Women Educational Advancement in Sub-Saharan Africa: Situation Analysis of Consequence of Double Harmful Socio-demographic Practices

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Authors' contributions

This work was carried out in collaboration between all authors. Author SAA conceived the study idea, wrote introduction and contributed to methodology, results and discussion writing. Author MEP reviewed relevant literatures and contributed to the data analysis. Author BOY was involved in writing the methodology, data analysis and results sections while author KO wrote the discussion. All authors reviewed and approved the final manuscript.

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ABSTRACT

Background: Early childbearing (EC) and Child Marriage (CM) are harmful demographic practices that often limit girls' opportunities in life including education. We aim to examine the independent and joint influence of Age at First Birth (AFB) and Age at First Marriage/Cohabitation (AFMC) on educational attainment.
Methodology: We utilized Demographic and Health Survey dataset on women aged 25-49 years from 16 countries in sub-Saharan Africa. Data were analysed using linear and logistic regression (α=.05).

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Results: Mean AFB ranges from 18.66±4.0 years in Uganda through 21.31±3.8 years in Burundi. Also, the mean AFMC was highest in Namibia (23.58±6.1) and least in Burkina Faso (17.76±3.0). The highest proportion of women attaining At Least Secondary Education (ALSE) was found in Zambia (62.2%) and least in Burkina-Faso (5.9%). Independently and jointly, EC and CM hinder educational advancement. In Burundi, as the case for other 15 countries, the likelihood of attaining ALSE was higher (OR=2.76; C.I=1.82-4.18, p<0.001) among women who had first birth at ages ≥18years than their counterparts who had theirs at ages <18 years. In Nigeria, the likelihood of attaining ALSE was 7.52(C.I=6.97-8.10; p<0.001) more than that of those who married earlier than 18years. Interaction of the influence of AFB and AFMC also produce positive effect on number of years of schooling in all the studied countries.
Conclusion: Early childbearing and CM have strong negative influence on educational advancement of women in sub-Saharan Africa. Policies targeting these harmful practices should be enacted in the region.

Keywords: Educational attainment; early childbearing; child marriage; Sub-Saharan Africa.

1. INTRODUCTION

Child marriage is described as the union between two people, both or one of whom is below 18 years old [1]. Child marriage is often referred to as early or forced marriage, since children involved in most cases are females who are not able to give informed consent to their marriage partners at the time of marriage [1]. Instead, this important decision is made by either their parents or guardian on their behalf. Child marriage consequently result in early childbearing. While boys are affected by child marriage, the issue impacts girls in far larger numbers and with more intensity [1]. There are numerous consequences associated with Child marriage which are inimical to physical, developmental, psychological and social life of the girl involved [2]. These effects include forced sexual intercourse, high risk of; sexually transmitted diseases, cervical cancer, malaria, death during childbirth and obstetric fistula, premature birth, neonatal and infant deaths [2-5]. Other implications documented on early marriage are; low contraceptive use due to the inability of child brides to negotiate for contraceptive use, high fertility, gender-based violence against child brides; among others [4,6].

Evidence shows that early marriage is practiced in all regions of the world and it constitutes a violation of the human right of girls and young women as well as threat to their health and well-being [7]. Worldwide, nearly half of women ages 20-24 married before age 18 years, this puts such women at a higher risk for early pregnancy, maternal disability and mortality [7,8]. It also limits their access to education and employment [9]. Although, the prevalence of child marriage is lower in other regions, more than one in 10 girls were married by age 15 in the poorest region of the world, particularly sub-Saharan Africa [10]. UNICEF reported that 37% of women in sub-Saharan Africa over aged 24 years were first married or in union before age 18 [11].

Early childbearing on the other hand occurs when a parent who gives birth to a child is less than 18 years of age [12]. Despite a reduction in early childbearing around the world, it remains a common phenomenon in sub-Saharan Africa [1]. One of the factors that determine fertility levels in a population is the average age at first birth [13,14]. It is a useful indicator for gauging the success of family planning programs aiming to reduce maternal mortality, increase contraceptive use – particularly among adolescents, delay age at first marriage, and improve the health of newborns [15]. Women who begin childbearing early are typically exposed to pregnancy risks for a longer period and this often leads to a large family size [16]. Postponement of first births as a result of shift in age at first marriage has been found to contribute to overall fertility decline in many countries [17,18]. Early childbearing poses serious consequences to the health and development of young girls. Previous studies have revealed poor pregnancy outcomes among young women [19,20]. For instance, the risk of maternal death and disability is higher for young women than for women in their 20s [20]. Early childbearing limits girls' opportunities for formal education, training and socioeconomic advancement, it induces high dropout rates at school and engagement in low paid employment and increases economic dependence on husband's support [21,22].

The challenges resulting from early childbearing and child marriage are more common in

developing countries where nearly 10 percent of adolescent girls give birth each year, compared to less than 2% in developed countries [10]. Cultural expectation about marriage in most African communities is patriarchal. This is a social system in which males are the primary authority figures central to social organization; occupy roles of political leadership, moral authority and control of property, and where fathers hold authority over women and children [23]. In this situation, girls are seen as being provisional affiliate of their parents [23]. In the past, one of the main reasons for unwillingness to send a female child to school by their parents was based on beliefs that women are intimately involved in home-based activities [24]. Home care as an essential duty of women predisposes them to early marriage and early childbearing [24]. Early marriage and childbearing impose several limitations on the access of the girl child to formal education outside their homes [25]. Nelson Mandela once said that "education is the most powerful weapon an individual can use to change his/her world". A learned child has wealth within himself/herself but a child who misses education is a lost child [26]. Studies have revealed that if a woman is educated she would be more knowledgeable about; the use of health services, family planning methods and the health of her children [27-29]. The United Nations organization has emphasized that in all its member countries, every individual should have right to formal education [7,30].

Neither the culture of many sub-Saharan African countries nor their constitution recognizes child marriage as a problem [31]. There are dissimilar positions on early marriage and early childbearing in Africa, within the regions and ethnic diversities in each country. For instance, in Nigeria, a country from western Africa, the provision (b) of subsection (4) of their 1999 constitution states that any woman who is married shall be deemed to be of full age [32]. The question is what age segment does the full age mean? The consequence of the existence of this provision is that it gives hush credence to child marriage and its attendant menace which could have negative implication on the girl child. However, some traditions require that maturity into adulthood should be limited to being able to take certain communal responsibilities within the age-grade system, which is usually done even when the child is well above 18. Child marriage can deny female victims access to formal education, which is one of the most unswerving tools for empowerment [28,29,33].

