Original Research Article

Determining the Risk Factors and Causes of Stillbirths at GPHC

Abstract

Background

Although a worldwide issue, the burden of stillbirths is mostly upon middle- and low-income countries.[1][2] SDG for stillbirths has a target of 12 or fewer stillbirths per 1000 total births in all countries. Guyana, a middle-income country at the brink of achieving the upper limit for UN's SDG for stillbirths, in the year 2030.[1][4][5] GPHC is the main tertiary, referral, specialist hospital in Guyana.

Objectives

This study aimed to determine the stillbirth rate at GPHC during the period of January 1 to July 31, 2021. It also aimed to determine the number of stillbirth cases that were being managed as inpatients vs referral, the number of stillbirth cases that were fresh vs macerated and also the main risk factors and causes of stillbirths at GPHC during the period January 1 to July 31, 2021

Methodology

A quantitative, retrospective, case control study was conducted. Cases included 37 stillbirths occurring at GPHC January 1 to July 31, 2021 that were 28 weeks gestation and older. Controls were 37 livebirths selected at random, meeting the same inclusion criteria as cases. Maternal medical records for cases and controls were review and descriptive statistics was used to analyse data extracted from charts.

Results/Conclusion

Stillbirth rate at GPHC from January 1 to July 31, 2021 was found to be 11.96 per 1000 births. More stillbirths were managed as referral (24 cases) vs inpatients (13 cases). Most stillbirths were macerated (68.57%) vs fresh (31.43%). Possible risk factors of stillbirth at GPHC include *male sex, referral management, HTN disease, DM disease, not having antenatal labs done, having less than 8 ANC clinic visits, multiparity, preterm and post term gestation, advanced maternal age and being 35 and older.* Most common cause of stillbirths was placenta abruption. Most common maternal condition is complications of placenta cord and membrane. The most common antepartum cause is foetal death unspecified, while the most common intrapartum cause was is acute intrapartum event.

Background Information

Stillbirths are an issue in all of the world.[1] [2] In the year 2015 alone, the stillbirth rate was noted to be 18.4 per 1000 births.[4] Although, it is a global problem, the burden of stillbirths is experienced more in middle- and low-income countries.[2] What's even more appalling is, the majority of the causes of stillbirths are preventable.[2]

UNs Sustainable Development Goals (SDG), has set a target for 12 stillbirths or fewer per 1000 total births for every country by the year 2030.[4] Guyana, a middle-income country in South America, is at the precipice of the upper limit of SDG target for stillbirths, with a rate of 13.8 (per 1000 total births) in the year 2019.[1] The trend of the stillbirth rate in this country is also decreasing when compared to previous years.[1] In order for Guyana to achieve UN's SDG by the next 9 years, strategies need to be put in place to eliminate preventable causes of stillbirths. This would entail the regular assessment of country's stillbirth rate and an analysis of causes of stillbirths, that will help guide the implementation of new strategies in maternal and child healthcare (MCH).

Georgetown Public Hospital Corporation (GPHC) is the largest hospital in Guyana and serves as a regional hospital and main tertiary referral health care institution. It is a specialist hospital, inclusive of an Obstetrics and Gynaecological (OB/GYN) department. The OB/GYN department

follows standardised protocols adopted from ACOG and other international bodies with the aim of reducing the number of maternal and child morbidity and mortality. The stillbirth rate for a 7 months period from January to July, 2019 was 15.8 (per 1000 total births), considerably higher that than country's stillbirth rate in 2019, possibly attributed to high number of referral cases.[5]

This study aimed to determine the stillbirth rate at GPHC from the period of January to July, 2021 and to distinguish the stillbirth cases that were being managed as inpatients vs the referral cases. It also aimed to highlight the main causes identified for stillbirths and assess their modifiability.

Literature Review

Stillbirths cause devastation worldwide. However, the burden of stillbirths is unequally shared, with the majority of the cases occurring in the middle-and low-income countries, with a mere 2% occurring in high-income, developed countries.[1][2].

Sun et al did a study which showed the stillbirth rate in Taiwan (a high-income country) was 2.4 per 1000 births from 2006 to 2013 – very low, when compared to a study done by *Okonofua et al,* at six referral hospitals in Nigeria (a lower middle-income country) over a six-month period, which revealed an average stillbirth rate of 39.6 per 1000 births.[14][17]

Not only are there stark differences in the stillbirth rate in high-income vs low- and middle-income countries, but disparities also exist in risk factors for stillbirths in these countries. In low- and middle-income countries, where there are many rural areas with limited resources healthcare institutions, if obstetric emergencies arise, patients would need to be transfered to specialist healthcare institutions. Most of the times these obstetric emergencies are identified at late stages due to the limited resources for intrapartum monitoring. *Egbe et al* and *Okonofua et al* identified this phenomenon as a major risk factor in low- and middle-income countries. [13][17][18][19]

Egbe et al, also highlighted other risk factors for stillbirths that were identified in their study at 2 hospitals in Cameroon (lower middle-income country): anaemia, preeclampsia, late booking visits, labour dystocia, preterm birth and low birth weight. *Lakshmi et al* also identified the following risk factor in a study conducted in a hospital in India (low middle income country): maternal age, low socio-economic status, obesity, maternal sleep position during pregnancy, primi-parity, hypertension and febrile illness. [23] Similar risk factors were highlighted by *Mutihir et al* in their study.[22]

Risk factors for stillbirths in high income countries involved less infectious causes and obstetric issues. *Sun et al* among other studies found strong associations with stillbirths and the following factors: single women, female baby, maternal obesity, small for gestational age and large for gestational age infants, and women with hypertension, diabetes mellitus, anaemia, and oligohydramnios or polyhydramnios.[10][14][15]

Identifying whether a stillbirth is fresh vs macerated is very important in distinguishing whether the cause could have been due to some problem in the obstetric care or antenatal care respectively. [22] In developed, high-income countries where post-mortem, placental histology and karyotyping help to determine cause of death for stillbirths.[11][16] Nevertheless, even with these advanced technologies, majority of the causes of stillbirths, like in developing countries remain unknown. [16] Preterm birth, abruption, congenital malformations, congenital abnormalities, placental and umbilical abnormalities are some identified causes of stillbirths.[16][20][21]

Study Goals and Objectives

The aim of this research was:

1. To determine the incidence of stillbirths (stillbirth rate) during the period of January 1 to July 31, 2021 at the Georgetown Public Hospital Corporation (GPHC)
2. To determine the number of stillbirth cases at GPHC during January 1 to July 31, 2021 that were being managed as inpatients vs those who were referred from other health institutions
3. To ascertain how many stillbirths at GPHC during January 1 to July 31, 2021 were fresh vs macerated.
4. To determine the main risk factors and causes of stillbirths at GPHC during the period January 1 to July 31, 2021

Study Design

This research followed a quantitative, descriptive approach to conduct a retrospective, observational, case control study. The population of this study consisted of all the births recorded at the GPHC from the period of January 1 to July 31, 2021. The sample of cases included all stillbirths recorded at GPHC during the period January 1, 2021 to July 31, 2021 and, was selected based on the following criteria:

Inclusion Criteria

1. Still births recorded at GPHC from the period of January 1 to July 31, 2021
2. Stillbirths at 28 weeks gestation and older

Exclusion Criteria

1. Stillbirth occurring before January 1, 2021 and after July 31, 2021 at GPHC
2. Stillbirths less than 28 weeks gestation

The population of control for this study was all live births occurring during the period of January 1 to July 31, 2021.

The sample of controls was selected using the random sampling method. The sample size of controls was made to match the sample size of cases. Controls selected were based on the following criteria:

Inclusion Criteria

1. Livebirths recorded at GPHC from the period of January 1 to July 31, 2021
2. Livebirths at 28 weeks gestation and older

Exclusion Criteria

1. Livebirths recorded before January 1, 2021 and after July 31, 2021 at GPHC
2. Livebirths less than 28 weeks gestation

Methodology

Selecting Sample of Cases

All stillbirths that are delivered at GPHC are recorded in the *Maternity Ward Stillbirth Book*. The book included information under the following headings: *Name of patient that delivered, Age, Parity, Maturity by Dates, Address, Sex of Infant, Date of Delivery, Time of Delivery, Type of Delivery, Clinic Attended, Outcome of Delivery (Fresh vs Macerated), Remark/Dx.*

1. Stillbirths that met the requirements highlighted in the inclusion criteria for cases information were extracted from the book and placed in a table under similar headings as in the book. Those stillbirths formed the sample of cases, sample size equalling 37.

Selecting Sample of Controls

At the records department livebirth maternal charts are filed in folders of 25. Each folder of 25 came in a batch of four, with each chart in batch having the same serial number expecting for the last two digits, which ranged from 00 to 99. N.B: All batches did not have their full complement of charts.

1. Each chart in a batch was allocated a number in ascending order, starting with one.
2. These number allocations were entered into a random number generator and one chart was selected from each batch randomly.
3. The charts were selected in such a way, so that the number of charts per month were the same as the stillbirth cases noted to occur each month.

Extracting Data

1. The maternal charts for all unit cases and controls in the samples were pulled from the medical records.
2. The information extracted for cases and controls were inputted into two separate tables labelled cases and controls respectively.
3. Each patient was identified by their registration number on chart and the initials of first and last names; full names were excluded from table to maintain patient confidentiality.
4. The following information was extracted from each patient in the control sample, medical record: *Registration Number, Initial of First and Last Name, Date of Admission,*

Maternal Age, Date and Time of Delivery, Gender of Baby, Fate of Baby, Maturity of Pregnancy, Birth Weight, Inpatient vs Referral, GsPs, Maternal Morbidity, Toxic Habits, Trauma, Number of Antenatal Clinic Attendances, HTN and/or DM disease, Maternal Hb, Recent Obstetric Ultrasound Findings, Diagnosis on Admission, ROM >18hrs, Antenatal Labs Done, Type of Delivery. The same data was extracted from each case unit medical records.

Extracting Data on the Cause of Death of Stillbirths from cases charts

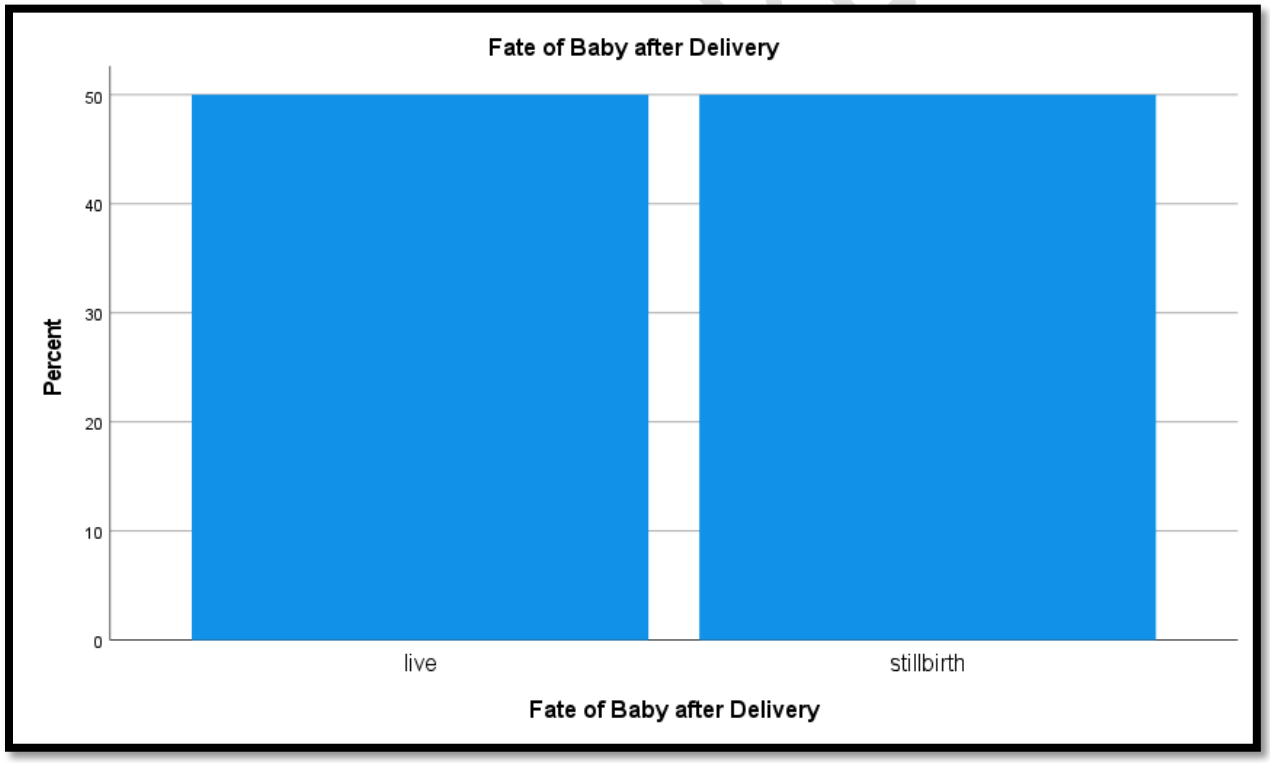
At GPHC it is compulsory that every stillbirth that occurs at the hospital will have a *Stillbirth Registry Form* and a *Medical Certificate of Stillbirth form* filled out by a senior staff on duty (ranging from the senior resident to a senior registrar/consultant. The cause of death of the stillbirth is usually indicated on both forms, which can be found in the maternal charts. Rarely autopsies are done on stillbirths unless such is recommended by a doctor. Usually, a little note is made in the chart to follow up autopsy report.

