Gestational Diabetes Mellitus, its Control and Perinatal Outcome in Delhi, India

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Contents

Cover photograph: Red Fort, Delhi

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- Neonatal Society
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Aims and Objectives

Aim: To determine perinatal complications of gestational diabetes mellitus in a developing country

Objectives:

1) Gain experience in clinical research
2) Understand methods of statistical analysis
3) Experience of obstetric and neonatal outcomes in a developing country

Risk Assessment

Prior to my elective attachment, I identified the following health and safety risks:

1) Infectious diseases
2) Contaminated food and water
3) Needlestick injury
4) Theft

I had a travel consultation with a nurse at my GP practice before leaving the UK. I was vaccinated against yellow fever and received antimalarials for the entire trip. I was conscientious about taking daily doxycycline to minimise risks of malaria. To avoid gastrointestinal infections, I only drank bottled water and avoided eating salads which may have been washed with untreated water.

The directors of the two hospitals confirmed this was an observational attachment, and staff were aware that my role was did not include venepuncture. However, I did carry HIV post – exposure prophylaxis on my elective, in case of an emergency. I did not carry large amounts of money with me and valuables were hidden to reduce the risk of theft.

Background to India

The Republic of India is the second most populous country in the world and its capital, Delhi, is a sprawling, vastly overcrowded city of 13 million inhabitants. Ruled by the Mughal Empire for more than three centuries, Delhi became one of the great cultural and intellectual cities of the world, accommodating large numbers of inhabitants from both Hinduism and Islam. Following the Indian rebellion in 1857, the British seized control of Delhi until independence in 1947.

St. Stephen's Hospital (Fig. 1) was founded by missionaries in 1885 and was the first of its kind in Delhi. Adjacent to the Tis Hazari law courts, the hospital is situated in Old Delhi, among one of the oldest residential districts in the city. A bustling and noisy atmosphere surrounds the hospital and infiltrates to the main entrance. Outside of the hospital, relatives sleep on hard floors waiting to hear news of loved ones (Fig. 2).

The hospital maintains its Christian presence; however its patients are representative of modern Delhi's religious allegiances, the majority being Hindu. One quarter of hospital beds are private, while the remainder comprise the general wards. Old Delhi is a crowded and large residential area housing many of the city's economically disadvantaged inhabitants. Treatment is frequently subsidised, and the poorest can be treated for free. Twice weekly outpatient clinics are conducted for the poor at no charge and the hospital acquires an even greater degree of activity. The hospital does not receive any government finance and is reliant upon donors to meet its financial needs.

Fig. 1. St. Stephen's Hospital,

The modern wing of the maternity ward was opened in 1969 by one of India's most famous personalities, Mrs. Indira Gandhi, the former Prime Minister. More than three hundred deliveries occur each month, however due to restrictions in space, no relatives can be present at the birth. The atmosphere is therefore very different to the UK, and instead of being given a room while in labour, women often wait on trolleys for a delivery room to become available.

Fig. 2. Waiting area outside the hospital.

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Abbreviations

FPG, fasting plasma glucose
GDM, gestational diabetes mellitus
LSCS, lower segment Caesarean section
OGTT, oral glucose tolerance test
PPPG, post prandial plasma glucose
PIH, pregnancy – induced hypertension
SCBU, special care baby unit

Introduction

Over 31 million people in India are currently diagnosed with diabetes, more than any other country in the world. The World Health Organisation states that 80% of all new diabetes cases are expected to be in developing nations by 2025.[1]

Gestational diabetes mellitus (GDM) is defined as glucose intolerance first diagnosed in pregnancy.[2] Prevalence of GDM in northern India is estimated at nearly 4%,[3] however may be as high as 19%.[4] The condition carries a thirteen-fold risk of developing overt diabetes,[5] and western studies report increased lower segment Caesarean section (LSCS) rates and worse neonatal outcomes.[6] Differences in outcomes have been observed between ethnic groups,[7] however there is a scarcity of data from India and other developing countries. [8, 9]