United Nations agencies focus attention on the need to address child marriage and early childbearing which are part of the militating factors against women empowerment and fulfillment of the fundamental human rights of young girls [1]. Child marriage has been a hazard and has formed a larger part of the advocacy of gender-friendly civil society groups in the past few decades and in contemporary times [1]. Civil society groups often focus on preventing child marriage, which is known to be human rights violation impacting in every facet of a girl child's life endeavors. At country level and globally, UNICEF also helps to develop stronger programmes and policies based on a deeper understanding of how to identify and address social norms as well as the economic and structural realities that perpetuate child marriage. The efforts of these organizations necessitate for research that evaluates and provides better understanding of the interrelationship between child marriage, early childbearing and educational advancement.

Societies, traditions and cultures change, and so do the people in them. If the reasons for the keen consideration of such change are carefully considered, then the realizations of the need to change from some harmful traditional practices should be unchallenging. In traditional society and even modern cultures, it is believed that a girl automatically transforms into an adult of 'full age' once she is married [34]. We therefore argue that this view might be a move to disrupt the constructive development of the female gender. This is because in the same society, if a male child aged below 18 years shows his intention to get married, the response inevitably from the parents will be that he cannot since he is not full-grown enough for marriage. For the same reasons, an adolescent girl who bears the risk of child bearing and rearing likewise should not be deemed ready in this respect.

Women younger than 18 years of age often have not reached physical maturity and when they become pregnant; their pelvises may be too constricted to accommodate the baby's head during delivery [35]. In these cases, obstructed delivery and prolonged labour are more likely, thereby increasing the risk of haemorrhage, infection, fistula and maternal mortality [10,36]. Hypertension in pregnancy is common in adolescent pregnancy than older women [36]. If it is left uncontrolled, it can progress to extreme hypertension which can compromise the survival chances of both the young mother and the baby

[36]. Also, infants born to adolescent mothers are more likely to be stillbirth, premature, of low birth weight, and to suffer consequences of retarded fetal growth [37,38]. Thus women who married early are most likely to begin childbearing early and as such would be susceptible to the hazards discussed above. Apart from these physiological problems, their educational advancement can be put to a halt or challenged. Knowing fully the implications of education on real life processes, the researchers were motivated to conduct this study against the shortfall of research that explore the interaction between child marriage, early childbearing and education attainment in sub-Saharan Africa.

The study objectives are to; determine the percentage of women that have attained at least secondary education in sub-Saharan Africa, examine the influence of early childbearing (first birth at age ≤17 years) and early marriage (first marriage at age ≤17 years) independently on educational attainment, explore the joint effect (*I*: both childbearing ≤17 years and early marriage: ≤17 years; *II*: either childbearing ≤17 years or early marriage: ≤17 years; *III*: both childbearing >17 years or early marriage: >17 years) of early childbearing and early marriage on educational attainment. These objectives were conceived with the view to having a glimpse of how these two harmful socio-demographic practices solely or jointly influence the educational advancement of adult women aged 25-49 years in sub-Saharan Africa. Educational attainment in this context means having completed at least secondary education. Having completed at least secondary education in the Africa context passes good information on the level of gender equality as education in the past few decades is known to be meant for male children.

2. DATA AND METHODS

2.1 Data Extraction

The Demographic and Health Survey (DHS) data across 16 sub-Saharan African countries were used for this study. Four countries were selected from the four regional blocks in sub-Saharan Africa. The selection was based on data availability. In each of the selected countries, the most recent round of DHS surveys was used. The countries are; Burundi (2010), Uganda (2011), Zambia (2010-2011), and Tanzania (2010) from the Eastern Africa; Congo Democratic Republic (2007), Cameroun (2011), Gabon (2012) and Sao Tome & Precipe (2009-2010) from the Central Africa; Burkina Faso (2010), Cote d'Ivoire (2011-2012), Ghana (2008) and Nigeria (2008) from the Western Africa; Lesotho (2009), Namibia (2006-2007), South African (1999) and Swaziland (2006-2007) from the Southern Africa. The data were extracted from measure DHS web platform after the permission for its use was approved by the data originators (http://www.measuredhs.com/). The individual recode section of the data which focused mainly on women of childbearing age (15-49 years) was used.

The data as presented in each country were collected using multi-stage sampling technique and all were national representative survey. Comprehensive information on data collection procedures with respect to design of the survey instruments, training of the research assistants, pre-test of the study instruments, validity test and other procedures of the survey are available in the demographic and health survey report for each country.

Background information of the selected countries are as shown in Table 1.

2.2 Study Design

The design of the study was cross-sectional. The analyses were restricted to women who are either married or cohabiting but aged 25-49years. We removed those younger than 25 years from the study to eliminate bias that younger women who are still anticipating to acquiring secondary education can pose to the study's outcome. It is assumed that across the countries, women who are older than 24 years must have completed their secondary education ceteris paribus. The restriction reduced the number of women in the original sample for each country to; 3929 (Burundi), 3826 (Uganda), 3901 (Zambia), 4718 (Tanzania), 4460 (Congo Democratic Republic), 6690 (Cameroun), 3496 (Gabon), 1216 (Sao Tome & Precipe), 9656 (Burkina Faso), 4765 (Cote d'Ivoire), 2314 (Ghana), 17307 (Nigeria), 2776 (Lesotho), 2807 (Namibia), 4192 (South African) and 1583 (Swaziland).

2.3 Variables Included in the Study

The dependent variable was education attainment which was analysed in two forms. The first is number of years of schooling. The second is the level of education which was categorical variable (None=0; Primary=1; Secondary=2; Higher=3) and we re-coded the variable into two levels.

Thus we have;

$$\text{Level of Education} = \begin{cases} 1 & \text{if level of education of a woman is at least secondary} \\ 0 & \text{Otherwise} \end{cases}$$

The independent variables are: Age at First Marriage or Cohabiting (AFM/C) and Age at First Birth (AFB). The two variables are quantitative but were disentangled into two categories in order to capture their effect on educational attainment.

Thus we have;

$$\text{Age at first marriage/co} - \text{habiting} = \begin{cases} 1 & \text{if a woman first married/co} - \text{habited at age} \leq 17 \text{ years} \\ 0 & \text{Otherwise} \end{cases}$$

$$\text{Age at first birth} = \begin{cases} 1 & \text{if a woman had first birth at age} \leq 17 \text{ years} \\ 0 & \text{Otherwise} \end{cases}$$

We also combined the age at first marriage and age at first birth in order to see their joint influence on educational attainment as shown below;

Joint	0		1	
0	0+0=**0**;	if AFM/C≥18 & AFB≥18	0+1=**1**;	if either AFM/C≥18 or AFB<18
1	1+0=**1**;	if either AFB or AFM/C≥18	1+1=**2**;	if AFB <18 & AFM/C<18

The interaction of Child Marriage (CM) and Early Childbearing (EC) is shown in the Venn diagram below.

