



Effect of Breastfeeding-Pregnancy Overlap on Current Pregnancy, and Pregnancy Outcomes Among Pregnant Women on ANC Follow-Up in Public Hospitals, North Shewa Zone, Central Ethiopia, 2024, Prospective Cohort Study

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Abstract

In many low-income countries many women become pregnant while they are still breastfeeding their most recently born child. Breastfeeding a child during pregnancy considered a type of tandem feeding for the nursing mother as, she provides nutrition for two. Objective: To assess Effects of Breastfeeding-Pregnancy Overlap on Current Pregnancy, Pregnancy Outcome among Pregnant Women, Ethiopia in 2023. Method: Institutional-based prospective cohort study was conducted, involving 436 pregnant mothers (291 control and 145 exposed) in 5 selected public hospitals. Collected data using structured interviews administered questionnaires were processed and analysed using SPSS version 27. Findings are summarized using descriptive statistics, RR & CI. Results: The risk of underweight, vaginal bleeding during pregnancy, preeclampsia, eclampsia, abruptio placentae, Intrauterine Growth Restriction (IUGR), preterm birth, ante-partum hemorrhage, premature rupture of membrane, post-partum hemorrhage, prolonged labor, abnormal presentations, incomplete placental separation, and new born referred to NICU were significantly higher among pregnant women during breast feeding than those who were not. Conclusion: The study highlights the significant risks associated with pregnancies overlapping with breastfeeding. Improving education and access to family planning, enhancing healthcare infrastructure, and advocating for interventions through collaboration with NGOs and community-based initiatives to mitigate risks for maternal and child health is recommended.

Keywords: pregnancy breast feeding overlap, intrauterine growth restriction, Underweight, Ethiopia

Introduction

Globally, breastfeeding-pregnancy overlap (BPO) the concurrent occurrence of breastfeeding while pregnancy raises significant concerns about maternal and fetal health. The World Health Organization (WHO) recommends exclusive breast feeding for the first six months and continued breast feeding for up to two years (WHO, 2022). However, when a woman becomes pregnant while breastfeeding, the increased physiological demands can potentially lead to adverse outcomes such as maternal anemia, preterm birth, low birth weight, and maternal malnutrition (Packia & Vati, 2023). Despite this recognition, the overall

magnitude of BPO's impact remains inconsistently documented across the globe (Milinco et al., 2020). Approximately 15% of women in various regions report becoming pregnant while still breastfeeding, with reports of adverse outcomes ranging widely across studies (Chowdhury et al., 2015). This inconsistency highlights a gap in the global understanding of the exact mechanisms by which BPO affects pregnancy outcomes and maternal health, particularly over the long term (Gebremariam, et al., 2020). Furthermore, the effectiveness of interventions aimed at mitigating these risks remains largely unknown, and there is limited longitudinal research to better establish causal relationships (Ministry of Health, Ethiopia, 2021).

In Africa, where fertility rates are high, BPO is more prevalent due to cultural norms that encourage extended breastfeeding. In countries such as Nigeria and Kenya, studies suggest that 25% to 30% of women experience BPO, which is associated with adverse pregnancy outcomes, including maternal malnutrition, anemia, and low birth weight (Batist, 2019). However, much of the research in Africa has been cross-sectional, focusing primarily on neonatal outcomes rather than maternal health (Nasir, Aderoba, & Ariana, 2022). The known effects include nutrient depletion and heightened health risks during pregnancy, but the unknowns persist regarding the socio-economic, healthcare access, and cultural factors that shape the decision to continue breastfeeding during pregnancy (Udenigwe, et al. 2023). Furthermore, the lack of longitudinal cohort studies and robust data on maternal health outcomes presents a significant gap in African BPO research, leaving many questions about the full extent of its impact unaddressed.

In Ethiopia, where high fertility rates and prolonged breastfeeding are common, BPO is widespread, particularly in rural areas. For example, studies indicate that approximately 40% to 50% of women in rural Ethiopia, especially in the North Shewa Zone, experience BPO due to cultural practices and high fertility rates. However, research on the effects of BPO in Ethiopia remains scarce, with the specific impacts on maternal health and pregnancy outcomes poorly documented. A few studies have suggested that BPO may contribute to negative outcomes such as maternal anemia, preterm birth, and low birth weight (Gebremariam et al., 2020). Nevertheless, the magnitude of these outcomes is not well-documented, and most studies have been cross-sectional, limiting our understanding of causal links (Ministry of Health, 2021).