Recent data from the Hyperglycemia and Adverse Perinatal Outcome (HAPO) study reports increasing blood glucose levels affecting maternal and neonatal outcomes, even in ranges thought previously safe.[10] Women from the Indian subcontinent have an increased preponderance for GDM[11] and it has been contested that not all perinatal outcomes are affected by the degree of glycaemic control.[8]

This study has two objectives:

- to compare pregnancy outcomes in women with GDM to those with normal glucose tolerance
- to analyse glycaemic control in women with GDM and its effect on perinatal outcome

Methods

Pilot Study

Prior to commencing data collection in Delhi, a small pilot study was completed at Great Western Hospital, Swindon. The data from 18 women was analysed; 9 with GDM and 9 controls (Table 1). This study was not powered to reach significant differences, but a feasibility study of data collection prior to the Indian study.

Women with GDM had an increased likelihood of LSCS and birth at an earlier gestational age. Other neonatal outcomes were comparable between groups. Women with GDM were subdivided according to glycaemic control. Women with good control had a post prandial plasma glucose (PPPG) ≤ 6.7 mmol/l, while those with poor control had PPPG > 6.7 mmol/l. Women with good control delivered later, and offspring had no admissions to the special care baby unit (SCBU). One baby from the GDM group had neonatal hypoglycaemia. The pilot study demonstrates that perinatal outcome may be influenced by GDM, and highlights the potential importance of glycaemic control.

Table 1. Pilot study outcomes for women with GDM vs. Controls.

	GDM (n=9)	**Controls (n=9)**
Induced	3	3
LSCS	2	6
Pre – eclampsia	1	0
Gestational age	$36^{+2} \pm 1^{+0}$	$38^{+4} \pm 3^{+2}$
Birth weight (kg)	3.14 ± 0.49	3.15 ± 0.83
APGAR score (5 mins)	9.44	10
Stillbirth	0	0
Mortality Prior to Discharge	0	0
Congenital Malformations	0	0
Macrosomia	0	0
Neontal Hypoglycaemia	1	0
SCBU	5	3
Preterm Delivery	1	0

Screening Procedure and Subjects

This case-control study identified singleton pregnancies at a hospital in Delhi, prior to September 1st 2007. It is a Christian missionary hospital, comprised of 650 beds, a quarter of which are private. The remainder are available at a subsidised rate or free to the very poor. A total of 200 consecutive mothers were identified from the birth register, the last 100 with GDM and the last 100 control births (normal glucose tolerance). Two entries were later excluded due to incomplete records, while three twin pregnancies were discounted.

Table 2. Pilot study outcomes for women with GDM, comparing good and poor control.

	Good Control (n=3)	Poor Control (n=6)
Induced	1	2
LSCS	2	4
Pre – eclampsia	0	1
Gestational age	$37^{+1} \pm 1^{+0}$	$36^{+0} \pm 0^{+6}$
Birth weight (grams)	3633 ± 433	2889 ± 304
APGAR score (5 mins)	10	9.17
Stillbirth	0	0
Mortality Prior to Discharge	0	0
Congenital Malformations	0	0
Macrosomia	0	0
Neontal Hypoglycaemia	0	1
SCBU	0	5
Preterm Delivery	0	1

Hospital Management and Diagnosis

The hospital aims to give all women an oral glucose tolerance test (OGTT) during antenatal care. The Diabetes In Pregnancy Study group India (DIPSI) guidelines recommend that all women are given an OGTT when they first visit the antenatal clinic.[12] This is either the first visit if in a fasting state or at a second appointment. An insulin or diet regimen is initiated according to clinical judgement and OGTT result. Women who are prescribed dietary control have an appointment with a diabetes nurse. To assess the effectiveness of the treatment regimen, the hospital aims to regularly assess fasting plasma glucose (FPG) and PPPG in the antenatal period. Treatment is adjusted accordingly. Babies are breast fed soon after birth and stay with their mother until discharge.

