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Multilevel analysis of quality of intrapartum care and its associated factors: evidence from 35 Sub-Saharan African countries demographic and health survey



Enyew Getaneh Mekonen^{1*} and Mohammed Seid Ali²

Abstract

Background The majority of feto-maternal morbidities and mortalities in sub-Saharan Africa, happen during the intrapartum period. Maternal mortality and morbidity have not decreased as much as anticipated, despite the significant progress made by many nations to improve access to maternity services. There are currently no nationally representative studies in sub-Saharan Africa assessing the quality of intrapartum care and its associated factors. Hence, this study aimed to determine the quality of intrapartum care and identify its associated factors using Demographic and Health Survey data from 35 countries.

Methods Data from the most recent health and demographic surveys, which were carried out between 2006 and 2022 in 35 sub-Saharan African countries, were used. This analysis included a weighted sample of 353,483 women who had given birth within the last five years. STATA/SE version 14.0 statistical software was used to clean, recode, and analyze data that had been taken from DHS data sets. Utilizing multilevel mixed-effects logistic regression, the factors associated with the outcome variable were identified. Model comparison and fitness were assessed using deviance (-2LLR), likelihood ratio tests, median odds ratios, and intra-class correlation coefficient values. Ultimately, factors were deemed statistically significant if they had a p-value < 0.05.

Results About 28.58% (95% CI: 28.43–28.73) of the study subjects had received quality intrapartum care. Factors the like respondent's age [AOR = 1.49; 95% CI (1.42, 1.57)], educational status [AOR = 1.80; 95% CI (1.76, 1.85)], working status [AOR = 1.03; 95% CI (1.01, 1.05)], media exposure [AOR = 1.19; 95% CI (1.16, 1.21)], household wealth index [AOR = 1.53; 95% CI (1.49, 1.56)], family size [AOR = 0.90; 95% CI (0.88, 0.92)], healthcare decisions [AOR = 1.04; 95% CI (1.01, 1.06)], sex of the household head [AOR = 1.08; 95% CI (1.05, 1.10)], ANC visits attended during pregnancy [AOR = 0.60; 95% CI (0.59, 0.61)], number of children ever born [AOR = 0.57; 95% CI (0.55, 0.58)], age at first birth [AOR = 1.06; 95% CI (1.04, 1.08)], mode of delivery [AOR = 0.71; 95% CI (0.68, 0.73)], and residence [AOR = 1.09; 95% CI (1.06, 1.11)] were significantly associated with the quality of intrapartum care.

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Conclusions In the present study, less than one in three mothers had received quality intrapartum care. Respondent's age, educational status, working status, media exposure, household wealth index, healthcare decisions, sex of the household head, age at first birth, and residence were associated with the quality of intrapartum care. Health policy makers and program planners should empower women through comprehensive education and mass media campaigns in order to maximize the quality of intrapartum care. It is also advised that each country's Ministry of Health assess its community health professionals and medical facilities in order to boost funding for rural inhabitants and lower-class households.

Keywords Quality, Intrapartum care, Sub-saharan Africa, Multilevel analysis, DHS

Background

While substandard healthcare affects every aspect of the health system, nowhere is it arguably more severe than in the postpartum and intrapartum phases [1]. According to estimates from the World Health Organization (WHO), many more people are impacted by illnesses that can be prevented, and 303,000 women and 2.7 million newborn infants pass away every year around the time of childbirth [2, 3]. For the survival and well-being of mothers, fetuses, and newborns, the time of labor and the postpartum period are especially important [4]. According to a United Nations report, at an estimated cost of \$4.5 billion per year (\$0.9 per person), high-quality care during childbirth might avoid roughly 113,000 maternal deaths, 531,000 stillbirths, and 1.3 million newborn deaths annually [5].

In sub-Saharan Africa, the majority of the high fetomaternal morbidities and mortalities happen during the intrapartum period [6]. It will need a significant financial commitment to improve access to, demand for, and utilization of professional maternity care in addition to raising the standard of care given in order to lower the unacceptable high rates of maternal and perinatal morbidity and mortality in low-income nations [7]. Women are especially vulnerable during the intrapartum period, in which life-threatening problems such as eclampsia, delayed or obstructed labour, and postpartum hemorrhage can occur, which can result in severe morbidity or even maternal death [8, 9]. The quality of intrapartum care has been defined as having two extremes: overmedicalization with harmful or inefficient therapies or inappropriate use of interventions, leading to unfavorable maternal outcomes; and substandard, unavailable, or withheld intrapartum care [10].

