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COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF PREVENTIVE MEDICINE

GENERAL PUBLIC HEALTH

Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa

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A RESEARCH THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF PUBLIC HEALTH, DEPARTMENT OF PREVENTIVE MEDICINE IN PARTIAL FULFILMENT FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH IN GENERAL PUBLIC HEALTH

December, 2020

Addis Ababa, Ethiopia

Addis Ababa University

College Of Health Sciences

School Of Public Health

This is to certify that the thesis prepared by Selamawit Mandefro Kibret, entitled: *Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa* and submitted in fulfillment of the requirements for the Degree of Masters of Public Health in General Public Health complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Chairman, Examining Committee	sign	Date
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Internal Examiner	sign	Date
Advisor	sign	Date

Declaration

I the undersigned, declare that this thesis is my original work and it has not been presented in other universities, colleges, or institutions for a similar degree or another purpose. All sources of the materials used in this thesis have been duly acknowledged.

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Duration of project	September 2019- December 2020
Study Area	Addis Ababa
Total Cost of the project	21,239.90 ETB
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Acknowledgement

I would like to dedicate my heart felt gratitude to my advisor Dr. Negussie Deyessa for every guidance and constructive feedbacks throughout the work of this thesis. I would also like to take the moment to thank my friends and family for their support. My gratitude also goes to the School of Public Health for arranging the opportunity to successful accomplishment of this work. Above all, I am always grateful to God.

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Acronyms and abbreviations

AAU: Addis Ababa University

AOR: Adjusted Odds Ratio

ANC: Antenatal Care

BMI: Body Mass Index

BSC: Bachelors of Science

CI: Confidence Interval

EC: Ethiopian Calendar

EDHS: Ethiopian Demographic Health Survey

EI: Exposure Index

ETB: Ethiopian Birr

ETS: Environmental Tobacco Smoke

FMHACA: Food Medicine and Health care Administration and control authority

GATS: Global Adult Tobacco Survey

GDM: Gestational Diabetic Mellitus

LBW: Low Birth Weight

LMP: Last Menstrual Period

MOH: Ministry Of Health

NICU: Neonatal intensive care unit

OR: Odds Ratio

PRAMS: Pregnancy Risk Assessment and Monitoring Survey

PROM: Premature Rupture of Membranes

PTD: Preterm Delivery

SD: Standard Deviation

SHS: Second-hand Smoke

UK: United Kingdom

USA: United States of America

UTI: Urinary Tract Infection

UNICEF: United Nations Children Fund

VLBW: Very Low Birth Weight

WHO: World Health Organization

ABSTRACT

Background: Low Birth Weight is a major public health problem in developing countries like Ethiopia with a prevalence rate of 13% and a higher proportion of women have been exposed to passive smoking. So far, a number of predictors of low birth weight have been established; however, passive smoke exposure as a risk factor for low birth weight is hardly understood.

Objective: To assess the association between Passive smoke exposure during Pregnancy and low birth weight among the selected public hospital attendees in Addis Ababa.

Method: The study used an unmatched facility-based case-control design. Data was collected using a face to face interview with a structured and pre-tested questionnaire supplemented with medical chart review. The study was conducted in Addis Ababa among women attending delivery services in three public hospitals (Mahatma Gandhi, Zewditu Memorial, and Yekatit 12 hospitals) from May to August, 2020 G.C. The overall sample size was assigned for each of the three health facilities using proportional allocation based on their patient load, and a total of 205 cases of neonates with low birth weight (weight at birth < 2500grams) at term were compared with 410 controls of neonates born with a birth weight of >=2500 grams at term. The data was analyzed using both bivariate and multivariable analyses. Binary logistic regression was used to determine the association between dependent and independent variables at 95% confidence level.

Result: From a total of 205 cases and 408 controls, the proportion of passive smoke exposure among mothers gave birth at the selected public hospitals (mothers of the controls) was 49% (95 % CI: 44%, 54%) and the odds of delivering low birth weight infant were 4 times higher among those who had a passive smoke exposure as compared to those who were not exposed during pregnancy [AOR: 4.1, (95% CI: 2.21, 7.76)]. And among the place of exposure, public place exposure showed a significant association with low birth weight with [AOR: 6.1 (95% CI: 3.56, 10.65)].

Conclusion and Recommendation: This study demonstrated a very high proportion of passive smoke exposure among women who gave birth at the public hospitals (mothers of the controls). And low birth weight is significantly associated with passive smoke exposure during pregnancy. Likewise, Public place exposure was the only passive smoke exposure predictor that showed association with low birth weight. Therefore Mothers should protect themselves from Passive

Smoke Exposure during pregnancy primarily from exposure at public places, since it is among preventable risk factors for low birth weight.

Key words: *Low birth weight, Normal birth weight, passive smoke exposure, Addis Ababa*

1. INTRODUCTION

1.1. Background

Low birth weight (LBW) is defined by the World Health Organization (WHO) as weight at birth less than 2500 gram (1). It's a multifaceted problem that includes preterm neonates (born before 37 weeks of gestation), small for gestational age neonates at term, and the overlap between these two conditions (2). The etiology of LBW is multifactorial and is related to maternal, fetal, placental, and environmental risk factors as well as Antenatal care (ANC) status and socio-economic status of the mother (3).

According to United Nations Children Fund (UNICEF) 2014 estimate, the proportion of infants with LBW in sub-Saharan Africa is 13% (only considering those with regional aggregates and adequate population coverage) but the percentage of infants not weighed at birth was 54% (4).

The term "passive smoking" (also known as second-hand smoke or environmental tobacco smoke) usually refers to the inhalation of tobacco smoke that is either exhaled by a smoker or released as sidestream smoke from a burning cigarette (5). Ogawa et al, operationalized passive smoking as an exposure to other persons' cigarette smoke for at least 2h a day at home, the workplace, and other places (6). Second-hand smoke contains the same toxic substances that are expected to have a similar effect on the fetus as active smoking (7). Passive smoke exposure is a major public health problem accounting for over 600,000 deaths annually (8).

Exposure to passive smoke harms health, especially vulnerable population groups such as children, mothers, and pregnant women (9). Around the world, 40% of children and 35% of female non-smokers were exposed to environmental tobacco smoke (ETS) in 2004 (10) putting them at higher risks such as low birth weight delivery. Evidences show that, LBW in passively exposed women is attributed to many factors, including the vasoconstriction properties of nicotine, elevated fetal carboxyhemoglobin levels, fetal tissue hypoxia, reduced delivery of nutritional elements, and elevation of heart rate and blood pressure (11).

When we look at the local context, in Ethiopia according to the recent Ethiopian Demographic Health Survey (EDHS 2016) report, women smokers are scarce but they are exposed to the ill effects of tobacco smoke in which Addis Ababa accounts for a proportion of 5.4% active

smokers (12) whereas the WHO estimates of Ethiopia's tobacco use in both sexes was 4% of the total population (13)

Though there is legislation on smoking bans in public places (14), the latest review of the legislative history of Ethiopia's tobacco showed that, there are gaps in the legislation such as permitting smoking in designated rooms and areas in some banned public or workplaces and that this should be resolved to prevent the tobacco industry from exploiting such gaps to interfere with national tobacco control policies (15).

1.2 Statement of the problem

LBW is a major public health problem in developing countries like Ethiopia, with its prevalence among births with reported birth weight as high as 13% (16) and according to a recent meta-analysis, Endalamaw et al. have estimated the national pooled prevalence of LBW in Ethiopia as high as 17.7% (17). Maternal smoking during pregnancy is associated with adverse effects in utero such as impaired fetal growth, low birth weight, preterm delivery, and increased neonatal and infant mortality (18) similar effects were reported for pregnancies exposed to passive smoke. Maternal Environmental Tobacco Smoke exposure for more than 3 hours a day in late pregnancy was significantly associated with an increased risk of LBW in the Generation R Study (19).

Alarmingly, the 2016 Global adult tobacco survey (GATS) fact sheet Ethiopia, estimated that 26% of adult women are exposed to tobacco smoke at the workplace and 12.5% are exposed at least monthly at their home (20) this figure could rise as high as 33% daily indoor second-hand smoke (SHS) in Kersa, Eastern Ethiopia (21).

The tobacco industry is now concentrating its attention on emerging markets in Sub-Saharan Africa, trying to take advantage of the continent's patchwork tobacco control regulations and limited resources to combat industry marketing advances and being the second most populated African country after Nigeria, Ethiopia is a major opportunity for foreign tobacco companies to invest and recruit new smokers (22).

Exposure to adverse effects is preventable. Improving public health through continuing efforts to mitigate the burden associated with tobacco-related deaths and exposure to tobacco smoke still has become a national and international priority for governments and other stakeholders (23) but

it still remains a prominent cause of premature mortality and morbidity, with evidence showing that there is no safe level of tobacco smoke exposure.

Given the multi-factorial nature of LBW, tackling the problem would require a holistic approach. So far, the documented evidences on determinants of LBW contains Socio-demographic factors, Maternal and obstetric factors, maternal substance use factors such as alcohol and "Khat" (24–26) However, Passive smoke exposure as a preventable risk factor for LBW has not been well addressed.

Therefore this study aims to assess the association between passive smoke exposure during pregnancy and LBW among women who gave birth at selected public hospitals in Addis Ababa, Ethiopia.

1.3 Significance of the study

- The findings of this study could be used as a first step or input to combat neonatal death attributed to LBW from a stance of environmental risk factors such as Passive smoke exposure.
- It will shed a light for stakeholders such as regulatory authorities and strengthen the tobacco regulation policy.
- It will also serve as a baseline for further various studies and for planning health intervention or promotion programs aimed at improving the health of infants and women.

2. LITERATURE REVIEW

2.1 Prevalence of active and passive Smoking

Smoking during pregnancy has been associated with several adverse health consequences for both the fetus and the mother. Lancet 2018 report showed a 1.7% global prevalence of smoking during pregnancy with regional disparity on its magnitude ranging from the highest in European Region with a prevalence of 8·1% (95% CI 4·0–12·2) to the lowest in the African Region with a prevalence of 0·8% (0·0–2·2) (27).

Second-hand smoke kills approximately 900,000 individuals per year, but one quarter remained globally exposed, placing a higher risk of exposure and associated burden on certain groups such as non-smoking women and those in lower socio-economic strata (28). According to the WHO 2019 report on the Age-standardized prevalence estimates for daily tobacco use among people aged 15 and above, Africa is among the highest top three shares of tobacco users from which Lesotho being the uppermost tobacco epidemic country in the continent with estimates of 22.6 % (95% C.I 16.9-28.8) (29).

According to WHO's recent reports, passive smoke exposure causes more than 1.2 million premature deaths each year and 65,000 children die per year from illness related to passive smoke exposure (30).

A population-based study and a meta-analysis of cross-sectional data by Owili et al on domestic second-hand smoke and the risk of under-five mortality in 23 Sub-Saharan Africa countries have shown that exposure to domestic second-hand tobacco smoke had a significant positive impact on the risk of under-five mortality in sub-Saharan Africa with Ethiopia's Hazard ratio of 1.16 (95% CI: 1.02-1.31) indicating a risk of death (31).

In a population-based cohort study in Taiwan, approximately 62% of the 18-month-old infants lived in a household with at least one smoker where the father's smoking accounts for 84% of the households. Among these infants, 70% were exposed to SHS and 36% were exposed to heavy SHS in utero (32).

In a Cross-sectional survey of 646 mother-child pairs from China, Liu et al. has found that 240 (37%) mothers had a total second-hand smoke exposure throughout pregnancy. The mothers reported Domestic and workplace exposure as their primary sources of exposure with 62% and 46% respectively. And among the exposed group, 41% of them reported Domestic exposure as their only exposure source (33).

Evidence on the local context

An exploratory cross-sectional study of women in Aleta Wondo, Ethiopia, by Petersen et al. showed that the prevalence of living with a tobacco user was 7.6% however 14 .4% of the overall and 22% of the urban participants had daily exposure at their home. After controlling for other covariates, place of residence, allowing smoking in the home, living with a tobacco user, and exposure to point-of-sale advertising within the last 30 days was found to be strong correlates that contributed significantly to the prediction of the probability of reporting daily SHS prevalence at home (34).

In a cross-sectional study done in Butajira region on substance use during pregnancy, Alamneh et al. has found that About 0.6% (95% CI: 0.1, 2.3%) of pregnant women were exposed to tobacco smoke at workplaces, 15.2% (95% CI: 11.8, 19.5%) of pregnant women exposed to tobacco smoke at public places and 9.7% (95% CI: 6.9, 13.3%) had a domestic SHS exposure from which 75.8% of them had a daily SHS exposure. The total SHS exposure of the mothers was 23.2 % (95% CI: 19.0, 28.0) (35).

2.2 Prevalence of Low birth weight

Low birth weight is a good summery measure of the mother's health, nutrition, health care delivery, and poverty as LBW infants are at a higher risk of morbidity and mortality right after their birth including Non- communicable disease later in their life if they thrive (36).

Looking at the burden of LBW in the local context, evidence indicates the severity of the problem in Ethiopia. Bililign N et al, review showed that LBW accounted for 27,243 deaths in 2014 which constitutes 4.53% of the total deaths (37). Further prevalence studies done in Gondar, Tigray, and Jimma zone of Ethiopia reported 11.2%, 14.6%, and 22.5% prevalence respectively ((38),(39)(40)).

In addition to the mentioned evidence, a systematic review and meta-analysis by Endalemaw et al. has found that from total of 30 studies with 55,085 participants used for prevalence estimation, The pooled prevalence of LBW was 17.3 % (95% CI: 14.1 –20.4) (17).

2.3. Determinants of Low birth weight

Epidemiologic studies conducted in Ethiopia identified some risk factors of LBW, a recent evidence is a review by Bililign et al. on LBW and its risk factors in Ethiopia have found that Socio-demographic (maternal education level, occupation, income and place of residence), maternal/obstetric (maternal age, antenatal care visit, maternal weight, and stature, preterm birth, and parity), obstetric and medical disorders during pregnancy (hypertensive disorders of pregnancy, anemia, and malaria) and fetal factors (infant sex and congenital malformations) are the common risk factors for low birth weight in Ethiopia (37).

Another case-control study by Lema Desalegn and Deresse Legesse on determinants of LBW in Debre Berhan referral hospital has reported that mother's hemoglobin level (AOR=1.00, p-value<0.045), pregnancy-induced hypertension (AOR =3.415, p-value<0.047) and gestational age <37 weeks (AOR=4, p-value<0.001) are the significant determinants of LBW (25).

2.4 Passive smoking and Low birth weight

In relation to the association between passive smoke exposure and birth weight of neonates, there are different arguments or findings in our review. Some found a significant association while others didn't. Among the articles that didn't find a significant association between second-hand smoke exposure and low birth weight are.

A study was done in Japan by Miyake et al which used pre-birth cohorts of has shown that mothers who had domestic or workplace exposure weren't significantly associated with the risk of any adverse birth outcomes. Likewise, no association was found between maternal SHS exposure at home or work and the infant's weight at birth (28).

Another study supporting this finding is done by Nora L. Lee et al in North china on Postpartum women who had given birth to full-term, live-born singletons, found that there was no association between prenatal SHS exposure and birth weight among babies after controlling for the known predictors of birth weight. There was no reduction in average birth weight when the exposure from all sources of SHS was combined (41).

Another Retrospective cohort study in the UK by Ward et al with 3 categories, The non-exposed group, active smoking group at any trimester during pregnancy group, and SHS exposure group showed that for the SHS exposed group, a significant reduction in birth weight was observed but it was only in the crude analysis, mean weight at birth difference = [-59 g (95% CI -0.090, -0.027)] and for the actively smoking group = [-168 g (95% CI -0.191, -0.146)]. Even though a decrease in birth weight is seen, the decrease in the SHS exposed group as compared to the no exposure group was found to be not significant after adjustment (37).

Among the articles that showed a significant association between passive smoke exposure and birth weight are.

Ashford et al in Kentucky USA has assessed maternal passive smoking using both biomarker (Maternal hair nicotine) and questionnaire and has found a 306 grams decrease in birth weight which was in alignment with the medium hair nicotine level correlation as compared to the non-smoking and the actively smoking mothers and women who had prenatal SHS exposure were more likely to have immediate newborn complications (OR = 2.4; 95% CI 1.09-5.33) than non-exposed women (42).