(CM**U**EC)[1]

Child Marriage (CM) Alone

Child Marriage and Early Childbearing (CM∩EC)

Early Childbearing (EC) Alone
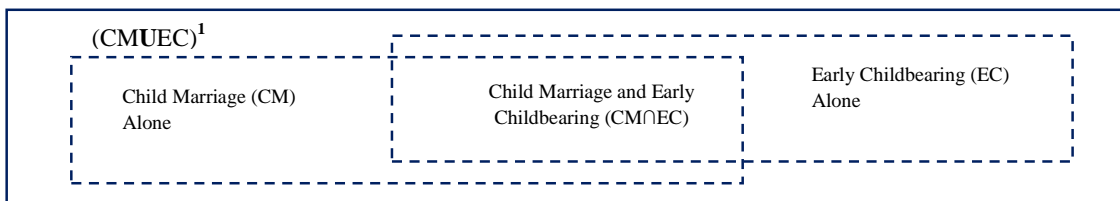
$$\text{Educational Attainment} = f\{\text{CM}, \text{EC}, \text{joint}(\text{CM} \cap \text{EC}), (\text{CM} \cup \text{EC})^1, \acute{\omega}\}$$

$$\text{Educational Attainment} = B_0 + (\text{CM} + \text{EC}) + \text{joint}(\text{CM} \cap \text{EC}) + (\text{CM} \cup \text{EC}) + \acute{\omega}$$

Where B_0 and $\acute{\omega}$ are arbitrary constants.

2.4 Bivariate Analysis

Data analyses begin by weighting the data-set for each country for better representation of the study population from which the sample was selected. This is necessary as these surveys were conducted using cluster sampling. Consequently, all the descriptive tables were based on weighted numbers. The bivariate analyses was carried out using Chi-square model (α=.5%). We also used ordinary linear regression model to examine the association between age at first marriage/co-habiting, age at first birth and number of years of schooling as shown in equations 1-3.

$$y_1 = \alpha_0 + \propto_1 (AFM/C) + \varepsilon \qquad (1)$$

$$y_2 = \beta_0 + \beta_1(AFB) + \varepsilon \qquad (2)$$

$$y_3 = \gamma_0 + \gamma_1(AFM/C) + \gamma_2(AFB) + \varepsilon \qquad (3)$$

Where $\propto_0, \propto_1, \beta_0, \beta_1, \gamma_0, \gamma_1, and \gamma_2$ are regression coefficients and ε is an error term.

2.5 Multivariate Analysis

Multivariate analyses were ran to explain the connection between and/or among individual responses to questions and how they relate generally to the measurement. The multivariate analysis was therefore based on un-weighted data since it preserves the one respondent/one response relationship. We examined the relationship between age at first birth, age at first marriage/cohabiting and educational attainment using logistic regression (α=.5%).

Table 1. Population figure, total fertility rate, births per 1,000 population, modern contraceptive prevalence rate, females life expectancy at birth and GDI PPP per Capita for 16 selected countries in sub-Saharan Africa

Regional block Country	Population Mid-2012 (million)	Total fertility rate	Births per 1,000 population	Modern CPR	Females' life exp. at birth	GDI PPP per Capita (US$) 2010
Eastern Africa						
Burundi	10.6	6.4	42	18	60	400
Uganda	35.6	6.2	45	26	54	1,250
Zambia	13.7	6.3	46	27	49	1,380
Tanzania	47.7	5.4	41	26	58	1,440
Central Africa						
Congo Democratic Rep.	69.1	6.3	45	5	50	320
Cameroun	20.9	5.1	44	14	52	2,270
Gabon	1.6	3.3	27	12	63	13,060
Sao Tome and Precipe	0.2	4.9	37	33	64	1,930
Western Africa						
Burkina Faso	17.5	6.0	43	15	56	1,250
Cote d'Ivoire	20.6	4.6	35	8	56	1,810
Ghana	25.5	4.2	32	17	55	1,620
Nigeria	170.1	5.6	40	8	54	2,240
Southern Africa						
Lesotho	2.2	3.2	28	46	47	1,970
Namibia	2.4	3.3	26	53	62	6,420
South Africa	51.1	2.4	21	60	54	10,360
Swaziland	1.2	3.5	30	63	48	5,600

Source: Population Reference Bureau (2012 World Population Data Sheet); CPR: Contraceptive Prevalence Rate among Married women aged 15-49

The logistic regression model is defined as;

$$\log\left(\frac{\rho_i}{1 - \rho_i}\right) = \xi_0 + \xi_1 x_1 + \xi_2 x_2$$

Where ρ_i is the outcome measure and $i = 1$ if ρ is the proportion of respondents that have at least secondary education and 0 if otherwise. Also, ξ_1, ξ_2, are the estimated regression coefficients; x_1, x_2 are the independent variables (Age at first marriage/co-habiting and age at first birth).

2.6 Ethical Consideration

Permission to use the data was granted by the data originator, Micro International U.S.A. Informed consent were obtained from all the study participants at the point of data collection. All consenting participants were assured of confidentiality of the information they provided.

3. RESULTS

The result in Fig. 1 show that the Mean Age at First Birth (MAFB) was highest in Burundi (21.3±±3.8) and least in Uganda (18.7±4.0). Also, the Mean Age at First Marriage/Co-habitation (MAFMC) was highest in Namibia (23.6±6.1) and least in Burkina Faso (17.8±3.0).

The data is evidenced that the MAFB and MAFMC were higher in countries in Southern Africa than any other regional blocks in sub-Saharan Africa. Among the Southern African countries, the MAFB was above 20 in three of the four countries studied except in Swaziland where the value was slightly below 20 (19.0±3.6). The MAFB was the same in Lesotho (20.5±3.5) and South Africa (20.5±4.0). In Eastern, Central, Western and Southern African countries, the MAFB was lowest in Uganda (18.7±3.6), Gabon (18.7±3.9), Cote d'Ivoire (19.1±3.9) and Swaziland (19.0±3.6) respectively. Also, in each of the regional blocks, Uganda (17.9±3.1), Cameroon (18.4±4.6), Burkina Faso (17.8±3.0) and Lesotho (23.6±6.1) had the least MAFMC among the countries in Eastern Africa, Central Africa, Western Africa and Southern Africa respectively.

In Table 2, the results show that in all the 16 analysed countries, the proportion of women having At Least Secondary Education (ALSE) was consistently higher among women who married/co-habited or had their first birth at ages ≥18 years (p<0.001). As an example, In Burundi, 4.6% of women who had their first birth at ages ≤ 17 years had ALSE, while 11.7% of those who had their first birth at ages above 17 years had ALSE (p<0.001). This pattern was similar for all

the countries analysed. While Zambia (69.1%) had the highest proportion of those with ALSE among those who had their first birth at ages ≥18 years (p<0.001), Gabon (47.8%) recorded the highest proportion of women with ALSE among those who had their first birth at ages below 18 years (p<0.001).