1. Cause of death was extracted from both forms to ensure they correspond.
2. The *ICD-PM Classification of cause death* was then determined for each stillbirth, and also whether Cause of Death was Preventable/ Non- Preventable.

Results

Table 1:Fate of Baby after Delivery					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	live	37	50.0	50.0	50.0
	stillbirth	37	50.0	50.0	100.0
	Total	74	100.0	100.0	

Figure 1: Fate of Baby after Delivery



Sample for cases and controls consisted of 37 stillbirths and 37 livebirths respectively. The frequency table and bar chart in figures 1 and 2 depicts the aforementioned information.

Stillbirth Rate Calculation

- *Total Number of Stillbirth recorded at GPHC from Jan 1, 2021 to Jul 31, 2021 =* **42**
- *Total Number of Stillbirths whose medical records were located from Jan 1, 2021 to Jul 31, 2021 =* **37**
- *Total Numbers of Births Occurring at GPHC from Jan 1, 2021 to Jul 31, 2021 =* **3, 094**
- *Stillbirth Rate at GPHC from Jan 1, 2021 to Jul 31, 2021 =* **13.57 per 1000 births**
- *Stillbirth Rate at GPHC from this study, from Jan 1, 2021 to Jul 31, 2021 =* **11.96 per 1000 births**

Table 2: Frequency Table

Variables	Categories	Stillbirths N (%)	Stillbirth %	Livebirths N (%)	Livebirths %
Sex of Baby	Male	22	**57.9**	16	**42.1**
	Female	13	**38.2**	21	**61.8**
Management in Hospital	Inpatient	13	**30.2**	30	**69.8**
	Referral	24	**77.4**	7	**22.6**
HTN Disease	HTN	16	**76.2**	5	**23.8**
	No HTN	21	**39.6**	32	**60.4**
DM Disease	DM	3	**60**	2	**40**
	No DM	34	**40**	35	**50.7**
Maternal Hb	Anaemia	9	**47.4**	10	**52.6**
	Normal Hb	27	**50**	27	**50**
Toxic Habits	Yes	2	**40**	3	**60**
	no	32	**48.5**	34	**51.5**
Trauma	Yes	1	**3.4**	0	**0**
	no	28	**96.6**	36	**100**
Antenatal Labs Done	Yes	28	**43.8**	36	**56.3**
	No	6	**85.7**	1	**14.3**
Type of	SVD	28	**50.9**	27	**49.1**

Delivery	LSCS	9	**47.4**	10	**52.6**
ROM<18hrs	Yes	22	**37.9**	36	**62.1**
	No	2	**66.7**	1	**33.3**
Antenatal USG Done	Yes	30	**45.5**	36	**54.5**
	No	5	**83.3**	1	**16.7**
Number of ANC Attendance	Less than 8 visits	23	**51.1**	22	**48.9**
	8 visits and above	6	**28.6**	15	**71.4**
Parity	Nulliparity	11	**44**	14	**56**
	Primiparity	3	**23.1**	10	**76.9**
	Multiparity	20	**66.7**	10	**33.3**
	Grand-multi parity	3	**50**	3	**50**
Gestational Age	28+0 to 31+6	13	**36.1**	0	**0**
	32+0 to 33+6	5	**13.9**	0	**0**
	34+0 to 36+6	11	**30.6**	3	**9.7**
	37+0 to 38+6	5	**13.9**	10	**32.3**
	39+0 to 41+6	1	**2.8**	18	**58.1**
	>42+0	1	**2.8**	0	**0**
Birth Weight	<1000g	5	**14.3**	0	**0**
	1000g to 1499g	7	**20**	0	**0**
	1500g to 2499g	10	**28.6**	2	**5.4**
	2500g to 4000g	11	**31.4**	32	**86.5**

	>4000g	2	**5.7**	3	**8.1**
Age	19 years and less	1	**2.7**	6	**16.2**
	20years to 34years	28	**75.7**	27	**73**
	35years and older	8	**21.6**	4	**10.8**

Figure 2 is a frequency table depicting frequencies for the following variables: *"Sex of Baby, Management in Hospital, Hypertensive Disease, Diabetic Disease, Maternal Hb, Toxic Habits, Trauma, Antenatal Labs Done, Type of Delivery, ROM<18hrs, Ultrasound Done Antenatally, Maternal Age. Birth Weight of Baby, Number of ANC Attendances, Gestational Age, Parity", for* Stillbirth and Livebirth pregnancies that occurred in GPHC from January 1 2021 to July 31, 2021. The table also includes the percentages of frequencies for each variable.

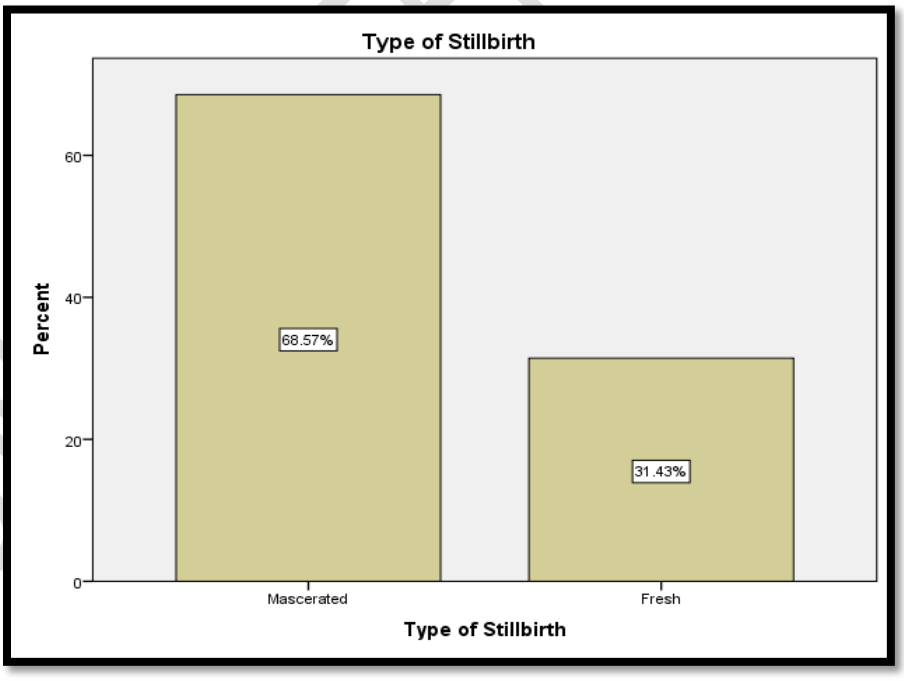


Figure 2 Frequency Table

Figure 2 is a bar graph showing the % frequencies of types of stillbirths. % Macerated stillbirth 68.57% while % fresh stillbirths 31.43%.

Sex of the Baby

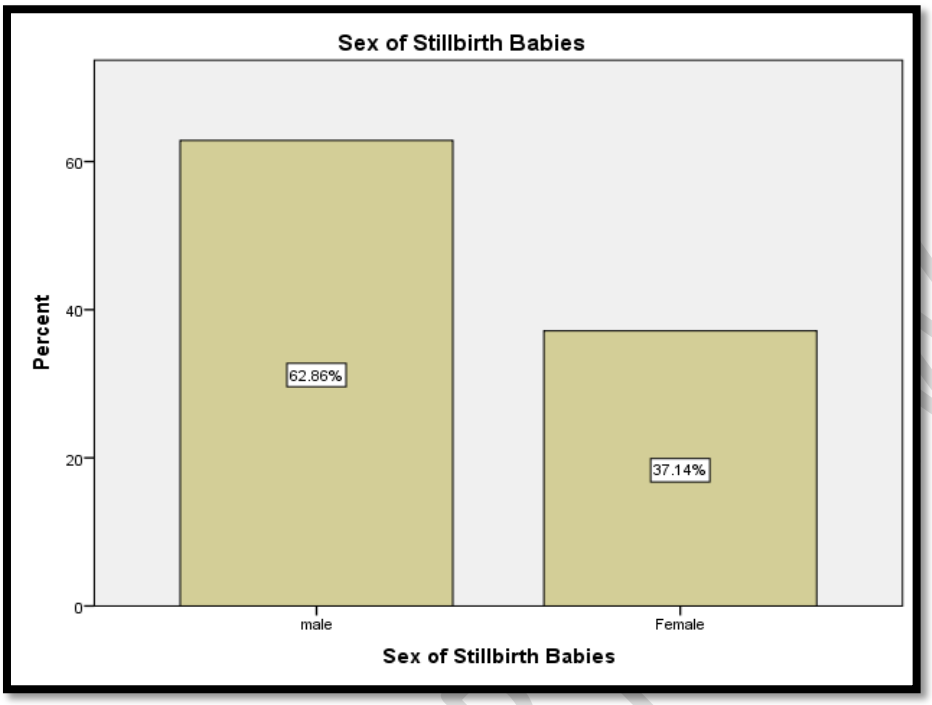


Figure 3 Sex of the Baby

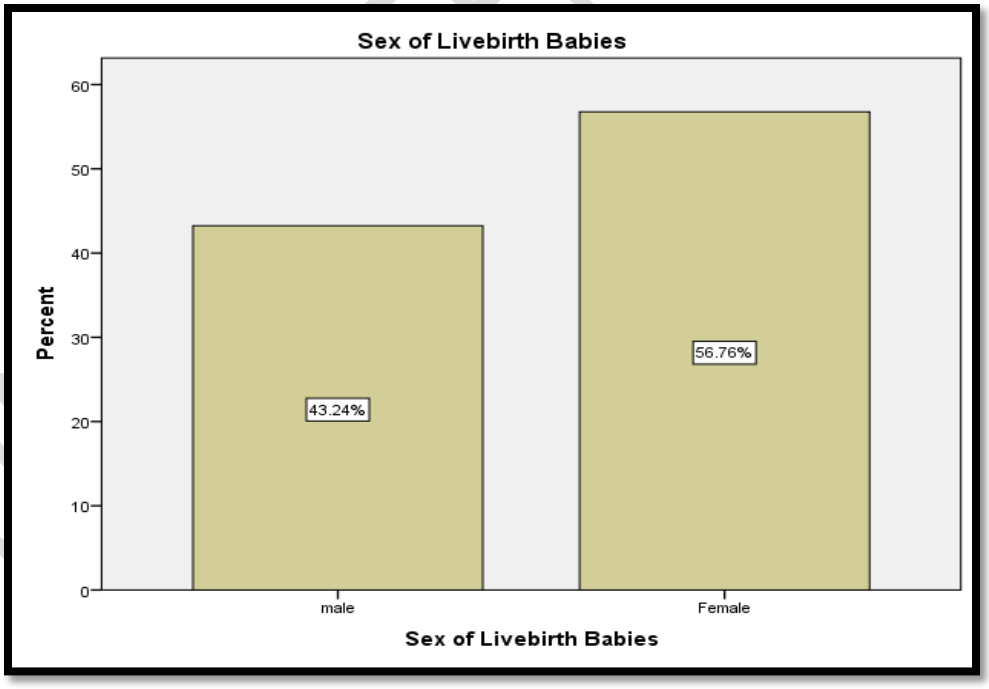


Figure 4 Sex of livebirth Babies

Figures 3 and 4 are bar graphs showing % frequencies of *"sex"* of stillbirth and livebirth babies respectively at GPHC from January 1 to July 31, 2021. For stillbirth babies 62.86% were male while 37.14% were females. While for livebirths, 43.24% were male and 56.76% were female.

