JIMMA UNIVERSITY

INSTITUTE OF HEALTH, PUBLIC HEALTH FACULTY,
DEPARTMENT OF EPIDEMIOLOGY

DETERMINANTS OF ADVERSE NEONATAL BIRTH OUTCOMES AMONG MOTHERS WHO GAVE BIRTH AT HOSPITALS IN JIMMA ZONE, ETHIOPIA: FACILITY BASED UNMATCHED CASE-CONTROL STUDY.

BY

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A RESEARCH THESIS TO BE SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH, DEPARTMENT OF EPIDEMIOLOGY; IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF MASTERS IN PUBLIC HEALTH (GMPH).

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Jimma, Ethiopia

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ABSTRACT

Back ground: The magnitude of perinatal mortality in Ethiopia was among the highest in Sub Saharan Africa. Hence, achievement of reducing perinatal and neonatal death is strongly influenced by the number of adverse birth outcomes. Therefore identifying those problems is a priority area to give policy insight and recommendations. The aim of the study was to determine the factors associated with adverse birth outcome.

Methods: Unmatched case control study was conducted on 127 cases and 381 controls with a total of 518 samples by proportional allocation; from June 1-30/2022. Data was collected through face to face interview and using data extraction sheet from delivery, Voluntary Counseling and Testing and Neonatal Intensive Care Unit registration book. Both cases and controls were selected by convenience as it is homogeneous population Binary and Multivariable logistic regression analysis was performed at significance level of p value ≤ 0.25 and 0.05 respectively. **Findings**: In this study, 381 controls and 127 cases were involved with a response rate of 98.06%. In multivariable analysis, Multigravida [AOR=3.769, 95% CI (2.295, 6.188)], Residence [AOR=1.921, 95% CI (1.156, 3.190)], Female Genital Mutilation [AOR=2.88, 95% CI (1.569, 5.285)], Being male baby [AOR=3.935, 95% CI (2.388,6.483)], Presence of preexisting medical condition [AOR=1.737, 95% CI (1.005,3.003)], Drinking alcohol [AOR=2.28, 95% CI (1.175,4.426)], Not Attending Focused Ante natal Care [AOR=1.963, 95% CI (1.190,3.238)] and Being delivered by Caesarean Delivery [AOR=0.124, 95% CI (0.059,0.259)] were significantly associated with adverse birth outcome.

Conclusion Rural residence, multigravida, being a male baby, female genital mutilation, presence of preexisting medical condition, drinking alcohol, not attending full ante natal care, and delivery by caesarean delivery were factors which had associations with adverse birth outcomes. Therefore, providing appropriate information on the above mentioned factors is very important.

Keywords: adverse birth outcome; factors; jimma zone.

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LISTS OF ACRONYMS AND ABBREVIATIONS

AIDS – Acquired Immune Deficiency Syndrome

ANC – Antenatal Care

AOR– Adjusted Odds Ratio

APH – Antepartum Hemorrhage

BEmONC –Basic Emergency Obstetric and Neonatal Care

CEmONC–Comprehensive Emergency Obstetric and Neonatal Care

C/S –Caesarean Section

CI – Confidence Interval

EDHS– Ethiopian Demographic and Health Survey

EmOC – Emergency Obstetric Care

FANC – Focused Antenatal Care

FGM – Female Genital Mutilation

HIV – Human Immune-deficiency Virus

HMIS–Health Management Information System

IUGR – Intra –Uterine Growth Restriction

LBW – Low Birth Weight

LGA – Large for Gestational Age

WH–Maternity Waiting Home

NICU–Neonatal Intensive Care Unit

OR – Odds Ratio

PI–Principal Investigator

PIH – Pregnancy Induced Hypertension

TFR – Total Fertility Rate

WHO – World Health Organization

1. CHAPTER 1: INTRODUCTION

1.1. Background

Adverse neonatal birth outcome may be lethal outcomes which include fetal and infant losses including abortion, stillbirth, macrosomia, neonatal deaths and few post neonatal deaths related to pregnancy and labor. Adverse birth outcomes are influenced by a different of biological, psychosocial and environmental factors. Different studies indicated that socioeconomic status, maternal education, marital status, pregnancy desire and teenage pregnancy, maternal co -morbidities and genetic vulnerabilities have also each been linked to poor pregnancy outcomes. Perinatal mortality, comprising of still births and early neonatal deaths is one of the sensitive indices of the quality of prenatal, obstetric and early neonatal care available to women and newborns. It is estimated that nearly two-thirds of the eight million infant deaths that occur each year result largely from poor maternal health and hygiene, inadequate care, inefficient management of delivery, and lack of essential care of the newborns. In developing countries, just over 40% of deliveries occur in health facilities and little more than one in two with the assistance of a doctor, midwife or qualified nurse. There has been much effort to reduce neonatal mortality; however, there have been little studies to find out the factors that contribute to adverse birth outcomes.To address the problems of maternal and neonatal health in developing countries, a standard of care is required to define level of performance, improve quality of services provided and, ultimately, reduce maternal and newborn deaths.

1.2. Statement of the Problem:

The world has made substantial progress in child survival since 1990. Globally, the number of neonatal deaths declined from 5.0 million in 1990 to 2.4 million in 2019. Approximately, 2.6 million stillbirths occurred each year, of which about 50% of the incidents occurred just after the onset of labor . About 84% of all stillbirths occur in low-and-middle-income countries including SSA where maternal health service coverage is low. Furthermore, stillbirth has psychological costs to women and their families, such as maternal depression, financial and economic repercussions, as well as stigma and taboo. Accordingly, of the identified and prioritized 34 high cost-effective interventions in the Ethiopian Child Survival Strategy, seventeen are to improve neonatal survival. By following a continuum of care approach to rollout the delivery of the selected new-born interventions to address particular needs of mother and new-born, it aims to reduce neonatal mortality ratio from 28 to 11 per 1,000 live births by 2020. In response to adverse neonatal outcomes in Ethiopia; United States Agency for International Development invests in high impact interventions that improve the health and well-being of women, children and families across the country by expanding access to quality health services with a focus on reaching underserved communities(1).

Working closely with the Ministry of Health and regional health bureaus across the country, they strengthen health workers' skills to provide better quality services at the facility, community and household levels, with a focus on safe childbirth practices that protect the lives of mothers and infants. However, the decline in neonatal mortality from 1990 to 2019 has been slower than that of post-neonatal under-5 mortality. Parent's socio-economic and cultural factors such as education (both maternal and paternal), work status, wealth and religion as well as mother's habitat and environment (depicted by region of residence) are likely to influence perinatal mortality through maternal health status as depicted by nutritional status of the mother. Maternal demographic characteristics such as age, parity, and birth order and pregnancy interval may directly influence perinatal mortality. According to 2019 Ethiopian Demographic Health Survey, neonatal mortality is increasing to 30 /1000 births as compared to 2016 EDHS showed that 29/1000 births. This implies that much effort is needed to halt the gap of identifying the factors associated with adverse neonatal outcome. There is limited documentation of factors contributing to adverse neonatal birth outcomes in Jimma Zone. There is also limited study of determinants that are associated with adverse

neonatal birth outcome in other study areas in Ethiopia that were added in this study such as female genital mutilation, alcohol intake, readiness of staff and smoking status of the pregnant women. Therefore; this study seeks to identify the factors that contribute to adverse neonatal birth outcomes in selected public hospitals of Jimma Zone, Ethiopia.

1.3 Significance of the study

Childbirth is the time of greatest lifetime risk of mortality for a mother and her baby. Reducing the global total of 3.82 million neonatal deaths, particularly the 3 million who die in the first week of life is crucial. This study's findings will further reveal how identifying factors for adverse neonatal birth outcome can be used in averting neonatal morbidity and mortality. The findings would be of major importance in assessing how predictors of neonatal birth outcome are affecting neonatal outcomes and further additional investigation. Addressing major predictors for adverse neonatal birth outcomes (still birth, preterm birth and low birth weight) can be a major tool in improving neonatal outcomes. The solutions to reduce neonatal deaths, especially early neonatal deaths, are intimately linked to maternal health and to provision of effective maternal and neonatal health services. Even though this study had conducted in some parts of the country, still there is unknown about association of adverse neonatal birth outcome of mothers with alcohol drinkers, genitally mutilated and smoking habit of the mother. The study also helps other researchers to identify further contributing factors for adverse neonatal outcomes in the study area. In order to attain Country's Health Sector Development Plan, a substantial reduction in neonatal deaths is required. This understanding of factors that contribute to adverse neonatal birth outcomes helps the policy makers and health administrators as well as community to improve health and healthcare services. Therefore, this study will help efforts to reduce child mortality rates which may occur as a result of the adverse pregnancy birth outcomes. Rural community at large will benefit from this study as factors that contribute to adverse neonatal outcome mostly affect the rural part of the community. Health sectors at all levels also will be benefited from the research as for further intervention.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Factors associated to adverse birth outcome

2.1.1. Socio demographic factors

A study conducted in Italy demonstrated that as educational level increases, the frequency of several outcomes (i.e., preterm birth, low birth weight, small for gestational age, cerebral distress and respiratory distress) decreases proportionally(2). According to study done in Ghana, timely and adequate antenatal care is generally acknowledged to be an effective method of preventing adverse neonatal birth outcomes to their babies (3). A study conducted in London demonstrated that advanced maternal age, after adjustment for other maternal characteristics and obstetric history, is associated with increased risk for a wide range of adverse neonatal birth outcomes, including miscarriage, SGA, GDM but not stillbirth, gestational hypertension, spontaneous preterm delivery or LGA (4). A study done in Baracaldo, Spain demonstrates that advanced maternal age, after adjustment for other maternal characteristics and obstetric history, is associated with increased risk for a wide range of adverse pregnancy outcomes, except stillbirth, gestational hypertension, spontaneous preterm delivery or LGA (4). A study conducted in Gamo Gofa, Southern Ethiopia showed that being male, mother do not know dangers sign during pregnancy and being multigravida has associated with adverse pregnancy outcomes (5).

