

Original Research



Adverse pregnancy outcomes of advanced maternal age pregnant women in Sri Lanka

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Abstract

Introduction: Pregnant women above 35 years are in advanced maternal age (AMA) and those above 40 years in very advanced maternal age (VAMA). These pregnancies have become common in both low- and high-income countries, including Sri Lanka, showing a rising trend with possible adverse outcomes.

Objectives: To describe the adverse pregnancy outcomes and associated factors of women in AMA in Sri Lanka

Methods: A hospital-based cross-sectional study was conducted among 216 postpartum women aged 35 years and above at their booking visit and delivered by any mode, at Colombo North Teaching Hospital, selected by consecutive sampling method during 2020-2021, using a pretested interviewer-administered questionnaire. Maternal ages above years 35 and above years 40 were categorized as 'advanced' and 'very advanced' maternal age, respectively. Pregnancy outcomes were assessed under the mode of delivery, maternal outcomes, and new-born outcomes. The significance of adverse pregnancy outcomes and associated factors in VAMA was evaluated with multivariate analysis with p-value of 0.05.

Results: Response rate was 100%. The mean age of primiparous and multiparous women, who participated was 37.8 (SD=2.4) and 24.5% were >40 years. Nearly 40% of the participants had pre-existing chronic non-communicable diseases and of that, 23.6% were diabetes mellitus. The majority were planned pregnancies (77.8%) and 52.8.1% had antenatal complications. More than half (57.4%) had undergone caesarean section. Adverse new-born (37%) and maternal (8.3%) outcomes were reported. By multivariate analysis, Age over 40 years (adjusted odds ratio (aOR)=6.2; 95% CI: 2.9, 21.6; p=0.003), non-Sinhalese (aOR=4.0; 95% CI: 2.0, 16.2; p=0.036), lower segment caesarean section (LSCS) in previous pregnancy (aOR=12.5; 95% CI: 5.3, 29.6; p=0.000), antenatal complications (aOR=7.6; 95% CI: 1.8, 32.3; p=0.006), period of gestation (POG) at delivery (aOR=5.0; 95% CI: 1.9, 13.3; p=0.001) and educated above G.C.E. Ordinary Level (aOR=6.3; 95% CI: 2.3, 36.5; p=0.031) were significantly associated with adverse pregnancy outcomes in AMA.

Conclusions & Recommendations: VAMA pregnancies are common in the study population. A high prevalence of non-communicable diseases was observed among the AMA population. The experience of adverse pregnancy outcomes is substantial being pregnant after 40 years. Effective strategies should be implemented to promote well-planned pregnancies in early reproductive ages of women and among AMA women.

Key words: Advanced maternal age, Adverse pregnancy outcomes

Introduction

Advanced maternal age (AMA) is commonly considered a pregnancy in women aged 35 years or older (1). Bearing a child older than 40 is defined as very advanced maternal age (VAMA) (2). Globally, in 2014, the estimated prevalence of AMA pregnancies was 12.3%, with the highest proportion (9.5%) among women aged 35-39 (1). However, regional variations are evident over time, with AMA prevalence in the United States increasing from 5.8% in 1994 to 9.1% in 2014 (3). Similarly, a substantial shift in childbearing to older ages is a trend in countries like Sweden, with 25% of births in 2013 occurring among women aged 35 or older (4). Also in Asian countries, the prevalence of advanced maternal-age pregnancies varies widely. In Japan, there has been a significant rise in births among AMA women, from 8.6% in 1990 to 25.9% in 2012 (5) and 31% in 2014, with more than 5% in VAMA category (1). In contrast, the prevalence in India and Nepal remains as low as 3% (1). In Sri Lanka, AMA pregnancies account for approximately 15%, which is consistent with global trends (6). Of them, more than 4% represented the VAMA category (1). The driving force behind the significant shift in childbearing to later ages is closely aligned with female higher education, career goals and aspirations, delayed marriage, divorce and remarriage, social factors and access to assisted reproductive technology (5).

