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Research Article

Perinatal Fetal Losses, Burden and Indentifiable Risk Factors

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ABSTRACT

Introduction: - *Perinatal period is the interval between the birth of an infant- born after 20wks gestation, and the 28 completed days after that birth. When perinatal rates are based on birth weight rather than gestational age, it is recommended that the perinatal period be defined as commencing at 500gms.*
Death during perinatal period has become a public health problem. Perinatal mortality is high in developing countries even when infant mortality has declined.

Objective:-
1. *To calculate the current-perinatal mortality rate in the institution under study.*
2. *To find out the identifiable risk factors*
3. *To segregate the modifiable risk factors among the identifiable risk factors.*

Materials & Methods: *This is a prospective observational study conducted for a period of one year from 1st July 2014-30th June 2015 on all cases of still born and early neonatal death (from 28th week of gestation onwards upto first 7 postnatal day), in the department of Obstetrics and Gynecology, Medical College Hospital, Kottayam.*

Results: *During the study period of 1 year there were 5,546 deliveries among which 159 perinatal death, 109 (68%) were still births and 50 (31%) cases were early neonatal death (ENND)*
Perinatal mortality rate- 28.66 per 1000 total births. There are various identifiable risk factors. Among that prematurity and low Birth weight are the most common cause for perinatal mortality. Prevalance of neonatal diseases like Hypertension and Diabetes are high among the population under study.

Conclusion: *Current perinatal mortality in the institution under study is 28. 66 deaths per 1000 total birth. There are various risk factors, including modifiable risk factors for the same. So individualize each woman not only at the time of pregnancy, from preconceptional period itself, if not possible, periconceptional screening and early detection of risk factors and timely proper intervention is a key to achieve optimal, perinatal outcome and to reduce perinatal fetal losses.*

Keywords:- *perinatal mortality; risk factors; perinatal out come.*

INTRODUCTION

Perinatal mortality is used as one of the indicators of the quality of health provided during the antenatal and perinatal period. Globally about 136 million births occur every year, and of these approximately 3.7 million die during the neonatal period and 3.3 million are stillbirths.

Achievement of Millennium Development Goals (MDG) 4 and 5 requires a focus on antenatal, intrapartum and postpartum perinatal and maternal care. These goals are linked because maternal and perinatal outcomes are inherently linked, and programs addressing improving the care of one often has impact on the outcomes of the other, and it is particularly centered on management of hypertension and intrapartum care.[1]

A number of social and biological factors are known to be associated with perinatal mortality. The degree to which these factors influence perinatal mortality varies from country to country, institution to institution.

With the decline of the infant mortality rate to low levels in many developed countries, perinatal mortality rate has assumed greater significance as a yardstick of obstetric and paediatric care before and around the time of the birth. Although perinatal period occupies less than 0.5% of the average lies span, there are more deaths within this period during the next 30-40 years of life in many developing countries.

Perinatal mortality rate is a valuable indicator of the extent of pregnancy wastage as well as the quality and quantity of healthcare available to the mother and the new-born. It reflects the results of the maternity care more clearly than the neonatal death rate. It now accounts for about 90 per cent of all fetal and infant mortality in the developed countries.[2]

Thus, by doing the study if risks factors of the perinatal morality are identified, and found to be modifiable at least to some extent, it will be a great help for the community.

AIMS AND OBJECTIVES

1. To calculate the current Perinatal mortality rate in the institution under study.
2. To find out the identifiable risk factors.
3. To segregate the modifiable risk factors among the identifiable risk factors

MATERIALS AND METHODS

A prospective observational study was conducted for a period of one year from 1st July 2014 – 30th June 2015 on all cases of still born and early neonatal death (from 28th week of gestation onwards up to first 7 postnatal day) in the department of Obstetrics and gynaecology, Medical College Hospital, Kottayam.

Inclusion Criteria

- All patients diagnosed to have intrauterine death (from 28th week gestational age and early neonatal death up to 7 postnatal days if gestational age is known).
- Stillborn and neonatal death weighing more than or equal to 1000grams if gestational age is not known.

