Pregnancy Care Practices among Childbearing Adolescents and Young Mothers in sub-Saharan Africa

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Abstract

Background: Almost a quarter of adolescent women are mothers by age 16 years in sub-Saharan Africa (SSA), and this is a major contributory factor to the estimated 545 maternal deaths per 100,000 live births in the region. Pregnancy care reduces the risk of birth complications and improves maternal and fetal health. However, evidence is sparse on pregnancy care practices among childbearing adolescents [15-19 years] and young mothers [20-24 years] (CAYM) in SSA. Such evidence is crucial for addressing the high maternal mortality in SSA.

Methods: Data were extracted from the latest Demographic and Health Surveys (DHS) of sixteen countries in SSA. A pooled weighted sample of 34,276 women aged 15-24 years with childbirth experience in the previous year was analyzed. Adjusted generalized linear models were fitted to identify the predisposing, enabling, and need factors that influenced CAYM's pregnancy care practices in SSA. Data analysis was performed using STATA 14 at a 95% confidence interval.

Results: Overall, young adults reported a higher prevalence of good pregnancy care compared to adolescents (4.7% vs. 2.9%). The prevalence ranged from 1.0% and 2.2% in East Africa (lowest) to 8.9% and 10.6% in West Africa (highest) for adolescent and young mothers, respectively. Wealth status was a significant enabling factor as the middle class and the rich had 2% (coef.=0.02; CI:0.01-0.03) and 5% (coef.=0.05; CI:0.04-0.06) higher likelihood, respectively, than the poor. Rural residents had a lower likelihood (coef.=-0.04; CI: -0.05 -0.03) than urban residents, while women with good media exposure had a higher likelihood to engage in pregnancy care practices. The likelihood of good pregnancy care increased consistently and significantly with higher education as the coefficients were 0.03 (CI:0.02-0.05) for primary education, 0.07 (CI:0.05-0.08) for secondary education, and 0.11 (CI:0.08-0.14) for tertiary education. Adolescent mothers who reportedly wanted the pregnancies when conceived had a 3% significantly higher likelihood of pregnancy care practices than their counterparts with unwanted pregnancies.

Conclusion: Good pregnancy care practice is very low among CAYM in SSA. There is a need for additional public health interventions to prevent unwanted pregnancies to halt poor pregnancy care in SSA. Also, CAYM need to be enabled, as shown in the Anderson model's adaptation, to be able to access pregnancy care services.

Keywords: Pregnancy care, Childbearing Adolescents, Young Women, sub-Saharan Africa

BACKGROUND

According to the World Health Organization [1] estimates, about 800 pregnant women died every day in 2020 globally, while over 9 of every 10 such deaths occurred in LMICs. About 70% of global maternal deaths are concentrated in SSA. One of the contributing factors to high maternal deaths in SSA is adolescent fertility, estimated at 104 births per 1000 women aged 15–19 years within the region. Adolescents are often noted to have an increased risk of death during pregnancy or childbirth compared with older women, and the risks are greater for younger adolescents 15 years or younger (570 deaths) than older adolescents (510) [2]. There is convergence of evidence in some SSA countries that adolescent pregnancy contributes significantly to the high maternal mortality in the region [3, 4]. For instance, Liberia still records 1,072 maternal deaths per 100,000 live births [5]. Infant mortality rates in Nigeria and Sierra Leone are 68 and 78 per 1,000 live births, both of which are higher than the Sustainable Development Goal (SDG) Target by 2030. A study in Nigeria showed that over 3 of every 10 maternal deaths are related to adolescent pregnancy [6]. There is other evidence across the globe on the substantial contribution of adolescent pregnancy to high maternal mortality [2, 7 – 9] due to their high risk of obstetric complications [10].

Unlike their counterparts (mothers aged >24 years) who may already have some level of information and experience that help them safely navigate through pregnancy stages, adolescents and young women (AYW) are bereft of experience and knowledge helpful to mitigating pregnancy risks [11]. Moreover, most pregnancies among AYW may be unwanted, and most of them lack spousal support because they are predominantly unmarried. Also, due to the prevailing socio-cultural norms against premarital pregnancies in many African settings [12], unmarried AYWs who are pregnant may be castigated and poorly cared for by their own families. In some instances, they experience stigmatization by the health care providers. These put them at a social disadvantage, making institutional care lifesaving to them.

Pregnancy care (PC) promotes maternal and fetal health and reduces the risk of birth complications [13]. PC within this context refers to the continuum of healthcare and health-promoting information that women receive before and during pregnancy. An integral part of PC is antennal care visits, which the World Health Organization (WHO) recommends that women undertake at least eight times during pregnancy [14]. The recommended number of antenatal care (ANC) visits is important to women and fetal health as it allows healthcare providers to monitor the pregnancy and identify potential complications [15]. Moreover, in the developed countries of Europe and America, standardized healthcare packages for pregnant women make it feasible for the number of ANC visits to sufficiently reflect the amount and type of care [16]. The practice in sub-Saharan African countries differs significantly [17]. In some contexts, for instance, some health facilities perform blood and urine tests on all pregnant women. In contrast, in others, such screenings are either not available or will not be performed until patients show specific symptoms [18]. Meanwhile, blood and urine screenings are an important part of PC.

Blood screening enables the detection of diseases like HIV, syphilis, and hepatitis B in pregnant women, which, if tested positive, would provoke interventions that would protect the baby from being infected [19]. The prevention of mother-to-child transmission of HIV is an important health intervention that thrives on blood screening. Through urine screening, pregnant women's status or vulnerability to preeclampsia and gestational diabetes, which are leading causes of birth complications and maternal deaths [20, 21], is determined. Also, the WHO-recommended tetanus steroid injection for pregnant women is a part of PC. This anti-tetanus injection is recommended for pregnant women, particularly those from developing countries where the sub-optimal sanitary conditions in infant delivery settings make newborns vulnerable [22]. In 2018 alone, 25,000 newborns died from neonatal tetanus, 88% of which occurred in SSA [22]. Some other PC components are tablets for iron/folic acid supplements, drugs for intestinal parasites, and malaria medicines. Iron deficiency in pregnancy impairs the functioning of the immune system [23] and increases the risk of stillbirths, congenital abnormalities, and perinatal mortality [24, 25].