Maternal mortality has decreased significantly in many countries, but more effort has to be made to achieve the worldwide objective of fewer than 70 per 100,000 live births by 2030, which is part of the Sustainable Development Goals (SDGs) [11]. 80% of maternal mortality is avoidable [12]. It is predicted that pregnancy- and delivery-related factors accounted for 295,000 maternal deaths worldwide in 2017 [11]. Maternal mortality and morbidity have not decreased as much as anticipated, despite the significant progress made by many nations to improve access to maternity services [13]. The inadequate quality of services offered to women during their pregnancies, deliveries, and postpartum periods is the reason for this discrepancy between health outcomes and access to services [13, 14]. To reduce maternal and newborn mortality in low- and middle-income countries (LMICs), a quick enhancement in the standard and accessibility of healthcare services is required [15].

Increasing access to skilled attendance during childbirth, which includes experienced, competent, and motivated health workers offering evidence-based interventions in a supportive environment, is a key strategy for lowering maternal mortality [16]. A skilled birth attendant is a medical professional, typically a nurse, midwife, or doctor, who is educated to handle a typical delivery, recognize warning indications, and promptly refer women to obtain specialist treatment [17]. A functional referral system, in conjunction with the availability of necessary medications and equipment, constitutes an enabling environment [17]. Approximately 80% of deliveries worldwide are aided by a trained attendant [18]. Nonetheless, there are regional and national differences in the prevalence of skilled birth attendance. In Central and Southern Asia, trained birth attendants attend 77% of deliveries, whereas in sub-Saharan Africa, experienced providers attend roughly 59% of births [18].

The global agenda for maternal, neonatal, and child health is changing from a survival-only approach to one that includes factors that promote thriving and transformation [19, 20]. This change is in keeping with the new Global Strategy for Women's, Children's, and Adolescents' Health (2016-2030) as well as the third Sustainable Development Goal, which is to ensure healthy lifestyles and promote wellbeing for all people at all ages [21]. WHO is supporting this global objective by defining a vision for high-quality care for all pregnant women and their newborns, throughout pregnancy, childbirth, and the postnatal period, through research and the development of norms and standards [20]. WHO recently released updated guidelines on intrapartum care as part of this endeavor, emphasizing the significance of having a pleasant birthing experience once more [22]. There are currently no nationally representative studies in sub-Saharan Africa (SSA) assessing the quality of intrapartum

care and its associated factors. Therefore, this study aimed to determine the quality of intrapartum care and identify its associated factors using Demographic and Health Survey (DHS) data in order to deliver insights to policymakers on how to design strategies to improve the quality of intrapartum care in SSA.

Methods and materials

Data sources, study design, and sampling

A cross-sectional pooled dataset utilizing the recent DHS data from 35 SSA countries, which was conducted between 2006 and 2022, was employed. Demographic and health surveys from 35 SSA countries, including Angola (2015-16), Burkina Faso (2010), Benin (2017-18), Burundi (2016-17), Congo Democratic Republic (2013-14), Congo (2011-12), Cote d'Ivoire (2011-12), Ethiopia (2016), Gabon (2019-21), Ghana (2014), Gambia (2019-20), Guinea (2018), Kenya (2022), Comoros (2012), Liberia (2019-20), Lesotho (2014), Madagascar (2008), Mali (2018), Malawi (2015-16), Mozambique (2011), Nigeria (2018), Niger (2019), Namibia (2013), Rwanda (2019-20), Sierra Leone (2019), Senegal (2019), Sao Tome and Principe (2008-09), Swaziland (2006-07), Chad (2014-15), Togo (2013-14), and Tanzania (2022), Uganda (2016), South Africa (2016), Zambia (2018), Zimbabwe (2015), were used. To determine the quality of intrapartum care and its associated factors in SSA countries, the data were appended. Each country's survey has different datasets, such as those for males, females, children, births, and households. The kid's record (KR) file was employed in this investigation. The DHS is a national survey that is primarily conducted in LMICs every five years. By using common methods for sampling, questionnaires, data collection, cleaning, coding, and analysis, it enables cross-national comparison [23]. This research included a weighted sample of 353,483 women who had given birth within the last five years (Table 1). The DHS uses a two-stage, stratified sampling method [24]. The first step is creating a sample frame, which is a list of enumeration areas (EAs) or primary sampling units (PSUs) that encompass the entire nation. This list is typically created using the most recent national census that is available. The systematic sampling of the households included in each cluster, or EA, is the second step. More details on survey sample techniques are available in the DHS guideline [25].