A recent case-control study by Niu Z et al. on pregnant women who gave birth to full-term infants has found that full-term LBW was found to be significantly associated with passive smoke exposure during pregnancy (AOR=2.14; 95%CI =1.06–4.32), after controlling for potential confounders (43).

A cross-sectional study in Iran, by Eftekhar et al, has found a statistically significant reduction in birth weight (p-value < 0.001). In this study, 14.2% of mothers had passive smoke exposure during pregnancy with their mean infant's weight 2885.20 ± 354.35 grams, and in the non-exposed group, 3136.46 ± 413.32. Pre-mature birth in the SHS exposed group has been 14.1% and 2% in the non-exposed group with a statistically significant (p-value < 0.001) difference. It has been found that the risk of premature birth in the SHS exposed group is 7.95 times more than those in the non-exposed group (44).

In another case-control study in India on residential tobacco exposure by Khattar, et al. Environmental Tobacco Smoke exposure was reported by 45% of the 300 subjects enrolled in

this study. Mothers who were passively exposed had 3.45 times the odds of delivering a LBW neonate when compared to the non-exposed mothers (P<0.001) and was found to have a strong dose-response relationship with LBW (45).

On an additional retrospective cohort study in Malaysia, a significant birth weight decrease of 12.9 grams (95% CI: 7.01, 18.96) for each unit of exposure to a cigarette was observed. Exposed mothers showed a LBW incidence of 10% (95% CI 5.94, 14.06) as compared to the unexposed women. The proportion of premature delivery among LBW newborns was 33.8% for exposed women and 30% for non-exposed women (8).

On a retrospective population study in Czech Republic, Dejmek et al have shown that about 25% of non-smoking mothers reported SHS exposure during pregnancy when compared with 67% of the mild and 85% of the heavy active maternal smoking with an AOR of low birth weight for infants of SHS exposed mothers was 1.51 (95%CI, 1.02–2.26) (46).

A cross-sectional study in Jordan S. Khader et al found that SHS exposed women were 1.5 times [(AOR = 1.56 (95% CI: 1.31,1.89), p<0.005] more likely to deliver an LBW baby when compared to non-exposed women after adjusting for age, level of education, employment, family income, height, blood type, parity and history of preterm delivery (47).

Meanwhile Prospective study done in the same study area by Abu-Baker et al has shown that the SHS predictor variables explained 22% of the birth weight difference. Also, subjects who reported a higher average number of SHS exposure hours per week from occupational exposure in the second trimester and home and outside in the third trimester were at a greater risk of having a LBW neonate than women who reported a lower average number of SHS exposure hours ($p < 0.05$) with an AOR of 1.331 (95% CI 1.052–1.684) for work exposure, AOR =1.075 (95% C1 1.029–1.124) for home exposure, and AOR = 1.154 (95% CI 1.055–1.262) for outside (public place) exposure (48).

2.5 Measurement of main exposure variable and outcome variable

Measurement of Passive smoke exposure

An assessment of the risks associated with tobacco exposure relies on validity, reliability, and measurement error of the measurement methods and it can be assessed by three mechanisms: measuring tobacco smoke components in the air (environmental measurements), self-reported exposure using questionnaires or interviews, and measurement of concentrations of smoke components in the body (biomarkers) (49). Therefore the decision to choose which method to use will vary based upon the subject of interest, assessment objectives and cultural context (50).

However, it has been shown that when measured by cotinine (a biomarker-based measurement method), levels of tobacco smoke exposure from partner smoking were low in non-smoking pregnant women indicating that it is valid to use partner smoking as a negative control for investigating in-utero effects (51).

Measurement of Birth Weight

Despite the fact that birth weight is a good summery measure of the long term maternal malnutrition, birth weight measurement has always been a difficulty in low-middle income countries. There are different techniques such as birth records or mothers recall to reporting neonatal birth weight in national surveys (12) but then again only 14% are measured at birth in Ethiopia (with regional variation where Addis Ababa constitutes for 89.2% of births with reported birth weight from total births) according to the recent EDHS. Therefore, mother's subjective assessment helps as a proxy indicator when measured birth weight is not present with evidence suggesting that it should be used cautiously according to Nigatu D et al. who reported that maternal birth size recall correctly identified only 57% of actual LBW's and only 41% of the babies perceived as "small" by their mother were actually in the LBW category (52).

Another challenge of birth weight measurement is heaping where, infants who are weighed at birth are less likely to have a low birth weight given the substantial heaping (53).

3. CONCEPTUAL FRAMEWORK

The conceptual frame work described the major exposure variable, associate variables, and the outcome variable. Our dependent (outcome) variable was LBW which is affected by associate variables like Socio-demographic factors, maternal and obstetric factors, substance use factors (Which we had later controlled for their effect with multivariable model) and The exposure variable was passive smoke exposure with predictors like Place (home, work, public places), Timing (trimester),amount of exposure. The conceptual frame work was used only to explain the possible factors that can affect the outcome variable, and only the bold arrow was the aim of the study. The confounding variables were not assessed in this study. This conceptual framework was self-constructed based on reviewed literature (24–26,54)

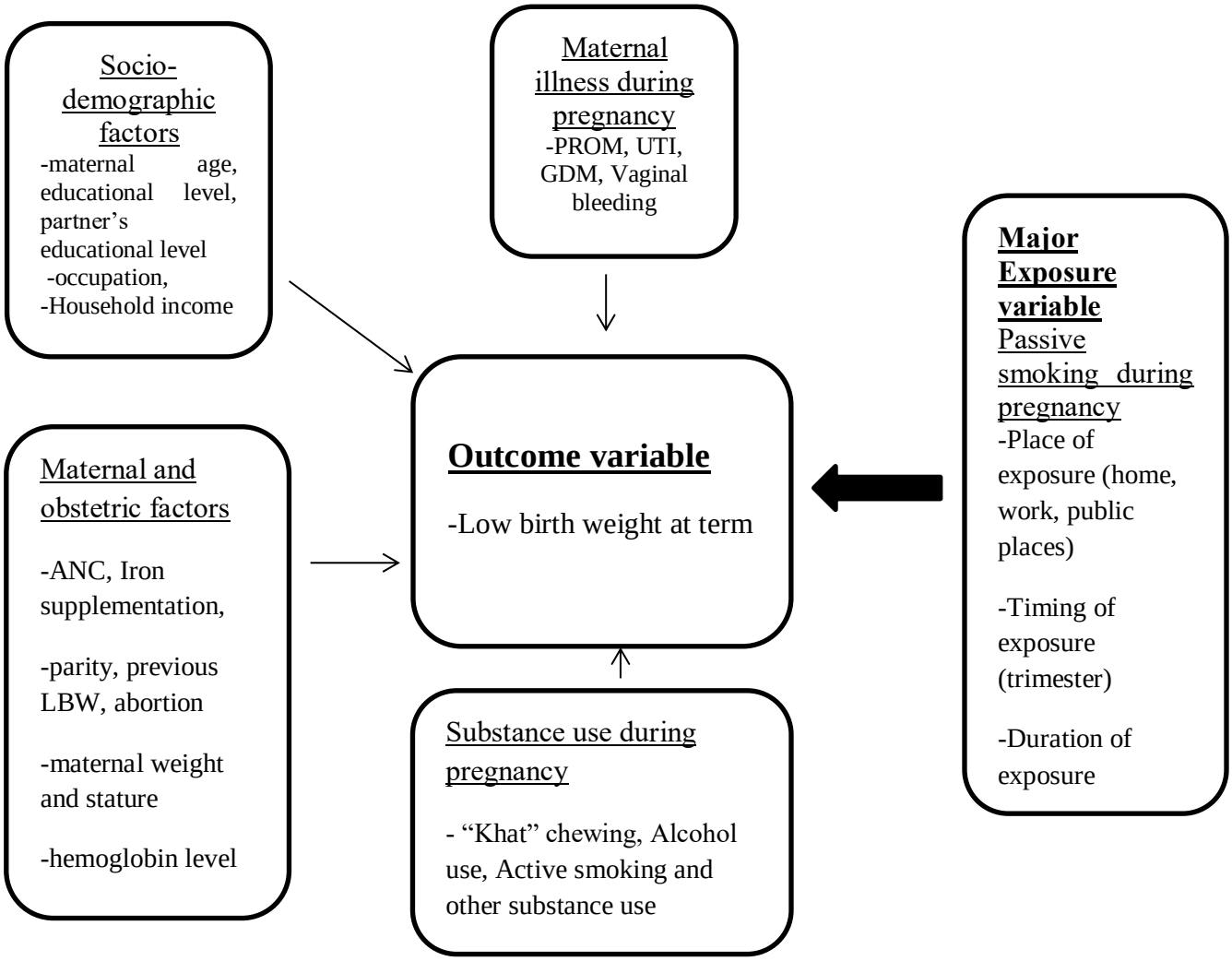

Figure 1: Conceptual framework for the Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa

4. RESEARCH QUESTION

Is there an association between passive smoke exposure during pregnancy and Low birth weight?

5. OBJECTIVES

5.1 General objective

The main objective of this study was to assess the association between passive smoke exposure during pregnancy and Low Birth Weight among women who gave birth at the selected public hospitals of Addis Ababa, Ethiopia 2019/2020.

5.2 Specific objectives

The specific objectives of the study were the following

1. To determine the proportion of passive smoke exposure during pregnancy among women who gave birth at the selected hospitals (mothers of the controls).
2. To determine the association between passive smoke exposure during pregnancy and Low Birth Weight at the selected hospitals.

6. METHOD

6.1 Study area and period

The study was conducted in regional hospitals found under Addis Ababa City Administration Health Bureau namely; Gandhi memorial hospital, Zewditu, and Yekatit 12 hospitals. Addis Ababa has an estimated area of 530.14 square kilometers and a density of 5,936.16 people per square kilometer, its estimated population in 2019 was 7.8236 million according to the 2019 world population review ((55)**,**(56)**).** According to the Federal Ministry of Health, Addis Ababa has 13 public hospitals, 32 private hospitals, and 93 health centers. The hospitals are equipped with midwives, skilled physicians with obstetrics and gynecology specialists and delivery services (57). Neonates delivered in these facilities are weighed and recorded in the registration book. This study was conducted from May to August 2020.

6.2 Study design

A facility-based unmatched case-control study design was used to compare maternal passive smoking during pregnancy against newborn birth weight in the selected hospitals of Addis Ababa. Term live newborns who have low-birth-weight (less than 2500 g) at birth were considered as cases, while term neonates who have a birth weight (>=2500 g) were considered as controls.

6.3 Target population

All pregnant women attending delivery service at public facilities of Addis Ababa were the target population.

6.4 Source population

All pregnant women who gave live, singleton birth and are attending delivery service at the selected public facilities of Addis Ababa were the source population.

6.5 Study population

All pregnant women who gave live, singleton birth and are attending delivery service at the selected public facilities of Addis Ababa birth during the study period and fulfill the eligibility criteria for being a case or a control.

6.6 Study unit

Mother-infant pair was the study unit.

6.7 Inclusion and Exclusion criteria

6.7.1 Inclusion criteria

- The eligible subjects for this study were mothers who delivered live singleton infants with a birth weight of < 2500 grams at term for being a case and birth weight >=2500 grams at term for being a control attending at the selected public hospitals during the data collection period and who were willing to participate in the study.

6.7.2. Exclusion criteria

- Those excluded from the study were mothers with a previous history of medical conditions of (diabetic Mellitus, cardiac illness, hypertension), or had multiple pregnancy/deliveries.

6.8 Sample size determination and sampling procedure

6.8.1. Sample size determination

The sample size was calculated using Epi Info version 7.2.1.0 statistical software package (Annex 7) and a 5% non-response rate was added to it to obtain the final sample size and the largest value was taken as the final sample size.

For the first specific objective with an assumption of:

- The proportion of passive smoke exposure in normal birth weight as 6% (58), the margin of error 3%, level of significance 5%, and power as 80% therefore the final sample size was 241, adding a 5% non-response rate the final sample size for this objective was 253

For the second specific objective with an assumption of:

Using two population proportions approach with the following assumptions: 95% confidence level (Z α/2= 1.96), power (Zβ = 0.84), control to case ratio 2:1 (r = 2), the proportion of passive smoke exposure among pregnant women (general population) the normal birth weight = 6% with detectable OR = 2.44 (from a previous study which only took in to account partner smoking) (58). Accordingly, after adding 5% for non-response rate 205 cases and 410 controls were enrolled in the study.

Since the sample size for the second specific objective was larger, the final sample size was taken as 205 cases and 410 controls.

6.8.2 Sampling procedure

The study subjects were selected from three hospitals that are Mahatma Gandhi Memorial, Zewditu Memorial, and Yekatit 12 hospital. Purposive sampling technique was used to select the hospitals because of their higher skilled deliveries, the three facilities had a skilled delivery of 9763, 6982, 5581 deliveries respectively with a total of 22,326 skilled deliveries in 2011 E.C (59). Then the proportional allocation technique was used to assign the sample size to each facility in accordance to their delivery load. In each selected health facility, the newly born neonates who fulfill the eligibility criteria for cases, as an index study subject were enrolled consecutively till the expected sample size for the facility was complete. For every case selected as an index subject, two consecutive controls were included in the study.

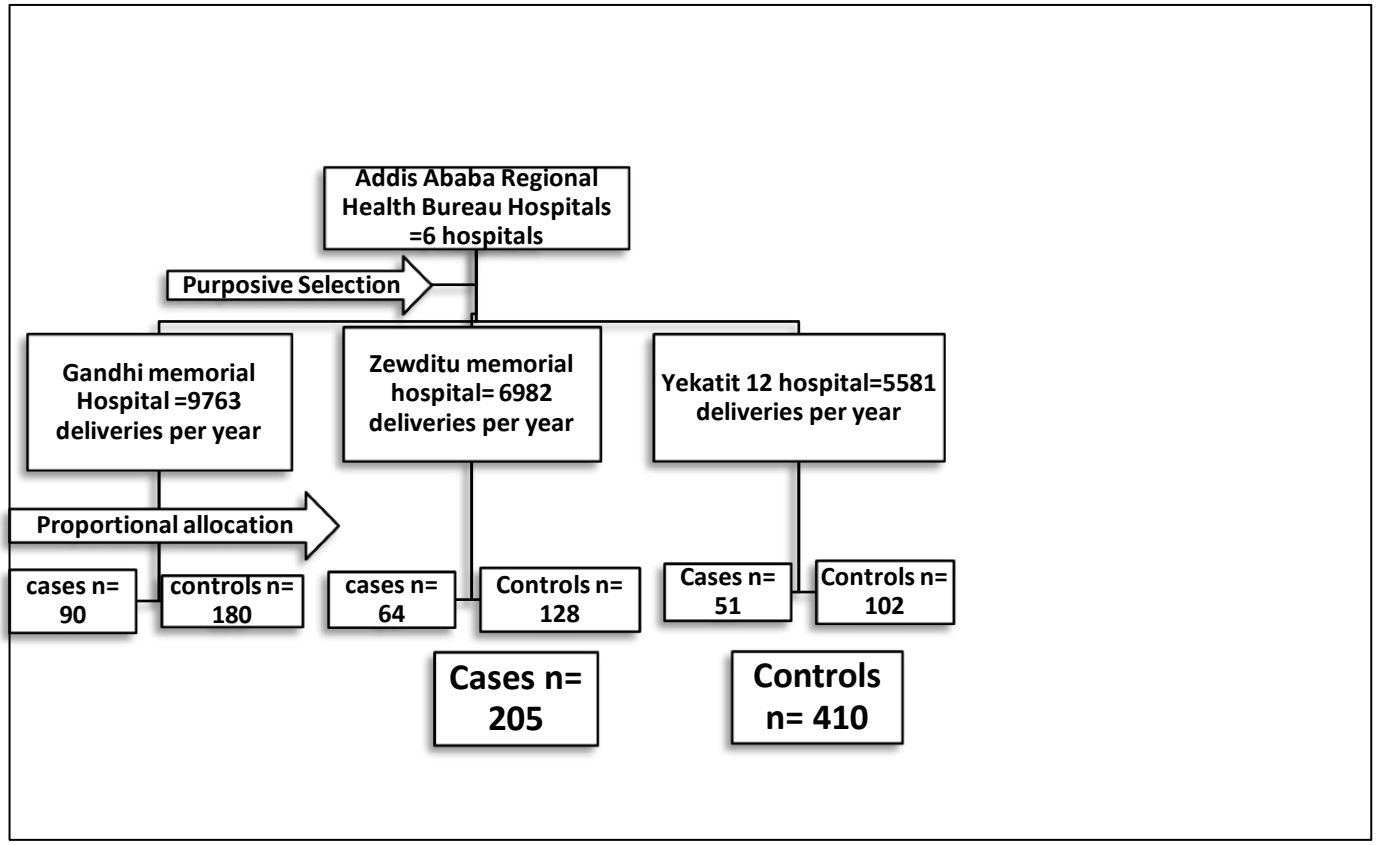

Figure 2: Schematic presentation of sampling technique for the Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa

6.9 Variables

6.9.1 Dependent variable

Low birth weight at term

6.9.2 Independent variables

Major exposure variable

Passive smoking status during pregnancy (place, duration, timing)

Other covariates

Socio-demographic characteristics of the mother- age, educational status, marital status, occupation, spouse's education, occupation and monthly household income

Maternal and obstetric characteristics- parity, history of abortion, history of LBW, ANC visits, number of ANC visits, iron supplementation, no of days iron tablet was taken, Mode of delivery, hemoglobin level, maternal BMI, maternal stature, pregnancy related risks (Vaginal bleeding, gestational DM, early labor, UTI, severe nausea/vomiting/dehydration, PROM)

Maternal substance use characteristics during pregnancy- alcohol, "Khat" chewing, active smoking, other substances use like cannabis

Newborn characteristics - sex, gestational age, birth weight

6.10 Operational definitions

1. **Passive smoke exposure**: Being exposed to someone else's cigarette smoke during the entire or part of the trimester during their pregnancy among home, work, or public places (Restaurants, Bars, or cafeterias) for more than 15 minutes at least 1 day a week.
2. **Cases**: Term infants weighing less than 2500 grams
3. **Controls**: Term infants weighing greater than or equal to 2500 grams**.**

6.11 Data collection tools and procedures

Data was collected through interviews and medical record review. At the postnatal, interviewer-administered pre-tested structured questionnaires were used to collect data from the mothers.

