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Early motherhood among adolescents in Mbuji-Mayi, Democratic Republic of Congo: Prevalence and Determinants

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Abstract

Teenage motherhood remains a major global public health concern, particularly in developing countries. According to the World Health Organization (WHO), more than two million adolescent girls become pregnant each year, leading to serious health, social, and economic consequences. This study aimed to determine the prevalence and associated factors of teenage motherhood in Mbuji-Mayi, Democratic Republic of Congo.

A cross-sectional analytical study was conducted among 1,256 adolescent girls aged 10 to 19 years. A simple multistage sampling method was applied across ten health zones of the city. Data were collected confidentially through KoboCollect after informed consent and analyzed using SPSS version 20. Bivariate associations were tested with Chi-square, and multivariate analyses employed binary logistic regression at a 5% significance level.

The prevalence of teenage motherhood was 16%. Significant associated factors included being among the eldest children (aOR = 1.48; 95% CI: 1.00–2.18), non-schooling (aOR = 25.55; 95% CI: 16.75–38.99), low maternal education (aOR = 1.72; 95% CI: 1.13–2.62), and a family history of teenage pregnancy (aOR = 2.27; 95% CI: 1.44–3.59).

These findings highlight the urgent need for education, family-based interventions, and targeted reproductive health programs to prevent early motherhood and reduce related morbidity and mortality among adolescents.

Keywords : Prevalence, determinants, early motherhood, Mbuji-Mayi

INTRODUCTION

Early motherhood or pregnancy is one that occurs in the first two years of gynecological age—the time elapsed since walking—and/or when the adolescent is still dependent on the family of origin. For the United Nations, it is early when the girl becomes pregnant before the age of 18.[1]. While for the World Health Organization (WHO), we speak of early pregnancy before the age of 20. In any case, whatever the age, a pregnant teenager inevitably becomes dependent on another person.[2].

Teenage motherhood is a global phenomenon that remains one of the major reproductive health problems. In 2021, according to the United Nations report, approximately 10 percent of babies born worldwide, or nearly 13 million, were born to adolescent girls under the age of 20, 50% of whom were in sub-Saharan Africa.[3][4]In developing regions, an estimated 21 million adolescent girls aged 15 to 19 become pregnant, of whom more than half, 12 million give birth. Of those who do become pregnant, 50% are unwanted and 55% end in abortions with poor quality care, increasing pregnancy-related morbidity and mortality.[5].

In East Africa, the prevalence of early motherhood ranges from 18 to 29% in 5 countries (Kenya, Malawi, Uganda, Tanzania and Zambia) and more than half of these pregnancies were also unplanned.[6]In sub-Saharan Africa, the nine high fertility countries (Angola, Burkina

Faso, Burundi, Chad, Democratic Republic of Congo, Gambia, Mali, Nigeria and Niger) have a very high overall prevalence of early motherhood, at 55.11%, ranging from 28.11 in Burundi to 80.77 in Niger.[7]. On the other hand, the prevalence is relatively low in North Africa at around 9.2%.[8][9].

The Democratic Republic of Congo (DRC) is also facing this challenge. The 2023 Demographic and Health Survey (DHS) showed that one in five adolescent girls aged 15 to 19 has already been pregnant, 33% of whom had no education. Of these adolescent girls, 15% have already had a live birth. Furthermore, the survey showed a low proportion of adolescent girls who have already been pregnant and had a live birth, among those with a higher level of education. While in Kasai Oriental, 17.2% have already been pregnant and nearly 10% have had a live birth.[10]In the DRC, one of the risk factors is limited access to sexual and reproductive health care. This is more noticeable in rural areas than in urban areas. According to the 2018 MICS survey, the fertility rate is higher in rural areas than in urban areas, i.e., 132 versus 82 per 1,000 women. Furthermore, this rate is inversely proportional to the level of education. It is higher among less educated adolescents compared to those with education. Of these pregnant adolescents, nearly 2.1% had a pregnancy before the age of 15 and 19.6% had a live birth before the age of 18.[11]In the eastern part of the DRC, a study conducted in a healthcare setting showed that approximately 14% of women giving birth were under 20 years old on the one hand, and that overall the majority of women (73%) had their first birth before the age of 20 on the other hand.[12].

