Sept. 1989.

18. Ghana, Living Standards Survey ; First year report 1989. Ghana Statistical Survey.

19. Children and Women of Ghana (1990): A situation analysis 1989-90. Republic of Ghana and United nations Children's Fund, Accra, June 1990.

20. Adjei S, Achiaw O, Kwawukuma S, Edusei J.(1991) A review of primary health care in Ghana. Ministry of Health: March 1991.

21. Ashanti Regional Health Services: Annual report 1989 Regional Director of Health Services, Kumasi, Ashanti.

22. Deganus S (1989). Safe motherhood initiative: A proposal for action in Kumasi District. MCH Division Ministry of Health, Accra, Ghana.

23. Ghana: Results from the demographic and health survey (1990). Stud Fam Plann; 21; (4); p 236-240.

24. Maternal and Child Health/Family Planning 1990. National Report. Ministry of Report, Accra, Ghana.

25. Ampofo DA (1969) Causes of maternal deaths and comments; Maternity Hospital, Accra. W Afr Med J; 18; p 75-81.

26. Antwi PM, Marshall M, Adjei S. Retrospective analysis of maternal mortality data from three major maternity hospitals in the greater Accra Region 1986-88. Unpublished 1989.

27. Western Regional Health Services (1990). Annual Report; Regional Director of Health, Ministry of Health, Ghana.

28. Upper East Regional Health services (1990) Annual Report; Regional Director of Health, Ministry of Health, Ghana.

29. Ashanti Region: Summary of Baseline data on pregnant women (1987). Statistical unit; Ashanti Regional Health Service, Kumasi, Ghana.

30. Eschenbach DA, Wager GP (1980). Puerperal Infections. Clin Obstet Gynecol; 23; (4); p 1003-1037

31. Adetoro OO (1990). Maternal mortality from infection at a university hospital in Nigeria. Asia Oceania J Obstet Gynaecol; 16; (2); p 101-104.

32. Crowther CA (1986). Maternal deaths at Harare hospital during 1983. S Afr Med J; 69; p 180-182.

33. Boes EGM (1987). Maternal mortality in Southern Africa 1980 - 1982. Part II Causes of maternal deaths. S Afr Med J; 71; (3); p 160-161.

34. El Goulli M, Chelli H, Chelli M (1978). La mortalite maternelle a la maternite a L' Hospital Charles Nicolle a Tunis de 1972 a 1975. J Gynecol Obstet Biol Reprod; 7; p 779-84.

35. Voorhoeve AM, Multer AS, W,oigo H (1979). Machakos project studies. Agents affecting the health of mother and child in rural area of Kenya XVI : The outcome of pregnancy. Trop Geogr Med; 31; p 607-627.

36. Grech ES, Galea J, Trussel RR (1969). Maternal mortality in Uganda. Int J Gynecol Obstet; 7; (6); p 263-267.

37. Fortney JA, Susanti I, Gadalla S, Saleh S, Feldblum PJ, Potts M (1988). Maternal mortality in Indonesia and Egypt. Int J Gynecol Obstet; 26; p 21-32.

38. Kahn AR, Jahan FA (1986), Begum SF. Maternal mortality in Rural Bangladesh: The Jamalpur District: Stud Fam Plann 17; (1); p 7-12.

39. Kroenig MA, Fauveau V, Chowdhury AI, Chakraborty J, Khan MA (1988). Maternal mortality in Matlab, Bangaldesh 1976-85. Stud Fam Plann; 19; (2); p 69-80.

40. Bhatia JC (1984). Maternal mortality in Anantapur district, India. Preliminary findings of a Study. Geneva: World Health Organization, Nov 1985; p 24.

41. Syverson CJ, Atrash HK, King GE (1991). Pregnancy related mortality in New York City 1980 to 1984: Causes of death and associated factors. Am J Obstet Gynecol; 164; p 603-608.

42. Maternal mortality statistics (1986-1978); Source Unknown; Ontario disease surveillance report p:2-6

43. The complicated puerperium: Puerperal infection: In Fundamentals of Obstetrics and Gynaecology: D Llewellyn Jones. 5th Edition 1990. Faber and Faber, Great Britain. p 369-378.

44. Gibbs RS, Weinstein AJ (1976) Puerperal infection in the antibiotic era. Am J Obstet Gynecol; 124; p 769-787.

45. Sweet RL, Ledger WJ (1973). Puerperal infectious morbidity: A two year review. Am J Obstet Gynecol; 117; (8); p 1093-1100.

46. Muir DG, Belsey MA (1980). Pelvic inflammatory disease and its consequences in the developed world. Am J Obstet Gynecol; 138; (7); p 913-926.

47. Nasah BT, Nguematcha R, Eyong M. Godwin S (1980). Gonorrhoea, Trichomonas and Candida among gravid and non-gravid women in Cameroon. Int J Gynecol Obstet; 18: p 48-52.

48. Perine PL, Duncan ME, Krause DW, Awoke S (1980). Pelvic inflammatory disease and puerperal sepsis in Ethiopia. I Etiology. Am J Obstet Gynecol; 138; p 969-973.

49. Soper DE (1988). Post partum Endometritis; Patho-physiology and prevention. J Repr Med [Suppl] 33; (1); p 97-100.

50. Rehu M (1980). The effect of education, marital status and sexual behaviour on the incidence of puerperal endometritis and bacteruria. Ann Clin Res; 12; p 315-319.

51. Sounio S, Sarikoski S, Vohlonen I, Kauhanen O (1989). Risk factors for fever, endometris and wound infection after abdominal delivery. Int J Gynecol Obstet; 29; (2); p 135-142.

52. Gibbs RS, Rodgers PJ, Castenada YS, Ramzy I (1980). Endometritis following vaginal delivery. Obstet Gynecol; 56; p 555-558.

53. Cates W, Farley MM, Rowe PJ (1985). World wide patterns of infertility; is Africa different. Lancet; ii; (8455); p 596-598.

54. Ekwempu CC, Lawande RV, Egler LJ (1981). Microbial flora of the lower genital tract of women in labour in Zaria, Nigeria. J Clin Pathol; 34; p 82-83.

55. Welgemoed NC, Mahaffey A, Van den Ende J (1986). Prevalence of Nersseria Gonorrhoea infection in patients attending antenatal clinic. S Afr Med J; 69; p 32-34.

56. Mason PR, Katzenstein DA, Chimbira THK, Mtimavalye L and the Puerperal Study Group (1989). Microbial flora of the lower genital tract of women in labour at Harare hospital. Cent Afr J Med; 35; (3); p337-343.

57. Mabey PCW, Whittle HC (1982). Genital and neonatal chlamydial infection in a trachoma endemic area. Lancet; ii; (8293); p 300-301.

58. Ratnam AV, Din SN, Chatterjee TK (1980). Gonococcal infection in women with pelvic inflammatory disease in Lusaka, Zambia. Am J Obstet Gynecol; 138; p 965-968.

59. Mtimavalye LA, Belsey MA (1987). Infertility and sexually transmitted diseases: Major problems in maternal and child health and family planning. International Conference on Better Health for Women and Children Through Family Planning. Nairobi, 5-9th October. p 1-25.

60. Quarcopome CO (1983). Ophthalmia Neonatorium: Problems of prophylaxis and treatment in Africa. WHO PBL / ON / 83-7, Geneva: p 1-4.

61. Wasserbiet JN (1989). The significance and scope of reproductive tract infections among third world women. Int J Gynecol Obstet [Suppl]; 3; p 145-168.

62. George WF (1974). An approach to VD control based on a study in Kingston, Jamaica. Br J Vener Dis; 50; p 222-227.

63. Donoso E, Vera E, Villaseca P et al (1984). Infection gonococica en el embarazo. (Gonococcal infection during pregnancy) Rev Chil Obstet Ginecol 49; p 84.