Fertility is known to decline with age due to reduced ovarian reserves and oocyte quality, with the steepest decline occurring after age 35 (7) and the likelihood of producing chromosomally normal embryos dropping below 5% by age 40, leading to higher rates of infertility and congenital anomalies (8). Additionally, health conditions like hypertension, diabetes mellitus and thyroid disorders are commoner among AMA women, contributing to adverse pregnancy complications such as gestational diabetes mellitus (GDM), pregnancy induced hypertension (PIH), preeclampsia, eclampsia, preterm birth (9) and even maternal death (10). Maternal aging also affects uterine function leading to complications such as

placenta previa and abnormal foetal presentations, leading to increased risk of caesarean deliveries (11), notably in nulliparous women of advanced maternal age (12). Neonates born to AMA mothers face risks such as low birth weight (LBW) (13), intrauterine growth restriction (IUGR) and prematurity (14). Stillbirths are also increased with advanced maternal age (11). To address these challenges, it requires comprehensive antenatal care, early screening and tailored interventions to improve outcomes for both mothers and infants (15). Thus, health facilities, health expenditures, skills of health workers, new technology and inventions are the main areas that need special attention worldwide (5).

Sri Lanka has made significant progress in maternal and child health, with hospital deliveries (99.9%) and excellent antenatal care (95.4%) (16). As a result, maternal and neonatal mortality rates have gradually declined and now stagnated over the past decade. However, the increasing burden of AMA pregnancies is a challenge for Sri Lanka's healthcare system in meeting the Sustainable Development Goal (SDG) targets for maternal and neonatal mortality reduction (17). Therefore, further studying the adverse pregnancy outcomes and associated factors among pregnant women in AMA is essential for guiding healthcare providers, policymakers and communities in reducing maternal and neonatal risks. Such findings can support Sri Lanka's achievement in SDG targets and improve maternal and neonatal health outcomes in Sri Lanka.

Methods

A hospital-based cross-sectional study was conducted in Colombo North Teaching Hospital, Ragama. Being the only teaching hospital in the area, it receives patients from a larger catchment area from both Gampaha and Puttalam Districts. Women in AMA who remained in postnatal wards up to seven days after their delivery were included in the study, irrespective of their mode of delivery and gestational period. Ill women who were not able to actively

participate in the study and those following multiple pregnancies were excluded.

The sample size was calculated using the standard formula for cross-sectional studies, based on an estimated proportion of AMA mothers of 15% (1) with a margin of error set at 5%. With a non-response rate of 10%, it was decided to recruit 216 women aged 35 years and above from postnatal wards. Birth registries in labour rooms were used to select these mothers. Moreover, maternal records were used to cross-check and verify each participant's age at the time of the booking visit, ensuring that they were 35 years or older at the time of being pregnant. In case any eligible participant refused to participate in the study, the next mother fulfilling the eligible criteria was enrolled.

A pre-tested, interviewer-administered questionnaire, which was judgmentally validated by an expert committee was used to collect data. It gathered their sociodemographic characteristics, data on pre-existing comorbidities, and their past and present obstetric characteristics including the contraceptive history. The pregnancy outcomes were extracted from bed head tickets. The obstetric pregnancy outcomes were categorized into maternal and newborn outcomes, and mode of delivery. Postpartum haemorrhage, pre-eclampsia and eclampsia, infected episiotomy or caesarean scar, breastfeeding problems, mental imbalance and near misses were considered as adverse maternal outcomes. Overweight (above 3.5 kg), LBW (less than 2.5 kg), extremely premature delivery (28 weeks or less), sepsis, meconium aspiration, congenital anomalies, jaundice and stillbirth were considered as adverse newborn outcomes. Mode of delivery was categorised as normal vaginal delivery and caesarean/instrumental deliveries. All the pregnancy outcomes

were extracted from the bed head ticket and available medical records.

Data analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22. Women characteristics were described using mean, standard deviation (SD), range and proportions. Bivariate analysis was employed to test the associations between dependent (adverse pregnancy outcomes) and independent variables. All three categories of adverse pregnancy outcomes were assessed separately. Variables with $p\text{-value} \leq 0.25$ were included in the multivariate analysis to avoid prematurely excluding potentially important variables during the initial selection phase. The magnitude of the association was measured using aOR at 95% CI.