Furthermore, the gaps identified in Ethiopian studies include the lack of prospective cohort studies to track the outcomes of pregnant women experiencing BPO over time. Therefore, this study aims to fill the gaps in the effect of breastfeeding-pregnancy Overlap on Current Pregnancy, and Pregnancy Outcomes among Pregnant Women on ANC follow-up in public Hospitals, in North Shewa, Ethiopia.

Methods

Study Area and Period

The study was conducted in selected public hospitals found in North Shoa zone Amhara region Ethiopia from March 2023 – January 2024. The head office of the North Shoa zone is found in Debre Berhan which is 130 km far from Addis Ababa, the capital city of Ethiopia, and 682 km away from Bahir Dar, the capital city of Amhara regional state. The zone has 23 districts with a total population of 2,370,488; 1,213,536 men and 1,156,952 women. North Shoa zone has 11 public hospitals of which 7 of them are primary hospitals, 2 general hospitals, 1 comprehensive specialized hospital, and 1 teaching hospital. This study was conducted in 5 of the 11 hospitals, Namely Hakim Gizaw Hospital, Debre Sina Hospital, Enat Hospital, Ataye Hospital, and Shewarobit Primary Hospital. The study was carried out from March 1, 2023 to January, 30 2024.

Study Design: Institution based Prospective cohort study design

Population

Source Population

Exposed: All multiparous women who breastfed an older child three to five times a day for at least 30 days during their current pregnancy at the ANC clinic of public health facilities of North Shewa Zone, Amhara, Ethiopia

Non-Exposed: All women who do not breastfeed during their current pregnancy in the ANC clinic at health facilities of North shewa Zone, Amhara, Ethiopia.

Study Population

Exposed: All selected multiparous women who breast-fed an older child three to five times a day for at least 30 days during their current pregnancy at the ANC clinic of selected public health facilities of North Shewa Zone, Amhara, Ethiopia.

Non-Exposed: All selected women who do not breastfeed during their current pregnancy in the ANC clinic at selected health facilities

Eligibility Criteria

Inclusion Criteria

Inclusion of Exposed groups: All women who breastfeed during their current pregnancy and who are ≥ 20 years of age and on ANC follow-up at the selected health facilities

Inclusion of non-exposed groups: All women who do not breastfeed during their current pregnancy and who are ≥ 20 years of age and on ANC follow-up at the selected health facilities. **Exclusion Criteria:** In both groups, all pregnant women who do not have a child and those with health conditions associated with premature delivery, fetal growth retardation, younger than 20 years of age, pregnant women who were critically ill, and unable to communicate were excluded.

Sample Size Determination

The sample size was determined by using the double population proportion formula and computed by using Epi-Info version 7 statistical software taking the sample size was calculated using Epi Info version 7.2.6.0 assuming a 95% confidence level, 80% of power, 2:1 ratio of unexposed to exposed, and 65.9% vaginal birth in unexposed group, 50.7 % vaginal birth in exposed group according to a study from Egypt carried out in 2015 (Shaaban et al., 2015). Adding 10 % for the non-response rate, the final sample size was 436(145 exposed and, 291 non-exposed).

Sampling Technique

A total of 11 hospitals are found in the north Shoa zone Amhara region of which 5 hospitals (Hakim Gizaw Hospital, Debre Sina Hospital, Enat Hospital, Ataye Hospital, and Shewarobit Primary Hospital) were selected by using a simple random sampling Technique. The sample was allocated proportionally to each hospital based on the number of women who have ANC follow-up visits during the data collection period calculated using a month back report. We selected exposed groups consecutively at each facility and the next two non-breast-feeding pregnant women coming after the selected exposed woman were included until the required sample size was reached.