64. Mason PR, Katzeinstein DA, Chimbira TH, Mtimavalye L and the puerperal sepsis study group (1989) Vaginal flora of women admitted with signs of sepsis following normal delivery, caesarean section or abortion. Cent Afr J Med; 35; (3); p 344-351.

65. Bentsi C, Klufio CA, Perine PL, Bell TA, Cles LD, Keester M, Wang SP (1985). Genital infections with chlamydia trachomatis and Neisseria gonorrhoea in Ghanaian women. Genitourin Med; 61; p 48-50.

66. Fiander A (1990). Causes of infertility in 1000 patients in Ghana. Trop Doct; 20; (3); p 137-138.

67. Ebomoyi E, Adetoro OO (1990). Sociobiological factors influencing infertility in a rural Nigerian community. Int J Gynecol Obstet; 33; p 41-47.

68. Little PJ (1966). The incidence of urinary tract infection in 5000 pregnant women. Lancet; ii; (7470): p 925-928.

69. Rehu M, Nilsson CG, Haukkamaa M (1980). Significant bacteriuria in the puerperium. A Prospective study of risk factors. Ann Clin Res; 12; p 112-115.

70. Tan JS, File TM(Jr.) (1990). Urinary tract infections in Obstetrics and Gynaecology. J Repr Med; 35[3 Suppl]: p 339-342.

71. Kaitz AL, Hodder EW (1961). Bacteriuria and pyelonephritis of pregnancy. A prospective study of 616 pregnant women. N Eng J Med; 263; (14); p 667-672.

72. Fihn SD (1988). Urinary tract infection in primary health care; Obstetrics and Gynaecology. Clin Obstet Gynecol; 31; (4); p 1003-1016.

73. Stray-Pederson B, Blakstad M, Bergan T (1990). Bacteriuria in the puerperium. Risk factors, screening procedures and treatment programs. Am J Obstet Gynecol; 162; (3); p 792-797.

74. Williams GL, Campbell H (1969) Influence of social class, age, parity etc. on the incidence of bacteruria in pregnancy. J Obstet Gynaec Brit Comm; 76; p 229-234.

75. Giles C, Brown JAH (1962) Urinary infection and anaemia in pregnancy. Br Med J; 2; p 10-13.

76. Baill IC, Witter FR (1990). Sickle cell trait and its association with birth weight and urinary tract infection in pregnancy. Int J Gynecol Obstet; 33; p 19-21.

77. Gatti F et al (1967). A symptomatic bacteriuria in the Congolese preganant woman. Preliminary data on its incidence and relation to sickle cell trait. (French). Ann Soc Belg Med Trop; 47; p 413-424.

78. Nouhouayi A et al (1970). Bacteriuria in pregnant women in Dakar its relationship to haemoglobin S; value of numeration of bacteria. (French) Bull Soc Med Afr Noire Lang Franc 15; p 619-623.

79. Okubadejo OA, Akinkugbe OO, Ojo OA (1969). Asymptomatic bacteruria in pregnancy in Nigeria. East Afr Med J 46; p 367-70.

80. Ojo OA, Akinkugbe OO (1976). The significance of asymptomatic bacteruria in pregnancy in Ibadan. W Afr J Surg; 1; p 23-28.

81. Diejomaoh FME (1981). Acute urinary tract infection in pregnancy in a Nigerian community. East Afr Med J 58; (3); p 199-207.

82. Shaaban MM, Zaki MM (1971) Asymtomatic bacteriuria in pregnancy in Assuit, Upper Egypt. J Egypt Med Assoc; 54; p 47-53.

83. Kass EH (1960) Bacteruiria and Pyelonephritis of pregnancy. Arch Intern Med; 105; p 194-198.

84. Van Rooyen AJL (1969) Pregnancy and the lower urinary tract: (ii) Urinary bacteriological and microscopical studies on 300 pregnant females. S Afr Med J; 43: p 818-819.

85. Phillips I, Basson SS, Kasule J, Makuto DG (1969) Bacteruiria in pregnancy in Kampala. East Afr Med J; 46; (9); p 516-519.

86. Mati JKG (1974) Pregnancy bacteruiria in Nairobi, Kenya. East Afr Med J; 51; (12); p 837-843.

87. Jenkinson D (1973). Asymptomatic bacteruria of pregnancy in Zambia. S Afr Med J; 47; p 1136.

88. Mustafa MA, Erwa HH (1972) Significant bacteruiria in pregnancy; a study in Khartoum, Sudan. Ulster Med J; 41; p 161-162.

89. Wilkin HA (1977) Shistosoma haematobium in a Gambian community: Prevalence of bacteruiria and hypertension. Ann Trop Med Parasitol; 71; p 179-186 .

90. Forsyth DM, Bradley DJ (1966) The consequencies of Bilhaziasis : Medical and public health importance in North-west Tanzania. Bull WHO; 34; p 715-735.

91. Osinusi BO, Adeleye JA (1989) Homozygous sickle cell anaemia at the University College Hospital, Ibadan, revisited. Int J Gynecol Obstet 30; p 51-55.

92. Sherman AJ (1956). Puerperal breast abscesses: (1) report of an outbreak at Philadelphia General Hospital. Obstet Gynecol 7:(3); p 268-272.

93. Knott FA, Baliakley JB (1944). The control of Staph. aureus infections in a maternity department. J Obstet Gynaec Brit Emp; 51; p 386.

94. Pyle LR (1948). Staph aureus haemolyticus puerperal mastitis and infections of the newborn. Am J Obstet Gynecol; 55; p 676-682.

95. Colbeck JC (1949). An extensive outbreak of staphyloccoccal infections in maternity units. (The use of bacteriophage typing in investigation and control). Can Med Assoc J; 61; p 557-568.

96. Devereux WP (1970). Acute puerperal mastitis. Evaluation of its management. Am J Obstet Gynecol; 108: (1); p 78-81.

97. Marshall BR, Hepper JK, Zirbel CC (1975). Sporadic puerperal mastitis: An infection that need not interrupt lactation. JAMA; 233: (13); p 1377-1379.

98. Riordan JM, Nicholas PH (1990). A descriptive study of Lactation mastitis in long term breast feeding women. J Hum Lact; 6: (2); p 53-58.

99. Scholefield JH, Duncan JL, Rogers K (1987). A review of a hospital's experience of breast abscesses. Br J Surg; 74; p 469-470.

100. Leach RD, Eykyn SJ, Phillips I, Corrin B (1979). Anaerobic subareola breast abscesses. Lancet (i); (8106); p 35-37.

101. Benson EA (1982). Breast abscesses and breast cyst. Practioner; 226; p 1379-1401.

102. Bates T, Down RHL, Tant DR, Fiddian RV (1973). The current treatment of breast abscesses in hospital and general practice. Practitioner; 211; p 541-547.

103. Amr SS (1985). Breast diseases in Jordanian females. A study of a 1000 cases. Eur J Surg Oncol; 11; p257-262.

104. Oluwole SF, Fadiran OA, Odesanmi WO (1987). Disease of the breast in Nigeria. Br J Surg; 74; p 582-585.

105. Sengupta H, Sulaimani SH, Alam MK, Girgis A (1987). Spectrum of breast diseases seen in a hospital breast clinic in Riyadh. J R Coll Surg Edinb; 32: (3); p 145-147.

106. Ogle KS, Davis S (1988). Mastitis in lactating women. J Fam Pract; 28: (2); p 139-144.

107. Olsen CG, Gordon RE (1990). Breast disorders in nursing mothers. Am Fam Physician; 41: (5); p 1509-1516.

108. Hartfield VJ (1980). Maternal mortality in Nigeria compared with an earlier international experience. Int J Gynecol Obstet; 18; p 70-75.

