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**A study on Pregnancy Induced Hypertension,
Gestational Diabetes Mellitus, Anemia and Thyroid
dysfunction among pregnant women: Evidences from
two Government Tertiary Hospitals in Kerala**

Dr. Shylaja L

Dr. Nancy P. S

Mathew M.C

Population Research Centre

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Foreword

Kerala has the lowest Maternal Mortality Ratio among the States in India. Yet the pregnancy related problems have always been a concern to Gynecologists. Anemia, pregnancy induced hypertension, gestational diabetes mellitus and thyroid dysfunction are identified more during pregnancy. The authors here attempts to understand the magnitude of this problems from information collected from two Government tertiary hospitals. The main objectives of the study are to understand the burden and background characteristics of PIH, GDM, thyroid dysfunctions and Anemia among pregnant women in Kerala.

Sincere thanks are due to the Directorate of Health Services, Government of Kerala, Medical Superintendents of SAT Hospital Thiruvananthapuram and Medical College Kozhikode for providing us permission to carry out the study and also facilitating data collection from the respective hospitals.

I appreciate the authors of the study Dr. Shylaja L, Research Officer, Dr. Nanzy P.S, Research Fellow and Mr. Mathew M.C, Field Investigator of the PRC in successfully completing the study. The findings will definitely be of great use to Planners and Policy makers.

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Dr. P Mohanachandran Nair
Director-in charge

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Executive Summary

Kerala is one among the better performing states of the country and has the highest literacy rate and the better infant and maternal mortality rate. Even though some health issues like NCD problems are reported to be higher in the state compared to other states in India. Along with other gynaecologic and obstetric factors, health problems or risk factors like gestational diabetes mellitus, pregnancy induced hypertension and anaemia during pregnancy are reported to be high in Kerala which lead to an increase the number of LSCS deliveries in Kerala. The main objectives of the study are to understand the burden and background characteristics of PIH, GDM, thyroid dysfunctions and anaemia among pregnant women in Kerala and to study their treatment seeking behavior. Data for the study were collected from two tertiary hospitals (SAT Thiruvananthapuram and Kozhikode Medical College Hospital).

All pregnant women who were admitted for delivery during the month of March 2017 have been taken for the study from the above selected hospitals. The case records of the above women were taken from the hospital. Medical records and report of diagnosis shows that about 17.4 percent of sample women are anemic, 31.4 percent of the women have GDM, 18.5 percent of them have experienced PIH and about 10 percent of women have experienced thyroid dysfunction during the current pregnancy period. Elder cohort women are more prone to get GDM and PIH during pregnancy. Women with PIH have more chances of preterm delivery than normotensive women. Age, gravida, BMI and previous pregnancy wastage of women have significant relationship with PIH. Social status, level of education and birth weight of baby are not found to have any significant relationship with PIH. Pregnancy-induced hypertension is associated with multiple complications in the mother and baby, and particularly preterm delivery. Complications such as HELLP syndrome can sometimes prove fatal to mother and foetus.

The prevalence of anemia is lower in Kerala compared to other Indian states. Among women with anaemia during pregnancy, women have one or two pregnancies are more anaemic than women who have three or more pregnancies.

Similarly a higher proportion of women who have anemia are in the first or second parity. Anaemic women have experienced higher proportion of pre term delivery than the non anaemic women. Also the proportion of anaemic women who have BMI below 18.5 is little higher than that of non anaemic women in this category.

Women who have higher number of pregnancies; taken treatment for infertility and those who experienced previous pregnancy wastages have more chances to become GDM in their future pregnancy. Present study has shown that increasing maternal age and BMI increase the risk for development of GDM. There was a statistically significant relation between increased maternal age and the risk of development of GDM. Similarly, the relation between increased maternal BMI and risk of development of GDM was also statistically significant. A change in lifestyle aiming at a healthy pre pregnant BMI may significantly lower the incidence of GDM.

The study finding shows that thyroid dysfunction among women is perhaps a cause of infertility among women in Kerala. Higher proportion of women from Southern most districts has experienced thyroid dysfunction during pregnancy than women from northern districts in Kerala. Birth weight or size of the baby, women treated for fertility and previous pregnancy wastages are also influencing factors associated with thyroid dysfunction among women. Present study recommends mothers to have a long term healthy life style with adequate diet and exercise so that they can have a healthy and uneventful pregnancy. Since the proportion of anaemia, GDM, PIH and thyroid dysfunction are found to be higher among sample women. It points urgent need for screening all the antenatal women for the above health problems, especially in a population where overall prevalence is very high. Monitoring and the timely diagnosis of the above problems during every antenatal visit are also essential. Need for screening and assessment even at primary health care level is mandatory, especially for early referrals and prevents maternal and neonatal complications. Follow up diagnosis and treatment is also needed for the affected women after the delivery.

1. Introduction

The state of motherhood is completed through giving birth of a child, so becoming a mother is one of the most exciting times in a woman's life. It comes true through the pregnancy period. So it can be said that Pregnancy- the nine months or so for which a woman carries a developing embryo and fetus in her womb is for most women a time of great happiness and fulfillment (WHO, 2015). During pregnancy every mother must be very careful about her and babies health, it is called prenatal care of the baby and the mother. Studies have shown that mothers who have good prenatal care have the healthiest babies. They also have less chance of medical problems when they are pregnant. To take care of mother herself and her baby, consciousness about various factors is needed (Ferguson and Nokes, 2015).

As maternal and child health is backbone of any nation, the well-being of societies is linked to the health of mothers and children. Healthy mothers are children's first line of defense against death, malnutrition and disease. Every minute a women, every day 1500 women die due to pregnancy related complications. Every year, approximately 8 million women suffer from pregnancy related complications and half million die. Thus maternal mortality continues to be a major public health problem. Majority of these deaths can be prevented by effective and affordable public health interventions. The focus on maternal death has sharpened when reduction in maternal mortality became one of the eight goals of millenniums development goals (MDG 5).

Some women experience health problems during pregnancy. These complications can involve the mother's health, the fetus, or both. Even women who were healthy before getting pregnant can experience complications. These complications make the pregnancy a high risk pregnancy. Some prenatal tests done during pregnancy can help to prevent these problems or spot them early. If a problem is found, patient must follow doctor's advice about treatment. Doing so will boost patient chances of having a safe delivery and a strong, healthy baby.

A high – risk pregnancy refers to anything that puts the mother, fetus or neonate at increased risk for morbidity or mortality during pregnancy or childbirth. All women must

be considered to be at risk. Several risk factors for high risk pregnancy has been identified and including risks that developed as a result of the pregnancy state and risks that were present before pregnancy. Also, multiple pregnancies, maternal age under 18 or over 35 years, more than 4 pregnancies and interval between pregnancies less than one year, high blood pressure (hypertension), diabetes, cardiovascular disease, anaemia, thyroid dysfunction etc. can be considered as risk factors for high-risk pregnancy.

According to World Health Organization, prevalence of Anemia among pregnant women in developed countries is about 14%, whereas it is still as high as 51% in the developing world (WHO, 2015). About half of all global maternal deaths due to anemia occur in South Asian countries, out of which India contributes to 80%. In India the prevalence of Anemia among pregnant women is about 65 to 75 percent. Anemia has been known to be responsible for a number of maternal and foetal complications. Apart from decreasing the woman's reserve to tolerate bleeding either during or after child birth, it has been known to be associated with low birth weight, premature delivery, intra uterine growth retardation and thus increased perinatal mortality. Anemia has also been found to be associated with increased risk of birth asphyxia and low Apgar score at birth.

The levels of hemoglobin used for classification of anemia in pregnant women as mild, moderate and severe Anemia were those recommended by the Indian Council of Medical Research (ICMR). Mild, moderate and severe anemia was defined as follows: Mild Anemia - level of Hb 10.0 mg/dl to 10.9 mg/dl, Moderate anemia - level of Hb 7.0 mg/dl to 10 mg/dl, Severe Anemia - level of Hb less than 7mg/d, Very severe anemia - level of Hb less than 4mg/dl. Medical reports show that high risk pregnancies and deliveries ended in caesarean section have been increasing in Kerala (Shylaja & Suresh Kumar, 2017).

Anemia among women is a major public health concern globally. It has been reported that the prevalence of anemia among pregnant women in developing countries accounts for about 56% while in the developed world is about 16%. During pregnancy, level of haemoglobin below 11 gms/dl, is labelled as Anemia. Before women were pregnant, they needed about 15 mg of Iron per day now women need twice this amount i.e., approximately

30 mg per day 40 – 60% of are pregnant woman, suffer from Anemia(Planababy, 2015). In developing countries, nutritional Anemia may be due to poor bioavailability of dietary iron, haemoglobinopathies or intestinal parasites. Anemia has long been recognized as a major public health problem especially in developing countries like India. India continues to be one of the countries with very high prevalence. National Family Health Survey (NFHS-3) reveals the prevalence of anemia to be 70-80% in children, 70% in pregnant women and 24% in adult men.

Anemia is when the patient does not have enough healthy red blood cells to carry oxygen to the rest of the body. Without enough oxygen, the body cannot work as well as it should, and so the patient feels tired and run down. In pregnancy, iron deficiency has been linked to an increased risk of premature birth is before 37 weeks of pregnancy.

Anemia is a decrease in the amount of hemoglobin and red blood cells. Anemia is a relatively normal finding in pregnancy. Plasma is the watery, non-cellular component of blood. In pregnancy, there is an increase in plasma volume of the blood in order to help supply oxygen and nutrients to mother and baby. There can be a 20% increase in the total number of red blood cells but the amount of plasma increases even more causing dilution of those red blood cells in the body. A hemoglobin level of pregnancy can naturally lower to 10.5 gm/dl representing a normal anemia of pregnancy (Benjamin, 2012). It is one of the most commonly encountered medical disorders during pregnancy. In developing countries it is a cause of serious concern as, besides many other adverse effects on the mother and the fetus it contributes significantly high maternal mortality. According to United Nations declaration 1997, anemia is a major public health problem that needs total elimination. It is estimated that globally two billion people suffer from anemia or iron deficiency (Sharma and Shankar, 2010). According to World Health Organization estimates, up to 56% of all women living in developing countries are anemic (Benoist, 2005). In 2011, 29% (496 million) of non-pregnant women and 38% (324 million) of pregnant women aged 15-49 years were anemic.