Global and regional health actors have recognized the important health benefits of PC and have formulated specific goals for improving women's PC practices. One such is the Sustainable Development Goals (SDG 3) developed by the United Nations in 2015 [26]. The SDG3 advocates healthy lives and well-being for all, including women and newborns. Some important targets of SDG3 are to reduce the global mortality ratio to less than 70 per 100,000 live births, end preventable deaths of newborns, and reduce neonatal mortality to no more than 12 per 1,000 live births. Ending the epidemics of AIDS and combatting hepatitis are also some of the targets of SDG3, which could be addressed through PC practices. At the regional level, the African Union, in 2013, formulated the Agenda 2063, which is in sync with the SDGs. Specifically, the third goal of Agenda 2063 aims to ensure that Africa is inhabited by healthy lives and well-nourished citizens, while the seventeenth advocates full gender equity in all spheres of life. Promoting gender equity is synonymous with promoting women's health in Africa, given the prevailing patriarchy in the region. The implementation of these goals has yielded important improvements in health and social indicators. For instance, the World Bank data show that the infant mortality rate declined worldwide from 32 to 27 per 1,000 live births between 2015 and 2021. In Norway, the infant mortality rate is 2 per 1,000 in 2021 (from 5 in 2015). Morocco in North Africa also has 15 per 1,000 in 2021 (from 20 in 2015).

Studies across SSA suggest that PC is generally at a sub-optimal level. For instance, a study reported that an average of 53% of pregnant women in SSA completed ANC visits during pregnancy [27]. Another study reported a 76% prevalence of skilled ANC visits in SSA [28]. These studies, however, did not report pregnancy care practices as a variable generated from the key components of pregnancy care, including the number of antenatal care visits (ANC), receipt of tetanus injection, iron tablet/syrup, Fansidar for malaria, a drug for intestinal parasites, and screening for blood and urine. Region of residence and wealth status were significantly associated with the reported 56% uptake rate of tetanus toxoid injection among pregnant women

in Nigeria [29]. Educational attainment was significantly associated with the nearly 29% rate of receipt of folic acid tablets during pregnancy in SSA countries [30]. While these studies have provided important information, they all shifted their focus away from the population who are in peculiar need of PC (i.e., AYW). Moreover, none of the studies investigated the completeness of PC and the factors associated with it among AYM.

This current analysis is guided by Anderson's Model of Healthcare Utilization, which posits that women's utilization of PC services during pregnancy is influenced by the dynamics of their predisposing, enabling, and need factors. According to the model, the predisposing factors would enable women to understand the benefits of PC, and this would enable them to utilize the services. The enabling factors are the women's socio-economic circumstances (such as education and income levels), which would offer them the resources and support they need to utilize PC services. The need factors reflect women's perception of their own health service needs. By virtue of their pregnancy, all women require pregnancy care. However, the PC package may be crucial and lifesaving to some more than others. Adolescent pregnancy constitutes a health risk, and unwanted pregnancy creates peculiar psychological and emotional challenges that negatively impact health [31]. This analysis is therefore aimed at contributing to the body of evidence on the levels of PC care and the predisposing factors to the PC practices among AYW in SSA.

METHODS

- Data and Participants

The study utilized secondary data obtained with permission from ICF, which is the implementer and primary owner of Demographic and Health Surveys (DHS) conducted in countries around the world. DHSs are funded by the United States Agency for International Development (USAID) in collaboration with individual countries. The surveys are cross-sectional design with a multi-stage, clustered, and stratified sampling design, using the most recent census of the individual countries as the sampling frame. Depending on the administrative nomenclatures adopted in each country, the multi-stage sampling typically starts from the districts/states and continues up to the last stage, which involves the selection of clusters from which households are selected. Eligible participants, i.e., women aged 15-49 years and men aged 15-65 years, were sampled within each household, thus making the survey nationally representative. Further details on the methodologies used for the implementation of DHSs are available on dhsprogram.com.

In this study, women's recode from the most recent DHS conducted in sixteen (16) countries across SSA were pooled. Based on data availability, two countries each were randomly selected (making four countries) from each of the four regions of SSA (Eastern, Southern, Central, and Western Africa). The present study analyzed a weighted sample of 34,276 women aged 15-24 years who had births within the previous year. 'Currently' pregnant women were excluded because the study evaluated the completeness of pregnancy care throughout the referenced pregnancy.

- Measures

The outcome variable is pregnancy care practices. This refers to women's involvement in specific care practices during their most recent pregnancy. These are the number of antenatal care visits (ANC), receipt of tetanus injection, iron tablet/syrup, Fansidar for malaria, a drug for intestinal parasites, and screening for blood and urine. This care package represents the minimum intervention recommended by the WHO for pregnant women in developing countries and the pregnancy-related care indices captured in the DHSs. ANC visits were grouped into four levels as (0, 1-3, 4-7, and 8+. Receipt of tetanus steroid injection was grouped into those who received none, 1-2 (incomplete), and 3+, which is the recommended minimum by the WHO. Others were measured as yes/no questions as to whether women received them or not. The seven pregnancy care variables were aggregated to generate a composite (count) variable, which ranged from 0 to 10. The generated count variable was further disaggregated into three levels in which values below the 50^{th} percentile (0-4) were grouped as 'poor pregnancy care. Values from the 75^{th} percentile (8-10) were grouped as 'good pregnancy care' while others (5-7) were grouped as 'fair pregnancy care'. This was done in line with one of the methodologies used in generating composite measures using DHS datasets [32, 33).

The independent variables were grouped into enabling, predisposing, and needs factors in consonance with Anderson's Model of healthcare utilization. The enabling factors were wealth status and marital support (proxied by marital status). These factors encompass the availability of financial resources and partnerships that enable women to access pregnancy care services [34]. Marital status was measured as women who were married, cohabiting, and others to show their level of involvement in marital partnership. Wealth status was grouped into poor, middle, or rich.