Data Collection Tool and Procedure

The data was collected by using face-to-face interviews with a structured questionnaire Tool comprised of questions adapted from different literature and a medical card review checklist. The questionnaire was developed in English then translated into Amharic language, and then back-translated to English by the independent translator to ensure consistency. This questionnaire has four sections; Socio-demographic characteristics, previous fertility characteristics, Current fertility characteristics, and Pregnancy outcome. The internal consistency/reliability of the item was checked by computing Cronbach's alpha. Data was collected by 16 data collectors and 4 supervisors who work outside of the selected health facilities and also had training on BEmONC or CEmONC.

Women included in the study were followed four times until delivery during their ANC follow-up based on the schedule. Data collectors gave the participants a follow-up card which included the patient serial number, Basic information about each case as name, address, Follow-up schedule, and Information about the nutrition and warning signs during pregnancy. Every woman in both groups (Exposed and Control) has

a follow-up during their ANC visit, during delivery time, and immediately after delivery to complete the required data.

Time of follow-up and Evaluations and measurements were based on the schedule:

The 1st Follow-up was held between 12 – 24 weeks of pregnancy (second trimester) for a baseline investigation: Mothers who come for ANC visits in the selected health facilities and who meet the required inclusion criteria were selected. Their exposure baseline information (socio-demographic, past obstetrics, and current pregnancy characteristics) was taken and full identification of the participants including her and/or their attendant phone Number, address i.e., districts, kebele, and house number was taken in a notebook.

The 2nd Follow-up is at 24 - 36 weeks of pregnancy/second trimester: at consecutive ANC follow-up after recruitment to cohorts if there any complications occurred during the current pregnancy (miscarriage, vaginal bleeding during pregnancy, placental separation (partial or complete), and delayed fetal growth, the elevation of blood pressure, eclampsia, and anemia was assessed.

The 3rd Follow-up is at 37 weeks till the immediate postnatal period: to know if there are any complications occurred during the current pregnancy (vaginal bleeding during pregnancy, mode of delivery, timing of birth, duration of labor, placental separation (partially or completely), the elevation of blood pressure, eclampsia, and anemia), and adverse pregnancy outcomes (stillbirth, low birth weight, and preterm).

Concept and Operational Definition

Body weight: was calculated using BMI which is calculated as weight in kilograms (kg) divided by height in meters squared.

Low birth weight: low birth weight is defined as a newborn with a body weight of less than 2500 grams.

Term baby: infant born after 37 completed weeks of gestation and before 42 weeks of gestation.

Preterm birth: infants born before 37 weeks gestation and after 28 weeks of gestation.

Very low birth weight (VLBW) - a newborn with a body weight < 1500g regardless of gestational age.

Stillbirth - a baby born dead after 28 completed weeks of pregnancy.

Data Processing and Analysis

After checking the completeness and consistency of the questionnaire, the Data was entered into Epi Data version 3.1 and exported to STATA version 17 for further Analysis and data exploration procedures. Descriptive statistics (frequencies, percentages, standard deviation, and analytical statistics (Relative risk (RR) was used to present the finding. Finally, the result of this study was presented using statements, tables, and figures.

Data Quality Control

The data collection tool was initially prepared in English language, then it was translated into the local language Amharic by language translators. The local language version of the questionnaire was used for data collection while the English version was used for analysis. A pretest was conducted before the actual data collection on 5% of the total sample size in Debre Birhan Comprehensive Specialized Hospital. Training for data collectors and supervisors was given for two days on the objective of the study, overall steps, and procedures of data collection. Regular meetings were held between data collectors, supervisors, and investigators to solve any challenging issues. The collected data was reviewed and checked for completeness and consistency before data entry. Double data entry was used to check consistency during data entry.

Ethical Consideration

Ethical approval to conduct this study was obtained from the Institutional Review Board (IRB) of Debre Berhan University, Asrat Woldeyes Health Science campus with a protocol number of IRB-089. A formal

letter was submitted to selected public hospitals, and written consent was obtained from each study subject before the data collection process. Subjects who did not want to take part in the study were not forced. They were informed that all the data obtained from them would be kept confidential by using codes instead of personal identifiers and would only be used for the study.

Results

Socio-demographic characteristics of participants: The total number of participants for this study was 423 (283 non-exposed and 140) yielding a response rate of 97% whereas Loss to follow-up was recorded among 7 non-exposed and 5 exposed participants (Fig 1).