2.1.2. Preexisting factors

Studies show that Hypertension and Diabetes are two of the most common medical conditions to complicate pregnancy, 7%-10% and 3%-5%, respectively (6). Recent studies of pregnancy in women in the United Kingdom with type 1 diabetes have shown a fourfold to tenfold increased risk of congenital malformation compared with non-diabetic women (7). Braham K et al conducted a meta-analysis and systematic review of both retrospective and prospective cohorts, population studies, and series of randomized controlled trials of pregnant women with chronic hypertension and it is associated with preterm delivery before 37 weeks' gestation, Low birth weight, perinatal death, and Neonatal Intensive Care Unit admission (8). Studies show that Patients with chronic hypertension in pregnancy are at increased risk for maternal and perinatal morbidity (8). Recent research on the interaction

between malaria and HIV infection shows that pregnant women with HIV and malaria are more likely to be anemic and the baby is at high risk of LBW, preterm birth and death (8). Different studies show that HIV positive women are confronted with the fear of vertical transmission of HIV as well as the possible risk of an adverse birth outcome and complications arise from HIV positive pregnant women are anaemia in pregnancy, intrauterine growth restriction, preterm labour and birth weight less than 2,500g (7). The same studies suggest that malaria infection may also result in an increased risk of postpartum sepsis for the mother (7). A study in Ethiopia found out that placental parasitaemia was associated with 17 premature births (7). There is a substantial amount of evidence showing that maternal iron deficiency anaemia early in pregnancy can result in low birth weight subsequent to preterm delivery and linked to intrauterine growth retardation (IUGR) of the baby, thus contributing to infant deaths (7).

2.1.3. Maternal Factors

Studies conducted in North Western Nigeria show that lack of access to appropriate obstetric care and obstetric emergencies especially during labor are independently associated with increased risk of stillbirth, neonatal death, or disability(7). Studies done in Southeast Madagascar indicate that social, culture norms and tradition customs influence neonatal birth outcome because of the ability of women to seek for health care services (9). Recognizing early warning signs of pregnancy problems and referring the woman to a health facility with resources to handle a complicated delivery can reduce neonatal mortality (10). Studies in Brazil, China and Turkey showed positive association of cigarette smoking during pregnancy with low birth weight (11). Further studies about the effects of antenatal tobacco use in the United States of America (USA) and Jordan revealed its strong association with preterm birth and congenital malformation (11). Possible adverse neonatal outcomes associated with maternal alcohol consumption include congenital and physical abnormalities such as cardiovascular, musculoskeletal, and craniofacial defects (11) . Vigorous physical activity can result in reduced blood flow to the fetus, with a consequent reduction in essential substrates for its growth, and may result in adverse perinatal outcomes (11) .

2.1.4. Health facility factors

Poor patient-provider relationships and provider inattention to health seekers' needs are foremost barriers to the uptake of formal care services and frequently-mentioned factors in poor maternal outcomes in developing societies (12). Studies show that women's deciding to seek care, delays in receiving care, referral linkage and delays in reaching care have association with adverse neonatal birth outcomes and great gain can made if quickly reach a facility where they can receive high-quality obstetric care (13). Previous studies show that short birth intervals, are known to have negative effects on maternal, prenatal and neonatal birth outcomes as well as on child health, though the precise mechanisms are poorly understood (14). In general, many investigations related to factors for adverse neonatal birth outcome such as socio demographic factors, short birth intervals, delays in health seeking care, access to health facility, pre-existing conditions (HIV/AIDS, Anemia, Malaria, Cardiac disease, Hypertension and Diabetes Mellitus), Obstetric emergency and Antenatal Care have been done and were independent predictors of adverse neonatal birth outcomes.

In Jimma Zone, many studies are still not well addressed related to adverse neonatal birth outcomes such as lifestyle factors (Smoking, Alcohol use during pregnancy and vigorous exercise during pregnancy). So the study was focused on the above well addressed factors as they were strongly associated with adverse neonatal birth outcome in Jimma Zone, Ethiopia. (See figure 1 below).

2.2. Conceptual Frame work of adverse neonatal birth outcome at selected hospitals of Jimma zone, from June 1-30, 2022. (Source: Constructed from literature review (5))

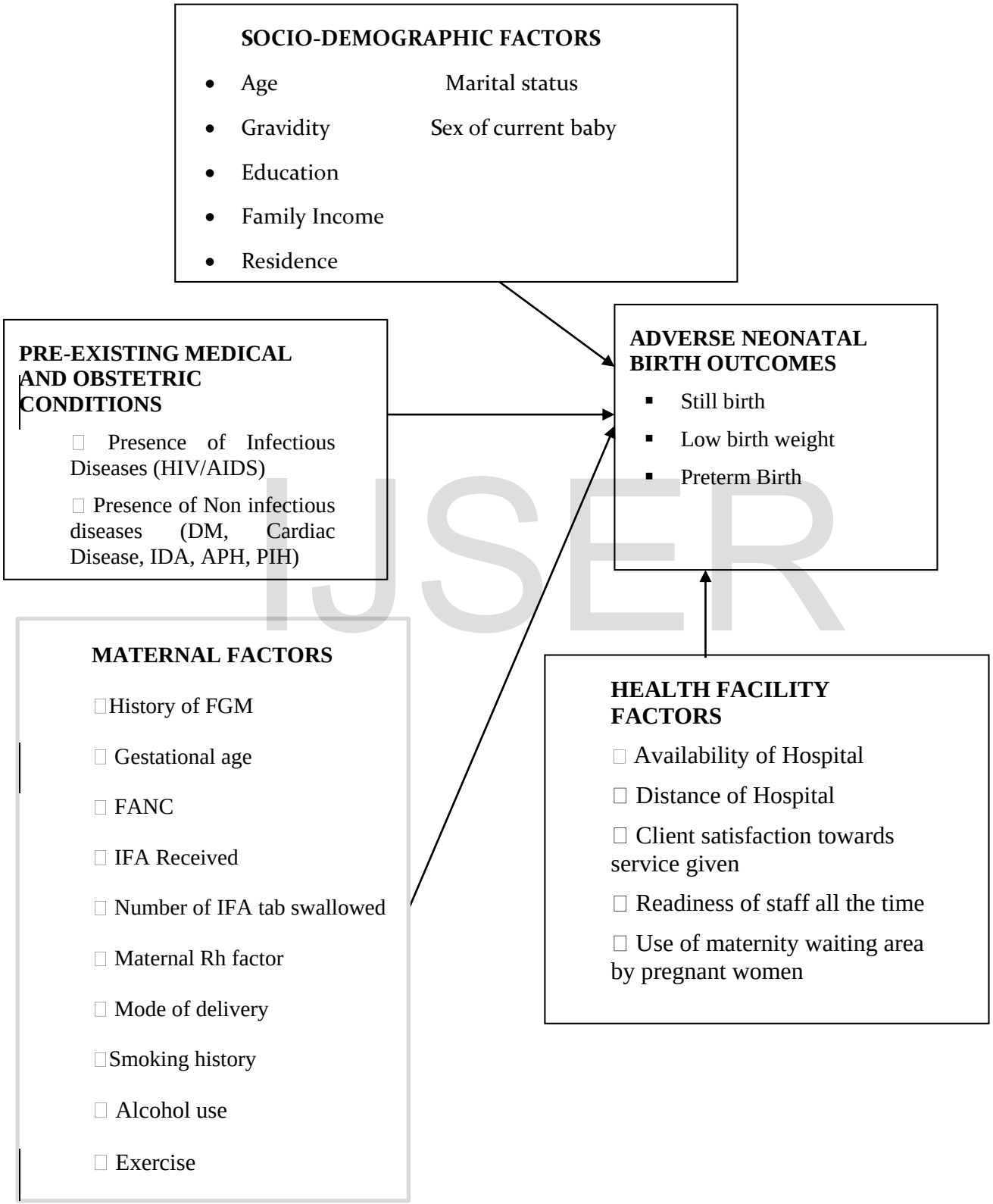


Figure 1 Conceptual Framework of the study.

3. CHAPTER 3: OBJECTIVES

The objective of this study was to identify determinants of adverse neonatal birth outcomes among women who gave birth in selected hospitals of Jimma Zone from June 1-30, 2022.