Study Method

After obtaining an informed written consent, the relevant features of the patient's mother like age, socio-economic status, blood group and Rh positivity and status of admission was entered. Detailed clinical history of the mother regarding a previous baby with congenital anomaly, diabetes, hypertension, epilepsy, infections (TORCH, sexually transmitted infections), cardiovascular diseases, psychiatric illness etc. was obtained. Relevant history regarding past gynaecological diseases and surgeries were asked.

Obstetric history, concerning the obstetric score, pre-eclampsia/Eclampsia/ HELLP/Partial HELLP syndrome of the mother was recorded. Details of the antenatal period with regards to the number of fetus, presentations and any complications before and during labour were documented.

A thorough examination of all the dead fetuses and neonates was conducted. The presence or absence of any external anomalies, colour of the babies' skin was done. Their umbilical cord was checked for any knots, prolapsed or entanglement etc. and details of the placenta was recorded. For neonatal deaths, postnatal events like resuscitation, care in NICU was recorded.

Diagnosis was made for the cause of death in all cases and efforts were made to determine whether it was due to maternal or fetal factors whenever possible.

Data Entry and Analysis

The data obtained was entered in EXCEL and analysed using SPSS version 22. Perinatal mortality rate and proportion and association of risk factors were calculated.

OBSERVATIONS AND RESULTS

According to this study, there were 5,546 deliveries during one year, among which 159 perinatal death, 109(68%) were still born babies and 50 (31.4%) cases were ENND.

Table 1: Maternal Age Distribution

Maternal Age	Frequency	Percentage
<20	15	9.4
20-30	89	56.0
>30	55	34.6
Total	159	100.0

In this study, higher rate of perinatal death is seen among age group between 20 – 30 years of age reflecting maximum deliveries among this age group.

Table 2:- Socio Economic Status

	Frequency	Percentage
Low	154	96.9
Middle	4	2.5
Upper	1	.6
Total	159	100.0

Majority of the cases belong to low socioeconomic status (154cases, 96%). This study being done in a Government hospital, majority of the subjects were from lower socio economic status and this is reflected in the above table.

Table 3:- Admission Status of the Mother

	Frequency	Percentage
Booked from current institution	40	25.2
Unbooked	4	2.5
Referred and Referred-Booked	115	71.1
Total	159	100.0

There were 40 cases of booked case (25.2%), 4 unbooked cases (4%), 100 cases of referred (62%) and 15 referred booked cases (9.4%). Booked cases

are those who are having regular antenatal check up from the beginning of present pregnancy from the current institution, so comparing to those groups like referred and referred booked cases who are booked somewhere else and unbooked cases who do not have regular antenatal checkup, incidence of perinatal deaths are much lesser among them.

Table 4:- Hypertensive Disorders:

	Frequency	Percentage
Preterm	32	76.1
IUGR	13	30.9
APH	13	30.9
Diabetes	7	16.67

There were 42 cases (26.4%) complicated by hypertensive disorders out of 159 perinatal deaths.

Table 5:- Diabetes Mellitus

	Frequency	Percentage
LBW	11	52.38
Preterm	12	57.14
PROM/PPROM	6	28.57
Hypertension	7	33.3

21 cases were diabetes mellitus complicating cases (13.2%).

Table 6:- History of Abortion

	Frequency	Percentage
Preterm	21	60
Hypertension	8	22.85
Congenital anomaly	3	8.57
Abnormal lie	5	14.2

Among 159 cases, 35 cases (22%) have history of 1st and 2nd trimester abortion and around 5 patients have recurrent abortion i.e. >/= 3 abortion.

Table 7:- Number of Fetus in the pregnancy

	Frequency	Percent
Singleton	153	96.2
Multiple pregnancy	6	3.7
Total	159	100

6 cases of multiple pregnancies (twins) were encountered.

Table 8:- Presentation/Lie of the Fetus

	Frequency	Percent
Vertex	136	85.5
Breech	19	11.9
Transverse	2	1.25
Brow (others)	2	1.25
Total	159	100

Abnormal presentation/ lie were 23 in number (14.5%); among which breech presentation were 19 in numbers, transverse lie are 2 cases and 2 cases of brow presentation.

Table 9:- Oligohydramnios

	Frequency	Percentage
Preterm	5	71.42
IUGR	5	71.42
Primipara	4	57.14
Hypertension	2	28.57

There were 7 cases of Oligohydramnios (4.4%).