The predisposing factors are educational levels, type of place of residence, and media exposure, which could influence women's understanding of the importance of pregnancy care practices. Educational levels were measured as none, primary, secondary, and tertiary. The type of place of residence was measured as women either living in urban areas or rural areas. This could predispose women to pregnancy care because residence determines proximity to healthcare facilities [35] where pregnancy care services are provided. Media exposure was measured in the DHS as the frequency of reading newspapers, watching television, and listening to the radio, with response groups saying 'not at all, less than once a week, or more than once a week.' Women who responded 'not at all' to all three media were grouped as 'poor media access' while others were grouped as 'good media access.' This variable is used as a predisposing factor on the assumption that these media outlets do release contents that expose women to health information. Also, the significant influence of media exposure on healthcare service utilization has been reported [36]. The need factors are pregnancy status, measured as wanted or unwanted, and respondents' age, measured as adolescent (14-19) or young women (20-24). Women who responded that their pregnancy was 'wanted later' or 'no more' were grouped as those with 'unwanted,' while others were grouped as 'wanted.' The groups in special need of pregnancy care were conceptualized as women with unwanted pregnancies because they typically lack the physical and emotional preparation to support pregnancy [37] and adolescents because of the biological risks posed by their pregnancies.

- Data Analysis

We carried out a descriptive analysis to show the prevalence of pregnancy care practices among adolescents and young mothers across the countries and regions of SSA. Cross tabulations were

performed to show variations in pregnancy care practices across different levels of the explanatory variables. We fitted an empty generalized linear model to ascertain variation in pregnancy care practices without the influence of the explanatory variables. At the bivariate level of analysis, generalized linear models (GLM) were fitted, and their coefficients were used to estimate the crude main effect of each of the explanatory variables on pregnancy care practices. Fitting GLM models are appropriate when the outcome measure variable is a count variable and not necessarily normally distributed [38]. Given the complexity of the survey design adopted in DHS implementation, the 'subpop' command of Stata 14 [39] was applied with the svy command to produce valid estimates of the standard errors of the fitted GLM coefficients [40].

The outcome variable used in the GLM model is the pregnancy care practice in its count form (1-10). Four levels of GLM models were fitted. Models 1 and 2 involved estimating the effect of pregnancy status and age, respectively, on pregnancy care practices. Model 3 (adjusted) estimated the effect of all the background characteristics on pregnancy care practices, while the final model (model 4[adjusted]) fitted the effect of all the study variables on the outcome. Model 4 formed the basis of the discussion of findings and the study's conclusion. A variance inflation factor (VIF) analysis was carried out to detect eliminating collinear variables. The rule of dumb was adopted, in which any variable with a VIF of 5+ would be dropped [41]. However, using the rule, no multicollinearity was found among the explanatory variables. Stata 14 [39] was used for data analysis, and statistical significance was accepted at a 95% confidence interval.

- Ethical considerations

The ICF's Ethical Review Board reviewed and approved the survey protocol, including questionnaires, of all DHSs. We got written authorization from ICF and MEASURE DHS to use the DHS dataset for the selected countries in this study. The data analyzed in the study are publicly available via https://dhsprogram.com/data/.

RESULTS

Table 1 presents results on the pregnancy care practices of childbearing adolescents and young adults in SSA countries. The results show that in all the SSA countries, young women had higher levels of practice than adolescents for all components of pregnancy care. Specifically, 2% and 6.6% of adolescents and young women received complete tetanus injections, respectively. While 6.6% of young women had 8+ antenatal care visits, 5.3% of adolescents had the same number of antenatal care visits. Also, more young women (83.1%) than adolescents (78.6%) had their blood specimens screened, and the same pattern was observed for urine screening, which 59.4% of adolescents did, compared with 62.8% of young women.

Regarding overall pregnancy care practices in all the SSA countries, only 2.9% of adolescents and 4.7% of young women had it well. However, the results show disparities in pregnancy care practices across the different regions of SSA. The proportion of 8+ antenatal care visits in East Africa was 2.1% and 2% for adolescents and young women, respectively, while in Western

Africa, it was much higher at 15.2% and 17.6%, respectively. About 84.1% of young women in Western Africa, compared with 38.9% in Central Africa, took malaria drugs during pregnancy. A huge majority (91.6%) of adolescents in Southern Africa, compared with 58.6% of adolescents in East Africa, did blood screening during pregnancy. The receipt of iron supplements by adolescents during pregnancy was 92.7% (highest prevalence) in Western Africa but relatively low in Eastern Africa (69.1%).

The highest proportion (52%) of adolescents with poor pregnancy care practices was recorded in Eastern Africa, followed by Central Africa (40%), while the least was recorded in Western Africa (12%). A common pattern observed in all the regions, however, is that all of them recorded less than 10% prevalence of good pregnancy care practices among adolescents, ranging from a low of 1% in Eastern Africa, 1.1% in Southern Africa, 1.7% in Central Africa to 8.9% in Western Africa. Across countries, nearly 1 in 4 (24.4%) of every childbearing young woman in Ghana had at least eight antenatal care visits, compared with Senegal (0%), where no young woman had up to 8 antenatal care visits. While only 28.3% and 42.4% of adolescents in Madagascar did urine and blood screening, respectively, 90.5% and 94.8% of adolescents in Kenya, 95.2% and 98.5% of adolescents in Namibia did urine and blood screenings. The highest prevalence of good pregnancy care practices across countries was 18.3% and was recorded in Sierra Leone. This was followed by Ghana (17.7%) and Senegal (9.9%). Apart from Lesotho, which had no childbearing adolescents who practiced good pregnancy care, the lowest prevalence of good practices among childbearing adolescents was 0.2%, which was reported in Lesotho. Chad followed this with 0.4% and Burundi with 0.5%.