The questionnaire comprised different parts including socio-demographic characteristics, maternal and obstetric characteristics, and substance use behavior during pregnancy, and passive smoke exposure. It was adapted from different related studies. The questionnaire for socio-demographic information was from EDHS 2016 (16), for the maternal and obstetric information from the Pregnancy Risk Assessment and Monitoring Surveillance (PRAMS) questionnaire (60), for passive smoke exposure measurement from Global Adult Tobacco Survey (GATS) (61) and The Second-hand Smoke Exposure Scale (62).

Method of assessment for dependent and independent variables

Data obtained through structured questionnaires were:

- Socio-demographic characteristics of the mother- age, educational status, marital status, occupation, spouse's education, occupation and monthly household income
- Maternal and obstetric characteristics- parity, history of abortion, history of LBW, ANC visits, number of ANC visits, iron supplementation, no of days iron tablet was taken, Mode of delivery, pregnancy related risks (Vaginal bleeding, gestational DM, early labor, UTI, severe nausea/vomiting/dehydration, PROM)
- Maternal substance use characteristics during pregnancy- alcohol, "Khat" chewing, active smoking, other substances use like cannabis
- Passive smoking status during pregnancy (place, duration, timing)

Data obtained through reviewing medical records were:

- Maternal and obstetric characteristics : mother's hemoglobin level, pre-pregnancy weight and height
- Newborn information- sex, gestational age, birth weight

6.12 Data quality assurance

The tool was prepared in English at first and translated to Amharic, the local language, and then back to English by another person to assure its consistency. The Amharic version of the tool was used as a data collection instrument and it was pre-tested on women (n= 30) and face validity was performed. The questionnaire was pre-tested by the principal investigator at Gandhi

memorial hospital (those subjects were excluded from the study), afterwards minor modification of the study tool, like wording, rearticulating, and quantifying the time required to interview respondents were made. Among the modifications were, Last Menstrual Period (LMP) wasn't easily remembered by most of the respondents so we omitted that in the final questionnaire, and also the "Not applicable" response for the item "Do you usually work indoors, outdoors or both" wasn't included in the original tool for the mothers who were either a housewife or a student.

Intensive training was given for two days by the principal investigator to the data collectors. It mainly focused on the objective, the content of the tool, procedure of data collection, participant's privacy, and confidentiality. Six midwives and nurses with BSc degree qualifications who were staff at the respective hospitals and were experienced with data collection were assigned to collect the data.

6. 13 Data processing and analysis procedure

After the data was collected, the completeness and consistency of the questionnaire were checked manually, then before analysis, missing values and outliers were checked by the principal investigator. Then both the questionnaires and the variables were coded. After this, Epi DATA version 4.4.2.1 was used to enter the data; it was then exported to Statistical Package Statistical software (SPSS, version 25) where data cleaning was made before the analysis.

During the analysis, missing values (those extracted from medical records) were handled by using mean/median series statistical technique. After that cross-tabulation was used in both cases, and controls and Chi-square test was used to test the association between categorical variables. To assess the association between LBW babies and various risk factors, a binary logistic regression model was used at a 95% confidence interval. Binary logistic regression analysis was first performed to assess for potential confounders by checking if variables have an association (borderline association) with both the exposure and the outcome variable at p-value<0.25 in the crude odds ratio after testing for multicollinearity. Afterwards, potential confounders were identified (Annex 8 and 9) and adjusted in the final model to determine the adjusted odds ratio in the Multi-variable logistic regression. Statistical significance was declared at P-value <0.05.

For the estimation the proportion of passive smoke exposure during pregnancy among women who gave birth at public hospitals (mothers of the controls), the descriptive analysis (cross tabs)

was done for women who responded “yes” to being exposed to at least one of the three places (home, workplaces in the last 30 days, public or outside places in the last 7 days) during any point of their pregnancy accordingly, the 95 % CI was used to report the prevalence estimate.

6.14 Ethical consideration

Ethical clearance was found from the Research and Ethics Committee of the School of Public Health, Addis Ababa University for appropriateness and scientific content. The study was conducted in the selected health facilities after permission was obtained from the relevant bodies. Informed verbal consent was obtained from mothers of eligible neonates before participating in the study. They were informed regarding the purpose, procedures, potential risks, and benefits of the study. Each participant was informed on the right to refuse, ask any question that is not clear, and discontinue the interview any time in between for any inconveniences. They were assured of maximum confidentiality about any information obtained and no identifiers were used. Data were obtained 1-2 days after delivery, either at the Neonatal intensive care unit (NICU) for the cases and postnatal ward for the controls during their maximal comfortable time.

7. RESULT

7.1 Socio-demographic characteristics of the mothers and neonates

From a total of 615(205 cases and 410 controls) mothers who were selected from the three public hospitals that is, Mahatma Gandhi Memorial, Zewditu Memorial hospital, and Yekatit 12 hospital, 2 of the controls refused to give informed consent therefore did not participate in the current study. Therefore a total of 205 cases and 408 controls participated in the study, making the response rate 100% among cases and 99% among controls. The study had a high response rate probably due to the incorporation of data collectors from the respective public hospitals.
The mean maternal age ± Standard Deviation (S.D) among cases and controls was 26.1 (±4.4) and 26.7(±3.8) respectively. The majority of the respondents were between the age group of 25-29 years. Two-third (67.8%), of the cases and more than half (59.1%) of the controls belongs to Orthodox Christian religion.

In this study, maternal age, mother's education status, mother's religion, marital status, mother's occupation, and household income level showed a statistically significant association with LBW. However, partner's educational levels didn't show a statistically significant association with LBW (Table 1.)

Among the cases, 103(50.2%) were male while among the controls, 220(53.9%) were male but there was no significant association between infant's sex and LBW. Regarding their gestational age and birth weight, among the cases, the mean gestational age (±SD) and mean birth weight (±SD) was 42(±1.9) weeks and 1846.2 (±400) grams, respectively. While among the controls, it was 44(±0.9) weeks and 2676.4 (±210.6) grams, respectively.

The median of house hold monthly income among mothers of cases was 5000 Ethiopian birr (ETB) with minimum of 2000 ETB and a maximum of 15,000 ETB whereas among mothers of controls, the median was 5000 ETB with a minimum of 2000 and a maximum of 20,000 ETB.

Table 1: Socio-demographic characteristics of infants and mothers (cases n=205, controls n=408) Addis Ababa, 2020

Characteristics	Cases N (%)	Controls N (%)	Statistics X^2 test
Infant's sex			
Male	103(50.2%)	220(53.9%)	X^2=0.74
Female	102(49.8%)	188(46.1%)	(df=2) p>0.05
Infant Gestational age (weeks)	205(100%)	408(100%)	
Mean (S.D)	42 (±1.9)	44 (±0.9)	
Mother's Age (26.5 (±4.0)			
15-24	82(40.0%)	124(30.4%)	**X^2=6.57**
25-29	81(39.5%)	201(49.3%)	**(df=2) p<0.05**
>=30	42(20.5%)	83(20.3%)	
Mother's education			
Never educated	7(3.4%)	20(4.9%)	**X^2=12.37**
Elementary	31(15.1%)	110(27.0%)	**(df=2) p<0.05**
Secondary or More	167(81.5%)	278(68.1%)	
Partner's education			
Never educated	17(8.3%)	37(9.1%)	X^2=1.86
Elementary	15(7.3%)	43(10.5%)	(Df=2) p>0.05
Secondary or more	173(84.4%)	328(80.4%)	
Religion			
Orthodox	139 (67.8%)	241 (59.1%)	**X^2=11.85**
Muslim	35(17.1%)	75(18.4%)	**(Df=4) p<0.05**
Protestant	25(12.2%)	55(13.5%)	
Catholic	6(2.9%)	37(9.1%)	
Marital status			
Without a partner	19(9.3%)	48(11.8%)	**X^2=10.87**
With a partner	186(90.7%)	360(88.2%)	**(Df=1) p<0.05**
Mother's occupation			
Housewife	70(34.1%)	200(49.0%)	**X^2=12.25**

Employed	135(65.9%)	208(51.0%)	**(Df=1) p<0.001**
Monthly household income(Quintile)			
Unknown*	46(22.4%)	190(46.6%)	**X^2=37.94**
<2000	7(3.4%)	14(3.4%)	**p<0.001**
2001-4000	46(22.4%)	80(19.6%)	
4001-6000	60(29.3%)	74(18.1%)	
>6001	46(22.4%)	50(12.3%)	

* Unknown describes the respondents who either doesn't know their house hold monthly income or who refused to answer.

7.2 Maternal and obstetrics related characteristics

Of the total respondents, 179 (87.3%) of cases and 341 (83.6%) of controls had parity of less than 3. And when asked whether they wanted the pregnancy or not, 161 (78.5%) of the cases and 330 (80.9%) of the controls wanted the pregnancy. Of all the respondents, 22 (10.7%) of cases and 11 (2.7%) of controls had a history of low birth weight and 40 (19.5%) of the cases and 63 (15.4%) of the controls had a history of abortion. The mean hemoglobin level (±SD) of the mothers was 11.3(±1.8)g/dl and 12.7(±1.1) g/dl among cases and controls respectively. Regarding ANC follow-up, 178 (86.8%) of the cases and 392 (96.1%) of the controls had ANC follow-up.

The variables that were found to be significantly associated with LBW were, history of previous LBW delivery, ANC follow up, Number of ANC, Iron supplementation, Number of days iron tablets were taken, PROM, Mode of delivery. The remaining maternal and obstetric related characteristics were found to be not significantly associated with LBW (Table 2).

Table 2: Obstetrics characteristics of mothers who gave birth to lower and normal birth weight (cases n=205, controls n=408) Addis Ababa, 2020

Characteristics	**Category**	**Cases No (%)**	**Controls No (%)**	**Statistics X^2 test**
Maternal hemoglobin		205(100%)	408(100%)	
Mean (S.D)		11.3(±1.8)	12.7(±1.1)	

Wanted the pregnancy	Yes	161(78.5%)	330(80.9%)	X^2=0.47 (Df=1) p>0.05
	No	44(21.5%)	78(19.1%)	
Parity	<3	179(87.3%)	341(83.6%)	X^2=1.48 (Df=1) p>0.05
	>=3	26(12.7%)	67(16.4%)	
History of LBW	Yes	22(10.7%)	11(2.7%)	**X^2=17.29 (df=1) P<0.01**
	No	183(89.3%)	397(97.3%)	
GDM	Yes	6(2.9%)	12(2.9%)	X^2=.000 (Df=1) P>0.05
	No	199(97.1%)	396(97.1%)	
Vaginal bleeding	Yes	7(3.4%)	26(6.4%)	X^2=2.34 (Df=1) p>0.05
	No	198(96.6%)	382(93.6%)	
UTI	Yes	20(9.8%)	45(11.0%)	X^2=0.23 (Df=1) P>0.05
	No	185(90.2%)	363(89.0%)	
Severe nausea, vomiting, dehydration	Yes	50(24.4%)	90(22.1%)	X^2=0.42 (Df=1) P>0.05
	No	155(75.6%)	318(77.9%)	
Early labor	Yes	46(22.4%)	115(28.2%)	X^2=2.33 (Df=1) P>0.05
	No	159(77.6%)	293(71.8%)	
PROM	Yes	58(28.3%)	35(8.6%)	**X^2=41.2 (df=1)P<0.001**
	No	147(71.7%)	373(91.4%)	
ANC follow up	Yes	178(86.8%)	392(96.1%)	**X^2=17.8 (df=1) P<0.001**
	No	27(13.2%)	16(3.9%)	
Frequency of ANC	<4	177(86.3%)	239(58.6%)	**X^2=48.2 (Df=1) P<0.001**
	>=4	28(13.7%)	169(41.4%)	
Iron supplementation	Yes	144(70.2%)	347(85.0%)	**X^2=18.7 (Df=1) P<0.001**
	No	61(29.8%)	61(15%)	
No of days iron tablets were taken	<60	113(55.1%)	173(42.4%)	**X^2=8.87 (Df=1) P<0.05**
	60-90	92(44.9%)	235(57.6%)	
Mode of delivery	Vaginal	131(63.9%)	299(73.3%)	**X^2=6.42 (Df=2) P<0.05**
	Assisted	14(6.8%)	26(6.4%)	
	C-S	60(29.3%)	83(20.3%)	

History of abortion	Yes	40(19.5%)	63(15.4%)	X^2=1.62 (Df=1) P>0.05
	No	165(80.5%)	345(84.6%)	
Gestational weight gain	<10 K.g	174(84.9)	324(79.4%)	X^2=2.67 Df=1 P>0.05
	>=10 K.g	31(15.1%)	84(20.6%)	
Pre-pregnancy weight	<45 K.g	6(2.9%)	6(1.5%)	X^2=1.50 (Df=1) p>0.05
	>=45 K.g	199(97.1%)	402(98.5%)	
Pre-pregnancy BMI	Underweight	1(0.5%)	3(0.7%)	X^2=1.50 (Df=3) p>0.05
	Normal	146(71.2%)	271(66.4%)	
	Overweight	56(27.3%)	128(31.4%)	
	Obese	2(1.0%)	6(1.5%)	

7.3 Substance use characteristics during pregnancy

Among the total mothers, 95 (46.3%) of mothers of the cases and 143 (35%) of mothers of the controls consumed alcohol during pregnancy which made alcohol consumption during pregnancy 40% among the total mothers. Of the total respondents, 8 (3.9%) of the cases and 27(6.6%) of the controls had "Khat" chewing practices. Alcohol consumption was significantly associated with LBW but, other behavioural related characteristics ("Khat" chewing, cigarette smoking, and other substance use) were found to be not significantly associated with LBW.

