



ORIGINAL ARTICLE

Prevalence and Associated Risk Factors of HIV among Pregnant Adolescents and Adolescent Mothers in the Kumbo West Health District of Cameroon

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Abstract

Objectives: The aim of this study was to determine the prevalence of HIV infection among pregnant adolescents and adolescent mothers and to assess risk factors associated with HIV infection.

Methods: This was an analytical cross sectional study among pregnant adolescents and adolescent mothers, carried out from April to May 2018 in the Kumbo West Health District (KWHD) of Cameroon. We used a multistage sampling design to select 6 health areas. In each of these 6 health areas selected, proportionate sampling method was employed to get 400 participants from the health areas. Data was collected using structured questionnaires and analysed using SPSS version 21. We adjusted for confounding variables (age category, sexual debut, multiple sex partners, irregular/no use of condoms) by carrying out multivariate binary logistic regression.

Results: We used 400 adolescents (68 pregnant and 332 mothers), with mean age 14.5 years (SD = 0.21). The overall prevalence of HIV infection was 4.58% (95% CI: 2.7-6.7) even though, the prevalence of HIV in pregnant adolescents was (4.9%) compared to that in adolescent mothers (3.2%) though not statistically significant ($p = 0.74$). The significant HIV associated risk factors discovered among the two categories were; HIV infection occurring mostly in late adolescence: 15-19 years (AOR 2.05; 95% CI 1.11-4.24), sexual debut before the age of 14 (AOR 2.40; 95% CI 1.14-5.04), having had 2 or more sexual partners in the last 12 months (AOR 1.51; 95% CI 1.04-3.15), and irregular or no use of condom (AOR 1.20; 95% CI 1.04-1.53).

Conclusion: There is a need to address adolescent pregnancy not only as a health outcome but as a risk factor for HIV infection. Preventing adolescent pregnancies is important in a comprehensive HIV prevention in Cameroon.

Keywords

Prevalence, HIV, Risk factors, Adolescents, Pregnancy, Cameroon

Introduction

Adolescents are growing up in a context marked by pervasive poverty, limited educational opportunities, high (Human Immunodeficiency Virus) HIV prevalence, widespread conflicts, and weak social controls [1]; all pre-disposing factors to poor sexo-reproductive health outcomes. The World Health Organization (WHO) has established that, HIV is one of the most important sexually transmitted infection [2]. This is not different in Cameroon as it has been shown that unprotected sex presents the dual risk of unwanted pregnancy and HIV infection especially among adolescents [3]. These risks are disproportionately borne by young women and the period of adolescence is a period of emerging sexual desires, behaviors and relationships. The sexo-reproductive health of adolescent girls is a public health issue, especially because the world has a larger population of adolescents now than ever before [4].

Adolescent girls having unprotected heterosexual intercourse are at risk of HIV infection and unwanted pregnancy [5]. In Cameroon, HIV prevalence for the population ages 0-14, 15-49, 15-64 are 0.2%, 3.4% and 3.7%, respectively [6]. This is such that, the HIV prevalence for 0-14 years is the first direct measurement among that age group and merits more targeted research to better understand HIV epidemiology in children. However, there is little evidence to indicate whether pregnancy in adolescence or adolescent motherhood increases the risk of an HIV infection. There is no disaggregated data on the prevalence of HIV in Cameroon among pregnant adolescents and adolescent mothers. It has been established in Cameroon that, the disparity in HIV prevalence between males and females is most pronounced among younger adults, with women in age groups 15-19, 20-24 and 25-29 all having prevalence at least triple that of males in the same age groups [6]. It is worthy to highlight that, the HIV Prevalence among 15-24 year olds is 1.2%: 2.0% among females and 0.4% among males [6]. Multiple partners and non-use of condoms also increase the risks of HIV transmission [7]. Efforts to end AIDS will impact on other health targets, including on reducing maternal mortality, preventing deaths of newborns and children under the age of 5 years, improve *sexo-reproductive health* [8]. The most important aspect of adolescent health is *sexo-reproductive health* (SRH) [9].

A qualitative study carried out in Kumbo West Health District of Cameroon by Wirsy, et al. reported that knowledge on *sexo-reproductive health* issues is low among adolescent girls including both pregnant adolescents and adolescent mothers with majority of them getting information on *sexo-reproductive health* from their peers. The issue of lack/insufficient *sexo-reproductive health* education in schools is a reality [10]. Also, having a sexual partner(s) and engaging in premarital sex is common. Equally it was established that, adolescents engaged in unprotected sexual practices as a way of making money and for livelihood [10]. Drinking dry marijuana mixed with water, concoctions and sachet whisky were identified as local methods employed by adolescent girls to induce abortion [10]. *Sexo-reproductive health* services were available in the community but received low utilization because of perceived negative attitude and intrusiveness of the community health workers, confidentiality and social norms [10]. To maintain *sexo-reproductive health*, adolescents need access to accurate information and to the safe, effective, affordable, and acceptable contraception method of their choice [11]. However, due to a host of biological, social and economic factors, adolescent girls can be at high risk of adverse *sexo-reproductive health* outcomes, including unintended pregnancy, unsafe abortion, HIV infection and other sexually transmitted infections. Should they give birth, adolescent girls are also at elevated risk for poor health

outcomes for themselves and their newborns, including at the extreme, death [6]. We therefore sought in this study to determine the prevalence of HIV infection among pregnant adolescents and adolescent mothers, establish HIV risky behaviours among participants and the risk factors associated with HIV infection in participants.