Gestational diabetes mellitus occurs with the onset of pregnancy and is characterized by the inability of the pregnant patient to tolerate glucose. Patients who develop gestational diabetes may develop diabetes later in life. However, gestational diabetes often resolves after delivery. The cause of gestational diabetes is largely unknown. However, it is believed that as the fetus grows, glucose demands increase for the pregnant patient. In addition, the “insulin-antagonistic” properties of placental hormones affect the patient by causing insulin resistance (Lowdemilk & Perry, 2010). As a result, the pregnant is unable to process glucose in the body and hyperglycemia occurs. Gestational diabetes mellitus (GDM), which is defined as the onset or recognition of glucose intolerance during pregnancy, is associated with an increased risk of prenatal morbidity and mortality. After delivery, though the glucose levels return to normalcy, the mother is at a higher risk for Type 2 DM, and the child of a woman with GDM is at a higher risk for metabolic syndrome.

The prevalence of GDM is high in the Indian population as compared to other populations of Southeast Asia. In south India, the prevalence of GDM has increased from 1% in 1998 to 16.55% in 2004 (Sashia et al, 2004). The factors that have been postulated to influence the risk of GDM among the mothers include obesity, positive family history of diabetes in first-degree relative, treatment for infertility, polyhydramnios, recurrent UTI, recurrent moniliasis, history of still birth, delivery of a large infant (> 4 kg), unexplained neonatal death, prematurity, pre-eclampsia in multipara, diabetes in previous pregnancy, and advancing maternal age. GDM in pregnant women had been considered if two of the four criteria were detected following 100 gm glucose tolerance test: (FBS \geq 95, 1h BS \geq 180, 2hBS \geq 155, 3hBS \geq 140 mg/dl). Diabetes in pregnancy is increasing and therefore it is important to raise awareness of the associated health risk to the mother, the growing fetus, and the future child. Prenatal mortality and morbidity is increased in diabetic pregnancies through increased stillbirths and congenital malformation rates. These are mainly the result of early fetal exposure to maternal hyperglycemia. In the mother, pregnancy may lead to worsening or development of diabetic complications such as retinopathy, nephropathy, and hypoglycemia (Ali and Dornhorst, 2011).

Gestational diabetes, or diabetes that is diagnosed during pregnancy in a woman who previously did not have diabetes, occurs when the pancreas fails to produce enough insulin to regulate blood sugar efficiently. For years, doctors believed that GDM affected three to five percent of all pregnancies, but new, more rigorous diagnostic criteria puts the number closer to 18 percent. The condition, which can strike any pregnant woman, usually develops in the second trimester, between weeks 24 and 28, and typically resolves after baby is born. But gestational diabetes that goes untreated, or isn't carefully monitored, can be harmful for both mother and baby. If one's had gestational diabetes in a previous pregnancy, she has a 60 percent chance of developing it again, according to the American Diabetes Association. Additionally, half of all women with a history of gestational diabetes develop type 2 diabetes within 10 years of the onset of their gestational diabetes, so it's important to maintain good exercise and nutritional habits after the baby is born (Dashiell, 2015).

Gestational hypertension formerly known as pregnancy-induced hypertension (PIH) refers to hypertension occurring for the first time during pregnancy. Worldwide, 10 percent of all pregnancies are complicated by hypertension, with pre-eclampsia and eclampsia being the major causes of maternal and prenatal morbidity and mortality (WHO, 2014). It is also estimated that pregnancy induced hypertension (PIH), one of the hypertensive disorders of pregnancy, affects about 5 – 8 % of all pregnant women worldwide. Pre-eclampsia affects 5-7 % of all pregnancies. PIH is a major pregnancy complication associated with premature delivery, intra-uterine growth retardation (IUGR), abruptio placentae, and intra-uterine death, as well as maternal morbidity and mortality. Pregnancy induced hypertension (PIH) is defined as BP \geq 140/90 mmHg, taken after a period of rest on two occasions or \geq 160/110 mmHg on one occasion in a previously normotensive woman (Innes and Wimsatt, 1999, Watanabe et al., 2013). Despite being the leading cause of maternal death and a major contributor of maternal and perinatal morbidity, the mechanisms responsible for the pathogenesis of PIH have not yet been fully elucidated (Granger, 2001).

During pregnancy, many women are affected by hypertensive problems, especially in the first pregnancy. Such problems fall into four categories; chronic (pre-existing) hypertension, gestational (transient) hypertension, pre-eclampsia /eclampsia, and pre-eclampsia superimposed on chronic hypertension. While the exact prevalence of each condition is

difficult to determine, almost 10% of all pregnancies are thought to be complicated by high blood pressure. Nearly 30% of first pregnancies are thought to be affected by gestational hypertension, pre-eclampsia, or eclampsia(Magee, 1999).

The thyroid diseases (hyperthyroidism and hypothyroidism)are relatively common in pregnancy and important to treat.The thyroid is an organ located in the front of neck that releases hormones that regulate metabolism (the way your body uses energy),heart and nervous system, weight, body temperature, and many other processes in the body(Aleppo,2015). During pregnancy, if women have pre-existing hyperthyroidism or hypothyroidism, they may require more medical attention to control these conditions during pregnancy, especially in the first trimester.Occasionally, pregnancy may cause symptoms similar to hyperthyroidism in the first trimester.If anyone experience palpitations, weight loss,and persistent vomiting, they should contact physician (Aleppo, 2015).Untreated thyroid diseases in pregnancy may lead to premature birth, preeclampsia (a severe increase in blood pressure), miscarriage, and low birth weight among other problems (Aleppo, 2015).About 10-15% of pregnant women have thyroid dysfunction during the first half of pregnancy, which may be hypothyroidism or hyperthyroidism. One third of the pregnant women with type I diabetes may also have thyroid dysfunction simultaneously (Bloomgarden, 2003). Delayed diagnosis of hypothyroidism in pregnancy leads to congenital malformations and respiratory distress in newborns of these mothers. Furthermore mother's diabetes during pregnancy can influence the secretion of T3 or conversion of T4 to active T3 in the fetus and premature newborns. When anti-thyroid antibodies are positive, there is risk of premature rupture of amniotic sac and preterm labor. Some studies have showed that even without the overt thyroid dysfunction, autoimmune thyroid disease increases abortion rates up to 3 to 5 times. Individuals with normal levels of T4 and T3 and TSH $<0.3\text{mIU / L}$ had been considered as sub clinical hyperthyroidism and individuals with normal T4 and T3 and TSH $> 4\text{mIU / L}$ as sub clinical hypothyroidism. High T4 and TSH < 0.3 are considered as hyperthyroidism and T4 <4.8 and TSH >4 as hypothyroidism.

Thyroid diseases are the second most common cause of endocrine dysfunction in the women of child bearing age after diabetes. Thyroid disease is known to affect many aspects of pregnancy and post-partum health, as well as the health of the baby. Thyroid disorders can have adverse reproductive and pregnancy implications. Although gestational hyperthyroidism is uncommon (0.2%), gestational hypothyroidism occurs in higher prevalence (2.5%) can lead to neonatal and child neuro developmental deficits and maternal obstetric complications (Soldin, 2006). Maternal hypothyroidism is associated with an increased risk of Pregnancy- induced hypertension, placental abruption, spontaneous abortion, fetal distress, perinatal death, Preterm birth, and Low birth weight.

Maternal morbidity and mortality could be prevented significantly if women and their families recognize obstetric danger signs and promptly seek health care. Raising awareness of pregnant women on the danger signs would improve early detection of problems and reduce the morbidity. Hence the study is relevant.

2. Objectives

The main objectives of the study are to understand the burden and background characteristics of PIH, GDM, thyroid dysfunctions and Anemia among pregnant women in Kerala.

3. Data and Methodology

Data for the study were collected from two tertiary hospitals: SAT Thiruvananthapuram and Kozhikode Medical College Hospital. All pregnant women who were admitted for delivery during the month of March 2017 have been taken for the study from the above selected hospitals. The case records of the above women were taken from the hospital. The details were collected after conducting an in-depth study of the case histories of the women with the help of concerned Medical Officers and other responsible staff in the Gynaecology and Obstetrics department of the selected hospitals. We have identified the women who have PIH, GDM, thyroid dysfunction and Anemia during pregnancy from the case records with the help of lab tests and diagnosis done during pregnancy. We have also

collected the background characteristics of the women from her through personal interviews. Data were taken by using a semi structured questionnaire.

A total of 2091 delivery cases were taken, out of which 1199 were from IMCH, Govt. Medical College, Kozhikode and the remaining 892 cases from SAT, Govt. Medical College, Thiruvananthapuram. The social and demographic variables like Maternal Age, education and occupation of husband and wife, religion, social status (APL/BPL), Age at marriage, number of pregnancy, parity, number of living children, pregnancy wastages, BMI of women at current pregnancy, type of current pregnancy and outcome, type of delivery, reasons for CS, previous history of illnesses, present history of illnesses (including PIH, GDM, Anemia, and thyroid dysfunction), family history of illnesses, sex of child, birth weight of baby, UPGAR score of the baby at one minute and five minutes, results of lab test of thyroid dysfunction (values of TSH, T3 and T4), Hb level, values of GCT and GTT, values of blood sugar test (FBS and PPBS), blood pressure values (systolic and diastolic), test results of HIV, VDRL, HBsAg and HCV are considered. Univariate and bivariate analysis have been performed to study the background characteristics and the profile of pregnant women who have PIH, GDM, Thyroid dysfunction and Anemia during pregnancy.

Limitations of the study

This study is mainly based on hospital records in two Govt. tertiary hospitals, one from Thiruvananthapuram district and other from Kozhikode district in Kerala and the sample is restricted to short period of one month duration although the sample size is sufficiently large. Large cohort and longer duration of the study in the future will help in establishing association between the risk factors associated with the study.