Table 1: Pregnancy Care Practices among Childbearing Adolescents and Young Women in SSA countries

					Antenatal Care visits (8+)	Complete Tetanus Injection	Received Iron Tablet/Syrup	Took Fansidar for Malaria	Took Drugs for Intestinal Parasites	Urine Screened	Blood Screened	Facility Delivery
	N	Year		n	%	%	%	%	%	%	%	%
All	34276		15-19	8382	5.3	2.0	82.4	54.3	43.7	59.4	78.6	59.9
			20-24	25894	6.6	6.6	82.8	54.2	45.7	62.8	83.1	61.3
Eastern Africa	9321		15-19	2248	2.1	1.0	69.1	41.7	52.6	49.2	58.6	63.3
			20-24	7073	2.0	4.9	74.6	34.8	53.2	57.7	68.9	67.3
Madagascar	3265	2021	15-19	975	1.8	1.6	76.6	57.5	64.5	28.3	42.4	43.8
			20-24	2290	2.2	6.4	82.7	51.5	68.5	32.6	47.1	43.9
DR Congo	3061	2014	15-19	785	2.3	0.5	59.6	35.7	51.5	50.6	55.6	80.4
			20-24	2276	2.1	4.4	66.2	36.8	58.0	49.9	60.1	78.9
Rwanda	1071	2020	15-19	124	0.0	0.6	78.0	0.0	38.9	83.1	98.4	97.6
			20-24	947	0.0	3.2	80.6	0.0	41.2	87.3	97.2	97.1
Kenya	1924	2014	15-19	364	3.5	1.0	66.8	26.9	27.8	90.5	94.8	66.8
			20-24	1560	2.7	4.4	71.3	28.5	30.9	88.0	96.8	66.7
Central Africa	7393		15-19	1960	2.9	2.5	80.0	40.2	41.5	63.7	78.3	48.0
			20-24	5433	3.7	10.0	72.7	38.9	49.3	59.5	83.0	41.0
Chad	2409	2014	15-19	809	0.6	0.7	84.1	32.0	34.7	42.0	54.6	36.0
			20-24	1600	1.2	2.9	83.2	35.4	34.8	46.0	57.8	35.9
Cameroun	1823	2018	15-19	549	3.8	2.9	89.6	82.1	35.1	86.8	97.4	55.9
			20-24	1274	7.8	5.7	91.4	85.3	33.8	92.1	97.0	56.7
Burundi	1954	2017	15-19	229	0.9	7.3	34.2	23.9	55.4	41.6	90.1	25.0
			20-24	1725	0.4	21.9	39.6	23.9	64.0	30.6	89.1	21.2
Gabon	1207	2012	15-19	373	7.5	10.4	85.0	6.0	57.1	90.0	94.3	76.4
			20-24	834	8.7	45.4	92.7	6.0	70.3	95.5	97.3	67.9
Southern Africa	9641		15-19	2402	2.9	3.2	89.1	54.8	36.2	46.5	90.6	63.7
			20-24	7239	2.9	8.7	89.8	59.3	37.9	49.1	91.6	68.2
Lesotho	942	2014	15-19	210	7.1	3.2	73.9	0.0	0.0	77.4	94.3	65.5
			20-24	732	9.6	5.4	80.5	0.0	0.0	82.3	97.8	67.2
Mozambique	1784	2015	15-19	807	0.8	2.8	89.3	38.9	28.3	49.8	85.0	23.4
			20-24	977	1.1	5.6	89.6	44.3	32.0	49.0	84.7	25.0
Malawi	4962	2016	15-19	1134	1.8	1.4	91.0	85.7	54.8	29.4	92.6	86.2
			20-24	3828	1.3	6.5	91.2	89.7	54.9	31.9	91.9	82.9
Namibia	1144	2013	15-19	250	11.2	12.7	92.5	11.5	7.3	87.7	96.9	90.4
			20-24	894	15.9	26.9	90.4	7.9	7.4	95.2	98.5	92.0
Western	7922		15-19	1772	15.2	0.8	92.6	85.2	45.1	85.1	87.9	63.4

Africa			20-24	6150	17.6	3.0	92.7	84.1	43.3	87.9	89.5	64.2
Sierra Leone	2177	2019	15-19	592	20.2	1.1	95.8	94.1	82.3	85.0	95.2	87.2
			20-24	1585	20.2	1.5	96.4	93.6	81.0	85.1	94.8	86.6
Nigeria	3926	2018	15-19	813	14.0	0.5	89.3	76.6	18.1	80.2	79.9	38.4
			20-24	3113	19.1	2.2	89.5	77.2	22.3	85.3	85.4	45.7
Ghana	863	2017	15-19	180	20.3	1.8	90.9	85.6	38.4	97.5	97.8	73.7
			20-24	683	24.4	4.3	92.5	83.5	41.1	96.3	96.8	74.3
Senegal	956	2019	15-19	187	0.0	0.7	98.5	94.5	50.9	94.3	89.7	87.1
			20-24	769	0.2	8.6	98.7	92.9	52.5	96.3	88.5	84.3

Results, as illustrated in Figures 1 and 2, show the summary of pregnancy care practices of childbearing adolescents and young women, respectively. The results show that fewer childbearing adolescents than young women engaged in good pregnancy care practices. The highest proportion of childbearing adolescents who engaged in good pregnancy practices was in Sierra Leone, while the highest among young women was in Ghana.

Results, as presented in Table 2, show that the highest proportion (58.2%) of the respondents were not married, nor were they living with their partners (cohabiting). About 5% of married adolescents, compared with 2.5% of married young mothers, practiced good pregnancy care. The highest proportion of respondents who had good pregnancy care practices across educational groups was found among those with tertiary education, both for adolescents (7.9%) and young women (9.3%). Slightly more of the respondents who wanted the pregnancy (4.6%) than those who did not want the pregnancy (4.6%) took good care of the pregnancy. Among young women, those who never wanted the pregnancy (31.7%) than those who wanted it (17.6%) had poor pregnancy care practices. A similar pattern of higher prevalence of poor pregnancy care practices among those who did not want the pregnancy was reported among the childbearing adolescents (38.6% vs 29.2%). Also, more of the respondents whose pregnancies were their second born reported a higher prevalence of good pregnancy care than those having their first pregnancies. Specifically, this is 3.3% vs. 2.8% among childbearing adolescents, 5.3% vs. 4.1% among young mothers, and 5.1% vs. 3.6% among all the respondents.