Variables of the study Outcome variable

The dependent variable of the current study was receiving quality intrapartum care, generated by merging three variables: (1) health facility delivery; (2) getting skilled assistance during birth; and (3) placing the baby on the mother's breast within one hour after birth by the skilled birth attendant [26, 27]. Health facility delivery was further classified as yes (giving birth at a public, private, nongovernmental, and faith-based organization's health facility or clinic) or no (others). Getting skilled assistance during birth was also categorized as yes (receiving birth assistance from a doctor, nurse, midwife, or clinical officer) or no (others). Similarly, placing the baby on the mother's breast within one hour after birth was grouped as yes or no. As a result, women who received all three elements of intrapartum care were considered to be receiving quality intrapartum care, which was categorized as a binary outcome (no = "0" or yes = "1").

Explanatory variables

Both individual- and community-level variables were considered to accommodate the hierarchical nature of DHS data. Individual-level variables: respondent's age in years [15-49], educational status (no education, primary, secondary & above), wealth index (poor, middle, rich), working status (not working, working), family size (≤ 4 , \geq 5), household head (male, female), healthcare decision maker (self, partner, jointly with partner, someone else), media exposure (no, yes), number of children ever born $(\leq 2, 3-4, \geq 5)$, number of ANC visits $(\leq 3, \geq 4)$, age at first birth in years (≤ 19 , ≥ 20), pregnancy intention (unintended, intended), mode of delivery (vaginal, cesarean). Community-level variables: place of residence (urban, rural), community level education (low, high), community level media exposure (low, high), and community poverty level (low, high).

Description of explanatory variables

Media exposure defined as "yes" if the mother was exposed to at least one of these media and "no" otherwise. It is created by combining the respondent's reading of newspapers or magazines, listening to the radio, and watching television.

Pregnancy intention reclassified as either intended (if the pregnancy was desired) or unintended (including both unplanned and mistimed).

Media exposure at the community level refers to the percentage of women who have been exposed to at least one media, such as a newspaper, radio, or television. This percentage is classified as low (communities where 50% or less of women are exposed) or high (communities where 50% or more of women are exposed) based on the national median value.

Education at the community level: the percentage of women who have completed at least primary school, as determined by information on respondents' educational attainment. Next, it was divided into two groups based on the national median value: low (communities where

Table 1	Sample size for c	quality of intrapartum	care and its associated f	factors in sub-saharan	African countries
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Country	Year of survey	Weighted sample (n)	Weighted sample (%)
Angola	2015-16	13,515	3.82
Burkina Faso	2010	14,647	4.14
Benin	2017-18	12,826	3.63
Burundi	2016-17	12,998	3.68
Congo Democratic Republic	2013-14	18,083	5.12
Congo	2011-12	8,928	2.53
Cote d'Ivoire	2011-12	7,319	2.07
Ethiopia	2016	10,066	2.85
Gabon	2019-21	5,770	1.63
Ghana	2014	9,039	2.56
Gambia	2019-20	8,165	2.31
Guinea	2018	6,784	1.92
Kenya	2022	19,198	5.43
Comoros	2012	2,570	0.73
Liberia	2019-20	5,481	1.55
Lesotho	2014	2,921	0.83
Madagascar	2008	12,122	3.43
Mali	2018	9,241	2.61
Malawi	2015-16	16,801	4.75
Mozambique	2011	10,725	3.03
Nigeria	2018	32,752	9.27
Niger	2019	12,203	3.45
Namibia	2013	4,775	1.35
Rwanda	2019-20	7,942	2.25
Sierra Leone	2019	9,591	2.71
Senegal	2019	5,963	1.69
Sao Tome and Principe	2008-09	1,897	0.54
Swaziland	2006-07	2,447	0.69
Chad	2014-15	17,858	5.05
Тодо	2013-14	6,752	1.91
Tanzania	2022	10,483	2.97
Uganda	2016	14,979	4.24
South Africa	2016	2,971	0.84
Zambia	2018	9,696	2.74
Zimbabwe	2015	5,975	1.69
Total sample size		353,483	100.00

at least 50% or less of women have completed primary school) and high (communities where 50% or more of women have completed primary education).

Community poverty level recoded as low and high community poverty level, as above. It is an aggregated variable derived from household wealth status (the percentage of women with poor and rich wealth status).