With reference to age at first marriage/co-habiting, women who got married/co-habiting at ages above ≥18 years had higher proportion of their members having at least secondary education than those who married/co-habited at younger ages. For instance, in Uganda, 33.9% and 10.2% of women who married/co-habited at ages ≥18 years and ages <18 years had ALSE respectively (p<0.001). Although, there are variations across the 16 selected countries in sub-Saharan Africa, the pattern was similar to situation for Uganda.

The data plot shown in Fig. 2 is an indication that consistently, positive difference (married/co-habited at ≥18 years - married/co-habited at ages <18 years) exists in the proportion of women who got married/co-habited at ages ≥18 years and <18 years in terms of their educational advancement. Although, clear disparity exists between the countries, but the difference was

consistently positive in all the 16 countries studied in the region. For instance, the highest gap was experienced in Nigeria (39.6) as against 7.6 in Burkina Faso where the least gap was found.

Similar pattern was also found for difference in the proportion of those who had their first birth at ages ≥18 years and <18 years. The difference was mostly prominent in Uganda (28.4) and least in Burkina Faso (5.5). However, the gap in proportion of women who had ALSE was consistently higher for AFMC than AFB across the 16 countries studied.

In Fig. 3, we defined three different states by considering the joint effect of Age at First Birth (AFB) and Age at First Marriage/Cohabitation (AFMC) on educational advancement (having ALSE). These are; I: Both (AFB and AFMC) <18; II: Either (AFB or AFMC) <18; III: Both (AFB and AFMC) ≥18.

The data as shown in Fig. 3 revealed that there was a significant association between the joint effect of AFB and AFMC and educational advancement in all the countries studied (p<0.001). Among the studied women, Zambia (62.2%) has the highest proportion of their
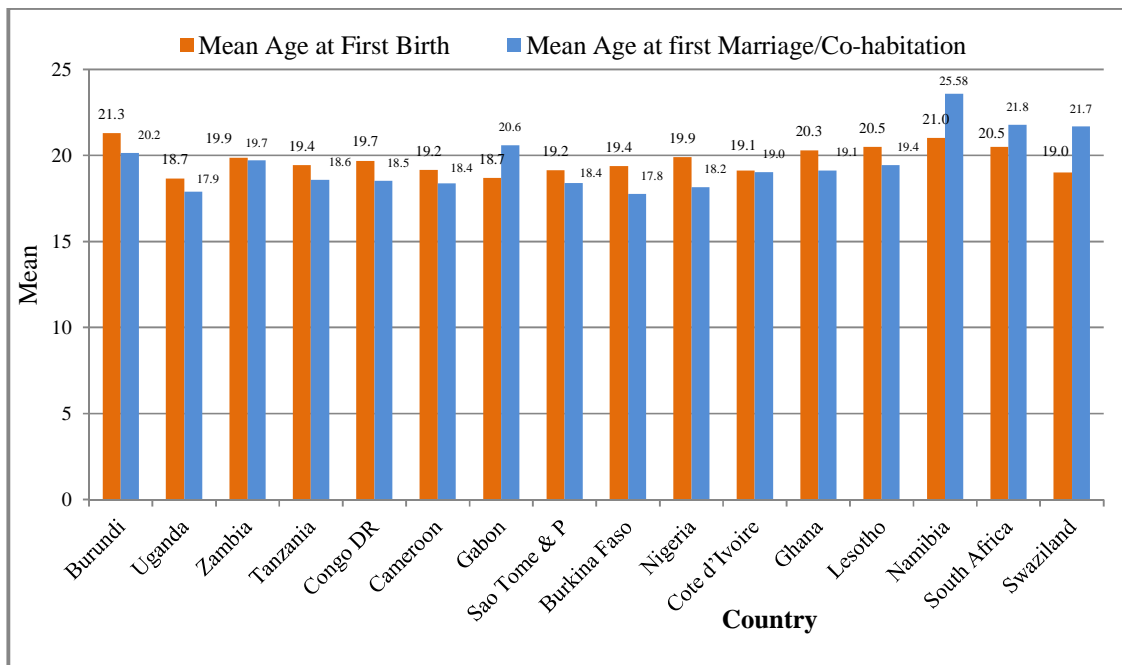

Fig. 1. Bar chart of mean age at first marriage/co-habitation and mean age at first birth in countries in the four regional blocks in sub-Saharan Africa

Table 2. Distribution of proportion of women having at least secondary education (ALSE) by age at first marriage/co-habitation and age at first birth in 16 selected countries in sub-Saharan Africa

Regional block	Age	Age at 1st birth		Age at 1st Marriage/Co	
Country		ALSE	Total	ALSE	Total
Eastern Africa					
Burundi*	<18years	4.6(25)	544	3.6(34)	947
	≥18years	11.7(397)	3385	13.0(388)	2982
Uganda*	<18years	11.1(173)	1564	10.2(201)	1970
	≥18years	29.0(657)	2262	33.9(629)	1856
Zambia*	<18years	40.7(387)	951	41.3(529)	1281
	≥18years	69.1(2038)	2950	72.4(1896)	2620
Tanzania*	<18years	7.0(96)	1381	7.7(157)	2044
	≥18years	16.0(534)	3337	17.7(473)	2674
Central Africa					
Congo Democratic R*	<18years	27.6(378)	1368	27.9(569)	2041
	≥18years	39.0(1205)	3092	41.9(1014)	2419
Cameroun*	<18years	19.9(479)	2410	18.4(611)	3320
	≥18years	40.9(1750)	4280	48.0(1618)	3370
Gabon*	<18years	47.8(728)	1523	42.9(537)	1253
	≥18years	53.4(1054)	1973	55.5(1245)	2243
Sao Tome & P*	<18years	10.0(36)	857	10.7(57)	534
	≥18years	23.1(198)	359	26.0(177)	682
Western Africa					
Burkina Faso*	<18years	2.1(59)	2873	2.4(125)	5172
	≥18years	7.6(513)	6783	10.0(447)	4484
Cote d'Ivoire*	<18years	6.1(109)	1785	5.3(112)	2107
	≥18years	11.8(351)	2980	13.1(348)	2658
Ghana*	<18years	27.8(171)	615	29.0(262)	903
	≥18years	46.9(796)	1699	50.0(705)	1411
Nigeria*	<18years	13.5(815)	6033	12.8(1176)	9187
	≥18years	41.0(4620)	11274	52.4(4259)	8121
Southern Africa					
Lesotho*	<18years	17.1(74)	432	18.5(167)	1872
	≥18years	42.9(1006)	2344	48.8(913)	904
Namibia*	<18years	35.0(207)	592	32.5(142)	437
	≥18years	63.2(1400)	2215	61.8(1465)	2370
South Africa*	<18years	41.7(388)	931	34.8(292)	838
	≥18years	59.8(1951)	3261	61.0(2047)	3354
Swaziland*	<18years	35.8(210)	586	27.4(96)	350
	≥18years	63.3(631)	997	60.4(745)	1233