Operational Definition of Terms

“Sexo-reproductive” health

This is a term coined in this study to mean the state of complete physical, mental and social well-being in all matters relating to the reproductive system such that, people are able to have a satisfying and safe sex life, the capability to reproduce, and the freedom to decide if, when, and how often to do so.

Adolescent

Adolescence, according to WHO refers to the period between the ages of 10 and 19 years in which the individual progresses from the initial appearances of secondary sexual characteristics to full sexual maturity and during which psychological and emotional processes develop from those of a child to those of an adult.

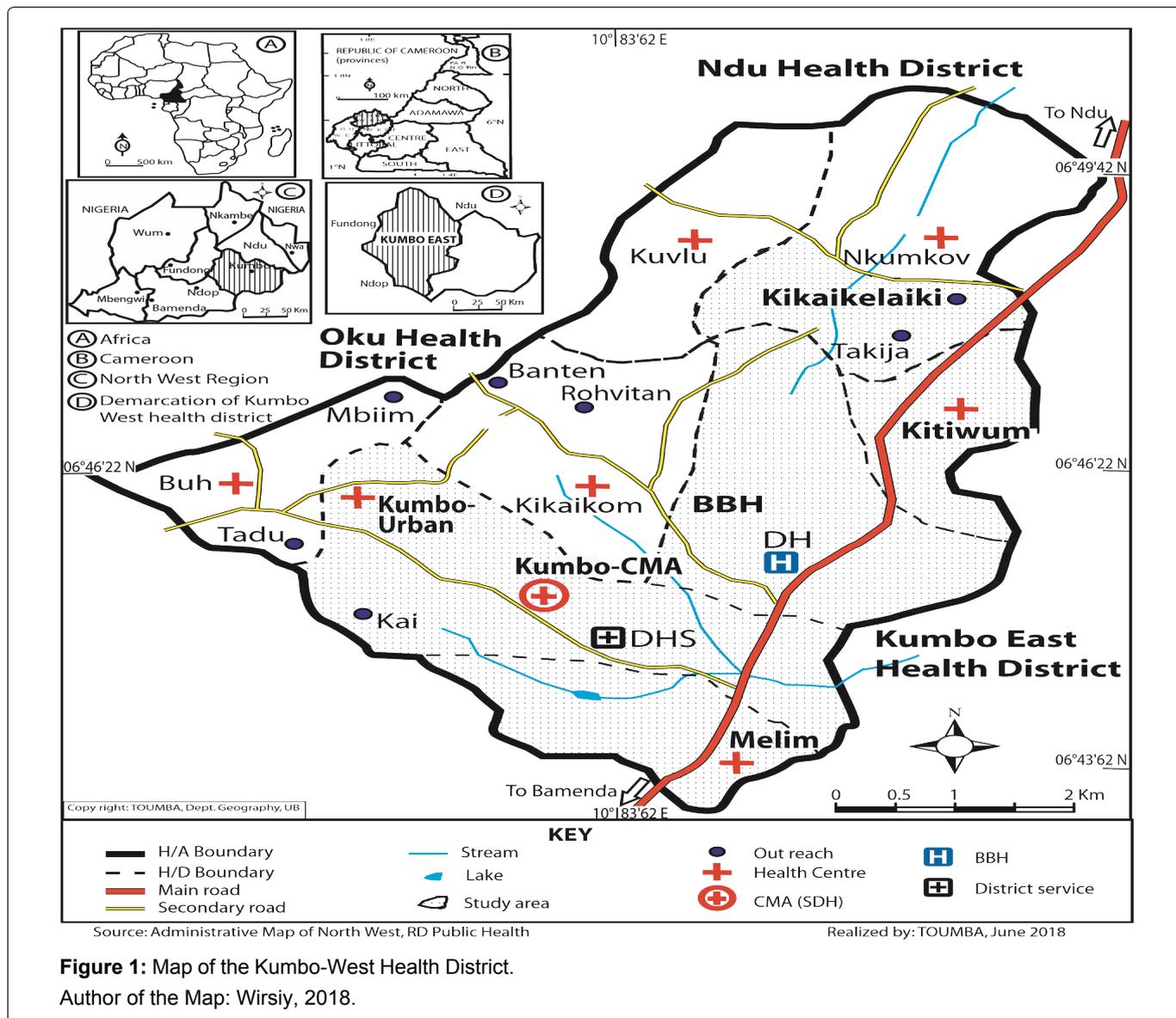
Methods

Study design

This was an analytical cross-sectional study among pregnant adolescents and adolescent mothers carried out from April to May 2018 in the Kumbo West Health District, a semi-urban/rural community composed of eleven health areas [12], (Figure 1 shows map of Kumbo West Health District) in Cameroon. The study involved community mobilization. The target population were pregnant adolescents and adolescent mothers both early and late adolescents aged 10-14 years and 15-19 years respectively. Young girls who were not in the age range of 10-19 years and were not resident in the selected communities for the study were excluded. The sample size was determined in consideration of the analysis according to the Population Division of the United Nations [13].