Furthermore, results show that good pregnancy care practices had a higher prevalence among the respondents living in the urban area (5.9%) than those living in the rural area (3.5%). This pattern was common to both respondent groups. Regarding the respondents' wealth status, the results show that the proportion of those who practiced good pregnancy care practices

consistently increased with higher levels of wealth. This was 5.9%, 4.4%, and 3.8% among the rich, middle, and poor young mothers, respectively. However, while more of the young women who had good media exposure (5.3%) practiced good pregnancy care than those who had bad media exposure (3.5%), the reverse was the case among the childbearing adolescents. In all, more young women (4.7%) than childbearing adolescents (2.9%) engaged in good pregnancy care practices.

Table 2: Cross-tabulation of pregnancy care practices by the socio-demographic characteristics of the childbearing adolescents and young mothers

Variables	Levels	Childbearing Adolescents (n=8382)				Young Mothers (N=25894)				N (34,275)				
		Pregnancy Care Practices				Pregnancy Care Practices				Pregnancy Care Practices				
		Poor	Fair	Good	χ^2 (**sig.**)	Poor	Fair	Good	χ^2 (**sig.**)	Poor	Fair	Good	% of N	χ^2 (**sig.**)
Marital Status	Married	1629 (38.5)	2503 (59.1)	105 (2.5)	438 (0.00)	4721 (30.0)	10255 (65.2)	743 (4.7)	89 (0.02)	6350 (31.8)	12759	848 (4.3)	25.4	104 (0.00)
	Cohabiting	542 (42.3)	712 (55.6)	27 (2.1)		1418 (32.8)	2722 (63.0)	180 (4.2)		1960 (35.0)	3434 (61.3)	207 (3.7)	16.3	
	Single & others	1000 (34.9)	1754 (61.3)	109 (3.8)		1694 (28.9)	3871 (66.1)	290 (5.0)		2694 (30.9)	5625 (64.5)	399 (4.6)	58.2	
Educational levels	None	671 (42.6)	849 (53.9)	55 (3.5)	2652 (0.00)	1791 (36.1)	2951 (59.5)	216 (4.4)	2520 (0.00)	2462 (37.7)	3800 (58.2)	270 (4.1)	19.1	2635 (0.00)
	Primary	1592 (43.5)	2006 (54.8)	61 (1.7)		3573 (35.3)	6190 (61.2)	351 (3.5)		5164 (37.5)	8196 (59.5)	411 (3.0)	40.2	
	Secondary	906 (28.9)	2109 (67.2)	124 (4.0)		2403 (23.5)	7248 (70.8)	594 (5.8)		3309 (24.7)	9357 (69.9)	718 (5.4)	39.1	
	Tertiary	4 (35.9)	6 (56.2)	1 (7.9)		64 (11.1)	460 (79.6)	53 (9.3)		68 (11.6)	465 (79.2)	54 (9.2)	1.7	
Pregnancy Status	Not wanted	2972 (38.6)	4498 (58.4)	226 (2.9)	338 (0.00)	7361 (31.7)	14777 (63.7)	1073 (4.6)	1011 (0.00)	10333 (33.4)	19275 (62.4)	1299 (4.2)	90.2	1000 (0.00)
	Wanted	200 (29.2)	471 (68.7)	14 (2.1)		471 (17.6)	2072 (77.2)	140 (5.2)		671 (19.9)	2543 (75.5)	155 (4.6)	9.8	
Birth order	First	2579 (36.7)	4248 (60.5)	196 (2.8)	354 (0.00)	3655 (30.2)	7972 (65.8)	490 (4.1)	96 (0.00)	6234 (32.6)	12220 (63.9)	686 (3.6)	55.8	157 (0.00)
	2^{nd}+	593 (43.7)	721 (53.1)	45 (3.3)		4177 (30.3)	8877 (64.4)	723 (5.3)		4770 (31.5)	9598 (63.4)	768 (5.1)	44.2	
Preceding birth interval (in years)	Na	2604 (36.8)	4275 (60.4)	197 (2.8)	351 (0.00)	3692 (30.2)	8057 (65.8)	498 (4.1)	153 (0.00)	6296 (32.6)	12332 (63.8)	695 (3.6)	56.4	225 (0.00)
	<3	462 (43.2)	577 (53.8)	33 (3.1)		2760 (31.3)	5617 (63.7)	437 (5.0)		3222 (32.6)	6194 (62.7)	470 (4.8)	28.8	
	3+	106 (45.2)	118 (50.4)	10 (4.4)		1380 (28.6)	3174 (65.7)	278 (5.8)		1485 (29.3)	3292 (65.0)	288 (5.7)	14.8	
Type of place of	Urban	610 (25.8)	1644 (69.7)	106 (4.5)	2929 (0.00)	1570 (19.2)	6092 (74.5)	512 (6.3)	3127 (0.00)	2181 (20.7)	7737 (73.4)	618 (5.9)	30.7	3133 (0.00)

residence	Rural	2562 (42.6)	3325 (55.2)	134 (2.2)		6261 (35.3)	10758 (60.7)	701 (4.0)		8823 (37.2)	14081 (59.3)	836 (3.5)	69.3	
Wealth Status	Poor	1702 (42.6)	2205 (55.1)	92 (2.3)	1215 (0.00)	3882 (35.5)	6646 (60.7)	415 (3.8)	1506 (0.00)	5584 (37.4)	8850 (59.2)	507 (3.4)	43.6	1521 (0.00)
	Middle	659 (36.4)	1101 (60.8)	50 (2.8)		1679 (30.7)	3544 (64.9)	242 (4.4)		2338 (32.1)	4645 (63.9)	293 (4.0)	21.2	
	Rich	811 (31.5)	1663 (64.7)	98 (3.8)		2271 (23.9)	6659 (70.2)	556 (5.9)		3082 (25.6)	8323 (69.0)	654 (5.4)	35.2	
Media Access	Poor	1550 (43.6)	1904 (53.5)	106 (3.0)	1211 (0.00)	3593 (38.2)	5484 (58.3)	333 (3.5)	2003 (0.00)	5144 (39.7)	7388 (57.0)	439 (3.4)	37.8	1845 (0.00)
	Good	1621 (33.6)	3066 (63.6)	135 (2.8)		4238 (25.7)	11366 (69.0)	880 (5.3)		5860 (27.5)	14430 (67.7)	1014 (4.8)	62.2	
Total		3172 (37.8)	4969 (59.3)	241 (2.9)		7832 (30.3)	16849 (65.1)	1213 (4.7)		11004 (32.1)	21818 (63.7)	1454 (4.2)		