women attaining ALSE and the least was found in Burkina Faso (5.9%). In each of the regional blocks, the least proportion of women who had ALSE was recorded in Burundi (10.7%), Sao Tome and Precipe (19.2%), Burkina Faso (5.9%) and Lesotho (38.9%) in Eastern, Central, Western and Southern Africa respectively. It is also important to note that the proportion of women with ALSE was low in Cote d'Ivoire (9.7%). Evidence of higher proportion of women having ALSE is seen in Zambia (62.2%), Gabon (51.0%), Namibia (57.2%), South Africa (55.8%) and Swaziland (53.1%) than those with less than secondary education.

In all the 16 countries studied, women that are characterized with state III (Fig. 3) consistently have at least higher education than those in states I and II. The pattern of increasing proportion of women having ALSE with increase in state was observed across all the countries studied (p<0.001). For instance, in Zambia, 38.2%, 47.0% and 74.2% (p<0.001) were found in state I, state II and state III respectively, while 1.8%, 3.4% and 10.0% (p<0.001) were reported in Burkina Faso.

In Table 3, two models are derived from the data by introducing only age at first birth into the logistic model to examine its influence on educational advancement having ALSE. Similar model was generated using the age at first marriage. In the second model, the age at first marriage and age at first birth were introduced to ascertain there interaction influence on ALSE.
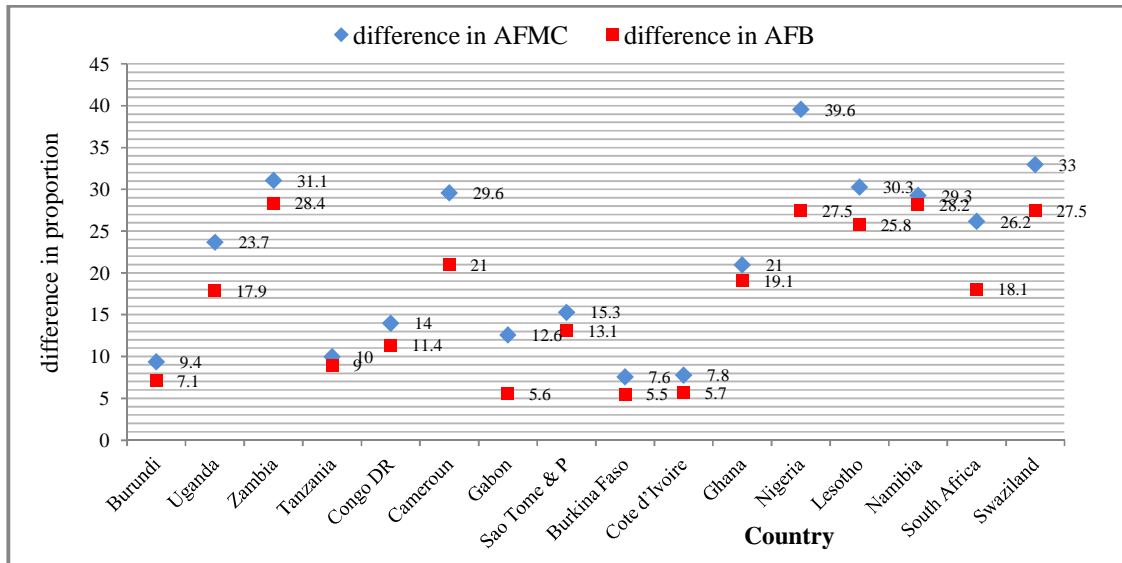
Fig. 2. Data Plot of the deference in proportion of women attaining at least secondary education among women who had their first birth or married/co-habited at ages ≥18 years and <18 years

Table 3. Logistic regression of women having at least secondary education according to country by age at first birth and age at first marriage (*Unadjusted and Adjusted*)

Region	Age	Age at first birth				Age at first marriage			
Country		Model 1		Model 2		Model 1		Model 2	
		OR	CIOR	AOR	CIAOR	OR	CIOR	AOR	CIAOR
Eastern Africa									
Burundi	<18years	1		1		1		1	
	≥18years	2.76*	1.82-4.18	0.86	0.50-1.49	4.02*	2.81-5.75	4.35*	2.72-6.97
Uganda	<18years	1		1		1		1	
	≥18years	3.29*	2.74-3.95	1.53*	1.22-1.91	4.51*	3.79-5.37	3.56*	2.88-4.40
Zambia	<18years	1		1		1		1	
	≥18years	3.26*	2.80-3.79	1.79*	1.50-2.15	3.72*	3.24-4.28	2.79*	2.37-3.30
Tanzania	<18years	1		1		1		1	
	≥18years	2.55*	2.03-3.20	1.67*	1.28-2.17	2.58*	2.13-3.13	2.04*	1.64-2.55
Central Africa									
Congo DR	<18years	1		1		1		1	
	≥18years	1.67*	1.46-1.92	1.25**	1.07-1.47	1.87*	1.65-2.12	1.68*	1.45-1.95
Cameroun	<18years	1		1		1		1	
	≥18years	2.79*	2.48-3.13	1.54*	1.34-1.76	4.10*	3.67-4.57	3.39*	2.99-3.84
Gabon	<18years	1		1		1		1	
	≥18years	1.25**	1.10-1.43	1.11	0.97-1.28	1.66*	1.45-1.91	1.62*	1.40-1.87
Sao To & P	<18years	1		1		1		1	
	≥18years	2.70*	1.85-3.94	1.73***	1.13-2.64	2.93*	2.12-4.05	2.35*	1.64-3.36
Western Africa									
Burkina Faso	<18years	1		1		1		1	
	≥18years	3.90*	2.97-5.13	1.58**	1.14-2.21	4.47*	3.65-5.48	3.60*	2.82-4.61
Cote d'Ivoire	<18years	1		1		1		1	
	≥18years	2.05*	1.64-2.57	1.41**	1.10-1.80	2.68*	2.15-3.35	2.32*	1.82-2.96
Ghana	<18years	1		1		1		1	
	≥18years	2.29*	1.87-2.80	1.53*	1.21-1.93	2.44*	2.05-2.92	2.01*	1.63-2.47
Nigeria	<18years	1		1		1		1	
	≥18years	4.45*	4.09-4.83	1.46*	1.32-1.62	7.52*	6.97-8.10	6.18*	5.64-6.76