Study area

This study was specifically carried out in six randomly selected health areas of the Kumbo West Health District namely Bansa Baptist Hospital-BBH, Kikaikelaiki, Kitiwum, Kumbo_CMA, Kumbo_Urban and Melim. Kumbo is the second-largest city in the North West region of Cameroon and the capital of Bui Division. Kumbo is split into three distinctive hilly settlements of Tobin, Mbveh, and Squares [14]. Kumbo is known for horse racing and traditional medicine, and also for its palace (Nso Palace), a market and two big hospitals.



Sample size determination

The minimum sample size was estimated using formula for cross-sectional studies [15]. $n = \frac{Z^2 P(1-P)}{d^2}$. Since there was no similar study in Cameroon, we estimated a 50% proportion. Considering: 95% ($Z = 1.96$) confidence interval, and 5% margin error. Therefore $n = \frac{(1.96) (1.96) \times 0.5 (1-0.5)}{(0.05) (0.05)} = 384$.

To take care of anticipated non responses of participants, 4% was added to the computed sample making up $n = 384 + 16 = 400$. Thus, 400 adolescent (68 pregnant and 332 mothers) were surveyed.

Sampling

Multi-stage cluster sampling was used to select 6 health areas from the Kumbo West Health district namely BBH, Kikaikelaiki, Kitiwum, Kumbo_CMA, Kumbo_Urban and Melim in the Bui division of the North-West region of Cameroon and the 400 participants were further selected using systematic random sampling from households (Figure 2). The various participants were then obtained via probability proportionate to size

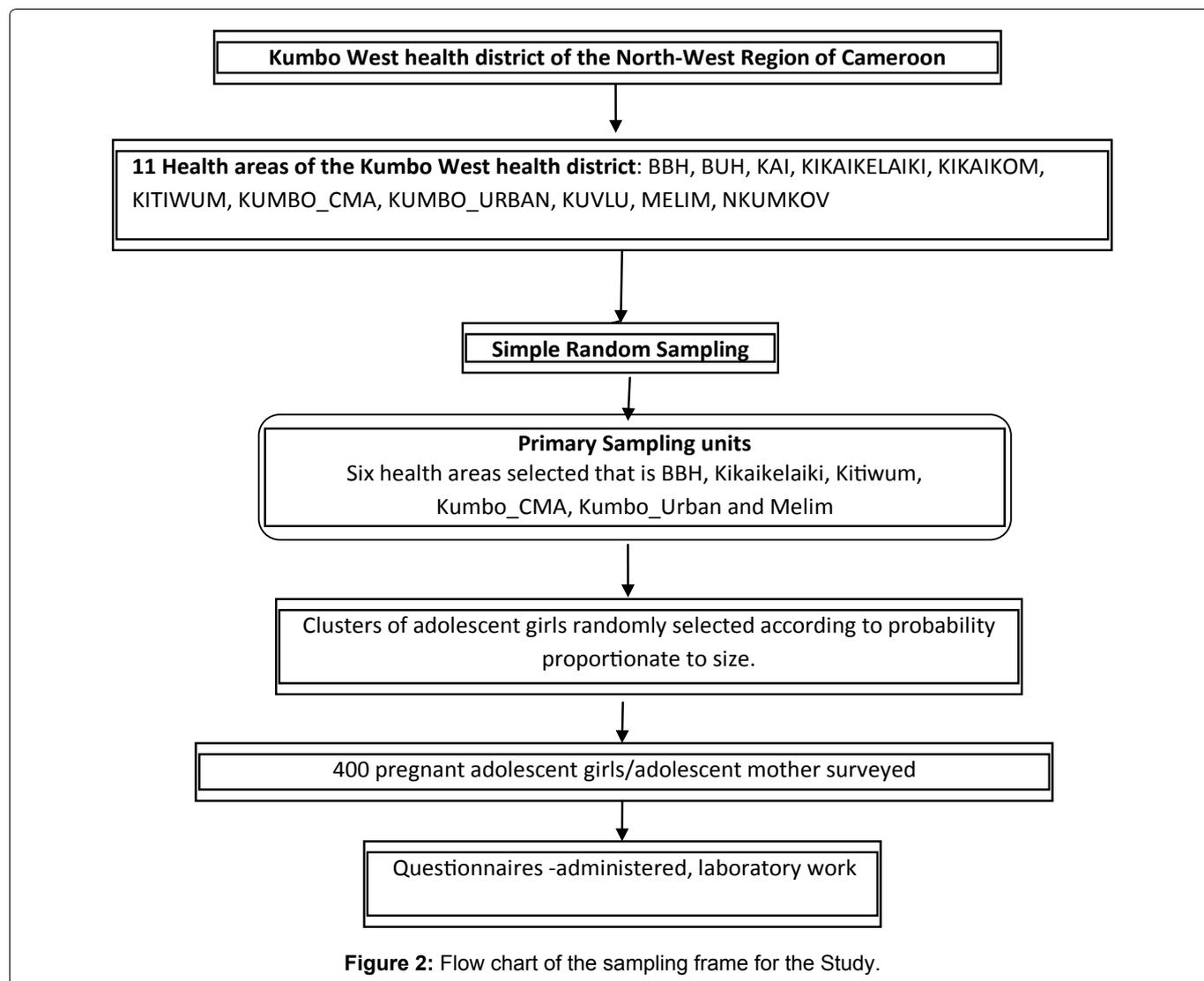
from the respective selected health areas.