OGTT with a 75g glucose load was performed to identify gestational diabetes mellitus. FPG > 7 mmol/l (multiply by a factor of 18 for mg/dl) or 2 hour plasma glucose > 7.8 mmol/l diagnosed GDM according to WHO criteria.[13] FPG and PPPG values were monitored antenatally in the diabetic cohort. The median value was calculated for FPG and PPPG. A minimum of 3 glucose samples were required, and subjects were assigned to a group of good control if FPG ≤ 5.3 mmol/l and PPPG ≤ 6.7 mmol/l, and poor control if FPG > 5.3 mmol/l and/or PPPG > 6.7 mmol/l. Only 48 of the 100 cases had 3 or more glucose samples recorded in the notes, limiting the quality of the analyses. A comparison of the 48 who had 3 glucose values or more with the other GDM women demonstrated they were significantly more likely to be treated with insulin (P = 0.01) and had higher 2 hour OGTT results (P = 0.003). Maternal and neonatal outcomes were similar between those with 3 or more values and those without.

Maternal Characteristics and Outcomes

Whether the delivery was booked at the hospital was recorded, and the level of education attained by the mother was categorised as graduate from university, school education or illiterate. Pregnancy – induced hypertension (PIH) was recorded, instead of pre – eclampsia, because it was objectively reported in the case notes. It was defined as elevated blood pressure (diastolic >90 mmHg or systolic >140 mmHg) after the 20^{th} week of pregnancy.

Neonatal Outcomes

Neonatal outcomes included congenital anomalies, neonatal hypoglycaemia, macrosomia, admission to SCBU, stillbirth, mortality prior to discharge and preterm delivery. Neonatal glucose levels were examined in the majority of women with GDM, and investigated in controls if clinically indicated. A diagnosis of neonatal hypoglycaemia was made if blood glucose < 2.6 mmol/l within 4 hours of birth. Birth weight and gestational age were plotted on female or male Indian growth charts. Macrosomia was defined as $>90^{th}$ centile. Congenital malformations recorded were neural tube defects and other nervous system malformations, congenital heart disease, internal GU system abnormalities, chromosomal, limb, musculoskeletal and connective tissue disorders. Six cases of undescended testes were recorded, one in the GDM group and five in the controls, however these were not considered a congenital malformation. Mortality prior to discharge recorded postnatal deaths before discharge. Two women in the control group had a stillbirth; one foetus had anencephaly and the other was very preterm. One neonate from the GDM group died prior to discharge due to hyperbilirubinaemia. Preterm delivery was defined as delivery at less than 37 weeks gestation.

Calculations and Statistical Analyses

Statistical analysis was performed with Statview V.5.0.1. (Adept Scientific, Letchworth, UK). Student's 't' test was used to compare continuous variables, while Chi-square test analysed nominal variables. Data that did not have a normal distribution was analysed using non-parametric methods. Statistical significance was considered at $P<0.05$.

Results

Maternal characteristics and outcomes

Maternal characteristics and outcomes for GDM mothers and controls are displayed in Table 3. More graduates were present in the GDM group (70% vs. 58%), while more illiterate women were present in the control group (8% vs. 2%), however neither educational category reached significance. All GDM women had booked their birth at the hospital prior to labour, however only 72% of controls had done so. Pregnancy-induced hypertension was significantly associated with GDM, and LSCS occurred at an increased frequency compared to controls (49% vs. 30%). Induction of labour and was similar between the two groups. Fasting and 2 hour glucose values were significantly higher in women with GDM compared to controls (Table 4).

Neonatal outcomes

A total of 41% of babies born to mothers with GDM were admitted to SCBU compared to 13% of the controls. Neonatal hypoglycaemia had an increased incidence in GDM mothers, while congenital anomalies were more common in the control group (Table 5). Mean gestational age at delivery and birth weight were similar in both groups (Fig. 3). APGAR score at 5 minutes and preterm delivery were also comparable between groups. 3% of GDM pregnancies resulted in macrosomic babies while none were recorded in the control group, however it did not reach significance. Mortality prior to discharge did not differ between the groups.