Na – not applicable

In Table 3, results on the influence of each of the needs, enabling, and predisposing factors on pregnancy care practices are presented. The results show that pregnancy wantedness significantly increased the likelihood of pregnancy practice care practices by 7% (Coef.=0.07; C:0.04 0.09) among childbearing adolescents. In other words, adolescents whose pregnancies were wanted had a 7% higher likelihood of good pregnancy care practices compared with their counterparts whose pregnancies were unwanted. A similar pattern was observed among young women whose pregnancy wantedness increased their likelihood of pregnancy care practices by 9% (Coef.=0.09; C:0.08 0.11). On the other hand, birth order had a significant negative influence on pregnancy care practices (Coef.=-0.04; C:-0.07 -0.02). This indicates that as birth order increased, the level of pregnancy care practices among childbearing adolescents decreased by 4% and vice versa. Education had a significant influence on pregnancy care practices both among adolescents and young women. An increase in educational level from none to secondary increased the likelihood of good pregnancy care by 12% among adolescents (Coef.=0.12; C:-0.06 0.30) and by 18% among young women (Coef.=0.18; C:0.15 0.20). Rural residence decreased the likelihood of good pregnancy care practices by 13% among childbearing adolescents (Coef.=-0.13; C:-0.15 -0.11) and by 12% among young women (Coef.=-0.12; C:-0.13 -0.10).

Table 3: Bivariate analysis of the relationship between pooled background characteristics and pregnancy care practices among childbearing adolescents and young mothers in SSA

Variables	Levels	Adolescents	Young women
		uβ(95% C.I)	uβ(95% C.I)
Pregnancy Status	Not wanted	0[a]	0[a]
	Wanted	0.07 (0.04, 0.09)*	0.09 (0.08, 0.11)*
Birth Order	First	0[a]	0[a]
	2nd +	-0.04 (-0.07, -0.02)*	0.01 (-0.00, 0.02)
Preceding Birth Interval	na (1st)	0[a]	0[a]
	<3years	-0.03 (-0.06, -0.01)*	0.00 (-0.01, 0.01)
	3+ years	-0.08 (-0.14, -0.02)*	0.02 (0.01, 0.03)*
Education	None	0[a]	0[a]
	Primary	-0.01 (-0.04, 0.02)	-0.01 (-0.02, 0.01)
	Secondary	0.11 (0.08, 0.13)*	0.09 (0.07, 0.10)*
	Tertiary	0.12 (-0.06, 0.30)	0.18 (0.15, 0.20)*
Residence	Urban	0[a]	0[a]
	Rural	-0.13 (-0.15, -0.11)*	-0.12 (-013, -0.10)
Wealth Status	Poor	0[a]	0[a]
	Middle	0.05 (0.03, 0.08)*	0.03 (0.02, 0.05)*
	Rich	0.09 (0.07, 0.11)*	0.09 (0.08, 0.10)*
Marital Status	Married	0[a]	0[a]
	Cohabiting	-0.05 (-0.08, -0.02)*	-0.03 (-0.04, -0.01)*
	Others	-0.03 (-0.05, -0.01)*	-0.00 (-0.01, 0.01)
Media Exposure	Poor	0[a]	0[a]
	Good	0.08 (0.06, 0.10)*	0.09 (0.08, 0.10)*
Countries	Nigeria	0[a]	0[a]
	Cameroun	0.08 (0.05, 0.12)*	0.07 (0.05, 0.09)*
	Chad	-0.28 (-0.32, -0.23)*	0.29 (-0.33, -0.25)*
	Congo	-0.24 (-0.29, -0.18)*	-0.22 (-0.26, -0.18)*
	Gabon	0.01 (-0.03, 0.04)	0.02 (-0.00, 0.04)
	Ghana	0.18 (0.14, 0.21)*	0.13 (0.11, 0.16)*
	Kenya	-0.10 (-0.14, -0.06)*	-0.11 (-0.13, -0.09)*
	Lesotho	-0.21 (-0.24, -0.17)*	-0.20 (-0.22, -0.17)*
	Madagascar	-0.19 (-0.22, -0.15)*	-0.18 (-0.20, -0.15)*
	Malawi	-0.04 (-0.07, -0.02)*	-0.06 (-0.08, -0.04)*
	Mozambique	-0.14 (-0.18, -0.10)*	-0.17 (-0.19, -0.14)*
	Namibia	-0.08 (0.12, -0.04)*	-0.08 (0.11, -0.06)*
	Burundi	-0.23 (-0.29, -0.18)*	-0.20 (-0.23, -0.17)*
	Rwanda	-0.17 (-0.22, -0.13)*	-0.17 (-0.20, -0.15)*
	Senegal	0.11 (0.07, 0.15)*	0.10 (0.07, 0.12)*
	Sierra Leone	0.21 (0.19, 0.24)*	0.14 (0.12, 0.16)*

LogLikelihood
Akaike's IC
Bayesian IC
a. Set to zero because this parameter is redundant; *p<0.001; **p<0.01; ***p<0.05

Results shown in Model 1 (see Table 4) indicate that among all the respondents, pregnancy wantedness increased the likelihood of good pregnancy care by 9% (Coef.=0.09; C:0.07 0.10). Model 2 shows that age had a significant influence on pregnancy care practices as a unit increase in age increased the likelihood of good pregnancy care practices by 6% (Coef.=0.06; C:0.05 0.07). When other background characteristics were controlled for, secondary and tertiary educational levels retained their significant influence on pregnancy care practices (Coef.=0.06; C:0.04 0.07) and (Coef.=0.07; C:0.05 0.08 respectively (see adjusted model 3). The rural residence also maintained a significant negative influence on pregnancy care practices (Coef.=-0.08; C:-0.10 -0.07), unlike wealth status, which became insignificant (Coef.=0.13; C:-0.00 0.02). In the final adjusted model (see model 4), pregnancy status and age remained significant but with lower coefficients. Given their coefficients at 0.02 and 0.03, women who wanted their pregnancy and those aged 20-24 had a 2% and 3% likelihood of good pregnancy care, respectively. Using Nigeria as the base reference, respondents from Cameroun (Coef.=0.08; C:0.05 0.11), Ghana (Coef.=0.15; C:0.12 0.19), Senegal (Coef.=0.13; C:0.10 0.16) and Sierra Leone (Coef.=0.19; C:1.55 1.62) had a significantly higher likelihood of practicing good pregnancy care. Other countries had a lower likelihood than Nigeria to practice good pregnancy care.