Management in Hospital

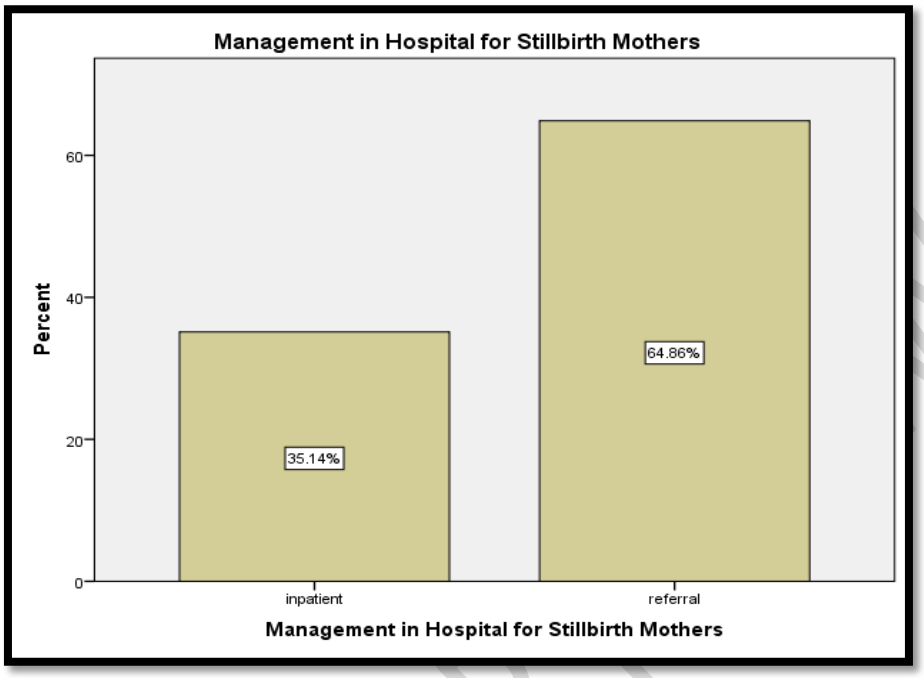


Figure 5 Management in Hospital

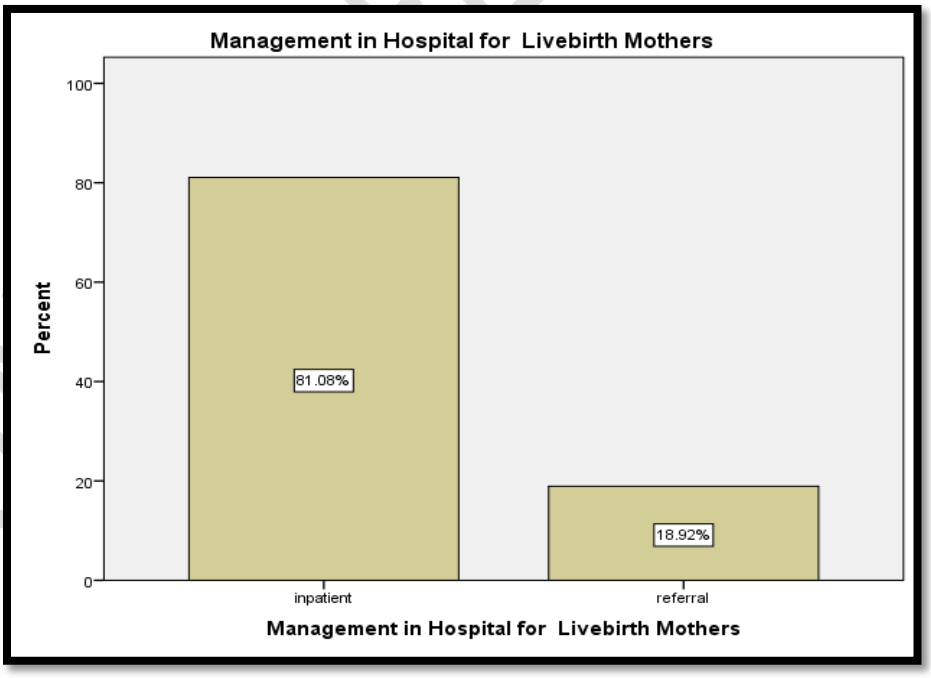


Figure 6: Management In hospital for live birth Mothers

Figures 5 and 6 are bar graphs showing % frequencies for *"Management of Stillbirth and Livebirth in Hospital",* respectively, from January 1 to July 31, 2021 at GPHC. 35.14% of

stillbirths were managed as inpatients, while 64.86% were referrals. For livebirths 81.08% were managed as inpatients while 18.92% were referrals.

Hypertensive Disease

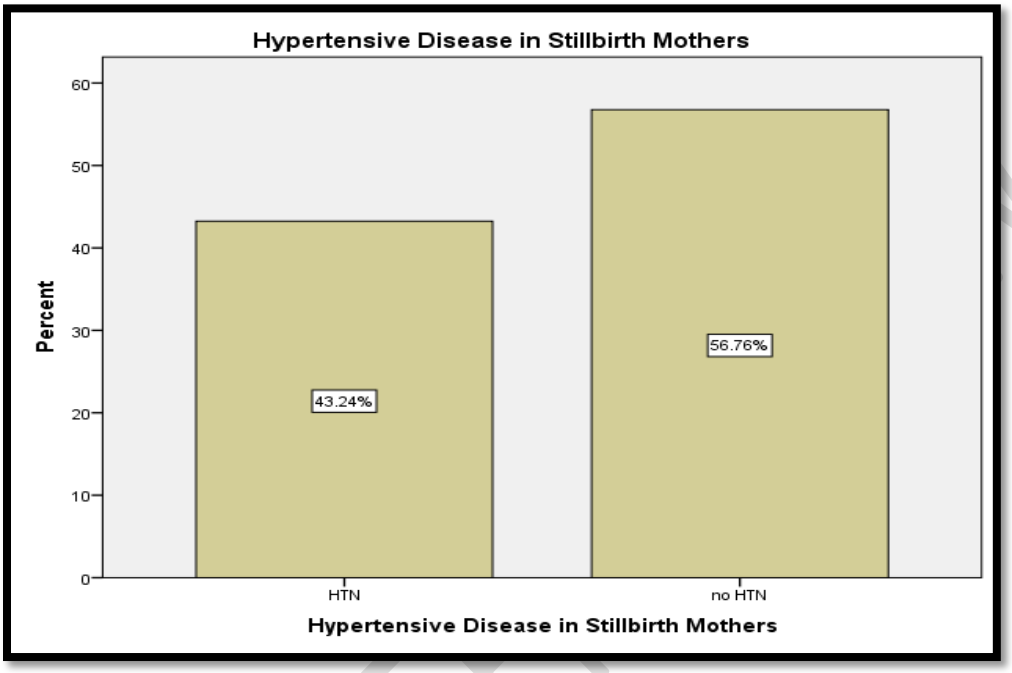


Figure 7 Hypertensive Disease

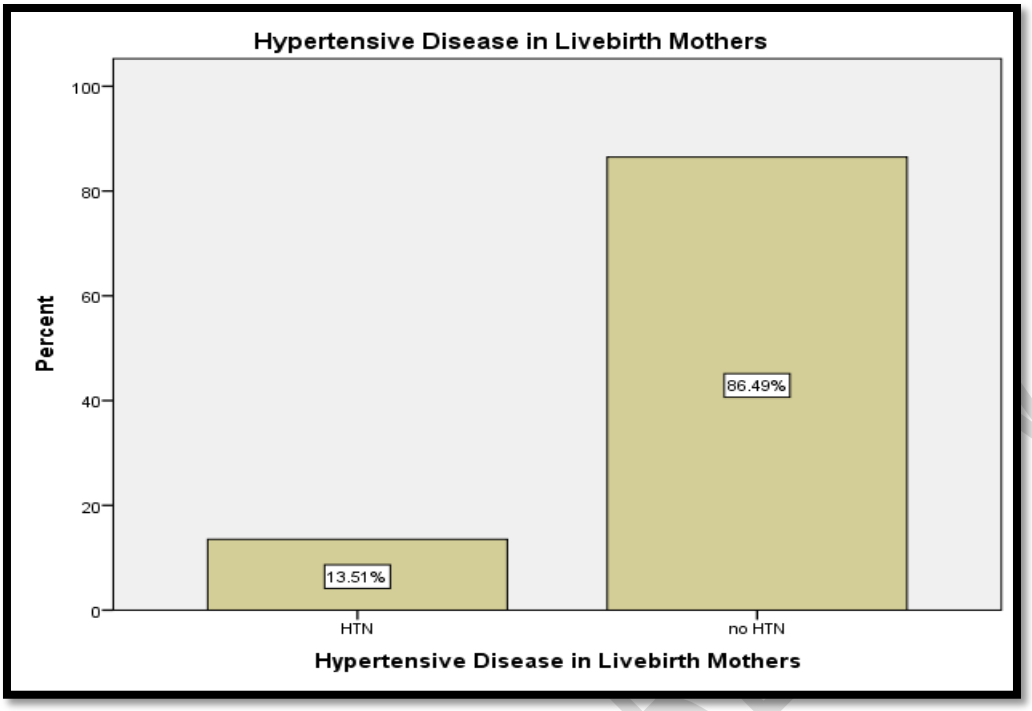


Figure 8: Hypertensive Disease In Livebirth Mothers

Figure 7 and 8 are bar graphs showing % frequencies for *"HTN Disease"* in Stillbirth and Livebirth pregnancies, respectively, from January 1 to July 31, 2021 at GPHC. 43.24% of stillbirth mothers had HTN while 56.76% of had no HTN. For livebirth cases 13.51% had HTN while 86.49% had no HTN.

Diabetic Disease

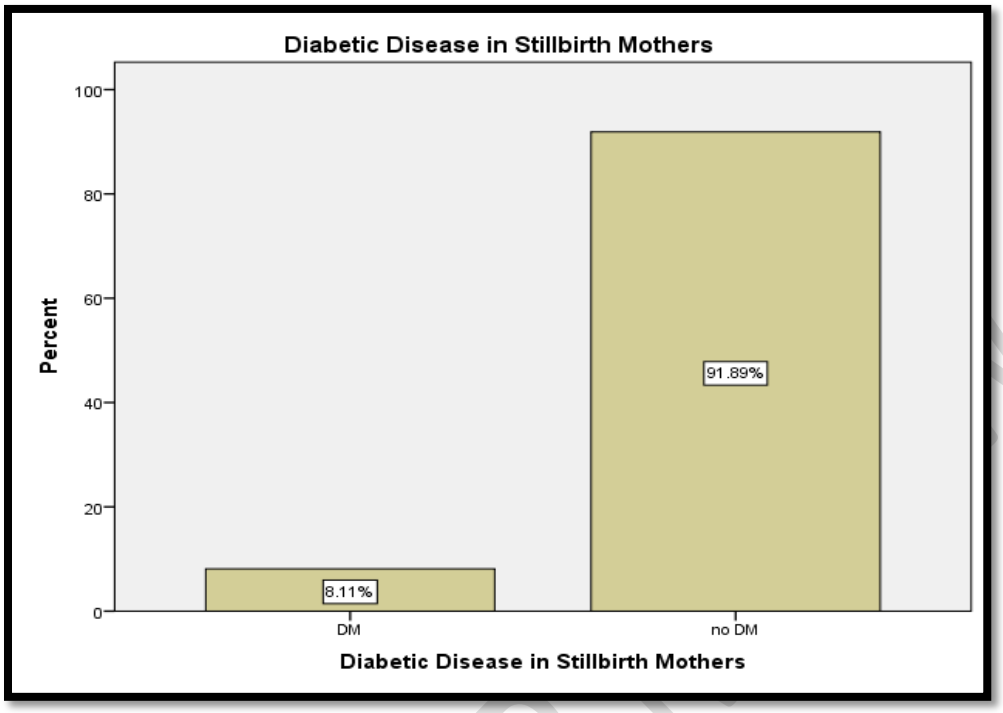


Figure 9 Diabetic Disease

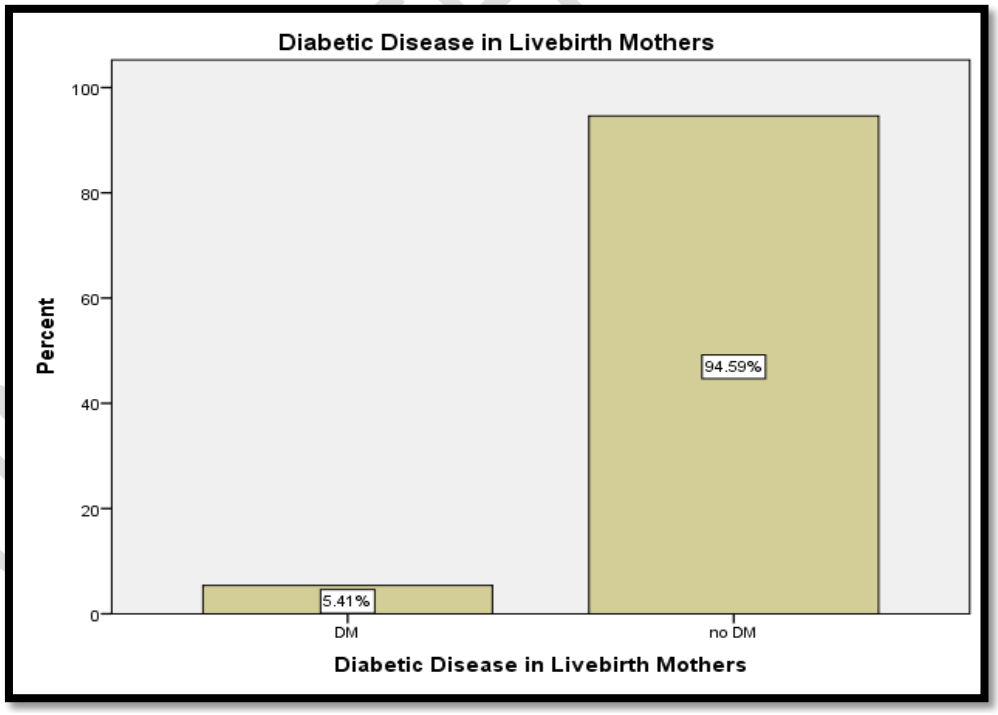


Figure 10 Diabetic Disease in Livebirth mothers

Figures 9 and 10 are bar graphs showing % frequencies of *"DM Disease"* in Stillbirth and Livebirth pregnancies from January 1 to July 31., 2021 at GPHC. 8.11% of stillbirth mothers had DM. While 91.89% had no DM. For livebirth mothers 5.41% had DM while 94.59% had no DM.