Maternal Glycaemic Control

Only 48 women with GDM had 3 or more capillary blood glucose samples prior to delivery recorded in the notes. There was no difference in maternal characteristics between groups that had good or poor control (Table 6). Good control was not associated with the treatment regimen used. Fasting and 2 hour glucose levels at OGTT were not predictive of future control (Table 7). The mean gestational age, birth weight and APGAR score at 5 minutes were comparable between groups.

Neonatal Glycaemic Control

Neonatal hypoglycaemia was significantly associated with poor control. The incidence of macrosomia, transfer to SCBU and mortality prior to discharge was similar, irrespective of glucose control (Table 8). All women eligible for good and poor control analysis were booked for delivery and there were no congenital malformations.

Table 3. Maternal characteristics and outcomes

	GDM Cases (n=100)	Control Cases (n = 100)	P Value	95% CI
Graduate	70	58	P = 0.08	0.94 to 3.03
School	28	34	P = 0.36	0.41 to 1.38
Illiterate	2	8	P = 0.05	0.05 to 1.13
Booked	100	72	P < 0.0001	4.56 to 22.44
Induced	46	40	P = 0.39	0.73 to 2.24
LSCS	49	30	P = 0.006	1.25 to 4.00
PIH	28	14	P = 0.02	1.17 to 4.88

Table 4. Continuous variables for neonatal outcome and glucose values at OGTT. Mean ± standard deviation.

	GDM Cases (n=100)	Control Cases (n = 100)	P Value
Gestational age	$37^{+5} \pm 2^{+1}$	$37^{+6} \pm 1^{+2}$	P = 0.61
Birth weight (kg)	2.73 ± 0.53	2.75 ± 0.63	P = 0.85
APGAR (5 mins)	8.9 ± 0.30	8.89 ± 0.43	P = 0.82
Fasting glucose at OGTT (mmol/l)	5.15 ± 1.15	4.39 ± 0.50 *	P < 0.0001
2 hour glucose at OGTT (mmol/l)	8.99 ± 1.26	5.97 ± 0.92 *	P < 0.0001

* Fasting; n = 67, 2 hours; n = 63.

Table 5. Neonatal outcomes.

	GDM Cases (n=100)	Control Cases (n = 100)	P Value	95% CI
Stillbirth	0	2*	P = 0.16	0.008 to 2.16
Mortality Prior to Discharge	1*	0	P = 0.32	0.15 to 372.41
Congenital Malformation	1	4	P = 0.17	0.03 to 2.21
Macrosomia	3	0	P = 0.08	0.77 to 72.61
Neonatal Hypoglycaemia	6	0	P = 0.01	1.51 to 38.58
SCBU	41	13	P < 0.0001	2.24 to 9.21
Preterm Delivery	18	19	P = 0.83	0.45 to 1.89

* Details in methods.

Fig. 3. Scattergram of gestational age and birth weight, split by GDM status.

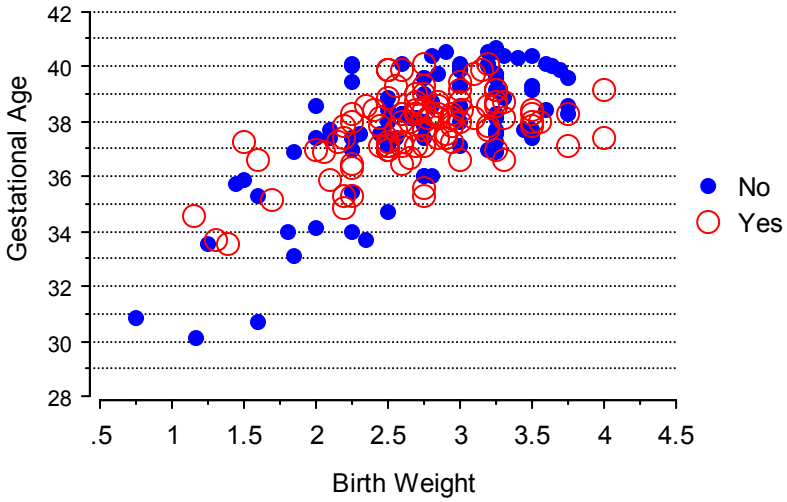

Table 6. Maternal characteristics and outcomes in women with good and poor glycaemic control.