Null Hypothesis: There is no difference between the controls and the cases in the risk of disease. *(HO: OR=1)*

Alternative Hypothesis: There is a difference between the controls and the cases in the risk of disease. *(H1: OR not =1)*

4. CHAPTER 4: METHODS AND MATERIALS

4.1. Study Area and Period

This study was conducted in selected hospitals of Jimma Zone, Ethiopia from March 1-30/2022. Jimma zone is located 355 km away from Addis Ababa, a capital city of the Ethiopia. Based on the 2007 Census conducted by the CSA, this zone has a total population of 2,486,155 and a female-to-male ratio of 1.01:1. The great majority (89%) of the population of the Zone are rural residents. The Zone has a total of 521,206 households with an average household size of 4.77 persons per household. The potential health service coverage of the zone for the year 2013 E.C is about 97%. Estimated number of women of reproductive age (15-49) is 463419. From this, estimated number of delivery is 86,269 and estimated number of live birth is 80054. In Jimma zone, the skilled delivery rate is 51%. In the study area there are 3 primary hospitals, 3 Zonal Hospitals, 1 Specialized Hospital, 117, health centers, and 520 health posts. Besides there are certain non-governmental organizations (NGOs) providing health service for the community, there are private health facilities including low level clinics, medium clinics, drug store and pharmacies (15). The study was conducted from Jun 1-30/2022.

4.2. Study Design

This study was facility based unmatched case control study.

4.3. Population

4.3.1. Source population

All mothers who give birth in public hospitals**.**

4.3.2. Study Population

For Cases: Selected women who gave birth with at least one adverse birth outcome (preterm birth, stillbirth or low birth weight) in selected Hospitals in Jimma zone from June 1-30/2022.

For Controls: Selected women who gave birth without adverse birth outcomes in hospitals from June 1-30/2022.

4.4. Definition of Cases and Controls

4.4.1. Definition of Cases

Neonates who were born with preterm, low birth weight and still birth (Birth before a gestational age of 37 complete weeks, infants' weighs less than 2500g at term birth and neonates born with no signs of life at or after 20 weeks gestation respectively).

4.4.2. Definition of Controls

Neonates who were delivered normally (Weight of baby >=2.5kg-3.9kg, live birth and term baby).

4.5. Inclusion and Exclusion criteria

4.7.1. Inclusion Criteria

Neonates born single, born after 28 weeks of gestation at the selected hospitals and under the catchment area. (For both cases and controls)

4.7.2. Exclusion Criteria

Neonates born being multiple, mothers whose cards are missed, incomplete delivery registration with outcome variable, and clients came by referral from other catchment area were excluded from the study.

4.6. Sample Size Determination and Sampling Procedure/Techniques

4.6.1. Sample Size determination

The sample size was computed using open Epi –Info-7; Statistical software package by considering the 37.2% of cases exposed and 23.5% controls exposed (taken from previous study conducted in Gamo Gofa zone, South Ethiopia and since it is maximum); OR: 1.928 CI: 95%; Power of the study: 80% and ratio of cases to

controls of 1:3 As computed in the below table, the larger sample size is 494. With adjustment for 5% non-response rate, the total sample size was 518.

The required final sample size for cases was 130 and for controls 388.

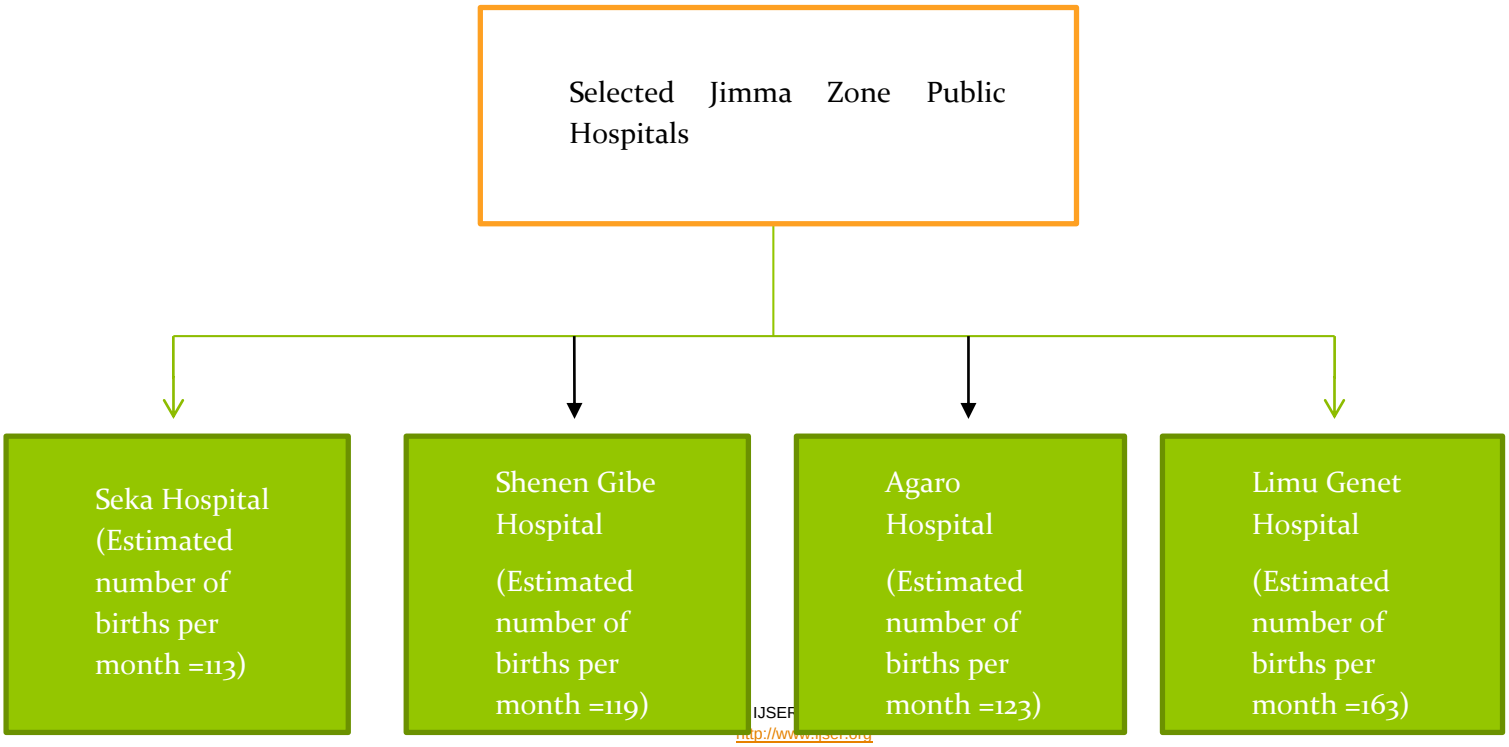
Table 1 Sample Size Determination

Independent Variables	Percent of cases exposed	Percent of controls exposed	(AOR)	Ratio	Power	Confidence Interval	Total Sample Size (Using Epi-Info
Multi gravida (45)	47.2%	21.9%	3.187	1:3	80	95%	Cases 80, Controls 119, Total 159
Being male baby (45)	49.9%	23.9%	3.171	1:3	80	95%	Cases 39, Controls 117, Total 156
Do not know danger sign during pregnancy (45)	37.2	23.5%	1.928	1:3	80	95%	Cases 124, Controls 370, Total 494

4.6.2. Sampling Techniques

Agaro, Limu Genet, Seka and Shenen Gibe Hospitals were included based on number of cases at each hospital and these hospitals were selected from different

geographical locations. To allocate proportional sample size for each hospital; the numbers of delivery conducted in the past three months and reported from delivery registration book of each hospital was taken as a reference. They were grouped as cases or controls based on their birth outcome in selected hospitals. Both cases and controls were selected by convenience as it is homogeneous population. 1:3 ratio of case to control was assigned until the allocated sample was achieved at each hospital.