Table 3: Substance use characteristics of mothers who gave birth to Lower and Normal birth weight (cases n=205, controls n=408) Addis Ababa, 2020

Characteristics	**Category**	**Cases N (%)**	**Controls N (%)**	**Statistics X^2 test**
Alcohol consumption	Yes	95(46.3%)	143(35%)	**X^2=7.326 (Df=1) P<0.05**
	No	110(53.7%)	265(65%)	
"Khat" chewing	Yes	8(3.9%)	27(6.6%)	X^2=1.868 (df=1) P>0.05
	No	197(96.1%)	381(93.4%)	
Active smoking	Yes	0(0%)	9(2.2%)	X^2=3.520 (df=1) P>0.05*
	No	205(100.0%)	399(97.8%)	
Other substance	Yes	0(0%)	7(1.7%)	X^2=3.558 1 (df=1) P>0.05*

(cannabis ,injectable)	No	205(100%)	401(98.3%)

* Fisher exact test for cell counts less than 5

7.4 Proportion of passive smoke exposure during pregnancy among women who gave birth at the selected public hospitals (Mothers of controls)

Among the total mothers, The proportion of passive smoke exposure during pregnancy among women who gave birth at selected public hospitals (mothers of controls) was found to be 49% (95 % CI: 44%, 54%) who reported being exposed to Passive smoke at least at one of these places among the mother's home (from their spouses or other family members), work-place in the last 30 days or public place in the last 7 days with a significant difference between cases and controls.

Table 4: Passive smoke exposure predictors among mothers who gave birth to Lower and Normal birth weight (cases n=205, controls n=408) Addis Ababa, 2020

Characteristics	**Cases N (%)**	**Controls N (%)**	**Statistics X^2 test**
Total Second-hand smoke exposure			
Exposed	128(62.4%)	200(49%)	**X^2=9.88 (DF=1)**
Not exposed	77(37.6%)	208(51%)	**P<0.001**
Home exposure			
Exposed	25(12.2%)	21(5.1%)	**X^2= 9.76 (DF=1)**
Not exposed	180(87.8%)	387(94.9%)	**P<0.05**
Work place			

Exposed	45(22.0%)	54(13.2%)	**X^2= 7.65 (DF =1)**
Not exposed	160(78.0%)	354(86.8%)	**P<0.05**
Public place			
Exposed	123(60%)	91(22.3%)	**X^2= 85.33 (DF=1)**
Not exposed	82(40%)	317(77.4%)	**P<0.001**
No of cigarettes per day at home			
Not exposed	177(86.3%)	387(94.9%)	**X^2= 13.440 (DF=1)**
1-20 cigarettes	28 (13.7%)	21 (5.1%)	**P<0.001**
Trimester of home Exposure			
Not exposed	180(87.80%)	387(94.85%)	X^2= 0.23 (DF=2)
Exposed at least for 1 trimester	10(4.88%)	7(1.72%)	p>0.05
Exposed at the entire trimester	15(7.32%)	14(3.43%)	

7.5. Passive smoke exposure versus Place of exposure

Total Home, work, public place exposure among mothers of cases and controls in this study was found to be 7.5%, 16.2%, and 34.9%, respectively in which the women were exposed to smoke coming from either their spouses or other family members, their workplaces in the last 30 days or public places such as restaurants, bars or cafeteria in the last 7 days during either at part or the entire pregnancy as shown in (Figure 3).

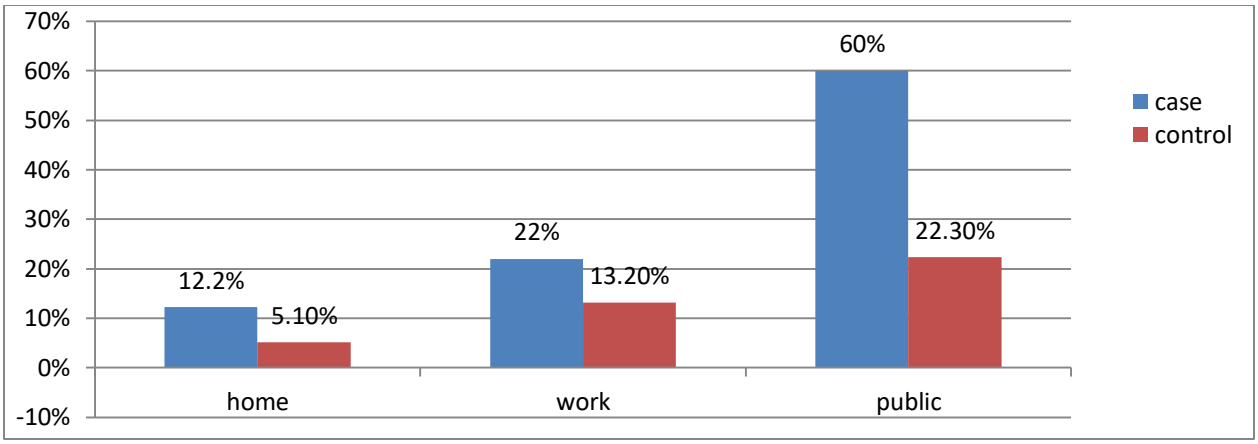

Figure 3: Comparison of Passive exposure among cases (n=205) and controls (n=408) based on the location of exposure, Addis Ababa, 2020

7.6 Passive smoke exposure versus amount and trimester of exposure of home exposure

The number of cigarettes was also calculated as the women were asked to answer the number of cigarettes they were exposed in ranges of cigarettes as well as the trimester of exposure at home. Accordingly, there were 3 categories within the first predictor namely the No exposure category, 1-20 cigarettes per day exposure category, and >21 cigarettes (more than 1 pack) category. 13.7% of mothers of the cases and 5.1% of mothers of the controls reported being exposed to 1-20 cigarettes per day at their home while the rest were no exposure category (no mother reported the higher category). This predictor showed a significant difference among cases and controls (Table 4).

The trimester of exposure at home was also asked with 3 categories namely No exposure category, Exposed at least for 1 trimester, Exposed at the entire pregnancy. Accordingly, 4.88% of mothers of cases and 1.72% of mothers of controls reported to being exposed for at least for 1 trimester while 7.3% of mothers of cases and 3.43% of mothers of controls reported to being exposed through the entire pregnancy. This predictor was found to be not significantly different among cases and controls (Table 4).

7.7 Bi-variable analysis of factors associated with passive smoke exposure

In this study, the variables that showed an association with passive smoke exposure at P-value<0.25 were the following variables. Partner education (COR:3.23:p-value<0.001), Infant's

gestational age (COR=0.69:p-value<0.001), Maternal hemoglobin (COR=0.70:p-value<0.001), pre-pregnancy BMI (COR=1.06:p-value<0.25), mother's education(COR:0.50 p-value<0.05), mother's occupation (COR=1.46:p-value<0.05), number of ANC follow-up (COR=1.79:p-value<0.05), Iron tablet yes/no (COR=0.77:p-value<0.25), number of days iron supplementation was given (COR=1.60:p-value<0.05), mothers height (COR=0.15:p-value<0.25), gestational DM (COR=2.19:p-value<0.25), Kidney, bladder, Urinary tract infection (COR=1.42:p-value<0.25), PROM(COR=1.36:p-value<0.25), gestational weight gain (COR=1.05:p-value<0.25), alcohol consumption (COR=1.3:p-value<0.25), workplace passive smoke exposure (COR=4.06:p-value<0.001), public place exposure (COR=43.2:p-value<0.001) as shown in (Annex 8).

7.8 Bi-variable analysis of factors associated with Low birth weight

In this study, the variables that showed an association with LBW at P-value<0.25 were the following variables. Maternal hemoglobin (COR=0.5 :p-value <0.001), Pre-pregnancy BMI (COR=0.9 :p-value <0.25), Pre-pregnancy (COR=1.03:p-value <0.05) and Post-pregnancy weight (COR=1.03 :p-value <0.05), Infant Gestational age (COR=0.4 :p-value <0.001), Mother's Age (COR=0.61 :p-value <0.05), Mother's education (COR=0.47 :p-value <0.001), Mother's occupation (COR=1.85 :p-value <0.001), Marital status (COR=32 :p-value <0.05), Household income (COR=0.26 :p-value <0.001), Mother's religion(COR=0.28 :p-value <0.05), Vaginal bleeding (COR=0.25 :p-value <0.25), Preterm (early) labor (COR=0.74 :p-value <0.25), History of abortion (COR=1.33 :p-value <0.25), PROM (COR=4.2 :p-value <0.001), ANC follow-up (COR=2.4 :p-value <0.001), No of ANC (COR=4.47 :p-value <0.05), Iron supplementation (COR=2.4 :p-value <0.001), No of days iron tablets were taken (COR=1.67 :p-value <0.25), Mode of delivery (COR=1.65 :p-value <0.05), Gestational weight gain (COR=1.46 :p-value <0.25), Alcohol (COR=1.60 :p-value <0.01) and "Khat" consumption (COR=0.57 :p-value <0.25), Second-hand smoke exposure (COR=1.7 :p-value <0.01), Exposure at Home (COR=2.56 :p-value <0.01), Exposure at workplace (COR=1.84 :p-value <0.01), Exposure at public place (COR=5.23 :p-value <0.001), and No of cigarettes/ day at home (COR=2.91 :p-value <0.001) (Annex 9).

7.9 Multivariable logistic regression model of socio-demographic, Obstetric, Substance use and passive smoke exposure between cases and controls

Based on their significance at p-value<0.25 at the bi-variable analysis, The possible confounders were Gestational age, maternal hemoglobin, pre-pregnancy BMI, mother's education, mother's occupation, number of ANC follow-up, number of days iron supplementation was given, PROM, Alcohol consumption, Total Passive-smoke exposure, workplace exposure, and public place exposure. Multicollinearity was then assessed by a variance inflation factor (VIF) between covariates which showed a value of VIF< 10 (Annex10). The model fit test was adequate with a Negelkere R-Square value of 62.8%. Hosmer-Lemeshow statistics also indicates a good fit with (p>0.05).

The variables that showed a significant association after being adjusted were the following, Gestational age was found to be protective in which a unit increase in their gestational age in weeks reduced the odds of delivering a LBW infant by 67% [(AOR =0.33, (p<0.001)]. Maternal hemoglobin had also a protective effect in which a unit increase in maternal hemoglobin reduced the odds of delivering a LBW infant by 66.7% [AOR= 0.45, (p-value<0.001). Pre-pregnancy BMI was also a protective factor and infants born from a mother who has a higher Pre-pregnancy BMI were less likely to be LBW [AOR=0.85, (p-value<0.05) compared to the lower ones. Mother's education also showed a significant association where mothers who attended primary education were less likely to deliver LBW infants compared to those with no education [AOR=0.13, p-value <0.05)]. In this study, total passive-smoke exposure where mothers responded yes to either being exposed at home, workplace in the last 30 days or public place in the last 7 days was significantly associated with LBW where exposed mothers were 4 times more likely to deliver a LBW infant as compared to the non-exposed [AOR=4.14, (p-value <0.001)]. Finally, public place exposure was the only predictor of Passive smoke exposure that remained significant after adjustment and those who were exposed at public places were 6 times more likely to deliver a LBW infant as compared to the non-exposed [AOR: 6.16, (p-value <0.001)]. The remaining variables were found to be not significant after adjustment (Table 5).

Table 5: Multivariable association of socio-demographic, Obstetric, Substance use and passive smoke exposure between cases (n=205) and controls (n=408) Addis Ababa, 2020

Variables	COR (95 % CI)	AOR (95% CI)
Maternal hemoglobin	**0.46 (0.39, 0.55)**	**0.45 (0.36, 0.58)****
Infant Gestational age	**0.36 (0.29, 0.43)**	**0.33 (0.26, 0.42)****
Pre-pregnancy BMI	0.94 (0.88, 1.01)	**0.87 (0.78, 0.97)****
Mother's education		
Never educated	0.58 (0.24, 1.41)	0.75 (0.37, 1.48)
Elementary	**0.47 (0.30, 0.73)**	**0.13 (0.04, 0.40)***
Secondary or More	1	1
Mother's occupation		
Unemployed	0.54 (0.38, 0.76)	0.65 (0.38, 1.14)
Employed	1	1
No of ANC		
<4	4.47 (2.87, 6.97)	1.46 (0.77, 2.78)
>=4	1	1
No of days iron tablets were taken		
<60	1.67 (1.19, 2.34)	0.67 (0.35, 1.29)
60-90	1	1
Alcohol consumption		
Yes	1.60 (1.14, 2.25)	1.05 (0.61, 1.79)
No	1	
Passive smoke exposure [a]		
Exposed	**1.73 (1.23, 2.44)**	**4.14 (2.21, 7.76)****
Not exposed	1	1
Work place exposure [b]		
Exposed	1.85 (1.19, 2.86)	1.46 (0.70, 3.06)
Not exposed	1	
Public place exposure [b]		

Exposed	**5.23 (3.63, 7.52)**	**6.16 (3.56, 10.65)****
Not exposed	1	1

*Statistically significant at P-value <0.05

** Statistically significant at P-value < 0.001

a entered in to the final model with-out work place exposure and public place exposure

b entered in to the final model with-out passive smoke exposure

8. DISCUSSION

The findings in this study have shown that the proportion/magnitude of passive smoke exposure during their pregnancy was found to be very high among mothers who gave birth at the public hospitals (Mothers of controls).Correspondingly, a significant association between total passive smoke exposure, public place exposure, and LBW was found after controlling for potential confounders. In addition to that in a comprehensive analysis of the risk factors for LBW, maternal educational status, maternal hemoglobin level, gestational age in weeks, pre-pregnancy BMI were identified as factors determining the likelihood of low birth weight after adjustment.

The proportion/magnitude of passive smoke exposure in those mothers attending public hospitals (mothers of the controls) was found to be very high which was 49% (p-value<0.05). A varied magnitude was reported in different studies. A case-control study from India (45) showed a 35% (p-value<0.05) proportion of exposure among mothers of controls from a total of 300 study subjects (100 cases and 200 controls) and a matched case-control study from Gaza (63) reported a 26.9% (p-value <0.05) proportion of passive smoke exposure among mothers of the controls from 446 study subjects. The reason for the variation might be while the current study included home, work place, and public place exposures, those studies only included exposure from home (partner smoking)which may probably underestimate the true exposure proportion/magnitude.

On a comprehensive analysis of the risk factors for LBW, the result of this study confirmed that mother's educational status , Pre-Pregnancy BMI, mother's hemoglobin level, and Infant's gestational age in weeks were found to be protective against LBW ((17),(64),(54),(25),respectively.

Our main objective in the current study was the association between Passive smoke exposure and LBW. Accordingly, mothers who had a second-hand smoking exposure (among home, work, public place) were 4 times (p-value<0.001) more likely to deliver a LBW neonate as compared to mothers who had no second-hand smoke exposure which was in agreement with a case-control study from India (30) which reported an AOR for Environmental tobacco exposure association with LBW neonate as 3.16 (95% CI; 1.88-5.28) , it is also in agreement with another case-control study in Gaza strip (63) which reported an AOR ranging from 2.5 (95% CI: 1.4, 4.3) to 4.6 (95%

CI: 1.9, 10.7) corresponding to a lower and higher amount of exposures. Possible explanation for the association could be factors including the vasoconstriction properties of nicotine, elevated fetal carboxyhemoglobin levels, fetal tissue hypoxia, reduced delivery of nutritional elements, and elevation of heart rate and blood pressure (11).

Likewise, this study also found that the odds of delivering a low birth weight infant in those mothers who had public place passive smoke exposure during their pregnancy were 6 times (p-value<0.001) higher as compared to those who were not exposed. These finding were consistent with a study from Hungary (65) which implemented complete smoking banning from public places and seen reduction in the probability of being born with very low and low birth weight by 1.2 and 2.2 percentage points respectively with the implication that public places exposure is significantly associated with LBW.

However, in this study, other predictors of passive smoking such as workplace exposure were found to be not significant after adjustment in the final multi-variable model.

In this study, even though 22% of mothers of the cases reported to being exposed to passive smoke exposure at workplace, these predictor was found to be not significantly associated with low birth weight which is comparable to findings from Japan (41) and India (66). The reason might be due to the relatively lower proportion of passive smoke exposure coming from such source as compared to public places as supported by evidence from the GATS survey (20).