	Good Control	Poor Control	P Value	95% CI
No. With Results/ Total Cases	41/100	7/100		
Graduate	28	7	P = 0.08	0.05 to 1.24
School	12	0	P = 0.09	0.74 to 28.79
Illiterate	1	0	P = 0.68	0.01 to 832.22
Induced	22	4	P = 0.86	0.17 to 4.38
LSCS	21	3	P = 0.68	0.28 to 7.06
PIH	10	1	P = 0.56	0.21 to 18.07
Insulin regimen	12	4	P = 0.15	0.06 to 1.60

Table 7. Continuous variables for neonatal outcome and glucose values at OGTT. Mean ± standard deviation.

	Good Control	Poor Control	P Value
No. With Results/ Total Cases	41/100	7/100	
Gestational age	$37^{+6} \pm 1^{+3}$	$37^{+3} \pm 1^{+2}$	P = 0.41
Birth weight	2.74 ± 0.60	2.63 ± 0.63	P = 0.67
APGAR score (5 mins)	8.95 ± 0.22	8.86 ± 0.38	P = 0.35
Fasting glucose at OGTT (mmol/l)	5.38 ± 1.36	5.33 ± 0.89	P = 0.92
2 hour glucose at OGTT (mmol/l)	9.44 ± 1.48	8.96 ± 1.13	P = 0.42

Table 8. Neonatal outcomes in good and poor glycaemic control groups.

	Good Control	Poor Control	P Value	95% CI
No. With Results/ Total Cases	41/100	7/100		
Stillbirth	0	0		
Mortality Prior to Discharge	1	0	P = 0.68	0.01 to 832.22
Congenital Malformations	0	0		
Macrosomia	2	0	P = 0.55	0.06 to 175.12
Neontal Hypoglycaemia	1	2	P = 0.008	0.005 to 0.82
SCBU	19	3	P = 0.86	0.23 to 5.81
Preterm Delivery	5	2	P = 0.26	0.05 to 2.29

Discussion

The findings from a missionary hospital in Delhi suggest that gestational diabetes mellitus (GDM) adversely affects perinatal outcomes. In spite of treatment with insulin or diet on clinical judgement, women with GDM were more likely to have pregnancy – induced hypertension (PIH), lower segment Caesarean section (LSCS) and offspring with neonatal hypoglycaemia. In agreement with studies from the west, the results report similar outcomes in spite of ethnic differences.[14] This study demonstrates the difficulty of identifying a subgroup of high risk GDM women by glycaemic control. Only neonatal hypoglycaemia was reduced in the women with good control, while all other outcomes were similar. $HbA1_c$ use was limited in this hospital due to its cost and may have provided an effective way of identifying high risk women.

Identification of women with GDM differs from the UK, the aim being to give all women an oral glucose tolerance test (OGTT). In the UK, it is usual practice to identify those at highest risk, considering factors such as GDM status of previous pregnancies and body mass index (BMI). Mean delivery is in the 38^{th} week for women with GDM and controls, which is considerably earlier than in the UK. Considering this, it is surprising the rate of induction is high in both groups. However, with reference to Figure 1, there are a few preterm deliveries which may lower the mean gestational age.

Aside from the limitations of retrospective data collection, the power of the study was limited by the number of women with GDM who had their glucose monitored on 3 or more occasions, which was chosen as a minimum for data analysis. A reason for fewer glucose values in the remaining 52 women may be that they did not suffer any symptoms from GDM, whereas those who presented with symptoms had worse glycaemic control. Surprisingly, birth weight and gestational age at birth were similar between GDM and controls. Nearly half of women were induced however, yet not for any apparent reduction in incidence of macrosomia.