Several studies have focused on the study of risk factors for teenage pregnancy in low- and middle-income countries. Based on the ecological model, it appears that there are micro and macro factors at several levels that interact to influence this phenomenon. Personal status, behavior, family, friends, school, community, and socioeconomic and political factors that explain teenage pregnancy are noted.[13].

A comprehensive review of studies on the subject, from 2015 to 2022, revealed several risk factors and consequences of early motherhood. These include health factors (drug use, mental disorders, poor access to and use of contraceptive methods, poor access to the healthcare system), sociodemographic factors (poverty, low educational level, non-attendance at school, low or lack of employment by parents, regular absence of parents, poor sexual education, unemployment and economic dependence).[2][13]In sub-Saharan Africa, low education and rural residence are the factors that present the greatest risk.[7]A meta-analysis taking into account all of Africa showed almost the same factors associated with early pregnancy. These

include residence in a rural area (OR: 2.04), having been married (OR: 20.67), not attending school (OR: 2.49), lack of maternal education (OR: 1.88), lack of paternal education (OR: 1.65) and lack of communication between parents and adolescents on sexuality, lack of education of the mother (OR: 1.88), of the father (OR: 1.65), and lack of communication between parents and adolescents on sexual and reproductive health issues (OR: 2.88).[8][14][15].

In addition to these factors, a study conducted in 31 countries in sub-Saharan Africa adds the early onset of sexual intercourse around 15 years of age[9]In Gambia, large families and knowledge of the ovulatory cycle at the end of the period must be added.[16]In India, the study on the disparity of determinants revealed marginalization, low media exposure, relationship with husband before marriage, caste and Hindu religion.[17]However, research has also shown that the prevalence is very high in late adolescence between 17 and 19 years of age, and that being married, having completed primary, secondary and higher education were significantly associated[18]In Rwanda, peer pressure and dependence on someone other than the parent complete the list of factors.[19].While in South Africa teenage girls whose parents are absent are three times more likely to get pregnant than their counterparts[20]In the DRC, in the city of Lubumbashi, access to pornographic films and early sexuality are cited as factors by women.[21].

In East Africa, education level, age at first intercourse, household wealth, family structure, and media exposure were significantly associated with teenage pregnancy in at least one of the five countries.[6].

Early motherhood exposes adolescents to health, social and economic consequences[22]Health consequences include haemorrhages, septicemia, blood pressure disorders, dystocia, complications related to abortions, indirect maternal deaths, late maternal deaths and maternal deaths aggravated by HIV-AIDS, tuberculosis and other infections or non-communicable diseases.[22]. Childbirth in adolescent girls compared to those in women over 20 years of age has a very poor prognosis due to tears, mechanical dystocia, caesarean sections, episiotomies and pathological deliveries, low birth weight and maternal death.[23][24]Worldwide, adolescent sexual and reproductive health problems are among the factors underlying nearly three million deaths recorded worldwide each year.[22]Adolescent girls have a high rate of unwanted pregnancies, which can lead to various deleterious physical, social and economic consequences.[22]In newborns, it is associated with low birth weight.[25], prematurity, low birth weight, fetal distress and contributes to neonatal mortality[15].

The experience of early pregnancy is not at all welcome among adolescent girls because of certain challenges they face. For example, in Ghana, the results show that adolescent girls express some of the negative aspects of motherhood that they have faced and that have affected their lives. The main social challenges are managing economic and financial constraints, resorting to abortion to reduce stigma, and managing additional responsibilities such as caring for the baby and the challenge of returning to school after giving birth.[26].

From the above, despite the scale of early motherhood in the Democratic Republic of Congo, very little scientific research has focused specifically on the province of Kasai Oriental and the city of Mbuji-Mayi in particular. The available data come mainly from national surveys (EDS-DRC), which provide overall estimates without analyzing the sociocultural and economic particularities specific to this province.[10].

However, Kasai Oriental, including the city of Mbuji-Mayi, is characterized by a context marked by poverty and limited access to sexual and reproductive health services. The persistence of traditional norms and early marriages likely to influence early motherhood are still current. The absence of targeted research constitutes a significant gap, which prevents the availability of scientific evidence necessary to guide public health policies and interventions adapted to the local context. Therefore, this study is justified by the need to fill this scientific gap and provide factual knowledge on the extent and determinants useful for planning effective strategies to reduce early motherhood in Mbuji-Mayi.

