

## Adverse Maternal Outcomes of Advanced Maternal Age Pregnancy in Northwest Ethiopia 2020: Comparative Cross Sectional Study

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### Abstract

**Objective:** advanced maternal age is a substantial risk for different adverse maternal outcomes, responsible for maternal morbidity and mortality. Despite these adverse maternal outcomes of advanced maternal age pregnancy, the research focus given to maternal outcomes of these populations is limited specifically, no study was done in the study area. Therefore, this comparative cross-sectional study was conducted in Awi Zone public hospitals, Northwest Ethiopia to compare adverse maternal outcomes among adult and advanced maternal aged pregnancy. Systematic random sampling was employed to select 447 women. Data were analyzed using SPSS version 25.

**Result:** The odds of gestational diabetic melitus (AOR=4.36, 95% CI: 1.18, 6.14), severe preeclampsia (AOR=2.42, 95% CI: 1.30, 4.50), antepartum hemorrhage (AOR=3.10, 95% CI: 1.47, 6.54) and cesarean delivery (AOR=3.07, 95% CI: 1.52, 6.19) were significantly higher among advanced aged women. Women at advanced aged had a higher risk of adverse maternal outcomes when compared to adult aged women. Therefore, counseling to have child in adult aged period, provision of quality family planning and perinatal care should be addressed.

**Keywords:** Advanced maternal age pregnancy; Adverse maternal outcomes; Ethiopia

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### Introduction

Pregnancy in Advanced Maternal Age (AMA) is a pregnant women who has an estimated delivery date established for a time when a mother is  $\geq 35$  years [1,2]. In low and middle income countries and South Africa, 12.3% and 17.5% of pregnancies occurred at AMA level [3,4]. Increased AMA population, postponing marriage until later, the availability of better contraceptive options, social and cultural shifts and career advancement have impacted AMA prevalence [5,6]. Fertility is reduced as women age, with a significant reduction in ovarian oocyte reserves after the age of 35 years [5,7]. Globally, adverse pregnancy outcomes are the major causes of maternal and neonatal morbidity and mortality and represent a gap in the ability to reach sustainable developmental goals targets [8,9].

Evidences showed that AMA pregnancy was associated with increased risk of pregnancy induced hypertension (gestational hypertension, preeclampsia and eclampsia), antepartum hemorrhage (APH), gestational diabetes mellitus (GDM) and premature rupture of membrane (PROM). Alongside with this, it is also significantly associated with malpresentation, post-partum hemorrhage (PPH), cesarean delivery, maternal near-miss and meternal death [10,11]. Most of these outcomes are related to the aging process alone, even though coexisting factors are common

[12]. Even though AMA pregnancy associated with these adverse maternal outcomes, some literatures have reported inconsistent results and failed to support.

Despite these adverse maternal outcomes of AMA pregnancy, the research focus given to maternal outcomes of these populations specifically in Ethiopia is limited [13] and unable to control confounding variables. Therefore, this study is the first study done which was aimed to compare adverse maternal outcomes among women with adult and AMA pregnancy. In a country like Ethiopia where striving to reduce maternal mortality in 2030, investigating such under studied topic will have paramount input for future maternal health improvement especially in the

study area where such research not done. Any gaps in maternal morbidity and mortality may inform policy makers and program implementers, to pass evidence based informed decisions and target maternal and neonatal outcomes.

## Methods

### Study design, area and period

Institutional based comparative cross sectional study was conducted at Awi zone public hospitals, Northwest, Ethiopia. There are five public hospitals and 47 health centers that serve for a total population of 1,077,144 [14]. This study was conducted from February 25/2020 to April 25/2020.

### Study population and eligibility criteria

All women with the age of  $\geq 20$  years old who gave birth at 28 weeks of gestation or greater in Awi zone public hospitals were included in this study. Those women with age range of 20-34 years old (inclusive) were grouped as adult aged women while 35 years old and above were classified as advanced aged women.