Table 4: Hierarchical modeling of pooled background characteristics and pregnancy care practices in SSA

Background Characteristics	Model 1 uβ(95% C.I)	Model 2 uβ(95% C.I)	Model 3 aβ(95% C.I)	Model 4 aβ(95% C.I)
Pregnancy Status				
Not wanted	0[a]			0[a]
Wanted	0.09(0.07, 0.10)*			0.02(-0.00, 0.05)
Age Groups				
15-19		0[a]		0[a]
20-24		0.06(0.05, 0.07)*		0.03(0.02, 0.04)*
Birth Order				
First			0[a]	0[a]
2nd +			-0.01(-0.07, 0.05)	-0.02(-0.07, 0.03)
Preceding Birth Interval				
1st birth			0[a]	0[a]
<3years			0.04(-0.02, 0.10)	0.05(-0.00, 0.10)
3+ years			0.06(-0.01, 0.12)	0.05(0.01, 0.10)**
Education				
None			0[a]	0[a]
Primary			-0.01(-0.03, 0.00)	0.03(0.02, 0.05)*
Secondary			0.06(0.04, 0.07)*	0.07(0.05, 0.08)*
Tertiary			0.13(0.10, 0.15)*	0.11(0.08, 0.14)*
Residence				
Urban			0[a]	0[a]
Rural			-0.08(-0.10, -0.07)*	-0.04(-0.05, -0.03)*
Wealth Status				
Poor			0[a]	0[a]
Middle			0.01(-0.00, 0.02)	0.02(0.01, 0.03)*
Rich			0.01(-0.00, 0.02)	0.05(0.04, 0.06)*
Marital Status				
Married			0[a]	0[a]
Cohabiting			-0.02(-0.03, -0.01)*	0.01(-0.00, 0.02)
Others			0.02(0.01, 0.03)*	0.02(0.01, 0.03)*
Media Exposure				
Poor			0[a]	0[a]
Good			0.05(0.04, 0.06)*	0.03(0.02, 0.04)*
Countries				
Nigeria			0[a]	0[a]
Cameroun				0.08(0.05, 0.11)*
Chad				-0.25(-0.29, -0.21)*
Congo				-0.20(-0.24, -0.16)*
Gabon				-0.00(-0.03, 0.03)
Ghana				0.15(0.12, 0.19)*
Kenya				-0.10(-0.13, -0.07)*
Lesotho				-0.19(-0.22, -0.16)*
Madagascar				-0.15(-0.19, -0.12)*
Malawi				-0.02(-0.05, 0.01)
Mozambique				-0.14(-0.17, -0.11)*
Namibia				-0.08(-0.12, -0.05)*
Burundi				-0.14(-0.18, -0.11)*
Rwanda				-0.14(-0.17, -0.10)*
Senegal				0.13(0.10, 0.16)*
Sierra Leone				0.19(1.55, 1.62)*
LogLikelihood				
Akaike's IC				
Bayesian IC				

a. Set to zero because this parameter is redundant; *p<0.001; **p<0.01; ***p<0.05

DISCUSSION

This study was based on pooled DHS data from sixteen countries in sub-Saharan Africa. The study identified some factors underlying pregnancy care practices in Africa. Findings showed a very low prevalence of good pregnancy care practices among childbearing adolescents (2.9%) and young mothers (4.7%). This low prevalence is comparable with evidence provided in previous studies conducted in SSA [42, 17]. However, the low prevalence deviates widely from the levels reported in other studies [43, 44). The sharp deviation in the result of this study from those of others may not be unconnected with the differences in the measurement of pregnancy care and the focus of the study. While our study focused on young women (15-24) and assessed their receipt of essential care during pregnancy, many other studies focused on women aged 15-49 years and evaluated one specific care per time [43, 44]. Except for a few cases of women aged 15-24 who may have married or taken care of by their own immediate family, they are socially stigmatized (Kola et al., 2020) and lack the requisite experience to care for pregnancy [45] constitute a threat to their health and that of their fetus. This explains why our study isolated women aged 15-24. Also, while other studies used women who had childbirth in the five years preceding the survey [28], our study focused on women who had childbirth within the last year. This was to minimize recall bias and to ensure that the respondents' ages at the time of the referenced pregnancy were a maximum of one year less than their current ages, which were used to categorize them into adolescents and young mothers.

One key takeaway from the low level of good pregnancy care practices in SSA is that efforts aimed at Agenda 2063 and SDGs need to be rejuvenated if they are to achieve their targets in SSA. Ending preventable deaths of newborns and reducing neonatal mortality is not likely achievable when pregnant women do not receive the essential interventions that could prevent maternal death and birth complications. In southern Africa, for instance, more than half of pregnant women did no urine screening during pregnancy. This meant that in the region, women's risks for gestational diabetes and preeclampsia, both of which are leading causes of birth complications and maternal and child deaths [20, 21], were not known. Another instance was in a Central African country, Chad, where over 2 of 5 pregnant women did no blood screening during pregnancy. Consequently, if such women had blood-borne diseases like HIV, syphilis, or hepatitis B, they might have transmitted the diseases to their fetuses. This might have played a role in the reported 17% rate of mother-to-child transmission of HIV in SSA [46], compared with 2% in the United States and 7.7% in India [47].