METHODOLOGY

Study design

A cross-sectional analytical study was conducted in the community of Mbuji-Mayi, the capital of Kasai Oriental Province, one of the 26 provinces of the Democratic Republic of the Congo. The study took place from May to June 2025.

Study setting

The study was conducted in the ten health zones of Mbuji-Mayi city: Bipemba, Bonzola, Dibindi, Diulu, Kansele, Lubilanji, Lukelenge, Mpokolo, Muya, and Nzaba. Each health zone includes several health areas, and a total of 50 health areas (five per health zone) were selected as the framework for the study.

Study population

The target population consisted of adolescent girls aged 10 to 19 years residing in the selected households within the study areas. For this study, an adolescent was defined as any individual aged 10 to 19 years at their last birthday, with a distinction made between *early adolescents* (10–14 years) and *late adolescents* (15–19 years).

Sampling procedure

A simple multi-stage random sampling technique was employed to obtain a representative sample. In each selected health area, five neighborhoods were randomly chosen, followed by five avenues per neighborhood. From each avenue, five households were selected, provided that at least one adolescent girl aged 10–19 years was present.
In total, 1,256 adolescent girls were successfully interviewed.

Inclusion and exclusion criteria

Adolescent girls aged 10–19 years who were present in the selected households and who voluntarily agreed to participate were included in the study. For this study, an adolescent is anyone between the ages of 10 and 19. A distinction is made between young adolescents aged 10 to 14 and older adolescents aged 15 to 19.[22]. Those who were eligible but declined to respond to the questionnaire were excluded.

Data collection

Data were collected using the **KoboCollect** mobile application based on a structured questionnaire that had been developed, pretested, and standardized prior to field deployment. The questionnaire was administered to each participant in French and in the local language, depending on comprehension. The variables collected included sociodemographic and socioeconomic characteristics of the adolescents. The structured questionnaire was specifically developed for this study, pretested among 30 adolescents outside the study areas, and refined for clarity and reliability. An English version of the questionnaire is provided as Supplementary File 1

Study variables

The main study variables were:

- **Dependent variable:** Early motherhood among adolescents.

- **Independent variables:** Age, educational level, occupation, marital status, household socioeconomic conditions, and other sociodemographic characteristics.

Data analysis

Collected data were exported to **SPSS version 20** for analysis. Descriptive statistics (frequencies, means, and medians) were used to summarize quantitative variables, while proportions were calculated for categorical variables.

Bivariate analysis was performed using the **Chi-square test** to identify associations between early motherhood and independent variables. Variables with $p < 0.20$ in bivariate analysis were entered into a **binary logistic regression model (forward stepwise method)** to determine independent predictors. Sensitivity and specificity were calculated with a significance level set at **5% ($p < 0.05$).**

Ethical considerations

Ethical approval for this study was obtained from the Ethics Committee of the [insert name of institution, e.g., University of Kamina or PEV DRC]. Verbal informed consent was obtained from each participant (and from parents or guardians for adolescents under 18 years). Confidentiality and anonymity were strictly maintained throughout the study.

RESULTS

1. Sociodemographic characteristics of adolescent girls

Table 1. Sociodemographic characteristics of adolescent girls surveyed in the city of Mbuji-Mayi

Features	n=1256	%
Age group		
10 to 13	319	25.4
14 to 17	632	50.3
18 and over	305	24.3
Religion		
Catholic	368	29.3
Revival Church	654	52.1
Muslim	34	2.7
Orthodox	43	3.4
Protestant	157	12.5
Order in the siblings		
Eldest in the family	456	36.3
Other	800	63.7
Marital status		
Bachelor	1073	85.4
Divorce	22	1.8
Married	161	12.8
Early Education		
No	123	9.8
Yes	1133	90.2
Who do you currently live with?		
both parents	862	68.6
Husband	141	11.2
mother only	113	9.0
father only	36	2.9
guardians or adoptive parents	104	8.3
Father's education level		
Low level	382	30.4
High level	874	69.6
Mother's education level		
Low level	733	58.4
High level	523	41.6
Merchant	269	21.4
Merchant	536	42.7
Father's work		

Farmer	119	9.5
Other	156	12.4
Employee	510	40.6
Daily	202	16.1
Merchant	269	21.4
Mother's work		
Farmer	104	8.3
Other	118	9.4
Employee	144	11.5
housewife	354	28.2
Merchant	536	42.7