Table 10:- Intrauterine Growth Restriction (IUGR)

IUGR	Frequency	Percentage
Preterm	32	57.1
HTN	13	23
Abnormal lie/presentation	10	17.85
DM	6	10.7
Oligohydramnios	5	8.9

56 cases are complicated by intrauterine growth restriction accounting 35. 2 %.

Table 11:- PPROM/PROM

	Frequency	Percentage
Preterm	6	75
LBW	5	62.5

There were 8 cases (5%) of premature rupture of membrane. Premature rupture of membrane before onset of labour has a great impact on the perinatal outcome.

Table 12:- Birth Weight (in grams)

	Frequency	Percent
<1000	29	18.2
1000-1499	41	25.8
1500-2499	61	38.4
>2500	28	17.6
Total	159	100.0

Low birth weight babies were 131 in number comprising 82.4 % of the perinatal deaths.

Table 13:- Congenital Anomalies

Anomalies	Frequency	Percentage
LBW	15	65.5
Abnormal lie	6	26.08
Elderly	6	26.08
DM	2	8.6

23 cases (14.5%) are seen.

Table 14:- Cord Accident

	Frequency	Percentage
Entanglement	4	66.6
Cord prolapse	1	16.6
True knot	1	16.6

Table 15:- Gestational Age

Gestational Age	Total	
	Count	%
Term	50	31.4
32-36 weeks	64	40.3
28-31 weeks	45	28.3
Total	159	100.0

Term fetuses comprise 31% of total cases, very preterm (28 – 31 weeks of gestation) comprise 28% and maximum contribution is from Late preterm group (32- 36 weeks of gestation) comprising 40% of the total cases.

The following tables are summaries of this study:
Table 16:- Perinatal Mortality Rate, Still birth and early neonatal death

Total deliveries	5,546
Total perinatal death	159
Perinatal mortality rate	28.66
Total stillbirth	109
Macerated stillbirths	104
Fresh stillbirths	5
Total early neonatal death	50
Total deliveries	5,546

Table 17:- Risk factors of perinatal mortality

Risk factor	Frequency	Percentage
Low socioeconomic status	154	96.5
Low birth weight	131	82.39
Prematurity	109	68.55
Intrauterine growth restriction	56	35.22
Hypertensive disorders	42	26.42
Antepartum hemorrhage	25	15.72
Congenital anomalies	23	14.46
Abnormal presentation/lie	23	14.46
Diabetes mellitus	21	13.2
History of congenital anomaly	13	8.1
PROM/PPROM	8	5.05
Oligohydramnios	7	4.4
Cord accident	6	3.77
Hypothyroidism	4	2.51
Polyhydramnios	3	1.88
Anemia	2	1.25
Sepsis	2	1.25
Obstructed labour	2	1.57

DISCUSSION & SUMMARY

During the study period of 12 months from 1st July 2014 – 30th June 2015, there were 5,546 deliveries among which 159 perinatal death, 109 (68%) were still births and 50 (31%) cases were early neonatal death (ENND).

Perinatal mortality rate –28.66 per 1000 total births.

Out of 159 subjects, 15 of them were younger than 20 years of age with the youngest being 18 years old, followed by age more than 30 years who were 55 in numbers, the oldest being 38 years old.

Maximum subjects in this study belonged to age group between 20 – 30 years of age. According to Sarka Lisonkova[3],the perinatal mortality rate was slightly elevated among women 35 years old Vandana Sharma[4] had conducted the same study, and concluded that LBW, preterm delivery and SGA were strongly associated with both neonatal mortality and young maternal age as a consequence of early marriage and child bearing as well as low socio economic status and illiteracy of the mother.

As this study being conducted in government hospital, maximum subjects were from low socio economic status group. Therefore risk factors like poor maternal health, and undiagnosed maternal /

fetal diseases may contribute to the perinatal fetal losses in this scenario.

Similar evidence were reported by several authors like J. Morrison[5] McDermott J[6]as increased incidence of perinatal mortality are seen among low socio economic status.

There were 40 cases of booked case (25.2%), 4 unbooked cases (4%), 100 cases of referred and 15 referred booked cases (9.4%). PNMR is lesser in booked cases comparing unbooked, referred and referred booked cases.