4. Profile of sample women selected from two Govt. Tertiary hospitals (SAT, Thiruvananthapuram and IMCH, Kozhikode) in Kerala.

The data for the study were collected from two tertiary hospitals in Kerala namely SAT, Hospital Govt. Medical College Thiruvananthapuram which represents the southern region

and IMCH, Govt. Medical College Kozhikode represents the northern region of Kerala. High risk pregnant women and other complicated pregnancies which are not managed in the peripheral hospitals within Thiruvananthapuram district and hospitals from nearby districts (Kollam, Pathanamthitta, Kottayam and Alappuzha) are being referred to SAT hospital Thiruvananthapuram. Similarly high risk pregnant women and women having severe complications are referred to IMCH Kozhikode from different hospitals in Kozhikode and nearby districts namely Malappuram, Palakkad, Wayanad and Kannur. Majority of the referral cases are from the lower level facilities like Taluk level hospitals, District Hospitals, General hospitals, W&C hospitals and some of the major private hospitals from the same district and from the nearby districts. Table 1 gives the background characteristics of women who have been (delivered in March 2017) selected for the study. Their pregnancy histories were taken from the case records and by a personal interview with the women. Total number of women selected for the study is 2091, out of which 892 were taken from SAT Hospital, Thiruvananthapuram and 1199 were taken from IMCH, Govt. Medical College Kozhikode.

Age distribution shows that about seven percent of the total women are below age 19 years, 39 percent of the women are in the age group (20-24) years, 32 percent in the age group of (25-29) years, about 16 percent belongs to the age group of (30-34) years and the remaining 6 percent belongs to the age greater than or equal to 35 years. About three third of the selected women belongs to BPL category in SAT hospital while 85 percent of the sample women are from BPL families in IMCH Kozhikode and the overall proportion shows that four fifth (80 percent) are from the BPL category. This shows that majority of the women received services from the Government tertiary hospitals belongs to the low income group or having low socio economic status. Religious distribution of total sample women shows that about sixty one percent of them are Hindus, twenty nine percent are Muslims and the remaining 10 percent are Christians. The religious categories in facility wise show some variations. About 39 percent of the women received services from IMCH Kozhikode are belongs to Muslim community while the above proportion is 16 percent in SAT hospital Thiruvananthapuram. Similarly seven percent of the sample women from Christian families received services from IMCH while the above proportion is two times higher in SAT

Hospital. Educational status of women shows that a higher proportion of the women in low educational status are depending on the Government hospitals for maternal and child health services. About 30 percent of the total sample women who received MCH services from the Govt. tertiary hospitals have completed 10 years of schooling and about 37 percent of women have completed their education up to higher secondary level (+2 level). Around 20 percent of the total sample women have the educational qualification of degree and above. Proportion of sample women has educational level degree and above (24 percent) who received maternal services from SAT hospital Thiruvananthapuram is comparatively higher than the same educational category of women who got maternal services from IMNCH, Kozhikode (15 percent). About 90 percent of the total sample women are housewives while the above proportion is 85 percent for the sample women from SAT Hospital and the corresponding figure for sample women from IMCH, Kozhikode is 96 percent.

Table 1: Distribution of Background characteristics of sample women selected for the study from two Govt. tertiary hospitals in Kerala

Characteristics	SAT hospital TVPM(Percent) N=892	IMCH ,Kozhikode (Percent) N=119	Total (Percent) N=2091
Age of Women			
15-19	6.7	7.3	7.1
20-24	39.6	38.5	39.0
25-29	29.7	33.7	32.0
30-34	17.7	14.4	15.8
≥35	6.3	6.0	6.1
Social Status			
APL	25.4	15.2	19.6
BPL	74.6	84.8	80.4
Religion			
Hindu	70.3	54.1	61.0
Christian	14.0	6.8	9.9
Muslim	15.7	39.0	29.1
Educational status of Wife in completed years			
≤9	3.3	4.7	4.0
10	28.6	31.5	30.1
12	32.3	42.0	37.2
13 & 14	11.9	6.4	9.2
≥15	23.8	15.3	19.6

Educational status of Husband in completed years			
≤9	8.4	16.6	12.5
10	37.7	44.7	41.2
12	27.4	19.3	23.3
13&14	14.8	10.4	12.6
≥15	11.6	9.0	10.3
Occupational status of women			
housewife	85.1	96.1	92.1
Government	3.4	1.3	2.0
Private	10.8	2.2	5.4
others	0.3	0.2	0.3
coolie	0.4	0.2	0.3
Occupational status of Husband			
Coolie	42.3	72.2	61.2
Government	5.5	3.4	4.2
Private	24.0	9.9	15.1
Gulf	9.4	4.2	6.1
Driver	9.6	5.2	6.8
Skilled	7.6	2.9	4.6
Unskilled	1.0	0.5	0.7
others	0.6	1.7	1.3
Age at Marriage of women			
≤19	3.4	9.8	7.1
20-24	77.8	77.6	77.7
25-29	15.8	10.0	12.5
30-34	2.1	2.0	2.1
≥35	0.9	0.5	0.7
Consanguineous Marriage			
NO	97.0	99.0	98.1
yes	3.0	1.0	1.9
RSBY/JSSK/Tribal			
RSBY	19.4	34.5	28.1
JSSK	80.0	63.3	70.4
Tribal	0.2	1.7	1.1
Others	0.3	0.6	0.5

Distribution of age at marriage shows that a higher proportion (78 percent) of women got married at the age group of (20-24) years. About seven percent of total sample women who were married at the age below 20 years while the above proportion is 10 percent and 3.4 percent among women from IMCH Kozhikode and SAT hospital

Thiruvananthapuram. Around 3 percent were married after attaining 30 years of age. Table 1 show that about two percent of the marriages are consanguineous marriage for total sample women and the proportion is 3 percent among sample women from SAT hospital Thiruvananthapuram. About 28 percent of the total sample women seek treatment through RSBY benefit. While comparing the RSBY beneficiaries, IMCH Kozhikode has a higher proportion of beneficiaries (35 percent) than SAT hospital Thiruvananthapuram (19 percent). About 80 percent of the sample women received JSSK benefit from SAT Hospital Thiruvananthapuram. About 2 percent of the sample women from IMCH Kozhikode are tribal women and most of them were referred from the districts of Wayanad, Malappuram (Nilambur) and from the remote areas of Palakkad.

5. Menstrual history of selected women

Table 2: Menstrual history of sample women by tertiary hospitals selected

Menstrual history	SAT hospital TVPM(Percent) N=892	IMCH ,Kozhikode (Percent) N=119	Total (Percent) N=2091
Age at Menarche			
≤12	43.6	23.1	31.9
≥13	56.4	76.9	68.1
Menstrual cycle			
Irregular	8.1	4.4	6.0
Regular	91.9	95.6	94.0
Total	892	1199	2091

Table 2 provides the menstrual history of the selected sample women which shows that 43.6 percent of the women selected from SAT hospital attained puberty at the age of less than 13 years while the above proportion is 23.1 percent among women selected from IMCH Kozhikode. About eight percent of women selected from SAT hospital, Thiruvananthapuram reported that their menstrual cycle is irregular while it is only 4 percent for the selected women from IMCH.

6. Maternal Characteristics of Selected sample women

It can be seen from the Table 3 that about 43 percent of the selected women have at least

one pregnancy and the above proportion is more or less same to the women who have selected from the two hospitals.

Table 3: Maternal Characteristics of sample women by selected tertiary hospitals

Characteristics	SAT Hospital TVPM(Percent)	IMCH,Kozhikode (Percent)	Total(Percent)
Number of pregnancy			
1	43.0	42.4	42.7
2	36.2	29.6	32.4
3	15.1	16.9	16.2
≥4	5.6	11.1	8.8
Parity of Women			
1	51.6	48.8	50.0
2	39.8	34.0	36.5
3	7.3	13.2	10.7
≥4	1.3	4.0	2.9
Number of Living Children			
0	1.2	1.4	1.3
1	53.3	50.2	51.5
2	39.1	33.7	36.0
3	5.7	11.9	9.3
≥4	0.7	2.8	1.9
Total pregnancy wastage			
No	75	75.8	75.5
Yes	25	24.2	24.5
Infant death	6	10	16
Neonatal death			
1	18	35	53
≥2	4	0	4
Outcome of last pregnancy			
Live birth	96.6	96.3	96.5
IUD	1.5	3.3	2.5
still birth	1.1	0.0	0.5
NND	0.8	0.4	0.6
Type of last delivery			
Normal	54.3	59.6	57.3
Emergency LSCS	27.6	25.1	26.2
Elective LSCS	12.6	12.5	12.5
Assisted	5.6	2.8	4.0
Sex of Child			
Male	53.5	51.3	52.2
Female	46.5	48.5	47.7
Not determined	0	0.2	0.1
Total	892	1199	2091

About 36 percent of the women from SAT hospital Thiruvananthapuram have experienced two pregnancies while 30 percent of the women from IMCH Kozhikode have experienced two pregnancies. About 11 percent of the women taken from IMCH have experienced four or more pregnancies while it is around six percent for women selected from SAT hospital at the time of data collection. Around nine percent of the total sample women selected for the study have experienced four or more pregnancies. Considering the parity of selected women, about half of them are in first parity. About 4 out of 10 women in SAT hospital and 3 out of 10 women in IMCH Kozhikode are attained second parity, proportion of women attained third parity from SAT hospital and IMCH Kozhikode are 7 percent and 13 percent respectively. About four percent of women from IMCH Kozhikode attained fourth or more parity while the corresponding proportion is only one percent for women who were taken from SAT hospital Thiruvananthapuram. About half of the selected women from each tertiary hospital have a single living child and around one percent of women, who are childless at the time of survey, about six percent of sample women from SAT hospital have three living children whereas the corresponding proportion is double (12 percent) among women selected from IMCH Kozhikode than that of SAT hospital Thiruvananthapuram and proportion of women who have ≥ 4 children in IMCH Kozhikode (3 percent) is slightly higher than that of women selected from SAT hospital Thiruvananthapuram. Total proportion of pregnancy wastage among selected women from both the hospital is more or less same (around 25 percent). About 35 neonatal deaths and 10 infant deaths were occurred among the selected women from IMCH Kozhikode in the month of March 2017 while the corresponding figures for women taken from SAT hospital, Thiruvananthapuram are 6 and 22 respectively.