The average age of adolescent girls is 15.25 years (± 2.645) and nearly half of the adolescent girls are between 14 and 17 years old (50.3) for the median age of 15 years. More than half of the adolescent girls (52%) attend revival churches followed respectively by the Catholic church (29.3%), the Protestant church (12.5%). Muslim and Orthodox churches are weakly represented with nearly 3% each. Among the siblings, 36.3% of adolescent girls are eldest in their family, either first or second. The majority (85.4%) are still single compared to 14.6 who have already contracted marriage. It appears that 9 out of 10 adolescent girls surveyed are already attending school. Of all adolescent girls, 68.6% live with both parents, while 2 out of 10 live with one parent or guardian, sometimes an adoptive parent. Mothers have a relatively low level of education (58.4%) compared to fathers (30.4%). (Table 1)

2. Extent of early motherhood among adolescent girls in the city of Mbuji-Mayi

The proportion of adolescent girls who had been pregnant was 16% (95% CI: 14.08 – 18.13), or 201 out of a total of 1256 adolescent girls surveyed. (Figure 1).

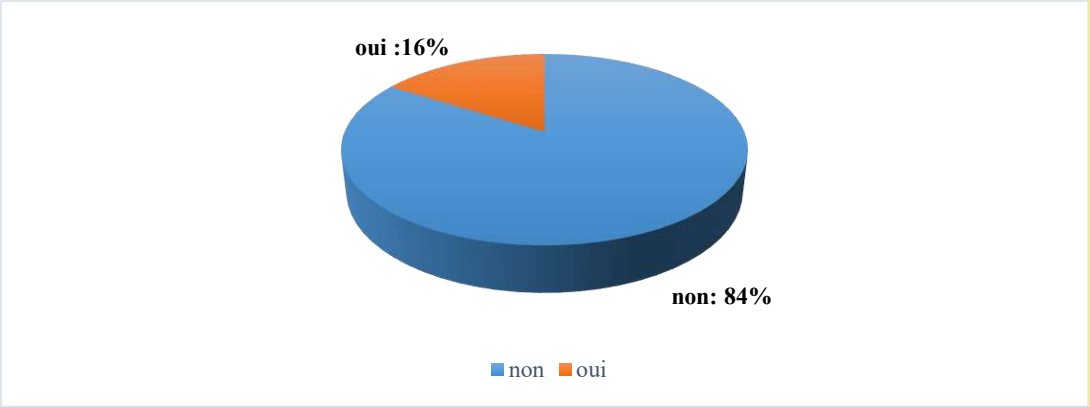


Figure 1. Distribution of adolescent girls according to whether or not they have ever been pregnant in Mbujimayi (n=1256), June 2025.

3. Adolescent girls who have already been pregnant in the health zones of the city of Mbuji-Mayi.

The Bipemba health zone represents more than half of the adolescent girls who have been pregnant (55.8%) followed by Muya (22.8%), Nzaba (19.8%), Mpokolo (15.5%), Dibindi (13.5%), Lubilanji (11.1%), Diulu (10.4) and others. (Figure 1).

Table 2. Distribution of adolescent girls who have already been pregnant at least once by health zone in the city of Mbuji-Mayi.

Health Zone	Having already been pregnant (n=201)
	n(%)
Bipemba	67(55.8)
Bonzola	0(0)
Dibindi	12(13.5)
Diulu	12(10.4)
Kansele	1(9)
Lubilanji	13(11.1)
Lukelenge	4(4.1)
Mpokolo	39(15.5)
Muya	28(22.8)
Nzaba	25(19.8))
City of Mbuji-Mayi	201(100)

4. Association between sociodemographic characteristics and early motherhood

Table 3. Association between sociodemographic and other characteristics of adolescent girls and early motherhood.