Community Mobilization

Mobilization activities at the selected communities were conducted before the survey team started fieldwork in each cluster. The community mobilization team focused on using key messages of the survey. Mobilization team consisted of individuals who are well-known and respected in the community and were trained to facilitate communication about the survey. The community leaders were consulted and provided with information on the purpose of the survey to share with their community members. During the fieldwork, designated survey staffs monitored the local community response, and addressed/clarify any questions/concerns regarding the survey especially as the study area is experiencing a socio-political unrest.

Administration of Questionnaires

A structured questionnaire was administered to selected adolescent girls who agreed to participate in the study. The questionnaires were interviewed-administered in English/Pidgin-English. The questionnaire was



made up of four sections namely, i) HIV test results, ii) Socio-Demographic Information, iii) Source of information on reproductive health, knowledge related factors and lastly, iv) Attitude, Perception and Practice related questions.

Laboratory Diagnosis for HIV Testing

HIV testing and counseling was conducted in some selected facilities of the various selected communities. Informed consent/parental/guardian permission/procedures for the laboratory survey was used for the field practice. The participants were asked for their consent to collect a blood sample for biologic testing and return of results. Standard phlebotomy techniques were used in the collection of the blood sample by trained nurses. HIV rapid testing was conducted by survey staff after completion of pre-test counseling. The HIV Rapid-Test result defined HIV status among participants in this survey. Rapid HIV testing was conducted according to the Cameroon national HIV testing algorithm [16] at the time of data collection.

Patient and Public Involvement Statement

Patients were not involved in the original systemic review that underpinned Guidance for Reporting

Involvement of Patients and the Public (GRIPP) and they didn't contribute to identifying the issue of inconsistent reporting, the need for guidance, and the research questions. The patient partners, recruited nearly half of all participants for this survey. The patient partners didn't contribute to edits of the paper. The results of this study will be disseminated to all study participants via a workshop. The authors will equally disseminate the results of this study through conference presentations.

The community leaders as part of the public, were involved in the study as community mobilization coordinators. They were consulted and provided with information on the purpose of the survey to share with their community members. They didn't contribute to edits of the paper.

Data Management

A coded number was given to identify each participant. Collected data was firstly entered into the research log book. Research questionnaires as well as work books and other study materials were stored safely in a locker in a safe location and secured by locking it with a lock. After collection of the data, the

questionnaires were checked visually for completeness, obvious errors, and inconsistencies and then corrected. Data collected was entered daily into an electronic questionnaire (template) created in Epi info version 7 by the investigator. During the data entry process, 10% of data entered at the beginning was checked to ensure that the data was correctly entered. For confidentiality, the computer in which the data was stored was password protected and the information was accessible only to the researcher. Data was backed-up in an external hard drive and email box. The data was then imported into Microsoft excel spread sheet for cleaning/editing and finally analysed using social science package statistical software version 21.

Data Analysis

The analysis of participant demographics and outcome variables was summarized using descriptive summary measures: expressed as mean (standard deviation) or median (minimum-maximum) for continuous variables and number (percentages) for categorical variables. The chi-squared test for binary outcomes was used. The Bonferroni method was used to adjust the level of significance for testing for secondary outcomes to keep the overall level at $\alpha = 0.05$. For all group comparisons, the results were expressed as effect (or odds ratio for binary outcomes), corresponding two-sided 95% confidence intervals and associated p-values. P-values were reported to two/three decimal places with values less than 0.001 reported as < 0.001 . Adjusted analyses using baseline covariates were performed using regression techniques to investigate the residual impact of key baseline characteristics on the outcomes (HIV risky behaviours among participants and the risk factors associated with HIV infection in participants). We adjusted for confounding variables (age category, sexual debut, multiple sex partners, irregular/no use of condoms) by carrying out multivariate binary logistic regression.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of the Faculty of Health Sciences (IRB-FHS N°: 765-03) of the University of Buea. The administrative approval was obtained from the Regional Delegation of Public Health for the North West Region of Cameroon. Informed consent/parental/guardian/permission/assent was taken from every participant prior to collection of data and interviews were conducted in private.

Results

Sociodemographic characteristics of participants

This study included 400 adolescents (68 pregnant and 332 mothers), 30.5% of participants were 10-14 years old and 69.5% were 15-19 years old. The participants' mean age was 14.5 years (SD = 0.21). Majority (87.3%) of the participants were single, 10.0% were either married/cohabiting and 2.7% were either divorced,

separated or widowed. 81.0% of the participants were Christians and 19.0% were Muslims. Regarding education level, 7.0% had no formal education, 70.0% had attended primary education, 13.0% had attended secondary school and 10.0% had attended tertiary education. Their reported occupation status included students (37.0%), apprentice (10.5%), employed (20.5%) and unemployed (32.0%). Majority (62.7%) of the participants were semi-urban dwellers (Table 1).