109. Ojo Ao, Savage VY (1974). A ten year review of maternal mortality rates in the University College Hospital, Ibadan, Nigeria. Am J Obstet Gynecol; 118; p 517-522.

110. Kwast BE (1987). Viral Hepatitis as a major cause of maternal mortality in Addis Ababa. Int J Gynecol Obstet; 25: (2); p 99-106.

111. McGregor IA (1984) Epidemiology, Malaria and Pregnancy. Am J Trop Med Hyg; 33; (4); p 517-525.

112. Brabin BJ (1983) An analysis of Malaria in Pregnancy in Africa. Bull WHO 61; (6); p 1005-1016.

113. Ojo VA, Adetoro OO, Okwerekwu FE (1988). Characteristics of maternal deaths following cesarean section in a developing country. Int J Gynecol Obstet; 27; (2); p 171-176.

114. Moran BJ, Busch I Kirby K (1990). Septic complications of 100 abdominal deliveries in the rural tropics. Trop Doct; 20; p 39-40.

115. Colombo A, Ferrari G (1990). Wound infections after cesarean section in Kenya. Trop Doct; 20; (4); p 169.

116. Leigh DA, Emanuel FX, Sedgwick J, Dean R (1990). Post operative urinary tract infection and wound infection in women undergoing cesarean section: A comparison of two study periods in 1985 and 1987. J Hosp Infect; 15; (2); p 107-116.

117. Thorp JM, Bowes WA (1989). Epsiotomy: Can its routine use be defended? Am J Obstet Gynecol; 160; (5); p 1027-1030.

118. Reynolds JL, Yudkin PL (1987). Changes in the management of labour; 2: Perineal management. Can Med Assoc J; 136; p 1045-1049.

119. Beisher NA (1967) The anatomical and functional results of medio-lateral episiotomy. Med J Aust 2;p 189.

120. Doh AS, Nasah BT, Kamdom-Mayo J (1989). The outcome of labour at the University Teaching Hospital (CHU) Yaounde, Cameron. Int J Gynecol Obstet; 30; p 317-323.

121. Dunn PM (1985). Galba Araujа of Brazil and Epsiotomy. Lancet; 2; (8460); p 884-885.

122. Thacker SB, Banta HD (1982) Benefits and risk of episiotomy: An interpretive review of the English language literature 1960-1980. Obstet Gynaecol Surv 39; p 322-378.

123. Harris RE (1970). An evaluation of median epsiotomy. Am J Obstet Gynecol; 106; p 660-665.

124. Reading AE, Sledmere CM, Cox DN, Campbell S (1982). How women view epsiotomy pain. Br Med J 1; p 243-246.

125. Abraham S, Child A, Ferry J, Vizard J, Mira M (1990). Recovery after childbirth: A preliminary prospective study. Med J Aust; 152; p 9-12.

126. Shy KK, Eschenbach DA (1979). Fatal cellulitis from an episiotomy site. Obstet Gynecol; 54; (3); p 290-292.

127. Sutton GP, Smirz LR, Clark DH, Bennet JE (1985). Group B necrotising fasciitis arising from an episiotomy. Obstet Gynecol; 66; (5); p 733-736.

128. Soper DE (1986) Clostridial myonecrosis arising from an episiotomy. Obstet Gynecol 68 [3 Suppl]; p265-285.

129. Royal College of General Practitioners 1967: Oral contraceptives and thromboembolic disease. R Coll Gen Pract; 13; p 267-279.

130. Howie PW (1977). Thromboembolism. Clin Obstet Gynaecol; 4; p397-417.

131. Turnbull AC, Tindall VR, Robson G, Dawson MP, Cloake EP, Ashley JSA (1986). Pulmonary embolism. A report on confidential enquiries into maternal deaths in England and Wales 1979-1981. H.M.S.O. London; p 30-42.

132. Aaro LA, Juergens JL (1971). Thrombophlebitis associated with pregnancy. Am J Obstet Gynecol; 109; (8); p1128-1136.

133. Kierkegard A (1983). Incidence and diagnosis of deep vein thrombosis associated with pregnancy. Acta Obstet Gynecol Scand; 62; p 443-448.

134. Bergqvist A, Bergqvist D, Hallbrook T (1983). Deep vein thrombosis during pregnancy: A prospective study. Acta Obstet Gynecol Scand; 62; p 443-448.

135. Skillman JJ, Kent KC, Porter DH, Kim D (1990). Simultaneous occurence of superficial and deep vein thrombosis in the lower extremity. J Vasc Surg; 11; p 813-823.

136. Treffers BL, Huidekeper BL, Weenin KGH, Kloosterman CJ (1983). Epidemiological observations of thromboembolic disease during prgnancy and the puerperum in 56,022 women. Int J Gynecol Obstet; 21; p 327-331.

137. Coon WW, Willis PW, Keller JB (1973). Venous thrombo embolism and other venous diseases in the Tecumseh Community Health Study. Circulation; 48; p 839-846.

138. Dixon JE (1987). Pregnancies complicated by previous thromboembolic disease. Br J Hosp Med; 37; p 449-452.

139. Jewett FP (1987). Sickle cell trait, thalassaemia, G6PD and puerperal thromboembolism. N Eng J Med; 295; (19); p 1076-1072.

140. Satiani B, Rustin R, Biggers K, Bordner L (1991). Non invasive diagnosis of deep vein thrombosis. Am Fam Physician; 44; (2); p 569-574.

141. Osime U (1978). Incidence of post operative deep vein thrombosis in Nigerians using I(125) 1-labelled fibrinogen. Br Med J; 2; (6152); p 1607.

142. Joffe SN (1974). Racial incidence of post operative deep vein thrombosis in South Africa. Br J Surg; 61; p 982-983.

143. Shead GV, Narayanan R (1980). Incidence of post operative venous thrombosis in South India. Br J Surg; 67; p 813-814.

144. Hassan MA, Rahman EA, Rahman IA (1973). Post operative deep vein thrombosis in Sudanese Patients. Br Med J; 1; p 515-517.

145. Anaemia in Pregnancy in low-income women United States, 1987. (1990) MMWR 39; 5; p 73-76

146. Royston E (1982). The prevalence of nutritional anaemia in women in developing countries. A critical review of available information. World Health Stat Q; 35; (2); p 52-91.

147. Lourdenadin S (1969). Hazards of anaemia in pregnancy in Malaysia. Int J Gynecol Obstet; 7; 5; p 234-242.

148. Kulkarni AG (1987). Anaemia and blood requirements during pregnancy in patients from Guinea Savanna of North of Nigeria. East Afr Med J; 64; (1); p 65-70.

149. Fleming AF (1970). Seasonal incidence of anaemia in pregnancy Ibadan. Am J Clin Nutr 23; p 224-230.

150. Ogunbode O, Oluboyede OA (1976). Iron deficiency anaemia in Nigerian pregnant women. Int J Gynecol Obstet 14; p 375-378.

151. Fleming AF (1989). The aetiology of severe anaemia in pregnancy in Ndola, Zambia. Ann Trop Med Parasitol; 83; (1); p 37-49.

152. Prual A, Galan P, De Bernis L, Hercberg S (1988). Evaluation of iron status in Chadian women: Consequences of maternal iron deficiency on the haematopoeitic status of newborns. Trop Geogr Med; 40; (1); p 1-5.

153. Lamperelli RD, Bothwell TH, MacPhail AP, Van der Westhuyen J, Baynes RD, Macfarlane BJ (1988). Nutritional anaemia's in coloured women in Johannesburg; S Afr Med J; 73; 8; p 477-481.

154. Oluboyede OA (1980). Iron studies in pregnant women and non pregnant women with haemoglobin SS or SC disease. Br J Obstet Gynaecol; 87; p 989-996.

155. Fleming AF (1989). Tropical obstetrics and Gynaecology. 1. Anaemia in pregnancy in tropical Africa. Trans R Soc Trop Med Hyg; 83; (4); p 441-488.