Results

The sample included 216 AMA postpartum women (100% response rate). Their mean age was 37.8 years (SD=2.4) with one-fourth above the age of 40 years (Table 1). Most AMA women were Sinhalese (87.5%), Buddhist (64.8%) and educated up to GCE O/L passed and beyond (61.1%). Almost all women were married (98.1%) while 12.5% of them had delayed marriage. Main reasons for the delay were completing education or promotions in their career (25.9%) and financial issues (25.9%).

Multiparous women (91.7%) comprised the dominant category (Table 2). Approximately, two-thirds of them had two or more children. During previous pregnancies, 29.4% had undergone caesarean section; 14% had experienced miscarriages; 14.5% showed antenatal complications; and 13.5% of multiparous women experienced postpartum complications.

Table 1: Sociodemographic characteristics of the sample (N=216)

Characteristics	No.	%
Age (years)		
35-39	163	75.5
40 or above	53	24.5
Ethnicity		
Sinhala	189	87.5
Muslim	14	6.5
Tamil	11	5.1
Burger	2	0.9
Religion		
Buddhist	140	64.8
Catholic/Christian	51	23.6
Islam	14	6.5
Hindu	11	5.1
Highest educational level		
No schooling	2	0.9
Grade 1-5	15	6.9
Grade 6-11	67	31.0
GCE O/L Qualified	81	37.5
Grade 12-13	5	2.3
GCE A/L Qualified	38	17.6
Higher Education	8	3.7
Current occupation status		
Unemployed	175	81.0
Employed	41	19.0
Marital status		
Married	212	98.1
Unmarried	4	1.9
Age at marriage (n=212) *		
Below 35 years	189	87.5
35 years or above	27	12.5
Reason for delaying marriage (n=23) **		
Completing education/promotion	7	25.9
Financial Reasons	7	25.9
Delay in finding a partner	5	21.7
Social reasons and others	8	29.6

*Women who were legally married; **Women at age of marriage ≥ 35 years

Table 2: Pre-existing chronic diseases and obstetric characteristics before delivery (N=216)

Characteristics	No.	%
Parity		
Multiparous	198	91.7
Primiparous	18	8.3
Presence of living children before current pregnancy (n=198)*		
Yes	187	94.4
No	11	5.5
Number of children (n=187)**		
One	61	32.6
Two	88	47.0
Three	32	17.1
Four	3	1.6
Five	3	1.6
Antenatal complications (n=198)*		
No antenatal complications	169	85.3
Gestational diabetes (GDM)	16	8.0
Pregnancy-induced hypertension (PIH)	10	5.0
Pre-eclampsia	1	0.5
Placenta praevia	1	0.5
Heart disease	1	0.5
Mode of delivery in last pregnancy (n=187)**		
Normal vaginal delivery	126	67.3
Caesarean section	55	29.4
Vacuum delivery	3	1.6
Forceps delivery	2	1.0
Vaginal delivery after caesarean section	1	0.5
Previous postpartum maternal complications (n=198)*		
No complications	171	86.3
Postpartum haemorrhage	19	9.5
Preeclampsia	8	4.0
Past pregnancy outcomes (n=198)*		
Live birth	160	80.8
Miscarriage	27	13.6
Intrauterine death	8	4.0
Induced abortion	2	1.0
Preterm deliveries	1	0.5
Medical conditions		
No pre-existing medical condition	127	58.8
Diabetes mellitus only	51	23.6
Essential hypertension	16	7.4
Hypertension and diabetes mellitus	7	3.2
Psychiatric illness	5	2.3

Anaemia	4	1.9
Heart disease	2	0.9
Thyroid disease	3	1.4
Planning of current pregnancy		
Intended	168	77.8
Unintended	48	22.2
Complications of current pregnancy		
GDM only	60	27.8
PIH and GDM	21	9.7
PIH only	12	5.6
Placenta previa	7	3.2
Anaemia	6	2.8
Pre-eclampsia	4	1.9
GDM & pre-eclampsia	4	1.9
None	102	47.2