Maternal Hb

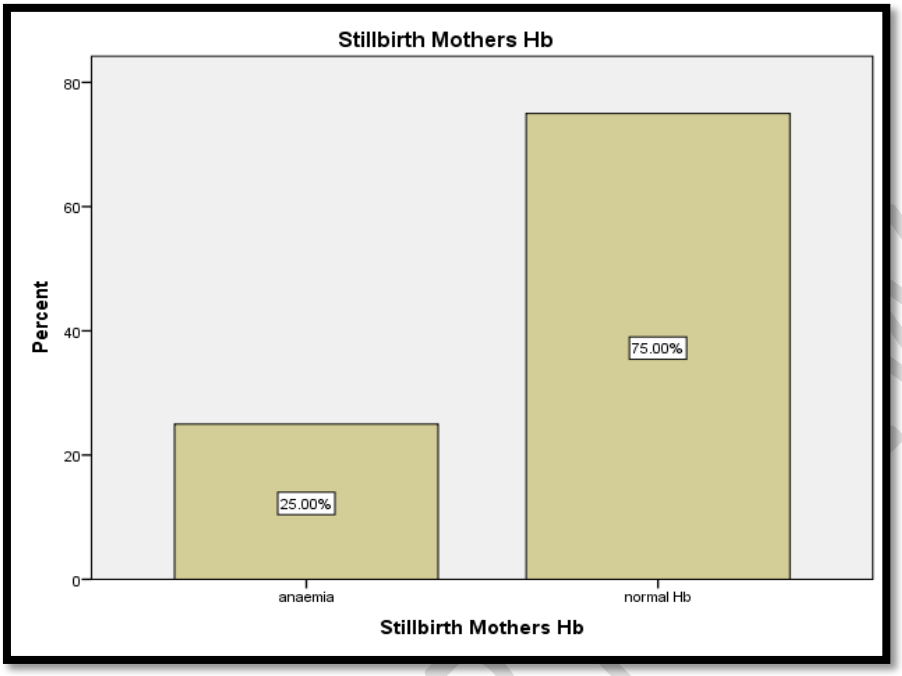


Figure 11 Maternal Hb

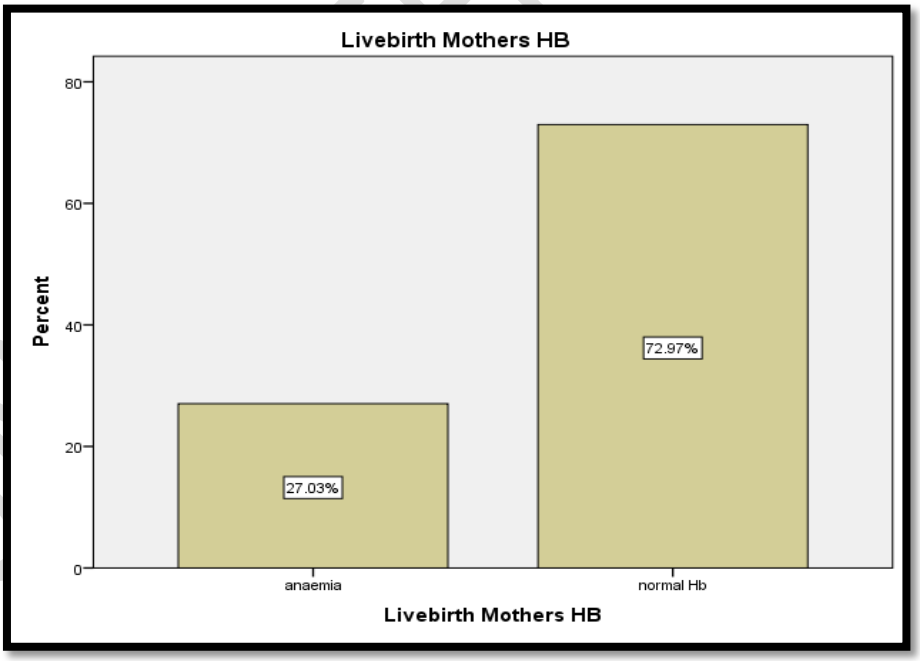


Figure 12 Livebirth Maternal Hb

Figures 11 and 12 are bar graphs showing % frequencies of *"Maternal Hb"* in Stillbirth and Livebirth pregnancies respectively, at GPHC from January 1 to July 31, 2021. For stillbirth mothers 25% had anaemia while 75% did not have anaemia. While for livebirth mothers 27.03% had anaemia while 72.97% had no anaemia.

Toxic Habits

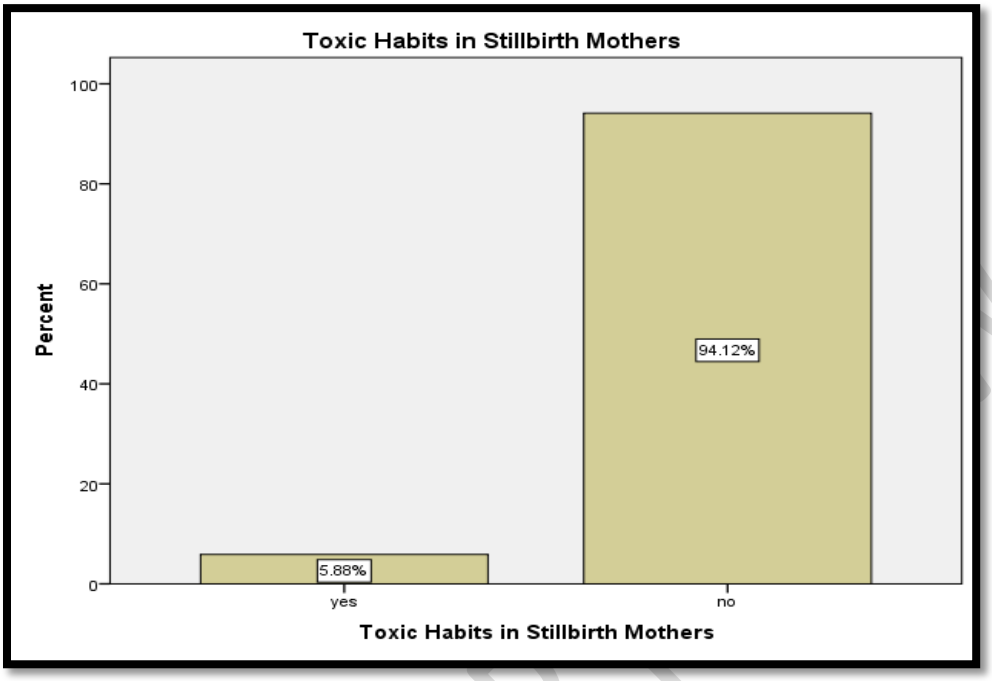


Figure 13 Toxic Habits

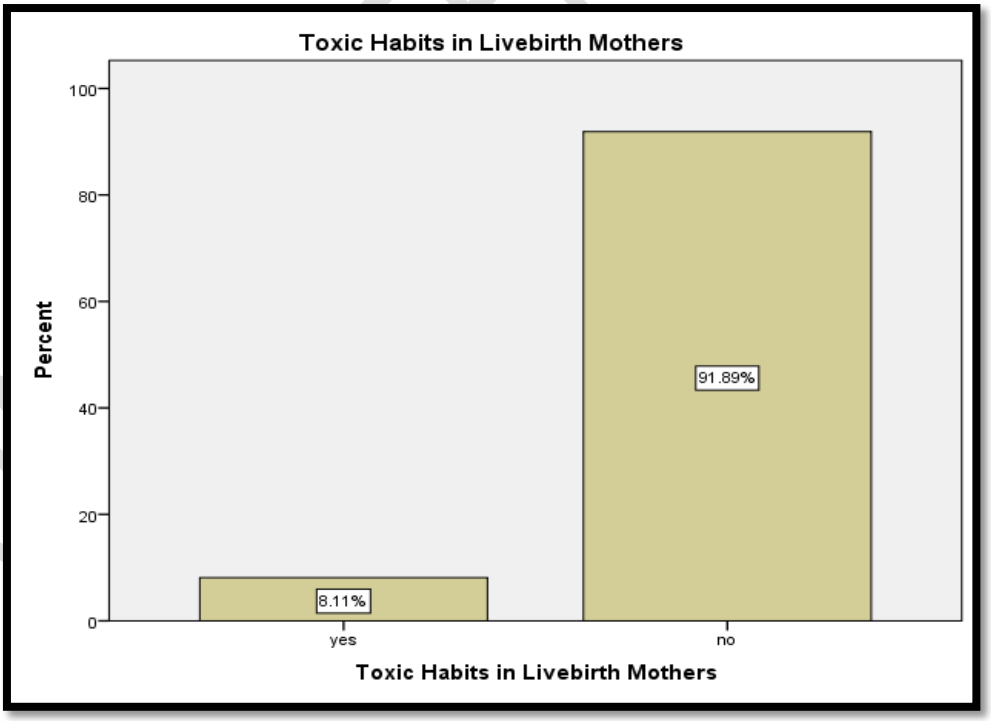


Figure 14 Toxic Habits in livebirth mothers

Figures 13 and 14 are bar graphs showing the % frequencies of *"Toxic Habits"* in Stillbirth and Livebirth pregnancies, respectively, at GPHC from January 1 to July 31, 2021. For stillbirth

mothers 5.88% had toxic habits, while 94.12% had no trauma. While for livebirths 8.11% had toxic habits while 91.89% had no toxic habits.

Trauma

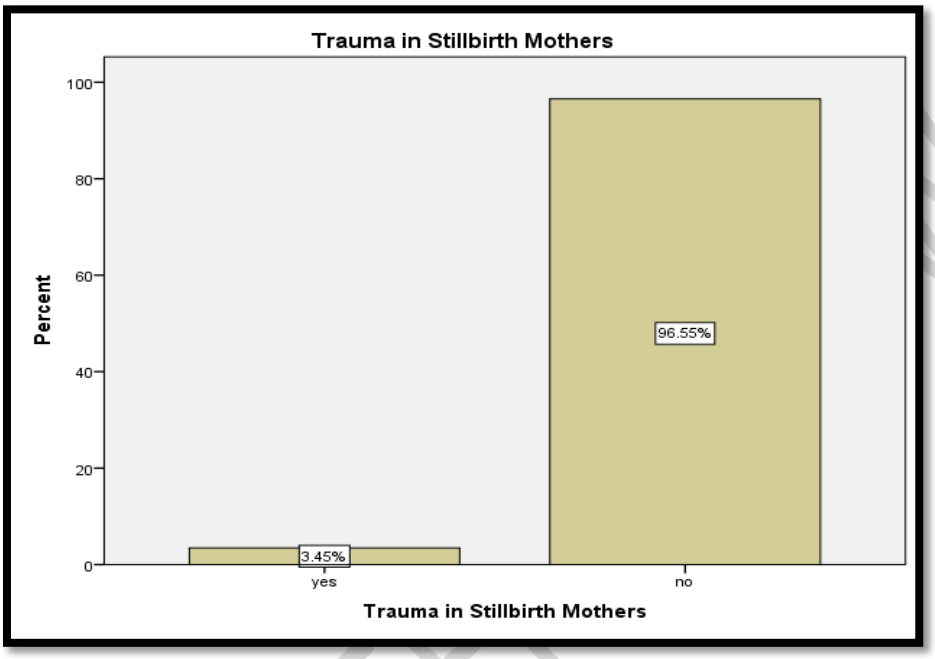


Figure 15

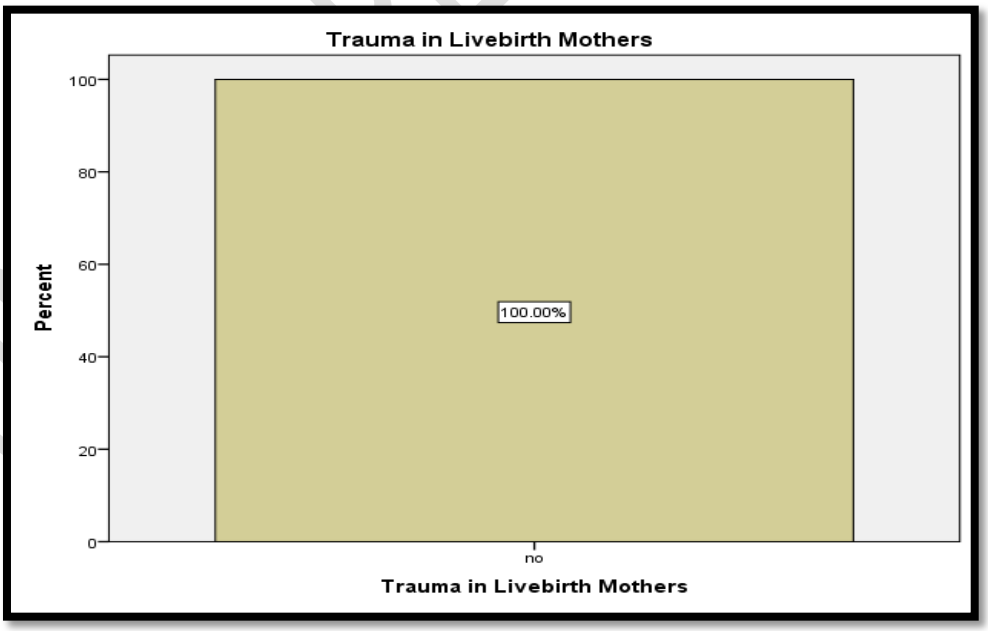


Figure 16

Figures 15 and 16 are bar graphs showing the % frequencies for *"Trauma"* in Stillbirth and Livebirth pregnancies, respectively, at GPHC from January 1 to July 31, 2021. 3.45% of

stillbirth mothers had trauma while 96.55% had no trauma. 100% of livebirth mothers had no trauma.