156. Boutaleb Y, Mesbhahi M, Lahlou N (1982). L'etat a l'admission. J Gynecol Obstet Biol Reprod; 11; (1); p 81-83.

157. Newton M; Mosey LM, Egli GE; Giffod WB, Hull CT (1961). Blood loss during and immediately after delivery. Obstet Gynecol; 17; (1); p 9-18.

158. Lowenstein L, Pick CA, Philpott NW (1950) Correlation of blood loses with volume and haematological studies during and after child birth. Am J Obstet Gynecol; 60; (6); p 1206-1216.

159. Brant HA (1967). Precise Estimation of postpartum haemorrhage: Difficulties and Importance. Br Med J; 1; p 368-400.

160. Gahres EE, Albert SN, Dodek SM (1962). Intrapartum blood loss measured with Cr 151 tagged erythrocytes. Obstet Gynecol; 19; (4); p 455-462.

161. Conn LC, Vant JR, Cantor MM (1941). Critical analysis of blood loss in 2000 obstetric cases. Am J Obstet Gynecol, 42; p 768-785.

162. Combs CA, Murphy EL, Laros RK (1991). Factors asociated with postpartum haemorrhage after vaginal birth. Obstet Gynecol; 77; (1); p 69-76.

163. Hartfield VJ, Woodland M (1980). Prevention of maternal death in a Nigerian village. Int J Gynecol Obstet; 18; p 150-152.

164. Fathalla MF, Kamal I (1964). Haemoglobin levels before and after parturition. J Egypt Med Assoc 34; p 373-381.

165. Kwa SB, Gaw YN (1968). Anaemia in pregnancy and the puerperum a two year prospective survey. Singapore Med J; 9; (1); p 17-26.

166. Edelstein T, Zail SS, Faulding GE, Metz J (1967). Iron folate and vitamin B12 nutrition in Bantu patients with postpartum anaemia. S Afr Med J 41; p 300-303.

167. Prentice AM, Lunn PG, Watkinson M, Whitehead RG (1983) Dietary supplements of lactating Gambian women: Effects on health, nutritional status and biochemistry. Hum Nutr Clin Nutr 37 C; p 65-74.

168. Hypertensive disease in pregnancy in fumdamentals of obstetrics and gynaecology by D. Llwellyn Jane Ed. 5th Edition 1990. Faber and Faber UK; p 207-221.

169. Obstetric and Gynaecologic diagnosis and treatament in 1987 Ed. ML Pernoll, RC Bensor. 6th edition Appleton and Lange. Connecticut/Los Altos, California; p 524.

170. The hypertensive disorders of pregnancy World Health Organisation: Report of WHO study group: Technical Report series, 1987. No; 758 Geneva.

171. Hypertensive disorders of pregnancy (1991): Report of WHO/MCH Interregional collaborative study. WHO/MCH 91.4.

172. Davis AM (1971). Geographical epidemiology of the toxaemias of pregnancy. Isr J Med Sci; 7; (6); p 751-821.

173. Stout ML (1934). Hypertension six weeks postpartum in apparently normal patients. Am J Obstet Gynecol; 27; p 730-733.

174. Meyer H (1934). Postpartum hypertension following a normal prgnancy. Am J Obstet Gynecol; 35; p 150-155.

175. Meyer H, Nadler SB (1941). Unexpected postpartum hypertension. Am J Obstet Gynecol; 41; p 231-236.

176. Piver MS, Carson SL, Bolognese RJ (1967). Hypertension six weeks post partum: A reappraisal and challenge. Obstet Gynecol 30; (2); p 238-241.

177. Kaltreider DF, Gilbert RA (1951). Unexpected hypertension in the early and late puerperum. Am J Obstet Gynecol; 61; p 161-166

178. Walters BNJ, Thompson ME, Lee A, de Swiet M (1986) Blood pressure in the puerperium. Clin Sci 71; p 589- 594

179. Walters BNJ, Walters T (1987) Hypertension in the puerperium. Lancet ii; (8554); p 330.

180. Dieckmann WJ (1938) The geographical distribution and effect of climate on eclampsia, toxaemia of pregnancy, hyperemesis gravidarum and abruptio placentae. Am J Obstet Gynecol 36; p 623-631.

181. Snoo K de, Remmelts R (1938) Die eklampsie geographisch betrachtet. Int Cong Verlosk Gynaecol, Amsterdam. Leiden 1; p 107-136.

182. Arkutu AA (1978). A clinical study of maternal age and parturition in 2791 Tanzanian primiparae. Int J Gynecol Obstet; 16; p 20-23.

183. Thompson B, Baird D (1967) Some impressions of child-bearing in tropical areas: II Pre-eclampsia and low-birth-weight. J Obstet Gynaec Br Comm 74; p 499-509.

184. Van Dongen PWJ (1977). Blood pressure survey of Zambian primigravidae. Trop Geogr Med; 29; p 374-380.

185. Schoon MG, Van der Walt WJ, Fourie J, Kruger H (1990). Blood pressure profiles and perinatal outcome in pregnant women in Pelomni Hospital. Bloemfontein, South Africa. Int J Gynecol Obstet; 33; (2); p 111-114.

186. Adetoro OA (1989). A sixteen survey of maternal mortality associated with eclampsia in Ilorin. Int J Gynecol Obstet; 30; p 117-121.

187. Moodley J, Nakker RS, Mankowitz E (1983). Eclampsia: A method of menagement. A preliminary report. S Afr Med J; 63; p 530.

188. Lopez Ilera M (1982). Complicated eclampsia: Fifteen years experience in a referral medical centre. Am J Obstet Gynecol 142; 1; p 28-35.

189. Andersch B, Svensson A, Hansson L (1984) Characteristics of hypertension in pregnancy: A retrospective study of 261 consequetive cases. Acta Obstet Gynecol Scand [Suppl] 118; p 33-38.

190. Sibai BM, McCubbin JH, Anderson GD, Lipshitz J, Dilts PV (jr) (1981) Eclampsia: I Observations from 67 cases. Obstet Gynecol 58; p 609-613.

191. Sibai BM (1990) Eclampsia: VI Maternal and perinatal outcome in 254 consequetive cases. Am J Obstet Gynecol 165; (5);p 1049-1054.

192. Pritchard JA, Pritchard SA (1975) Standardised treatment of 154 cases of eclampsia. Am J Obstet Gynecol 123; p 543-552.

193. Wightman H, Hibbard BM, Rosen M (1978) Perinatal mortality and morbidity associated with eclampsia. Br Med J; 2; p 235-237.

194. McD Davidson, N, Parry EHO (1978). Peripartum cardiac failure. Q J Med; 188; p 431-461.

195. Brockington IF (1971). Postpartum hypertensive heart failure. Am J Cardiol; 27; p 656-8.

196. Rehan N, Tafida DS (1980). Multiple births in Hausa women. Int J Gynecol Obstet; 87; p 997-1004.

197. Cox ML (1963). Incidence and aetiology of multiple births in Nigeria. J Obstet Gynaec Br Comm; 70; 878-874.

198. Egwatu VE, Ozumba BC (1989). Observations on molar pregnancy in Enugu, Nigeria. Int J Gynecol Obstet; 29; p 219-225.

199. Boutaleb Y, Aderdour M, Setauani A (1982). Inlfuence du mileau sur la maladie trophoblastique. J Gynecol Obstet Biol Reprod; 11; (1); p 78-80.

200. Seedat YK (1990). Perspectives of hypertension in Black vs White differences. J Cardiovasc Pharmacol 16 [suppl 7]; p S67-70.

?01. Hulsey TC, Levkoff AH, Alexander GR, Tompkins M (1991) Differences in black and white infant birth weights: The role of maternal demographic factors and medical complications of pregnancy. South Med J 84; 4; p 443-446.