*Number of multiparous women; **Number of women having children

Table 3: Period of gestation at delivery and adverse pregnancy outcomes

Characteristics	No.	%
>37 weeks	189	87.5
29-37 weeks	20	9.3
28 weeks or less	7	3.2
Mode of delivery (n=216)		
Elective caesarean section	68	31.5
Emergency caesarean section	56	25.9
Normal vaginal delivery	91	42.1
Vacuum delivery – Delivery arrest in 2 nd stage	1	0.5
Indications for elective caesarean section (n=68)		
Past caesarean section	45	66.2
Elderly primly and sub-fertile	11	16.2
Primi 40 years and above	7	10.3
Secondary subfertility	5	7.3
Indications for emergency caesarean section (n=56)		
Lack of progression	22	39.3
Foetal distress	16	28.5
Past section in pain	10	17.8
Foetal malpresentation in labour	5	8.9
Impending eclampsia	3	5.3
Maternal outcomes		
Normal without complications	198	91.7
Adverse maternal outcomes	18	8.3
Adverse maternal outcomes (n=18)		
Postpartum haemorrhage	8	44.4

Pre-eclampsia/eclampsia	5	27.7
Infected episiotomy or caesarean scar	2	11.1
Breastfeeding problems	1	5.5
Mental imbalance	1	5.5
Near-miss following arrest while caesarean section	1	5.5
Newborn outcomes		
Normal without complications	136	63.0
Adverse newborn outcomes	80	37.0
Adverse newborn outcomes (n=80)		
Overweight (above 3.5 kg)	42	52.5
Low birth weight (less than 2.5 kg)	21	26.2
Extremely premature delivery (28 weeks or less)	7	8.75
Sepsis	5	6.25
Meconium aspiration	2	2.5
Congenital anomalies	1	1.2
Jaundice	1	1.2
Stillbirth	1	1.2

Table 4: Factors associated with adverse pregnancy outcomes

Factor		Adverse maternal outcomes, No. (%)		Multivariate analysis	
		Yes (n=18)	No (n=198)	Adjusted OR* (95% CI)	p-value
Age >40 years	Yes	10 (55.6%)	43 (21.7%)	6.29 (2.9, 21.6)	0.003
	No	8 (44.4%)	155 (78.3%)		
Non-Sinhalese	Yes	6 (33.3%)	21 (10.6%)	4.0 (2.0, 16.2)	0.036
	No	12 (66.7%)	177 (89.4%)		
Presence of antenatal complications	Yes	11 (61.1%)	37 (18.7%)	7.6 (1.8, 32.3)	0.006
	No	7(38.9%)	161(81.3%)		
Educated above G.C.E. O/Level	Yes	12 (66.7%)	120 (60.6%)	6.3 (2.3, 36.5)	0.031
	No	6 (33.3%)	78 (39.4%)		
		Adverse newborn outcomes, No. (%)		Multivariate analysis	
		Yes (n=80)	No (n=136)	Adjusted OR* (95% CI)	p-value
Pre-term delivery < 37 weeks	yes	20(25.0%)	7 (5.1%)	5 (1.9, 13.3)	0.001
	no	60 (75.0%)	129 (94.9%)		
		Complicated mode of delivery		Multivariate analysis	
		Yes (n=125)	No (n=91)	Adjusted OR* (95% CI)	p-value
Past section and instrumental deliveries	Yes	79 (63.2 %)	11(12.1%)	12.5 (5.3, 29.6)	0.000
	No	46 (36.8%)	80 (87.9%)		

*adjusted odds ratio

In the current pregnancy, more than two-fifths of study participants experienced pre-existing chronic diseases. However, most of the index pregnancies were planned pregnancies, while more than half had antenatal morbidities. One-fourth presented with GDM only; 5.6% with PIH only; and 9.7% with both PIH and GDM. The majority (87.5%) delivered after completing 37 weeks of POG and 3.2% were extremely preterm births (delivered at 28 weeks of POG or less). The main mode of delivery (57.4%) was caesarean section, out of which 25.9% had undergone emergency section due to lack of progression to labour (39.3%) and foetal distress (28.5%).

Only 8.3% had selected adverse maternal outcomes, which included post-partum haemorrhages, near-miss case and caesarean section. More than one-third of women faced adverse newborn outcomes (37%), which included overweight babies and LBW babies (Table 3).