According to this study, around 27% cases had hypertensive disorders complicating pregnancies (42 cases), among which 27% were preterm, 30% were IUGR, 30.9% were complicated by APH and 17% were associated with diabetes mellitus. Gezehagn Endeshaw[7] C. V. Ananth[8] stated that risk of stillbirth is higher than neonatal death in hypertensive complicating pregnancy mainly due to premature delivery and growth restriction.

There were 21 cases of diabetes complicating pregnancies (14%), associated with LBW (53%), prematurity (57%), PROM/PPROM (29%) and hypertension (33.3%)[9]. Moreover, diabetes increases the risk of abortion, intrauterine growth restriction if long term, macrosomia predisposing fetal distress during labour which in turn increase surgical intervention rate followed by poor neonatal outcome.[10]

Endocrinological disorder like hypothyroidism which complicated pregnancy was 4 in number Emmyvanden[11] hadconducted a study on hypothyroidism in pregnancy and concluded that there is higher prevalence of preeclampsia, perinatal mortality and recurrent miscarriage.

Only 2 cases of maternal anemia were seen, both were IUD (1.8%). From this study, anemia complicating pregnancy exclusively seen among still births signified that anemia alone is unlikely to be a risk factor but as it predisposes to many complications like intrauterine growth restriction, preterm birth, low birth weight, low 1 minute APGAR score therefore it is a contributing factor for poor perinatal outcome which may lead to increased incidence of perinatal death.[12]

Bronchial asthma complicating pregnancies were 4 in number. FaranakFiroozi[13] has found that lack of oxygen to the fetus can lead to hypoxia combined with respiratory alkalosis that decrease the placental blood flow. Decreased fetal blood oxygen could result in both an abnormal growth and abnormal fetal development causing perinatal mortality, low birth weight and prematurity and IUGR.[14]

About 8% of the cases had history of previous pregnancy loss due to congenital anomaly. There were 4 cases with history of congenital anomaly, and they were associated with diabetes complicating pregnancy.

History of previous pregnancy complicated by congenital anomaly has risk of 19% recurrence in subsequent pregnancy in diabetes complicating pregnancy.[15]

35 subjects had previous pregnancy loss due to abortion. As 21 out of 35 cases had preterm deliveries, 9 cases had hypertension, 6 cases were of abnormal lie and 3 cases of fetal congenital anomaly, be considered for those patients.

Malpresentation, cervical incompetence, high incidence of uterinec anomalies, APLA, hypertension, preterm deliveries are more prevalent among patient with Bad Obstetric History (BOH) like recurrent pregnancy loss, history of IUD/ENND/Congenital anomalous baby.[16]

Among abnormal lie/ presentations, 5 of them had congenital anomaly (22 % of total abnormal presentation/lie). Ten of them had IUGR (43.5%), 16 were preterm babies.[17]

23 cases were complicated by antepartum haemorrhage among which 19 cases were abruptio placenta. The rest 4 cases were placenta preavia. 7 cases of abrutio placenta were associated with hypertensive disorder, 13 cases were preterm babies.

There are 7 cases of oligo Hydramnios 2 cases were associated with hypertensive disorders, 5 of them were preterm and IUGR babies.

3 cases of polyhydramnios were encountered showing a comparatively lower incidence than oligohydramnios. In this study, all of them were preterm babies who have congenital anomalies with no maternal diabetic/ infection history.

56 cases were complicated by IUGR accounting for 35% of total cases and 19 cases were from ENND and the rest 37 were from IUD. It had association with hypertension (23%), prematurity (57%), diabetes (11%), abnormal presentation/lie (17%), congenital anomaly (10%) and Oligohydramnios (9%).

IUGR may be constitutional or associated with pregnancy induced hypertension, fetal anomaly etc.anddepending on its associated risk factors, the perinatal outcome may be different.[18] Since the underlying factors are usually overlapping each other like young maternal age, multiparity, low socioeconomic status, preterm birth, multiple congenital anomaly, it has very high perinatal mortality and neonatal morbidity.[19]

As 46% of ENND cases had previous caesarean deliveries, 46 % of ENND underwent caesarean section compared to 25 % from IUD, and the reason of lesser number of caesarean section among IUD was as most of the IUD cases were diagnosed before onset of labour, and 80% of them were kept for vaginal delivery and labour was induced by either mechanical and/or medical methods. Therefore mode of delivery is found clinically insignificant except for two cases of obstructed labours.