202. Montushi E (1968) Hypertension in the tropics. Br Med J 1; p 313.

203. Ashcroft MT, Beadnell HMSG, Bell R, Miller GJ (1970). Characteristics relevant to cardiovascular diseases among adults of African and Indian origin in Guyana. Bull WHO; 42; p 205-225.

204. Meadows WR (1957). Idiopathic myocardial failure in the last trimester of pregnancy and the puerperuim. Circulation 15; p 903-914.

205. Hargood JL, Brown MA(1991). Pregnancy induced hypertension recurrence rate in second pregnancy. Med J Aust; 154; (6); p 376-7.

206. Selvaggi L, Loverro G, Schena FP, Manno C, Cagnazzo G, (1988). Long term followup of women with hypertension in pregnancy. Int J Gynecol Obstet 27; p 45-49.

207. Hull E, Hafkesbring E, (1937). Toxic postpartal heart diesease. New Orleans Med Surg J; 89; p 550-557.

208. Hull E, Hidden E, (1938). Postpartal heart failure. South Med J; 31; p 265-275.

209. Demakis JG, Rahimtoola SH (1971). Peripartum cardiomyopathy. Circulation 44; p 964-968.

210. Homan DC (1985). Peripartum cardiomyopathy. N Eng J Med; 312; (22); p 1432-1437.

211. Seftel H, Susser M (1961). Maternity and myocarcial failure in African women. Br Heart J; 23; p 48-52.

212. Walsh JJ, Burch GE, Black WC, Ferrans VJ, Hibbs RG (1965). Idiopathic cardiopathy of the puerperum (post partal heart disease). Circulation 32; p 19-31.

213. Priece JA, Price BO, Joyce JW (1963). Familial occurence of postpartal heart failure. Arch Intern Med; 111; p 651-655.

214. Benchimol AB, CarneiroRD, Schlesinger P (1959). Postpartum heart disease. Br Heart J 21; p 89-100.

215. Blegen SD (1965). Postpartum congestive heart failure. Acta Med Scand 178; p 515-524.

216. Nagaratnam N, Somasundaram M (1965). Puerperal cardiomyopathy in the Ceylonese. Celon Med J 10; 203-208.

217. Perrine RP (1967). An obscure myocardiopathy in postpartum Saudi Arabs. Trans R Soc Trop Med Hyg; 61; p 834-838.

218. Payet M, Sankale M, Fesner M, Cacgua P (1961). La Myodardite' primitive du postpartum. Sem Hop Paris; 37; p 969-979.

219. Sanderson JE, Adesanya CO, Anjorin FI, Parry EHO (1979). Postpartum cardiac failure, Heart failure due to volume overload. Am Heart J 98; (5); p 613-620.

220. Midei MG DeMent SH, Feldman AM, Hutchins GM, Baughman KL (1990). Peripartum myocarditis and cardiomyopathy. Circulation; 81; (3); p 922-928.

221. Meadows WR (1960). Postpartum heart disease. Am J Cardiol, 6; p 778-802.

222. Adesanya CO, Anjorin FI, Adeoshun IO, McD Davdison N Parry EHO (1989). Peripartum cardiac failure. A ten year follow-up study. Trop Geogr Med 41; p 190-196.

223. Pugh TF, Jerath BK, Schmidt WM, Reed RR (1963). Rates of mental disease related to child bearing. N Eng J Med; 268; (22); p 1224-1228.

224. Paykel ES, Emms EM, Fletcher J, Rassably ES (1980). Live events and social support in puerperal depression. Br J Psychiatry; 136: p 339-346.

225. Meltzer ES, Kumar R (1985). Puerperal mental illness: clinical features and its classification. A study of 142 mother and baby admissions. Br J Psychiatry; 147; p 641-646.

226. Dean C, Kendell RE (1981). The symptomatology of puerperal psychiatric illnesses. Br J Psychiatry; 139; p 128-133.

227. Pitt B: (1973). Maternity blues. Br J Psychiatry 122; p 431-433.

228. Tod EDM (1964). Puerperal depression. A prospective epidemiological study. Lancet; ii (7372); p 1264-1266.

229. Dalton K (1971). Prospective study into puerperal depression. Br J Psychiatry; 118; p 689-692.

230. Cox JL, Connor V, Kendell RE (1982). A prospective study of psychiatric disorders of childbirth. Br J Psychiatry; 140; p 111-117.

231. Kendell RE, Rennie D, Clarke JA, Dean C (1981). The social and obstetric correlates of psychiatric admissions in the puerperium. Psychol Med; 11; p 341-350.

232. Rehman AU, St. Clair D, Platz C (1990). Puerperal insanity in the 19th and 20th centuries. Br J Psychiatry; 156; p 861-865.

233. Handley SL, Dunn TL, Waldron G, Backer JM (1980). Tryptophan, cortisol and puerperal mood. Br J Psychiatry; 136; 498-508.

234. Vinogradov S, Csernansky JG (1990). Postpartum psychosis with abnormal movements: Dopamine sensitivity unmasked by withdrawal of endogenous oestrogens? J Clin Psychiatry; 51; (9); p 365-366.

235. Hopker SW, Brockington IF (1991). Psychosis following hydatidiform mole in a patient recurrent puerperal psychosis. Br J Psychiatry; 158; p 122-123.

236. Kumar R, Robson KM (1984). A prospective study of emotional disorders in childbearing women. Br J Psychiatry 144; p 35-47.

237. Brockington IF, Oates M, Rose G (1990). Prepartum psychosis; J Affective Disord 19; (1); p 31-35.

238. Cheetham RWS, Rzadkowolsk A, Rataemane S (1981). Psychiatric disorders of the puerperium in South African women of Ngui Origen. S Afr Med J; 60;p 502-506.

239. Swift CR (1972). Psychosis during the puerperium among Tanzanians. East Afr Med J; 49; (9); p 651-657.

240. Shoeb IH, Hassan GA (1990). Postpartum psychosis in the Assir Region of Saudi Arabia. Br J Psychiatry; 157; p 427-430.

241. Cox JL (1988). Childbirth as a life event: Socio-cultural aspects of postnatal depression. Acta Psychiatr Scand [Suppl]; 344: p 75-83.

242. Ifabumuyi OI, Akindele MO (1985). Postpartum mental illness in northern Nigerian. Acta Psychiatr Scand; 72: p 63-68.

243. Ebie JC (1972). Psychiatric illness in the puerperium among NIgerians. Trop Geogr Med; 24; p 253-256.

244. Makanjoula ROA (1982). Psychiatric disorders after childbirth in Nigerian women. Trop Geogr Med; 34; p 67-77.

245. Agrawal P, Bhatia MS, Malik SC (1990). Post partum psychosis: a study of indoor cases in a general hospital psychiatric clinic. Acta Psychiatr Scand; 81; (6); p 571-575.

246. Da Silva L, Johnsstone EC (1981). A follow-up of severe puerperal psychiatric illness. Br J Psychiatry; 139; p 346-354.

247. SPSS-X Users Guide. SPSS Inc. Chicago Ilinois 60611 Third Edition. 1988 p 515-567 & 805-821

248. Marija Norusis. SPSS-X Advanced statistics guide: SPSS Inc. Chicago Ilinois. McGraw-Hill Book Company 1985 p 297-365.

249. Moller B, Lushino O, Meirik M, Gerbre-Medhin M, Lindmark G (1989) A study of antenatal care at village level in rural Tanzania. Int J Gynecol Obstet 30; p 123-131.

250. Deganus-Amorin S (1990) Haemoglobin levels and maternal weight gain of pregnant women in Newfoundland, 1989. Unpublished.

251. Newfoundland Health Review (1986) Public Health Branch: Department of Health: Government of newfoundland and Labrador. p 36-37.