Adverse maternal outcomes were significantly associated with age above 40 years (aOR=6.2; 95% CI: 2.9, 21.6), non-Sinhalese ethnicity (aOR=4.0; 95% CI: 2.0, 16.2), antenatal complications (aOR=7.6; 95% CI: 1.8, 32.3) and educated below O/Levels (aOR=7.6; 95% CI: 1.8, 32.3) after adjusting for confounders. Adverse new-born outcomes were significantly associated with deliveries before 37 weeks (aOR=5.0; 95% CI: 1.9, 13.3; $p=0.001$), while delivery methods other than normal vaginal delivery were associated with past sections (aOR=12.5; 95% CI: 5.3, 29.6) in the multivariate analysis (Table 4).

Discussion

The mean age of women with AMA in this study was 37.8 years (SD=2.4), ranging from 35 to 45 years. This aligns with previous studies, including one conducted in Sri Lanka reporting a mean age of 37.1 years (17) and a Northern Ethiopian study reporting a median age of 37 years (18) among AMA women.

Ethnically, the majority of participants were Sinhalese (87.5%) followed by Muslims (6.5%) and Tamils (5.1%). Regarding religion, 64.8% were Buddhists, 23.6% Christians/Catholics, 6.5% Muslims and 5.1% Hindus. These proportions are broadly consistent with national data from the Economic and Social Statistics 2020, though the study had a higher percentage of Christians/Catholics and Hindus, likely due to the hospital's location in the Western coastal region. In terms of education, 37.5% of participants had passed G.C.E. O/L and 31% had completed secondary education, while only 3.7% had a diploma or degree. These figures differ from the 2012 National Census, which reported 40.7% with secondary education and 2.7% with higher education. Employment among women in the study was 19%, which was lower than the national female employment rate of 31.7% (19), likely due to the older age group included in this study. In Japan, delayed childbearing was associated with higher education and income (20).

Most participants (91.7%) were multiparous in contrast to the 2018 national proportion of 32.3% primiparous mothers. This difference is expected as the study focused solely on AMA women. A South Korean study also found that most AMA women were multiparous (60%) (18). Further, contraceptive use among participants was 68.1%, closely aligning with the national contraceptive prevalence rate of 66.9% (14). In China, the relaxation of the one-child policy led to an increase in AMA pregnancies (5).

Over half of the AMA women (52.7%) experienced antenatal complications, with GDM and PIH being the most common. This is higher than the national average of 42% but acceptable considering the study population. A case-control study at Colombo South Teaching Hospital found that GDM and PIH were twice more likely among AMA women compared to the younger women (21). Similarly, a Chinese study confirmed significant associations between AMA and these morbidities (5).

Caesarean section was performed in 57.4% of cases, higher than the national rate of 40.5% (16). This rise is expected among AMA women due to increased obstetric risks. Less than 10% experienced adverse maternal outcomes, with postpartum haemorrhage being the most common (3.7%). This may be attributed to age-related intrapartum complications such as perineal tears and episiotomy extensions (9). Although the WHO multicounty survey reported higher maternal mortality among AMA women (1), no maternal deaths were recorded in this study.

More than one-third of newborns had experienced adverse outcomes (37%). Out of them, 52.8% were overweight and 26.2% were LBW. Seven babies were born preterm accounting for 3.2 % of all deliveries. The Asian population indicates an increased risk of preterm delivery and LBW with AMA (20). Furthermore, there is a higher risk of chromosomal anomalies and stillbirth. Dias et al. (2014) revealed that stillbirth and preterm birth rates were high among AMA women in a retrospective cohort study conducted in the district general hospital Ampara (17).

Women aged 40 years and above had a six-fold higher risk of adverse maternal outcomes than those aged 35–39 years (aOR=6.2; 95% CI: 2.9, 21.6), consistent with Kahveci's findings (5). Ethnicity also played a significant role, as non-Sinhalese women were four times more likely to experience adverse outcomes (aOR=4.0; 95% CI: 2.0, 16.2), possibly due to differences in healthcare access, cultural practices or socioeconomic status.