Features	To have been pregnant			
	Yes (201) n(%)	**no (1055)** n(%)	**OR [95% CI]**	**p-value**
Order in the siblings				
Elder	86(18.9)	370(81.1)	1,384[1,019-1,881]	0.037
Others	115(14.4)	685(85.6)		
Have started formal education				
Has not started	31(25.2)	92(74.8)	1.09[1.231-2.959]	0.003
Began	170(15.0)	963(85.0)		
Currently be in school				
Not in school	**170(50.6)**	166(49.4)	29.3[19.352-44.5568]	<0.001
educated	31(3.4)	889(96.6)		
School Club Participation				
Participate	18(3.7)	464(96.3)	1.268[0.614-2.6620]	0.520
Do not participate	13(3.0)	425(97.0)		
Parental absence				
Absent	41(16.2)	212(83.8)	From	0.922
Other	160(16.0)	843(84.0)		
Father's education level				
Low level	96(25.1)	286(74.)	2,458[1,806-3,346]	<0.001
High level	105(12.0)	769(88.0)		
Mother's education level				
Low level	156(21.3)	577(78.7)	2,872[2,017-4,088]	<0.001
High level	45(8.6)	478(91.4)		
Having had sexual intercourse				
Had sexual intercourse	198(56.9)	150(43.1)	398.2[125.689-1261.553]	<0.001
Did not have sex	3(0.3)	905(99.7)		
Have received sex education				
No sex education	53(10.5)	452(89.5)	0.478[0.341-0.669]	<0.001
With sex education	148(19.7)	603(80.3)		

Mother's pregnancy history				
Antecedent	59(20.8)	224(79.2)	1,541[1,100-2,160]	0.012
No history	142(14.6)	831(85.4)		
Sister's pregnancy history				
Antecedent	60(31.4)	131(68.6)	3.001[2.108-4.273]	<0.001
No history	141(13.2)	924(86.8)		

The study showed that nine factors are associated with early motherhood among teenagers in the city of Mbuji-Mayi. Being the eldest child in the family: OR1,384[1,019-1,881], not having started formal education: OR1.09[1.231-2.959], non-schooling:29.3[19.352-44.5568], the father's low level of education: OR2,458[1,806-3,346], the mother's low level of education: OR2,872[2,017-4,088], the fact of having had sexual intercourse:398.2[125.689-1261.553], lack of sex education: OR0.478[0.341-0.669], history of adolescent pregnancy in the mother: OR1,541[1,100-2,160]and have a sister with a history of teenage pregnancy: OR3.001[2.108-4.273]. On the other hand, participation in the school club1.268[0.614-2.6620]and the absence of one of the parents1.019[0.701-1.482]are protective factors. (Table 3)

5. Logistic regression of explanatory factors of early motherhood

Table 4. Explanatory factors of early motherhood among adolescents

Explanatory factors	B	SE	Wald	p	Exp(B)	CI for EXP(B) at 95% CIfor	
						lower	superior
Order in the siblings (among the first 2)	0.391	0.198	3,894	0.048	1,478	1,003	2,180
Not being in school	3,241	0.216	226,079	0.000	25,552	16,748	38,985
Low level of education of the mother	0.542	0.215	6,384	0.012	1,720	1,129	2,620
Family history of teenage pregnancy	0.820	0.233	12,357	0.000	2,270	1,437	3,586
Constant	-1,027	0.262	15,403	0.000	0.358		

Legend: B: regression coefficient, ES: Standard error of regression coefficient, Wald: Wald test, p: adjusted p value, Exp(B): adjusted odds ratio, CI: confidence interval.

After the logistic regression, four explanatory factors were retained: the fact that the adolescent was among the eldest, not attending school, the low level of education of the mother and the history of pregnancy in the adolescent in the family (Table 4).

The ROC curve analysis performed on the variable to have been pregnant showed an area under the curve (AUC) of 0.731; 95% CI: 0.683–0.779 ($p < 0.001$). This result indicates that this variable has a discriminatory capacity significantly better than chance. The discrimination performance is in the "acceptable" category, reflecting a good ability to distinguish positive from negative subjects. The confidence interval not including the zero value confirms the statistical robustness of this performance (Figure 2).