Prevalence of HIV Infection among adolescent mothers and pregnant adolescents

The overall prevalence of HIV infection was 4.58% (95% CI: 2.7-6.7) among study participants. The prevalence of HIV in pregnant adolescents was higher (4.9%) compared to that of adolescent mothers (3.2%) though not statistically significant ($p = 0.74$).

HIV risky behaviours among adolescent mothers and pregnant adolescents

The mean age at first sexual intercourse was 13.1 (SD = 1.65). Majority (57.5%) of the participants reported

Table 1: Sociodemographic characteristics of adolescent mothers and pregnant adolescents (n = 400) in KWHD, 2018.

Variables	N _o (%)
Age groups (years)	Mean = 14.5 SD = 0.21
10-14	122 (30.5)
15-19	278 (69.5)
Marital status	
Single	349 (87.3)
Married/cohabiting	40 (10.0)
Divorced/widowed/separated	11 (2.7)
Motherhood status	
Pregnant adolescent	68 (17.0)
Adolescent mother	332 (83.0)
Religion	
Christian	324 (81.0)
Muslim	76 (19.0)
Level of education	
No formal education	28 (7.0)
Primary education	280 (70.0)
Secondary education	52 (13.0)
Tertiary education	40 (10.0)
Occupation	
Student	148 (37.0)
Apprentice	42 (10.5)
Unemployed	128 (32.0)
Employed	82 (20.5)
Residence	
Rural	149 (37.3)
Semi-Urban	251 (62.7)

SD: Standard Deviation.

Table 2: HIV risky behaviours among adolescent mothers and pregnant adolescent girls in KWHD, 2018.

Variables	N _o (%)
Age at first sexual intercourse	Mean = 13.1 SD = 1.65
< 14 years	230 (57.5)
≥ 14 years	170 (42.5)
Number of sexual partners in past 12 months	Mean = 1.65 SD = 0.42
< 2 partners	266 (66.5)
≥ 2 partners	134 (33.5)
History of STD in the past 12 months	
No	303 (75.7)
Yes	97 (24.3)
Condom used during last sexual intercourse	
No	210 (52.5)
Yes	190 (47.5)
Use of alcohol and local concoctions as emergency contraceptives	
No	338 (84.5)
Yes	62 (15.5)

SD: Standard deviation; STD: Sexually Transmitted Disease.

Table 3: Multivariate binary logistic regression models of the factors associated with HIV infection among adolescent mothers and pregnant adolescents in KWHD, 2018.

Variables	Bivariate analysis		Multivariate analysis	
	UOR (95% CI)	P-value	AOR (95% CI)	P-value
Age group (years)				
10-14	1		1	
15-19	2.11 (1.20-4.60)	0.004	2.05 (1.11-4.24)	0.007
Marital status				
Single	1			
Married	0.74 (0.41-2.01)	0.451		
Widowed/divorced	1.42 (0.94-3.4)	0.771		
Educational status				
No formal education	1		1	
Primary education	0.72 (0.4-0.95)	0.211	0.67 (0.32-0.85)	0.251
Secondary education+	0.54 (0.25-1.76)	0.072	0.40 (0.20-0.11)	0.061
Religion				
Christian	1		1	
Muslim	0.84 (0.42-1.20)	0.09	0.81 (0.69-1.87)	0.541
Age at first sexual intercourse (Year)				
> 14	1		1	
< 14	2.55 (1.22-5.54)	< 0.001	2.40 (1.14-5.04)	< 0.001
Number of sexual partners in the past 12 months				
< 2 partners	1		1	
≥ 2 partners	1.62 (1.10-3.22)	0.007	1.51 (1.04-3.15)	0.005
History of STD in the past 12 months				
No	1		1	
Yes	1.11 (1.21-3.22)	0.042	1.01 (0.90-3.02)	0.075
Regular use of condom				
Yes	1		1	
No	1.22 (1.05-1.55)	0.03	1.20 (1.04-1.53)	0.042

UOA: Unadjusted Odds Ratio; AOR: Adjusted Odds Ratio; STD: Sexually Transmitted Diseases; Statistical significance is indicated in bold.

having had their first sexual intercourse before the age of 14. The mean number of sexual partners in the past 12 months was 1.65 years old (SD = 0.42) and 33.5% of the participants had more than 2 sexual partners in the past 12 months. About one quarter (24.3%) of the participants reported having had sexually transmitted diseases in the past 12 months. About half (52.5%) of the participants reported not having used condom during their last sexual intercourse. The use of sachet whisky and locally made concoctions as emergency contraceptive was still common (15.5%) among participants (Table 2).

Risk factors associated with HIV infection among adolescent mothers and pregnant adolescents

On bivariate analysis, factors demonstrating significant relationships with risk of HIV infection were age group 15-19 years (UOR 2.11; 95% CI 1.20-4.60), having had first sexual intercourse before the age of 14 (UOR 2.55; 95% CI 1.22-5.54), having had 2 or more sexual partners in the last 12 months (UOR 1.62; 95% CI 1.10-3.22), having had a history of STD in the last 12 months (UOR 1.11; 95% CI 1.21-3.22) and irregular or no use of condom (UOR 1.22; 95% CI 1.05-1.55). However, after adjusting for confounding, only age categories 15-19 years (AOR 2.05; 95% CI 1.11-4.24), having had first sexual intercourse before the age of 14 (AOR 2.40; 95% CI 1.14-5.04), having had 2 or more sexual partners in the last 12 months (AOR 1.51; 95% CI 1.04-3.15), and irregular or no use of condom (AOR 1.20; 95% CI 1.04-1.53) remained significant and strongly associated with HIV infection (Table 3).