### Sample size and sampling procedure

Sample size was calculated using double population formula using Epi-info version 7. Using cesarean section among adult (19.4%) and AMA (32.7%) [13], and assumptions (95% two sided level of confidence, a power of 80%, 2 to 1 ratio of adult and AMA and 10% non-response rate), 447 mothers (149 advanced age and 298 adult mothers) were considered. All five public hospitals found in Awi zone were included in this study. The previous year two months average delivery report of each hospitals with similar season was used to proportionally allocate the sample size. Systematic random sampling technique was employed.

### Definition of outcomes

Advanced maternal age: is considered when maternal age is greater or equal to 35 years old [15,16] Adult maternal age: is considered when maternal age is 20-34 years -inclusive [17,18].

### Data collection tool and procedure

Data collection tool was adapted after reviewing different related articles and documents [17,19-23]. The questionnaire was translated in to local language (Agew). The tool was pretested and reviewed with senior researchers to check reliability and validity. Structured questionnaire was used to collect the data. Mother's sociodemographic data, obstetric related data, life style and chronic medical disease related data were included in the tool.

### Data quality assurance, processing and analysis

Training was given for data collectors and supervisors. Data collectors were supervised throughout the course of data collection period. The collected data were entered using Epi data version 3.1 computer program and exported to IBM statistical package of social sciences version 25 for analysis. Chi square and independent t-test were computed. Logistic regression analysis were conducted to assess association between adverse obstetric outcomes and maternal age. Adjusted Odds Ratio (AOR) with

their corresponding 95% Confidence Intervals (CI) was used to declare the presence of association while p-value  $< 0.05$  was used to declare statistical significance.

### Ethical consideration

Ethical clearance was obtained from institutional Review Board (IRB) of College of Medicine and Health Science, Bahir Dar University. Responsible officials and managers at Zone, District and Hospitals were communicated. The collected data were kept in the form of file in secured place and used only for study purpose.

## Results

### Socio-demographic and obstetric characteristics

In this study, a total of 447 participants were included giving a response rate of 100%. The mean age  $\pm$  standard deviation (SD) of adult and advanced aged mothers was 25.8 ( $\pm 3.02$ ) and 37.6 ( $\pm 2.9$ ) years respectively. More than half 94 (63%) of AMA women had no education compared to 53 (17.8%) adult aged women. Nearly 38% (56) of advanced aged women had previous bad obstetrical history, compared with 14 (10%) adult aged women. Only 52 (35.9%) advanced aged women were initiate ANC at 12 weeks or before compared to 169 (55.7%) adult aged women. Similarly, significant percentage of advanced aged women 21.5% (32) had chronic medical illness compared to 7.7% (23) of adult aged women. In contrast, there was no significant differences between advanced aged and adult women regarding tetanus toxoid vaccination and iron folate supplementation (**Table 1**).

### Magnitude of adverse maternal outcomes

Twenty four (16%) advanced aged women had severe preeclampsia, compared to 26 (8.8%) of adult aged women. Similarly, antepartum hemorrhage was significantly more common among advanced aged women 18% (27) compared to adult aged women 5.7% (17). In addition, significant percentage of advanced aged women (16.7%) gave birth through cesarean section compared to adult women (5.7%) (**Figure 1**).