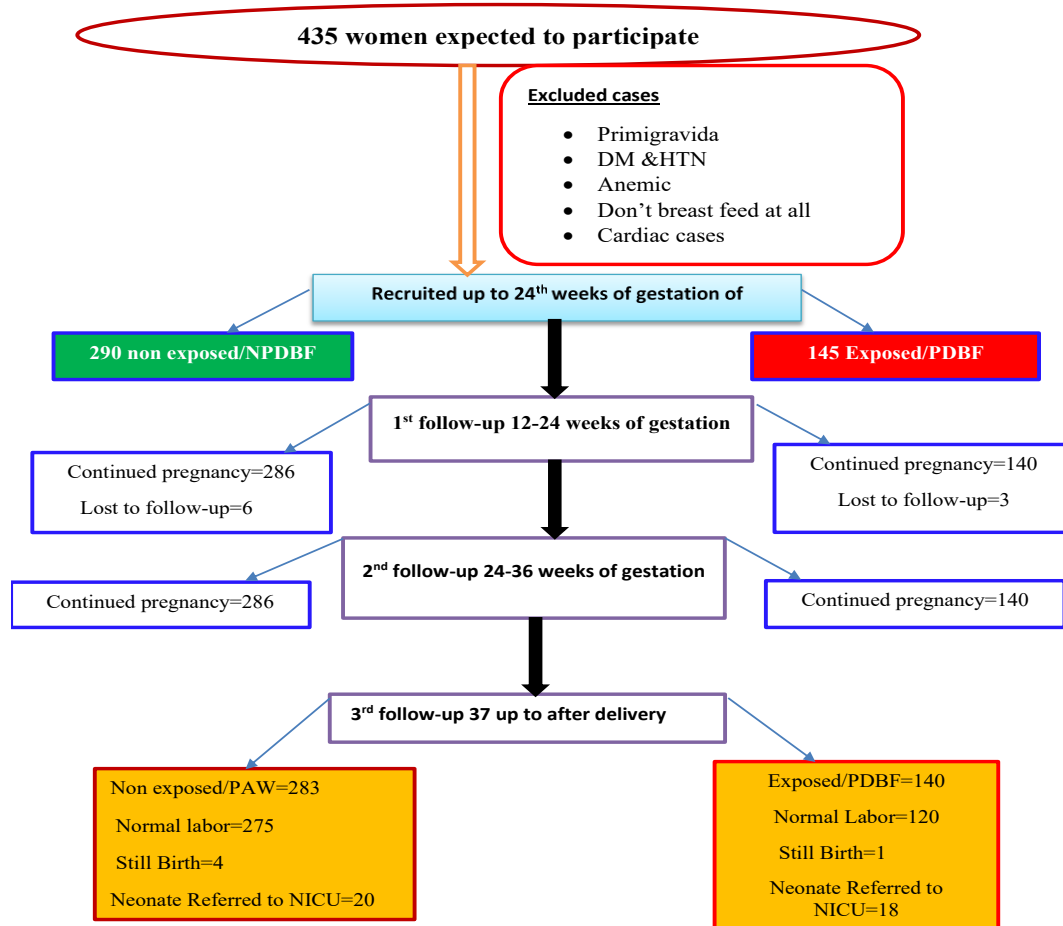


Fig. 1:Flow Chart of the study participant

The study subjects had a mean age with standard deviation (28.11±4.8). Three-fourth 108(77.1%) of pregnant women breastfeeding and 219(77.4%) breastfeeding pregnant women were from urban residences while 140(100.0%) and 261(92.2%) of the exposed and non-exposed groups were married. Additionally, more than half of 94(67.1%) and 168(59.4%) of the pregnant women on breastfeeding and non-breast-feeding pregnant women are housewives respectively (See Table 1).