Region	Age	Age at first birth				Age at first marriage			
Country		Model 1		Model 2		Model 1		Model 2	
		OR	CIOR	AOR	CIAOR	OR	CIOR	AOR	CIAOR
Southern Africa									
Lesotho	<18years	1		1		1		1	
	≥18years	3.64*	2.80-4.73	1.74*	1.30-2.34	4.20*	3.47-5.09	3.503*	2.84-4.32
Namibia	<18years	1		1		1		1	
	≥18years	3.20*	2.65-3.87	2.54*	2.08-3.10	3.36*	2.70-4.17	2.48*	1.97-3.11
South Africa	<18years	1		1		1		1	
	≥18years	2.08*	1.80-2.42	1.6*	1.36-1.87	2.93*	2.50-3.43	2.53*	2.14-2.98
Swaziland	<18years	1		1		1		1	
	≥18years	3.09*	2.50-3.82	2.34*	1.87-2.93	4.04*	3.11-5.24	2.98*	2.27-3.93

*Significant at 0.1%; *Significant at 1%; *Significant at 5%; OR: Odds Ratio; AOR: Adjusted Odds Ratio; CIOR: Confidence Interval of Odds Ratio; CIAOR: Confidence Interval of Adjusted Odds Ratio*
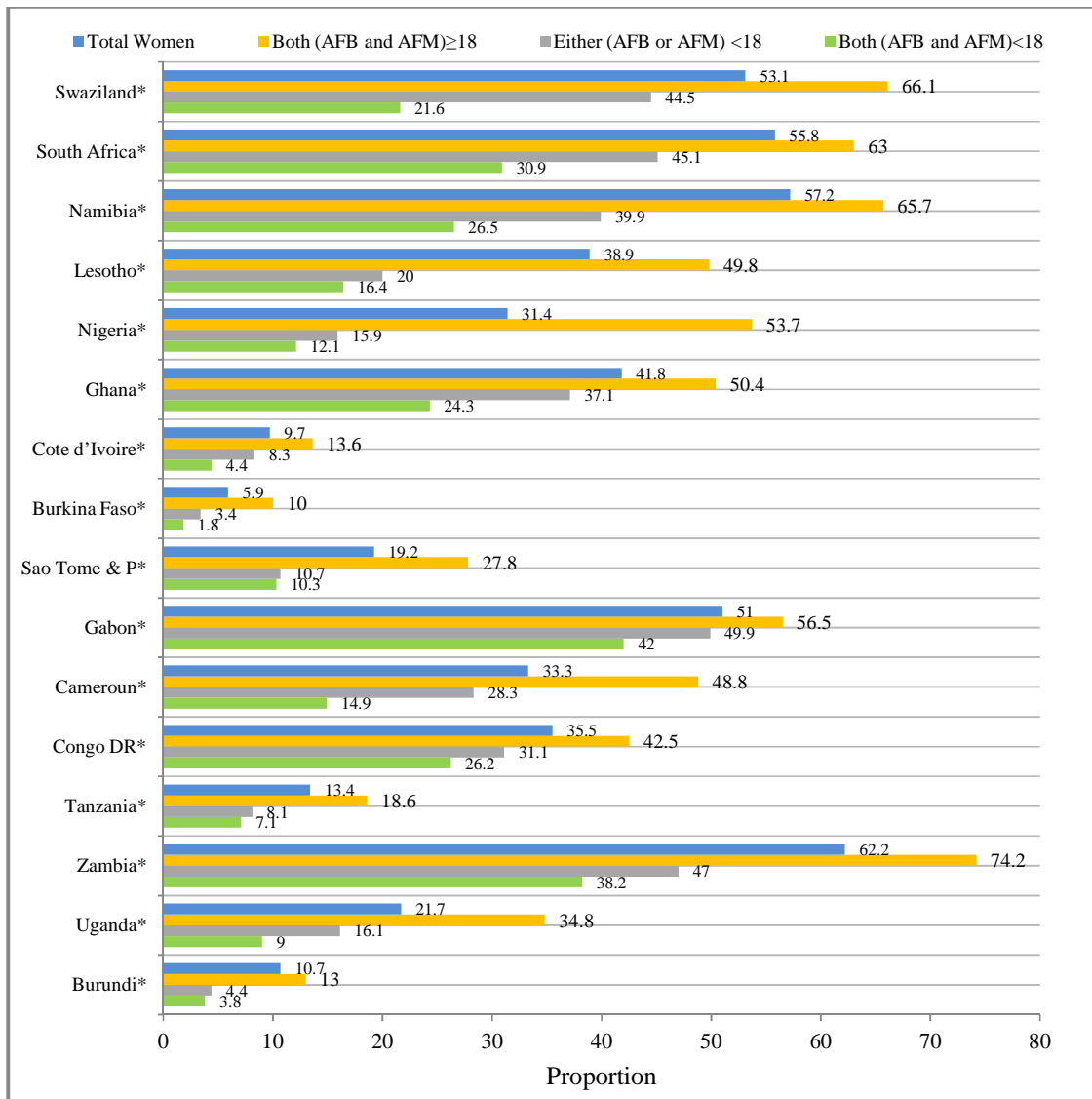

Fig. 3. Multiple bar charts of percentage distribution of women in sub-Saharan Africa according to "attaining at least Secondary Level of Education" by state of age at first marriage/cohabitation (AFMC) and age at first birth (AFB)
Significant at 0.1%

Across the countries, marrying or having first birth at ages above 18 is a prospect for higher educational attainment, even when the two variables where jointly introduced into the equation. For instance, in Burundi as the case for other 15 countries, the odd ratio of attaining ALSE was 2.76 (C.I=0.50-1.49; p<0.001) times more likely higher among women who gave birth to their first child at ages ≥18 years than their counterparts who had their first birth at ages <18 years. The odds ratio of attaining ALSE was highest in Nigeria (OR=4.45; C.I=4.09-4.83; p<0.001) and least in Gabon (OR=1.25; C.I=1.10-1.43, p<0.01). With respect to age at first marriage, in Zambia, women who married at ages ≥18 years were 3.72 (C.I=3.24-4.28; p<0.001) times more likely to attain ALSE than those who married at younger age segment. Marrying at ages 18 years and above was as much as 7 times improving the likelihood of attaining ALSE than those who married at ages <18 years in Nigeria.

It is worth noting that during interaction of the two independent variables, the odds of attaining ALSE reduces across all the countries as for when they were introduced into the equation independently except in Burundi where reverse was observed.