Data management and analysis

STATA/SE version 14.0 statistical software was used to clean, recode, and analyze data that was taken from the most recent DHS data sets. To control for non-responses and sampling errors, a sample weight was used. Continuous variables were categorized, and categorical variables were further re-categorized. The results were presented in frequencies and percentages using descriptive analysis. Descriptive statistical methods were used to present the variables at the individual and community levels. The variables in the DHS data were arranged into clusters; households were nested within 1692 clusters, and 353,483 women are nested within households. In order to use the conventional logistic regression model, the assumptions of independent observations and equal variance across clusters were broken. This suggests that accounting for between-cluster effects requires the use of a complex model. Multilevel mixed-effects logistic regression was therefore employed to identify the variables associated with the quality of intrapartum care. The null model (outcome variable only), model I (only individual-level variables), model II (only community-level variables), and model III (both individual and community-level

variables) are the four models that multilevel mixed effect logistic regression uses. The null model, which is a model devoid of independent variables, was employed to examine the variation in quality of intrapartum care across the cluster. The association of individual-level variables with the outcome variable (Model I) and the association of community-level variables with the outcome variable (Model II) were assessed. In the final model (Model III), the association of both individual and community-level variables was fitted simultaneously with the outcome variable (quality of intrapartum care).

Through the use of the intra-class correlation coefficient (ICC) and proportionate change in variance (PCV), the magnitude of the clustering effect and the extent to which community-level factors explain the unexplained variance of the null model were assessed. The best-fitting model was determined to be the one with the lowest deviance. Ultimately, factors were deemed statistically significant when they had a p-value of less than 0.05 and an adjusted odds ratio (AOR) with a 95% confidence interval (CI). A variance inflation factor (VIF) lying within acceptable limits of 1–10 was used to test for multi-collinearity amongst covariates, demonstrating the absence of significant collinearity among independent variables.

Random-effect results

Random effects or measures of variation of the outcome variable were estimated using the median odds ratio (MOR), ICC, and PCV. The variation between clusters was measured by the ICC and PCV. Taking clusters as a random variable, the ICC reveals that the variation in quality of intrapartum care between clusters is computed as ICC = $VC/(VC + 3.29) \times 100\%$. The MOR is the median value of the odds ratio between the area of the highest risk and the area of the lowest risk for quality of intrapartum care when two clusters are randomly selected, using clusters as a random variable; MOR = $e^{0.95\sqrt{VC}}$. In addition, the PCV demonstrates the variation in quality of intrapartum care explained by factors and computed as: PCV = (Vnull-VC)/Vnull×100%, where Vnull=variance of the null model and VC = cluster level variance [28]. The fixed effects were used to estimate the association between the likelihood of quality intrapartum care and individual and community-level independent variables.

Results

Individual- and community-level characteristics of study subjects

A total of 353,483 women were included in the present study. The mean age of respondents was 29.08 ± 0.01 years, and 70.21% of them fall in the age range of 20-34 years. More than one-third (39.91%) of women had no formal education, and 70.43% of them had jobs. Nearly

half (47.57%) of the study subjects had poor wealth status, and 61.96% of them had media exposure. Only 16.62% of women made health care decisions by themselves, and 73.85% of them had five or more family members. More than three-fourths (78.97%) of women were from maleheaded households, and 72.19% of them wanted their current pregnancy. More than one-third (34.86%) of women had five or more children ever born, and 71.04% of them had 4+ANC visits. The majority (95.22%) of women gave birth through the vagina, and 60.01% of them were aged nineteen and below at their first birth. More than half (58.67%) of the study subjects were from communities with low media exposure, and 70.27% of them were rural dwellers. More than half (53.52%) of women were from communities with low levels of education, and 53.51% of them were from communities with high levels of poverty (Table 2).

Quality of intrapartum care

In the current study, about 28.58% (95% CI: 28.43–28.73) of the study subjects had received quality intrapartum care. As part of the intrapartum care, 67.53% (95% CI: 67.37–67.68) gave birth in a health facility, 83.71% (95% CI: 83.59–83.84) obtained assistance from skilled birth attendants, and 39.27% (95% CI: 39.11–39.43) had their babies placed on the breast by birth assistants within the first hour (Fig. 1). The proportion of women who received quality intrapartum care was highest in Rwanda (62.96%) and lowest in Chad (2.74%) (Fig. 2).

Measures of variation and model fitness

A null model was used to determine whether the data supported the decision to assess randomness at the community level. Findings from the null model showed that there were significant differences in the quality of intrapartum care between communities, with a variance of 0.0438 and a P value of < 0.001. The variance within clusters contributed 86.87% of the variation in the guality of intrapartum care, while the variance across clusters was responsible for 13.13% of the variation. In the null model, the odds of quality of intrapartum care differed between higher- and lower-risk clusters by a factor of 1.22 times. The intra-class correlation value for Model I indicated that 21.02% of the variation in quality of intrapartum care accounts for the disparities between communities. Then, with the null model, community-level variables were used to generate Model II. According to the ICC value from Model II, cluster variations were the basis for 12.85% of the differences in quality of intrapartum care. In the final model (model III), which attributed approximately 21.72% of the variation in the likelihood of quality of intrapartum care to both individual and communitylevel variables, the likelihood of quality of intrapartum