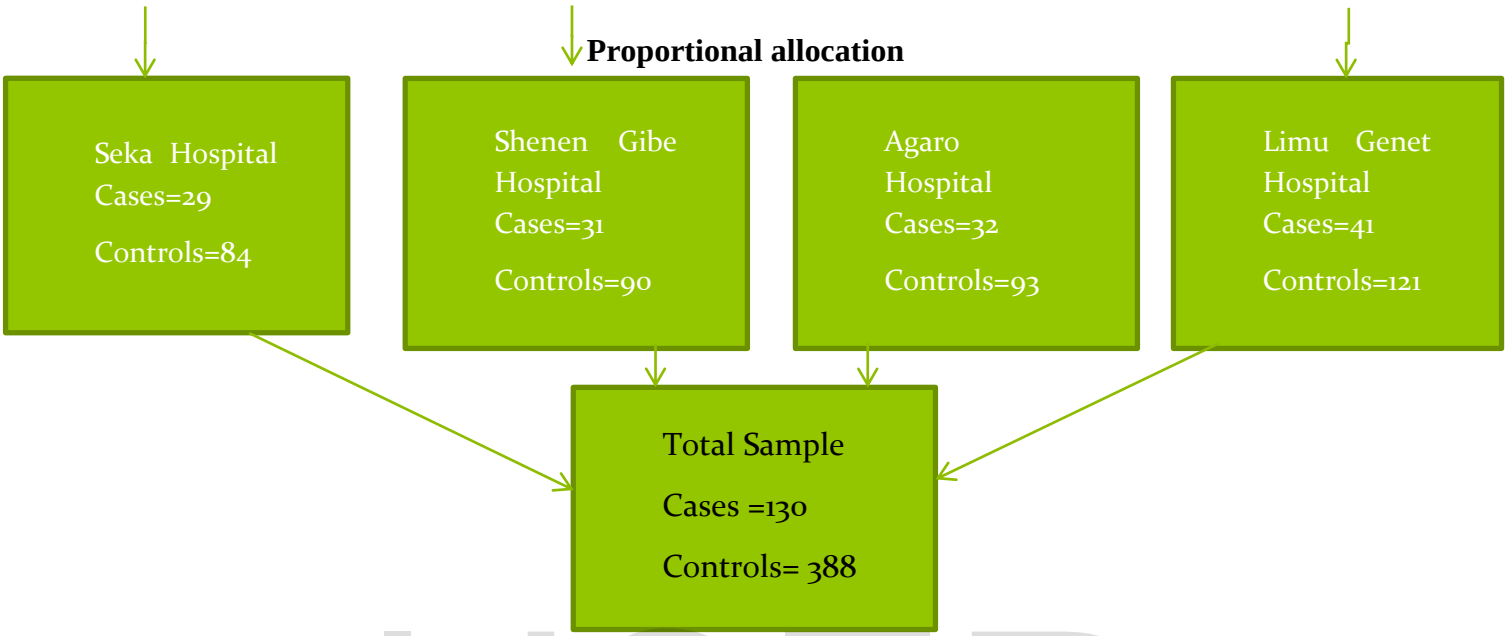


Figure 2 Sampling technique of adverse neonatal birth outcome at selected hospitals of Jimma zone from June-1-30, 2022.

4.7. Selection of Cases and Controls

4.7.1. Selection of Cases

Neonates who were born with preterm, low birth weight and still birth (Birth before a gestational age of 37 complete weeks, infants weighs less than 2500g at term birth and neonates born with no signs of life at or after 28 weeks gestation and delivered at selected hospital respectively) were selected by convenience sampling following their registration. The cases were selected during the data collection time until the allocated sample size was reached.

4.7.2. Selection of Controls

Case registration book was used for selection of controls. Neonates who were born without any of the adverse birth outcomes at selected hospitals were selected by convenience sampling.

4.8. Data Collection Procedures

Pre-tested and structured questionnaire were used to collect the data. Oral interview of delivered mothers were also included in the questionnaire. A lesson from the pretest was used to modify the questionnaire. Data collected by professional health workers (1 Data collectors (BSc Midwifery) and 1 supervisor (HO) for each hospital) who can write, read and speak Afan Oromo and who can write, read English. Data collectors were selected based on their experience in data collection. Training was given by PI for data collectors and supervisors for two days. The training includes concepts of adverse neonatal birth outcomes, their definitions, and definitions of variables of outcome interest such as low birth weight, Pre-term Birth, and Still Birth, contents of questionnaires. The training also includes how to select cases and controls, how to fill the questionnaires and the ethical principles such as anonymity to be considered when the data were collected. Cases and controls were selected from delivery registration book and Clients' individual folder at selected hospital according to their standard definitions. Controls were selected consecutive to the cases, mothers who deliver babies without the adverse birth outcomes. Completed questionnaires were checked daily and errors were corrected.

4.8.1. Data Collection Instruments

Data collection tools were structured questioners established after review of relevant literatures that can address particular objectives. Tools were adopted from various similar studies in different parts of the world and modified according to local context. Data were collected through observation method (record review). Clients' data, including month of delivery, age, residence, delivery outcome, weight of the baby, sex of current baby, lab investigations including HIV test and hemoglobin test, Diabetes mellitus test, hypertension test, cardiac history were extracted from medical records using a well-structured checklist.

4.9. Study Variables

Dependent Variable: Adverse neonatal birth outcome

Independent Variables are

- **Socio-demographic factors**
- Maternal age**,** Marital status**,** Family Income**,** Educational level, Residence, Gravidity
- **Pre-Existing Conditions**

- DM, Cardiac Disease, HIV/AIDS, Iron Deficiency Anemia, APH, PIH

- **Maternal Factors**

Smoking, Alcohol Consumption, Exercise, History of FGM, Sex of current baby, Gestational age, Focused ANC, IFA received, Number of IFA tab swallowed, Maternal Rh factor, Mode of delivery

- **Health Facility Factors**

- Availability of hospital, Distance, Client service satisfaction, Readiness of staff all time, availability of MWH

4.10. Operational definitions and definition of terms

Adverse Neonatal Birth Outcome birth outcome of new-born delivered with at least preterm, low birth weight or still birth.

Stillbirth: Fetal loss after 28 weeks of gestational age and during intra partum period.

Preterm birth Birth of a baby through regular contractions of the uterus resulting in changes in the cervix that starts before 37 completed weeks of gestation since the first day of a woman's last menstrual period

Low birth weight Infant born weighing less than 2500 grams.

Readiness of staff all the time Availability of 7 BEmONC signal functions at delivery ward.

4.11. Data Processing and Analysis

Data from questionnaires were edited, coded; entered using double data entry and validation and cleaning was done using Epidata 3.1 and was exported to SPSS version

20 for analysis. Univariate (descriptive) analysis for summarizing both continuous and categorical variables was done. Bivariate analysis at P value of ≤ 0.25 was computed for selecting candidate predictor variables using Pearson chi-square to identify whether there is a relationship between two categorical variables. Checking multi collinearity and interaction between candidate variables of P value of ≤ 0.25 before running multivariate was considered and there were no independent variables which are Variance Inflation Factor (VIF) of 10. Multivariable logistic regression analysis was performed to predict factors which affect the dependent variable and to control confounding. Those variables with AOR and a 'p' value ≤ 0.05 were considered statistically significant in multivariable analysis. The fitness of model were checked by descriptive statistics which is chi square goodness of fit and all values were greater than 0.5.

4.12. Data Quality Management

Data quality was ensured during collection, coding, entry and analysis. It was assured by applying properly designed and pre-tested on 5% of delivered mothers in two weeks before the actual data collection to make its ability to elicit relevant information. A lesson from the pretest was used to modify the questionnaire. Training was given by Principal Investigator (PI) for data collectors and supervisors for two days. One day training was given to the reviewers, data collectors and supervisors on how to use the checklist, method of reviewing, and objectives of the study for eight data collectors and four supervisors to avoid any confusion and have a common understanding about the study. Each client card was checked for consistency and giving of full information. The reviewers were instructed to write card number on the check list during the data collection so that any identified errors was traced back using the card number. The filled checklist was reviewed daily based for its completeness. Structured questionnaire was prepared in English and then was converted in to Afan Oromo and then to English for consistency. Secondary data was collected from selected Hospitals for those neonates born of adversely and normally and this information was gathered from HMIS log book and

history sheet in individual cards using a structured data collecting format. Completed questionnaires were checked daily and errors were corrected.

4.13. Ethical Consideration

The research was approved by Ethical Review board of Health Institute of Jimma University before the start of the study. Official letter was written for each hospital and informed verbal consent from delivered mothers was sought often brief explanation of the purpose of the study. The respondents have the right to refuse participation or terminate their involvement at any point during the interview. The information provided by each respondent was kept confidential and their Individual Foder was kept at separate place and was locked until the data was collected and completed.

4.14. Dissemination Plan

The study result will be presented to the Department of Epidemiology, Jimma University Institute of health science. The result of the study will be disseminated to the relevant organization that can make use of findings, including the regional Health Bureaus, Districts of Health Offices, and respective Health Institutions. Efforts will be attempted to publish the findings on scientific journal.

5. CHAPTER 5: RESULT

5.1. Socio-demographic characteristics of the respondents

In this study, from 130 respondents the response rate among case were 127 (97.7%) and from 388 respondents, 381 (98.1%) were among controls with a total of 10 (1.9%) non response rates and a total response rate of 508 (98.06%). Delivered mothers' age 30-39 years among case were 55 (43.3%) when compared to 127 (33.3%) among control. Regarding to residence, delivered mothers from rural residents among case were 85 (66.9%), when compared to 201 (52.7%) among control. Delivered mothers attended high school among case were 74 (58.2%), when compared to 249 (63.3%) among control. Delivered mothers whose monthly income <1800 ETB among case were 55 (43.2%) when compared to control 181 (47.5%) among control. Regarding to marriage status; delivered mothers who were not married among case were 4 (3.14%) when compared to 10 (2.62%) among control. Multigravida mothers were 84 (66.1%) among case when compared to 121 (31.7%) among controls. (See Table 2 below)

Table 2 Section One: Socio-demographic characteristics of delivered mothers in selected Hospitals of Jimma zone, 2022 G.C.

Variables	Response options	Catagory	
		Case (%) N=127	Control (%) N=381
Current age of the mother	20-29	72 (56.6)	254 (66.7)
	30-39	55 (43.3)	127 (33.3)
Residence	Rural	85 (66.9)	180 47.3)
	Urban	42 (33.1)	201 (52.7)
Educational Status	Primary school and under	53 (41.7)	132 (34.6)
	Secondary school and above	74 (58.2)	249 (65.3)
Family Income	<1800ETB	55 (43.2)	181 (47.5)
	>=1800ETB	72 (56.7)	200 (52.5)
Marital Status	Not married	4 (3.14)	10 (2.62)
	Married	123 (96.8)	371(97.3)
Gravida	Multigravida	84 (66.1)	121(31.7)
	Primigravida	43 (33.8)	260 (68.2)

5.2. History of Pre-existing medical condition

Regarding to preexisting medical conditions; 41 (32.2%) of delivered mothers had preexisting medical condition among case when compared to 93 (24.4%) among control. Delivered women with noninfectious medical conditions (DM, HTN, CVD and IDA) were 27 (21.21%) among cases when compared to 67 (17.6%) among controls. Delivered mothers with infectious medical conditions were 15 (11.8%) among case when compared to 27 (7.1%) among control. Delivered mothers with Antepartum hemorrhage were 8 (6.3%) among case when compared to 10 (2.6) among control. 6 (4.7%) of delivered mothers among case were developed abruption placenta whereas 5 (1.3%) were developed among control. (See table 3 below).