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9. STRENGTH AND LIMITATION

The strengths of this study were:

- The cases that were used in this study were incident cases thus it can minimize the recall bias. However, it should be noted that recall bias was inevitable since the mothers were asked to report their exposure status to passive smoke while they were pregnant.
- Confounding bias was attempted to be minimized using Multivariate analysis.
- This study used a sample size which was adequate enough to reduce the role of chance.
- The study used questionnaire-based passive smoking exposure identification which makes it advantageous at identifying past exposure status than biomarker-based methods however it makes it disadvantageous since it can be subjected to misclassification of exposure although studies suggest the accuracy of such methods ((11,51)).

Despite that, these were the limitations of the study:

- Low Birth Weight was assessed by reviewing the neonate's medical card which might be subjected to heaping.
- Prematurity/Gestational age was assessed by reviewing their ultrasound examination since majority of the mothers don't remember their LMNP.
- The study partly used secondary data for extracting newborn information and for maternal and obstetric information and mean substitution technique was done for handling missing data in the independent variables which might be subjected to an underestimate of errors.
- The study also had a high response rate probably due to the incorporation of data collectors from the respective public hospitals which may have influenced the behavior of the respondents.
- We were also unable to control the effects of factors such as the closeness to the smoker and the air ventilation during exposure.
- The effect of some potential covariates like diet was just assessed with pre-pregnancy BMI (which is calculated from the mothers Pre-pregnancy weight and height extracted from their medical card) and dietary assessment wasn't done.

- Another limitation might be since the women were asked about their exposure status based on self -reported exposure, it might be prone to social desirability bias therefore might underestimate their exposure mainly home exposures.
- Finally, the results of this study should be taken cautiously since its only institution based and could not be extrapolated to the population.

10. CONCLUSION AND RECOMMENDATION

10.1 Conclusion

In conclusion, this study demonstrated a very high proportion of passive smoke exposure among women who gave birth at the public hospitals (mothers of the controls). It also showed that LBW is a significant public health problem that is associated with passive smoke exposure during pregnancy.

Likewise, the current study showed that passive smoke exposure at public places was the only passive smoke exposure predictor that showed association with LBW. However, passive smoke exposure at work wasn't significantly associated with LBW.

Finally, mother's education, maternal hemoglobin, Pre-pregnancy BMI, and infant's gestational age remained to be significant determinants of LBW.

10.2 Recommendation

Based on the study findings, the following recommendations were drawn:

- Mothers should protect themselves from Passive Smoke Exposure during pregnancy primarily from exposure at public places, since it is among preventable risk factors for LBW.
- Health care providers should provide health education for pregnant women or women who intend to get pregnant along with their partners during ANC visits about the potential risks of passive smoke exposure on the fetus.
- For researchers, validation studies using primary data sources need to be done in order to accurately predict the extent of the risk.

11. REFERENCES

1. WHO report. Low Birth WeightPolicy Brief. policy Br. 2014;28:66.

2. Risnes KR, Vatten LJ, Baker JL, Jameson K, Sovio U, Kajantie E, et al. Birthweight and mortality in adulthood: A systematic review and meta-analysis. Int J Epidemiol. 2011;40(3):647–61.

3. Idris MZ, Gupta A, Mohan U, Srivastava AK, Das V. Maternal Health and Low Birth Weight Among Institutional Deliveries. Indian J Community Med. 2000;XXV(4):156–60.

4. UNICEF. Improving child nutrition The achievable imperative for global progress. Vol. 18, NCSL legisbrief. 2013.

5. Ryan H, Trosclair A, Gfroerer J. Adult current smoking: Differences in definitions and prevalence estimates - NHIS and NSDUH, 2008. J Environ Public Health. 2012;2012.

6. Ogawa H, Tominaga S, Hori K, Noguchi K, Kanou I. Passive smoking by growth. 1991;164–8.

7. California Environmental Protection Agency. State of California Proposed Identification of. Propos Identif Environ Tob Smoke as a Toxic Air Contam. 2005;

8. Norsa'Adah B, Salinah O. The effect of second-hand smoke exposure during pregnancy on the newborn weight in Malaysia. Malaysian J Med Sci. 2014;21(2):44–53.

9. World Health Organization. Global Health Observatory (GHO) data Second hand smoke. 2015. Available from: [https://www.who.int/gho/phe/secondhand_smoke/en/]

10. Öberg M, Jaakkola MS, Woodward A, Peruga A, Prüss-Ustün A. Worldwide burden of disease from exposure to second-hand smoke: A retrospective analysis of data from 192 countries. Vol. 377, The Lancet. 2011. p. 139–46.

11. Ana F, Roberta F, Einarson T, Peter S, Offie S, Gideon K. Methods for Quantification of Exposure to Cigarette Smoking and Environmental Tobacco Smoke: Focus on Developmental Toxicology. Ther Drug Monit. 2012;23(1):1–7.

12. Central Statistical Agency (CSA) [Ethiopia] and ICF. 2016. Ethiopia Demographic and

Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF.

13. WHO. Global Progress Report on implementation of the WHO Framework Convention on Tobacco Control 2018. World Health Organization. 2018. 1–41 .

14. FMHACA. Ethiopian Food , Medicine and Healthcare Administration and Control Authority Tobacco Control Directive. 2015.

15. Erku DA, Tesfaye ET. Tobacco control and prevention efforts in Ethiopia pre- And post-ratification of WHO FCTC: Current challenges and future directions. Tob Induc Dis. 2019;17(February):1–10.

16. Kaewkiattikun K. Effects of immediate postpartum contraceptive counseling on long-acting reversible contraceptive use in adolescents. Vol. Volume 8, Adolescent Health, Medicine and Therapeutics. 2017.

17. Endalamaw A, Eshetu, Haileselassie Engeda Daniale TE, Getaneh, Mulualem Belay Mekuriaw AT. Low birth weight and its associated factors in Ethiopia: A systematic review and meta-analysis. Ital J Pediatr. 2018;44(1):1–12.

18. Magee B, Hattis D, Kivel N. Role of smoking in low birth weight. J Reprod Med. 2004; Available from: https://www.ncbi.nlm.nih.gov/pubmed/14976791

19. Jaddoe VWV, Troe EJWM, Hofman A, Mackenbach JP, Moll HA, Steegers EAP, et al. Active and passive maternal smoking during pregnancy and the risks of low birthweight and preterm birth: The generation R study. Paediatr Perinat Epidemiol. 2008;22(2):162–71.

20. GATS .Global Adult Tobacco Survey. FACT SHEET Ethiopia. 2016.

21. Reda AA, Kotz D, Biadgilign S. Adult tobacco use practice and its correlates in eastern Ethiopia: A cross-sectional study. Harm Reduct J. 2013;10(1):1–6.

22. Savell E, Gilmore AB, Fooks G. How does the tobacco industry attempt to influence marketing regulations? A systematic review. PLoS One. 2014;9(2).

23. World Health Organization. WHO Report on the Global Tobacco Epidemic, 2017.World Health Organization 2017. Available from: [http://www.who.int/tobacco/global_report/2017/en/%0Ahttp://apps.who.int/iris/bitstream/handle/10665/255874/9789241512824-eng.pdf?sequence=1%0Ahttps://www.world-heart-federation.org/wp-content/uploads/2017/07/WHO-Report-on-the-global-tobacco-epidemic-2017]

24. Demelash H, Motbainor A, Nigatu D, Gashaw K, Melese A. Risk factors for low birth weight in Bale zone hospitals, South-East Ethiopia : A case-control study. BMC Pregnancy Childbirth. 2015;15(1):1–10.

25. Hailu LD, Kebede DL. Determinants Of Low Birth Weight Among Deliveries At A Referral Hospital In Northrn EthiopiaBioMed Research International. 2018;1-8.

26. Gebregzabiherher Y, Haftu A, Weldemariam S, Gebrehiwet H. The Prevalence and Risk Factors for Low Birth Weight among Term Newborns in Adwa General Hospital, Northern Ethiopia. Obstet Gynecol Int. 2017.

27. Shannon L, Charlotte P, Jürgen R, Svetlana P. National, regional, and global prevalence of smoking during pregnancy in the general population: a systematic review and meta-analysis. Lancet Glob Heal. 2018;6(7):e769–76.

28. Global Adult Tobacco Survey. The Tobacco Atlas Second Hand Smoke.2016. Available from: [https://tobaccoatlas.org/topic/secondhand/]

29. WHO Report on the Global Tobacco Epidemic 2019 Appendix X. Age-standardized prevalence estimates for current tobacco use among persons aged Region. 2019. Available from: [http://www.who.int/tobacco/global_report/en]

30. Lee AC, Blencowe H, Lawn JE. Small babies, big numbers: global estimates of preterm birth. Lancet Glob Heal. 2019;7(1):e2–3. Available from: http://dx.doi.org/10.1016/S2214-109X(18)30484-4

31. Patrick OO, Miriam AM, Wen-Chi P, Hsien-Wen K. Indoor secondhand tobacco smoke and risk of under-five mortality in 23 sub-Saharan Africa countries: A population based

study and meta-analysis. PLoS One. 2017;12(5):1–17.

32. Kai-Wen C, Wan-Lin C, Tung-Liang C. In utero and early childhood exposure to secondhand smoke in Taiwan: A population-based birth cohort study. BMJ Open. 2017;7(6):1–10.

33. Jianghong L, Patrick W.L L, Linda M, Yuexian A, Jennifer P-M. Mother's environmental tobacco smoke exposure during pregnancy and externalizing behavior problems in children. Neurotoxicology. 2013;34(1):167–74.

34. Anne BP, Lisa MT, Gezahegn BD, Alemu T, Janine KC. Factors associated with secondhand tobacco smoke in the home: An exploratory cross-sectional study among women in Aleta Wondo, Ethiopia. BMC Public Health. 2016;16(1):1–12. Available from: http://dx.doi.org/10.1186/s12889-016-3588-6

35. Alamneh AA, Endris BS, Gebreyesus SH. Caffeine, alcohol, khat, and tobacco Use During Pregnancy In Butajira, South Central Ethiopia. PLos One. 2020 May8;15(5).

36. Agbozo F, Abubakari A, Der J, Jahn A. Prevalence of low birth weight, macrosomia and stillbirth and their relationship to associated maternal risk factors in Hohoe Municipality, Ghana. Midwifery. 2016;40:200–6.

37. Bililign N, Legesse M, Akibu M. A Review of Low Birth Weight in Ethiopia: Socio-Demographic and Obstetric Risk Factors. Glob J Res Rev. 2018;05(01):1–5.

38. Adane AA, Ayele TA, Ararsa LG, Bitew BD, Zeleke BM. Adverse birth outcomes among deliveries at Gondar University Hospital, Northwest Ethiopia. BMC Pregnancy Childbirth. 2014;14(1):1–8.

39. Gebremedhin M, Ambaw F, Admassu E, Berhane H. Maternal associated factors of low birth weight: A hospital based cross-sectional mixed study in Tigray, Northern Ethiopia. BMC Pregnancy Childbirth. 2015;15(1):1–8. Available from: http://dx.doi.org/10.1186/s12884-015-0658-1

40. Tema T. Prevalence and determinants of low birth weight in Jimma zone, southwest Ethiopia. East Afr Med J. 2006;83(7):366–71.

41. Yoshihiro M, Keiko T, Masashi A. Active and passive maternal smoking during pregnancy and birth outcomes: The Kyushu Okinawa Maternal and Child Health Study. BMC Pregnancy Childbirth. 2013;13(1):1.

42. Kristin BA, Ellen H, Lynne H, Mary KR, Melody N, James EF. The Effects of Prenatal Secondhand Smoke Exposure on Preterm Birth and Neonatal Outcomes. J Obs Gynecol Neonatal Nurs. 2012;23(1):1–7.

43. Zhongzheng N, Chuanbo X, Xiaozhong W, Fuying T, Shixin Y, Deqin J, et al. Potential pathways by which maternal second-hand smoke exposure during pregnancy causes full-term low birth weight. Sci Rep. 2016;6(October 2015):1–8. Available from: http://dx.doi.org/10.1038/srep24987

44. Maryam E, Soheila P, Parvin S, Fatane M. Relation of Second Hand Smoker and Effect on Pregnancy Outcome and Newborns Parameters. Women's Heal Gynecol. 2016;2(2):022.

45. Divya K, Shally A, Vinita D. Residential environmental tobacco smoke exposure during pregnancy and low birth weight of neonates: Case control study in a public hospital in Lucknow, India. Indian Pediatr. 2013;50(1):134–8.

46. Jan D, Ivo S, Kater˘ina P, Radim JS. The exposure of nonsmoking and smoking mothers to environmental tobacco smoke during different gestational phases and fetal growth. Environ Health Perspect. 2002;110(6):601–6.

47. Yousef SK, Nemeh A-A, Ibrahim MA, Sam L. The association between second hand smoke and low birth weight and preterm delivery. Matern Child Health J. 2011;15(4):453–9.

48. Abdulrhman, M Hawsawi Lawrence OB, Lynda TG. Association between exposure to secondhand smoke during pregnancy and low birthweight: A narrative review. Respir Care. 2015;60(1):135–40.

49. Florescu A, Ferrence R, Einarson T, Selby P, Soldin O, Koren G. Methods for quantification of exposure to cigarette smoking and environmental tobacco smoke: Focus

on developmental toxicology. Ther Drug Monit. 2009;31(1):14–30.

50. Avila-Tang E, Elf JL, Cummings KM, Fong GT, Hovell MF, Klein JD, et al. Assessing secondhand smoke exposure with reported measures. Tob Control. 2013;22(3):156–63.

51. Taylor AE, Davey Smith G, Bares CB, Edwards AC, Munafò MR. Partner smoking and maternal cotinine during pregnancy: Implications for negative control methods. Drug Alcohol Depend. 2014;139:159–63. Available from: http://dx.doi.org/10.1016/j.drugalcdep.2014.03.012

52. Nigatu D, Haile D, Gebremichael B, M Tiruneh Y. Predictive accuracy of perceived baby birth size for birth weight: A cross-sectional study from the 2016 Ethiopian Demographic and Health Survey. BMJ Open. 2019;9(12):1–8.

53. Blanc AK, Wardlaw T. Monitoring low birth weight: An evaluation of international estimates and an updated estimation procedure. Bull World Health Organ. 2005;83(3):178–85.

54. Seid S, Tolosa T, Adugna D. Prevalence of Low Birth Weight and Associated Factor among neonate Born at Jimma Medical Center (JMC), Jimma , South Western Ethiopia Abstract. iMedPub Journals. 2019;1–4.

55. Addis Ababa Population Data. Central Statstics Agency Available from: [www.EthioDemographyAndHealth.Org]

56. Addis Ababa Population 2020 (Demographics, Maps, Graphs) Available from: [http://worldpopulationreview.com/world-cities/addis-ababa-population/]

57. Federal Ministry of Health Health and Health Related Indicators 2005 E . C (2012 / 2013). 2014;

58. Dendir E, Deyessa N. Substance use and birth weight among mothers attending public hospitals: A case control study. Ethiop J Heal Dev. 2017;31(1):27–35.

59. Top three skilled deliveries in Addis Abeba Health Bereau Facillities. 2019 G.c.

60. Pregnancy Risk Assessment Monitoring System (PRAMS). 2012;3(September):1–47.

61. WHO CDC. Global Tobacco Surveillance System Tobacco questions for surveys. 2011;6. Available from: [http://www.who.int/tobacco/surveillance/tqs/en/]

62. Constantine V, Israel A, Filippos F, Antonis K, Charis G, Emmanouil S, et al. The Secondhand Smoke Exposure Scale (SHSES): A hair nicotine validated tool for assessing exposure to secondhand smoke among elderly adults in primary care. Tob Prev Cessat. 2017;3(April):1–7.

63. Abusalah A, Gavana M. Low Birth Weight and Prenatal Exposure to Indoor Pollution from Tobacco Smoke and Wood Fuel Smoke : A Matched Case – Control Study in Gaza Strip. 2011;

64. Demelash H, Motbainor A, Nigatu D, Gashaw K, Melese A. Risk factors for low birth weight in Bale zone hospitals, South-East Ethiopia : A case-control study. BMC Pregnancy Childbirth. 2015;15(1):1–10.