The last delivery details of women were taken for the analysis. Considering the outcome of last pregnancy, about 96 percent of the last pregnancies were ended in live birth for women who were taken from both hospitals, last pregnancies ended in IUD among women from SAT hospital is about 1.5 percent and the corresponding proportion among women from IMCH Kozhikode is 3.3 percent. About a very small proportion of last deliveries ended in still birth among women who were taken from SAT hospital while there is not any still birth among women who are taken from IMCH Kozhikode. A negligible proportion of last

pregnancies are ended in neonatal death among women who were taken for the study from both hospitals (0.8 percent for SAT hospital and 0.4 percent for IMCH Kozhikode). About 60 percent of the last deliveries were performed as normal deliveries among women in IMCH Kozhikode while the above proportion is 54 percent among sample women delivered in SAT hospital Thiruvananthapuram. Proportion of last deliveries undergone by elective LSCS is more or less same in theselected hospitals (12.5 percent) and emergency LSCS performed in SAT hospital is about 28 percent and IMCH Kozhikode is 25 percent. About 6 percent of deliveries performed at SAT hospital were assisted deliveries the corresponding proportion for IMCH Kozhikode is only 3 percent. Gender differential of newborns in last delivery shows that it is only 2 percent point in IMCH Kozhikode while it is 7 percent points in SAT hospital Thiruvananthapuram. Number of twin/triplet births at SAT hospital and IMCH Kozhikode are 30 and 28 respectively.

Table 3.1: Maternal Characteristics of Samplewomen by selected tertiary hospitals.....continued

Characteristics	SAT Hospital TVPM(Percent)	IMCH ,Kozhikode (Percent)	Total(Percent)
Last child birth			
Full term	79.6	85.2	82.8
Pre-term	20.4	14.8	17.2
Birth Weight of last child			
<2499	39.1	21.7	29.1
2500-3000	35.5	38.6	37.3
3001-3499	20.4	27.6	24.5
≥3500	5.1	12.1	9.1
ANC checkup			
Regular	98.3	98.6	98.5
Irregular	1.7	1.4	1.5
BMI ofwomen			
≤18.4	4.1	3.5	3.8
18.5-24.9	53.0	43.8	48.6
25-29.9	34.0	40.3	37.0
≥30	8.9	12.4	10.6
Infertility treated			
Not treated	89.0	91.7	90.5
Male factor	2.1	2.8	2.5
Female factor	5.2	4.3	4.6
Both	3.7	1.3	2.3
Total	892	1199	2091

According to WHO's report, preterm birth or premature birth is the birth of a baby at less than 37 weeks of gestational age. The report also mentioned that premature infants are at greater risk for cerebral palsy, delays in development, hearing problems, and sight problems. These risks are greater the earlier a baby is born. Actual cause of preterm birth is often not known but the risk factors include diabetes, high blood pressure, being pregnant with more than one baby, being either obese or underweight, a number of vaginal infections, tobacco smoking and psychological stress (WHO, 2014). It is noted that one fifth of the total number of last child birth of sample women taken from SAT hospital are preterm birth and the corresponding proportion of last child birth as premature is 15 percent at IMCH Kozhikode. Regarding the birth weight of last child, four out of ten women taken from SAT hospital have low birth weight babies (birth weight < 2.5 Kg) and the corresponding figure is 2 out of ten among selected women from IMCH Kozhikode. Similarly the birth weight of last child is ≥ 3.5 Kg among five percent of women selected for the study from SAT hospital whereas among one out of ten women, their last child have the birth weight ≥ 3.5 Kg. Considering the ANC checkup attained by women during last pregnancy, a negligible number of women had received irregular ANC checkup. About 2 percent of women from SAT hospital and 1.4 percent women from IMCH Kozhikode received irregular ANC checkup. BMI is an important indicator which brings adverse effect (low BMI and obesity) on women before and during pregnancy. Table 3 shows that about 4 percent of the sample women are thin or they have low BMI (BMI less than 18.5), nearly one out of ten pregnant women has BMI greater than or equal to 30 which means that they are obese. It is interesting to note that about four out of ten women are overweight (pregnant women whose BMI lies between 25 and 29.9).

Obesity, stress and lifestyle changes are wreaking havoc with the reproductive health of women. Women seem to be paying a higher price for lifestyle changes than men. Gynaecologists reported that women with metabolic and reproductive problems have one common factor, a high percentage of body fat. Stress is another factor which takes a toll on the reproductive health of women. Obesity has far more consequences for women than men because apart from metabolic disorders and cardiovascular risks, it also affects their reproductive health adversely. Dr. Sheila Balakrishnan, Associate Professor of Gynaecology

at SAT hospital, who is also in charge of the infertility clinic opined that the first step in infertility treatment for many women now is weight reduction. According to her about 30-40 per cent of women who go for infertility treatment are obese and she added that the ability to conceive spontaneously is reduced by obesity. Obesity also affects pregnancy outcome as related conditions like hypertension or gestational diabetes present increased risk for the mother as well as the baby (The Hindu daily, 2016). In our study, about 10 percent of the sample women were treated for infertility. About 11 percent of the women taken from SAT Hospital and 8 percent of the women taken from IMCH Kozhikode are previously treated for infertility. Obesity, thyroid dysfunction, PCOD among women, less count among men etc are the major problems reported in the case records available in the hospitals.

7. Details of reference from other hospital to the selected hospitals and major reasons for reference

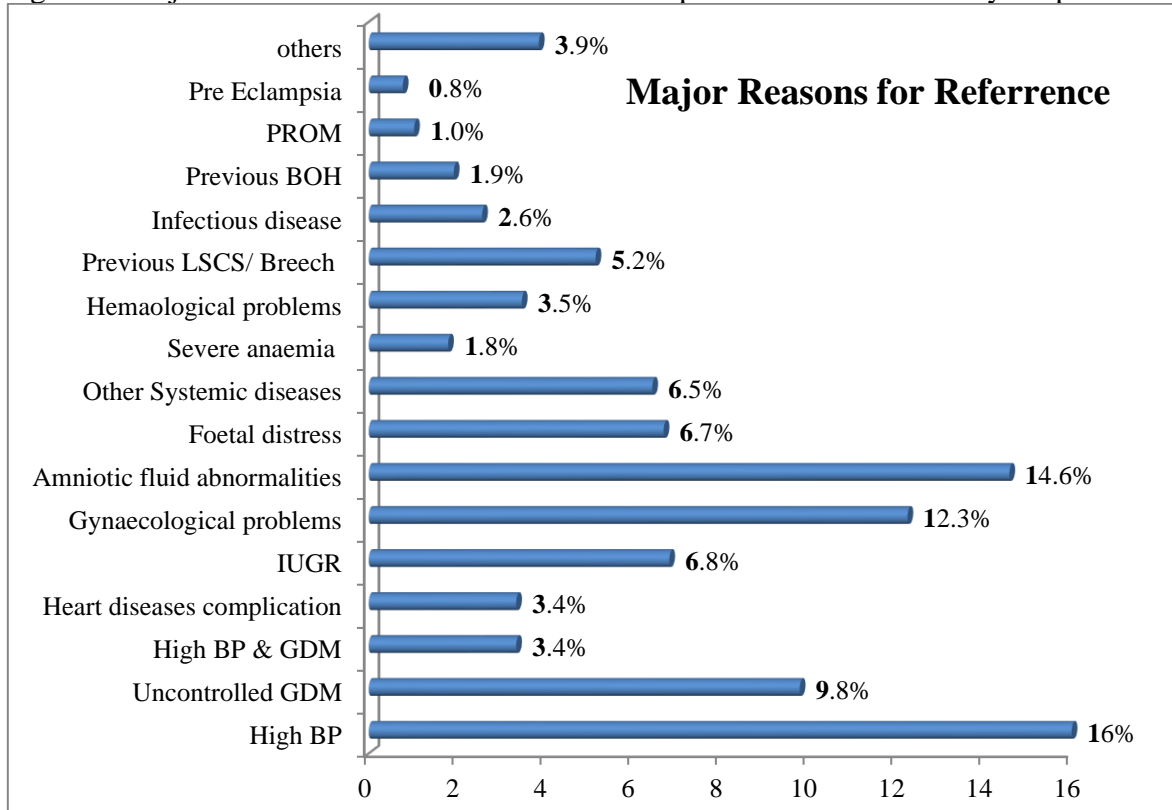
SAT hospital Thiruvananthapuram and IMCH Kozhikode are the Maternal and child Health hospitals in two Govt. Medical College Hospitals which are functioning as referral hospitals in Thiruvananthapuram district and Kozhikode district. Proportion of women referred from other public and private hospitals nearby to SAT hospital and IMCH Kozhikode are 59 percent and 21 percent respectively (see Table 4).

Out of the total referred cases around one third is from nearby Taluk hospitals to SAT Thiruvananthapuram. Some of the Taluk hospitals have no Gynaecologist, so they referred pregnant women to SAT hospital for delivery. About 16 percent of the referral case was from Taluk hospitals to IMCH Kozhikode. Similarly the referral cases from W & C hospitals to SAT hospital, Thiruvananthapuram and IMCH Kozhikode are about 19 percent and 15 percent respectively. Nearly 16 percent of pregnant women were referred from general hospitals to each of the selected tertiary hospitals for delivery. Pregnant women referred from private hospitals to the selected tertiary hospitals for delivery to SAT and IMCH are about 22 percent and 27 percent respectively.