The percentage of women who are university graduates delivering at this missionary hospital (64%) is considerably higher than the national average of female graduates, reported at 1% in 1993.[15] More recent data has estimated the number of male and female Delhiites receiving a university education at 16%,[16] suggesting the figure may be higher. Previous Indian studies have reported an association between low educational level and low birth weight.[17] Further analysis of educational level and perinatal outcomes would demonstrate if obstetric care currently available is exacerbating health inequalities.

Further knowledge of the husband's education may provide greater insight into the educational level of a family and the degree of health inequalities. In northern India, men play an integral part in decisions about the healthcare of their wife, and it has been demonstrated that having an educated husband is protective against maternal death.[18, 19]

In conclusion, GDM is associated with adverse perinatal outcomes. The degree of glycaemic control in GDM pregnancy is not highly predictive of morbidity and mortality.

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Background to Tanzania

The United Republic of Tanzania is located on the east African coast and has 38 million inhabitants. Independence from British colonisation was achieved in 1961, however English is still widely spoken alongside Swahili. Dar es Salaam is the largest city in Tanzania, and the Aga Khan Hospital provides one of the country's best healthcare services (Fig. 4). It is an 80 bed hospital, composed of single and double occupancy rooms, and part of the Aga Khan Health Services Group, incorporating hospitals in Kenya, India and Pakistan.

Clinical Experience

I undertook a two week placement in general medicine. My experience highlighted the differing prevalence of diseases in an African country compared to the UK. At one time, a quarter of patients on the general medicine ward (Fig. 5) were HIV positive, had tuberculosis or both. I gained a great understanding of the complications of HIV and the importance of communication skills when discussing the diagnosis.

Fig. 4. Aga Khan Hospital, Dar es Salaam

When breaking the diagnosis to a 22 year old woman, further arrangements were made for future counselling and support. An interesting aspect of such cases is the ethical issues that develop. The woman does not have an obligation to divulge their diagnosis to their husband, although is strongly encouraged to do so. The importance of confidentiality and the patient as the central focus of care were key issues respected by the doctors.

Case Study

Fig. 5. General medicine ward, Aga Khan Hospital.

29 year old woman, married with no children.

She was diagnosed as HIV positive 7 years ago and had increasing viral load and decreasing CD4 count in the past year. She was identified as having HIV nephropathy, and her condition deteriorated. She was admitted to Aga Khan Hospital.

On admission, it was explained that her brother would pay the hospital fees. Aga Khan Hospital has one of three dialysis machines in Tanzania, and her condition necessitated treatment. She commenced dialysis, following which it was discovered she did not have any family members who could afford the fees.

Her case was referred to the financial department at the hospital and treatment was continued in the meantime. Without dialysis and future kidney transplant (in Kenya) her prognosis was very poor.

This case highlights the problems of resource – poor countries and the dilemmas when patients cannot afford their healthcare. I found this case particularly alarming, complicated and desperately sad. It raises the ethical issue of beneficence for the doctor, however it is an issue outside of their control. The idea that a patient's prognosis is dependent upon their financial status is something alien to a medical student from the UK, and emphasises the health inequalities that exist in developing countries.

Personal Development

This elective project has been invaluable for my personal development and will aid my progression from undergraduate to academic foundation doctor. Each stage of the project has been challenging, from planning to clinical research, and finally writing up. I have gained a vast amount of knowledge in research skills that is not a part of the undergraduate curriculum.

The project was initiated following an evidence – based medicine SSC I undertook into maternal diabetes and spontaneous preterm delivery. I decided to continue my learning and understanding in this area and designed a case – control study. I believe that continual learning and critical analysis of my previous work has been beneficial and will be essential for professional development in my future career.

Fig. 6. Labour room, St. Stephen's Hospital,

Through numerous phone calls and e mails, I gained an insight into whether the project would at all be possible and what data would be available from the labour room (Fig. 6). In addition, I gained ethical approval for the research. I have not applied for ethical approval in the UK before, and while the process was different in India, I have gained an insight into the necessary considerations that will be required in future. While I contacted the hospital about approval eight months before, I realise that such a period should be considered a minimum in the UK, and will attempt to apply a year before my next major research project in 2009. I have continued to respect the rights of patients, and the necessity for their treatment and indeed medical records to be viewed in a way that permits beneficence and non – maleficence. Data was anonymised and I kept case records well organised, so future patient care would not be affected.