Low birth weight babies were 131 in number comprising 82.4 % of the total cases, associated with prematurity, hypertension, APH, diabetes, primiparity and age > 30 years of age. Many studies had been conducted over the globe with similar findings[20]. As birth weight is affected by maternal age[21], parity, socio economic status, smoking, maternal medical disorders, fetal conditions, placenta and umbilical cord abnormality, intra uterine growth restriction, prematurity and many others, low birth weight itself is a risk factor for poor perinatal outcome, especially when it is associated with multiple factors.[22]

In this study, 23 fetuses were borne with congenital anomaly, among which 32% were ENNDs and 7 cases were IUDs. Out of 23, 9% were diabetic

complicating, 26% were maternal age more than 30 years, 26% with abnormal lie/ presentation and 65% were LBW. Diabetes and increased maternal age have great impact on fetal anomaly[.]

Term fetuses comprised 31% of total cases, very preterm (28 – 31 weeks of gestation) comprised 28% and maximum contribution were from late preterm group (32- 36 weeks of gestation) comprised 40% of the total cases.

There were 4 cases of cord entanglements, 1 case of true knot, 1 case of cord prolapse (0.6%), all of these incidents found exclusively in IUDs in this study.[23]Ultrasonography is advised forearly detection and if diagnosed early, early admission of these mother should be advised for preventing its complications in case of cord entanglement and true knot. And in case of abnormal lie, early admission and vigilant intrapartum monitoring should be given[.24]

The identifiable risk factors have been listed above.

- ➤ The definite cause of death is not identifiable in 15% of total perinatal losses.
- ➤ Among the identifiable causes, Prematurity, Low Birth Weight, Hypertensive Disorders, Antepartum Hemorrhage, Congenital anomalies, abnormal Low birth weight are on the top list.
- ➤ As 83% and 68.5% of total perinatal losses were associated with low birth weight and prematurity respectively, and in most of them, there were associated risk factors like hypertensive disorders, uncontrolled diabetes, low socioeconomic status, premature rupture of membrane, congenital anomaly, intrauterine growth restriction, preterm labour etc. By detecting these underlying causes and intervening accordingly, perinatal losses can be reduced at least to some extent.
- ➤ Early detection of Congenital anomaly by using high resolution ultrasonography before 20 weeks of gestation, timely medical termination of pregnancy can further reduce PNMR.
- ➤ Risk factor like Low socio economic status, though it seems to be the leading cause of

perinatal fetal losses and difficult to change in any third world country, as majority of the subjects under study have health seeking behavior with regular antenatal checkup which is clearly outlined, routine antenatal care alone does not seem to reduce perinatal losses further.

- ➤ Prevalence of Maternal diseases like hypertension and diabetes mellitus are high in the population under study, if properly controlled, the outcome of pregnancy complicated by these risk factors are comparable with the rest of the population.
- ➤ By screening population at risk for those identifiable risk factors, detecting and achieving optimal control in the periconceptional period, administration of proper treatments, vigilant antepartum and intrapartum monitoring and neonatal care according to the recommended steps should be followed for optimal perinatal outcome.
- ➤ To some extent, Antepartum hemorrhage and abnormal lie/presentation and to some extent, cord accident can be managed individually by better obstetric care.
- ➤ Therefore individualizing each woman not only at the time of pregnancy, from preconceptional period itself, if not possible, periconception screening and early detection of risk factors and timely proper intervention is a key to achieve optimal perinatal outcome and the main step for reduction of public grief to perinatal fetal losses.

CONCLUSION

From this study, the following conclusions are made:

The current perinatal mortality in the institution under study is 28.66 deaths per 1000 total birth.

Risk factors of perinatal mortality are as follows:

Low socioeconomic status, Low birth weight ,Prematurity ,Intrauterine growth restriction, Hypertensive disorders, Antepartum haemorrhage, Congenital anomalies, Abnormal presentation/lie,

Diabetes mellitus, History of congenital anomaly, PROM/PPROM, Oligohydramnios, Cord accident, Hypothyroidism, Polyhydramnios, Anaemia , Sepsis, Obstructed labour

Modifiable risk factors are as follows:

Prematurity, Hypertension, Diabetes mellitus, Congenital anomaly

Limitation of study

As this study is being conducted for one year in a single hospital, those risk factors which have been highlighted need to be evaluated thoroughly to assess its significance with perinatal fetal losses and proper steps and measures to be taken for further reduction of perinatal mortality rate.