Variables	Category	Frequency (<i>n</i>)	Percentage (%)
Respondent's age	15-19 years	21,490	6.08
	20-34 years	248,197	70.21
	35–49 years	83,796	23.71
Educational status	No education	141,087	39.91
	Primary	115,431	32.66
	Secondary/higher	96,965	27.43
Working status	Not working	104,524	29.57
	Working	248,959	70.43
Media exposure	No	134,452	38.04
	Yes	219,031	61.96
Household wealth index	Poor	168,152	47.57
	Middle	69,051	19.53
	Rich	116,280	32.90
Family size	≤4	92,445	26.15
	≥5	261,038	73.85
Health care decisions	Self	50,913	16.62
	Partner	139,433	45.52
	Jointly with partner	113,965	37.20
	Someone else	2,020	0.66
Sex of household head	Male	279,145	78.97
	Female	74,338	21.03
Pregnancy intention	Unintended	98,318	27.81
	Intended	255,165	72.19
Number of antenatal care visits	≤3	102,386	28.96
	≥4	251,097	71.04
Number of children ever born	≤2	120,025	33.95
	3–4	110,232	31.18
	≥5	123,226	34.86
Age at first birth	≤ 19 years	212,119	60.01
	≥ 20 years	141,364	39.99
Mode of delivery	Vaginal	336,603	95.22
	Cesarean	16,880	4.78
Place of residence	Urban	105,098	29.73
	Rural	248,385	70.27
Community media exposure	Low	207,386	58.67
	High	146,097	41.33
Community-level education	Low	189,176	53.52
	High	164,307	46.48
Community poverty level	Low	164,328	46.49
	High	189,155	53.51

Table 2 Individual- and community-level characteristics of study subjects, pooled data from 35 SSA countries, DHS 2006–2022

care varied by 1.30 times across low and high quality of intrapartum care (Table 3).

Individual- and community-level factors associated with the quality of intrapartum care

In the final fitted model of multivariable multilevel logistic regression, the respondent's age, educational status, working status, media exposure, household wealth index, family size, healthcare decisions, sex of the household head, ANC visits attended during pregnancy, number of children ever born, age at first birth, mode of delivery, residence, community media exposure, and community-level education were significantly associated with quality of intrapartum care.

The odds of quality intrapartum care were 1.49 times higher among women aged 35-49 years compared with those aged 15-19 years [AOR = 1.49; 95% CI (1.42, 1.57)]. Women who completed primary and secondary/higher education were 1.78 and 1.80 times more likely to receive quality intrapartum care than those who had no formal education, respectively [AOR = 1.78; 95% CI (1.74, 1.81)] and [AOR = 1.80; 95% CI (1.76, 1.85)]. Working women were 1.03 times more likely to receive quality intrapartum care than non-working women [AOR = 1.03; 95%



Fig. 1 Components of intrapartum care received by study subjects



Fig. 2 Proportion of women who received quality intrapartum care by country

CI (1.01, 1.05)]. Women who had media exposure were 1.19 times more likely to receive quality intrapartum care than their counterparts [AOR = 1.19; 95% CI (1.16, 1.21)]. Women with middle and rich wealth status were 1.26 and 1.53 times more likely to receive quality intrapartum care than those with poor wealth index, respectively [AOR = 1.26; 95% CI (1.23, 1.29) and [AOR = 1.53; 95% CI (1.49, 1.56)]. Women who had five or more family members were 10% less likely to receive quality intrapartum

care than those who had three or fewer family members [AOR = 0.90; 95% CI (0.88, 0.92)].

The odds of quality intrapartum care were 1.04 times higher among women who made health care decisions jointly with their partner compared with those who made decisions by themselves [AOR = 1.04; 95% CI (1.01, 1.06)]. Female-headed households were 1.08 times more likely to receive quality intrapartum care than male-headed households [AOR = 1.08; 95% CI (1.05, 1.10)]. Women who attended 4+ANC visits were 40% less likely to

2000 2022 (11-555,105)				
Parameter	Null model	Model I	Model II	Model III
Variance	0.0437737	0.0706506	0.0428404	0.0730546
ICC	13.13%	21.02%	12.85%	21.72%
MOR	1.22	1.28	1.21	1.30
PCV	Reference	61.40%	21.32%	66.89%
Model fitness				
LLR	-210936.97	-168937.09	-209445.13	-168828.56
Deviance	421,873.94	337,874.18	418,890.26	337,657.12