65. Hajdu T, Hajdu G. Smoking ban and health at birth: Evidence from Hungary. Econ Hum Biol. 2018;30:37–47.

66. Jayaraj NP, Rathi A, Taneja DK. Exposure to Household Air Pollution During Pregnancy and Birthweight. Indian Pediatr. 2019 Oct 15;56(10):875-876

12. ANNEXES

Annex 1: Participants Information sheet in English

Dear Participants

My name is..... I am here on behalf of Selamawit Mandefro who is a master's degree student at Addis Ababa university school of public health in department of General public health. She is working her thesis on the "Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa" and she has received permission from the university and the respective hospitals.

This letter serves to ask consent from you to take part in this research. The purpose of this research is to assess the association between Passive smoke exposure during Pregnancy and Low Birth Weight (LBW) among the selected hospitals attendees in Addis Ababa. This study will be helpful to know the association of passive smoking during pregnancy with LBW babies. This study will help us to increase awareness of the negative health effects of passive smoke exposure during pregnancy, in order to protect the health of women and infants. It will also serve to provide useful empirical information for the responsible bodies such as regulatory authorities on tobacco policy.it will also serve as a baseline for other wide studies as well as for planning health intervention or promotion activities in the country.

Your participation in this research is voluntary. If you decide not to participate there will be no negative consequences for you. If you decide to participate there will be no benefits for you. However your participation on this study is very important for achievement of the study. There will not be any risk occurring to you because of your participation in this study. All the responses given by you and results obtained will be kept confidential using coding system whereby no one will have access to your response. You are not expected to give your name or phone number. Without permission from you and legal body, any part of this study will not be disclosed to third person. The questions take 20-30 minutes. You have full right to refuse and withdraw from the participation at any time if you don't wish to continue. We hope you will participate in the study for the sake of the benefit of the research result. If you are willing to participate in this study, please sign the agreement form. Thank you for your time.

Annex 2 Informed Consent Form in English

Based on the understanding of the information, Are you willing to participate in the Study? Yes_____ (continue)

No_____ Thank you!

Respondent

Signature _____Date_____

Interviewer

Name_____ Signature_____

Questionnaires number_____

Date of interview_____ Starting time_____ Completed_____

Result of interview A) Completed B) Not completed C) Partially completed D) Refused

Checked by Supervisor: Name _____Signature_____

Address: Cell phone +251922489508

Email: faylulazora@gmail.com

Annex 3: Participants information sheet in Amharic

የተጠያቂዉ/ የመላሾች የመረጃ ቅፅ

እንደምን አደሩ/ዋሉ;

ስሜ.....ይባላል፡፡ከዚህ የመጣሁት በአዲስ አበባ ዩኒቨርሲቲ የህብረተሰብ ጤና አጠባበቅ ክፍል ውስጥ ሁለተኛ ዲግሪ ተማሪ የሆነቸዉን ሰላማዊት ማንደፍሮ ወከዬ ነዉ፡፡እርሷ በእርግዝና ወቅት የሚያጋጥም ለሲጋራ/ትምባሆ ተጋላጭነት በጨቅላ ህጻናት የሰዉነት ክብደት ላይ በሚያመጣዉ ተጽእኖ ላይ የመመረቅያ ጥናትን እየሰራች ሲሆን ከዩኒቨርሲቲ እና ከሆስፒታሎች ፈቃድ አግኝታለች፡፡

ይህ ደብዳቤ በዚህ ጥናት ውስጥ ለመሳተፍ ከእርስዎ ፈቃድ ለመጠየቅ ያገለግላል፡፡የዚህ ጥናት ዓላማ በእርግዝና ወቅት የሚያጋጥም ለሲጋራ/ትምባሆ ተጋላጭነት በጨቅላ ህጻናት የሰዉነት ክብደት ላይ በሚያመጣዉ ተጽእኖ በተመረጡት ሆስፒታሎች ውስጥ የሚደረግ ሲሆን በዚያም መካከል ያለዉን ግንኙነትን ለማጥናት ነው፡፡ ይህ ጥናት የሴቶች እና የህፃናትን ጤና ለመጠበቅ ሲባል በእርግዝና ወቅት የትንባሆ ማጨስ የሚያስከትለውን አሉታዊ ተፅእኖ ግንዛቤ ለማሳደግ ይረዳናል፡፡

በተጨማሪም ለትንባሆ የቁጥጥር ባለስልጣናት እንደየደረጃው ጠቃሚ መረጃ ይሰጣል፡፡ከፖሊሲ አክሎም ለሌሎች ሰፋፊ ጥናቶች እንደመነሻ ሆኖ ያገለግላል፡፡

በዚህም ምርምር ውስጥ ያለዎት ተሳትፎ በፈቃደኝነት ነው፡፡ላለመሳተፍ ከወሰኑ ለእርስዎ ምንም መጥፎ ውጤቶች አይኖሩም፡፡ለመሳተፍ ከወሰኑ ለእርስዎ ምንም ጥቅሞች አይኖሩም፡፡

ሆኖም በዚህ ጥናት ላይ ያደረጉት ተሳትፎ ለጥናቱ ግኝት በጣም አስፈላጊ ነው፡፡በዚህ ጥናት ውስጥ እርስዎ በመሳተፍዎ ላይ ምንም ዓይነት አደጋ አይኖርም፡፡ለእርስዎ የተሰጡ ሁሉ ምላሾች እና የተገኙት ውጤቶች ማንም ለእርስዎ ምላሽ የማይሰጥበት የኮምፒተር ስርዓት በመጠቀም በሚስጥር ይያዛሉ፡፡ስምዎን ወይም ስልክ ቁጥርዎን እንዲሰጡ አይጠበቅብዎትም።ከእርስዎ እና ከሕጋዊ አካል ያለፈቃድ፣ የዚህ ጥናት ማንኛውም ክፍል ለሶስተኛ ሰው አይገለጽም።ጥያቄዎቹ 20-30 ደቂቃዎችን ይወስዳል፡፡ለመቀጠል የማይፈልጉ ከሆነ በማንኛውም ጊዜ ላይ ከመሳተፍ የመቃወም እና የመተው ሙሉ መብት አለዎት።

ለጥናቱ ውጤት ጥቅምሲባል በጥናቱ ውስጥ እንደሚሳተፉ ተስፋ አለን፡፡በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ ከሆኑ እባክዎ የስምምነት ቅጹን ይፈርሙ፡

፡ለጊዜዎት አመሰግናለሁ፡፡

ለማንኛዉም ጥያቄ ዋና አጥኝዉን መጠየቅ ይችላሉ

+251922489508

Annex 4: Informed consent form in Amharic

የስምምነት መጠየቅያ/ማረጋገጫ ቅፅ

ከላይ በሠጠሁት መረጃ መሰረት በዚህ ጥናት ላይ ለመሳተፍ ፍቃደኛ ነዎት?

1. አዎ ☐

2 አይደለሁም ☐

ፈቃደኛ ካልሆኑ ወደሚቀጥለዉ ተሳታፊ ይለፉ

መጠይቁ የተካሄደበት ቀን	
የሆስፒታሉ ስም	
መጠይቁ የተጀመረበት ሰዐት	
መጠይቁ ያበቃበት ሰዐት	

የጠያቂዉ ስም ፊርማ ቀን

የተጠያቂው ፊርማ ቀን

የቃለ መጠይቅ ዉጤት በሙሉ የተሞላ ☐

በከፊል የተሞላ ☐

ምንም ያልተሞላ ☐

ለማንኛዉም ጥያቄ ዋና አጥኝዉን መጠየቅ ይችላሉ፤

+251922489508

Annex 5: Questionnaires English format

Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa

Code ☐

Note the exclusion criteria:

- **Is it singleton, live delivery 1: YES 2: NO**
- **Is the mother free of chronic medical conditions like diabetes mellitus, hypertension and cardiovascular disorders 1: YES 2: NO**

If "No" to any of the exclusion criteria, stop the data collection.

Name of Health institution _____

Section I Newborn related Questionnaire

Instruction**: fill the neonate information from medical records.**

Question numbers	Questions	Alternatives	Skip
101	Birth weight of the baby in grams?	Birth weight in gram: |____|_____|_____|_____| grams	
102	What is the sex of the newborn?	1. Male 2. Female	
103	Gestational age of the newborn in weeks?	Gestational age in …… |___|____| Weeks	

Section-II: Socio-Demographic Data Questionnaire.

Instruction: Now I am going to ask you questions about your socio-demographic information.

Ask the following questions carefully and circle the response unless there is no specific instruction.

Question numbers	Questions	Alternatives	Skip

201	How old were you on your last birthday?	Age in completed years…… |___|____| years	
202	What is your religion?	1. Orthodox 2. Catholic 3. Protestant 4. Muslim 5. Others	
203	What is the highest level of school you attended? **(completed years in education)**	|___|____| years 00 if not educated	
204	What is your marital status?	1. Single 2. Married 3. Separated 4. Divorced 5. Widowed	
205	What is your Occupation?	1. Housewife 2. Farmer 3. Civil Servant 4. Merchant 5. Daily Laborer 6. Student 7. Other(specify)_____	
206	How much is your household's monthly income? **in Ethiopian Birr**	|___|___|___|___| Birr Do not remember/do not know……99	
207	What is your partner's educational status? **(completed years in education)**	|___|____| years 00 if not educated	

Section III. Maternal and Pregnancy-Related Questionnaire

Instruction: Now I am going to ask you questions about your maternity and Pregnancy conditions.

Question	**Questions**	**Alternatives**	**Skip**

numbers			
301	When was your last menstrual Period start?	|___|___| |___|___| |___|___|___|___| DDD MMM YYYYYYY **Don't know……...99 / 99 / 99**	
302	When you got pregnant, did you want to get pregnant at that time?	1. Yes 2. No	
303	During your life, how many times have you become pregnant including the current pregnancy **(Including a pregnancy that miscarried, was aborted, or ended in a stillbirth**)?	|___|___| Pregnancies A total number of pregnancies…….	If"01" go to 309
304	During your life, how many times have you given live birth? (**I mean, to a child who ever breathed or cried or showed other signs of life-even if he or she lived only a few minutes or hours**) OR parity of the mother?	[_____] times	
305	Have you ever had a pregnancy, which miscarried, was aborted, or ended in a stillbirth?	1. Yes 2. No	If "no" go to 309
306	During your life, how many times have you had a pregnancy that miscarried, was aborted, or ended in a stillbirth?	[_____] times	
307	During your life, how many times have you had an abortion or a pregnancy terminated before 24 weeks of gestation?	|___|___| Abortions A total number of abortions…….	
308	How many times did you give birth that		

	occurred after 7 months of gestation? (**Including those births ended in still birth**)	|___|___| deliveries The total number of deliveries…….	
309	Did you see a doctor or health care provider for antenatal care during this pregnancy?	1. Yes 2. No	➡ Section IV
310	During your pregnancy how many times have you had antenatal care visit	|___|___| ANCs The total number of ANCs…….	
311	How did you give birth? That is mode of delivery.	Vaginal delivery----------1 Assisted delivery----------2 Cesarean section----------3	
312	During this pregnancy, were you given or did you buy any iron tablets?	Yes ---------- 1. No ---------- 2 Do not remember ---------99	➡ 214
313	During the whole pregnancy how many days did you take the tablets?	No of Days: _____	
314	What was your hemoglobin level on the current pregnancy? (could be filled from the mother's card)	_____g% Do not remember ---------99	
315	If you have weighed prior to your pregnancy (recent one) or prior 12 gestational weeks of your current pregnancy, what was your weight in kg?	Weight of the mothers: _____ Do not remember ---------99	
316	What was your weight in the last weight measurement taken? (after your third trimester)	Weight of the mother: _____ Do not remember ---------99	
317	What was your height in the last weight measurement taken?	height of the mother: _____ c.m Do not remember ---------99	
318	Have you ever given birth to a baby whose	Yes ---------- 1	

	weight was less than 2.5 K.g	No ---------- 2 Do not remember ---------99	
319	Did you have any of these problems during your most recent pregnancy?		
	A. high blood sugar (diabetes) that started during this pregnancy	1. Yes 2. No	
	B. Vaginal bleeding	1. Yes 2. No	
	C. Kidney or bladder (urinary tract) infection	1. Yes 2. No	
	D. Severe nausea, vomiting, or dehydration	1. Yes 2. No	
	E. Labor pains more than 3 weeks before my baby was due (preterm or early labor)	1. Yes 2. No	
	F. Water broke more than 3 weeks before my baby was due (premature rupture of membranes [PROM])	1. Yes 2. No	

Section IV. Substance using habit during pregnancy Questionnaire

Instruction: Now I am going to ask you questions about Substance using conditions during pregnancy.

Question numbers	**Questions**	**Alternatives**	**Skip**
401	During your last pregnancy Have you ever taken alcoholic drinks? (Like beer, whisky, "Tela", "Areqe","Tej" etc..)	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	
402	During your last pregnancy Have you ever chewed "khat"?	1. Not at all 2. Somewhat	

		3. Moderately 4. A lot 5. Extremely	
403	Have you ever smoked a cigarette During your last pregnancy, even one or two puffs?	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	
404	How often were you taking other substance like cannabis, injectable drugs	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	

Section-V: Second Hand Smoke Exposure Questionnaire

Instruction: Now I am going to ask you questions about your Second Hand Smoke Exposure during pregnancy.

Question numbers	**Questions**	**Alternatives**	**Skip**
501	Is there another person who smokes a cigarette in your family? [circle all that apply]	1. Yes, husband 2. Yes, other family member 3. No	➡ 506
502	How often anyone smokes inside your home while you are present? Would you say daily, weekly, monthly, less than monthly or never?	1. Daily 2. Weekly 3. Monthly 4. Less than monthly	

503	During your current pregnancy, in which trimester were you exposed to Second Hand Smoke at home? [circle all that apply]	1. During the 1st trimester 2. During the 2nd trimester 3. During the 3rdtrimester 4. During all trimesters 5. Never	➡ 506
504	During your current pregnancy, how many cigarettes were smoked per day at your house?	1. 1-5 cigarettes per day 2. 6-9 cigarettes per day 3. 10-20cigarettes per day 4. >20cigarettes per day 5. None	➡ 506
505	During your current pregnancy, how often do other people (excluding family members) smoke in your house per week while you are present?	1. 1-2 days per week 2. 3-4 days per week 3. Almost every day 4. Never	➡ 506
506	During your current pregnancy, did you work outside of your home?	1. Only During the 1st trimester 2. During 1st and 2nd trimester 3. During the entire pregnancy 4. Never	➡ 512
507	Do you usually work indoors or outdoors?	1. Indoors 2. Outdoors 3. Both	
508	Is smoking allowed at your workplace?	1. Yes 2. No 3. Don't remember	➡512
509	During the past 30 days, did any one smoke in indoor areas where you work?	1. Yes 2. No 3. Don't Know	➡ 512

510	During your current pregnancy were you exposed to Second hand smoke at work during the last month?	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	➡ 512
511	During your current pregnancy, how many times were you exposed to Second hand smoke at work?	1. Once or more 2. Never	➡ 512
512	During your current pregnancy, how many times did you go out to public places such as restaurants, bars and cafeterias during the last 7 days?	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	
513	During your current pregnancy, how often has any one smoked in your presence in the past 7 days at public places (restaurants, bars and cafeterias)?	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	
514	During your current pregnancy, how many often would you say you were you exposed to Second hand smoke in public places in the last 30 days?	1. Not at all 2. Somewhat 3. Moderately 4. A lot 5. Extremely	

Thank you for your co-operation.

Annex 6: Questionnaires Amharic format

Assessment of Passive Smoke Exposure during Pregnancy and Low Birth Weight: A Case-Control Study among Public Hospitals in Addis Ababa

Questionnaire Amharic form

Code ☐

Note the exclusion criteria:

- **Is it singleton, live delivery 1: YES 2: NO**
- **Is the mother free of chronic medical conditions like diabetes mellitus, hypertension and cardiovascular disorders 1: YES 2: NO**

If "No" to any of the exclusion criteria, stop the collection of data.