Table 3 History of pre-existing medical condition of study participants among delivered mothers in selected Hospitals of Jimma Zone, 2022 G.C

Variables	Response options	Category	
		Cases (N=127)	**Controls (N=381)**
Presence of pre-existing medical conditions.	Yes	41 (32.3)	93 (24.4)
	No	86 (67.7)	288 (75.6)
Types of pre-existing medical conditions	Non infectious diseases (DM, HTN, CVD, IDA)	27 (21.3)	67 (17.6)
	Infectious diseases (HIV/AIDS)	15 (11.8)	27 (7.1)
Presence of APH	Yes	8 (6.3)	10 (2.6)
	No	119 (93.7)	371 (97.4)
Types of APH	Abruptio placenta	6 (4.7)	5 (1.3)
	Placenta praevia	2 (1.5)	4 (1.0)

5.3. Maternal Conditions

Delivered mothers with history of genital mutilation were 106 (83.4%) among case when compared to 247 (64.8%) among controls. 84 (66.1%) delivered baby were male among case when compared to 122 (32.0%) were male among control. Delivered mothers who did not attend FANC were 66 (51.9%) among case when compared to 134 (64.8) among controls. Delivered mothers who did not receive IFA were 62 (48.8%) among case when compared to 121 (31.7%) among controls. Delivered women who swallowed <90 tabs of IFA were 46 (36.2%) among case when compared to 157 (41.2%) among control. Women who delivered by caesarean section among case were 10 (7.8%) when compared to 153 (40.1%) were among

control. Delivered women with Rh factor negative among case were 8 (6.2%) when compared to 10 (2.6%) among control. Delivered women who experienced any type of smoking were 12 (9.4%) among case when compared to 49 (12.8%) among control. 27 (21.2%) of delivered women were drinking any type of alcohol during their pregnancy time among case when compared to 45 (11.8%) among control. Delivered women who did any type of exercise were 75 (59.0%) among case when compared to 188 (49.3%) were among control. (See table 4 below)

Table 4 Maternal Conditions of study participants among delivered mothers in Jimma zone Hospitals, 2022 G.C.

Variables	Response options	Catagory	
		Cases (%) N=127	Controls (%) N=381
History of FGM	Yes	106 (83.4)	247 (64.8)
	No	21 (16.3)	134 (87.6)
Sex of current	Male	84 (66.1)	122 (32.0)
	Female	43 (33.8)	259 (67.9)
FANC	No	66 (51.9)	134 (64.8)
	Yes	61 (48.1)	247 (64.8)
IFA Received during pregnancy	No	62 (48.8)	121 (31.7)
	Yes	65 (51.1)	260 (68.2)
Number of IFA swallowed during pregnancy	<90 tabs	46 (36.2)	157 (41.2)
	>=90 tabs	18 (14.1)	101 (26.5)
Maternal Rh factor	Rh Negative	8 (6.2)	10 (2.6)

	Rh Positive	119 (93.7)	371(97.3)
Mode of delivery	C/S	10 (7.8)	153 (40.1)
	SVD	117 (92.1)	228 (59.8)
History of any type of smoking	Yes	12 (9.4)	49 (12.8)
	No	127 (100.0)	320 (83.9)
History of use of any type of alcohol	Yes	27 (21.2)	45 (11.8)
	No	100 (78.7)	336 (88.1)
Any type of exercise (sport)	Yes	75 (59.0)	188 (49.3)
	No	52 (40.9)	193 (50.6)

5.4. Information on Health Facility Factors

Delivered women who did not have availability of hospital around their residence area were 86 (67.7%) among case when compared to 182 (47.7%) among control. Delivered women who were away more than 10 Km from hospital were 86 (67.7%) among case when compared to 182 (47.7%) among control. Delivered women who were assisted by other health professionals among case were 42 (33.0%) when compared to 85 (22.8%) among control. The delivered women at which staff were not ready for delivery assistance among case were 75 (59.0%) when compared to 202 (53.0%) among controls. 99 (77.9 %) of delivered women among case did not use functional maternity waiting home before delivery when compared to 193 (50.6%) among control. Delivered mothers who did not satisfy to the service given during labor and delivery among case were 2 (1.5%) when compared to 12 (3.14%) among controls. Delivered baby whose weight <2.5Kg were 47 (37.0%) among case when compared to 1 (0.26%) among control. Still birth among case were 79 (62.2%) when compared to 0 (0%) among control. (See table 5 below)

Table 5 Information on health facility factors of study participants among delivered mothers at selected hospitals of Jimma Zone, 2022 G.C.

Variable	Response Option	Catagory	
		Cases (%) **N=127**	Controls (%) **N=381**
Availability of Hospital	No	86 (67.7)	182 (47.7)
	Yes	41 (32.2)	199 (52.2)
Distance of Hospital from the client's residence	>=10Km	86 (67.7)	182 (47.7)
	<10Km	41 (32.2)	199 (52.2)
The delivery was conducted by	Other health care professionals	42 (33.0)	87 (22.8)
	Midwives	85 (66.9)	294 (77.1)
Readiness of staff all time	No	75 (59.0)	202 (53.0)
	Yes	52 (40.9)	179 (46.9)
Clients use of maternity waiting home before delivery	Did not use	99 (77.9 %)	193 (50.6 %)
	Used	28 (22.0)	188 (49.3)
What is your satisfaction to service you have taken?	Not satisfied	2 (1.5)	12 (3.14)
	Satisfied	125 (98.4)	369 (96.8)
Weight of the baby	<2.5Kg	47 (37.0)	1 (0.26)
	>=2.5Kg-3.9Kg	80 (62.9)	380 (99.7)
Outcome of the baby	Still birth	79 (62.2)	0 (0)

	Live birth	48 (37.7)	381 (100.0)

5.5. Bivariate Analysis of Factors Associated with Adverse Neonatal Birth Outcome.

In bivariate analysis, Age, Education, Marital status, Gravida, Residence, Female Genital Mutilation, Sex of current baby, Presence of preexisting medical conditions, Presence of APH, History of smoking, History of drinking alcohol, Exercise, Availability of nearby hospital, Distance, Profession related delivery, Readiness of staff all time, Availability of maternity waiting home, Client satisfaction, Midwife additional activity, Number of delivery per day by each midwife, Focused ANC , Maternal Rh factor and mode of delivery were found significantly associated at $p < 0.25$ with adverse neonatal birth outcomes.

Table 6 Bivariate logistic regression analysis of factors associated with adverse neonatal birth outcome of the study subjects in public hospitals, Jimma Zone, Ethiopia, 2022 GC.

Variable	Category	Case	control	COR	P Value
Current age of the mother	30-39	55 (10.8)	127(25.0)	1.528	0.043
	20-29	72(14.2)	254(58.0)		
Residence	Rural	85 (66.9)	180 (47.2)	2.260	0.000
	Urban	42 (33.0)	201(52.7)		
Gravida	Multigravida	84 (49.6)	121(58.0)	4.19	0.000
	Primigravida	43 (50.4)	260 (41.9)		
Presence of pre-existing medical conditions.	Yes	41(32.2)	93(24.4)	1.476	0.082
	No	86(67.7)	288(75.5)		
Presence of APH	Yes	8 (6.3)	10 (2.62)	2.494	0.060
	No	119(93.7)	371(97.3)		
History of FGM	Yes	106 (83.4)	247 (64.8)	2.738	0.000
	No	21 (16.5)	134 (87.6)		
Sex of current baby	Male	84(66.1)	122(32.0)	4.147	0.000
	Female	43(33.8)	259(67.9)		
FANC	Yes	86(67.7)	213(55.9)	1.65	0.001
	No	41(32.2)	168(44.0)		

Variable	Category	Case	control	COR	P Value
IFA Received during pregnancy	No	62 (48.8)	121 (31.7)	2.050	0,001
	Yes	65 (51.1)	260 (68.2)		
Maternal Rh factor	Rh Negative	8 (6.2)	10 (2.6)	2.494	0.060
	Rh Positive	119 (31.2)	371(97.3)		
Mode of delivery	C/S	10(7.8)	153(40.1)	0.127	0.000
	SVD	117(92.1)	228 (59.8)		
History of use of any type of alcohol	Yes	27(21.2)	45(11.8)	2.016	0.009
	No	100(78.7)	336 (88.1)		
Any type of exercise (sport)	Yes	75 (59.0)	188 (49.3)	1.481	0.059
	No	52(40.9)	193(50.6)		
Availability of Hospital	No	86 (67.7)	182 (47.7)	2.793	0.000
	Yes	41 (32.2)	199 (52.2)		
Distance of Hospital from the client's residence	>=10Km	86(67.7)	182(47.7)	2.793	0.000
	<10Km	41(32.2)	199(52.2)		

5.6. Multivariable logistic regression analysis of factors associated with adverse neonatal birth outcomes.

After computing bivariate logistic regression using SPSS v. 26 to identify candidate variables for adverse neonatal birth outcomes, the result of above mentioned candidate variables were entered to SPSS v. 26 for multivariate logistic regression by using backward wald method. The predictors for adverse neonatal outcomes with p value of <=0.05 were multigravida, rural residence, history of having FGM, being male of current baby, presence of preexisting medical condition, history of use of alcohol, not attending of FANC and delivery by caesarean section. (See table 8 below)

The study revealed that the delivered women with multigravida were three times more likely to have adverse neonatal birth outcome (AOR 3.769 (95% CI 2.295-6.188)) when compared to primigravida.