252. Dougherty CRS, Jones AD (1982) The determinants of birth-weights. Am J Obstet Gynecol 144; p 190-200.

253. Low-birth-weight: United States 1975-1987. (1990) MMWR 39; (9); p 148-151.

254. Trends in fertility, infant mortality and maternal health 1980-1988 (1991) MMWR; 40; (23); p 381-382.

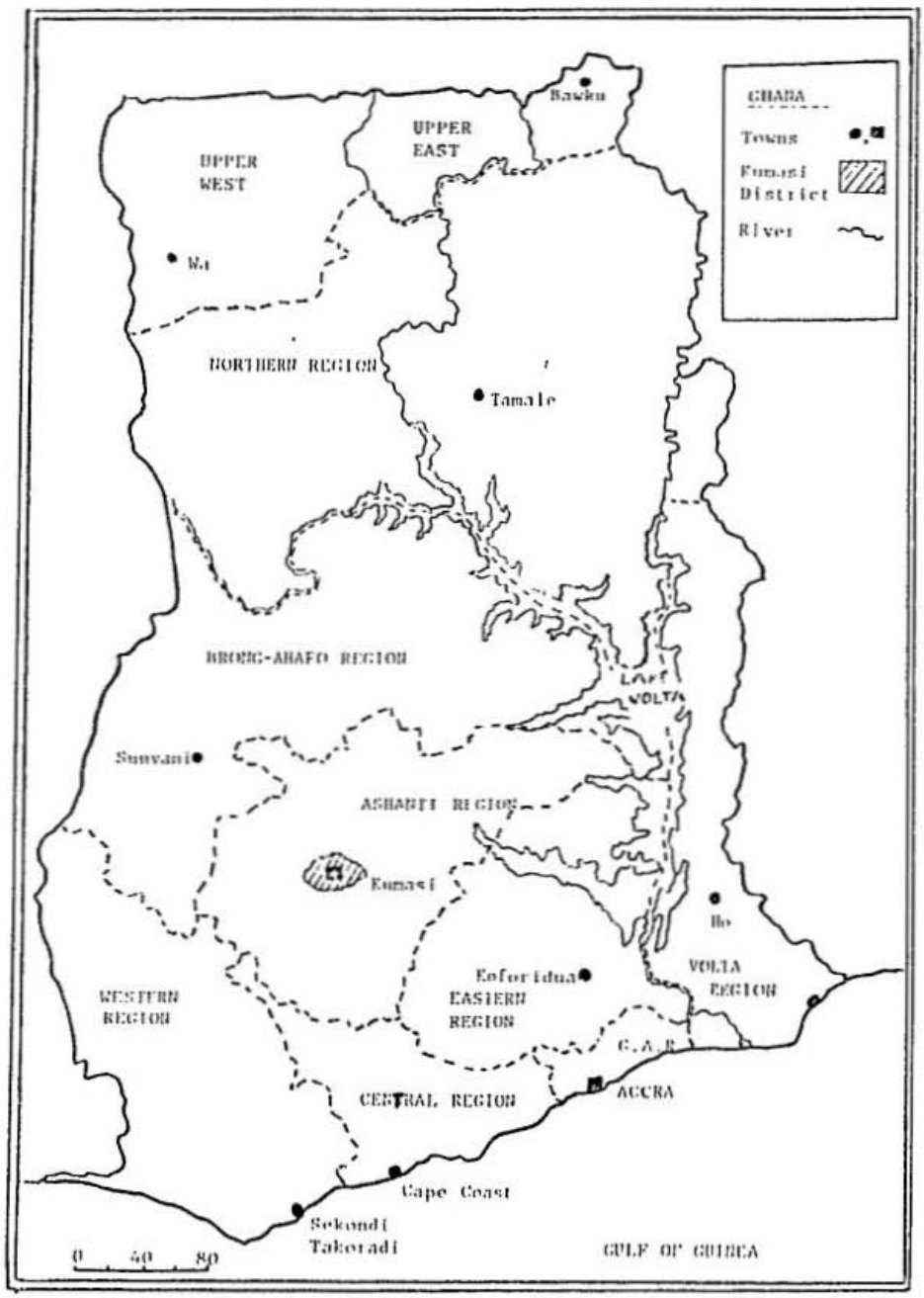
255. Humbert JR, Moore LL (1983) Iron deficiency and infection; A dilemma. J Pediatr Gastroenterol Nutr 2; (3); p 403-406.

256. Robson SC. Hunter S, Moore M, Dunlop W (1987) Haemodynamic changes during the puerperium. A doppler and mode echographic study. Br J Obstet Gynecol 94; p 1028-1038.

257. Stein GS (1981) Headaches in the first postpartum week and their relationship to migrane. Headache; 21; p 201-205.

APPENDIX A

MAP OF GHANA AND STUDY AREA



APPENDIX B

SAMPLE OF STUDY IDENTITY CARD

Front page

STUDY NUMBER:_____
NAME:_____ AGE:_____
DATE OF DELIVERY:_____

PLEASE NOTE THE BEARER OF THIS CARD IS ENLISTED IN AN ONGOING STUDY TITLED "EARLY PUERPERAL MORBIDITY IN KUMASI, GHANA." We would therefore be very grateful if you would kindly note behind this card any reported health problems and diagnosis for which you treat this patient at your center. THANK YOU.

Back page

DATE SEEN	CENTER.	HOSPITAL NO.	DIAGNOSIS	SIGNATURE

Please hand this card back to the patient. THANK YOU

APPENDIX C

EARLY PUERPERAL MORBIDITY IN KUMASI, GHANA.

STUDY FORM A: BASELINE DATA

STUDY NUMBER_____ NAME_____

AGE(YRS) _____ RESIDENTIAL ADDRESS_____

OCCUPATION_____ _____

EDUCATION _____

NONE _____

PRIMARY NEXT OF KIN_____

ELEMENTARY _____

SECONDARY

POSTSEC/UNIV TRIBE_____

PARITY 1

2

3

4

5 OR MORE STATE

PRESENT PREGNANCY

Antenatal care: NO

YES

IF YES Total number of clinic attendances(state)_____

Pregnancy duration at first attendance(in months)_____

STUDY FORM A: Page 2.

PREGNANCY/LABOUR RISK FACTORS (tick where appropriate)

Anaemia Preeclampsia

Antepartum haemorrage multiple pregnancy

Other(state) _____

DELIVERY

Date and time_____ Infant(s) Sex M

Type of delivery _____ F

Total duration of labour_____(hrs) Stillbirth

Livebirth

Blood loss at delivery_____(mls)

Birthweight(s) 1._____(kgs) 2. _____(kgs)

COMPLICATIONS OF LABOUR (tick where appropriate)

Antepartum haemorrhage

Postpartum haemorrhage

Premature rapture of membranes

Other (state)_____

_____

PRE-DELIVERY HAEMOGLOBIN LEVEL

Blood sample 1

Date and time collected_____

sample number _____

Name or signature of collector _____

APPENDIX D

EARLY PUERPERAL MORBIDITY IN KUMASI, GHANA.

FORM B: MORBIDITY ASSESSMENT

STUDY NUMBER:_____ DATE:_____

NAME_____

DATE OF DELIVERY_____

SECTION A: INTERVIEW.

1) How would you rank your health since your delivery a week ago? Excellent / Good / Poor

2) Have you had any fever YES / NO

IF YES, On which day did the fever start after delivery? _____

Did you seek any treatment NO / YES

IF YES where/what: Consulted doctor/midwife / Self treated with drugs / Other(state)_____

3) Have you had lower abdominal pain? NO / YES

STUDY FORM B: Page 2

IF YES, Did you seek any treatment? NO

YES

IF YES, where/ what: Consulted doctor/midwife

Self treated with drugs

Other(state) _____

IF YES do you have any pain now? NO

YES

4) If you have self treated what medicines did you use?