Table 1: Sociodemographic characteristics of women without and with pregnancy breast feeding overlap in North Shewa zone, Ethiopia, 2023

		Breast feeding pregnancy overlap			
		Exposed		Non- Exposed	
Residence	Rural	32	22.9%	64	22.6%
	Urban	108	77.1%	219	77.4%
Family size	less than or equal to 4	93	66.4%	218	77.0%
	greater than 4	47	33.6%	65	23.0%
Current marital status	Single	0	0.0%	16	5.7%
	Married	140	100.0%	261	92.2%
	Widowed	0	0.0%	2	0.7%
	Divorced	0	0.0%	4	1.4%
Educational status	Can't read and write	15	10.7%	42	14.8%
	Can read and write	6	4.3%	45	15.9%
	Primary (1-8)	45	32.1%	78	27.6%
	Secondary (9-12)	36	25.7%	55	19.4%
	College and above	38	27.1%	63	22.3%
Occupation	Own work	26	18.6%	53	18.7%
	House wife	94	67.1%	168	59.4%
	Private employment	3	2.1%	19	6.7%
	Government employee	17	12.1%	31	11.0%
	Other	0	0.0%	12	4.2%
Age	< 18 years	0	0.0%	3	1.1%
	18-24 years	23	16.4%	72	25.4%
	25-31 years	91	65.0%	151	53.4%
	>31 years	26	18.6%	57	20.1%
Monthly Family Income	<2000 ETB	15	10.7%	21	7.4%
	2000 -3999 ETB	27	19.3%	69	24.4%
	4000 -9999 ETB	69	49.3%	145	51.2%
	≥10000	29	20.7%	48	17.0%

Reproductive Health Characteristics of Participants

The majority of breastfeeding and non-breast-feeding pregnant women 99 (70.7%) and 157 (55.5%) are gravida of greater than 2 while, 23 (16.4%) and 34(12.0%) of them had a history of abortion respectively. Moreover, 100(71.4%) and 2(0.7%) of BF pregnant women and non-BF pregnant women had a history of breastfeeding during their previous pregnancy while 48 (34.3%) and 50 (17.7%) of them had >2 children in their family (**Table 2**)

Table 2: Reproductive health characteristics of women without and with pregnancy breast feeding overlap in North Shewa zone, Ethiopia, 2023

Reproductive health characteristics		Breast feeding pregnancy overlap			
		Exposed		Non- exposed	
Gravida	≤2	41	29.3%	126	44.5%
	>2	99	70.7%	157	55.5%
parity cat	≤2	86	61.4%	227	80.2%
	>2	54	38.6%	56	19.8%
Older child Age	< 2 years	33	23.6%	11	3.9%
	≥ 2 Years	107	76.4%	272	96.1%
Ever have unwanted pregnancy	Yes	11	7.9%	10	3.5%
	No	129	92.1%	273	96.5%
Ever had abortion	Yes	23	16.4%	34	12.0%
	No	117	83.6%	249	88.0%
History of pregnancy during breastfeeding	Yes	100	71.4%	2	0.7%
	No	40	28.6%	281	99.3%
Alive children number	≤2 Children	92	65.7%	233	82.3%
	>2 Children	48	34.3%	50	17.7%

Effects of breast-feeding pregnancy overlap on current pregnancy during 12-24 weeks of Gestation

This study indicates that pregnant women engaged in breastfeeding face a 76% higher risk of malnourishment (RR=1.76, 95% CI 1.12-2.78) compared to those without overlapping breastfeeding. Furthermore, the Risk of experiencing vaginal bleeding during pregnancy, and pre-eclampsia between the 12th and 24th weeks of gestation is elevated by 3.09 times (RR=3.09, CI 2.69-3.56), and 3.04 times (RR=3.04, CI 2.65-3.48), respectively, among women who breastfeed during pregnancy Than their counterparts (**Table 3**).

Table 3: Effects of breast-feeding pregnancy overlap on current pregnancy during 12-24 weeks of gestational age among pregnant women in North Shewa zone, Ethiopia, 2023

Pregnancy outcomes		Breast feeding pregnancy overlap				RR(CI)
		Exposed		Non- exposed		
Nutritional status	Underweight	45	32.1%	60	21.2%	1.51(1.09-2.10) *
	Normal Weight	95	67.9%	223	78.8%	
Vaginal bleeding during pregnancy	Yes	5	3.6%	135	0.0%	3.09(2.69-3.55) *
	No	0	96.4%	283	100%	
Abortion (12-24 wks.)	Yes	5	3.6%	4	1.4%	2.52 (0.68- 9.26)
	No	135	96.4	279	98.6	
Pre-Eclampsia	Yes	1	0.7%	0	0.0%	3.04(2.64-3.47) *
	No	139	99.3%	283	100%	

Effects of breast-feeding pregnancy overlap on current pregnancy during 25-36 weeks of Gestation

Likewise, women engaged in breastfeeding during pregnancy have a risk of experiencing vaginal bleeding(RR=3.08, CI 2.69-3.54) and Abruptio Placentae(RR=3.09, CI 2.69-3.56) more than three times higher than That of pregnant women without breastfeeding overlap. (See Table 4).