Discussion

The results support the hypothesis that girls who have an early, but not later, adolescent pregnancy are more likely to become HIV infected. The study provides strong evidence of the fact that the practice of unprotected sex among adolescents is common which may lead to pregnancy and an incident of HIV infection thus establishing the possibility that HIV infection occurred simultaneously or preceded the early pregnancies. This finding suggests that behavioural factors may be important in the increased risk of an incident HIV infection, adding to the results of earlier studies that suggest same [5,17,18] as well as the fact that higher transmission of HIV in pregnancy is also biological and the result of hormonal changes during pregnancy [19,20].

Risky behaviours of HIV acquisition towards adolescent pregnancy

The risky behaviours of HIV acquisition towards adolescent pregnancy was associated with early start of sexual activity (during their early adolescent ages that is between 10-14 years old) as well as subsequently having two or more sexual partners. This reflect studies

carried out by the WHO [21], Honor, et al. [22], Rachel, et al. [23] and Dinh, et al. [24] which establish the fact that adolescent pregnancy was associated with early start of sexual activity and having two or more sexual partners. In the same light, our study also showed that adolescent pregnancy was associated with non-use of contraceptives specifically the condom during the first sexual encounters and their last sexual intercourse. This relates to studies of Guleria, et al. [25], Breuner, et al. [26], Emmanuelle, et al. [27], Devika, et al. [28] and Rachel, et al. [29]. The use of sachet whisky and locally made concoctions as emergency contraceptives was still common among participants and this supports the study of Robert and Philip [30] and Consolata [31] who added that this locally made concoctions are equally used for abortion purposes.

Risk factors associated with HIV infection in participants

In this study, the risk factors associated with HIV Infection in participants demonstrating significant relation were, having had first sexual intercourse before the age of 14, having had 2 or more sexual partners in the last 12 months, having had a history of STI in the last 12 months and irregular or no use of condom. This paper builds on the previous works of Justman, et al. [32], Hina, et al. [33], Jenny, et al. [34], Suhee, et al. [35] and Cherrie, et al. [36] which found that child sexual abuse increased the risk of subsequent HIV infection among the same group of young women, history of other STD, early sexual encounters and non-use of condoms were associated with adolescent pregnancy. The United States Presidents Emergency Plan for AIDS Relief [37] also establishes that young women are facing a triple threat. They are at high risk of HIV infection, have low rates of HIV testing, and have poor adherence to treatment. Adolescents reporting an early pregnancy at the age of 14 or younger would all, by legal definition, have experienced child sexual abuse. However, qualitative data from the participants in this study indicated that, although some of these early sexual relationships were experienced as abusive, others were described as more equitable as such, relating to studies of Santhya and Shireen [38]. There is a complex interplay between adolescents' perceptions of autonomy and ability to consent to sexual intercourse, and the need for protective measures to prevent early marriages and child sexual abuse.

Interventions to address adolescent sexual risk behaviours

Behavioural interventions are common that address adolescent sexual risk behaviour and that aim to reduce unwanted pregnancies and HIV infection [39-43]; but the question remains- how sustainable are these interventions? Some studies have equally investigated adolescent pregnancy and HIV as co-occurring

outcomes, and prevention interventions have focused on the simultaneous prevention of both [44,45]. This study suggests the importance of preventing early adolescent pregnancy as related to incident and subsequent HIV infection. Critical Interventions that focus on mHealth are important such that adolescents will be provided with sustainable/long-term mobile based Reproductive Health Scheme that will basically involve the provision of accurate and persuasive information on how adolescents can meet their sexo-reproductive health needs.

Cameroon and HIV infection

In Cameroon, young women represent 7 in 10 of all youths aged 15 - 24 who are HIV infected [46]. Cameroon has one of the youngest and most youthful populations with 61.95% of the 24.9 million Cameroonians aged between 0 ± 24 years [47]. Cameroon successfully rolled back HIV infections especially as the prevalence decreased from 5.3% in 2010 [6] to 3.4% in 2018 [6]. Nonetheless, our findings present an opportunity for new and creative prevention approaches that specifically target young semi-urban/rural adolescent girls in low resource settings. Part of the strategic response to HIV in Cameroon, has been the institutionalization of voluntary counselling and testing for HIV services across the country [48]. The Ministry of Public Health has been striving hard to provide for the educational and medical needs of orphans and vulnerable (OVC) children, vocational training for the out-of-school OVC and income generating activities for foster families and families headed by children [49]. A continuous multi-sectorial approach headed by the government to solve the problem of OVC due to AIDS is very important. Also, specific sexo-reproductive health schemes including HIV prevention initiatives especially from a Mhealth perspective targeting young people in semi-urban/rural areas are a direct investment to a productive and future workforce of a nation.