In Table 4, the data depict that the likelihood of attaining ALSE was highest in state III i.e if a woman got married and had first birth at ages 18 years and above. This pattern is similar for all the countries in the region. For instance, in Burundi, the likelihood of having ALSE was 3.822(p<0.001) times higher than those who had got married/co-habited at ages below 18 years. Although, variation exists in the likelihood across all the countries studied, the likelihood of attaining ALSE was significantly higher in state III than state I (p<0.001) in all the 16 countries studied and was highest in Nigeria (8.439, p<0.001) but least in Gabon (1.788, p<0.001).

The data further show that, being in state II promotes the likelihood of having ALSE relative to state I. Despite slight disparity in odds ratio of having ALSE among women in state II across the countries in sub-Saharan Africa, the data is evidenced that, among the 12 countries where significant relationship was found, the likelihood was highest in Swaziland (2.913, p<0.001) and lowest in Congo Democratic Republic (1.270, p<0.05). The countries where significant relationship was not found between state II and state I are Burundi, Tanzania, Sao Tome & Precipe and Lesotho.

Table 4. Logistic regression of attaining at least secondary level of education according to state of age at first marriage/cohabitation (AFMC) and age at first birth (AFB) by country

Regional block	State of AFMC and AFB		
Country	I	II	III
	Odds ratio	Odds ratio	Odds ratio
Eastern Africa			
Burundi	1(Ref. Cat.)	1.175	3.822*
Uganda	1(Ref. Cat.)	1.948*	5.420*
Zambia	1(Ref. Cat.)	1.436**	4.656*
Tanzania	1(Ref. Cat.)	1.165	3.016*
Central Africa			
Congo Democratic Republic	1(Ref. Cat.)	1.270***	2.085*
Cameroun	1(Ref. Cat.)	2.265*	5.453*
Gabon	1(Ref. Cat.)	1.374**	1.788*
Sao Tome and Precipe	1(Ref. Cat.)	1.044	3.364*
Western Africa			
Burkina Faso	1(Ref. Cat.)	1.931*	6.056*
Cote d'Ivoire	1(Ref. Cat.)	1.962*	3.403*
Ghana	1(Ref. Cat.)	1.842*	3.175*
Nigeria	1(Ref. Cat.)	1.375*	8.439*
Southern Africa			
Lesotho	1(Ref. Cat.)	1.268	5.044*
Namibia	1(Ref. Cat.)	1.839*	5.302*
South Africa	1(Ref. Cat.)	1.832*	3.803*
Swaziland	1(Ref. Cat.)	2.913*	7.088*

*I: Both (AFB and AFMC)<18; II: Either (AFB or AFMC) <18; III: Both (AFB and AFMC)≥18; *Significant at 0.1%; *Significant at 1%; *Significant at 5%; R.C: Reference Category*

Table 5 depicts the results from the correlation analysis and ordinary linear regression of AFMC, AFB and number of years of schooling. The data show that across all the 16 countries studied, there was positive statistically significant correlation between AFB and number of years of schooling. This implies that the higher the AFB, the higher the number of years of schooling. Also, in all the countries studied, the regression parameter β indicates that if AFB is increased by one year, the number of years of schooling will also increase by some months. For example, in Burundi, a year increase AFB will increase the number of years of schooling by 0.291 (p<0.001). While this effect was highest in Nigeria (β=0.453; S.E=0.008, p<0.001) from western Africa, it was lowest in Gabon (β=0.084; S.E=0.016, p<0.001) from Central Africa. As for AFMC, across all the 16 selected countries, positive correlation exists between the AFMC and number of years of schooling (p<0.001). This data show that an increase in AFMC will also cause an increase in number of years of schooling. For instance, in Tanzania, if a AFMC is increased by a year, the number of years of schooling will increase by 0.277 (S.E=0.014, p<0.001). The effect was mostly felt in Nigeria (β=0.556; S.E=0.007, p<0.001) and least in Gabon (β=0.092; S.E=0.010, p<0.001).

Table 5. Correlation analysis and ordinary linear regression of number of years of schooling according to country by age at first birth and age at first marriage (*Unadjusted and Interaction effect*)

Region	Age at 1st	Number of years of schooling					
Country	(Birth;	Unadjusted				Interaction	
	Marr./Co.)	r	R^2	β	S.E	β	S.E
Eastern Africa							
Burundi	*AFB*	0.276*	0.076	0.291*	0.016	-0.116*	0.033
	AFMC	0.343*	0.118	0.352*	0.015	0.451*	0.032
Uganda	*AFB*	0.311*	0.097	0.372*	0.018	0.156*	0.025
	AFMC	0.352*	0.124	0.383*	0.016	0.285*	0.023
Zambia	*AFB*	0.355*	0.126	0.350*	0.015	0.305*	0.018
	AFMC	0.255*	0.065	0.193*	0.012	0.061*	0.014
Tanzania	*AFB*	0.240*	0.058	0.257*	0.015	0.096*	0.021
	AFMC	0.276*	0.076	0.277*	0.014	0.213*	0.020
Central Africa							
Congo Democratic R	*AFB*	0.134*	0.018	0.136*	0.015	0.034	0.019
	AFMC	0.182*	0.033	0.176*	0.014	0.156*	0.018
Cameroun	*AFB*	0.325*	0.105	0.352*	0.013	0.131*	0.014
	AFMC	0.430*	0.185	0.394*	0.010	0.331*	0.012
Gabon	*AFB*	0.091*	0.008	0.084*	0.016	0.047**	0.016
	AFMC	0.151*	0.023	0.092*	0.010	0.083*	0.011
Sao Tome & Pricipe	*AFB*	0.268*	0.072	0.213*	0.022	0.171*	0.026
	AFMC	0.215*	0.046	0.150*	0.020	0.068**	0.023
Western Africa							
Burkina Faso	*AFB*	0.228*	0.052	0.189*	0.008	0.014	0.013
	AFMC	0.279*	0.078	0.249*	0.009	0.236*	0.014
Cote d'Ivoire	*AFB*	0.175*	0.031	0.156*	0.013	0.051*	0.015
	AFMC	0.255*	0.065	0.187*	0.010	0.165*	0.012
Ghana	*AFB*	0.258*	0.067	0.294*	0.023	0.145*	0.031
	AFMC	0.279*	0.078	0.316*	0.023	0.218*	0.031
Nigeria	*AFB*	0.394*	0.155	0.453*	0.008	0.061*	0.011
	AFMC	0.508*	0.258	0.556*	0.007	0.514*	0.010
Southern Africa							
Lesotho	*AFB*	0.318*	0.101	0.281*	0.016	0.180*	0.020
	AFMC	0.310*	0.096	0.254*	0.015	0.149*	0.019
Namibia	*AFB*	0.337*	0.114	0.341*	0.018	0.322*	0.019
	AFMC	0.162*	0.026	0.121*	0.014	0.042**	0.014
South Africa	*AFB*	0.259*	0.067	0.274*	0.016	0.257*	0.017
	AFMC	0.133*	0.018	0.105*	0.012	0.037**	0.013
Swaziland	*AFB*	0.391*	0.153	0.496*	0.029	0.429*	0.031
	AFMC	0.271*	0.073	0.235*	0.021	0.135*	0.021