Table 4: Effects of breast-feeding pregnancy overlap on current pregnancy during 25-36 weeks of gestational age among pregnant women in North Shewa zone, Ethiopia, 2023

Pregnancy outcomes		Breast feeding pregnancy overlap				RR(CI)
		Exposed	%	Non-exposed	%	
Nutritional Status	under weight	19	13.6%	33	11.7%	1.16 (0.68-1.97)
	Normal Weight	121	86.4%	250	88.3	
Vaginal bleeding during pregnancy	Yes	4	2.9%	0	0.0%	3.08(2.69-3.54)*
	No	136	97.1%	283	100%	
Abruptio placentae	Yes	15	10.7%	0	0.0%	3.26(2.82-3.77)*
	No	125	89.3%	283	100%	

Effects of breast-feeding pregnancy overlap on current pregnancy after 37 weeks of Gestation

In this study, it was found that the risk of being underweight increased by 74% (RR=1.74, CI 1.29-2.36) in cases where pregnancy overlaps with breastfeeding. Moreover, the occurrence of vaginal bleeding during pregnancy was approximately three times higher (RR=2.9, CI 2.35-3.62), and the risk of experiencing Intrauterine Growth Restriction (IUGR) rose by over threefold (RR=3.26, CI 2.82-3.78) in women with concurrent breastfeeding and pregnancy compared to those who were not breastfeeding during pregnancy. Furthermore, pregnant women engaged in breastfeeding faced more than a threefold increased risk of developing pre-eclampsia (RR=3.11, CI 2.71-3.58) and eclampsia (RR=3.26, CI 2.82-3.78) compared to their counterparts. (See Table 5).

Table 5: Effects of breast-feeding pregnancy overlap on current pregnancy after 36 weeks of gestational age among pregnant women in North Shewa zone, Ethiopia, 2023

Pregnancy outcomes		Breast feeding pregnancy overlap				RR (CI)
		Exposed	%	Non-exposed	%	
Nutritional status	Under weight	27	19.3%	24	8.5%	2.27 (1.36- 3.79) *
	Normal Weight	113	80.7	259	91.5	
Vaginal bleeding during pregnancy	Yes	24	17.1%	4	1.4%	2.91 (2.35- 3.61) *
	No	116	82.9	279	98.6	
Intrauterine growth restriction	Yes	5	3.5	0	0.0%	3.09 (2.69-3.55) *
	No	135	96.5	283	100	
Pre-Eclampsia	Yes	6	4.3%	0	0.0%	3.11(2.71-3.58) *
	No	134	95.7	283	100	
Eclampsia	Yes	15	10.7%	0	0.0%	3.26(2.82-3.78) *
	No	125	89.3	283	100	

Effects of Breastfeeding Pregnancy Overlap on Obstetric and Birth Outcomes in Comparison to Pregnancy without Breastfeeding

As a result, the occurrence of preterm birth and Premature Rupture of the membrane was identified to be significantly higher among pregnant women who breastfeed, with a risk ratio of 3.76 (95% CI 3.15-4.48), and 2.77 (95% CI 2.19-3.49) compared to those who are solely pregnant. Similarly, the risks of prolonged labor, antepartum hemorrhage, and obstructed labor were found to be more than 2 times (RR=3.26, 95% CI 2.82-378), 92% (RR=1.92, 95% CI 1.10-3.35), and 17% (RR=1.17, 95% CI 0.58-2.36) higher among pregnant women experiencing breastfeeding overlap than their counterparts. Furthermore, pregnant women who breastfeed experience significantly higher rates of postpartum hemorrhage (PPH), abnormal presentation, and incomplete placenta separation compared to those who conceive after the weaning period, with risk ratios of 3.11 (95% CI 2.71-3.78), 3.38 (95% CI 2.79-4.08), and 2.22 (95% CI 1.65-2.98), respectively. In conclusion, the findings from this study indicate that the impact of breastfeeding during pregnancy elevates the risks of stillbirth, and new-born referral to the NICU by 20% (RR=1.20, 95% CI 0.77-1.87), and 49% (RR=1.49, 95% CI 1.04-2.16), respectively, compared to pregnant women without breastfeeding overlap (See Table 6).