Table 4: Women referred from other public and private hospitals to selected hospitals

Characteristics	SAT Hospital TVPM(Percent)	IMCH ,Kozhikode (Percent)	Total(Percent)
Referred cases			
No	41.1	79.1	62.9
Yes	56.7	20.5	36.0
Self-referred	2.1	0.3	1.1
Total	892	1199	2091
Institution from which reference made			
W&C	18.5	14.8	17.3
DH	5.5	13.6	8.1
General Hospital	15.8	16.0	15.9
TH	33.5	16.4	28.0
CHC/PHC	1.3	1.6	1.4
MCH	0.6	10.0	3.6
ESI	2.9	0.4	2.1
Private	21.5	26.8	23.2
others	0.4	0.4	0.4
Month at reference			
1st trimester	8	0.8	5.7
2nd trimester	26.3	15.2	22.7
3rd trimester	65.7	84	71.6
Total	525	250	775

Figure.1: Major reasons for reference from other hospitals to selected Tertiary hospitals



Similarly referral cases from district hospitals to SAT Hospital and IMCH are about 6 percent and 14 percent respectively. The other referral institutions are Medical College Hospitals, CHC/ PHC, ESI hospitals and other private hospitals. Most of the pregnant women were referred in their third trimester. About 66 percent of the women were referred on third trimester to SAT hospital and 84 percent of the women were referred on third trimester to IMCH Kozhikode.

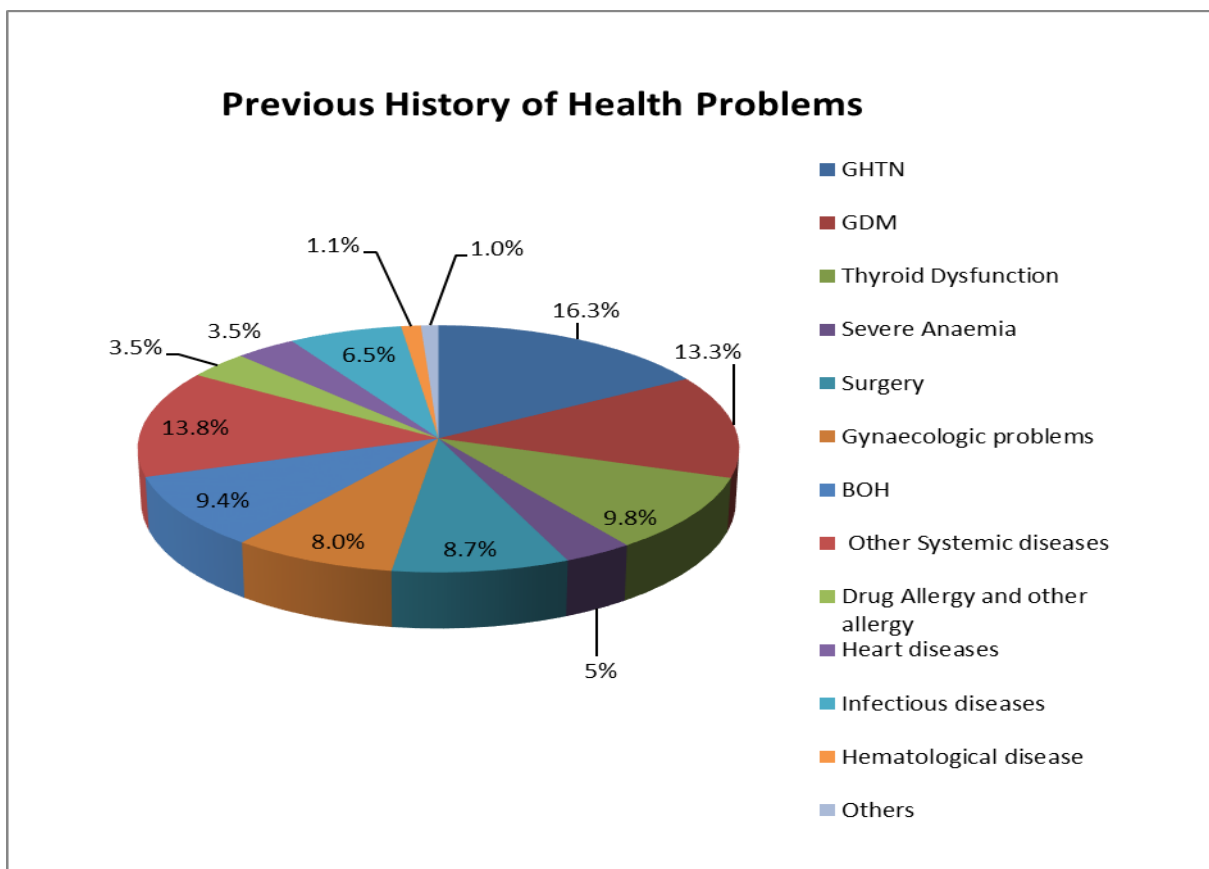
Major reasons for reference from other hospitals to the selected tertiary hospitals are given in Figure 1. The highest proportion of the referral cases were due to high blood pressure (16 percent), followed by amniotic fluid abnormalities (Polyhydramnios and Oligohydramnios) about 15 percent, gynaecological problems like fibroid/cystic/PCOD complications, placental abnormalities, twin or triplet pregnancy with complications, bleeding PV, preterm labour pain etc. (12 percent), uncontrolled GDM (10 percent), severe IUGR(7 percent), foetal distress (6.7 percent), other systemic diseases like bronchial asthma, seizure disorder etc. (60.5 percent) and previous LSCS and abnormal presentation (5.2 percent). About 3.5 percent of the pregnant women were referred due to hematological problems like low or high counts of platelets in blood, absent diastolic flow in uterine artery and 2.6 percent due to infectious diseases. Other reasons for reference are due to previous OBH, heart disease complication, severe Anemia and due to both high blood pressure and GDM complication. A small proportion was referred due to pre-eclampsia and PROM. About four percent of the women were referred due to 'other' reasons which mainly included the non-availability of gynaecologist in the nearby Taluk hospitals at the time of referral period.

8. Previous history of health problems among selected Sample Women

The history of previous health problems among the selected sample women from the two tertiary hospitals in Kerala are given in Figure 2 which shows (reported as per the medical records of women) that about 16 percent of the sample women have experienced gestational hypertension during their previous pregnancy. About 13 percent of the pregnant women have experienced gestational diabetes previously, one out of ten women have thyroid dysfunction, each eight percent of women have experienced any kind of surgery or

gynaecological problems, one out of ten women have experienced some bad obstetric histories like, abortions , still births, IUDs or any other obstetric history previously.

Figure 2: Previous history of health problems among selected sample women



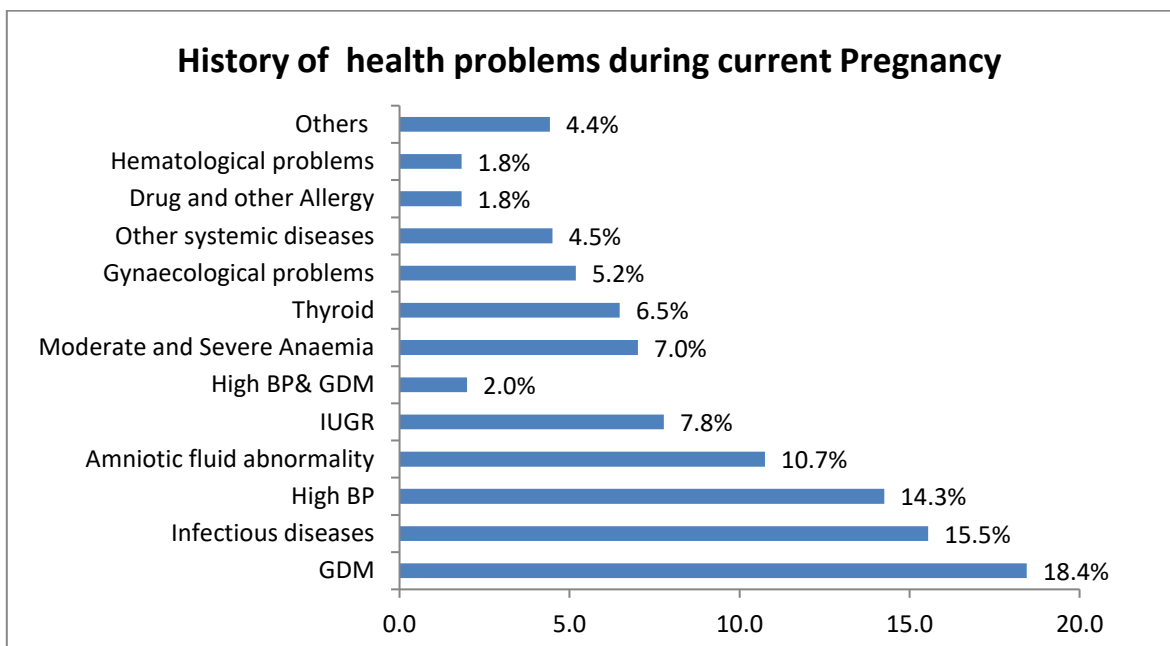
About 14 percent of women have previously experienced other systemic diseases. About seven percent of women have faced some infectious diseases including HBsAg +ve cases, nearly each four percent of women have identified heart disease or some drug or other allergies. About three percent of sample women have experienced severe anemia and one percent has experienced some hematological problems before the current pregnancy.

9. History of Health problems during current pregnancy

Both the selected hospitals are functions as tertiary level referral hospitals and most of the women delivered here are referred with some complications during pregnancy from the primary or secondary level hospitals from the district or the hospitals from nearby districts.

Figure 3 provides the proportion of different health problems during current pregnancy among women who have problems and received tertiary care and treatment from SAT hospital, Thiruvananthapuram and IMCH, Kozhikode during pregnancy and at the time of delivery.

Figure 3: History of health problems during current pregnancy



It is evident from the Figure. 3 that the highest proportion of sample women who have experienced the problem of GDM (18.4 percent) followed by infectious diseases (15.5 percent), high blood pressure (14 percent), amniotic fluid abnormalities (11 percent), IUGR (8 percent), moderate and severe anemia (7 percent), thyroid dysfunction (about seven percent), gynaecologic problems (5 percent), other systemic diseases (4.5 percent) and hematological problems (2 percent) respectively.