Antenatal Labs Done

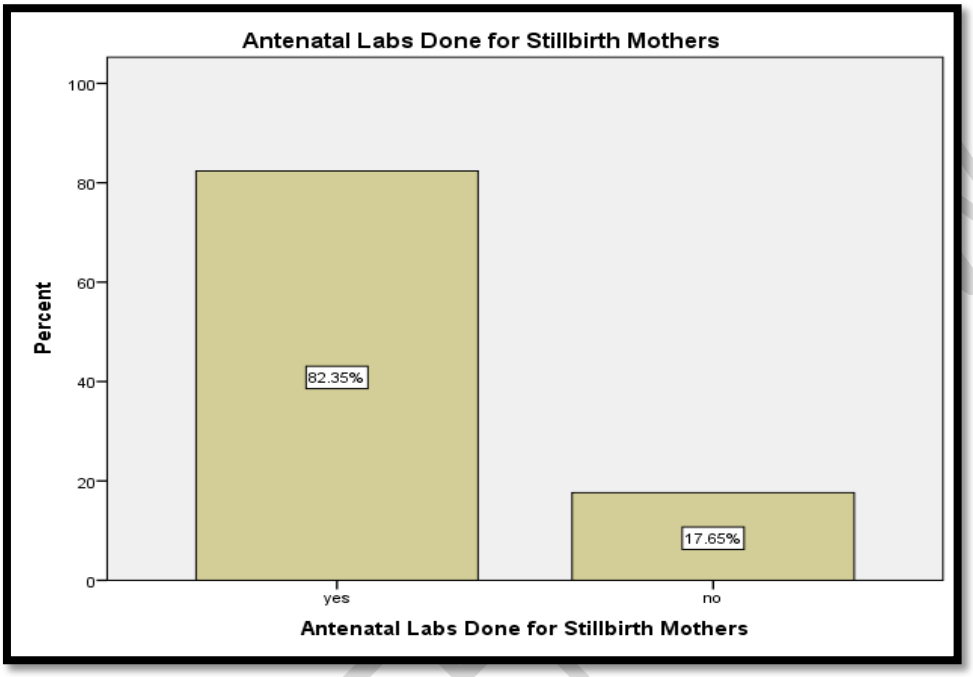


Figure 17

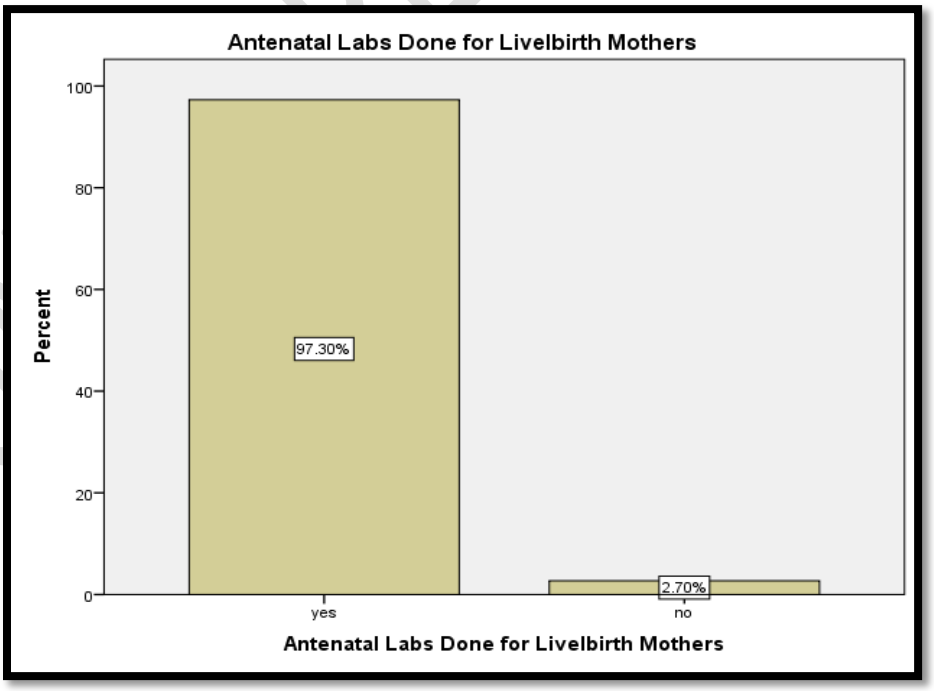


Figure 18

Figures 17 and 18 are bar graphs showing the % frequencies of *"Antenatal Lab Done"* for stillbirth and livebirth pregnancies, respectively, at GPHC from January 1 to July31, 2021. 82.35% of stillbirth mothers had antenatal labs done, while 17.65% had no labs done. For livebirth mother 97.30% had antenatal labs done while 2.70% had no labs done.

Type of Delivery

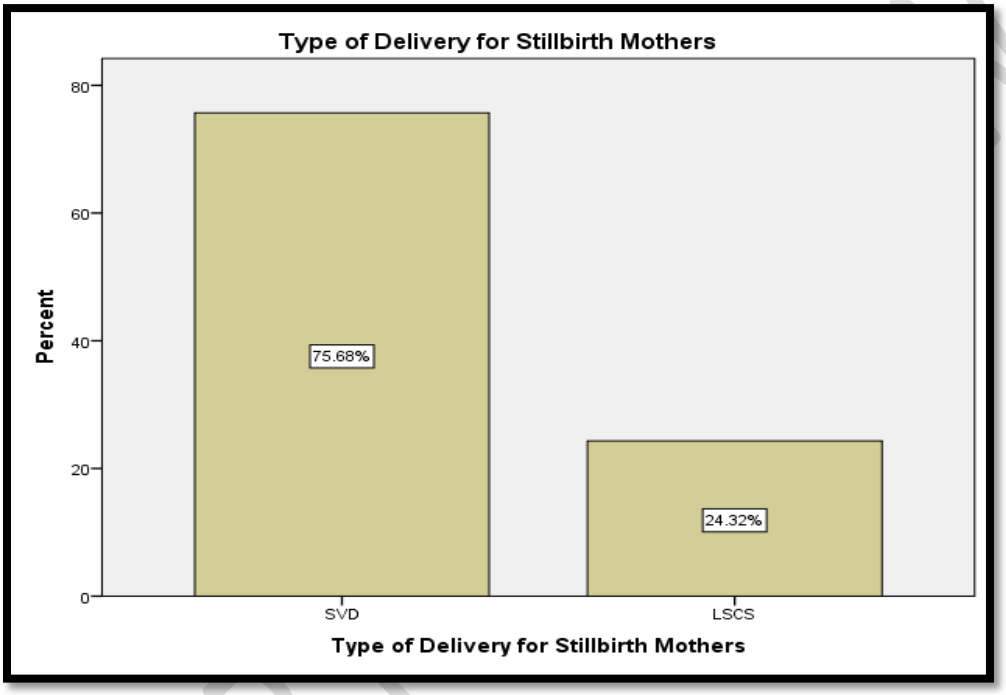


Figure 19

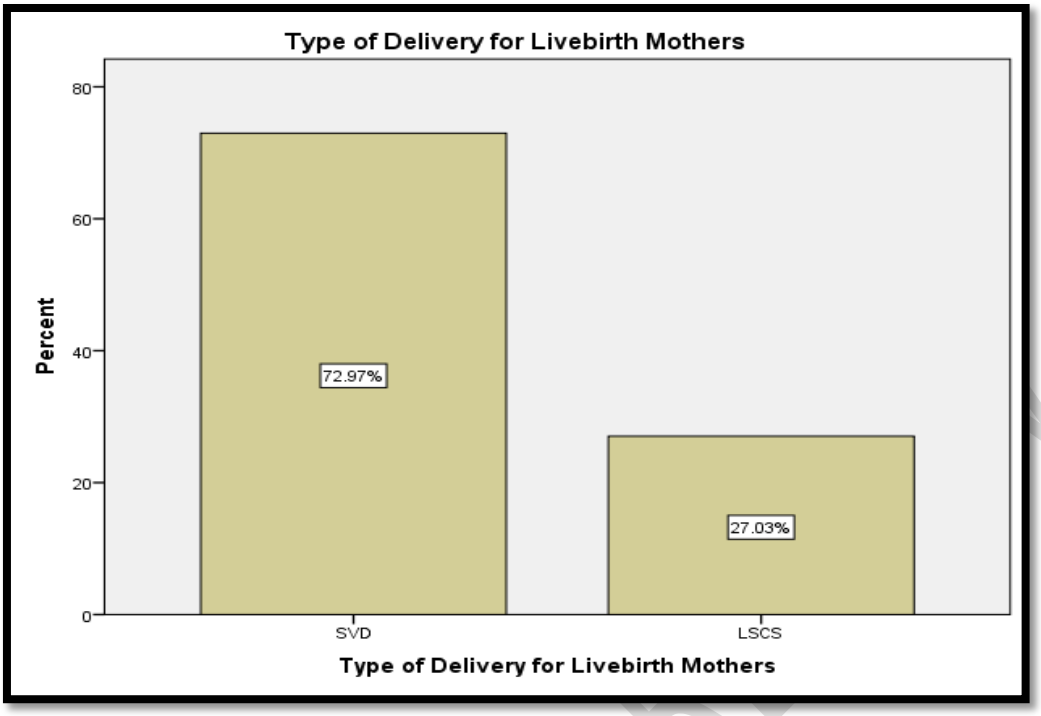


Figure 20

Figures 19 and 20 are bar graphs showing % frequencies of *"Type of Deliveries"* of Stillbirth and Livebirth pregnancies, respectively, at GPHC from January 1 to July 31, 2021. 75.68% of stillbirth cases were delivered via SVD while 24.32% were delivered via LSCS. For livebirth cases 72.97% were delivered via SVD, while 27.03% were delivered via LSCS.