### Association of advanced age and adverse maternal outcomes

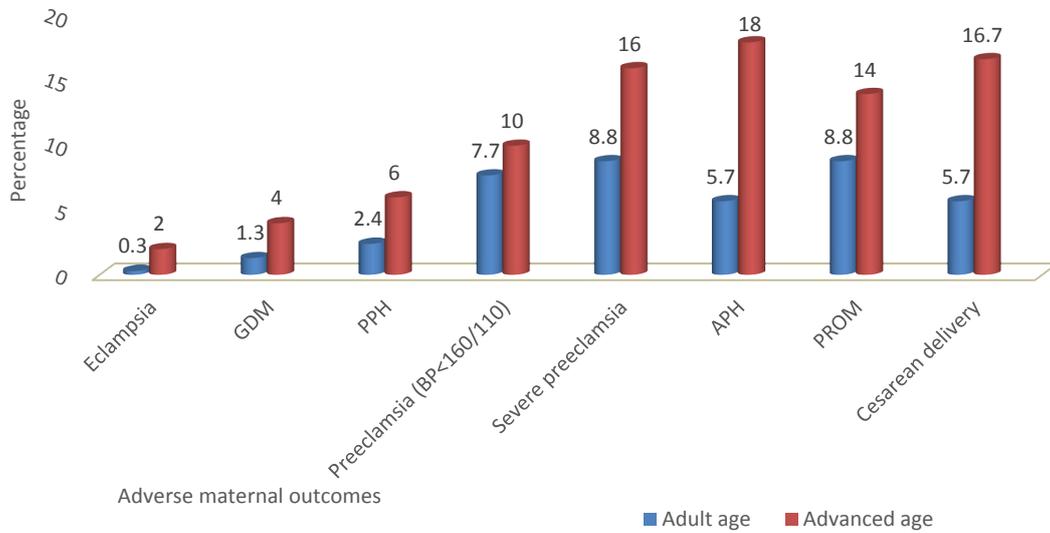
Model fitness was tested with Hosmer and Lemeshow Goodness of Fit test and fit with  $P=0.932$ .

The odds of GDM among advanced aged women was 4.36 times higher when compared with adult aged women (AOR=4.36, 95% CI: 1.18, 6.14 with p-value=0.027). Consistently, the likelihood of severe preeclampsia among advanced aged women was 2.42 times higher when compared with adult aged women (AOR=2.42, 95% CI: 1.30, 4.50 with p-value=0.005). In addition, women with advanced aged were 3.10 times more likely to have antepartum hemorrhage when compared with the reference group (20-34) (AOR=3.10, 95% CI: 1.47, 6.54 with p-value=0.003). Moreover, the odds of cesarean delivery among advanced aged women was 3.07 times higher when compared with advanced aged women (AOR=3.07, 95% CI: 1.52, 6.19 with p-value=0.002) (**Table 2**).

**Table 1** Socio-demographic and obstetric characteristics of mothers who gave birth in Awi Zone Public Hospitals, Northwest Ethiopia: 2020.