Conclusion

Adolescent girls who experienced an early adolescent pregnancy had an increased incidence of HIV infection. Adolescent pregnancies may lead to sexual risk behaviours such as higher partner numbers and a greater age difference with partners rather than only a biological explanation of hormonal changes during pregnancy. This study didn't examined risk factor pathways thus, further research is required to investigate the pathways through which early adolescent pregnancy increases the risk of subsequent HIV infection. There is a need to address adolescent pregnancy not only as a health outcome but as a risk factor for HIV infection. Thus, preventing early adolescent pregnancies is important in a comprehensive HIV prevention strategy in Sub-Saharan African countries with significant HIV prevalence, such as Cameroon.

Limitation

This study did not examine HIV infection in relation to substance abuse/drug injecting among the pregnant adolescents and adolescent mothers. This phenomena has been examined and reported in a different study by the same authors.

Acknowledgement

This is part of a Ph.D. thesis by Wirsiy Frankline Sevidzem under the supervision of Prof. Nsagha Dickson Shey and co-supervision of Prof. Omer Njajou and Dr. Joseph Besong Besong in the Department of Public Health and Hygiene of the University of Buea. We acknowledge all stakeholders including the District Medical Officer of Kumbo West Health District, Regional Delegate for Public Health-North West Region, Chief of Health Centres, Community leaders and colleagues for their contributions in the realisation of this study. We equally acknowledge all the participants of this study for their collaboration.

Authors' Contributions

FSW, DSN, ON and JBB designed and executed the research study. FSW was the principal investigator. FSW analysed the data and performed statistics. DSN, ON and JBB interpreted the data. DSN and ON supported data integration and project management. FSW, DSN, ON, JBB wrote the manuscript. All authors reviewed and approved the final manuscript.

Funding

No funding for the study was available.

Disclaimer

The views expressed are those of the authors.

Competing interests

The authors declare that they have no competing interests.

Participant consent

Obtained.

Ethics approval

The study was approved by the Institutional Review Board of the Faculty of Health Sciences, Buea in Cameroon under study number 765-03.

Provenance and peer review

Not commissioned; externally peer reviewed.

Data sharing statement

No additional data available.

References

1. Kabiru C, Izugbara C, Beguy D (2013) The health and wellbeing of young people in sub-Saharan Africa: An under-researched area? *BMC Int Health Hum Rights* 13: 11.