ROM<18hrs

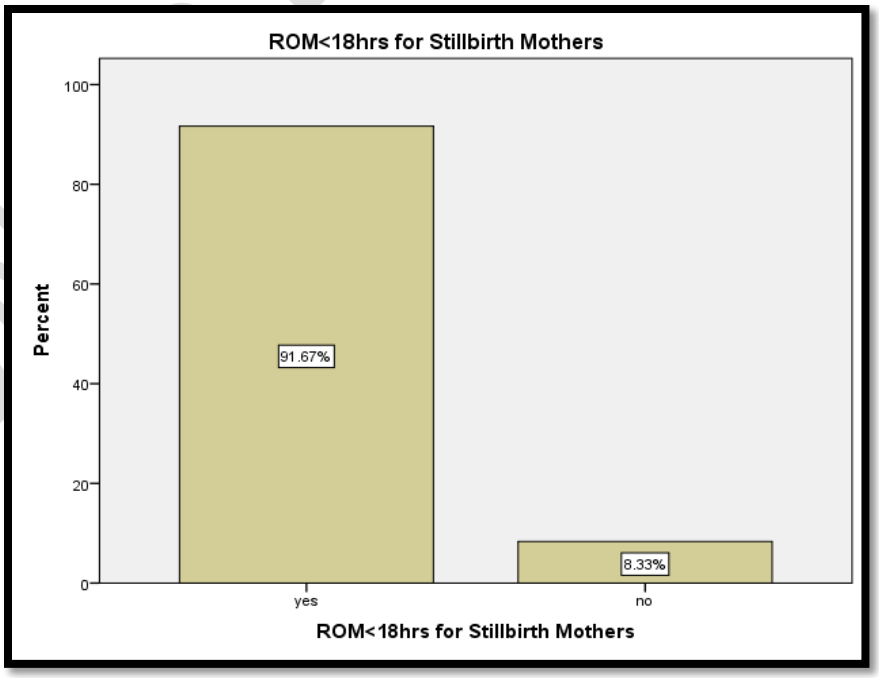


Figure 21

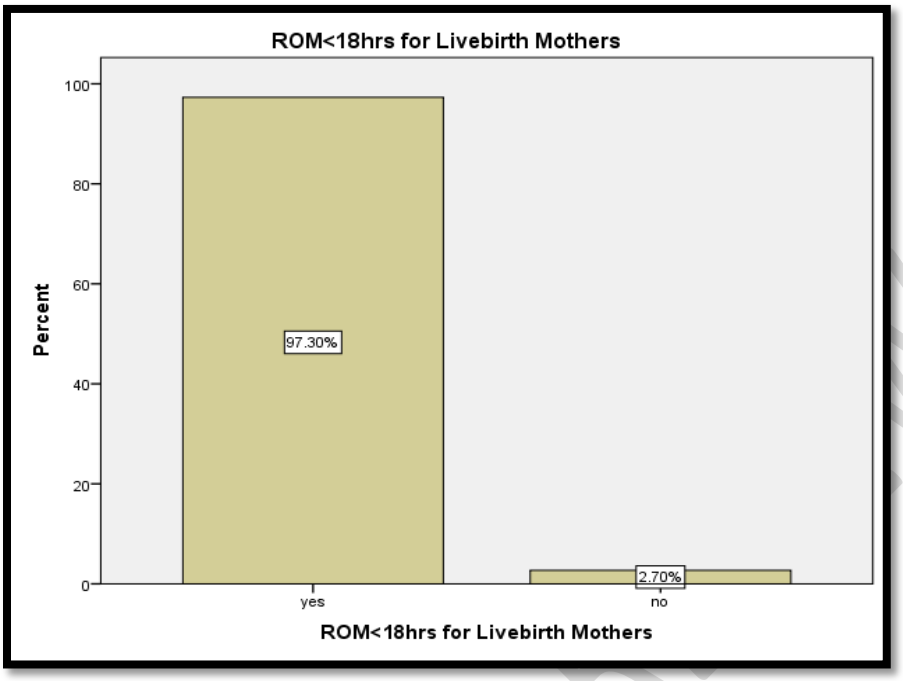


Figure 22

Figure 21 and 22 are bar graphs showing % frequencies for *"ROM<18hrs"* in stillbirth and livebirth pregnancies, respectively, at GPHC from January 1 to July 31, 2021. For stillbirth cases 91.67% had ROM<18hrs, while 8.33% had ROM>18hrs. While for livebirth cases 97.30% had ROM<18hrs while 2.70 had ROM>18hrs.

Ultrasound Done Antenatally

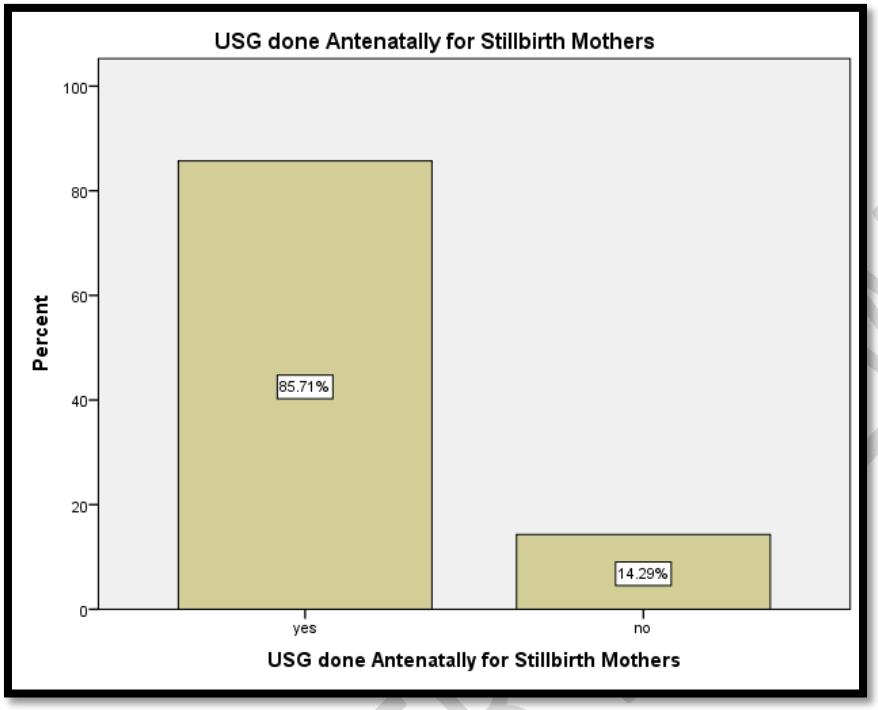


Figure 23

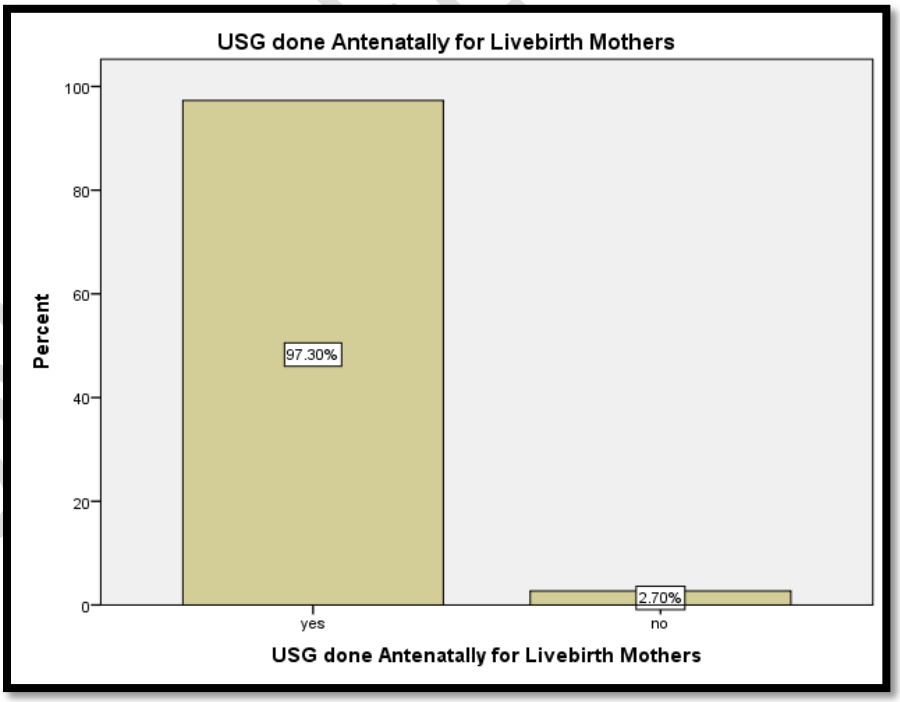


Figure 24

Figures 23 and 24 are bar graphs showing % frequencies for *"USG Done Antenatally"* for stillbirths and livebirths respectively, at GPHC from January 1 to July 31, 2021. For stillbirth

cases 85.71% had USG done antenatally and 14.29% had no USG done antenatally. For livebirths 97.30% had USG done antenatally while 2.70% had no USG done.

Maternal Age

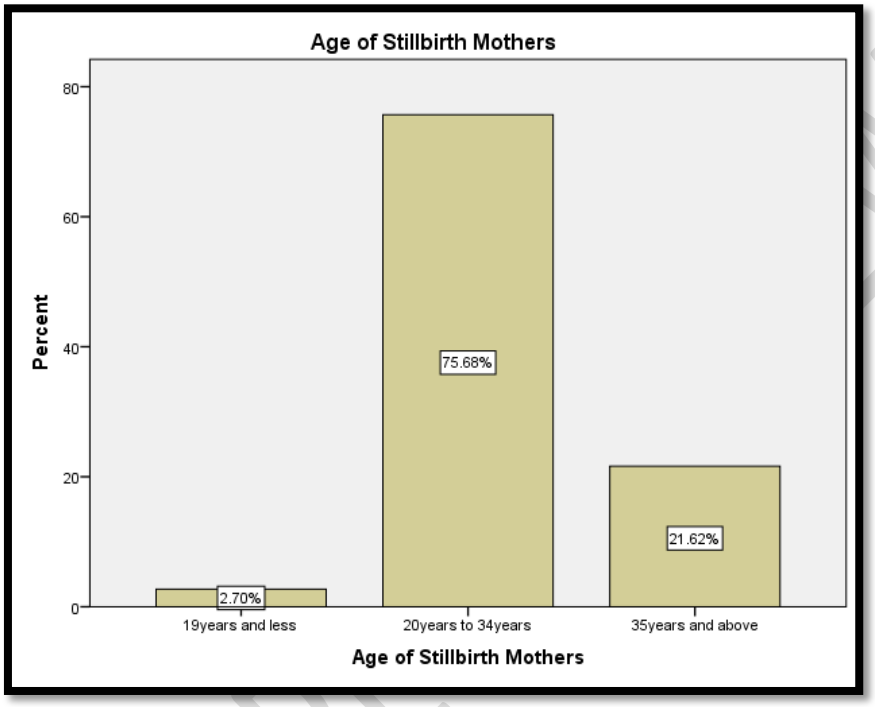


Figure 25

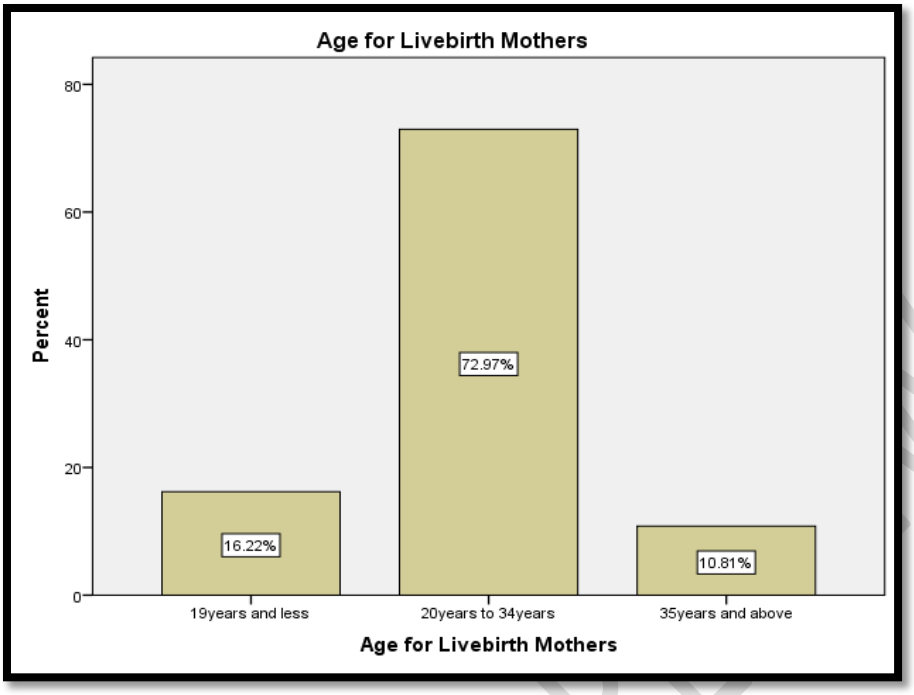


Figure 26

Figure 25 and 26 are bar graphs showing % frequencies for *"Ages of Stillbirth and Livebirth Mother",* respectively, from January 1 to July 31, 2021 at GPHC. 2.70% of stillbirth mothers were 19 years and less, 75.68% were 20 to 34 years and 21.62% were 35years and older. For livebirth mothers 16.22% were 19 years and less, 72.97% were 20 to 34years and 10.81% were 35years and older.