Variables		Advanced age (149)	Adult age (n=298)	Total (n=447)	
		Frequency (%)	Frequency (%)	Frequency (%)	p-value
Residence	Urban	50 (33.6%)	208 (69.8%)	258 (57.7%)	<0.001
	Rural	99 (66.4%)	90 (30.2%)	189 (42.3%)	
Marital status	Single	2 (1.3%)	8 (2.7%)	10 (2.2%)	0.634
	Married /union	146 (98%)	288 (96.6%)	434 (97.1%)	
	Others*	1 (0.7%)	2 (0.7%)	3 (0.7%)	
Maternal education	Illiterate	94 (63.1%)	53 (17.8%)	147 (32.9%)	<0.001
	Primary	28 (19.6%)	115 (38.6%)	143 (32%)	
	Secondary and above	27 (18.1%)	130 (43.6%)	157 (35.1%)	
Ethnicity	Amhara	149 (100%)	296 (99.3%)	445 (99.6%)	0.316
	Others**	0	2 (0.7%)	2 (0.4%)	
Religion	Orthodox	148 (99.3%)	291 (98.2%)	439 (98.2%)	0.162
	Others***	1 (0.7%)	7 (2.3%)	8 (1.8%)	
Maternal occupation	House wife	48 (32.2%)	135 (45.3%)	183 (40.9%)	<0.001
	Farmer	81 (54.4%)	62 (20.8%)	143 (32%)	
	Government employ	13 (8.7%)	56 (18.8%)	69 (15.4%)	
	Others <sup>a</sup>	7 (4.7%)	45 (15.1%)	52 (11.6%)	
Husband occupation	Farmer	99 (66.4%)	79 (26.5%)	178 (39.8%)	<0.001
	Government employ	28 (18.8%)	79 (26.5%)	107 (23.9%)	
	Merchant	12 (8.1%)	89 (29.9%)	101 (22.6%)	
	Others <sup>b</sup>	10 (6.7)	51 (17.1%)	61 (13.6%)	
Family monthly income (ETB)	Mean±SD	2664 ± 306	4758 ± 910	4060 ± 769	<0.001
Birth interval	<24 months	18 (12.2%)	24 (17.3%)	42 (14.6%)	0.221
	≥24 months	130 (87.8%)	115 (82.7%)	245 (85.4%)	
Previous bad obstetrical history	Yes	56 (37.8%)	14 (10%)	70 (24.3%)	<0.001
	No	92 (62.2%)	126 (90%)	218 (75.7%)	
No of pregnancy	Singleton	142 (95.3%)	293 (98.3%)	435 (97.3%)	0.063
	Twin	7 (4.7%)	5 (1.7%)	12 (2.7%)	
Status of pregnancy	Planned	90 (60.4%)	271 (90.9%)	361 (80.8%)	<0.001
	Unplanned	59 (39.6%)	27 (31.4%)	86 (19.2%)	
ANC follow up	Yes	145 (97.3%)	294 (98.2%)	439 (98.2%)	0.313
	No	4 (2.7%)	4 (1.3%)	8 (1.8%)	
GA when start ANC	≤ 12 weeks	52 (35.9%)	169 (57.5%)	221 (40.3%)	<0.001
	>12 weeks	93 (64.1)	125 (42.5%)	218 (49.7)	
Tetanus toxoid vaccine	Yes	139 (93.3%)	285 (95.6%)	424 (94.9%)	0.289
	No	10 (6.7%)	13 (4.4%)	23 (5.1%)	
Iron folate supplementation	Yes	142 (95.3%)	282 (94.6%)	424 (94.9%)	0.762
	No	7 (4.7%)	16 (5.4%)	23 (5.1%)	
Male partner involvement	Yes	89(59.7%)	176 (59.1%)	265 (59.3%)	0.896
	No	60 (40.3%)	122 (40.9%)	182 (40.7%)	
Gravidity	Mean ± SD	5.37 ± 1.87	1.72 ± 0.96	2.94 ± 2.18	<0.001
Parity	Mean ± SD	4.9 ± 1.72	1.79 ± 1.86	2.84 ± 2.33	<0.001
GA at delivery	Mean ± SD	38.73 ± 2.06	39.05 ± 1.45	38.94 ± 1.69	0.036
Onset of labor	Spontaneous	112 (75.7%)	252 (84.8%)	364 (81.8%)	0.009
	Induced	36 (24.3%)	45 (15.2%)	81 (18.2%)	
Fetal presentation	Vertex	144 (96.6%)	285 (95.6%)	429 (96%)	0.610
	Others <sup>c</sup>	5 (3.4%)	13 (4.4%)	18 (4%)	
Chronic medical illness	Yes	32 (21.5%)	23 (7.7%)	55 (12.3%)	<0.001
	No	117 (78.5%)	275 (92.3)	392 (87.7%)	

\*Divorced and widowed, \*\*Oromo and Benishangul Gumz,\*\*\*Muslim and protestant, <sup>a</sup>Student, merchant and private employ, <sup>b</sup> Private employ and driver<sup>c</sup>Breech, shoulder and face



**Figure 1** Adverse maternal outcomes among advanced age mothers who gave birth at Awi zone public hospitals, Ethiopia, 2020.

**Table 2** Logistic regression of the association between advanced maternal age and adverse maternal outcomes in Northwest Ethiopia, 2020.