Table 3 Model comparison and random effect analysis for quality of intrapartum care and its associated factors in SSA countries, DHS 2006–2022 (*n* = 353,483)

ICC: Intra cluster correlation; LLR: log-likelihood ratio; MOR: median odds ratio; PCV: Proportional change in variance

receive quality intrapartum care than those who attended three or fewer visits [AOR = 0.60; 95% CI (0.59, 0.61)]. Women who had 3-4 and 5+children ever born were 24% and 43% less likely to receive quality intrapartum care than women who had two or fewer children, respectively [AOR = 0.76; 95% CI (0.74, 0.78)] and [AOR = 0.57; 95% CI (0.55, 0.58)]. Women aged ≥ 20 years at their first birth were 1.06 times more likely to receive quality intrapartum care compared with those aged \leq 19 years [AOR = 1.06; 95% CI (1.04, 1.08)]. Women with cesarean delivery were 29% less likely to receive quality intrapartum care than those with vaginal delivery [AOR = 0.71; 95% CI (0.68, 0.73)]. Urban dwellers were 1.09 times more likely to receive quality intrapartum care compared with women who reside in rural areas [AOR = 1.09; 95% CI (1.06, 1.11)]. Women from communities with high media exposure were 16% less likely to receive quality intrapartum care [AOR = 0.84; 95% CI (0.80, 0.88)]. Furthermore, women from communities with high education levels were 13% less likely to receive quality intrapartum care compared with their counterparts [AOR=0.87; 95% CI (0.83, 0.91)] (Table 4).

Discussion

In the present study, about 28.58% (95% CI: 28.43–28.73) of the study subjects had received quality intrapartum care. This finding was higher than studies conducted in Ethiopia (13%, 23.8%, and 27.3%) [29-31]. On the other hand, the finding of the present study was lower than studies conducted in Ethiopia (43%, 29.2%) [26, 32] and Kenya (52.6%) [27]. The possible justification for this discrepancy might be attributed to variations in the study area, sample size, geographical variations, societal distinctions, and the accessibility of quality intrapartum care services between nations. The disparity may also result from variations in health care providers understanding of and attitudes regarding the components of intrapartum care services and their utilization. Another explanation for the discrepancy could be related to the methods used for evaluating quality; the current study included three important factors from the DHS, while other studies employed checklists that included extra variables, including labour stages and the availability of healthcare facilities.

The multivariable multilevel logistic regression analysis revealed that the odds of quality intrapartum care were higher among women aged 35-49 years compared with those aged 15-19 years. This finding was in agreement with a study conducted in India [33]. Given that pregnant women over 35 are more likely to experience gestational diabetes, placenta praevia, breech presentation, operative vaginal delivery, elective and emergency Caesarean section, postpartum hemorrhage, delivery before 32 weeks gestation, low birthweight, and stillbirth [34], it is possible that healthcare professionals might be more watchful during the birth of the older mother's child. However, this finding contradicts a study from Ethiopia, where teenage mothers had higher odds of receiving quality intrapartum care [26]. In order to address each older pregnant woman's unique requirements within maternity services, it is critical for healthcare personnel to understand the different emotions and experiences that older pregnant women may have. Women who completed primary and secondary/higher education were more likely to receive quality intrapartum care than those who had no formal education. This finding was consistent with studies conducted in Ethiopia [26, 31], Uganda [35], and Kenya [27]. This might be because they are more likely to seek medical attention; mothers with higher levels of education are also more likely to recognize the advantages of receiving high-quality healthcare as well as the morbidities and mortality associated with pregnancy [36]. This finding suggests that, in order to better enable women to obtain maternal health care, education is an indicator that has to be improved.

Working women were more likely to receive quality intrapartum care than non-working women. This finding was supported by a study conducted in Kenya [27]. According to studies, working women are more likely to have a better intrapartum experience since they have the means and ability to prepare for any needs during birth [37, 38]. Women who had media exposure (e.g., television, radio, and newspapers) were more likely to receive quality intrapartum care than their counterparts. A study