Some reasons for the prevalently poor pregnancy care practices in SSA might be access barriers, service unavailability, and the social stigma around adolescent pregnancy [48]. While these are plausible, it is also likely that the level of practice of specific pregnancy care might be indicative of the public health importance attached to the diseases that they are to prevent or address. For instance, the majority (9 of 10) of women in Southern Africa did blood screening during pregnancy, which might be because the region has the highest HIV prevalence in Africa [49], thus prompting them to know their status. Related to this is Nigeria's 77% uptake rate for

fansidar during pregnancy, compared with the 9% uptake rate in Namibia. Again, this may be explained by the reality that Nigeria accounts for 31.3% of all malaria deaths in the world, compared with Namibia, which accounts for only 0.3% [50]. On the flip, low uptake of specific pregnancy care may also mean that the targeted disease is of low public health importance within a given country. This points to Rwanda, where none of the mothers received Fansidar for malaria during pregnancy, plausibly suggesting that malaria may not be an issue in the country. However, given the report of an upsurge in malaria incidence rate from 48 to 403 cases per 1,000 persons between 2012 and 2017 in Rwanda [51], it might be argued that this study's reported zero prevention rate of malaria in pregnancy is indicative of a setback in malaria prevention efforts in Rwanda.

The study shows that predisposing factors such as low maternal education, poor exposure to the media, and rural residence hindered good pregnancy care practices, as also reported in previous studies [52, 53]. A high level of education, good exposure to the media, and urban residence not only improved women's understanding of the importance of pregnancy care practices but also influenced them to access them. Urban residence brings women closer to healthcare facilities, and this promotes the utilization of such services, partly due to relative availability in urban areas [54]]. Again, teenage and non-marital pregnancy may be less stigmatized in urban healthcare facilities than in rural areas because of relative conservatism in the latter [55]. Studies have reported that adolescents and young people jettison sexual and reproductive health services when they perceive that they may be judged by providers [56, 57]. This situation may be more prevalent in rural health facilities where providers and users may be living in the same neighborhood. Educated women and those with good media exposure are likely to be informed about the health benefits accruable to them (and the fetus) if they sufficiently access pregnancy care services. These results thus serve as evidence in support of the predisposing factor postulation of the Anderson Model of healthcare utilization.

A significant enabling factor that enabled the good practice of pregnancy care was wealth status, as earlier reported [58]. Understandably, this would enable women to afford pregnancy care services, especially as the coverage of maternal health insurance is poor in SSA [59]. However, being married did not significantly increase the likelihood of pregnancy care practices, in contrast with previous studies [60]. Again, a reason for the contrast might be that the current study focused on young women who were predominantly unmarried. Beyond that, being married may not automatically translate to enjoying spousal support for pregnancy care. Unmarried childbearing adolescents might even be living with their parents, who might ensure that they receive adequate pregnancy care. This, again, might have undermined the influence of marital status on pregnancy care practices.

Regarding the need factors such as pregnancy wantedness and age, the result showed that they had a significant influence on pregnancy care practices; however, they are not in tandem with the stated hypothesis. While we assumed that childbearing adolescents and women with unwanted pregnancies are in special need of care and thus would utilize pregnancy care services more than

others, the results showed otherwise, in line with earlier studies [61, 62]. This led to the rejection of the study hypothesis. The reasons that would make women with unplanned pregnancies have poor pregnancy care practices might not be far-fetched from what led to their unwanted pregnancies in the first instance. Some of these are limited availability of services, lack of access to maternal healthcare services, and poor education (63, 64]. The prevailing poor pregnancy care practices among childbearing adolescents may be explained by the prevailing stereotypes and stigma around adolescents' access to maternal healthcare services in Africa [48, 65]. Male partners who impregnated adolescents may even be ashamed to follow them to health facilities for pregnancy care. The adolescents' parents may also not be proud to take their pregnant adolescents to the facility, just as the adolescents themselves may not be able to go without support. All of these could make adolescents susceptible to poor pregnancy care practices.

- Strength & Limitations

Our study filled the knowledge gap created by the dearth of studies specific to childbearing adolescents and young women in SSA. This is despite overwhelming evidence that pregnancy and childbirth among this population pose significant risks to maternal and child health around the world. The use of pooled DHS data enabled the aggregation of pregnancy care practices across countries in SSA. At the same time, country-specific data permitted analysis of what pregnancy care practices looked like in individual countries. Both analytical approaches will strengthen the evidence base for relevant interventions in SSA. However, inferences made in this study may be limited by some drawbacks. One, the study did not investigate what was done with the result of the blood and urine screening performed on the women during pregnancy. That is, whether the test result prompted the appropriate interventions was not known. Two, the data obtained from individual countries were not collected at the same time, thus potentially making the cross-country comparison may be misleading. Even though the study used the latest available data from each country, it is not unlikely that the events of pregnancy care practices may have changed in the countries where the latest data are old.

CONCLUSION

The practice of good pregnancy care was very low among child-bearing adolescents and young mothers in SSA. High educational levels, good media exposure, and urban residence are factors that promote good pregnancy care practices. Maternal age, pregnancy wantedness, and wealth level are important predictors of pregnancy care practices. However, marital status had a negligible effect. Improving pregnancy care practices in SSA will be achieved by addressing unwanted pregnancies, especially among adolescents. Interventions that help adolescents and young women meet their pregnancy care needs are strongly recommended. This could be achieved through improvement in maternal education and enhancing their access to the media.

Declarations

List of Abbreviations

CAYM	Childbearing Adolescents and Young Mothers
DHS	Demographic and Health Surveys
LMIC	Low and Middle-Income Countries
PC	Pregnancy Care
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa

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Competing interests

The authors declare no competing interest

Data availability

The data analyzed in this study are publicly available at https://www.dhsprogram.com

Code availability

The Stata script used for the analysis is available upon request. The corresponding author should be contacted for this.

Authors' contributions

AIA conceptualized the study, and TOO developed the concepts. AAA and OOB reviewed the literature. TOO, SAA and AIA developed the methodology. TOO wrote the Stata script used for the analysis. TOO, AB, and OOB interpreted the results and discussed them. All the authors proofread the article for correct spelling and grammatical coherence. All the authors approved the submitted version of the manuscript.

Ethics approval and consent to participate

All experiments/methods/activities carried out during the implementation of the DHS were performed in accordance with the Declaration of Helsinki. The authors obtained written authorization from the owners of the DHS dataset before using the data for this study. Participation of the respondents was purely voluntary and premised on informed consent.

Consent to publish

Not applicable

Acknowledgments

Not applicable

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