1. _____ 2._____

3. _____ 4._____

5) What is the colour of your discharge presently?

Yellowish/clear

Pinkish

Bright red

How would you rank the odour of your discharge?

Foul smelling

Not foul smelling

If foul smelling when did you notice change? _____

6) Do you have any perineal soreness? NO

YES

STUDY FORM B: Page 3

7) Have you noticed pain or burning sensation with micturition? NO YES

8) Are you breast feeding? YES NO

9) Do you have any painful sore nipples? NO YES

10) Do you have any painful and swollen breast? NO YES

11) Have you noticed any swelling of your leg(s) NO YES
IF YES state where_____

9) Do you have any other complaints (please state)?

SECTION B: EXAMINATION

Temperature (C) _____

Blood pressure sitting (mmHg)_____

_____

Icterus YES NO

Pallor YES NO

STUDY FORM B: Page 4

Breast	Left	Right
Nipple cracks/soreness	_____	_____
Breast tissue-tenderness	_____	_____
-swelling	_____	_____
-Fluctuant mass	_____	_____

(Tick where appropriate)

Abdomen	Yes	No
Tenderness	_____	_____
Palpable uterus	_____	_____

Any other abnormal findings (please describe)

Perineal lesions	Healing well	Septic
Episiotomy wound	_____	_____
Other wounds/tears	_____	_____

Other lesions (please describe)_____

_____

Lochia

Colour: Alba/serous _____ Odour: Offensive _____

Serosanguinous _____ non-offensive _____

Rubra _____

STUDY FORM B: Page 5

Bimanual Palpation

Uterus .....Size < 12 wks: _____ >12 weeks: _____

Tenderness Present: _____ absent: _____

Adnexal tenderness Present: _____ absent: _____

Cervix Os dilated: _____ Os closed: _____

Lower Extremities	Left	Right
Evidence of thrombophlebitis	_____	_____

Other abnormal findings (please state)_____

_____

_____

SECTION C: LABORATORY

Blood specimen 2 (Day 7-10) Sample number_____

time collected _____

RESULTS: PRE-DELIVERYSAMPLE_____(g/dl)

POST-DELIVERY SAMPLE_____(g/dl)

SECTION D: OUTCOMES OF FOLLOW UP

Diagnosis: 1._____ Referred

2._____ Treated

3._____ Well

APPENDIX E

DEFINITION OF TERMS AND DIAGNOSTIC CRITERIA.

Puerperal Pyrexia:

This is defined as a fever of greater than 38°C (100.4°F) measured within two to ten days in the postpartum period. Women who report fever but do not have pyrexia as defined above on clinical examination, will still be considered as having had fever but will be considered under a separate subgroup during data analysis. This consideration is being made on the supposition that this being a malaria endemic area, patients are very much aware of what a fever is, since most malaria fevers often reach higher body temperatures.

Anaemia:

Anaemia is defined as a reduction of haemoglobin concentration, the haematocrit, or the number of red blood cells to a level below that which is normal for a given individual. In this study the World Health Organisation criteria for pregnant women will be used to define both prepartum and postpartum anaemia, that is a level is less than 11.0g/dl. Severe anaemia will be defined by haemoglobin levels of less than 8.0g/dl.

Genital Infections

It is difficult to clinically distinguish accurately between the various types of upper genital infection such as salpingitis, endometritis, myometritis or parametritis. For the purposes of this study, therefore, genital sepsis will be divided into Upper genital tract infection and Lower genital tract infection with the following diagnostic criteria:

Upper genital tract infection (UGTI):

1) Fever at examination and/or reported by subject
2) Lower abdominal tenderness on palpation of abdomen indicated by wincing and/or abdominal wall guarding.
3) Foul lochia with or without associated colour change.
4) Uterine tenderness with or without enlargement and/or cervical motion pain on bimanual examination.

The presence of three or more of these signs/symptoms will be considered diagnostic.

Lower genital tract infection (LGTI):

1) Local oedema and redness greater than 0.5cm on wound sides.
2) A discharge of pus.

3) Gaped wound/Delayed wound healing

4) Exquisite local tenderness

5) Fever

The presence of three or more of the above listed signs will be considered diagnostic. LGTI will also be further subdivided into the following two groups of; (I) Episiotomy infection and (II) Other infected lacerations or perineal lesions.

Secondary post-partum haemorrhage:

1) Bright red lochia observed at the time of examination with or without clots, is considered diagnostic.

Breast disorders

Mastitis: The presence of the following three clinical signs will be accepted as evidence of mastitis.

1) Fever at examination or reported by subject

2) Swollen, tender, and reddened breast

3) Cracked sore/tender nipples

3) Absence of a fluctuating mass

Breast Abccess: All the above criteria with the additional presence to of a fluctuant mass and/or pus discharge will classify the lesion as a breast abcess.

Nipple disorder: The presence only of a chaffed, cracked, and inflammed nipples without the above listed signs or symptoms.

Postpartum Hypertension

A sitting blood pressure readings of 140/90 mm Hg or more taken on two seperate occasions at least one hour apart and in a subject who has had more than 15 minutes of quiet rest will be considered as diagnostic of Hypertension postpartum. Severe hypertension will be defined by blood pressures of 160/100 mm Hg or more.

Thrombophlebitis/Thrombotic lesion of lower extremity:

1) Systemic fever
2) Tender localised area along a path of a vein
3) Tender cordlike mass along the path of a vein
4) Lower limb oedema with or without pain.
5) Presence of warm rather than a cool extremity.
6) Positive Homan sign

The presence of three or more of the above signs are considered as suggestive of a thrombotic vascular lesion.

APPENDIX F

RESULTS OF MUTIVARIATE LOGISTIC REGRESSION ANALYSIS OF SOCIODEMOGRAPHIC, PREGNANCY AND LABOUR FACTORS AS PREDICTORS OF CLINIC ATTENDANCE BY STUDY SUBJECTS

PARAMETER ESTIMATES :Logit Model :(LOG p/(1-p))/2 + 5)= Intercept + BX

Factor (Variable)	Regression coefficient	Standard error	Coeff. /S.E
Ethnic origin	-0.104	0.061	-1.708
ANC attendances	0.096	0.074	1.300
Education	0.059	0.065	0.910
Parity	0.075	0.113	0.662
Age	-0.008	0.014	-0.562
Duration of Labour	0.117	0.249	0.469
Sex of infant	0.045	0.104	0.434
Occupation	-0.001	0.041	-0.032
Labour complica.*	-0.018	0.119	-0.150

* Labour complications includes all perineal injury ie. tears and episiotomy.

APPENDIX G

SOCIO-DEMOGRAPHIC, PREGNANCY AND LABOUR CHARACTERISTICS AS POSSIBLE PREDICTORS OF CLINIC ATTENDANCE :RESULTS OF MULTIVARIATE LOGISTIC REGRESSION ANALYSIS:

THE CORRELATION MATRICES OF PARAMETER ESTIMATES

	Age	Educat.	Occup	Ethnic group	Parity	ANC attend	Dur. labour	Labour. compl.	Sex baby
Age	0.000	-0.080	0.145	-0.004	-0.705	-0.208	-0.054	0.039	-0.001
Educat.	-0.000	0.004	0.214	0.340	0.134	-0.066	0.045	-0.035	0.071
Occup.	0.000	0.001	0.002	-0.063	-0.045	-0.048	0.011	-0.054	-0.052
Ethnic grp.	0.000	0.001	-0.000	0.004	0.028	0.122	-0.063	-0.013	0.032
Parity	-0.001	0.001	-0.000	0.000	0.013	0.200	0.011	0.281	0.014
ANC attend	-0.000	-0.000	-0.000	0.001	0.002	0.005	-0.024	0.026	0.045
Dur labour	-0.000	0.001	0.000	-0.001	0.000	-0.001	0.062	-0.147	-0.002
Lab compli	0.000	-0.000	-0.000	-0.000	0.004	0.000	-0.004	0.014	0.002
Sex baby	0.000	0.001	-0.000	0.000	0.000	0.000	-0.000	0.000	0.011