Variables	Category	Model I AOR (95% Cl)	Model II AOR (95% CI)	Model III AOR (95% CI)
Respondent's age	15–19 years	1.00		1.00
	20–34 years	1.04 (0.99, 1.08)		1.04 (0.99, 1.08)
	35–49 years	1.49 (1.42,1.57)*		1.49 (1.42,1.57)*
Educational status	No education	1.00		1.00
	Primary	1.77 (1.73,1.81)*		1.78 (1.74,1.81)*
	Secondary & above	1.80 (1.76,1.84)*		1.80 (1.76,1.85)*
Working status	Not working	1.00		1.00
-	Working	1.03 (1.01,1.05)*		1.03 (1.01,1.05)*
Media exposure	No	1.00		1.00
	Yes	1.19 (1.16,1.21)*		1.19 (1.16,1.21)*
Household wealth index	Poor	1.00		1.00
	Middle	1.27 (1.24,1.30)*		1.26 (1.23,1.29)*
	Rich	1.58 (1.55,1.61)*		1.53 (1.49,1.56)*
Family size	≤4	1.00		1.00
	≥5	0.90 (0.88,0.92)*		0.90 (0.88,0.92)*
Health care decisions	Self	1.00		1.00
	Partner	0.70 (0.68,0.72)*		0.70 (0.68,0.72)*
	Jointly with partner	1.04 (1.01,1.06)*		1.04 (1.01,1.06)*
	Someone else	0.70 (0.63,0.78)*		0.70 (0.63,0.78)*
Household head	Male	1.00		1.00
	Female	1.08 (1.06,1.11)*		1.08 (1.05,1.10)*
Pregnancy intention	Unintended	1.00		1.00
	Intended	1.01 (0.99, 1.03)		1.01 (0.99, 1.03)
Antenatal care visits	≤3	1.00		1.00
	≥4	0.60 (0.59,0.62)*		0.60 (0.59,0.61)*
Number of children ever born	≤2	1.00		1.00
	3–4	0.76 (0.74,0.78)*		0.76 (0.74,0.78)*
	≥5	0.56 (0.55,0.58)*		0.57 (0.55,0.58)*
Age at first birth	≤ 19 years	1.00		1.00
-	≥ 20 years	1.06 (1.04,1.08)*		1.06 (1.04,1.08)*
Mode of delivery	Vaginal	1.00		1.00
	Cesarean	0.71 (0.68,0.74)*		0.71 (0.68,0.73)*
Residence	Urban		1.56(1.54,1.59)*	1.09 (1.06,1.11)*
	Rural		1.00	1.00
Community media exposure	Low		1.00	1.00
	High		0.91(0.87,0.94)*	0.84 (0.80,0.88)*
Community-level education	Low		1.00	1.00
	High		0.99 (0.95, 1.03)	0.87 (0.83,0.91)*
Community poverty level	Low		1.07(1.04,1.11)*	1.04 (0.99, 1.09)
	High		1.00	1.00

 Table 4
 Multivariable multilevel logistic regression analysis of individual- and community-level factors associated with quality of intrapartum care in SSA countries, DHS 2006–2022

*Statistically significant at p value < 0.05

conducted in South Asia reported a similar finding, in which maternal healthcare utilization is significantly higher among women exposed to mass media [39]. Mass media-exposed mothers are 46–86% more likely to obtain prenatal care, 24–53% more likely to give birth to their child with the assistance of a trained birth attendant, and 36–94% more likely to have postpartum check-ups after giving birth [39]. This suggests that it would be beneficial to support the use of mass media initiatives to spread

awareness of maternal health issues and encourage pregnant mothers to seek out maternal healthcare services.

Women with middle and rich wealth status were more likely to receive quality intrapartum care than those with a poor wealth index. This finding was consistent with studies conducted in Ethiopia [26, 31]. This is due to the fact that women from lower socioeconomic classes may have particular concerns and feel unworthy of assistance, which consequently reduces the minimal standard of health care [40]. Additionally, the expense of traveling to far-off medical facilities adds indirectly to the cost of high-quality intrapartum treatment, which pregnant women from wealthy homes can easily afford [41]. Thus, access to high-quality healthcare services is influenced by economic differences in getting maternal or reproductive health services [42, 43]. Women who had five or more family members were less likely to receive quality intrapartum care than those who had three or fewer family members. Similarly, women who had 3–4 and 5+children ever born were less likely to receive quality intrapartum care than women who had two or fewer children. This might be due to the fact that mothers with larger families could feel overconfident due to their prior pregnancy experiences [44].

The odds of quality intrapartum care were higher among women who made health care decisions jointly with their partner compared with those who made decisions by themselves. A study conducted in Nepal reported a similar finding [45]. In order to ensure maternal health and a safe delivery, fathers do play a crucial role. Given the possible advantages for mother and child health outcomes, male involvement in health education has to be acknowledged and addressed [45]. Femaleheaded households were more likely to receive quality intrapartum care than male-headed households. This finding was supported by studies conducted in Ethiopia [46], Gabon [43], and Indonesia [47], in which the odds of maternal healthcare utilization increase with a female head. Compared to women from male-headed households, women in female-headed households were more likely to use facility-based delivery [48]. Because femaleheaded households have more autonomy and decisionmaking ability than their male-headed counterparts, a larger portion of the household budget goes toward maternal healthcare services [49].