Birth Weight of Baby

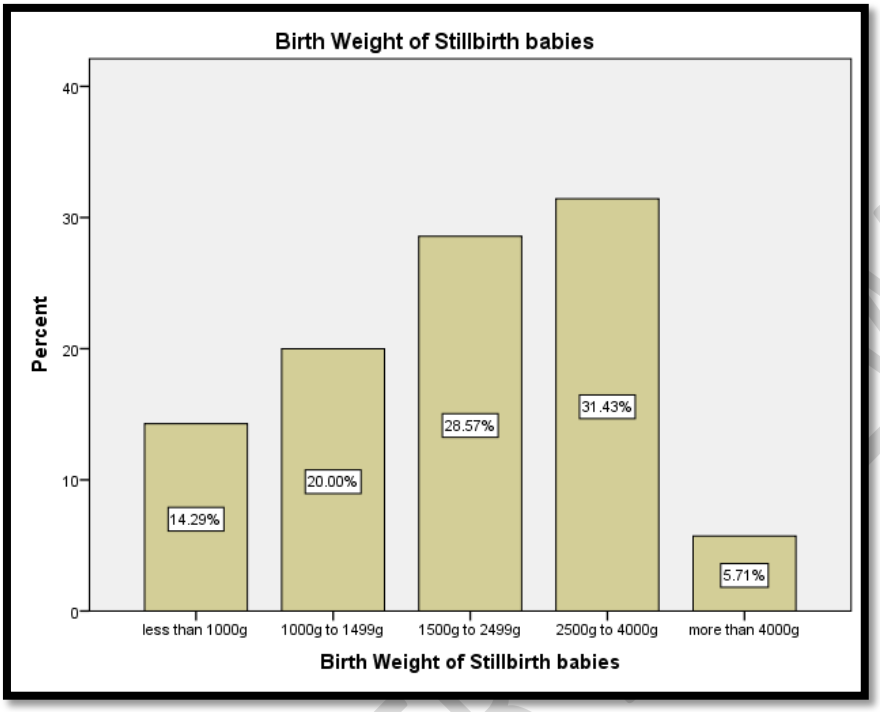


Figure 27

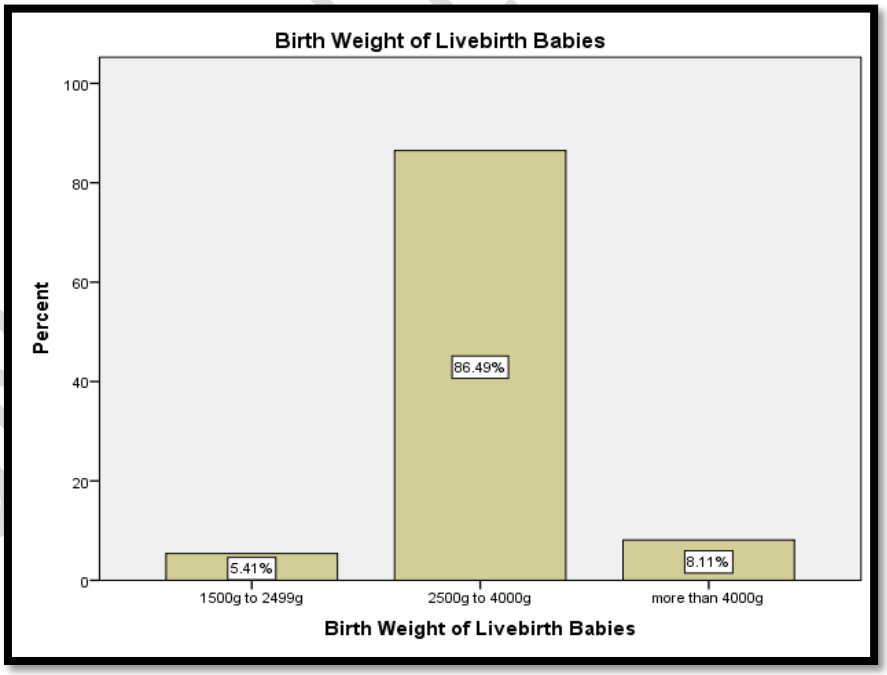


Figure 28

Figures 27 and 28 are bar graphs showing the % frequencies of *"Birth Weight of Babies"* from stillbirth and livebirth pregnancies respectively, in January 1 to July 31, 2021 at GPHC. For stillbirth cases 14.29% were less 1000g, 20% were 1000g to 1499g, 28.57% were 1500g to

2499g, 31.43% were 2500g to 4000g and 5.71% were more than 4000g. For livebirth cases 5.41% were 1500g to 2499g, 86.49% were 2500g to 4000g, while 8.11% were more than 4000g.

Number of ANC Attendances

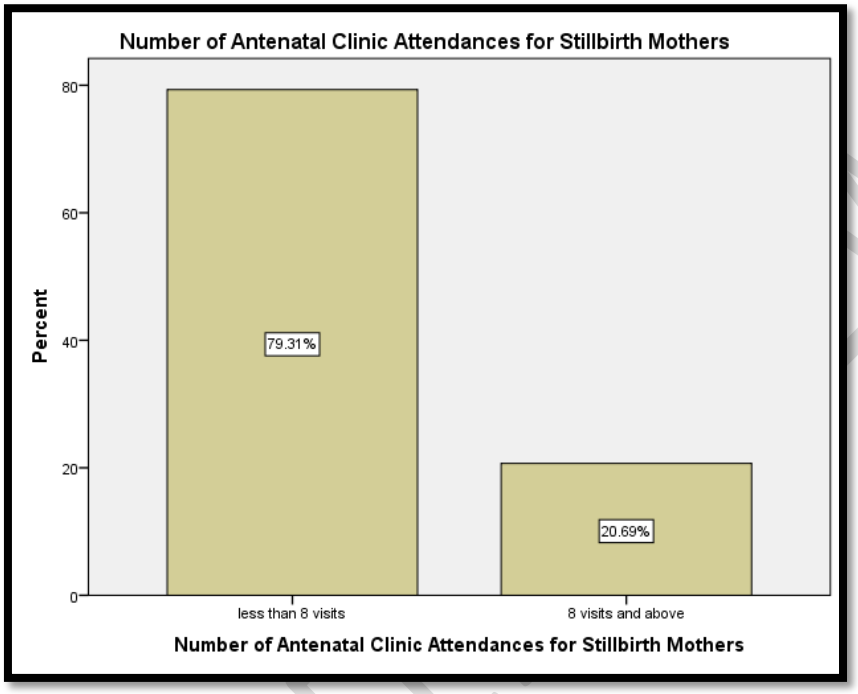


Figure 29

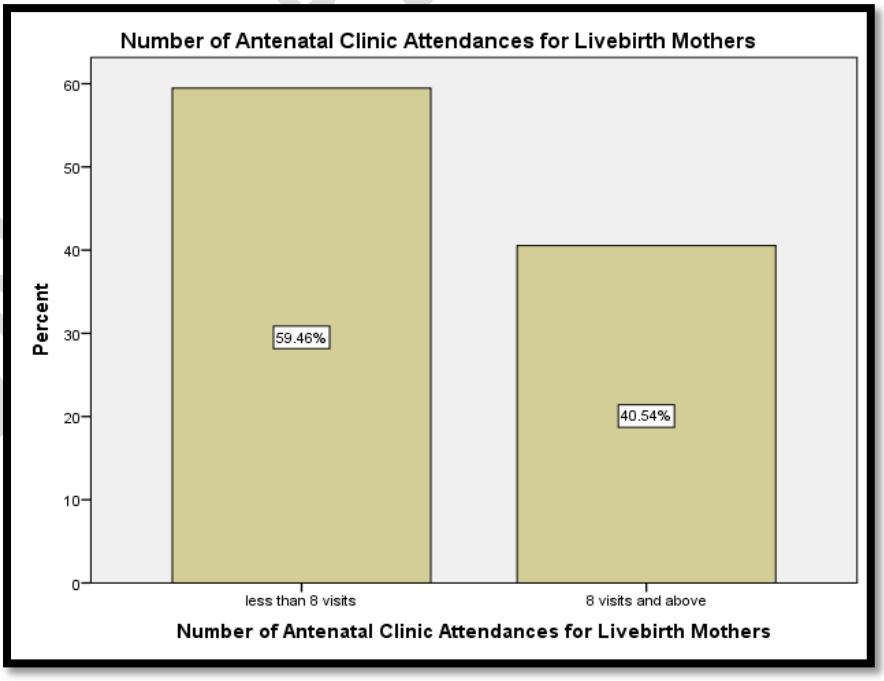


Figure 30

Figure 29 and 30 are bar graphs depicting the % frequencies of *"ANC Attendances"* for stillbirth and livebirth pregnancies, respectively, from January 1 to July 31, 2021 at GPHC. 79.31 % of stillbirth mothers had <8 ANC visits, while 20.69% had 8 and more ANC visits. For livebirth mothers 59.46% had <8 ANC visits, while 40.54% had 8 and more visits.

Gestational Age

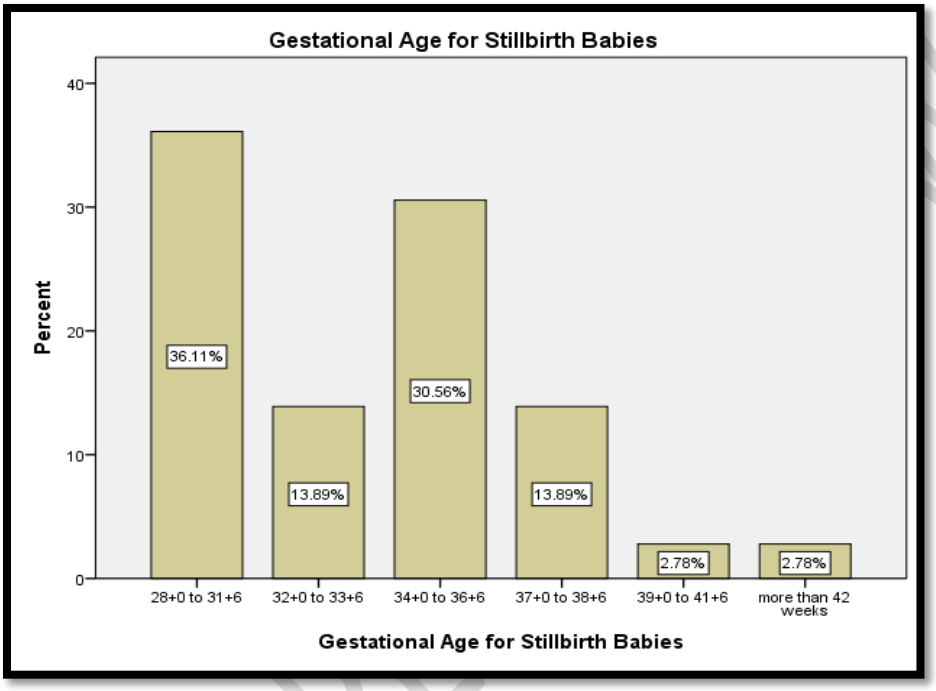


Figure 31

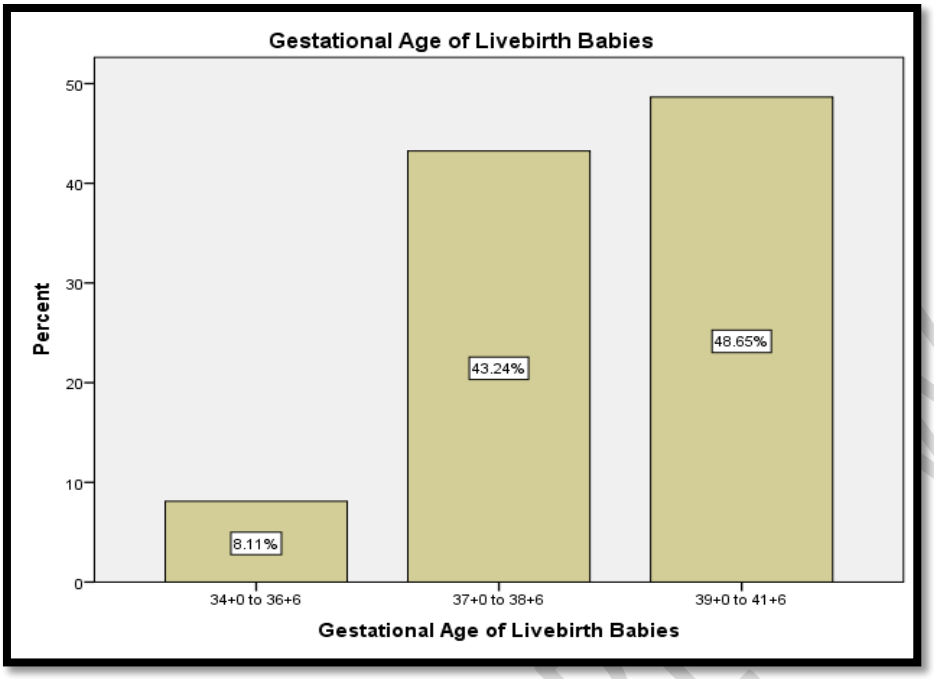


Figure 32

Figures 31 and 32 are bar graphs showing the % frequencies of *"Gestational Age"* of Stillbirth and Livebirth babies, respectively, from January 1 to July 31, 2021 at GPHC. For stillbirths 36.11% were 28+0 to 31+6, 13.89% were 32+0 to 33+6, 30.56% were 34+0 to 36+6, 13.89% were 37+0 to 38+6, 2.78% were 39+0 to 41+6, 2.78 were >42. For livebirths 8.11% were 34+0 to 36+6, 43.24% were 37+0 to 38+6, while 48.65% were 39+0 to 41+6.