Antenatal complications were strongly associated with adverse maternal outcomes (aOR=7.6; 95% CI: 1.8, 32.3). This finding underscores the importance of comprehensive antenatal care to identify and manage complications, thereby reducing the risk of poor maternal health outcomes. Furthermore, higher education level was significantly linked to adverse maternal outcomes (aOR=7.6; 95% CI: 1.8, 32.3). This unexpected finding may reflect differences in health-seeking behaviour, lifestyle factors or delayed

childbirth due to career aspirations, which could increase pregnancy-related risks. Further research is needed to explore the underlying mechanisms driving this association.

The findings of this study indicate a significant increase in the rate of caesarean section and instrumental deliveries in the current pregnancy compared to the previous one (aOR=12.5; 95% CI: 5.3, 29.6). This substantial rise suggests a strong association between advanced maternal age and increased obstetric interventions, possibly due to higher risks of pregnancy-related complications such as foetal distress, prolonged labour and PIH (22). Furthermore, the overall caesarean section rate among women of AMA appears to be excessively high. A similar trend has been observed elsewhere. For instance, an Ethiopian study reported that women aged 35 years and above were 2.7 times more likely to undergo caesarean section compared to younger women (aOR=2.722; 95% CI: 1.77, 4.17) (18). These findings highlight the need for careful assessment and clinical decision-making to ensure that caesarean deliveries are performed based on medical necessity rather than age alone (23). Given the increasing trend of caesarean sections among older mothers, targeted interventions are essential to optimize maternal and foetal outcomes. Strategies such as promoting vaginal delivery where appropriate, improving antenatal risk stratification and enhancing maternal health education may help in reducing unnecessary caesarean sections while ensuring safe deliveries (24).

Adverse newborn outcomes were five times higher among preterm births than term deliveries (aOR=5.0; 95% CI: 1.9, 13.3). Advanced maternal age significantly increased the likelihood of preterm delivery and LBW. Babies born to AMA mothers were 3.62 times more likely to be premature (aOR=3.622; 95% CI: 1.469, 8.930) and 3.14 times more likely to be LBW (aOR=3.137; 95% CI: 1.324, 7.433) than those born to younger mothers (17, 23).

In summary, this study reveals important trends and disparities in obstetric and neonatal outcomes among AMA women in Sri Lanka. The findings emphasize the need for targeted interventions, early risk identification, and evidence-based clinical management to improve outcomes for this growing demographic.

Conclusions & Recommendations

The majority of AMA women were multiparous and in the age range of 35–45 years. A significant proportion of them had preexisting chronic medical conditions (41.2%), experienced antenatal

morbidities (52.7%) and delivered by caesarean section (57.4%), which was above the national average. Adverse maternal outcomes were reported in 8.3%, including a near-miss situation and 3.7% experiencing post-partum haemorrhage. More than one-third of the newborns experienced complications such as overweight, preterm delivery and low birth weight. Findings align well with global and local literature, emphasizes the growing trend of AMA pregnancies and their associated challenges. Tailored interventions addressing delayed childbearing, improving ANC services and managing antenatal complications are essential to improve maternal and neonatal health outcomes in AMA women.

Public Health Implications

- Nearly one fourth of women aged above 40 years (VAMA) were among the advanced maternal-age pregnancies. Their adverse maternal outcomes were 6-fold higher than that of women aged 35 to 39 years.
- The risk of having non-communicable diseases, antenatal complications and adverse pregnancy outcomes was significantly high after being pregnant at age of 35 years or above.
- These maternal and newborn adverse consequences due to childbearing in late reproductive years will directly act on SDG in 2030 (i.e. reduction of maternal mortality to single digits, reaching neonatal deaths less than 2.2 and stillbirth less than 2 per 1000 live births).

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethics clearance was granted by the Ethics Review Committee of the Faculty of Medicine, University of Kelaniya. Informed written consent was obtained from each participant before data collection. Administrative clearance was obtained from the Director of North Colombo Teaching Hospital.

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Author contributions: PI was involved in literature review, study design, data collection, performing the statistical analysis, interpreting data and drafting the manuscript; KJ was the supervisor and participated in designing the study,

performing the statistical analysis, interpreting data and drafting the manuscript; PK participated in performing the statistical analysis, interpreted data and drafted the manuscript.

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