Delivered women with rural resident were 2 times more likely to have adverse neonatal birth outcome (AOR 1.921 (95% CI 1.15-3.19)) when compared to their counter parts of women with urban residents.

Delivered women with male baby were 4 times more likely to have adverse neonatal birth outcome (AOR=3.935, (95% CI: 2.388, 6.483) when compared to their counterpart of women with female baby.

Delivered women with genital mutilation were 3 times more likely to have adverse neonatal birth outcome (AOR 2.880 (95% CI 1.57-5.28)) when compared to their counterpart of those without genital mutilation.

Delivered women with pre-existing medical condition were 2 times more likely to have adverse neonatal birth outcome (AOR 1.737 (95% CI 1.005-3.003)) when compared to those without pre-existing medical condition.

Delivered women with use any type of alcohol during pregnancy were 2 times more likely to have adverse neonatal birth outcome (AOR 2.281 (95% CI 1.175-4.426)) when compared to those who do not use alcohol.

Delivered women without fully attended FANC were 2 times more likely to have adverse neonatal birth outcome (AOR 1.963 (95% CI 1.190-3.238)) when compared to those who attend FANC.

Delivered women with caesarean section during delivery to have adverse neonatal birth outcome where lower by 87.6% (AOR=0.124, (95% CI (0.059, 0.259)) compared to spontaneous vagina delivery. (See table 7 below)

Table 7 Multivariable logistic regression analysis of adverse neonatal birth outcomes among mothers who gave birth in selected public hospitals of Jimma Zone, Ethiopia, 2022 GC.

Variable	Category	Cases No.(%)	Controls No.(%)	COR,95%CI	p-value	AOR,95%CI	P-value
Gravida	Multigravida	84 (49.6)	121(58.0)	4.198 (2.741, 6.428)	0.000	3.769 (2.295, 6.188)	0.000 *
	Primigravida	43 (50.4)	260 (41.9)	1.00		1.00	
Residence	Rural	85 (66.9)	180 (47.2)	2.260 (1.484, 3.442)	0.000	1.921(1.156, 3.190)	0.012 *
	Urban	42 (33.0)	201(52.7)	1.00		1.00	
Female Genital M.	Yes	106 (83.4)	247 (64.8)	2.738(1.639, 4.575)	0.000	2.880 (1.569, 5.285)	0.001
	No	21 (16.5)	134 (87.6)	1.00		1.00	
Sex of current baby	Boy	84 (66.1)	122 (32.0)	4.147 (2.709, 6.349)	0.000	3.935 (2,388, 6.483)	0.000 *
	Girl	43 (33.8)	259 (67.9)	1.00		1.00	
Pre-existing medical cond	Yes	41 (32.2)	93 (24.4)	1.476 (0.951, 2.291)	0.082	1.737 (1.005, 3.003)	0.048 *
	No	86 (67.7)	288 (75.5)	1.00		1.00	
History of drinking alc.	Yes	27 (21.2)	45 (11.8)	2.016 (1.190, 3.414)	0.009	2.281	0.015 *
	No	100 (78.7)	336 (88.1)	1.00		1.00	

Focused ANC	Yes	86 (67.7)	213 (55.9)	1.994 (1.328, 2.995)	0.001	1.963 (1.990, 3.238)	0.008 *
	No	41(32.2)	168 (44.0)	1.00		1.00	
Mode of delivery	C/S	10(7.8)	153(40.1)	0.127 (0.065, 0.251)	0.000	0.124 (0.059, 0.259)	0.000 *
	SVD	117(92.1)	228 (59.8)	1.00		1.00	

***significance at $\alpha \leq 0.05$**

6. CHAPTER SIX: DISCUSSION

This study was aimed to assess determinants of adverse neonatal birth outcomes in public hospitals of Jimma zone. The finding of this study indicated that the factors that associated with adverse birth outcome among pregnant mothers were rural residence, multigravida, Genital mutilation, being male baby, having preexisting medical condition, use of alcohol during pregnancy, not fully attending FANC and being delivered by C/S.

Although many interventions made to reduce poor neonatal outcomes; enough efforts did not made to work on various factors that could affect adverse neonatal birth outcomes. Finding of the study revealed that those pregnant women with multigravida were 3 times more likely to have adverse birth outcome when compared to women with gravida one or two (AOR 3.769 (95% CI 2.3-6.2)). In this study proportion of multigravida was high among cases as compared to group controls (43.5%). This is comparable with study done in Gamo Gofa which shows proportion of multigravida was high among cases when compared to control group (52.34%) (5). This study shows that those pregnant women with multigravida were 3 times more likely to have adverse neonatal birth outcome when compared to their counter parts of women with primigravida mothers. This finding was similar with studies done in Mekelle town which shows those primigravida mothers were 21% less likely to develop adverse birth outcome as compared to grand multi (16). This might be due to sharing of foods, housing, maternal attention to current baby, and medical care for the children with in house hold.

Other maternal factor in this study revealed that delivered women with rural resident were 2 times more likely to have adverse neonatal birth outcome (AOR 1.921 (95% CI 1.15-3.19)) when compared to their counter parts of women with urban residents.

This is in line with studies in Gondar and Wollo mothers with rural resident were a significant factor. Mothers who lived in rural area encountered poor birth outcomes more than two times than mothers who lived in urban area of Wollo(17). This may be due to rural lifestyle in all study areas have similar socio-economic status. This could be lack of access for quality pregnancy related cares in rural areas, high burden of work at home level, lack of access to information and also due to work overload.

In this study, the rate of male sex baby was predominant factor for adverse birth outcome, i.e., Delivered women with male baby were 4 times more likely to have adverse neonatal birth outcome (AOR=3.935, (95% CI: 2.388, 6.483) when compared to their counterpart of women with female baby.

This is in line with study conducted in Gamo Gofa Zone which states that the rate of male sex baby was predominant factor for adverse birth outcome, i.e., pregnant

women with male baby were 26 more likely to have adverse birth outcome as compared to their counter parts of women with female baby with [AOR=26.41, 95% CI (3.149, 221.414)] (45) (5). This could be explained by the fact that women in rural areas are prone to laborious working during the time of pregnancy, unable to access health care easily due to geographical locations and this could lead to maternal complications and adverse neonatal birth outcomes. This is inconsistent with studies done in Algeria and other countries; the rate of female sex was predominant among low birth weight infants and it is attributed to the predisposition of the female sex to the other risk factors(14). And also discrepancy between the studies in Axum and Laelay Maichew Districts and Gonder with this report, both explained that sex of the neonate being female was statistically significant with adverse birth outcome (18) . This discrepancy might be due the high number of male baby in the study area during study period.

The finding of the study showed that delivered women with genital mutilation were 3 times more likely to have adverse neonatal birth outcome (AOR 2.880 (95% CI 1.57-5.28)) when compared to their counterpart of those without genital mutilation.

The finding was compatible with a study conducted in Ghana which states mothers with FGM were nearly twice as likely to have caesarean delivery (adjusted odds ratios = 1.85 with 95% CI [1.72, 1.99]) and stillbirths (1.60 [1.21, 2.11]) compared with those without (19). Study done in Africa also states that circumcised women have increased risks of adverse events during labour and delivery with negative effects on their new-born babies (20) . These risks increase with the severity of type of FGM and include postpartum haemorrhage, episiotomies, perinea lacerations, prolonged second stage of labour, operative vaginal delivery, caesarean deliveries, prolonged maternal hospital stay, infant resuscitation, stillbirth, or neonatal death (20).

This study revealed that delivered women with pre-existing medical condition were 2 times more likely to have adverse neonatal birth outcome (AOR 1.737 (95% CI 1.005-3.003)) when compared to those without pre-existing medical condition.

This study was in line with a study done on neonates delivered in Dilchora Referral Hospital, in Dire Dawa, Eastern Ethiopia supports that still birth, LBW, abortion,

preterm birth and low APGAR score were the most neonatal outcomes in mothers with hypertension (21). A retrospective study done in referral hospital of Rwanda stated that three variables were significantly associated with neonatal death, and include maternal preexisting medical history, (p = 0.000) mode of delivery (p = 0.000), gestational age (p = 0.001), newborns whose mothers had a past medical history of HTN (20.5%), IUFD (78.9%), and other conditions (5.4%) were associated with neonatal death (8). This might be due to transmission of the disease through placenta to the fetus in the womb and leads adverse neonatal birth outcomes (low birth weight, still birth and preterm birth)

The study showed that delivered women with use any type of alcohol during pregnancy were 2 times more likely to have adverse neonatal birth outcome (AOR 2.281 (95% CI 1.175-4.426)) when compared to those who do not use alcohol.