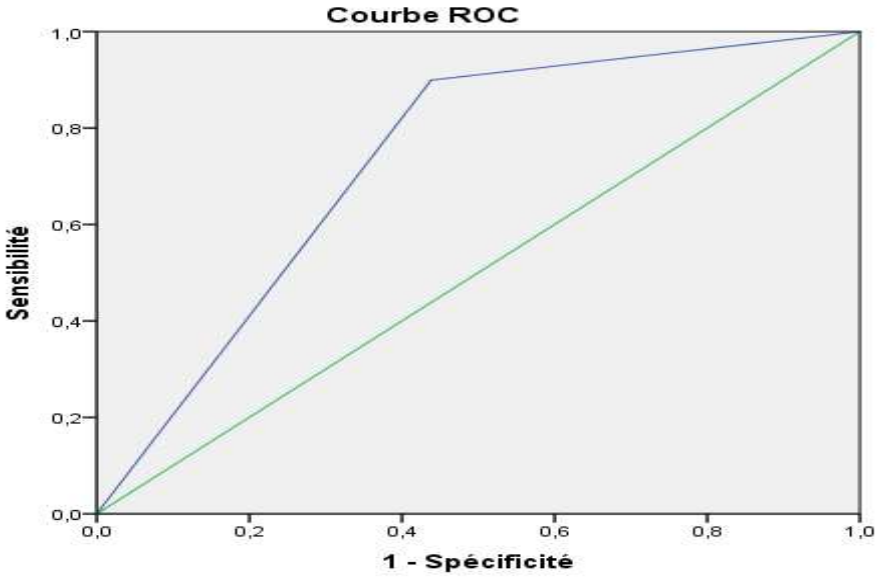


Figure 2. Roc curve of the different explanatory factors of early motherhood.

DISCUSSION

Our study aimed to determine the prevalence and determinants of early motherhood among adolescents in the city of Mbuji-Mayi.

Prevalence of early motherhood among adolescents in the city of Mbuji-Mayi.

Based on the results of our study, the prevalence of early motherhood among adolescents is 16% with a 95% probability that it varies between 14.08 and 18.13%. This prevalence is close to that of 17.2% in the province of Kasai Oriental, in the report of the 2023 demographic and health survey by the National Institute of Statistics (INS)[10]This frequency is also close to

14% found, although in a hospital setting by Christian and in the Kihumbu health zone in the East of the DRC[12]. However, the prevalence is different from that found in other countries, regions of Africa and in the world. It is higher than that found in Gambia (13.2%).[16], Rwanda (13%)[9]North Africa[8]However, this prevalence is significantly lower than the average of 31 countries in Sub-Saharan Africa, with the highest being in Chad (62%).[9]and on the other hand to that of 9 countries with high fertility whose prevalence varies between 28 and 80%[7]It is also lower than that found in East Africa (Kenya, Malawi, Uganda, Tanzania and Zambia) ranging from 18 to 29%[6]These differences between regions in Africa are dependent on norms and traditions, customs and cultures. Furthermore, it should be noted that more than half of pregnant adolescents are in the Bipemba health zone (55.8%). This can be explained by the fact that this health zone is peripheral with a majority of a rural population characterized by poverty, low schooling, and the weight of social norms such as the promotion of early marriages. This has not been confirmed by Bright Opoku Ahinkorah et al.[14]which showed that adolescent girls from rural areas had less risk than others.

Factors associated with early motherhood among adolescents in the city of Mbuji-Mayi.

According to our study, some factors have been identified as significantly associated with early motherhood among teenage girls. Among these factors, there is the fact of being the eldest daughter in the family. There are more teenage girls with pregnancy among the eldest daughters (18.9%) than the others (14.4%) and the eldest daughters have 1.4 times the risk of having early motherhood than those who are not. This high frequency is due to the fact that in Kasai Oriental, the eldest daughters are forced to marry early to give the dowry to the beneficiaries, and this under the influence and pressure of the parents. This reality confirms one of the results of Hye Won Chung et al who cites the parental influence to marry early on their daughters[13]. However, other studies have shown that in sub-Saharan Africa, early marriage is a major risk factor for early sexual relations and pregnancies. Those who marry early have 20 times (OR: 20.67) more risk of pregnancy than those who do not.[8]This was also proven by a study conducted in Ethiopia where married adolescent girls have 25 times more risk than others (AOR = 25.38; 95% CI: 15.33, 42.02)[18]Even in Senegal, the girl is considered an object, mothers push their daughter to hang out with rich men and they think mothers who think that at a certain age their daughter must have a boyfriend otherwise she is not worthy of being their daughter[1].