10. Anemia, GDM, PIH and Thyroid dysfunction among the sample women and their treatment seeking behaviour

Anemia is the most common nutritional problem in the world and has long been recognized as a major public health problem especially in developing countries like India. It is one of the leading causes of disabilities (WHO, 2011). Anemia at any age has significant negative

impact on the health of an individual varying from poor scholastic performance and cognitive impairment in children to one of the major indirect causes of maternal mortalities (Gregor&Ani , 2001). National Family Health Survey (NFHS-3) reveals the prevalence of anemia to be 70-80% in children, 70% in pregnant women and 24% in adult men. Table 5 gives the details of pregnant women who are anaemic during pregnancy.

Table 5:Proportion of Sample women affected by Anemia, GDM, PIH and Thyroid dysfunction and treatment seeking

Characteristics	SAT hospital TVPM (Percent)	IMCH ,Kozhikode (Percent)	Total(Percent)
Anemia noted during pregnancy			
No	75.2	88.2	82.6
Yes	24.8	11.8	17.4
Total	892	1199	2091
Anemia treated with	N=221	N=142	N=363
Oral Iron	64.4	58.5	62.1
Blood transfusion	13.1	19.0	15.4
Oral iron+ blood transfusion	2.7	2.1	2.5
Injectction	13.1	14.1	13.5
Through diet	6.8	6.3	6.9
Month at Which Anemiaidentified			
1st trimester	18.4	18.9	18.6
2nd trimester	44.1	22.1	35.1
3rd trimester	37.5	58.9	46.3
Diabetes noted during pregnancy			
No	64.7	71.5	68.6
Yes	35.3	28.5	31.4
Total	892	1199	2091
Month at Which diabetes identified	N=315	N=342	N=657
1st trimester	20.6	10.2	15.2
2nd trimester	37.1	34.8	35.9
3rd trimester	42.2	55.0	48.9
Diabetes treated with			
MNT	61.0	52.3	56.5
Insulin	30.5	43.0	37.0
Tablet&Insulin	2.5	1.2	1.8
Tablets	5.1	2.6	3.8
PIH noted during pregnancy			
No	79.6	82.9	81.5
Yes	20.4	17.1	18.5
Total	892	1199	2091

Month at Which PIHidentified	N=182	N=205	N=387
1st trimester	17.6	11.7	14.5
2nd trimester	26.9	20.5	23.5
3rd trimester	55.5	67.3	61.8
HTN	0	0.5	0.2
PIH treated with			
Not treated	3.3	3.0	3.2
Nicardia	48.6	60.8	55.0
Labetalol	20.8	10.3	15.2
Emdopa	11.5	2.5	6.7
Nicardia&labetalol	6.0	6.9	6.5
Injection	3.8	7.8	5.9
Nicardia&MGso4	2.7	2.5	2.6
Ecospirin	1.6	6.4	4.1
Emdopa+Nicardia+MGso4	1.6	0.0	0.8
Thyroid dysfunction noted during pregnancy			
No	84.9	94.7	90.5
Yes	15.1	5.3	9.5
Total	892	1199	2091
Type of treatment	N=135	N=63	N=198
Hypo	97.0	93.7	96.0
Hyper	2.2	4.8	3.0
Month at Which Thyroid dysfunction identified			
1st trimester	30.6	29.0	30.1
2nd trimester	35.8	29.0	33.7
3rd trimester	18.7	12.9	16.8
before pregnancy	14.9	29.0	19.4
Thyroid treated with			
Not treated	1.5	1.6	1.5
Thyronorm	51.0	27.0	44.2
Eltroxin	27.4	63.5	39.6
L-Thyroxine	12.7	4.8	10.2
Medicine not taken	5.2	1.6	4.1
others	2.2	1.6	0.5

About one fourth of the pregnant women who were taken from SAT hospital Thiruvananthapuram and one out of ten women who were taken from IMCH Kozhikode are reported as anaemic. It is noted that about 59 percent of pregnant women from IMC, KKozhikode and about 38 percent of pregnant women from SAT hospital Thiruvananthapuram who were identified as anemic in their third trimester. About 19 percent of pregnant women were identified as anemic in their first trimester. About six out of ten women were treated with oral iron, 15 percent of pregnant women who were under

gone blood transfusion and about 14 percent of pregnant women were treated with iron injections.

Gestational diabetes mellitus (GDM), which is defined as the onset or recognition of glucose intolerance during pregnancy, is associated with an increased risk of prenatal morbidity and mortality. The medical records of about 35 percent of pregnant women from SAT hospital and 29 percent of pregnant women from IMCH, Kozhikode show that they have GDM during the current pregnancy period. About six out of ten sample women selected from SAT hospital and five out of ten women from IMCH Kozhikode were treated with MNT. Regarding the treatment with insulin, four out of ten women from IMCH, Kozhikode and three out of ten women from SAT hospital were treated with insulin.

PIH is a major pregnancy complication associated with premature delivery, intra-uterine growth retardation (IUGR), abruptionplacentae, and intra-uterine death, as well as maternal morbidity and mortality. Pregnancy induced hypertension (PIH) is defined as BP \geq 140/90 mmHg, taken after a period of rest on two occasions or \geq 160/110 mmHg on one occasion in a previously normotensive woman. As far as PIH is concerned, about two out of ten pregnant women selected from both the tertiary hospitals were suffering from PIH during the current pregnancy period. PIH was identified among more than half of the sample women in their third trimester. Regarding the treatment seeking behavior for PIH among the above women, majority of them were treated with or consumed anti- hypertensive drugs like tablets of Nicardia, Labetalol, Emdopa and Ecosprin during pregnancy period.

Thyroid dysfunction is another health issue which affects many aspects of pregnancy and post-partum health, as well as the health of the baby. Finding from the present study shows that about 10 percent of the totalsample women have experienced thyroid dysfunction, the above proportion among pregnant women selected from SAT Hospital (15.1 percent) is three times more than that among the women selected from IMCH Kozhikode (5.3 percent). Result shows that higher proportion of women from southern most districts has experienced thyroid dysfunction during pregnancy than women from northern districts in Kerala. Regarding the type of thyroid dysfunction, majority of women have experienced

hypothyroidism. Hypothyroidism is associated with a higher rate of complications, such as spontaneous abortion, preeclampsia, and premature birth. Most of the diseased were identified the problem of thyroid in first or second trimester. Along with ANC checkup now the testing of thyroid function is also mandatory and the testing is also available on free of cost in the tertiary hospitals. About 98.5 percent of the affected women were treated for the disease.

11. Profile of anaemic women

Anemia was classified as per the World Health Organization (WHO) grading criteria is taken to be 11 g/dL. WHO further divides Anemia in pregnancy in to mild Anemia (haemoglobin 10-10.9 g/dl), moderate Anemia (haemoglobin 7.0-9.9 g/dl) and severe anemia (haemoglobin <7 g/dL). This criteria is followed in the present study. Out of the total 2091 sample women, 17.4 percent (363 women) are identified as anaemic and is evident from Figure 4.

Figure 4: Proportion of anaemic women

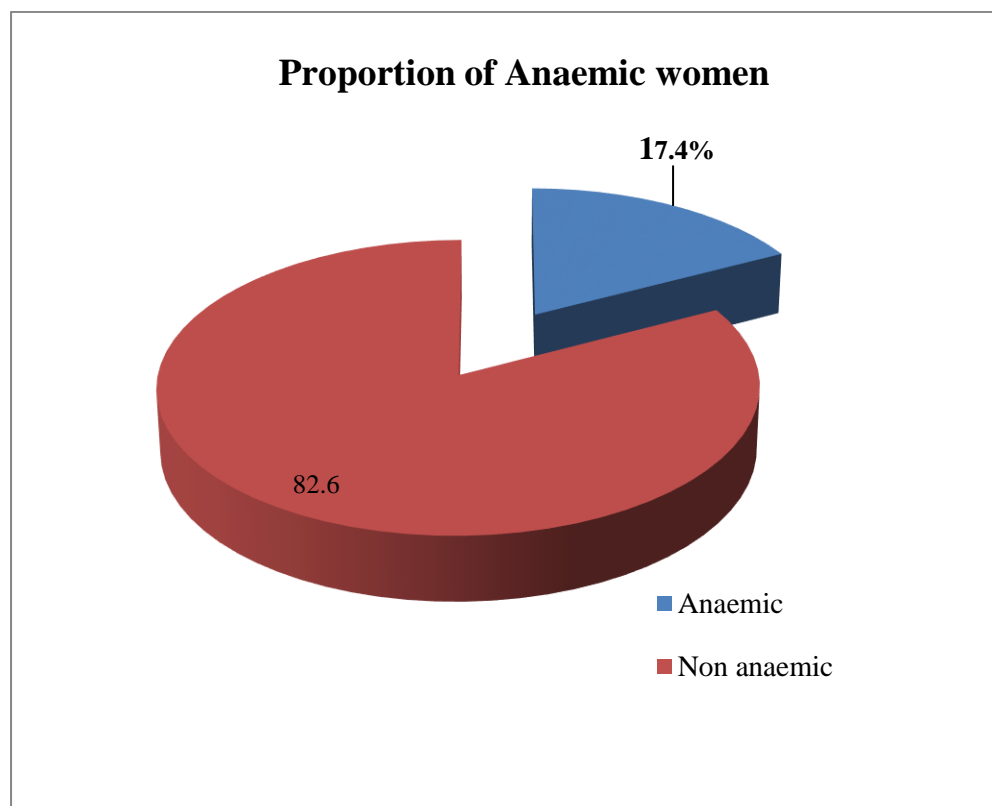


Table 6: Characteristics of sample womenby Anemia

Characteristics of women	Non Anaemic N=1728	Anaemic N=363
Age		
≤24	45.6	48.2
≥25	54.4	51.8
Social Status		
APL	18.8	23.1
BPL	81.2	76.9
District***		
Tvpm	38.8	60.9
Kozhikode	61.2	39.1
Education of women		
≤10	22.1	25.1
≥11	77.9	74.9
Gravida		
≤2	80.1	75.5
≥3	19.9	24.5
Parity		
≤2	87.0	83.7
≥3	13.0	16.3
Type of delivery***		
Normal	58.6	51.5
LSCS/ Assisted	41.4	48.5
Current delivery		
Full term	83.6	79.3
Pre-term	16.4	20.7
BMI		
<18.4	2.3	4.1
others	97.7	95.9
Infertility treated		
Not treated	90.3	91.7
Treated	9.7	8.3
Previous Abortion		
No	82.1	78.6
Yes	17.9	21.4

*P<.01, **P<0.05,***P<.001

Among the identified anaemic women whose Hb level less than 11 g/dL, about 11 percent have mild Anemia, around 6 percent have moderate Anemia(Hb level ranges from 7g/dL

to 9.9 g/dL) and three women are identified as severely anaemic (Hb less than seven g/dL). Table 6 depicts that among the total affected women, 48 percent are in the age group less than 25 years and about 52 percent belongs to the age group of 25 years and above.