Variables	Maternal age		COR (95% CI)	AOR (95% CI)	p-value
	Frequency (%)				
	20-34	35+			
GDM	4 (1.3%)	6 (4%)	3.08 (0.85, 11.1)	4.36 (1.18, 6.14)	0.027*
Preeclampsia (BP<160/90)	23 (7.7%)	15 (10%)	1.33 (0.67, 2.64)	1.38 (0.67, 2.84)	0.37
Severe preeclampsia	26 (8.8%)	24 (16%)	2.00 (1.10, 3.63)	2.42 (1.30, 4.50)	0.005**
Eclampsia	1 (0.3%)	3 (2%)	6.10 (0.62, 42.1)	4.60 (0.42, 50.0)	0.20
Antepartum hemorrhage	17 (5.7%)	27 (18%)	3.65 (1.92, 6.95)	3.10 (1.47, 6.54)	0.003**
PROM	26 (8.8%)	21 (14%)	1.55 (0.84, 2.87)	1.20 (0.57, 2.51)	0.61
Cesarean delivery	17 (5.7%)	25 (16.7%)	3.33 (1.73, 6.39)	3.07 (1.52, 6.19)	0.002**
Postpartum hemorrhage	7 (2.4%)	9 (6%)	2.62 (0.97, 7.32)	2.35 (0.79, 7.00)	0.12

\* Significant at P<0.05, \*\* Significant at P<0.01

## Discussion

The present study revealed that advanced maternal age was significantly responsible for different adverse maternal outcomes. Accordingly, the odds of GDM among advanced aged women was significantly higher when compared to adult aged women. This result is in line with studies conducted in Barcelona [24], China [25], United Kingdom [26] and Turkey [21]. The possible explanation could be the fact that advanced age is associated with endothelial damage and well known cardiovascular risk factor that produces structural and functional changes in the vasculature in turn increases the risk of developing insulin resistance [11,27].

In addition, the likelihood severe preeclampsia was significantly higher among advanced aged women when compared with adult aged women. This result is in line with findings of studies held in Sweden [12], Japan [22], Malaysia [16] and Tigray [13]. This is could be due to AMA is associated with decrease of endothelial response to vasodilators [10,28].

According to the present study, advanced aged women were at higher risk for antepartum hemorrhage. The odds of antepartum

hemorrhage was significantly higher among advanced aged women when compared to the reference group (20-34). This finding is consistent with studies done in Canada [23], Japan [22], South Korea [29] and Tigray [13]. This could be due to AMA is associated with increased gravidity, parity and cesarean scar which in turn make them at greater risk of having placental abruption and placenta previa [30].

Moreover, advanced maternal age was significantly associated with cesarean delivery. The odds of cesarean delivery was significantly higher among advanced aged women when compared to adult aged women. This is supported with findings of studies done in China [25], United Kingdom [20], California [31] and South Africa [3]. This could be due to inefficiency of the aging myometrium, decreased number of oxytocin receptors, increased rates of chronic medical diseases and maternal complications such as preeclampsia and GDM [32,33].

## Conclusion

Generally, odds of adverse maternal outcomes among advanced aged women were higher when compared to adult aged women. Thus, the odds of GDM, severe preeclampsia, APH and cesarean

delivery were significantly higher among advanced aged women compared to adult aged women. In adding this, substantial proportion of preeclampsia (BP<160/110 mmhg), eclampsia, PROM and PPH were seen among advanced aged women when compared to adult women.

Therefore, Ethiopian Ministry of Health should address provision of quality family planning and perinatal care for all reproductive age women. Finally, longitudinal study evaluating adverse maternal outcomes after 24hr of delivery regardless of delivery setting and gestational age is recommended.

## Limitation

Finally, this study shares the limitation of cross sectional study that may not indicate causal relationship. In addition, as the study was done in hospital setting, maternal outcome of women who gave birth at home was not assessed. Finally, our study misses adverse outcomes after 24hr of birth.

## Declaration

### Ethics approval and consent to participate

Ethical clearance was obtained from Institutional Review Board of Bahir Dar University's College of Medicine and Health Sciences. Then, officials at different levels in the hospitals were communicated through letters from College of Medicine and Health Science. Confidentiality of the information was secured throughout the study process.

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## Consent for publication

Not applicable

## Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

## Competing interest

The authors declare that they have no competing interest.

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There were no external organizations that funded this research.

## Authors' contribution

TG developed the project. TG, AN, GD, MD and MA participated in the methodology, data analysis and developing the initial drafts of the manuscript and revising subsequent drafts. TG and AA prepared the final draft of the manuscript. All authors read and approved the final manuscript.

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