A study conducted in Colombia and Canada, states that mothers with alcohol use identified as a risk factor during pregnancy had a statistically significantly greater proportion of any substance use compared to mothers who reported no alcohol use during pregnancy (22). This study were also supported by a prospective cohort study conducted in Gondar, North West Ethiopia which states women who reported a hazardous pattern of alcohol intake during pregnancy were 2.34 times (ARR = 2.34; 95% CI: 1.66, 3.30) increased the risk of low birth weight when compared to women who abstained entirely throughout pregnancy (23). Similarly, the risk of LBW was 50% (ARR = 1.50; 95% CI: 1.31, 1.98) higher for non- hazardous alcohol drinker pregnant women when compared to women who did not consume any alcohol (23).

Delivered women without fully attended FANC were 2 times more likely to have adverse neonatal birth outcome (AOR 1.963 (95% CI 1.190-3.238)) when compared to those who attend FANC.

This study is in line with the study conducted in Tigrai region which states, mothers who had less than four ANC follow-up visits had four times more risk of having adverse birth outcome than those who have had at least four ANC follow up visits. Similar study in Gonder University Hospital is significant with (AOR: 9.7, 95% CI 2.7 - 35.8) (24). This finding also has similarity with study in Gaza strip, in which the risk of preterm birth increased two folds among mothers who had less than four

ANC visits compared to their counterparts (25). Similarly, the current finding is supported by studies in Ethiopia and India, in which not having ANC has been shown as a significant risk factor of low birth weight (26). Furthermore, the current finding is in agreement with similar studies in Ethiopia and China, and a systematic review in LIMICs, in which the risk of still birth was significantly higher among mothers who had no ANC visits compared to their counterparts (27). This could be explained by mothers who have the recommended number of ANC visits have access to information on maternal nutrition which eventually results in better dietary practice.

This suggests that antenatal care should give much more emphasis to dietary counselling with special focus to stunted mothers who are at in-creased risk of adverse birth outcome. Similar study of a systematic review and meta-analysis conducted in Ethiopia on "the effect of antenatal care on perinatal outcomes" reveals that thirteen out of seventeen included studies revealed antenatal care utilization had a significant association with perinatal outcomes (3).

Delivered women with caesarean section during delivery to have adverse neonatal birth outcome where lower by 87.6% (AOR=0.124, (95% CI (0.059, 0.259)) compared to spontaneous vagina delivery. This study contradicts with study conducted in India which states "Adverse infant outcomes associated with caesarean section delivery in India" states that in India, there is an association between caesarean delivery and neonatal death (28). A study conducted in Ethiopia also stated that caesarean section results in early neonatal death (29). This contradiction might be due to a prospective study design of the research done in India and meta-analysis in Ethiopia. This contradiction might also be due to low number of caesarean section during study period.

Strength of the study

As there was no similar study in the study area, it can be used as a baseline for other studies.

Limitation

Delivered mothers' samples were collected from only public hospitals. These hospitals were only old hospitals exist in four towns. This might be lead to underestimation of the predictors of adverse birth outcome as majority of mothers are still delivering at home (30) and lower levels of health delivery or private health facility so that these deliveries were not included in this study. The retrospective nature of the study (retrospective record review) has also methodological limitation since data that were originally not designed to collect data for research. In another way the analysis can only provide evidence of statistical association between those items and adverse neonatal birth outcome and cannot show cause-effect relationships which leads to underestimation. This study also has selection biases as the study participants were those who only visited hospitals.

CHAPTER SEVEN: CONCLUSSION AND RECOMENDATIONS

Conclusion

In summary; this study has provided with useful insights on determinants of adverse neonatal birth outcomes and has implications in improving preventable adverse neonatal birth outcomes. Multigravida, rural residence, female genital mutilation , being male baby, having pre-existing medical condition, drinking any type of alcohol (hazardous or nonhazardous), not early booking and attending full ANC (visit of >=4 time) increased the odds of adverse neonatal birth outcome, whereas delivery by caesarean delivery had protective effect for adverse neonatal birth outcome. This study came with a new finding of delivered women with caesarean delivery during delivery to have adverse neonatal birth outcome were lower by 87.6% which contradicts with previous study done in India and Ethiopia. The coming social researchers need to review on caesarean delivery and adverse neonatal birth outcome for consistency of the result found.

Recommendations

This study shows that low focused antenatal care follow up and late booking results in adverse neonatal birth outcome. Respective catchment area health center need to

give appropriate information through health extension workers on risks of not attending and completing antenatal care of pregnant women.

This study revealed that preexisting medical condition results in adverse neonatal birth outcome. Woreda health office needs to give appropriate information and training on newly emerging infectious (HIV/AIDS) and non-infectious (DM, CD, HTN, APH, PPH) diseases for pregnant women.

This study shows that multigravida women are more likely to have adverse neonatal birth outcome than primigravida. Special focus should be given by health care professionals for multigravida mothers to give attention on nutrition they intake.

This study show that delivered mothers who use alcohol during their pregnancy time were more likely to have adverse neonatal birth outcomes than those who do not drink. Adequate and timely dissemination of information through leaflets and brochures on risk of using alcohol during pregnancy should be given by health care professionals

This study revealed that delivered mothers with male baby were more likely to have adverse neonatal birth outcomes than with female baby. Health Centers need to give attention for pregnancy of male baby and effective counseling should be given when attending ANC.

Delivered mothers who undergo female genital mutilation were more likely to have adverse neonatal birth outcome when compared to those who do not. Woreda health office needs to work on Behavior change communication (BCC) continuously on risks of female genital mutilation. Further study is needed to identify other possible predictors not stated in this study as the study didn't cover all.

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1. ANNEX TWO: INFORMED CONSENT AND QUESTIONNAIRE

1.1. Questionnaires –English Version

a. Questionnaire for quantitative data

JIMMA UNIVERSITY,

DEPARTMENT OF EPIDEMIOLOGY

Structured Questionnaire to determine Adverse Neonatal Birth Outcome in Jimma Zone, Ethiopia: Case-control study

To the interviewer, please inform the respondent about the aim of the study as described below.

INFORMED CONSENT SHEET

Dear respondent my name is _____ and I am working with researcher from Jimma University who is currently carrying out survey of Determinants of Adverse Neonatal Birth Outcome in Jimma Zone, Ethiopia.

As part of this survey, we are collecting your information on socio-demographic and economic, health facility, delivery, preexisting and health service related factors. Your genuine response will help us to find out the real risk factors to determine factors for adverse neonatal outcomes so that, possible intervention will be conducted by responsible bodies including the health institution and policy makers. The interview will not take more than 30 minutes .You have the right not to participate or withdraw at the middle of the interview and there is no payment for the participation. All the information you give us will be used for research purposes only and kept confidential. Your identification related issues will not be revealed for anybody. Is it clear?

Do you agree to participate?

1. Yes 2. No if no respect the decision and thank her/him. If yes, continue the interview.

Interviewer name _____ signature _____ date_____

Supervisors name _____ signature _____ date_____

Instruction: Interview respondents who are delivered their baby adversely or normal baby.

Encircle the response of the respondents for multiple choice questions and for short answers write on the space provided.

Section One: Socio- demographic characteristics

Health institution name:_____

No

100. Unique Ward .No.

_____

101. Age of the mother a) 20-29 b) 30-39

102. Education

a) Primary (1-8 grades) and less

b) Secondary (9-12 grades) and above

103. Family income (monthly)

a) <1800 ETB b) >=1800ETB

103. Gravida

a) Primi b) Multi

104. Marital Status

a) Married b) not married

105. Residence

a) Urban b) Rural

106. History of Female Genital Cutting (FGC)

a) Yes b) No

107. Sex of the current baby

a) Male b) Female

109. Gestational age at delivery

a) <37 weeks b) >=37 weeks

Section Two: **Pre-existing medical condition**

110. Presence of preexisting medical conditions a) yes b) no

111 Type of preexisting medical conditions

a) Infectious diseases (HIV/AIDS,

b) Non Infectious disease (Cardiac disease, Iron Deficiency Anaemia, APH, PIH)

Section Four: Information on Health Facility Factors

112. Availability of Hospital

a) Yes b) No

113. Distance of Hospital from the client's residence

a) >10km b) <10km

114. The delivery was conducted by

a) Other health professionals b) Midwives

115. Readiness of staff all time

a) Yes b) No

116. Is the facility at where you have been served has functional maternity waiting area?

a) Yes b) No

117. Do you satisfied with service of hospital??

a) Not satisfied b) Satisfied

118. FANC follow up

119. Maternal Rh factor

a) Rh negative, b) Rh Positive

a) No b) Yes

120. Mode of delivery

a) SVD b) C/S

121. Weight of the baby

a. <2.5K

b. 2.5Kg-3.9Kg

122. Outcome of the baby

a. Live birth

b. Stillbirth

I have finished the interview; Thank you very much!!

ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Institute of Health in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date._____ Signature _____

APPROVAL OF ADVISORS

Name of the first advisor: _____

Date._____ Signature _____

Name of the second advisor:_____

Date._____ Signature _____

ANNEX THREE: SERVICE RELATED SATISFACTION MATRIX

Table 8 Satisfaction related questionnaire for pregnant women delivered at selected hospitals of Jimma zone, Ethiopia, 2022 GC.