*Significant at 0.1%; *Significant at 1%; *Significant at 5%; AFB: Age at first birth; AFMC: Age at first marriage/co-habitating*

Interaction of the influence of AFB and AFMC also produce positive effect on number of years of schooling. The regression equation for Uganda as an example is $y = 0.262 + 0.156AFB + 0.285AFMC$. This shows that if a woman's AFMC and AFB are increased by a year, the AFB will influence the number of years of schooling by 0.156(S.E=0.025, p<0.001) while AFMC will influence it by 0.285(S.E=0.023, p<0.001). The contribution of the influence of AFMC was higher than AFB in 10 out of the 16 countries studied. It is striking that in all the countries studied in Southern Africa (Lesotho, Namibia, South Africa and Swaziland), the contribution of AFB was higher than that of AFM. Also, introducing AFMC and AFB together into the regression equation removed completely the statistical relationship between AFB and number of years of schooling in Congo Democratic Republic and Burkina Faso.

4. DISCUSSION, LIMITATION AND CONCLUSION

4.1 Discussion

The study revealed that the mean age at first birth was highest in Burundi and least in Uganda. These statistics are in accordance with the record of world fact book, where the mean age at first birth was reported to be 21.3 in Burundi and 18.9 in Uganda [15]. The average age at first marriage/co-habitation was highest in Namibia and least was experienced by the Burkina Faso women. Also, countries in Southern Africa experienced higher mean age at first marriage than countries selected from other regional blocks in sub-Saharan Africa. The possible explanation for Southern Africa countries' situation regarding late marriage may be the end result of apartheid which characterised the greater part of the last century in the region. In this context, marriage structure of countries in the region is different from other countries in sub-Saharan Africa.

Based on the available data, we found that, higher proportion of Zambia women had attained at least secondary education than women from other countries and the least was reported by women in Burkina Faso. A long-standing educational goal in Zambia has been that every child must have access to basic education. Although, Zambia is one of the poorest countries in the world, the country has made laudable progress in increasing access and gender parity in school [10]. The introduction of the free basic

education policy across the country in 2002 through the support of UNICEF has increased the enrolment in basic education levels [39]. Burkina Faso on the other hand is the ninth poorest country in the world [10] and more than 80% of the population still live in rural areas where access to formal education remains low. Despite concerted efforts to double its literacy rate from 12.8% in 1990 to 25.3% in 2008, Burkina Faso had some of the lowest net enrolment rates in the world in 2002 and a sizeable gender gap. As a result, in 2007, the government and its development partners were determined to reform the education system by removing fee payment from public primary school [1]. This effort has not manifested in secondary school enrolment in the country.

The effect of early childbearing on educational attainment was found to be highest in Nigeria where women who had their first birth at ages above 17 years were four times more likely to attain at least secondary education than those who had their first birth at ages 17 years and below. But such risk was least in Gabon. The finding for Nigeria is expected as the educational system does not permit pregnant students in either primary or secondary school to remain in school during the period of pregnancy. In most cases, the victims do not return to school after delivery due to stigmatisation from teachers and school mates. Often the parents see such child as a disgrace to them and consequently may not show willingness in investing in her education even if she intends to return to school. This is the situation in most sub-Saharan African countries and the consequence is drop out and absenteeism among young women and girls.

We found that women who married at ages above 17 years were more likely to have ALSE than those who married at earlier years. This pattern was seen across all the countries included in the study. For instance, in Zambia the likelihood was approximately four, but as much as 7 in Nigeria. The finding is consistent with revelation from Ikamari study conducted in Kenya where a strong positive effect was found between age at first marriage and level of education even when he controlled for potential confounding factors [40]. Our data further revealed that the likelihood of attaining ALSE was highest in state III where a woman married at ages above 18 years and had her first child at the same age range. Poor education was experienced by women who either married or gave birth to their first child at ages below 18

years (state I). This pattern was similar across the studied countries but variation exists in the risks.

When age at first marriage and first birth were analysed in quantitative terms, the interaction generated positive consequence on number of years of schooling. Meltem and colleagues' study corroborates this finding where they found that the impact of increased schooling on marriage and early fertility persists beyond the completion of compulsory schooling for an important duration [41]. In our study, it is essential to know that while the contribution of age at first marriage to the regression equation was higher than that of age at first birth in 10 out of the 16 countries studied, the converse scenario was observed in all the Southern African countries (Lesotho, Namibia, South Africa and Swaziland). The variation might be a result of differential in education policy of countries in sub-Saharan Africa. For instance, in South Africa, education policy allows secondary school girls to remain in-school during pregnancy which is not the case in some other sub-Saharan African countries. Also, the apartheid era had significant impact on family formation, marriage and childbearing dynamics of women in the regional block thus justifying the pattern found in our study.

4.2 Limitation

The study used the same data source, however the data were collected in different years. Variation in data collection timing could pose some elements of bias to this study's outcome as educational attainment, child marriage and early childbearing situations might have been different from what the situation was in earlier years and the contemporary times. It is quite obvious that early marriage and early childbearing are not the only factors that could influence educational attainment. Many factors do contribute to the level of formal education a girl attains in life. These factors should have been included as control in this study to explore the effect of their interaction with age at first birth and age at first marriage on educational advancement through a longitudinal survey. Such longitudinal surveys are scarce in sub-Saharan Africa. Therefore, longitudinal studies including these factors are highly recommended.

4.3 Conclusion

Early childbearing and child marriage have strong negative influence on educational advancement of women in sub-Saharan Africa whether considered independently or jointly. Although, there was discrepancy in these effects across countries, the pattern of the influence was similar. Early childbearing and child marriage are inimical to success that could have been achieved in female educational advancement in sub-Saharan Africa. Tackling the effect of early childbearing and child marriage on educational attainment is a daunting but possible task that requires political will and proactive multi-faceted strategies. Government, policy-makers, donors, and international agencies should be stimulated to take all necessary measures against child marriage and early childbearing in sub-Saharan Africa. Also, strategies to reduce the prevalence of child marriage and early childbearing as well as improvement of girl child education in the region should be developed. Female children, if well educated, will be more empowered and resourceful. This will give them confidence to best able to make key decisions touching their lives.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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