Additionally, not having a formal education (OR:1.09),non-schooling:(OR: 29.3) were found in our study to be significantly associated with early motherhood. Adolescent girls who do not attend school have 29 times the risk of experiencing early pregnancy and motherhood than those

who are educated. Several other studies have also reported this fact. For example, Mayang et al in India[17], Yohannes Dibaba Wado et al in some East African countries such as(Kenya, Malawi, Uganda, Tanzania and Zambia)[6], Tadele Biresaw Belachew et al in Sub-Saharan Africa[7], Getachew Mullu Kassa et al in the systematic review and meta-analysis in Africa[8], Bewuketu Terefe et al in a study conducted in Gambia[16], Bright Opoku Ahinkorah et al[14]. In Rwanda too, adolescent girls with little or no education have 24 times the risk of early motherhood than others (AOR = 23.76, 95% CI: 6.833–82.630, $p < 0.001$). It is true, as the WHO specifies, that the lack or low educational prospects of adolescents makes them among the risk factors for early pregnancies and related health problems.[4]Low education reduces access to information on sexual and reproductive health and ignorance of the complications of early pregnancy. It limits socio-economic prospects and reinforces the dependency of young girls, which increases the risk of early motherhood.[2].

In relation to the educational level of the father and mother, the adolescent girl whose father and mother have a low educational level runs respectively 2.4 and 2.8 times the risk of early motherhood than the one whose parents are educated (<0.001). This result has also been confirmed by other studies. For example, Getachew Mullu Kassa et al found that in Africa, low education of the father and mother increases the risk of early motherhood twice as much as in the opposite case.[8].

Regarding having had sexual intercourse, the risk of early motherhood is 398 times higher than those who did not (<0.001). This corroborates the results of other studies such as in sub-Saharan Africa where the prevalence of early motherhood varies between 36.5% (in Rwanda) and 76.5% (in Chad) among those who had already had at least one sexual intercourse.[14][13]. As for the'lack of sex education, the association with early motherhood is also proven ($p<0.001$). This is also in line with the result of Hye Won Chung et al in the systematic review that found the absence of sexual and reproductive education in the family as a risk factor in developing countries.[13][8]However, sex education for adolescent girls reduces the risk of early motherhood according to the study conducted by I. Nshimiyimana, M. Monica et al.[19]. Finally, our study also found that a history of teenage pregnancy in the mother and in a daughter in the family increases the risk of early motherhood by 2 to 3 times, respectively, as also found by Hye Won Chung et al.[13]

In short, of all the associated factors, logistic regression allowed us to retain four, namely: the fact that the adolescent is among the eldest(aOR = 0.662; 95% CI: 0.445, 0.986), non-schooling(aOR = 45.521; 95% CI: 1.986, 4.680), the mother's low level of education(aOR = 0.515;

95% CI: 0.334, 0.795)and the history of teenage pregnancy in the family(aOR = 0.362; 95% CI: 0.226, 0.599).

CONCLUSION

The aim of this study was to determine the extent and determinants of early motherhood in Mbujimayi. The prevalence of early motherhood is 16%. The determinants are: the adolescent being among the eldest, lack of schooling, low level of education of the mother and history of adolescent pregnancy in the family.

Limits of the study: The limitation of our study is its cross-sectional nature, for which the causal link between early motherhood and the factors studied is not easy to establish.

DECLARATIONS

Abbreviations

aOR: adjusted Odds Ratio; CI: Confidence Interval; DHS: Demographic and Health Survey; DRC: Democratic Republic of Congo; WHO: World Health Organization.

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Ethics Committee of the University of Lubumbashi (Approval No. UNILU/CEM/104/2025). Verbal informed consent was obtained from each participant, and for those under 18 years, consent was also obtained from parents or legal guardians. Participation was voluntary, and confidentiality was strictly maintained.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Conceptualization: Jean Michel M., François K., Michel K. ; Data curation: Jean Michel M., François K. ; Formal analysis: Jean Michel M., François K., Michel K. ; Investigation: Jean Michel M., Deca Blood B., Guislain K., Pauline K., Ignace B., Justine M. ; Methodology: Jean Michel M., François K., Michel K., Pauline K., Justine M. ;Software: Jean Michel M. ; Supervision: Michel K., François K. ; Validation: Jean Michel M., Michel K., Justine M. ; Visualization: Jean Michel M. ; Writing – original draft: Jean Michel M., François K. ; Writing – review & editing: Michel K., François K., Pauline K., Ignace B., Justine M.

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