Name of Health institution _____

ክፍል 1 ከሕፃኑ ጋር የተዛመደ መረጃ መሰብሰቢያ

መመርያ፡ የሕፃኑን መረጃ ከ ካርድ ላይ ይሙሉ

የጥያቄ ቁጥር	**ጥያቄ**	**አማራጮች**	**ይዝለሉ**
101	የሕፃኑ ሲወለድ ያለዉ ክብደት?	በግራም የልደት ክብደት: _____ ☐☐☐☐	
102	ሕፃኑ ሲወለድ ያለዉ ፆታ?	ወንድ …… .1 ሴት ……... .2	
103	ሕፃኑ የተወለደበት ሳምነት(እድሜ)	የተወለደበት ሳምነት(እድሜ)……. ☐☐	

ክፍል 2: የስነ-ህዝብ መረጃዎች መጠይቅ

መመርያ፡አሁን የርስዎን የስነ-ህዝብ መረጃዎች የተመለከቱ ጥያቄዎችን እጠይቅዎታለሁ፡፡

የሚከተሉትን ጥያቄዎች በጥንቃቄ በመጠየቅ ምርጫ ከሆነ መልሱን ያክብቡ፤ነፃ ጥያቄ ከሆነ የመላሹን መልስ ይፃፉ::

የጥያቄ ቁጥር	**ጥያቄ**	**አማራጮች**	**ይዝለሉ**

201	እድሜዎ ስንት ነዉ?	እድሜ በሙሉዓመት……	
203	ሀይማኖትዎ ምንድን ነዉ?	ኦርቶዶክስ……..1 ካቶሊክ……..2 ፕሮቴስታንት ……..3 ሙስሊም……..4 ሌላ ካለ(ይገለፅ)……5	
204	ከፍተኛዉ የትምህርት ደረጃዎ ስንት ነዉ? **(በትምህርትያለፈ ጊዜ)**	|___|____| አመት ከሌለ 00 ይፃፉ	
205	የጋብቻ ሁኔታዎ ምንድን ነዉ?	ያላገባች ……..1 ያገባች……...2 ተጋብተዉ በተለያየ ቦታ የሚኖሩ……..3. የተፋታች……4 የሞተባት……5	
206	ስራዎ ምንድን ነዉ?	የቤት እመቤት…….…….1 ገበሬ……..2 የመንግስት ሰራተኛ…….3 ነጋዴ…….…….…….4 የቀን ሰራተኛ……..…5 ተማሪ……...……6 ሌላ (ይገለፅ)፡_____7	
207	ወርሃዊ ገቢዎ ስንት ነዉ?	ወርሃዊ ገቢዎ በኢትዮጵያ ብር፡ …… አላውቀዉም/አላስታዉስም…….99	
208	የትዳር አጋርዎ የትምህርት ደረጃ ?	|___|____| አመት ከሌለ 00 ይፃፉ	

ከፍል 3 ከእናቶች እና ከእርግዝና ወቅት ጋር የተዛመደ መጠይቅ

መመሪያ፡ አሁን የእናታዊ እና እርግዝና ሁኔታ የተመለከቱ ጥያቄዎችን እጠይቅዎታለሁ፡፡

የጥያቄ ቁጥር	**ጥያቄ**	**አማራጮች**	**ይዝለሉ**
301	ከአሁኑ የእርግዝና በፊት ለመጨረሻ ጊዜ የወር አበባ ሲያዩ መፍሰስ የጀመረ መቼ ነበር? (አላዉቀዉም ካሉ 99/99/9999 ይሞላ)	___/_____/___(ዓ.ም) ቀን / ወር/ዓመት	
302	እርግዝናዉን አስበዉበት/ፈልገዉት ነበር ያረገዙት?	አዎ……..…1 የለም…..…….2	
303	የአሁኑ ስንተኛ እርግዝናዎ ነዉ? (ዉርጃ እና ሞቶ የተወለደበት እርግዝናም ካለ ይቆጠር)	አጠቃላይ እርግዝና…. ☐☐	“01” ከሆነ ወደ 310 ይሂዱ
304	በአጠቃላይ በህይወትዎ ስንት ጊዜ ልጅ በህይወት ወልደዋል? **(በህይወት የተወለደ ልጅ የሚባለዉ እንደተወለደ ከተነፈሰ፣ካለቀሰ፣ከተንቀሳቀሰ ወይም ሌላ በህይወት የመኖር ምልክት ካሳየ ከተወሰኑ ደቂቃዎች በኃላ ቢሞትም በህይወት የተወለደ ይባላል)**	ህይወት ያለዉ ልጅ የተወለደበት እርግዝና ቁጥር……. ☐☐	
305	እሰከዛሬ ድረስ ዉርጃ ወይም ሞቶ የተወለደበት እርግዝና አጋጥሞዎት ያዉቃል?	አዎ…….....…….1 የለም…….....2	➡309
306	በህይወት ዘመንዎ ስንት ጊዜ ዉርጃ ወይም ሞቶ የተወለደ እርግዝና አጋጥሞዎት ያዉቃል?	ዉርጃ ወይም ሞቶ የተወለደበት እርግዝና ቁጥር……. ☐☐	
307	እሰከዛሬ ድረስ ስንት ጊዜ ዉርጃ **(ከ24 ሳምንት በፊት የተቋረጠ እርግዝና) አጋጥሞዎት ያዉቃል**?	የዉርጃ ቁጥር…… (ከሌለ 00 ይሞላ) ☐☐	
308	የእርግዝና ጊዜዉ 7 ወር ከሞላዉ በኃላ ስንት ጊዜ ወልደዋል? (**7ወር ከሞላዉ ሞቶ የተወለደበት ወሊድም ይቆጠር**)	7 ወር ከሞላዉ በኃላ የወሊድ ቁጥር…… ☐☐	

309	በአሁኑ እርግዝናዎ የቅድመ ወሊድ ክትትል አድርገዋል?	አዎ……1 የለም.....2	➡311
310	በአሁኑ እርግዝናዎ ወቅት ስንት ጊዜ የቅድመ ወሊድ ክትትል አድርገዋል?	የቅድመ ወሊድ ክትትል ብዛት …… ☐☐	
311	በአሁኑ እርግዝናዎ ወቅት ልጆን እንዴት ተገላገሉ?	በምጥ .....1 በታገዘ.....2 በቀዶ ጥገና.....3	
312	በአሁኑ እርግዝናዎ ወቅት በደም ውስጥ ላለ የብረት ንጥረ ነገር የሚያስተካክል መድሀኒት ወስደዉ ያዉቃሉ?	አዎ……..…1 የለም.....2 አላስታዉስም…….99	➡ 314
313	በአሁኑ እርግዝናዎ ወቅት ምን ያህል የብረት ንጥረ ነገር የሚያስተካክል መድሀኒት ወስደዉ ያዉቃሉ?	የብረት ንጥረ ነገር የሚያስተካክል መድሀኒት የወሰዱበት ቀን ብዛት ☐☐	
314	በአሁኑ እርግዝናዎ ወቅት በደም ውስጥ የነበር ሄሞግሎቢን መጠን (ከእናትየዉ ካርድ ላይ ሊሞላ ይችላል)	የሄሞግሎቢን መጠን_____g/dl አይታወቅም…….99	
315	ከርግዝና በፊት የከብደት መጠን ተመዝነዉ ከነበር ስንት ነበር?(ከእርግዝና በፊት በቅርብ ጊዜ የነበረዉን ኪሎ)	የእናት ክብደት መጠን ☐☐☐☐ አላስታዉስም…….99	
316	ከርግዝና ቦሓላ የከብደት መጠን ተመዝነዉ ከነበር ስንት ነበር?(በመጨረሻዉ የርግዝና ጊዜ የነበረዉን ኪሎ)	የእናት ክብደት መጠን ☐☐☐☐ አላስታዉስም…….99	
317	በእርግዝና ወቅት የቁመት መጠን	የእናት ቁመት መጠን ☐☐☐☐ አላስታዉስም …….99	
318	ከዚህ እርግዝና በፊት ኪሎዉ ከሁለት ተኩል በታች ሆኖ የተወለደ ልጅ ነበር?	አዎ……..…1 የለም.....2 አላስታዉስም…….99	

319	በ እርግዝናዎ ወቅት ከእነዚህ ችግሮች መካከል የነበሩት የትኞቹ ናቸዉ? ሀ. ከዚህ እርግዝና በፊት የጀመረው ከፍተኛ የደም ስኳር (የስኳር በሽታ)	አዎ …… .1 የለም …… .2	
	ለ. ከማህፀን የደም መፍሰስ	አዎ …… .1 የለም …… .2	
	ሐ. የኩላሊት ወይም የሬኛ (የሽንት ቧንቧ) ኢንፌክሽን	አዎ …… .1 የለም …… .2	
	መ. ከባድ ማቅለሽለሽ ፣ ማስታወክ ወይም ብዙ ፈሳሽ ከሰወነት ማጣት	አዎ …… .1 የለም …… .2	
	ሠ. ልጇ ከመወለዱ ከ 3 ሳምንት በፊት ህመም ተሰምቶኛል (ቅድመ ወሊድ ወይም ቀደም ያለ ምጥ)	አዎ …… .1 የለም …… .2	
	ረ. ልጇ ከመወለዱ ከ 3 ሳምንት በፊት ሽርት ውሃ ፈሶኛል [PROM]	አዎ …… .1 የለም …… .2	

ክፍል 3. በእርግዝና ጊዜ የንጥረ ነገር አጠቃቀምን ለማጥናት የተዘጋጁ ጥያቄዎች መጠይቅ

መመሪያ፡ አሁን በርግዝና ጊዜ የንጥረ ነገር አጠቃቀምን አጠቃቀምን የተመለከቱ ጥያቄዎችን እጠይቅዎታለሁ፡፡

የጥያቄ ቁጥር	**ጥያቄ**	**አማራጮች**	**ይዝለሉ**
401	በእርግዝናዎ ወቅት አልኮልን የያዙ መጠጦችን (ለምሳሌቢራ፣ዉስኪ፣ጠላ፣አረቄ፣ጠዠ የመሳሰሉት)ወስደው ያውቃሉ?	በጭራሽ ……1 በተወሰነ ደረጃ …… 2 በመጠኑ ……3 ብዙ ጊዜ ……..4 በጣም ብዙ ጊዜ…….5	
402	በእርግዝናዎ ወቅት ጫት አኝከዉ ያውቃሉ?	በጭራሽ ……1 በተወሰነ ደረጃ …… 2 በመጠኑ ……3 ብዙ ጊዜ ……..4 በጣም ብዙ ጊዜ…….5	

403	በእርግዝናዎ ወቅት የትኛዉንም የትምባሆ/ሲጋራ አይነት ተጠቅመዉ/አጭሰዉ ያዉቃሉ (አንድ ጊዜም ቢሆን ጭስ ቡልቅ ማድረግ)?	በጭራሽ ..... 1 በተወሰነ ደረጃ ..... 2 በመጠኑ .....3 ብዙ ጊዜ .....4 በጣም ብዙ ጊዜ.....5	
404	በእርግዝናዎ ወቅት ከላይ ከተጠቀሱት ዉጪ ሌሎች እዖችን (ሀሸሽ፣ካናቢስ፣የመሳሰሉት) ተጠቅመዉ ያዉቃሉ?	በጭራሽ ..... 1 በተወሰነ ደረጃ ..... 2 በመጠኑ .....3 ብዙ ጊዜ .....4 በጣም ብዙ ጊዜ.....5	

ክፍል- 5 ለሲጋራ ጭስ/ትምባሆ ተጋላጭነትን የተመለከቱ ጥያቄዎች

መመሪያ፡ አሁን በርግዝና ጊዜ ለሲጋራ ጭስ/ትምባሆ ተጋላጭነትን የተመለከቱ ጥያቄዎችን እጠይቅዎታለሁ፡፡

የጥያቄ ቁጥር	**ጥያቄ**	**አማራጮች**	**ይዝለሉ**
501	በቤተሰብዎ ውስጥ ሲጋራ የሚያጨስ ሌላ ሰው አለ? (ከ አንድ በላይ መልስ ይቻላል)	አዎ ባል .....1 አዎ ፣ ሌሎች የቤተሰብ አባላት.....2 የለም 3	➡ 506
502	በእርግዝናዎ ወቅት በቤትዎ ውስጥ እርሶ ባሉበት ሌሎች ምን ያህል ጊዜ ያጨሳሉ?	በየቀኑ ..... 1 በየሳምንቱ .....2 በየወሩ .....3 ከወር በታች 4	
503	በእርግዝናዎ ወቅት በቤት ውስጥ ከሌላ ሰዉ ለሚወጣ የሲጋራ ጭስ/ትምባሆ ምን ያህል ጊዜ ተጋለጡ?	በመጀመርያዉ የእርግዝና 3 ወራት .....1 በሁለከተኛው የእርግዝና 3 ወራት ..... 2 በሶስተኛው የእርግዝና 3 ወራት .....3 በሁሉም የእርግዝና ወራት .....4 በጭራሽ 5	➡ 506

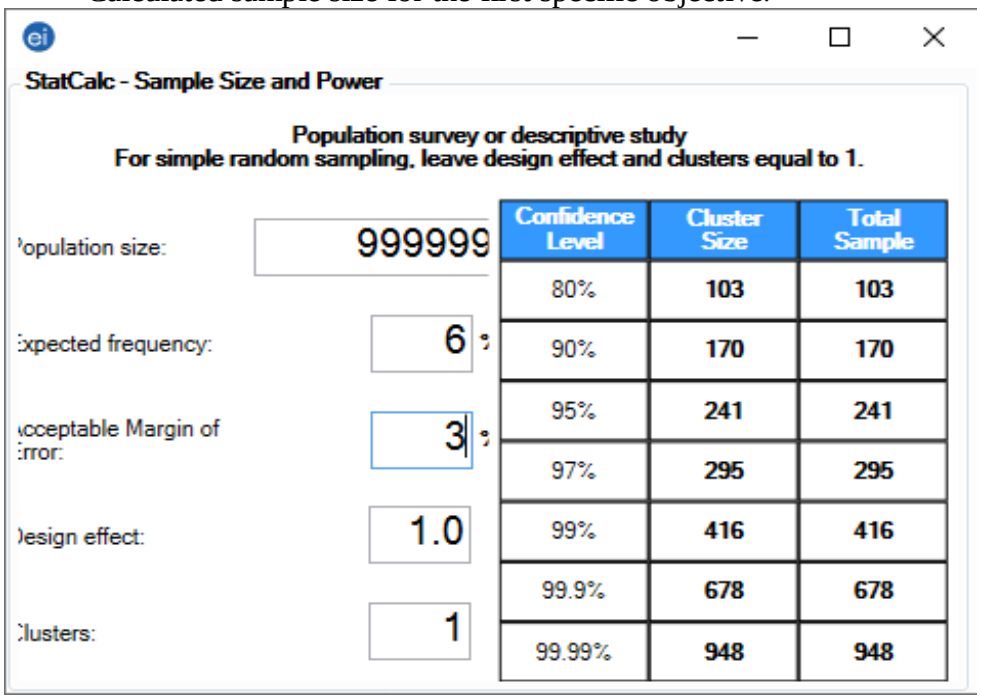
504	በእርግዝናዎ ወቅት ሌላ ሰዉ እርስዎ እያሉ በቤት ዉስጥ በቀን ምን ያህል ጊዜ አጨሰ/ሰች?	በቀን ከ1-5 ሲጋራዎች …….. 1 በቀን 6-9 ሲጋራዎች …… 2 በቀን 10-20 ሲጋራዎች ……3 በቀን > 20 ሲጋራዎች ……4 የለም …… 5	➡506
505	በእርግዝናዎ ወቅት ሌሎች ሰዎች (የቤተሰብ አባላትን ሳይጨምር) እርስዎ እያሉ በሳምንት ውስጥ በቤትዎ ውስጥ ምን ያህል ጊዜ ያጨሳሉ?	በሳምንት 1-2 ቀናት …… 1 በሳምንት 3-4 ቀናት …… 2 በየቀኑ ማለት ይቻላል …….. 3 በጭራሽ ……4	➡506
506	በእርግዝናዎ ወቅት ከቤትዎ ውጭ ስራ ይሰሩ ነበር?	በመጀመርያዉ የእርግዝና 3 ወራት…….1 በመጀመርያዉ እና በሁለተኛው የእርግዝና 3 ወራት…….. 2 በጠቅላላው የእርግዝና ወራት …….3 በጭራሽ …….4	➡512
507	በእርግዝናዎ ወቅት በአብዛኛዉ ከቤት ዉስጥ ነዉ ወይስ ከቤት ዉጭ የሚሰሩት?	በቤት ውስጥ …… 1 ከቤት ውጭ ……. 2 ሁለቱም …….3	
508	እርስዎ በሚሰሩበት ሥራ ቦታ ማጨስ ይፈቀዳል?	አዎ …… 1 የለም ……..2	➡512
509	ባለፉት 30 ቀናት ዉስጥ እርስዎ በሚሰሩበት ቦታ ሲጋራ ያጨሰ ሰዉ ነበር?	አዎ ……..… 1 የለም / አላውቅም …….2	➡512
510	በእርግዝናዎ ወቅት ባለፉት 30 ቀናት ዉስጥ እርስዎ በሚሰሩበት ቦታ ከሌላ ሰዉ ለሚወጣ የሲጋራ ጭስ/ትምባሆ ተጋለጠዉ ነበረ?	በጭራሽ ……1 በተወሰነ ደረጃ ……2 በመጠኑ …….3 ብዙ ……..4 እጅግ በጣም ……5	➡ 512
511	በእርግዝናዎ ወቅት ምን ያህል ጊዜ ከሌላ ሰዉ ለሚወጣ የሲጋራ ጭስ/ትምባሆ በስራ ላይ እያሉ ተጋለጠዉ ነበረ?	አንድ ወይም ከዚያ በላይ ……1 በጭራሽ …… 2	➡512
512	በእርግዝናዎ ወቅት ምን ያህል ጊዜ ወደ ህዝብ ቦታዎች ለምሳሌ (ምግብ ቤቶች ፣ ቡና ቤቶች እና ሻይ ቤቶች) ወጣ ብለዉ ያዉቃሉ?	በጭራሽ …… 1 በተወሰነ ደረጃ …… 2 በመጠኑ …….3	