REFERENCES

1. WHO (2006) Neonatal and perinatal mortality: country, regional and global estimates. WHO, Geneva.
2. Perinatal Mortality Rate, Mortality in infancy and childhood, Parks Textbook of Preventive and Social Medicine , Ed. 22, Page 521.
3. SarkaLisonkova et al-The Effect of Maternal Age on Adverse Birth Outcomes: Does Parity Matter? J ObstetGynaecol Can 2010; 32(6):541–548.
4. VandanaSharma et al: Young Maternal Age and the Risk of Neonatal Mortality in Rural NepalArchPediatrAdolesc Med. 2008 September; 162-9.
5. J. Morrison et al: Socio-Economic Status and Pregnancy Outcome: An Australian Study British Journal of Obstetrics and Gynaecology (1989) 96 (3): 298-307.
6. McDermott J et al -Perinatal mortality in rural Malawi.
7. Gezehagn et al- Perinatal Outcome in Women with Hypertensive Disorders of Pregnancy: A Retrospective Cohort Study International Scholarly Research Notices Volume 2015 (2015), Article ID 208043, 8 pages.
8. C. V. Ananth et al-"Impact of pregnancy-induced hypertension on stillbirth and neonatal mortality," Epidemiology, vol. 21, no. 1, pp. 118–123, 2010.
9. Cundy T et al. Perinatal mortality in Type 2 diabetes mellitus. Diabet Med 2000; 17: 33-9.
10. Rackham et al -Cause of death in infants of women with pregestational diabetes mellitus and the relationship with glycemic control. Postgrad Med. 2009 Jul; 121(4):26-32.
11. Emmyvan den et al: Significance of (sub) clinical thyroid dysfunction and thyroid autoimmunity before conception and in early pregnancy: a systematic review Human Reproduction Update, Vol.17, and No.5 pp. 605–619, 2011.
12. Umber et al - Relationship between maternal hemoglobin and perinatal outcome From Department of Obstetrics and Gynecology Islamic International Medical College Trust, Railway Hospital, Rawalpindi. Received: February 8, 2007 Accepted: June 18, 2007.
13. Faranak Firoozi et al: Effect of maternal moderate to severe asthma on perinatal 15 April 2010 page no -127950. .Acute asthma during pregnancy. Thorax 1996 Apr; 51(4):411e4.

14. Guy ES et al: Acute asthma in pregnancy. Crit CareClin 2004 Oct; 20(4):731e45.

15. Shamini etal : Risk of recurrent adverse pregnancy outcome in women with diabetes, Archives of disease in childhood-fetal and Neonatal Edition –ARCH DIS CHILD-FET:AL neonatal 01/2011; 96 (1).

16. Lt Col G Singh et al: Bad Obstetric History: A Prospective Study MJAFI, Vol. 66, No. 2, 2010.

17. Fischer R et al; Breech Presentation, Medscape, Jul 2012.

18. ShwetaAnand et al: Perinatal Outcome in Growth Retarted Babies Born to Normotensive and Hypertensive Mothers: A Prospective Study People's Journal of Scientific Research Vol. 5(1), Jan. 2012.

19. Kristensen, et al; SGA subtypes and mortality risk among singleton births. Early Hum Dev. 2006 Jul 11.

20. SohelyYasmin et al: Neonatal mortality of low-birth-weight infants in Bangladesh World Health Organization 2001 Bulletin of the World Health Organization, 2001:79.

21. Kari Klungsøyr et al: Birth weight and perinatal mortality: paradoxes, social class, and siblingdependencies International Journal of Epidemiology 2003;32:625–632

22. Rees JM et al: Pediatrics. 1996 Dec; 98(6 Pt 1):1161-6.Birth weight associated with lowest neonatal mortality: infants of adolescent and adult mothers.

23. Jason H Collins -Umbilical cord accidents Collins BMC Pregnancy and Childbirth 2012, 12(Suppl 1):A7.

24. V bangal et al - Umbilical cord accidents: predictable and preventable J MGIMS, September 2011, Vol 16, No (ii), 54-58.