APPENDIX H

DETERMINANTS OF UPPER GENITAL TRACT INFECTION:
RESULTS OF UNIVARIATE ANALYSIS FOR RISK FACTORS

The factor (Variable)	Type of test	Relative risk ratio	95% Confidence interval	P-value
AGE: Teenage/older	Chi-square	0.73	0.37-1.45	0.46
EDUCATION: Nil/Some	"	0.92	0.51-1.66	0.92
TRIBE: Migrant/Resident	"	0.69	0.40-1.16	0.20
PARITY: Primip/Multip	"	1.36	0.88-2.10	0.21
ANTENATAL CARE: Nil/Some	"	0.33	0.75-0.99	0.17
DELIVERY: Spont/Interv*	"	1.03	0.62-1.71	0.95
PPH*: Present/absent	"	0.83	0.29-2.40	0.51
PERINEUM: Intact/not intact*	"	1.08	0.69-1.70	0.84
PROLONGED LABOUR: Yes/No	"	1.20	0.88-1.64	0.12
PRE-DELIVERY ANAEMIA: Yes/No	"	1.68	1.02-2.76	0.06

*Spont=Spontaneous vaginal delivery Interv = Had intervention (Episiotmy and/or Vacum delivery; PPH= Postpartum haemorrhage; Not intact= tears and episiotomy

APPENDIX I

THE PREDICTORS OF POSTPARTUM UPPER GENITAL TRACT INFECTION
RESULTS OF MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

THE CORRELATION MATRICES OF PARAMETER ESTIMATES

	Age	Educat.	Occup	Ethnic group	Parity	Blood loss	Dur. labour	Pre-del anaemia
Age	0.029	-0.125	0.213	-0.055	-0.682	-0.000	-0.066	0.033
Educat.	-0.002	0.009	0.154	0.381	0.153	0.000	0.085	0.022
Occup.	0.002	0.001	0.004	-0.077	-0.100	-0.000	0.027	-0.159
Ethnic grp.	-0.001	0.004	-0.001	0.011	0.015	0.000	-0.131	-0.013
Parity	-0.019	0.002	-0.001	0.000	0.026	0.000	0.083	0.076
Blood loss	-0.082	0.042	-0.114	-0.036	0.124	0.000	-0.010	-0.014
Dur labour	-0.003	0.002	0.001	-0.004	0.004	-0.000	0.085	-0.064
Pre.anaemia	0.001	0.000	-0.002	-0.000	0.002	0.000	-0.003	0.029

APPENDIX J

DETERMINANTS OF POSTPARTUM ANAEMIA
RESULTS OF UNIVARIATE ANALYSIS FOR RISK FACTORS

The factor (Variable)	Type of test	Relative risk ratio	95% Confidence interval	P-value
AGE: Teenage/older	**Chi-square**	**1.66**	**1.20-2.29**	**0.009**
EDUCATION: Nil/Some	"	**1.67**	**1.21-2.32**	**0.007**
Elementary/Post Elem.	"	2.14	0.93-4.91	0.07
TRIBE: Migrant/Resident	"	0.69	0.40-1.16	0.20
PARITY: Primip/Multip	"	**1.64**	**1.21-2.21**	**0.001**
Grandmultip/multip	"	1.04	0.63-1.71	0.88
Teenage primip/others	"	**1.73**	**1.30-4.87**	**0.004**
ANTENATAL CARE: Nil/Some	"	1.01	0.48-2.09	0.59
DELIVERY: Spont/Interv*	"	**1.64**	**1.21-2.22**	**0.003**
PPH*: Present/absent	"	1.53	0.93-2.49	0.21
PERINEUM: Intact/not intact*	"	**1.56**	**1.16-2.11**	**0.006**
PROLONGED LABOUR: Yes/No	"	1.71	1.06-2.77	0.10
PRE-DELIVERY ANAEMIA: Yes/No	"	**4.31**	**2.76-6.74**	**<0.000**

* Spont=Spontaneous vaginal delivery Interv = Had intervention (Episiotmy and/or Vacum delivery; PPH =Postpartum haemorrhage; Not intact=tears and episiotomy.

APPENDIX K

THE PREDICTORS OF POSTPARTUM ANAEMIA
RESULTS OF MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

THE CORRELATION MATRICES OF PARAMETER ESTIMATES

	Age	Educat.	Occup	Ethnic group	Parity	Blood loss	Dur. labour	Labour compl	Pre-anaemia
Age	0.040	-0.124	0.145	-0.078	-0.686	-0.022	-0.085	-0.232	0.011
Educat.	-0.003	0.014	0.130	0.482	0.188	0.000	0.014	-0.053	-0.012
Occup.	0.002	0.001	0.006	-0.073	-0.060	-0.000	0.063	0.000	-0.137
Ethnic grp.	-0.002	0.007	-0.001	0.016	-0.042	-0.000	-0.126	0.102	-0.171
Parity	-0.026	0.004	-0.001	-0.001	0.036	0.000	0.065	0.210	0.070
Blood loss	0.000	-0.008	-0.102	-0.123	0.063	0.000	0.070	-0.142	0.215
Dur labour	-0.006	0.001	0.002	-0.006	0.005	0.000	0.131	-0.004	0.007
Lab. compl	-0.002	-0.001	0.000	0.001	0.013	-0.000	-0.013	0.043	0.187
Pre.anaemia	0.000	0.000	-0.002	-0.004	0.003	0.000	0.001	0.001	0.039

APPENDIX L

DETERMINANTS OF POSTPARTUM HYPERTENSION:
RESULTS OF UNIVARIATE ANALYSIS FOR RISK FACTORS

The factor (Variable)	Type of test	Relative risk ratio	95% Confidence interval	P-value
AGE: Teenage/older	Chi-square	0.88	0.36-2.18	0.97
EDUCATION: Nil/Some	"	1.63	0.80-3.31	0.27
TRIBE: Northern/southern	"	**2.75**	**1.47-5.14**	**0.002**
Northern/Ashanti	"	**3.04**	**1.56-5.91**	**0.001**
PARITY: Primip/Multip	"	1.74	0.88-3.44	0.17
ANTENATAL CARE: Nil/Some	"	1.30	0.34-4.93	0.48
PREGNANCY HYPERT.: Yes/No	"	4.29	0.52-58.17	0.07
MULTIPLE BIRTH: Yes/No	"	0.93	0.14-6.20	0.71
PROLONGED LABOUR: Yes/No	"	1.08	0.28-4.16	0.58

APPENDIX M

THE PREDICTORS OF POSTPARTUM HYPERTENSION
RESULTS OF MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

THE CORRELATION MATRICES OF PARAMETER ESTIMATES

	Age	Educat.	Occup	Ethnic group	Parity	ANC attend	Pregn hypert	Multiple pregn
Age	0.050	-0.054	0.049	-0.129	-0.650	-0.251	-0.038	0.034
Educat.	-0.002	0.015	0.261	0.360	0.201	-0.118	0.107	-0.076
Occup.	0.001	0.003	0.007	-0.045	0.069	0.006	0.214	0.045
Ethnic grp.	-0.003	0.005	-0.000	0.012	0.218	0.206	0.061	-0.136
Parity	-0.028	0.005	0.001	0.005	0.038	0.172	0.055	-0.152
ANC attend.	-0.008	-0.002	0.000	0.003	0.005	0.022	0.033	-0.049
P Hyperten	-0.006	0.009	0.012	0.004	0.007	0.003	0.431	0.022
Multi preg	0.005	-0.006	0.002	-0.009	-0.017	-0.004	0.008	0.337