Parity

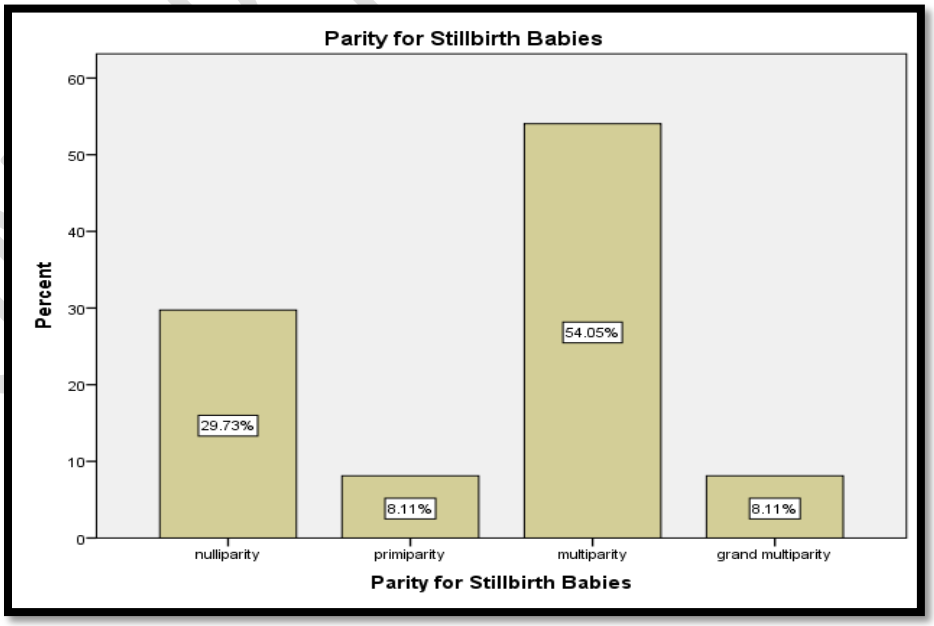


Figure 33

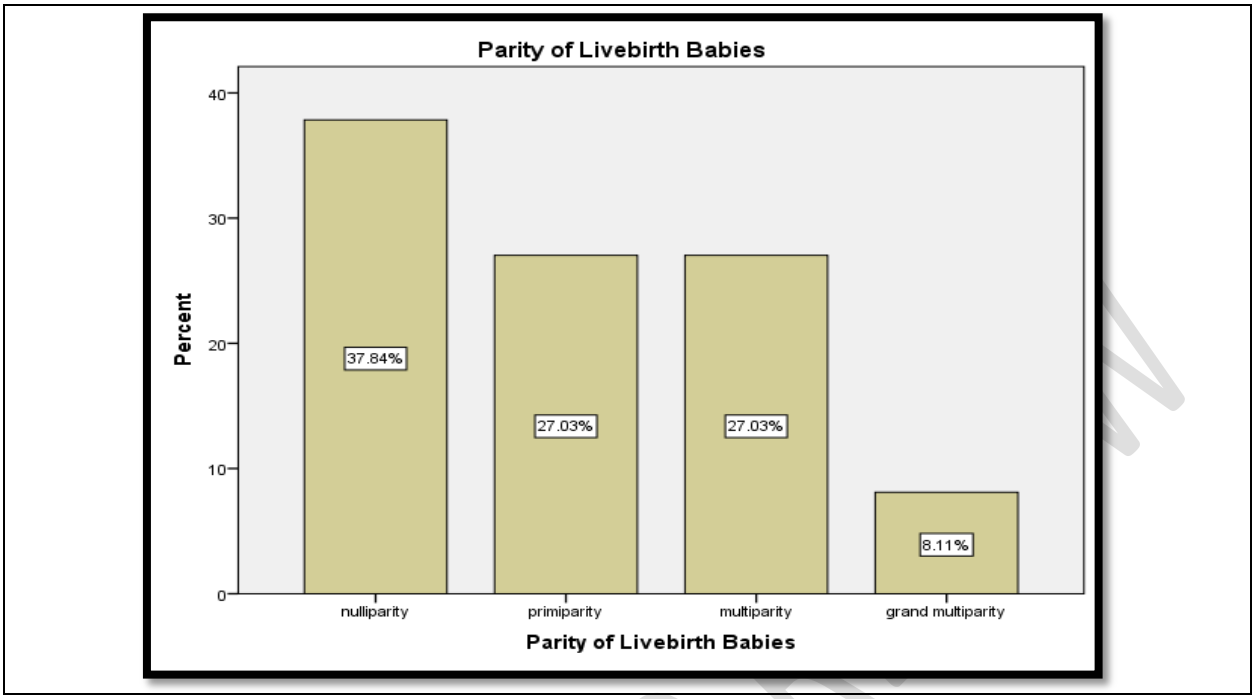


Figure 34

Figures 33 and 34 are bar graphs showing % frequencies of *"Parity"* of stillbirth and livebirth pregnancies, respectively, at GPHC from January 1 to July 31, 2021. For stillbirth mothers 29.73% were nulliparous, 8.11% were primiparous, 54.05% were multiparous, while 8.11% were grand multiparous. For livebirth mothers 37.84% were nulliparous, 27.03% were primiparous, 27.03% were multiparous and 8.11% were grand multiparous.

Table 1 Showing ICD-PM Classification of Stillbirth Deaths at GPHC from January 1 to July 31, 2021

Maternal Conditions	M1: Complications of placenta, cord and membranes	M2: Maternal complications of pregnancy	M3: Other complications of labour and delivery	M4: Maternal medical and surgical conditions	M5: No maternal condition identified	Causes Total %
Antepartum Causes of Death						
A1: Congenital malformations, deformities and chromosomal abnormalities		1				**1 (5.6)**
A2: Infection						**0 (0)**
A3: Antepartum Hypoxia						**0 (0)**
A4: Other specified antepartum disorder	1					**1 (5.6)**
A5: Disorder related to foetal growth	1					**1 (5.6)**
A6: Foetal death of unspecified cause	1			2	1	**4 (22.2)**
Intrapartum Causes of Death						
I1: Congenital malformations, deformities and						**0 (0)**

chromosomal abnormalities						
I2: Birth Trauma						**0 (0)**
I3: Acute Intrapartum Event	4		1			**5 (27.8)**
I4: Infection						**0 (0)**
I5: Other specified intrapartum disorder			1			**1 (5.6)**
I6: Disorder related to foetal growth	1				1	**2 (11.1)**
I7: Intrapartum death of unspecified cause				1	2	**3 (16.7)**
Total Maternal Condition (%)	**8 (44.4)**	**1 (5.6)**	**2 (11.1)**	**3 (16.7)**	**4 (22.2)**	**100**

This table displays the ICD-PM classification of stillbirth deaths at GPHC from January 1 to July 31, 2021. From the total of 37 stillbirths from this study only 18 had a stated cause of death. The most common cause of death was placental abruption secondary to HTN (6 cases), there were 2 cases of placental insufficiency, 3 cases of HTN+DM, 3 unknown causes, 1 post term dysmaturity syndrome, 1 asphyxia, 1 foetal hydrops secondary to Rh incompatibility, 1 meconium liquor.

Discussion

The following study was retrospective, case control in nature and the first objective of this study was to determine the stillbirth rate at GPHC for the 7-month period of January 1 to July 31, 2021. The stillbirth rate was found to be 11.96 per 1000 births. This rate for the hospital is much lower than the stillbirth rate calculated from a prior study done by *R. Hardyal* in 2019, for which the stillbirth rate was 15.8 per 1000 births. [5] This shows an improved stillbirth rate at GPHC over the past 3 years which infers that antenatal and obstetric care at the hospital is improving.
The records department at GPHC found 5 additional cases of stillbirths than this study for the same time period of January 1 to July 31, 2021, for which their stillbirth rate was calculated at 13.57 per 1000 total births. In the *"stillbirth book"*, which is a register of stillbirths occurring at GPHC, foetal demise <28 weeks gestation was also inputted into the register. It's likely that these 5 additional cases were births that did not meet the inclusion criteria for this study and therefore were not included in the sample of cases (sample of stillbirths).

The second objective of this study was to determine the number of stillbirth cases that were inpatient vs referrals. This study identified a total of 37 stillbirths occurring over the 7-month period of January 1 to July 31, 2021 at GPHC. Out of those 37 stillbirth cases, 13 were being managed as inpatients while 24 were referral cases. The higher frequency of referral cases (~65% of cases) proves that the number of stillbirths at GPHC is greatly influenced by referral *(see figures 3 and 4).* This may be likely due to these referring facilities having limited resources to quickly recognize and deal with emergencies. Also, most of these referring facilities are located in outlying areas, which means patients would have to travel long distances from referring facilities to GPHC which increases the likelihood of antepartum and intrapartum demise. A study done by *Egbe et al* found similar findings relating to stillbirths and referrals. [19]

The third objective of this study was to determine the number of macerated vs fresh stillbirths. Macerated stillbirths are more commonly as a result of antepartum insults (issues arising before labour). While, fresh stillbirths are commonly as a result of intrapartum insults (problems with labour and delivery) and the obstetric care. From the total number of stillbirths identified in this

study, it was noted that 24 were macerated stillbirths, while 11 were fresh stillbirths. The type of stillbirth was not stated for 2 cases. Macerated stillbirths had the higher proportion (68.57%), which suggest that majority of stillbirth are likely due to antepartum insults. Delay of referral cases may also precipitate these insults promoting intrauterine demise. On the other hand, fresh stillbirths had the lesser proportion (31.43%). This suggests that fewer stillbirths are caused by intrapartum complications and it may also suggest that there may be mild inadequacies in obstetric care and delivery at GPHC. *Mbachu et al* and *Mutihir et al* in their studies identified that macerated stillbirths were more prevalent than fresh stillbirths in middle-to-low-income countries.

The final objective of this study was to determine the risk factors and causes of stillbirths. From this study, the following variables were highlighted to be possible risk factors of stillbirths: *male sex, referral management, HTN disease, DM disease, not having antenatal labs done, having less than 8 ANC clinic visits, multiparity, preterm and post term gestation and advanced maternal age (being 35 and older).* These frequencies of these variables were found to be higher for stillbirths than livebirths. Contrary to this study's findings, *Nonterah et al* in their study showed that advanced maternal age was not a risk factor for stillbirths in Ghana.[6] However, *Mutihir et al* in their study findings showed that advanced maternal age and multiparty were risk factors of stillbirths.[22]

The most common cause of stillbirths highlighted in this study was placental abruption secondary to maternal comorbidities (HTN and DM). Other causes of stillbirths were maternal HTN and DM, unknown causes, post term dysmaturity syndrome, birth asphyxia, foetal hydrops secondary to Rh in compatibility and meconium liquor. Using the ICD-PM classification of causes of stillbirths the most common maternal condition noted to cause stillbirth was M1: complications of placenta cord and membrane. This was followed by no maternal condition identified, maternal medical and surgical conditions, other complications of labour and delivery and maternal complications of pregnancy, respectively. The most common antepartum cause was A6: foetal death unspecified, while the most common intrapartum cause was I3: Acute intrapartum event. Most studies identified *no known cause* as the popular cause of death. [7] [20]

[21] This was different for this study possibly because of missing information on the cause of death for half of the cases.

Limitations of Studies

1. Poor documentation and missing information from charts that were used for data collection
2. Using frequencies only to determine risk factors of stillbirth. Couldn't determine if variable had any significant association to stillbirths.

Strengths of Study

1. The total population of stillbirths was used for data analysis and sample of livebirths was selected using random sampling. Results from this study can be extrapolated to the entire population of stillbirths and livebirths at GPHC

Recommendations

The recommendations from this study are as follows:

- For GPHC: -
    1. There needs to be proper documentation of hospital charts and proper record keeping at GPHC.
- For mothers: -
    1 Antenatal care is paramount in pregnancy and each mother should attend at least 8 ANC sessions in her pregnancy. ANC inadequacies in pregnancy can be identified early and dealt with in a timely fashion, instead of them going unnoticed and becoming emergencies.

Conclusion

1. Stillbirth rate at GPHC from January 1 to July 31, 2021 is 11.96 per 1000 births and has shown significant improvement over the past 3 years.
2. Referrals have a great influence on the number of stillbirths and can be considered a risk factor of stillbirths.
3. The most common type of stillbirth was identified to be macerated.
4. Other possible risk factors of stillbirth at GPHC include *male sex, referral management, HTN disease, DM disease, not having antenatal labs done, having less than 8 ANC clinic visits, multiparity, preterm and post term gestation, advanced maternal age (being 35 and older)*
5. Most common cause of stillbirths at GPHC from January 1 to July 31, 2021 is placenta abruption. Most common maternal condition is complications of placenta, cord and membrane. The most common antepartum cause is foetal death unspecified, while the most common intrapartum cause was is acute intrapartum event.

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