Item/Variables	Strongly satisfied n (%)	Satisfied n (%)	Neutral n (%)	Not satisfied n (%)	Strongly not satisfied (%)
Satisfaction with providers' manner and supportiveness during care process					
Behavior of the SBA					

Providers communication					
Supportiveness of the provider					
Attention given by the birth attendant and other staffs					
Privacy of delivery care process					
Convenience with physical examination process					
Information received about the care process					
Cleanliness of delivery room & examination area					
Cleanliness of toilet					
Availability of water for					

drinking and bathing					
Availability of required drugs and medical supplies					
Condition of the Hospital (building & equipment)					
Distance of HC from place of residence					

1.2. Dabalata Lama: Heeyyama Odeeffannoo Fi Gaaffii 2.1. .

Gaaffiilee –Afaan Oromoo Version qeenxee.

Gaaffii ragaa baay'inaan (quantitative data).

YUNIVARSIITII JIMMAA, .

KUTAA DHIIBBAA

Bu'aa Dhaloota Daa'immanii Gadhee, Kibba Lixa Itoophiyaa Zoonii Jimmaa keessatti mul'atu murteessuuf Gaaffii caaseffame: Qo'annoo to'annoo haalaa Nama af-gaaffii godheef, kaayyoo qorannichaa akka armaan gaditti ibsametti deebii kennaaf beeksisaa. WARRAAQSA HEEYYAMA ODEEFFANNOO Kabajamaa deebii kennaa maqaan koo _____ yoo ta'u qorataa Yuunivarsiitii Jimmaa irraa yeroo ammaa kana Kibba Lixa Itoophiyaa Zoonii Jimmaa keessatti qorannoo Murteessitoota Bu'aa Dhaloota Da'umsaa Gadhee gaggeessaa jiru waliin hojjechaa jira. Akka qaama qorannoo kanaatti, dhimmoota hawaas-dimoogiraafii fi dinagdee, dhaabbata fayyaa, kenniinsa, duraan jiranii fi tajaajila fayyaa wajjin walqabatan irratti odeeffannoo keessan walitti qabaa jirra. Deebiin dhugaa keessan sababoota balaa dhugaa ta'an adda baasuuf nu gargaara, sababoota bu'aa daa'immanii hamaa ta'an murteessuuf akka, gidduu seenuun ta'uu danda'u dhaabbata fayyaa fi qaamolee imaammata baasan dabalatee qaamolee itti gaafatamummaa qabaniin akka gaggeeffamu taasisa. Af-gaaffiin daqiiqaa 30 ol hin fudhatu .If-gaaffii walakkaa irratti hirmaachuu dhiisuu ykn ofirraa baasuuf mirga qabda akkasumas hirmaannaadhaaf kaffaltiin hin jiru. Odeeffannoon isin nuuf kennitan hundi qorannoo qofaaf kan oolu yoo ta'u, iccitii ta'ee kan eegamu ta'a. Dhimmoonni eenyummaa kee wajjin walqabatan eenyuufuu hin ibsaman. Ifaadhaa? Hirmaachuuf walii galtuu? 1. Eeyyee 2. Lakki yoo hin taane murtee kabajaa ishee/isa galateeffadhu. Yoo eeyyee ta'e gaaffii fi deebii itti fufi. Maqaa gaaffii fi deebii _____ mallattoo _____ guyyaa_____ . Maqaa supparvaayizarootaa _____ mallattoo _____ guyyaa_____ . Qajeelfama: Deebii kennitoota daa'imni isaanii haala hamaadhaan ykn daa'ima idileetiin da'an af-gaaffii gochuu. Gaaffii filannoo dachaaf deebii deebii kennitootaa marsi, deebii gabaabaaf bakka kenname irratti barreessi.

Gaaffiif deebii Afaan Oromoo

Maqaa dhaabbata fayyaa:_____ Lakki Gaaffii Gara Deebii

Kutaa Tokko: Amaloota hawaas- dimogiraafii

100. Kutaa Addaa .Lakk. _____ .

101. Umurii haadha a) 20-29 b) 30-39

102. Barnoota a) Sadarkaa tokkoffaa (kutaa 1-8) fi isaa gadi b) Sadarkaa 2ffaa (kutaa 9-12) fi isaa ol

103. Giraaviidaa a) Priimii b) Baay'ee

104. Haala Gaa'ilaa a) Kan fuudhe b) kan hin fuudhin

105. Mana jireenyaa a) Magaalaa b) Baadiyyaa

106. Seenaa Qaama Saalaa Dubartii Muruu (FGC) . a) Eeyyee b) Lakki 107. Saala daa'ima ammaa a) Dhiira b) Dubartii

108. Seenaa haala fayyaa duraan ture a) eeyyee b) lakki

109. Gosoota duraan turan med cond a) Daddarbaa b) Daddarbaa hin taane

110. Seenaa ulfa baasuu a) Eeyyee b) lakki

111. Gosoota Ulfa Baasuu a) Kan kakaafame b) ofumaan kan dhufu

112. Umurii ulfaa a) Yeroo malee b) Yeroo

Kutaa lama: Haala fayyaa duraan ture

113. Argamuu APH a) eeyyee b) lakki

114. Haala fayyaa duraan ture jiraachuu. a) Eeyyee b)

115. Gosoota dhukkuba duraan turan

a) daddarbaa kan ta'e b) daddarbaa kan hintaane

Lakki Kutaa Sadii. Odeeffannoo dhimmoota Akkaataa Jireenyaa irratti

115 Seenaa gosa tamboo xuuxuu kamiyyuu a) Eeyyee b) Lakki

116 Seenaa itti fayyadama alkoolii gosa kamiyyuu a) Eeyyee b) Lakki

117. Sochii qaamaa gosa kamiyyuu (ispoortii) . a) Eeyyee b) Lakki

Kutaa Afur: Odeeffannoo Qabxiilee Dhaabbilee Fayyaa

118. Argamuu Hospitaala a) Eeyyee b) Lakki

119. Fageenya Hospitaala bakka jireenyaa maamilaa irraa qabu a) >10km b) <10km ta'uu isaati

120. Geejjibni kun kan gaggeeffame a) Ogeessota fayyaa biroo b) Deessistoota

121. Qophii hojjettoota yeroo hunda a) Eeyyee b) Lakki

122. Dhaabbanni bakka itti tajaajilamte bakka eegduu da'umsaa hojiirra oolu qabaa? a) Eeyyee b) Lakki

123. Tajaajila hospitaalaatti quuftuu?? a) Hin quufne b) Hin quufne

124. Deessistoonni da'umsa gaggeessuu bira darbee hojiiwwan biroo ni hojjetuu? a) Eeyyee b) Lakki

125. Guyyaatti deessistuu tokkoon da'umsa meeqa gaggeeffama? a) >6 b) <=6 jedhu

127. FANC hordoffii a) Lakki b) Eeyyee

128. Akkaataa kenniinsa a) SVD b) C/S jedhamuun beekama

129. Ulfaatina daa'imaa qeenxee. <2.5K jedhamuun beekama b. 2.5Kg-3.9Kg ta'a

130. Bu'aa nama qeenxee. A) Dhaloota lubbuun jiru b. Du'ee dhalachuu

Gaaffii fi deebii xumureera; Baay'ee galatoomi!!

ANNEX FOUR: INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the vigorous activities that you did in the last 7 days. *Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.* Think only about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

1. _____ days per week
2. No vigorous physical activities Skip to question 3

2. How much time did you usually spend doing vigorous physical activities on one of those days?
    1. _____ hours per day
    2. _____ minutes per day
    3. Don't know/Not sure

    Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
    1. _____ days per week
    2. No moderate physical activities Skip to question 5

4. How much time did you usually spend doing moderate physical activities on one of those days?
    1. _____ hours per day
    2. _____ minutes per day

    Don't know/Not sure

    Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
    1. _____ days per week

2. No walking Skip to question 7

6. How much time did you usually spend walking on one of those days? _____ hours per day

   1. _____ minutes per day

   2. Don't know/Not sure

   The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a week day?

   1. _____ hours per day

   2. _____ minutes per day

   3. Don't know/Not sure

MIRKANEESSAA QORATAA MUUMAA

Gaggeessaa naamusa saayinsaawaa fi teeknikaa pirojektii qorannoo fi gabaasa adeemsa hojii barbaachisu akkaataa haalawwanii fi tumaalee Inistiitiyuutii Fayyaa yeroo deeggarsa kennameetti hojiirra jiruun akka bu'aa iyyata kanaatti dabarfamuuf itti gaafatamummaa fudhachuuf kan mallatteesse armaan gaditti mallatteesse. Maqaa barataa: _____ . Guyyaa._____ Mallattoo _____ . GORZOOTAAF HEEYYAMAA ARGACHUU Maqaa gorsaa jalqabaa: _____ . Guyyaa._____ Mallattoo _____ . Maqaa gorsaa lammaffaa:_____ . Guyyaa._____ Mallattoo _____ .

DECLARATION

The undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all resources of materials used for the thesis have been fully acknowledged.

Name: _____

Signature_____

Name of the Institution:_____

Date of submission_____

This thesis has been submitted for examination with my approval as University advisor

Name and signature of the first advisor

Name and Signature of the second advisor