2. World Health Organisation (2016) HIV/AIDS and other sexually transmitted infections.
3. Dupas P, Huillery E, Seban J (2017) Risk information, risk salience, and adolescent sexual behavior: Experimental evidence from Cameroon. 145: 151-175.
4. Singh S, Darroch J, Lori SA (2014) Adding it up- The costs and benefits of investing in sexual and reproductive health. *Guttmacher Inst* 6: 58.
5. Christofides NJ, Jewkes RK, Dunkle KL, Nduna M, Shai NJ, et al. (2014) Early adolescent pregnancy increases risk of incident HIV infection in the Eastern Cape, South Africa: A longitudinal study. *J Int AIDS Soc* 17: 18585.
6. Ministry of Public Health Cameroon (2018) Cameroon Population-based HIV Impact Assessment Results, CAMPHIA. 1-6.
7. WHO (2016) Global health sector strategy on HIV 2016-2021.
8. UNICEF (2016) Strategy for health.
9. Jessica LM, Hamid R (2015) Adolescent sexual and reproductive health: The global challenges. *Int J Gynecol Obstet* 131: S40-S42.
10. Wirsy FS, Nsagha DS, Njajou OT, Besong JB (2019) A qualitative analysis of predictors of 'Sexo-Reproductive' health needs of adolescent girls in the Kumbo West Health District of Cameroon. *J Environ Sci Public Health* 3: 182-209.
11. Salam RA, Faqqah A, Sajjad N, Lassi ZS, Das JK, et al. (2016) Improving adolescent sexual and reproductive health: A systematic review of potential interventions. *J Adolesc Health* 59: S11-S28.
12. KWHDS (2015) Health system-Kumbo West Health District: Micro-Plannification Document of Kumbo West Health District Service, 5-6.
13. United Nations (2017) Sub-Saharan Africa - Adolescents and young people.
14. Ngoran G (2015) The people of Nso. The Nso Heritage.
15. Charan J, Biswas T (2013) How to calculate sample size for different study designs in medical research? *Indian J Psychol Med* 35: 121-126.
16. Ministry of Public Health, National AIDS Control Committee (2015) National Guideline on the prevention and management of HIV in Cameroon 214: 40-59.
17. Businge C, Longo-M, Mathews V (2016) Risk factors for incident HIV infection among antenatal mothers in rural Eastern Cape, South Africa. *Glob Health Action* 9: 29060.
18. Edelstein Z, Santelli J, HELLERINGER S, Schuyler A, Wei Y, et al. (2015) Factors associated with incident HIV infection versus prevalent infection among youth in Rakai, Uganda. *J Epidemiol Glob Health* 5: 85-91.
19. Heffron R (2018) Biological changes during, after pregnancy may increase HIV risk in women. *Healio*.
20. Kerry T, Hughes J, Baeten J, John-S, Celum C, et al. (2018) Increased risk of HIV acquisition among women throughout pregnancy and during the postpartum period: A prospective per-coital-act analysis among women with HIV-Infected partners. *J Infect Dis* 218: 16-25.
21. World Health Organization (2014) The sexual and reproductive health of younger adolescents.
22. Young H, Burke L, Gabhainn SN (2018) Sexual intercourse, age of initiation and contraception among adolescents in Ireland: Findings from the health behaviour in school-aged children (HBSC) Ireland study. *BMC Public Health* 18: 362.
23. Skinner SR, Robinson M, Smith MA, Robbins SC, Mattes E, et al. (2015) Childhood behavior problems and age at first sexual intercourse: A prospective birth cohort study. *Pediatrics* 135: 255-263.
24. Son DT, Oh J, Heo J, Huy N, Minh H, et al. (2016) Early sexual initiation and multiple sexual partners among Vietnamese women: Analysis from the multiple indicator cluster survey, 2011. *Glob Health Action* 9: 29575.
25. Guleria S, Juul K, Munk C, Hansen B, Arnheim D, et al. (2017) Contraceptive non use and emergency contraceptive use at first sexual intercourse among nearly 12000 Scandinavian women. *Acta Obstet Gynecol Scand* 96: 286-294.
26. Breuner C, Mattson G (2016) Committee on adolescence, committee on psychosocial aspects of child and family health. Sex edu for children and adolesc. *Pediatr* 138: e20161348.
27. Godeau E, Saoirse N, Celine V, Jim R, Will B, et al. (2008) Contraceptive use by 15-year-old students at their last sexual intercourse. *Arch Pediatr Adolesc Med* 162: 66-73.
28. Mehra D, Agardh A, Petterson K, Östergren P (2012) Non-use of contraception: Determinants among Ugandan university students. *Glob Health Action* 5: 18599.
29. Mola R, Pangui AC, Sháyra A, Layane S, Mayara R, et al. (2016) Condom use and alcohol consumption in adolescents and youth. *Einstein (Sao Paulo)* 14: 143-151.
30. Leke R, Nana P (2012) Abortions in low resource countries. *Intech Open*.
31. Mureithi Consolata W (2010) Self-care health seeking behaviour of the piave community in Nakuru District, Kenya. University of SA.
32. Justman J, Befus M, Hughes J, Wang J, Golin CE, et al. (2015) Sexual behaviors of US women at risk of HIV acquisition: A longitudinal analysis of findings from HPTN 064. *AIDS Behav* 19: 1327-1337.
33. Talib H, Silver E, Coupey S, Bauman L (2013) The Influence of individual, partner, and relationship factors on hiv testing in adolescents. *AIDS Patient Care STDS* 27: 637-645.
34. Petrak J, Byrne A, Baker M (2000) The association between abuse in childhood and STD/HIV risk behaviours in female genitourinary (GU) clinic attendees. *Sex Transm Infect* 76: 457-461.
35. Kim S, Lee C (2016) Factors affecting sexually transmitted infections in South Korean high school students. *Public Health Nurs* 33: 179-188.
36. Cherrie B, Mary-A, Lance M, Jesse C, Jeanne M, et al. (2006) Sociodemographic Markers and behavioral correlates of sexually transmitted infections in a nonclinical sample of adolescent and young adult women. *J Infect Dis* 194: 307-315.
37. (2018) The United states presidents emergency plan for AIDS Relief. Adolescent Girls and Women.
38. Santhya K, Jejeebhoy S (2015) Sexual and reproductive health and rights of adolescent girls: Evidence from low- and middle-income countries. *Glob Public Health* 10: 189-221.
39. Debra K, Andrew D, Alwyn C, Danielle L (2003) Preventing sexual risk behaviors and pregnancy among teenagers: Linking research and programs. *Guttmacher Institute*.

40. Bonell C, Imrie J (2001) Behavioural interventions to prevent HIV infection: rapid evolution, increasing rigour, moderate success. *Br Med Bull* 58: 155-170.
41. Manlove J, Fish H, Moore KA (2015) Programs to improve adolescent sexual and reproductive health in the US: A review of the evidence. *Adolesc Health Med Ther* 6: 47-79.
42. Downs J, De Bruin, Baruch J, Pamela J (2015) Behavioral decision research intervention reduces risky sexual behavior current HIV research. *Curr HIV Res* 13: 439-446.
43. (2015) HIV prevention programmes overview. AVERT.
44. UNICEF (2018) HIV/AIDS and children. Unite for children.
45. Nancy S, Sandra I, Salim A, Nina H, Julia H, et al. (2011) HIV prevention transformed: The new prevention research agenda. *Lancet* 378: 269-278.
46. Nsagha DS, Marcelin NN, Assob JCN, Njundah AL (2014) A public health model and framework to mitigate the impact of orphans and vulnerable children due to HIV/AIDS in Cameroon. *SciRes* 4: 27-37.
47. (2018) Cameroon Demographics Profile 2018. CIA World Factbook.
48. Nsagha DS, Njunda AL, Kamga HLF, Assob JCN, Bongkem EA (2012) HIV-1/HIV-2 co-infection among voluntary counselling and testing subjects at a regional hospital in Cameroon. *Afr Health Sci* 12: 276-281.
49. Nsagha DS, Bissek AC, Nsagha SM, Assob JC, Kamga HL, et al. (2012) The burden of orphans and vulnerable children due to HIV/AIDS in Cameroon. *Open AIDS J* 6: 245-258.