When considering designing a project in maternal diabetes, I used the knowledge I had gained from my SSC and combined it with a study of current literature, focusing on the understanding of developing countries and in particular India. Following this, I studied perinatal outcomes that had been used in other studies and considered what my research question was. I wanted to study both maternal and neonatal outcomes and was informed by the hospital that glucose values would be in the notes to determine glycaemic control. In hindsight, I would have had greater discussions with the hospital about what is recorded in the notes. Contact by telephone was difficult and the majority of correspondence was by e mail. I didn't have anyone directly overseeing my research project and found that I had to be greatly persistent in finding the right people to help me. From this experience I have gained a greater ability to deal with setbacks and problems, keeping calm and focused in spite of time constraints.

In preparation for the project, I applied for prizes or bursaries. Writing applications was an invaluable experience and has prepared me for applying for grants in future as part of my academic career.

Gaining funding is fundamental in research, and I have improved my capabilities in writing a concise account of my research and explaining my plan to tackle the research question.

After finalising my study design, I acknowledged my limited experience in research. To prepare for the project in India, it was best to have a sample data sheet and determine feasability, so I would be ready and organised to collect data. Studying Obstetrics and Gynaecology at the Great Western Hospital, I gained permission to do a small pilot study. Having been encouraged to perform the pilot study, I believe it is something I will continue to do in future to ensure proposed outcomes are indeed available and achievable. Furthermore, I found myself in an organised position, something which is not always the case. In future, I aim to be organised in every aspect of my clinical practice, to maximise my experience and achievements.

Having been posted to medical records, I explained my project to the head of department and several of the staff helped me to find the notes. In retrospect, instead of taking the last 200 patients, I should have asked what records were available. My biggest learning point has been my failure to collect complete data sets for all patients and has limited the value of the results. I realise I must analyse my research question and methods more thoroughly to maximise my results. Having more contact with a member of the department before arrival may have helped, however problems with communication hampered this. On completing the data collection, I had gained a greater understanding of neonatal and obstetric outcomes in a developing country, and fully appreciate how they differ to the UK.

On return from my elective, I started to analyse the data I had collected. Working with a statistics package proved challenging and my knowledge and understanding has improved greatly. Prior to this project, my knowledge of epidemiology and biostatistics from undergraduate medicine had not been as strong as I would have liked. Using the software was time consuming and required dedication and patience to understand the programme. However once I started using the program effectively, I found myself gaining a greater understanding of simple statistics and furthering my knowledge with detailed assessment of continuous and nominal variables. With the experience of such analysis, I am in a position to study scientific outcomes that few have the opportunity to achieve at medical school. On reflection, I achieved my objectives to gain experience in clinical research and understand statistical analysis. I am now well positioned to analyse data when I commence research in my academic foundation post.

Writing up my research has provided me with the opportunity to collaborate all aspects of my project, from literature review in my early planning stage through to results and their importance. My only previous experience of such a write-up was during my intercalated degree, and this study has provided me with an opportunity to recap and improve my writing skills. I have previously not been concise enough and my introduction and discussion have tended to diverge from the research question. I have attempted to correct these deficiencies, however following my first draft, I realised that my introduction considered points not directly relevant to my study, and posed questions that I

was not attempting to answer. I hope that I have made an improvement in these two areas, and will continue to do so in the future.

Conclusion

In conclusion, I have experienced a hugely enjoyable elective which has been greatly beneficial for my future career. I believe that living in an environment very different to the UK has challenged me and provided an opportunity to improve myself. I have learnt a great deal in medical and cultural aspects, broadening my horizons by comparison of the healthcare systems and societies of two vastly different countries. The experiences I have gained in every element of this elective will assist me in future as a researcher and clinician.