Social status of the women shows that about three fourth (77 percent) of the anaemic women belong to the BPL category. Considering the regions from which the sample women selected, women from southernmost districts (women selected from SAT hospital Thiruvananthapuram) are identified as more anaemic than women selected from the northern region(from IMCH Kozhikode). Educational level of the sample women shows that three fourth of the women who are identified as anaemic have their level of education as eleventh class and above. Women have one or two pregnancies are more anaemic than women who have three or more gravid. Similarly about 8 out of ten women who identified as anaemic are in the first or second parity women. About 49 percent of anaemic women undergone LSCS / Assisted deliveries while the corresponding proportion among non anaemic women is 41 percent. Anaemic women have experienced higher proportion (about a difference of 5 percent points) of pre-term delivery than the non anaemic women. Considering the BMI of women, it is noted that the proportion of anaemic women who have BMI below 18.5 is little higher than that of non anaemic women in this category.

12. Profile of women with GDM

Glucose Tolerance Test Between weeks 24 and 28, almost all pregnant women are screened for gestational diabetes mellitus (GDM). If women have specific risks, they might take it earlier. The test can't diagnose GDM, but will determine whether further testing is necessary. From the case records it is found that 657 pregnant women (31.4 percent) have GDM out of the total of 2091 selected sample women. Figure 5 shows the proportion of sample women have GDM.

Figure 5: Proportion of sample women has GDM

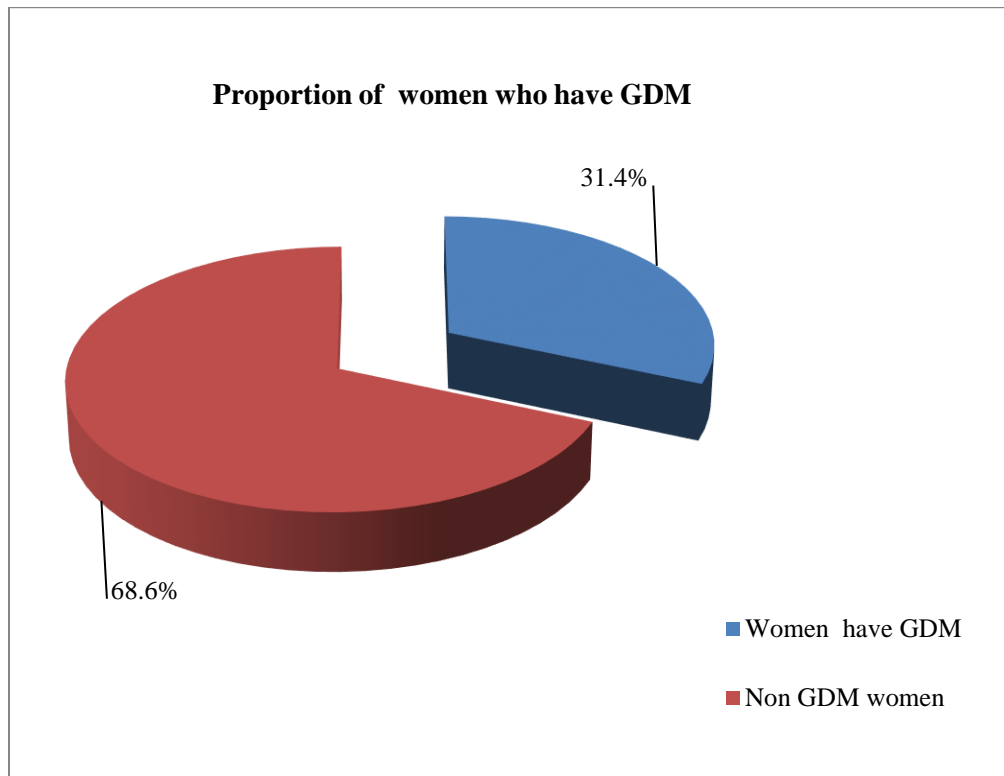


Table 7 depicts the profile of sample women by GDM. Regarding the age of pregnant women, about 64 percent of women who have GDM are in the age group 25 years and above. Women who have three or more pregnancies have more chances to become diabetic than women who have three or more gravid without GDM who have more than three pregnancies. Considering the type of delivery women with GDM have higher proportion of C-section or assisted deliveries than women without GDM.

Among women with GDM, the proportion of occurrence of birth of big babies (babies with birth weight greater than 3.5 kg) is higher than that of non GDM women. The proportion of women treated for infertility has more chances to become GDM. Findings show that women who experienced pregnancy wastage have more chances of getting GDM in the forthcoming pregnancy. There is no significant relationship of women who have GDM with their social status, level of educational and parity.

Table 7: Characteristics of sample women by GDM

Characteristics of women	Non GDM women N=1434	Women who have GDM N=657
Age***		
≤24	50.6	36.2
≥25	49.4	63.8
Social Status		
APL	19.7	19.3
BPL	80.3	80.7
District***		
Tvpm	40.2	47.9
Kozhikode	59.8	52.1
Education of women		
≤10	22.2	23.6
≥11	77.8	76.4
Gravida**		
≤2	76.6	71.7
≥3	23.4	28.3
Parity		
≤2	86.6	86.1
≥3	13.4	13.9
Type of delivery***		
Normal	59.6	52.4
LSCS/ Assisted	40.4	47.6
Size of Baby***		
Normal	92.3	87.8
Big baby(≥3.5 Kg)	7.7	12.2
Delivery		
Full term	82.4	83.7
Pre-term	17.6	16.3
BMI		
Normal	52.6	49.7
Over weight and obese	47.4	50.3
Infertility treated***		
Not treated	92.0	87.4
Treated	8.0	12.6
Pregnancy wastage***		
No	77.5	71.1
Yes	22.5	28.9

*p< .01, **p<0.05,***p< .001

13. Profile of sample women with PIH

Pregnancy-induced hypertension affects 2-10% of all pregnancy with results of many maternal and foetal complications. Early detection and treatment may reduce the complications in pregnancy outcome. PIH is a condition of elevated blood pressure level generally detected during pregnancy and become normal soon after delivery, resulting in immediate and long-term effects to both mother and child. Identifying women for the possibility of PIH is depended on the presence of risk factors, PIH is usually confirmed after the 20th week of pregnancy. But PIH can affect in any stage of gestation. The factors that can influence the pregnant women to develop

PIH include age, BMI, gravidity, parity, family history and obstetric history (Sivakumar & Rajasekeran, 2014). From the medical records of selected women it is found that out of the total 2091 sample women, 387 are hypertensive women during the current pregnancy. Figure 6 shows the proportion of pregnancy induced hypertensive sample women in the current study.

Figure 6: Proportion of sample women have PIH during current pregnancy

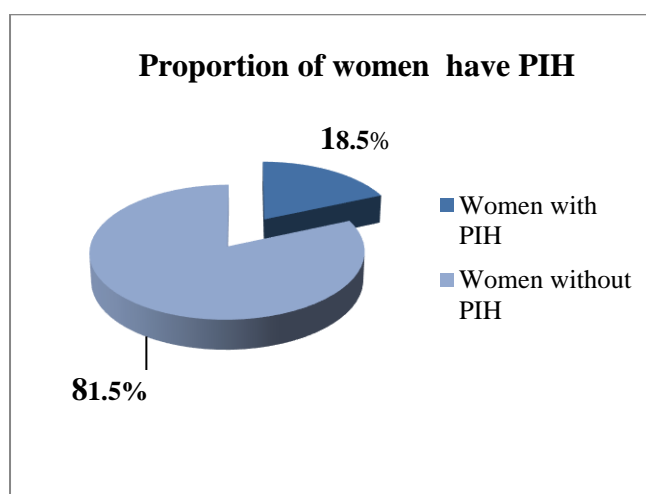


Table 8 shows that about 64 percent of the women with PIH are in the age group of 25 years and above and it is 52 percent among normotensive women. Finding shows that about 68 percent of pregnant women with PIH were having primi or second gravida. Similarly about 82 percent of women with PIH are having the first or second parity.

Table 8: Characteristics of sample women by PIH

Characteristics of women	Normotensive	Women who have PIH
Age***		
≤24	48.24	36.43
≥25	51.8	63.6
Social Status		
APL	19.2	20.9
BPL	80.8	79.1
District		
Thiruvananthapuram	41.7	47.0
Kozhikode	58.3	53.0
Education of women		
≤10	22.8	21.7
≥11	77.2	78.3
Gravida***		
≤2	76.8	67.7
≥3	23.2	32.3
Parity**		
≤2	87.4	82.4
≥3	12.6	17.6
Type of delivery***		
Normal	59.9	46.3
LSCS/ Assisted	40.1	53.7
Size of Baby		
Normal	91.0	90.4
Big baby(Birth weight ≥3.5 Kg)	9.0	9.6
Delivery***		
Full term	85.5	71.1
Pre-term	14.5	28.9
BMI***		
Normal	54.5	39.8
Over weight and obese	45.5	60.2
Infertility treated***		
Not treated	91.5	86.3
Treated	8.5	13.7
Pregnancy wastage***		
No	77.4	66.9
Yes	22.6	33.1

*P< .01, **P<0.05, ***P< .001

Considering the mode of delivery, 54 percent of the women with PIH were undergone LSCS or assisted deliveries. About 29 percent of the women with PIH have experienced premature birth or preterm delivery while the corresponding proportion for normotensive women is 15 percent. Nearly 13 percent of the women with PIH were previously treated for infertility while the same proportion for normotensive women is eight percent. Previous pregnancy wastage is also having significant relationship with PIH.