		ብዙ ጊዜ ……..4 በጣም ብዙ ጊዜ…….5	
513	በእርግዝናዎ ወቅት ካለፉት 7 ቀናት(1 ሳምንት) ውስጥ በየትኛውም የህዝብ ቦታዎች (ምግብ ቤቶች ፣ ቡና ቤቶች እና ሻይ ቤቶች) እርሶ ባሉበት ተጭሶ ያዉቃል?	በጭራሽ …… 1 በተወሰነ ደረጃ …… 2 በመጠኑ …… .3 ብዙ …… ..4 እጅግ በጣም …… .5	
514	በአሁኑ የወሊድ ወቅት በወር ውስጥ ስንት ጊዜ ለ ከሌላ ሰዉ በወጣ ሲጋራ ጭስ/ትምባሆ ተጋለጡ?	በጭራሽ …… 1 በተወሰነ ደረጃ …… 2 በመጠኑ …… .3 ብዙ …… ..4 እጅግ በጣም……5	

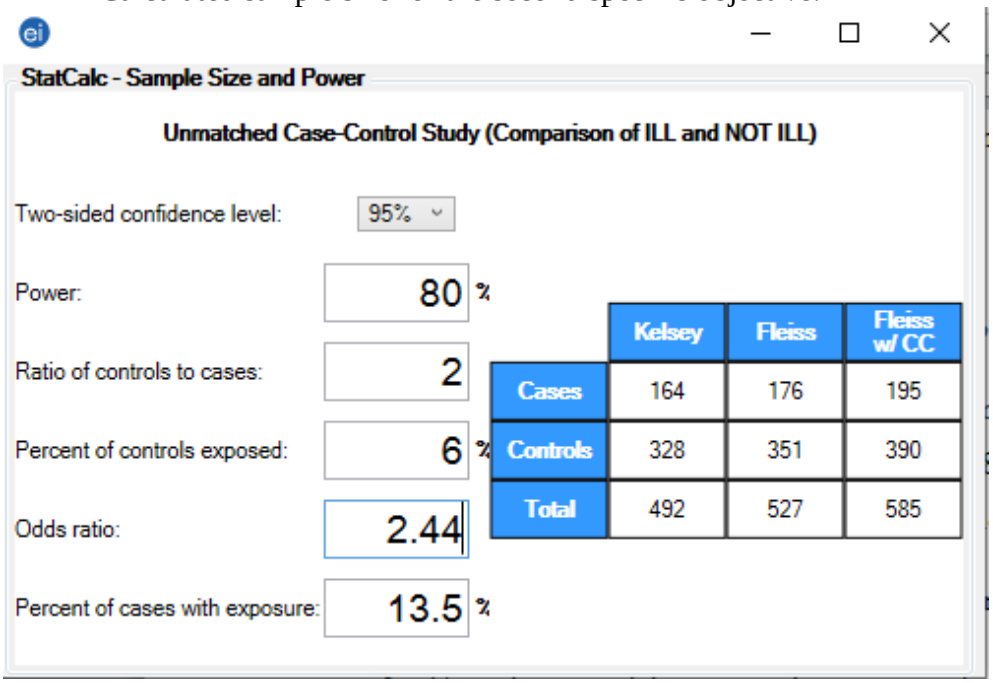
ስለ ትብብርዎ እናመሰግናለን።

Annex 7: Sample size calculation using Epi info version 7.2.1.0 Statistical Software Package

- Calculated sample size for the first specific objective.



- Calculated sample size for the second specific objective.



Annex 8: Result of Bi-variable Association of factors associated with Passive Smoke Exposure

Variables	passive smoke exposure	
	COR (95 % CI)	**P-value**
Mother's education		**0.003****
Never educated	1.03 (0.43, 2.50)	0.946
Elementary	0.50 (0.34, 0.75)	**0.001****
Secondary or More	1	
Partner's education		**0.000****
Never educated	3.23 (1.35, 7.70)	**0.008****
Elementary	0.29 (0.16, 0.50)	**0.000****
Secondary or more	1	
Mother's occupation		
Unemployed	1.45 (1.03, 2.06)	**0.034***
Employed	1	
ANC visits		
<4	1.79 (1.25, 2.57)	**0.002****
>=4	1	
Number of days Iron taken		
<60	1.60 (1.13, 2.27)	**0.009****
60-90	1	
Work place exposure		
Not exposed	1	
Exposed	4.06 (2.11, 7.80)	**0.000****
Public place exposure		
Not exposed	1	
Exposed	43.2 (15.74, 118.32)	**0.000****

PROM		
Yes	1.36 (0.82, 2.26)	0.229
No	1	
UTI		
Yes	1.42 (0.83, 2.43)	0.199
No	1	
GDM		
Yes	2.19 (0.63, 7.64)	0.221
No	1	
Iron supplementation		
Yes	0.77 (0.51, 1.18)	0.236
No	1	
Alcohol consumption		0.128
Yes	1.32 (0.92, 1.90)	
No	1	
Gestational weight gain	1.05 (0.99, 1.11)	0.114
Mother's height	0.15 (0.01, 3.10)	0.217
Pre-pregnancy BMI	1.06 (0.99, 1.14)	0.087
Maternal haemoglobin	0.70 (0.61, 0.80)	**0.000****
Infant Gestational age	0.69 (0.60, 0.80)	**0.000****

****** Significant at p-value<0.001

***** Significant at p-value<0.05

Annex 9: Result of Bi-variable association of factors associated with Low birth weight

Variables	Low birth weight		COR(95 % CI)	P-value
	Cases	Controls		
	N (%)	N (%)		
Maternal haemoglobin	205(100%)	408(100%)	0.46(0.389,0.548)	**0.000****
Pre-pregnancy BMI	205(100%)	408(100%)	0.941(0.881,1.006)	0.076
Pre-pregnancy weight	205(100%)	408(100%)	1.030(1.005,1.058)	**0.028***
Post-pregnancy weight	205(100%)	408(100%)	1.030(1.005,1.055)	**0.017***
Infant Gestational age	205(100%)	408(100%)	0.358(0.298,0.43)	**0.000****
Mother's Age				**0.038***
15-24	82(40.0%)	124(30.4%)	1	
25-29	81(39.5%)	201(49.3%)	0.61(0.42, 0.9)	**0.011***
>=30	42(20.5%)	83(20.3%)	0.76(0.48, 1.22)	0.259
Mother's education				**0.002****
Never educated	7(3.4%)	20(4.9%)	0.583(0.24,1.407)	0.230
Elementary	31(15.1%)	110(27.0%)	0.469(0.301,0.73)	**0.001****
Secondary or More	167(81.5%)	278(68.1%)	1	
Mother's occupation				
Unemployed	70(34.1%)	200(49.0%)	1.85(1.31,2.62)	**0.001****
Employed	135(65.9%)	208(51.0%)	1	
Marital status				
With a partner			0.318(0.125,0.807)	**0.016***
Without a partner			1	
Household income(Quintile)				**0.000**

Unknown	46(22.4%)	190(46.6%)	0.263(0.157-0.44)	0.000
<2000	7(3.4%)	14(3.4%)	0.543(0.202-1.47)	0.228
2001-4000	46(22.4%)	80(19.6%)	0.625(0.364-1.07)	0.088
4001-6000	60(29.3%)	74(18.1%)	0.881(0.521-1.49)	0.638
>6001	46(22.4%)	50(12.3%)	1	
Mother's religion				**0.036***
Orthodox	139 (67.8%)	241 (59.1%)	1	1
Catholic	35(17.1%)	75(18.4%)	0.281(0.116,0.683)	0.005
Protestant	25(12.2%)	55(13.5%)	0.788(0.470,1.321)	0.366
Muslim	6(2.9%)	37(9.1%)	0.809(0.515,1.272)	0.359
Parity				
<3	179(87.3%)	341(83.6%)	1.353(0.831,2.203)	0.225
>=3	26(12.7%)	67(16.4%)	1	
History of LBW				
Yes	22(10.7%)	11(2.7%)	4.339(2.06,9.136)	**0.045***
No	183(89.3%)	397(97.3%)	1	
Vaginal bleeding				
Yes	7(3.4%)	26(6.4%)	0.519(0.22,1.218)	0.172
No	198(96.6%)	382(93.6%)	1	
Preterm (early) labor				
Yes	46(22.4%)	115(28.2%)	0.74(0.498,1.092)	0.096
No	159(77.6%)	293(71.8%)	1	
History of abortion				
Yes	40(19.5%)	63(15.4%)	1.328(0.857,2.056)	0.204
No	165(80.5%)	345(84.6%)	1	
PROM				
Yes	58(28.3%)	35(8.6%)	4.21(2.652,6.667)	**0.000****
No	147(71.7%)	373(91.4%)	1	
ANC follow up				
Yes	178(86.8%)	239(58.6%)	1	

No	27(13.2%)	169(41.4%)	2.4(1.953,7.07)	**0.000****
No of ANC				
<4	177(86.3%)	239(58.6%)	4.47(2.866,6.973)	**0.015***
>=4	28(13.7%)	169(41.4%)	1	
Iron supplementation				
Yes	144(70.2%)	347(85.0%)	1	
No	61(29.8%)	61(15.0%)	2.410(1.608,3.61)	**0.000****
No of days iron tablets taken				
<60	113(55.1%)	173(42.4%)	1.668(1.19,2.34)	0.073
60-90	92(44.9%)	235(57.6%)	1	
Mode of delivery				**0.087**
Vaginal	131(63.9%)	299(73.3%)	1	
Assisted	14(6.8%)	26(6.4%)	1.229(0.622,2.43)	0.087
C-S	60(29.3%)	83(20.3%)	1.65(1.117,2.438)	0.092
Gestational weight gain				
>=10 K.g	31(15.1%)	84(20.6%)	1	
<10 K.g	174(84.9)	324(79.4%)	1.46(0.927,2.285)	0.103
Alcohol consumption				
Yes	95(46.3%)	143(35%)	1.60(1.137,2.252)	**0.007***
No	110(53.7%)	265(65%)	1	
Khat consumption				
Yes	8(3.9%)	27(6.6%)	1	
No	197(96.1%)	381(93.4%)	0.573(0.256,1.285)	0.177
Second-hand smoke exposure				
Exposed	128(62.4%)	200(49.0%)	1.729(1.227,2.436)	**0.002****
Not exposed	77(37.6%)	208(51.0%)	1	
Exposed at Home				
Exposed	25(12.2%)	21(5.1%)	2.560(1.396,4.69)	**0.002****
Not exposed	180(87.8%)	387(94.9%)	1	
Work place				

Exposed	45(22.0%)	54(13.2%)	1.844(1.190,2.86)	**0.006****
Not exposed	160(78.0%)	354(86.8%)	1	
Public place exposure				
Exposed	123(60%)	91(22.3%)	5.225(3.631,7.52)	**0.000****
Not exposed	82(40%)	317(77.4%)	1	
No of cigarettes/ day				
Not exposed	177(86.3%)	387(94.9%)	1	
1-20cigarrettes per day	28 (13.7%)	21 (5.1%)	2.915(1.611,5.27)	**0.000****

****** Significant at p-value<0.001

***** Significant at p-value<0.05

Annex 10: Collinearity statistics between dependent and Independent variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	5.640	.368		15.311	.000		
	Gestational age of infant in weeks	-.122	.009	-.427	-13.405	.000	.808	1.238
	Did you see a doctor or health care provider for ANC during this pregnancy?	.002	.060	.001	.028	.978	.785	1.274
	SMEAN(heamoglobin_level)	-.074	.010	-.242	-7.632	.000	.814	1.228
	being exposed to among home,work place or public places	.039	.035	.037	1.095	.274	.701	1.426
	catagorized maternal education	.073	.027	.085	2.717	.007	.836	1.196
	maternal_BMI	-.017	.005	-.090	-3.008	.003	.914	1.095
	catagorized maternal occupation	.055	.029	.058	1.911	.056	.891	1.123
	catagorized_ANC	-.107	.033	-.106	-3.236	.001	.771	1.297
	iron_supplementation	.008	.031	.009	.276	.783	.775	1.291
	catagorized_alcohol_consumption	.022	.029	.023	.749	.454	.887	1.127
	home exposure either by husband or other familly member	.086	.054	.048	1.593	.112	.903	1.107
	work place exposure	.051	.039	.040	1.314	.189	.898	1.114
	catagorized last 7days public place exposure	.231	.033	.233	6.939	.000	.726	1.377

a. Dependent Variable: Being a case or control

Annex 11: Curriculum Vitae of the Principal Investigator

1. **Personal Information**

Name: - Selamawit Mandefro

Sex: - Female

Address: - Addis Ababa, Ethiopia

Addis ketema sub-city

Tel: - +251922489508

Email: - faylulazora@gmail.com

Date of birth: - 6, June 1986

Place of birth: - Addis Ababa, Ethiopia

Nationality: - Ethiopian

Marital Status: - Single

Educational Background

Type of Education	**Educational Institution**	**Location**	**Years Attended**	**Certificates Awarded**
Secondary Education	Addis Ketema Secondary and Preparatory School	Addis Ababa, Ethiopia	2001-2008 G.C	Ethiopian General Secondary

				Education Certificate
Preparatory Education	Addis Ketema Secondary and Preparatory School	Addis Ababa, Ethiopia	2009-2012 G.C	Ethiopian Higher Education Entrance Certificate
Higher Education	Addis Ababa University (AAU), School of Allied health	Addis Ababa, Ethiopia	2013-2016 G.C	BSc degree in Medical Laboratory Technology

Trainings taken

- Training on malaria diagnosis and control by CDT
- Training on quantitative data analysis tool (SPSS) by AAU school of commerce
- Training on Project management by AAU school of commerce
- Training on Scientific writing and communication by AAU, school of public health NORHED Project

Language skills

Languages	Read	write	listen	speak
Amharic	Excellent	Excellent	Excellent	Excellent

English	Excellent	Excellent	Excellent	Excellent

Work experience

- SANTE medical center
- Gullele subcity woreda 1 FMHACA
- JSI Ethiopia
- Ethiopian Science Academy

Skills, Interests, Hobbies

 Know how on statistical software packages (SPSS, EPI INFO, WHO-Anthro, ATLAS Ti, OPEN EPI, open code)

 Reading

 Good communication skills

 IT know how

Professional Associations Membership

-Ethiopian Medical Laboratory Association (EMLA)

- Ethiopian Public Health Association (EPHA)

References

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   Phone number +251919367139
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