Table 6: Effects of breast-feeding pregnancy overlap on Birth outcomes among pregnant women in North Shewa zone, Ethiopia, 2023

Birth outcomes		Breast feeding pregnancy overlap				RR(CI)
		Exposed		Non- exposed		
Preterm birth	Yes	41	29.3%	1	0.4%	3.76(3.15-4.48) *
	No	99	70.7	282	99.6	
Ante-partum haemorrhage	Yes	5	3.6%	3	1.1%	3.36 (0.81-4.35) *
	No	135	96.4	280	98.9	
Premature Rupture of membrane	Yes	20	14.3%	4	1.4%	2.77(2.19-3.49) *
	No	120	85.7	279	98.6	
Post-partum haemorrhage	Yes	6	4.3%	0	0.0%	3.11(2.71-3.78) *
	No	134	95.7	283	100	
Prolonged labour	Yes	15	10.7%	0	0.0%	3.26 (2.82-378) *
	No	125	89.3	283	100	
obstructed labour	Yes	5	3.6%	8	2.8%	1.26 (0.42- 3.79)
	No	135	96.4	175	97.2	
abnormal presentations	Yes	35	25.0%	3	1.1%	3.38(2.79-4.08) *
	No	135	75	283	98.9	
Placental separation	partial	19	13.6%	9	3.2%	2.22(1.65-2.98) *
	complete	121	86.4	274	96.8	
Still Birth	Yes	1	0.7%	4	1.4%	1.20(0.77-1.87)
	No	139	99.3	279	98.6	
APGAR	Poor	7	5.0%	8	2.8%	1.76 (0.82-2.50)
	Good	133	95	275	97.2	
New born Referred to NICU	Yes	18	12.9%	20	7.1%	1.49(1.04-2.16) *
	No	122	87.1	263	92.9	

Discussion

In Ethiopia, breastfeeding-related pregnancies are common because women over-rely on nursing to space out their births without receiving enough instruction or knowledge about the needs of lactation management, which typically results in unintended pregnancies. In this study, the effects of breastfeeding and pregnancy overlap on current pregnancy and pregnancy outcomes were examined. Consequently, the prevalence of underweight, vaginal bleeding during pregnancy, preeclampsia, eclampsia, Abruptio placentae, intrauterine growth restriction (IUGR), preterm birth, antepartum hemorrhage, premature rupture

of the membrane, postpartum hemorrhage, prolonged labor, abnormal presentations, incomplete placental separation, and newborn. Compared to women who are pregnant after weaning, the number of pregnant women who were referred to the NICU during breastfeeding was much greater. The prevalence of intrauterine growth restriction (IUGR) is significantly higher among breastfeeding pregnant women than among non-breast-feeding pregnant women. This result is consistent with a study done in Egypt (Shaaban et al., 2015), and Assiut Egypt (El-Rhman, Salem, & Shaaban, 2014). This might be due to several factors contributing to the risk of IUGR, including maternal nutrition, maternal health, placental function, and genetic factors. Breastfeeding requires additional energy and nutrients from the mother, and if the mother's nutritional intake is insufficient, it could potentially affect the growth of the fetus in the subsequent pregnancy.

The results of our study revealed a significantly higher occurrence of hypertensive disorders in women who breastfed during pregnancy group as compared with women who didn't (Shaaban et al., 2015). This could be due to, the overlap of pregnancy and breastfeeding may increase the risk of hypertensive disorders during pregnancy due to fact as a result of increased maternal metabolic demands, hormonal changes, and potential depletion of essential nutrients like calcium and magnesium, which are important for maintaining blood pressure regulation. Additionally, the stress of simultaneously managing the needs of a breastfeeding child and a developing fetus may contribute to elevated blood pressure levels in some women.