Women who attended 4+ANC visits were less likely to receive quality intrapartum care than those who attended three or fewer visits. This finding was inconsistent with a study conducted in Ethiopia [26]. This is an indication that the timing of the first antenatal care visit among pregnant mothers is the most important parameter to improve maternal and child health, rather than focusing on the number of ANC visits. Women aged \geq 20 years at their first birth were more likely to receive quality intrapartum care compared with those aged \leq 19 years. Due to their lack of prior birthing experience, first-time mothers who are 19 years of age or younger may be more susceptible to negative interactions with caregivers. Giving inexperienced mothers extra care during childbirth is crucial since the first birth can affect decisions made about subsequent pregnancies. Women with cesarean deliveries were less likely to receive quality intrapartum care than those with vaginal deliveries. This finding was consistent with a study conducted in Kenya [27]. This may be explained by a number of cesarean section-related problems, such as heavy bleeding, abdominal pain, and incisional hernias, that require numerous treatments to treat [50]. Apart from being inherently uncomfortable and unfamiliar for mothers, cesarean section procedures involve a lot more apparatus than vaginal deliveries, which increases the risk of mishaps. Furthermore, urban dwellers were more likely to receive quality intrapartum care compared with women who reside in rural areas. This finding was in agreement with studies conducted in Ethiopia [26, 31]. Transportation and access to medical facilities are two factors that may contribute to the poor quality of intrapartum care in rural areas [36]. Compared to women who live in urban areas, conditionally pregnant women from rural areas may have challenges like poor road conditions and lengthy travel to medical facilities [51]. In addition, urban women are better educated, better informed, live closer to medical facilities, and are more exposed to the media.

Strengths and limitations of the study

The present study has the following strengths: First, a large sample size was produced using weighted nationally representative data from 35 SSA countries. Second, a multilevel mixed-effects analysis was performed to take into consideration the hierarchical structure of the DHS data and produce a trustworthy estimate. Third, because this study makes use of aggregated data from national surveys, program administrators and policymakers could utilize the findings as a starting point for developing appropriate intervention strategies to improve the quality of intrapartum care. This study has its shortcomings as well. Firstly, the DHS survey relied on self-reports from respondents, which means that recall and social desirability biases could have influenced the study's findings. Second, it was impossible to ascertain the cause-andeffect relationship between the variables due to the crosssectional nature of the data. Moreover, as DHS data does not have comprehensive indicators for measuring quality of intrapartum care, the definition of the outcome variable may not be comprehensive.

Conclusions

In the present study, less than one in three mothers had received high-quality intrapartum care. Respondent's age, educational status, working status, media exposure, household wealth index, healthcare decisions, sex of the household head, age at first birth, and residence were associated with the quality of intrapartum care. Health policy makers and program planners should empower women through comprehensive education and mass media campaigns in order to maximize the quality of intrapartum care. It is also advised that each country's Ministry of Health assess its community health professionals and medical facilities in order to boost funding for rural inhabitants and lower-class households.

Abbreviations

AOR A	djusted Odds Ratio
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- CI Confidence Interval
- DHS Demographic and Health Survey
- ICC Intra-class Correlation Coefficient LMICs Low- and Middle-Income Countries
- MOR Median Odds Ratio
- PCV Proportional Change in Variance
- SSA Sub-Saharan Africa
- VIF Variance Inflation Factor
- WHO World Health Organization

Acknowledgements

We are grateful to the DHS program for letting us use the relevant DHS data in this study.

Author contributions

Conceptualization, data curation, formal analysis, investigation, methodology, and software were done by E.G.M. and M.S.A. Supervision and validation were done by M.S.A. Visualization and writing the original draft were done by E.G.M. Writing, reviewing, and editing were done by E.G.M. and M.S.A. All authors gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

Not applicable.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethical approval and consent to participate

Before starting the study, permission was given to download and utilize the data from https://dhsprogram.com/data/available-datasets.cfm. The Institution Review Board of ICF International's DHS Program granted ethical approval. The Institution Review Board gave its approval to the DHS publicuse data set procedures. Names of persons or household addresses were not included in the data files, and identifiers for respondents, households, or sample communities were prohibited in any manner. There are no labels on the data file that list the names or locations of any of the EA numbers. Since the study's data set was made available to the public, neither patients nor members of the public were participating.

Consent for publication

Not applicable.

Competing interests

The authors declared that there was no competing interest.

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Received: 25 May 2024 / Accepted: 13 February 2025 Published online: 24 February 2025

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