BMI also has significant relationship with PIH. About 60 percent of women with PIH are in the category of overweight or obese but the corresponding proportion for normotensive is about 46 percent. About 33 percent of women with PIH have experienced pregnancy wastage previously while the corresponding figure for normotensive women is 23 percent. Social status, level of education and birth weight of baby are not found to have any significant relationship with PIH.

14. Profile of selected women has Thyroid dysfunction.

Medical records show that 198 women (9.5 percent) out of 2091 women have thyroid dysfunction. Considering the age of women selected for the study, about 62 percent of the women have thyroid dysfunction is in the age group of 25 years and above and it is 54 percent for women without thyroid dysfunction. About one third of the women with thyroid dysfunction are belongs to the BPL category. It is found that 68 percent of the women with thyroid dysfunction are from SAT hospital Thiruvananthapuram. Birth weight or size of the baby, women treated for fertility and previous pregnancy wastages are also influencing factors associated with thyroid dysfunction among women (See Table 9).

Table 9: Characteristics of sample women by Thyroid dysfunction

Characteristics of women	No thyroid dysfunction	Have thyroid dysfunction
Age		
≤24	46.9	38.4
≥25	53.1	61.6
Social Status		
APL	19.1	23.7
BPL	80.9	76.3

District***		
Tyvm	40.0	68.2
Kozhikode	60.0	31.8
Education of women		
≤10	22.6	22.7
≥11	77.4	77.3
Gravida		
≤2	75.3	73.2
≥3	24.7	26.8
Parity		
≤2	86.3	87.9
≥3	13.7	12.1
Type of delivery		
Normal	57.4	57.1
LSCS/ Assisted	42.6	42.9
Size of Baby**		
Normal	90.4	95.5
Big baby	9.6	4.5
Delivery		
Full term	83.2	79.3
Pre-term	16.8	20.7
BMI		
Normal	52.1	48.1
Over weight and obese	47.9	51.9
Infertility treated***		
Not treated	91.0	86.4
Treated	9.0	13.6
Pregnancy wastage***		
No	76.7	64.1
Yes	23.3	35.9

*P< .01, **P<0.05,***P< .001

15. Women who have experienced health problems like Anemia, GDM, PIH and Thyroid dysfunction by mode of delivery

The procedure of C-section is often used in cases where the mother has had a previous C-section. Dystocia or difficult labour is the other common cause of C-sections. Difficult labour is commonly caused by one of the three following conditions: abnormalities in the mother's birth canal; abnormalities in the position of the foetus; or abnormalities in the

labour, including weak or infrequent contractions. Another major factor is foetal distress, a condition where the foetus is not getting enough oxygen. Foetal distress is often related to abnormalities in the position of the foetus or abnormalities in the birth canal, causing reduced blood flow through the placenta. Other conditions also can make C-section advisable, such as vaginal herpes, hypertension, and diabetes in the mother. Evidence from large scale surveys like NFHS 1st, 2nd and 3rd round, DLHS 1st, 2nd and 3rd round and other research studies as well as HMIS data in Kerala indicate that there is a growing tendency for caesarean section deliveries, especially during complications confronted at the time of pregnancy and delivery. DLHS- 4 reports that about 35.3 percent of child births in Kerala after January 1, 2009 were done through caesarean section.

Figure 7: Mode of delivery among selected women

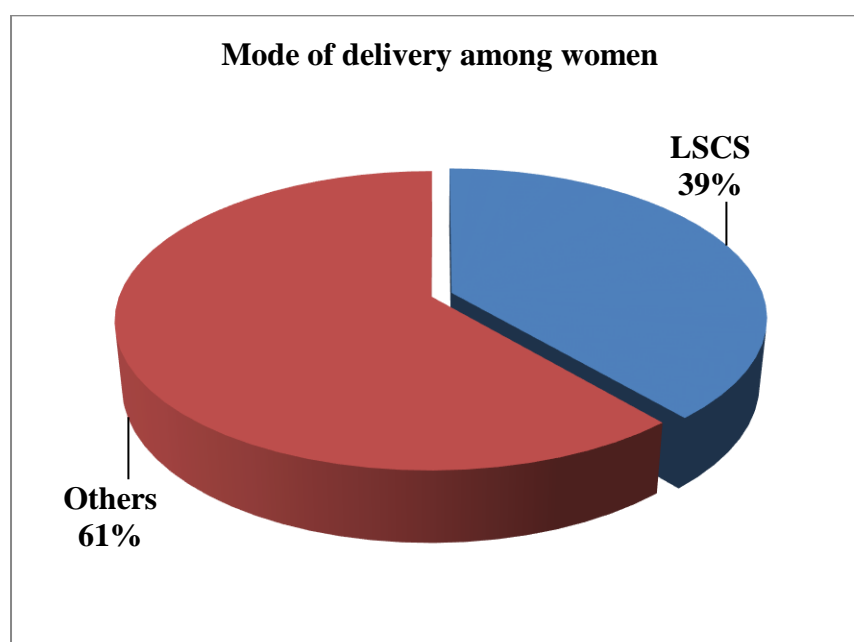


Figure 7 shows that among selected women, about 39 percent of women in the present study were experienced their last birth through LSCS.

We have analyzed the mode of current delivery among women who have the health issues like Anemia, GDM, PIH and thyroid dysfunction in present study and the findings are given in the Table 10.

Table 10: Mode of delivery by health problems of sample women

Health problems	Mode of delivery		Odds Ratio	95% CI	
	Normal /Assisted	LSCS			
Anemia*			1.26	1.00	1.58
No	83.9	80.6			
yes	16.1	19.4			
GDM**			1.33	1.10	1.61
No	71.0	64.8			
Yes	29.0	35.2			
PIH***			1.76	1.41	2.19
No	84.9	76.1			
Yes	15.1	23.9			
Thyroid dysfunction					
No	90.6	90.5			
Yes	9.4	9.5			

*P< .01, **P<0.05,***P< .001

The proportion of LSCS cases who report anemia is a higher at 19.4 percent compared to women who had a normal/assisted delivery reporting prevalence of anemia (16.1 percent). The odds of this occurrence is 26 percent. About 35 percent of women have reported GDM among women who had undergone LSCS in contrast to 29 percent among women who had a normal delivery with odds ratio of 33 percent. Similarly there is 76 percent more risk among women undergoing LSCS to report PIH (23.9 percent among LSCS cases as against 15.1 percent among normal delivery cases). Thyroid dysfunction has no significant association with type of delivery among women.

16. Conclusion and suggestions

Kerala is one among the better performing states of the country and has the highest literacy rate and the better infant and maternal mortality rate. Better treatment facilities are available and treatment seeking behaviour is also good in Kerala. Some health issues like NCD problems are reported to be higher in the state compared to other states in India. The study concludes that along with other gynaecologic and obstetric factors, health problems or risk factors like gestational diabetes mellitus, pregnancy induced hypertension and Anemia during pregnancy is higher among LSCS deliveries in Kerala.

The study finding shows that thyroid dysfunction among women leads to a cause of infertility among women. Elder cohort women are more prone to GDM and PIH during pregnancy. Women with PIH have more chances of preterm delivery than normotensive women. Age, gravid, BMI and previous pregnancy wastage of women have significant relationship with PIH. Social status, level of education and birth weight of baby are not found to have any significant relationship with PIH. Pregnancy-induced hypertension is associated with multiple complications in the mother and baby, and particularly preterm delivery. Complications such as HELLP syndrome can sometimes prove fatal to mother and foetus.

The prevalence of anemia is lower in Kerala compared to other Indian states. Considering the proportion of Anemia among women during pregnancy, women have one or two pregnancies are more anaemic than women who have three or more gravid. Similarly a higher proportion of women who have Anemia are in the first or second parity. Anaemic women have experienced higher proportion of pre-term delivery than the non anaemic women. Considering the BMI of women, it is noted that the proportion of anaemic women who have BMI below 18.5 is little higher than that of non anaemic women in this category. Women have higher number of pregnancies; taken treatment for infertility and those who experienced previous pregnancy wastages have more chances to become GDM in their future pregnancy. Gestational diabetes and obesity are the common metabolic abnormalities occurring during pregnancy. Decreased maternal pre gravid insulin sensitivity (insulin resistance) coupled with an inadequate insulin response are the pathophysiologic mechanisms underlying, the development of GDM. Insulin regulated carbohydrate, lipid and protein metabolism are all affected to a variable degree. Decreased maternal insulin sensitivity in women with GDM may increase nutrient availability to foetus, possibly accounting for an increased risk of foetal overgrowth and adiposity. Maintaining healthy body weight will protect mothers from development of such metabolic diseases. Present study has shown that increasing maternal age and BMI increase the risk for development of GDM. There was a statistically significant relation between increased maternal age and the risk of development of GDM. Similarly, the relation between increased maternal BMI and

risk of development of GDM was also statistically significant. A change in lifestyle aiming at a healthy pre pregnant BMI may significantly lower the incidence of GDM.

Findings show that higher proportion of women from southern most districts has experienced thyroid dysfunction during pregnancy than women from northern districts in Kerala. Birth weight or size of the baby, women treated for fertility and previous pregnancy wastages are also influencing factors associated with thyroid dysfunction among women. The study findings also indicate that women with PIH, GDM and anaemia during pregnancy have a higher chance to undergo C section delivery. This may be one among the reasons for increasing the number of C- section deliveries in Kerala. Present study recommends mothers to have a long term healthy life style with adequate diet and exercise so that they can have a healthy and uneventful pregnancy. Since the proportion of Anemia, GDM, PIH and thyroid dysfunction are found to be higher among sample women. It is true that the saying of 'prevention is better than cure' in the above cases. It points urgent need for screening all the antenatal women for the above health problems, especially in a population where overall prevalence is very high. Monitoring and the timely diagnosis of the above problems during every antenatal visit are also essential. Need for screening and assessment even at primary health care level is mandatory, especially for early referrals and prevents maternal and neonatal complications.

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