The risk of prolonged labor among breastfeeding pregnant women is found to be higher than those of PAW. This is consistent with a similar study done in the Assiut governorate where it showed that breastfeeding during pregnancy significantly increases the risk of prolonged labor (El-Rhman et al., 2014). This might be due to, pregnancy during breastfeeding, or tandem nursing, which can increase the risk of prolonged labor due to factors such as heightened uterine sensitivity and fatigue from continuous uterine stimulation. Additionally, hormonal interference, nutritional demands, maternal exhaustion, and psychological stress may contribute to the prolonged labor process in tandem nursing mothers.

Additionally, pregnancy overlapping with breastfeeding can exacerbate the risks of both ante-partum and post-partum hemorrhage. Antepartum hemorrhage may occur due to uterine sensitivity and potential hormonal imbalances, while post-partum hemorrhage risks are heightened due to uterine fatigue, nutritional demands, and maternal exhaustion from breastfeeding, increasing the likelihood of excessive bleeding during and after childbirth ("Müller MM, Salathé M. Crowdbreaks: tracking health trends using public social media data and crowdsourcing. *Frontiers in public health*. 2019 Apr 12;7:431532.,").

Similarly, the study revealed that the overlap of pregnancy and breastfeeding can increase the risk of premature rupture of membranes (PROM) and preterm birth due to factors like hormonal fluctuations, nutritional demands, and maternal exhaustion, potentially impacting uterine integrity and gestational duration. This combination may predispose mothers to complications such as PROM, where the amniotic sac breaks before the 37th week of pregnancy, and preterm birth, increasing the likelihood of delivering before the full term, which can have implications for the health of both the mother and the baby.

Pregnancy overlapping with breastfeeding may increase the likelihood of abnormal fetal presentations during labor, such as breech or transverse positions. The physical changes and uterine dynamics influenced by both processes could contribute to the misalignment of the fetus, potentially leading to complications during child birth ("Bergman NJ. Birth practices: Maternal-neonate separation as a source of toxic stress. *Birth defects research*. 2019 Sep 1;111(15):1087-109.,").

On the other hand, pregnancy overlapping with breastfeeding may increase the risk of incomplete placental separation during delivery due to factors such as uterine hyperstimulation, hormonal imbalances, and potential nutritional deficiencies. Breastfeeding-induced oxytocin release may cause uterine hyperstimulation, interfering with the normal process of placental detachment. Hormonal imbalances, particularly elevated prolactin levels from breastfeeding, could disrupt the hormonal cascade necessary for proper placental separation. Additionally, nutritional deficiencies resulting from the demands of both pregnancy and breastfeeding might compromise uterine contractility, potentially leading to incomplete

placental separation ("Chantry, C. J., & Nommsen-Rivers, L. A. (2008). Breastfeeding and the risk of postpartum hemorrhage: new perspectives on the role of oxytocin. *Current Women's Health Reviews*, 4(4), 255-260.,").

Finally, the study showed that Pregnancy overlapping with breastfeeding can increase the risk of newborn referral to the Neonatal Intensive Care Unit (NICU) due to various factors. These include potential prematurity or low birth weight of the newborn, increased likelihood of maternal complications such as anemia or inadequate prenatal care, and potential complications during labor such as prolonged labor or fetal distress. Additionally, maternal exhaustion and nutritional deficiencies from the demands of breastfeeding during pregnancy may impact the newborn's health (Maghbooli Z et al., 2008).

Conclusion

This study investigated the effects of breastfeeding-pregnancy overlap on pregnancy outcomes, finding significantly higher risks of various complications among women pregnant while breastfeeding compared to those who had weaned. Specifically, the prevalence of intrauterine growth restriction (IUGR) and hypertensive disorders during pregnancy were notably elevated in breastfeeding pregnant women.. Furthermore, overlapping pregnancy and breastfeeding were associated with increased risks of prolonged labor, antepartum and postpartum hemorrhage, premature rupture of membranes (PROM), preterm birth, abnormal fetal presentations, incomplete placental separation, and newborn referral to the Neonatal Intensive Care Unit (NICU). These findings underscore the importance of addressing the challenges posed by overlapping pregnancy and breastfeeding to mitigate adverse outcomes for both mothers and newborns through targeted education and healthcare interventions.

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